Konstantinos Anagnostopoulos
Publication and Citation List

1. Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, "*The emergence of expanding space-time in a novel large-N limit of the Lorentzian type IIB matrix model*", PoS **LATTICE2022** (2023) 371 [arXiv:2212.10127], [doi:10.22323/1.430.0371].
   Cited by 2 (2) articles

   The Lorentzian type IIB matrix model is a promising candidate for a non-perturbative formulation of superstring theory. However, it was found recently that a Euclidean space-time appears in the conventional large-N limit. In this work, we add a Lorentz invariant mass term to the original model and consider a limit, in which the coefficient of the mass term vanishes at large N. By performing complex Langevin simulations to overcome the sign problem, we observe the emergence of expanding space-time with the Lorentzian signature.

   1.1 Type: 0 Citation: Harold C. Steinacker, JHEP **05** (2023) 129 [arXiv:2303.08012], doi:10.1007/JHEP05(2023)129

   1.2 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

2. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, "*Progress in the numerical studies of the type IIB matrix model*", arXiv:2210.17537, [doi:10.1140/epjs/s11734-023-00849-x].
   Cited by 4 (1) articles

   The type IIB matrix model, also known as the IKKT model, has been proposed as a promising candidate for a non-perturbative formulation of superstring theory. Based on this proposal, various attempts have been made to explain how our four-dimensional space-time can emerge dynamically from superstring theory. In this article, we review the progress in numerical studies on the type IIB matrix model. We particularly focus on the most recent results for the Euclidean and Lorentzian versions, which are obtained using the complex Langevin method to overcome the sign problem. We also review the earlier results obtained using conventional Monte Carlo methods and clarify the relationship among different calculations.

   2.1 Type: 1 Citation: Yuhma Asano, Jun Nishimura, arXiv:2303.01008

   2.2 Type: 0 Citation: Samuel Laliberte, Suddhasattwa Brahma, arXiv:2304.10509

   2.3 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

   2.4 Type: 1 Citation: Jun Nishimura, Katsuta Sakai, Atis Yosprakob, arXiv:2307.11199

3. Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, "*Complex Langevin studies of the emergent space-time in the type IIB matrix model*", arXiv:2201.13200, [doi:10.1142/9789811261633_0002].
   Cited by 7 (4) articles

   The type IIB matrix model has been proposed as a non-perturbative definition of superstring theory since 1996. We study a simplified model that describes the late time behavior of the type IIB matrix model non-perturbatively using Monte Carlo methods, and we use the complex Langevin method to overcome the sign problem. We investigate a scenario where the space-time signature changes dynamically from Euclidean at early times to Lorentzian at late times. We discuss the possibility of the emergence of the (3+1)D expanding universe.

   3.1 Type: 0 Citation: Joanna L. Karczmarek, Harold C. Steinacker, J.Phys.A **56** (2023) 175401 [arXiv:2207.00399],
   doi:10.1088/1751-8121/acc61e

   3.2 Type: 1 Citation: Jun Nishimura, PoS **CORFU2021** (2022) 255 [arXiv:2205.04726], doi:10.22323/1.406.0255

   3.3 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, arXiv:2209.01255

   3.4 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

3.5 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

3.6 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, JHEP **09** (2022) 031 [arXiv:2206.12468],
doi:10.1007/JHEP09(2022)031

3.7 Type: 0 Citation: Robert Brandenberger, arXiv:2306.12458

4. Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, "*Relationship between the Euclidean and Lorentzian versions of the type IIB matrix model*", PoS **LATTICE2021** (2022) 341 [arXiv:2112.15368], [doi:10.22323/1.396.0341].
Cited by 11 (6) articles

The type IIB matrix model was proposed as a non-perturbative formulation of superstring theory in 1996. We simulate a model that describes the late time behavior of the IIB matrix model by applying the complex Langevin method to overcome the sign problem. We clarify the relationship between the Euclidean and the Lorentzian versions of the type IIB matrix model in a recently discovered phase. By introducing a constraint, we obtain a model where the spacetime metric is Euclidean at early times, whereas it dynamically becomes Lorentzian at late times.

4.1 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2201.13200, doi:10.1142/9789811261633_0002

4.2 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, PoS **LATTICE2022** (2023) 371 [arXiv:2212.10127],
doi:10.22323/1.430.0371

4.3 Type: 1 Citation: Jun Nishimura, PoS **CORFU2021** (2022) 255 [arXiv:2205.04726],
doi:10.22323/1.406.0255

4.4 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, arXiv:2209.01255

4.5 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 428 [arXiv:2112.15390],
doi:10.22323/1.396.0428

4.6 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

4.7 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, JHEP **09** (2022) 031 [arXiv:2206.12468],
doi:10.1007/JHEP09(2022)031

4.8 Type: 0 Citation: Robert Brandenberger, arXiv:2211.11273

4.9 Type: 0 Citation: Atis Yosprakob

4.10 Type: 0 Citation: Maxime Médevielle,
doi:10.17638/03170863

4.11 Type: 0 Citation: Robert Brandenberger, arXiv:2306.12458

5. Mitsuaki Hirasawa, Konstantinos Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, "*A new phase in the Lorentzian type IIB matrix model and the emergence of continuous space-time*", PoS **LATTICE2021** (2022) 428 [arXiv:2112.15390], [doi:10.22323/1.396.0428].
Cited by 9 (5) articles

The Lorentzian type IIB matrix model is a promising candidate for a non-perturbative formulation of superstring theory. In previous studies, Monte Carlo calculations provided interesting results indicating the spontaneous breaking of SO(9) to SO(3) and the emergence of (3+1)-dimensional space-time. However, an approximation was used to avoid the sign problem, which seemed to make the space-time structure singular. In this talk, we report our results obtained by using the complex Langevin method to overcome the sign problem instead of using this approximation. In particular, we discuss the emergence of continuous space-time in a new phase, which we discovered recently.

5.1 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2201.13200, doi:10.1142/9789811261633_0002

5.2 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, PoS **LATTICE2022** (2023) 371 [arXiv:2212.10127], doi:10.22323/1.430.0371

5.3 Type: 1 Citation: Jun Nishimura, PoS **CORFU2021** (2022) 255 [arXiv:2205.04726], doi:10.22323/1.406.0255

5.4 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, arXiv:2209.01255

5.5 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

5.6 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, JHEP **09** (2022) 031 [arXiv:2206.12468], doi:10.1007/JHEP09(2022)031

5.7 Type: 0 Citation: Robert Brandenberger, arXiv:2211.11273

5.8 Type: 0 Citation: Atis Yosprakob

5.9 Type: 0 Citation: Robert Brandenberger, arXiv:2306.12458

6. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, "*Dynamical Compactification of Extra Dimensions in the Euclidean IKKT Matrix Model via Spontaneous Symmetry Breaking*", PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], [doi:10.22323/1.376.0183].
Cited by 1 (1) articles

The IKKT matrix model has been conjectured to provide a promising nonperturbative formulation of superstring theory. In this model, spacetime emerges dynamically from the microscopic matrix degrees of freedom in the large-N limit, and Monte Carlo simulations of the Lorentzian version provide evidence of an emergent (3+1)-dimensional expanding space-time. In this talk, we discuss the Euclidean version of the IKKT matrix model and provide evidence of dynamical compactification of the extra dimensions via the spontaneous symmetry breaking (SSB) of the 10D rotational symmetry. We perform numerical simulations of a system with a severe complex action problem by using the complex Langevin method (CLM). The CLM suffers from the singular-drift problem and we deform the model in order to avoid it. We study the SSB pattern as we vary the deformation parameter and we conclude that the original model has an SO(3) symmetric vacuum, in agreement with previous calculations using the Gaussian expansion method (GEM). We employ the GEM to the deformed model and we obtain results consistent with the ones obtained by CLM.

6.1 Type: 0 Citation: Casey E. Berger, Lukas Rammelmüller, Andrew C. Loheac, Florian Ehmann, Jens Braun, Joaquín E. Drut, Phys.Rept. **892** (2021) [arXiv:1907.10183], doi:10.1016/j.physrep.2020.09.002

7. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, "*Complex Langevin analysis of the spontaneous breaking of 10D rotational symmetry in the Euclidean IKKT matrix model*", JHEP **06** (2020) 069 [arXiv:2002.07410], [doi:10.1007/JHEP06(2020)069].
Cited by 25 (12) articles

The IKKT matrix model is a promising candidate for a nonperturbative formulation of superstring theory. In this model, spacetime is conjectured to emerge dynamically from the microscopic matrix degrees of freedom in the large-N limit. Indeed in the Lorentzian version, Monte Carlo studies suggested the emergence of (3+1)-dimensional expanding spacetime. Here we study the Euclidean version instead, and investigate an alternative scenario for dynamical compactification of extra dimensions via the spontaneous symmetry breaking (SSB) of 10D rotational symmetry. We perform numerical simulations based on the complex Langevin method (CLM) in order to avoid a severe sign problem. Furthermore, in order to avoid the singular-drift problem in the CLM, we deform the model and determine the SSB pattern as we vary the deformation parameter. From these results, we conclude that the original model has an SO(3) symmetric vacuum, which is consistent with previous results obtained by the Gaussian expansion method (GEM). We also apply the GEM to the deformed matrix model and find consistency with the results obtained by the CLM.

7.1 Type: 0 Citation: F.R. Klinkhamer, Acta Phys.Polon.B **53** (2022) 1-A5 [arXiv:2110.15309], doi:10.5506/APhysPolB.53.1-A5

7.2 Type: 0 Citation: F.R. Klinkhamer, Acta Phys.Polon.B **52** (2021) 1339 [arXiv:2106.07632], doi:10.5506/APhysPolB.52.1339

7.3 Type: 0 Citation: Arpith Kumar, Anosh Joseph, Piyush Kumar, PoS **LATTICE2022** (2023) 213 [arXiv:2209.10494], doi:10.22323/1.430.0213

7.4 Type: 0 Citation: F.R. Klinkhamer, Int.J.Mod.Phys.D **30** (2021) 2150105 [arXiv:2105.05831], doi:10.1142/S0218271821501054

7.5 Type: 0 Citation: F.R. Klinkhamer, PTEP **2021** (2021) 013B04 [arXiv:2007.08485], doi:10.1093/ptep/ptaa168

7.6 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, arXiv:2009.08682

7.7 Type: 0 Citation: Frans R. Klinkhamer, PoS **CORFU2021** (2022) 259 [arXiv:2203.15779], doi:10.22323/1.406.0259

7.8 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2201.13200, doi:10.1142/9789811261633_0002

7.9 Type: 0 Citation: Harold C. Steinacker, PoS **CORFU2021** (2022) 232 [arXiv:2204.05679], doi:10.22323/1.406.0232

7.10 Type: 1 Citation: Jun Nishimura, PoS **CORFU2021** (2022) 255 [arXiv:2205.04726], doi:10.22323/1.406.0255

7.11 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 428 [arXiv:2112.15390], doi:10.22323/1.396.0428

7.12 Type: 0 Citation: F.R. Klinkhamer, Class.Quant.Grav. **40** (2023) 124001 [arXiv:2212.00709], doi:10.1088/1361-6382/accef5

7.13 Type: 0 Citation: Harold C. Steinacker, J.Phys.A **54** (2021) 055401 [arXiv:2009.03400], doi:10.1088/1751-8121/abd735

7.14 Type: 0 Citation: Nikhil Tanwar, arXiv:2007.14998

7.15 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, PoS **LATTICE2022** (2023) 371 [arXiv:2212.10127], doi:10.22323/1.430.0371

7.16 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 341 [arXiv:2112.15368], doi:10.22323/1.396.0341

7.17 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

7.18 Type: 1 Citation: Jun Nishimura, PoS **CORFU2019** (2020) 178 [arXiv:2006.00768], doi:10.22323/1.376.0178

7.19 Type: 1 Citation: Genki Fujisawa, Jun Nishimura, Katsuta Sakai, Atis Yosprakob, JHEP **04** (2022) 179 [arXiv:2112.10519], doi:10.1007/JHEP04(2022)179

7.20 Type: 1 Citation: Jun Nishimura, Katsuta Sakai, Atis Yosprakob, arXiv:2307.11199

7.21 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537, doi:10.1140/epjs/s11734-023-00849-x

7.22 Type: 0 Citation: Anosh Joseph, Arpith Kumar, JHEP **10** (2021) 186 [arXiv:2011.08107], doi:10.1007/JHEP10(2021)186

7.23 Type: 1 Citation: Mitsuaki Hirasawa, Akira Matsumoto, Jun Nishimura, Atis Yosprakob, JHEP **09** (2020) 023 [arXiv:2004.13982], doi:10.1007/JHEP09(2020)023

7.24 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

7.25 Type: 0 Citation: Casey E. Berger, Lukas Rammelmüller, Andrew C. Loheac, Florian Ehmann, Jens Braun, Joaquín E. Drut, Phys.Rept. **892** (2021) [arXiv:1907.10183], doi:10.1016/j.physrep.2020.09.002

8. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, "*Dynamical compactification of extra dimensions in the Euclidean type IIB matrix model: A numerical study using the complex Langevin method*", PoS **CORFU2018** (2019) 065 [arXiv:1906.01841], [doi:10.22323/1.347.0065].
Cited by 4 (3) articles

The type IIB matrix model is conjectured to be a nonperturbative definition of type IIB superstring theory. In this model, spacetime is a dynamical quantity and compactification of extra dimensions can be realized via spontaneous symmetry breaking (SSB). In this work, we consider a simpler, related, six dimensional model in its Euclidean version and study it numerically. Our calculations provide evidence that the SO(6) rotational symmetry of the model breaks down to SO(3), which means that the theory lives in a vacuum where 3 out of the 6 dimensions are large compared to the other 3. Our results show the same SSB pattern predicted by the Gaussian expansion method and that they are in quantitative agreement. The Monte Carlo simulations are hindered by a severe complex action problem which is addressed by applying the complex Langevin method.

8.1 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

8.2 Type: 0 Citation: Katsuta Sakai, doi:10.14989/doctor.k22243

8.3 Type: 0 Citation: Efstratios Pateloudis, doi:10.5283/epub.53625

8.4 Type: 0 Citation: Casey E. Berger, Lukas Rammelmüller, Andrew C. Loheac, Florian Ehmann, Jens Braun, Joaquín E. Drut, Phys.Rept. **892** (2021) [arXiv:1907.10183], doi:10.1016/j.physrep.2020.09.002

9. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, "*Complex Langevin analysis of the spontaneous symmetry breaking in dimensionally reduced super Yang-Mills models*", JHEP **02** (2018) 151 [arXiv:1712.07562], [doi:10.1007/JHEP02(2018)151].
Cited by 29 (12) articles

In recent years the complex Langevin method (CLM) has proven a powerful method in studying statistical systems which suffer from the sign problem. Here we show that it can also be applied to an important problem concerning why we live in four-dimensional spacetime. Our target system is the type IIB matrix model, which is conjectured to be a nonperturbative definition of type IIB superstring theory in ten dimensions. The fermion determinant of the model becomes complex upon Euclideanization, which causes a severe sign problem in its Monte Carlo studies. It is speculated that the phase of the fermion determinant actually induces the spontaneous breaking of the SO(10) rotational symmetry, which has direct consequences on the aforementioned question. In this paper, we apply the CLM to the 6D version of the type IIB matrix model and show clear evidence that the SO(6) symmetry is broken down to SO(3). Our results are consistent with those obtained previously by the Gaussian expansion method.

9.1 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, arXiv:2009.08682

9.2 Type: 0 Citation: Zhenning Cai, Xiaoyu Dong, Yang Kuang, arXiv:2007.10198

9.3 Type: 0 Citation: M.V. Ulybyshev, V.I. Dorozhinskii, O.V. Pavlovskii, Phys.Part.Nucl. **51** (2020)
,
doi:10.1134/S1063779620030314

9.4 Type: 1 Citation: Kohta Hatakeyama, Akira Matsumoto, Jun Nishimura, Asato Tsuchiya, Atis Yosprakob, PTEP **2020** (2020) 043B10 [arXiv:1911.08132],
doi:10.1093/ptep/ptaa042

9.5 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2201.13200,
doi:10.1142/9789811261633_0002

9.6 Type: 1 Citation: Keitaro Nagata, Jun Nishimura, Shinji Shimasaki, Phys.Rev.D **98** (2018) 114513 [arXiv:1805.03964],
doi:10.1103/PhysRevD.98.114513

9.7 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 428 [arXiv:2112.15390],
doi:10.22323/1.396.0428

9.8 Type: 1 Citation: Jun Nishimura, Asato Tsuchiya, JHEP **06** (2019) 077 [arXiv:1904.05919],
doi:10.1007/JHEP06(2019)077

9.9 Type: 1 Citation: Keitaro Nagata, Jun Nishimura, Shinji Shimasaki, JHEP **05** (2018) 004 [arXiv:1802.01876],
doi:10.1007/JHEP05(2018)004

9.10 Type: 1 Citation: Toshihiro Aoki, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Asato Tsuchiya, PTEP **2019** (2019) 093B03 [arXiv:1904.05914],
doi:10.1093/ptep/ptz092

9.11 Type: 0 Citation: Toshihiro Aoki

9.12 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, PoS **LATTICE2022** (2023) 371 [arXiv:2212.10127],
doi:10.22323/1.430.0371

9.13 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 341 [arXiv:2112.15368],
doi:10.22323/1.396.0341

9.14 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841],
doi:10.22323/1.347.0065

9.15 Type: 0 Citation: Anosh Joseph, Arpith Kumar, Phys.Rev.D **100** (2019) 074507 [arXiv:1908.04153],
doi:10.1103/PhysRevD.100.074507

9.16 Type: 0 Citation: Pallab Basu, Kasi Jaswin, Anosh Joseph, Phys.Rev.D **98** (2018) 034501 [arXiv:1802.10381],
doi:10.1103/PhysRevD.98.034501

9.17 Type: 0 Citation: Zhenning Cai, Yang Kuang, Hong Kiat Tan, Phys.Rev.D **105** (2022) 014508 [arXiv:2109.12762],
doi:10.1103/PhysRevD.105.014508

9.18 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

9.19 Type: 1 Citation: Jun Nishimura, PoS **CORFU2019** (2020) 178 [arXiv:2006.00768],
doi:10.22323/1.376.0178

9.20 Type: 0 Citation: Maksim Ulybyshev, Christopher Winterowd, Savvas Zafeiropoulos, Phys.Rev.D **101** (2020) 014508 [arXiv:1906.07678],
doi:10.1103/PhysRevD.101.014508

9.21 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

9.22 Type: 0 Citation: Anosh Joseph, Arpith Kumar, JHEP **10** (2021) 186 [arXiv:2011.08107], doi:10.1007/JHEP10(2021)186

9.23 Type: 0 Citation: Ayon Mukherjee, Abhijit Bhattacharyya, Stefan Schramm, Phys.Lett.B **797** (2019) 134899 [arXiv:1807.11319], doi:10.1016/j.physletb.2019.134899

9.24 Type: 1 Citation: Mitsuaki Hirasawa, Akira Matsumoto, Jun Nishimura, Atis Yosprakob, JHEP **09** (2020) 023 [arXiv:2004.13982], doi:10.1007/JHEP09(2020)023

9.25 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

9.26 Type: 0 Citation: I. Basile, J. Mourad, A. Sagnotti, JHEP **01** (2019) 174 [arXiv:1811.11448], doi:10.1007/JHEP01(2019)174

9.27 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

9.28 Type: 0 Citation: Ivano Basile, Riv.Nuovo Cim. **44** (2021) [arXiv:2107.02814], doi:10.1007/s40766-021-00024-9

9.29 Type: 0 Citation: Ivano Basile, arXiv:2010.00628

10. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, "*Monte Carlo studies of dynamical compactification of extra dimensions in a model of nonperturbative string theory*", PoS **LATTICE2015** (2016) 307 [arXiv:1509.05079], [doi:10.22323/1.251.0307].
Cited by 12 (1) articles

The IIB matrix model has been proposed as a non-perturbative definition of superstring theory. In this work, we study the Euclidean version of this model in which extra dimensions can be dynamically compactified if a scenario of spontaneously breaking the SO(10) rotational symmetry is realized. Monte Carlo calculations of the Euclidean IIB matrix model suffer from a very strong complex action problem due to the large fluctuations of the complex phase of the Pfaffian which appears after integrating out the fermions. We employ the factorization method in order to achieve effective sampling. We report on preliminary results that can be compared with previous studies of the rotational symmetry breakdown using the Gaussian expansion method.

10.1 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, arXiv:2009.08682

10.2 Type: 1 Citation: Takehiro Azuma, Yuta Ito, Jun Nishimura, Asato Tsuchiya, PTEP **2017** (2017) 083B03 [arXiv:1705.07812], doi:10.1093/ptep/ptx106

10.3 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 428 [arXiv:2112.15390], doi:10.22323/1.396.0428

10.4 Type: 0 Citation: Nikhil Tanwar, arXiv:2007.14998

10.5 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841], doi:10.22323/1.347.0065

10.6 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, JHEP **02** (2018) 151 [arXiv:1712.07562], doi:10.1007/JHEP02(2018)151

10.7 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 341 [arXiv:2112.15368], doi:10.22323/1.396.0341

10.8 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

10.9 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, PoS **LATTICE2022** (2023) 371 [arXiv:2212.10127], doi:10.22323/1.430.0371

10.10 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537, doi:10.1140/epjs/s11734-023-00849-x

10.11 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

10.12 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

11. Konstantinos Anagnostopoulos, Olaf Lechtenfeld, Dieter Lüst, Hikaru Kawai, Jun Nishimura, Harold Steinacker, Richard Szabo, Satoshi Watamura, George Zoupanos, "*Proceedings, 13th Hellenic School and Workshops on Elementary Particle Physics and Gravity : Workshop on Noncommutative Field Theory and Gravity (CORFU2013-NC)*", Fortsch.Phys. **62** (2014) , [doi:10.1002/prop.v62.9/10].
Cited by 1 (1) articles

11.1 Type: 0 Citation: Masaki J.S. Yang, PTEP **2016** (2016) 3 [arXiv:1510.04783], doi:10.1093/ptep/ptw004

12. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, "*Monte Carlo studies of the spontaneous rotational symmetry breaking in dimensionally reduced super Yang-Mills models*", JHEP **11** (2013) 009 [arXiv:1306.6135], [doi:10.1007/JHEP11(2013)009].
Cited by 30 (7) articles

It has long been speculated that the spontaneous symmetry breaking (SSB) of SO(D) occurs in matrix models obtained by dimensionally reducing super Yang-Mills theory in D=6,10 dimensions. In particular, the D=10 case corresponds to the IIB matrix model, which was proposed as a nonperturbative formulation of superstring theory, and the SSB may correspond to the dynamical generation of four-dimensional space-time. Recently, it has been shown by using the Gaussian expansion method that the SSB indeed occurs for D=6 and D=10, and interesting nature of the SSB common to both cases has been suggested. Here we study the same issue from first principles by a Monte Carlo method in the D=6 case. In spite of a severe complex-action problem, the factorization method enables us to obtain various quantities associated with the SSB, which turn out to be consistent with the previous results obtained by the Gaussian expansion method. This also demonstrates the usefulness of the factorization method as a general approach to systems with the complex-action problem or the sign problem.

12.1 Type: 0 Citation: Nikos Irges, George Koutsoumbas, Konstantinos Ntrekis, Phys.Rev.D **92** (2015) 094506 [arXiv:1503.06431], doi:10.1103/PhysRevD.92.094506

12.2 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2015** (2016) 307 [arXiv:1509.05079], doi:10.22323/1.251.0307

12.3 Type: 1 Citation: Yuta Ito, Jun Nishimura, Asato Tsuchiya, JHEP **03** (2017) 143 [arXiv:1701.07783], doi:10.1007/JHEP03(2017)143

12.4 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, arXiv:2009.08682

12.5 Type: 1 Citation: Takehiro Azuma, Yuta Ito, Jun Nishimura, Asato Tsuchiya, PTEP **2017** (2017) 083B03 [arXiv:1705.07812], doi:10.1093/ptep/ptx106

12.6 Type: 1 Citation: J. Nishimura, Fortsch.Phys. **62** (2014) [arXiv:1405.5904], doi:10.1002/prop.201400040

12.7 Type: 1 Citation: Kohta Hatakeyama, Akira Matsumoto, Jun Nishimura, Asato Tsuchiya, Atis Yosprakob, PTEP **2020** (2020) 043B10 [arXiv:1911.08132], doi:10.1093/ptep/ptaa042

12.8 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2201.13200, doi:10.1142/9789811261633_0002

12.9 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 428 [arXiv:2112.15390], doi:10.22323/1.396.0428

12.10 Type: 0 Citation: Asato Tsuchiya, Phys.Part.Nucl.Lett. **11** (2014) , doi:10.1134/S1547477114070462

12.11 Type: 1 Citation: Keitaro Nagata, Jun Nishimura, Shinji Shimasaki, PTEP **2016** (2016) 013B01 [arXiv:1508.02377], doi:10.1093/ptep/ptv173

12.12 Type: 1 Citation: Jun Nishimura, Asato Tsuchiya, JHEP **06** (2019) 077 [arXiv:1904.05919], doi:10.1007/JHEP06(2019)077

12.13 Type: 2 Citation: Kohta Hatakeyama, Konstantinos Anagnostopoulos, Takehiro Azuma, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, PoS **LATTICE2021** (2022) 341 [arXiv:2112.15368], doi:10.22323/1.396.0341

12.14 Type: 0 Citation: Toshihiro Aoki

12.15 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841], doi:10.22323/1.347.0065

12.16 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, JHEP **02** (2018) 151 [arXiv:1712.07562], doi:10.1007/JHEP02(2018)151

12.17 Type: 1 Citation: Toshihiro Aoki, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Asato Tsuchiya, PTEP **2019** (2019) 093B03 [arXiv:1904.05914], doi:10.1093/ptep/ptz092

12.18 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, PoS **LATTICE2022** (2023) 371 [arXiv:2212.10127], doi:10.22323/1.430.0371

12.19 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

12.20 Type: 1 Citation: Jun Nishimura, PoS **CORFU2019** (2020) 178 [arXiv:2006.00768], doi:10.22323/1.376.0178

12.21 Type: 0 Citation: Yuta Ito

12.22 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Asato Tsuchiya, JHEP **05** (2014) 131 [arXiv:1401.7848], doi:10.1007/JHEP05(2014)131

12.23 Type: 1 Citation: Yuta Ito, Jun Nishimura, Asato Tsuchiya, JHEP **11** (2015) 070 [arXiv:1506.04795], doi:10.1007/JHEP11(2015)070

12.24 Type: 0 Citation: Salman Ahamad Khan, Binoy Krishna Patra, Mujeeb Hasan, arXiv:2004.08868

12.25 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537, doi:10.1140/epjs/s11734-023-00849-x

12.26 Type: 1 Citation: Yuta Ito, Sang-Woo Kim, Yuki Koizuka, Jun Nishimura, Asato Tsuchiya, PTEP **2014** (2014) 083B01 [arXiv:1312.5415], doi:10.1093/ptep/ptu101

12.27 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

12.28 Type: 0 Citation: Harold C. Steinacker, Class.Quant.Grav. **37** (2020) 113001 [arXiv:1911.03162], doi:10.1088/1361-6382/ab857f

12.29 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

12.30 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176], doi:10.22323/1.263.0099

13. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, "*Monte Carlo Simulations of a Supersymmetric Matrix Model of Dynamical Compactification in Non Perturbative String Theory*", PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950], [doi:10.22323/1.164.0226].
Cited by 3 (2) articles

The IKKT or IIB matrix model has been postulated to be a non perturbative definition of superstring theory. It has the attractive feature that spacetime is dynamically generated, which makes possible the scenario of dynamical compactification of extra dimensions, which in the Euclidean model manifests by spontaneously breaking the SO(10) rotational invariance (SSB). In this work we study using Monte Carlo simulations the 6 dimensional version of the Euclidean IIB matrix model. Simulations are found to be plagued by a strong complex action problem and the factorization method is used for effective sampling and computing expectation values of the extent of spacetime in various dimensions. Our results are consistent with calculations using the Gaussian Expansion method which predict SSB to SO(3) symmetric vacua, a finite universal extent of the compactified dimensions and finite spacetime volume.

13.1 Type: 0 Citation: Arpith Kumar, Anosh Joseph, Piyush Kumar, PoS **LATTICE2022** (2023) 213 [arXiv:2209.10494], doi:10.22323/1.430.0213

13.2 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135], doi:10.1007/JHEP11(2013)009

13.3 Type: 0 Citation: Thomas Kaltenbrunner

14. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, "*Towards an Effective Importance Sampling in Monte Carlo Simulations of a System with a Complex Action*", PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531], [doi:10.22323/1.139.0181].
Cited by 2 (1) articles

The sign problem is a notorious problem, which occurs in Monte Carlo simulations of a system with a partition function whose integrand is not positive. One way to simulate such a system is to use the factorization method where one enforces sampling in the part of the configuration space which gives important contribution to the partition function. This is accomplished by using constraints on some observables chosen appropriately and minimizing the free energy associated with their joint distribution functions. These observables are maximally correlated with the complex phase. Observables not in this set essentially decouple from the phase and can be calculated without the sign problem in the corresponding 'microcanonical' ensemble. These ideas are applied on a simple matrix model with very strong sign problem and the results are found to be consistent with analytic calculations using the Gaussian Expansion Method.

14.1 Type: 0 Citation: Joshua H. Cooperman, arXiv:1410.0670, doi:10.1007/s10701-015-9972-8

14.2 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135], doi:10.1007/JHEP11(2013)009

15. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, "*A practical solution to the sign problem in a matrix model for dynamical compactification*", JHEP **10** (2011) 126 [arXiv:1108.1534], [doi:10.1007/JHEP10(2011)126].
Cited by 21 (3) articles

The matrix model formulation of superstring theory offers the possibility to understand the appearance of 4d space-time from 10d as a consequence of spontaneous breaking of the SO(10) symmetry. Monte Carlo studies of this issue is technically difficult due to the so-called sign problem. We present a practical solution to this problem generalizing the factorization method proposed originally by two of the authors (K.N.A. and J.N.). Explicit Monte Carlo calculations and large-N extrapolations are performed in a simpler matrix model with similar properties, and reproduce quantitative results obtained previously by the Gaussian expansion method. Our results also confirm that the spontaneous symmetry breaking indeed occurs due to the phase of the fermion determinant, which vanishes for collapsed configurations. We clarify various generic features of this approach, which would be useful in applying it to other statistical systems with the sign problem.

15.1 Type: 1 Citation: Yuta Ito, Jun Nishimura, PoS **LATTICE2016** (2016) 065 [arXiv:1612.00598], doi:10.22323/1.256.0065

15.2 Type: 1 Citation: Yuta Ito, Jun Nishimura, EPJ Web Conf. **175** (2018) 07019 [arXiv:1710.07929], doi:10.1051/epjconf/201817507019

15.3 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2015** (2016) 307 [arXiv:1509.05079],
doi:10.22323/1.251.0307

15.4 Type: 1 Citation: J. Nishimura, Fortsch.Phys. **62** (2014) [arXiv:1405.5904],
doi:10.1002/prop.201400040

15.5 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531],
doi:10.22323/1.139.0181

15.6 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950],
doi:10.22323/1.164.0226

15.7 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841],
doi:10.22323/1.347.0065

15.8 Type: 1 Citation: Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, JHEP **10** (2012) 147 [arXiv:1208.0711], doi:10.1007/JHEP10(2012)147

15.9 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2011) 135 [arXiv:1108.1293],
doi:10.1007/JHEP10(2011)135

15.10 Type: 1 Citation: Yuta Ito, Jun Nishimura, JHEP **12** (2016) 009 [arXiv:1609.04501],
doi:10.1007/JHEP12(2016)009

15.11 Type: 1 Citation: Jun Nishimura, Int.J.Mod.Phys.A **28** (2013) 1340002 [arXiv:1209.6386],
doi:10.1142/S0217751X13400022

15.12 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, JHEP **02** (2018) 151 [arXiv:1712.07562],
doi:10.1007/JHEP02(2018)151

15.13 Type: 0 Citation: Marco Cristoforetti, Francesco Di Renzo, Luigi Scorzato, Phys.Rev.D **86** (2012) 074506 [arXiv:1205.3996],
doi:10.1103/PhysRevD.86.074506

15.14 Type: 0 Citation: Ayon Mukherjee, Abhijit Bhattacharyya, Stefan Schramm, Phys.Lett.B **797** (2019) 134899 [arXiv:1807.11319],
doi:10.1016/j.physletb.2019.134899

15.15 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

15.16 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135],
doi:10.1007/JHEP11(2013)009

15.17 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, JHEP **12** (2011) 020 [arXiv:1108.5153],
doi:10.1007/JHEP12(2011)020

15.18 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

15.19 Type: 1 Citation: Jun Nishimura, PTEP **2012** (2012) 01A101 [arXiv:1205.6870], doi:10.1093/ptep/pts004

15.20 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

15.21 Type: 0 Citation: Badis Ydri, arXiv:1708.00734

16. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, "*A General approach to the sign problem: The Factorization method with multiple observables*", Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504], [doi:10.1103/PhysRevD.83.054504].
Cited by 26 (9) articles

The sign problem is a notorious problem, which occurs in Monte Carlo simulations of a system with the partition function whose integrand is not real positive. The basic idea of the factorization method applied on such a system is to control some observables in order to determine and sample efficiently the region of configuration space which gives important contribution to the partition function. We argue that it is crucial to choose appropriately the set of the observables to be controlled in order for the method to work successfully in a general system. This is demonstrated by an explicit example, in which it turns out to be necessary to control more than one observables. Extrapolation to large system size is possible due to the nice scaling properties of the factorized functions, and known results obtained by an analytic method are shown to be consistently reproduced.

16.1 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2015** (2016) 307 [arXiv:1509.05079], doi:10.22323/1.251.0307

16.2 Type: 0 Citation: Shinya Aoki, Masanori Hanada, Atsushi Nakamura, JHEP **05** (2015) 071 [arXiv:1410.7421], doi:10.1007/JHEP05(2015)071

16.3 Type: 1 Citation: J. Nishimura, Fortsch.Phys. **62** (2014) [arXiv:1405.5904], doi:10.1002/prop.201400040

16.4 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950], doi:10.22323/1.164.0226

16.5 Type: 0 Citation: Masanori Hanada, Carlos Hoyos, Andreas Karch, Laurence G. Yaffe, JHEP **08** (2012) 081 [arXiv:1201.3718], doi:10.1007/JHEP08(2012)081

16.6 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531], doi:10.22323/1.139.0181

16.7 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841], doi:10.22323/1.347.0065

16.8 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2011) 135 [arXiv:1108.1293], doi:10.1007/JHEP10(2011)135

16.9 Type: 1 Citation: Yuta Ito, Jun Nishimura, JHEP **12** (2016) 009 [arXiv:1609.04501], doi:10.1007/JHEP12(2016)009

16.10 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957], doi:10.22323/1.105.0167

16.11 Type: 1 Citation: Jun Nishimura, Int.J.Mod.Phys.A **28** (2013) 1340002 [arXiv:1209.6386], doi:10.1142/S0217751X13400022

16.12 Type: 0 Citation: Gert Aarts, Frank A. James, JHEP **01** (2012) 118 [arXiv:1112.4655], doi:10.1007/JHEP01(2012)118

16.13 Type: 0 Citation: Rodrigo Delgadillo-Blando, Denjoe O'Connor, JHEP **11** (2012) 057 [arXiv:1203.6901], doi:10.1007/JHEP11(2012)057

16.14 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, JHEP **02** (2018) 151 [arXiv:1712.07562], doi:10.1007/JHEP02(2018)151

16.15 Type: 0 Citation: Yuta Ito

16.16 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537, doi:10.1140/epjs/s11734-023-00849-x

16.17 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534], doi:10.1007/JHEP10(2011)126

16.18 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135], doi:10.1007/JHEP11(2013)009

16.19 Type: 0 Citation: Thomas Kaltenbrunner

16.20 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

16.21 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, JHEP **12** (2011) 020 [arXiv:1108.5153], doi:10.1007/JHEP12(2011)020

16.22 Type: 0 Citation: Gert Aarts, Pramana **84** (2015) [arXiv:1312.0968], doi:10.1007/s12043-015-0981-0

16.23 Type: 1 Citation: Jun Nishimura, PTEP **2012** (2012) 01A101 [arXiv:1205.6870], doi:10.1093/ptep/pts004

16.24 Type: 0 Citation: Gert Aarts, J.Phys.Conf.Ser. **706** (2016) 022004 [arXiv:1512.05145], doi:10.1088/1742-6596/706/2/022004

16.25 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

16.26 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176], doi:10.22323/1.263.0099

17. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, "*A Study of the Complex Action Problem in a Simple Model for Dynamical Compactification in Superstring Theory Using the Factorization Method*", PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957], [doi:10.22323/1.105.0167].
Cited by 3 (0) articles

The IIB matrix model proposes a mechanism for dynamically generating four dimensional space–time in string theory by spontaneous breaking of the ten dimensional rotational symmetry textrmSO(10). Calculations using the Gaussian expansion method (GEM) lend support to this conjecture. We study a simple textrmSO(4) invariant matrix model using Monte Carlo simulations and we confirm that its rotational symmetry breaks down, showing that lower dimensional configurations dominate the path integral. The model has a strong complex action problem and the calculations were made possible by the use of the factorization method on the density of states rhon(x) of properly normalized eigenvalues tildelambdan of the space–time moment of inertia tensor. We study scaling properties of the factorized terms of rhon(x) and we find them in agreement with simple scaling arguments. These can be used in the finite size scaling extrapolation and in the study of the region of configuration space obscured by the large fluctuations of the phase. The computed values of tildelambdan are in reasonable agreement with GEM calculations and a numerical method for comparing the free energy of the corresponding ansatze is proposed and tested.

17.1 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950], doi:10.22323/1.164.0226

17.2 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531], doi:10.22323/1.139.0181

17.3 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135],
doi:10.1007/JHEP11(2013)009

18. K. Anagnostopoulos, K. Farakos, P. Pasipoularides, A. Tsapalis, "*Non-Linear Sigma Model and asymptotic freedom at the Lifshitz point*", arXiv:1007.0355.
Cited by 20 (16) articles

We construct the general O(N)-symmetric non-linear sigma model in 2+1 spacetime dimensions at the Lifshitz point with dynamical critical exponent z=2. For a particular choice of the free parameters, the model is asymptotically free with the beta function coinciding to the one for the conventional sigma model in 1+1 dimensions. In this case, the model admits also a simple description in terms of adjoint currents.

18.1 Type: 0 Citation: Pedro R. S. Gomes, P.F. Bienzobaz, M. Gomes, Phys.Rev.D **88** (2013) 025050 [arXiv:1305.3792],
doi:10.1103/PhysRevD.88.025050

18.2 Type: 0 Citation: Jean Alexandre, arXiv:1009.5834

18.3 Type: 0 Citation: Toshiaki Fujimori, Takeo Inami, Keisuke Izumi, Tomotaka Kitamura, arXiv:1601.06470,
doi:10.1142/9789813203952_0054

18.4 Type: 0 Citation: Toshiaki Fujimori, Takeo Inami, Keisuke Izumi, Tomotaka Kitamura, PTEP **2016** (2016) 013B08 [arXiv:1510.07237],
doi:10.1093/ptep/ptv185

18.5 Type: 0 Citation: Ulf Lindström, PoS **CORFU2017** (2018) 166 [arXiv:1803.08873],
doi:10.22323/1.318.0166

18.6 Type: 0 Citation: Pedro R. S. Gomes, M. Gomes, JHEP **06** (2016) 173 [arXiv:1604.08924],
doi:10.1007/JHEP06(2016)173

18.7 Type: 0 Citation: Tom Griffin, Kevin T. Grosvenor, Petr Horava, Ziqi Yan, Phys.Rev.D **88** (2013) 101701 [arXiv:1308.5967],
doi:10.1103/PhysRevD.88.101701

18.8 Type: 1 Citation: K. Farakos, D. Metaxas, Phys.Lett.B **707** (2012) [arXiv:1109.0421],
doi:10.1016/j.physletb.2012.01.005

18.9 Type: 0 Citation: J. Alexandre, N.E. Mavromatos, D. Yawitch, Phys.Rev.D **82** (2010) 125014 [arXiv:1009.4811],
doi:10.1103/PhysRevD.82.125014

18.10 Type: 0 Citation: Jean Alexandre, Ariadni Vergou, Phys.Rev.D **83** (2011) 125008 [arXiv:1103.2701],
doi:10.1103/PhysRevD.83.125008

18.11 Type: 1 Citation: K. Farakos, D. Metaxas, Phys.Lett.B **711** (2012) [arXiv:1112.6080],
doi:10.1016/j.physletb.2012.03.045

18.12 Type: 0 Citation: Ziqi Yan, JHEP **03** (2023) 008 [arXiv:2210.04950],
doi:10.1007/JHEP03(2023)008

18.13 Type: 1 Citation: K. Farakos, Int.J.Mod.Phys.A **27** (2012) 1250168 [arXiv:1204.5622],
doi:10.1142/S0217751X12501680

18.14 Type: 0 Citation: Ziqi Yan, JHEP **09** (2021) 164 [arXiv:2105.00011],
doi:10.1007/JHEP09(2021)164

18.15 Type: 1 Citation: Jean Alexandre, Pavlos Pasipoularides, Phys.Rev.D **83** (2011) 084030 [arXiv:1010.3634],
doi:10.1103/PhysRevD.83.084030

18.16 Type: 0 Citation: Toshiaki Fujimori, Muneto Nitta, JHEP **10** (2015) 021 [arXiv:1507.06456],
doi:10.1007/JHEP10(2015)021

18.17 Type: 0 Citation: Kevin Torres Grosvenor

18.18 Type: 0 Citation: Takuya Kanazawa, Arata Yamamoto, Phys.Rev.D **91** (2015) 074508 [arXiv:1411.4667],
doi:10.1103/PhysRevD.91.074508

18.19 Type: 0 Citation: Jean Alexandre, Int.J.Mod.Phys.A **26** (2011) [arXiv:1109.5629],
doi:10.1142/S0217751X11054656

18.20 Type: 0 Citation: Hisaki Hatanaka, Makoto Sakamoto, Kazunori Takenaga, Phys.Rev.D **84** (2011) 025018 [arXiv:1105.3534],
doi:10.1103/PhysRevD.84.025018

19. J. Ambjorn, K.N. Anagnostopoulos, R. Loll, I. Pushkina, "*Shaken, but not stirred: Potts model coupled to quantum gravity*", Nucl.Phys.B **807** (2009) [arXiv:0806.3506], [doi:10.1016/j.nuclphysb.2008.08.030]. Cited by 32 (18) articles

We investigate the critical behaviour of both matter and geometry of the three-state Potts model coupled to two-dimensional Lorentzian quantum gravity in the framework of causal dynamical triangulations. Contrary to what general arguments on the effects of disorder suggest, we find strong numerical evidence that the critical exponents of the matter are not changed under the influence of quantum fluctuations in the geometry, compared to their values on fixed, regular lattices. This lends further support to previous findings that quantum gravity models based on causal dynamical triangulations are in many ways better behaved than their Euclidean counterparts.

19.1 Type: 0 Citation: Gemma De las Cuevas, Toby S. Cubitt, Science **351** (2016) 1180 [arXiv:1406.5955], doi:10.1126/science.aab3326

19.2 Type: 0 Citation: José Cerda-Hernández, Anatoly Yambartsev, Stefan Zohren, Braz.J.Probab.Statist. **31** (2017) ,
doi:10.1214/16-BJPS310

19.3 Type: 0 Citation: Gemma De las Cuevas, J.Phys.B **46** (2013) 243001 [arXiv:1312.6007], doi:10.1088/0953-4075/46/24/243001

19.4 Type: 0 Citation: J.Cerda Hernández, J.Math.Phys. **58** (2017) 123303 [arXiv:1603.04333], doi:10.1063/1.5017125

19.5 Type: 1 Citation: Jan Ambjorn, Acta Phys.Polon.B **42** (2011) [arXiv:1105.1741], doi:10.5506/APhysPolB.42.923

19.6 Type: 0 Citation: Bergfinnur Durhuus, Thordur Jonsson, John Wheater, arXiv:2211.15247

19.7 Type: 0 Citation: J. Cerda-Hernández, J.Stat.Mech. **1702** (2017) 023209, doi:10.1088/1742-5468/aa528a

19.8 Type: 0 Citation: Max R. Atkin, Stefan Zohren, arXiv:1209.6562, doi:10.1088/1742-6596/410/1/012131

19.9 Type: 0 Citation: Max R. Atkin, Stefan Zohren, AIP Conf.Proc. **1483** (2012) [arXiv:1209.6563], doi:10.1063/1.4756977

19.10 Type: 1 Citation: J. Ambjorn, A. Ipsen, Phys.Rev.D **88** (2013) 067502 [arXiv:1305.3148], doi:10.1103/PhysRevD.88.067502

19.11 Type: 0 Citation: John F. Wheater, P.D. Xavier, Class.Quant.Grav. **39** (2022) 075004 [arXiv:2109.04414], doi:10.1088/1361-6382/ac50ec

19.12 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Hongguang Zhang, Phys.Lett.B **743** (2015) [arXiv:1412.3873],
doi:10.1016/j.physletb.2015.03.008

19.13 Type: 0 Citation: Rohit Katti, Joseph Samuel, Supurna Sinha, Class.Quant.Grav. **26** (2009) 135018 [arXiv:0904.1057],
doi:10.1088/0264-9381/26/13/135018

19.14 Type: 0 Citation: Bergfinnur Durhuus, Xavier Poncini, J.ørgen Rasmussen, Meltem Ünel, J.Stat.Mech. **2111** (2021) 113102 [arXiv:2104.14176],
doi:10.1088/1742-5468/ac2dfa

19.15 Type: 0 Citation: I. Dukovski, Phys.Rev.D **87** (2013) 064022, doi:10.1103/PhysRevD.87.064022

19.16 Type: 0 Citation: Max R. Atkin, Stefan Zohren, Phys.Lett.B **712** (2012) [arXiv:1202.4322], doi:10.1016/j.physletb.2012.05.017

19.17 Type: 0 Citation: Praveen Dennis Xavier

19.18 Type: 1 Citation: J. Brunekreef, R. Loll, Phys.Rev.D **104** (2021) 126024 [arXiv:2110.11100], doi:10.1103/PhysRevD.104.126024

19.19 Type: 1 Citation: J. Ambjørn, B. Durhuus, J.F. Wheater, J.Phys.A **47** (2014) 365001 [arXiv:1405.6782], doi:10.1088/1751-8113/47/36/365001

19.20 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Hongguang Zhang, Mod.Phys.Lett.A **30** (2015) 1550077 [arXiv:1412.3434],
doi:10.1142/S0217732315500777

19.21 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, arXiv:1004.0352

19.22 Type: 1 Citation: Jan Ambjorn, Lisa Glaser, Andrzej Gorlich, Yuki Sato, Phys.Lett.B **712** (2012) [arXiv:1202.4435], doi:10.1016/j.physletb.2012.04.047

19.23 Type: 1 Citation: J. Ambjorn, R. Loll, Y. Watabiki, W. Westra, S. Zohren, Phys.Lett.B **670** (2008) [arXiv:0810.2408], doi:10.1016/j.physletb.2008.11.003

19.24 Type: 1 Citation: J. Ambjorn, R. Loll, W. Westra, S. Zohren, Phys.Lett.B **678** (2009) [arXiv:0905.2108], doi:10.1016/j.physletb.2009.06.031

19.25 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, arXiv:1007.2560

19.26 Type: 1 Citation: J. Ambjorn, A.T. Goerlich, J. Jurkiewicz, H.-G. Zhang, Nucl.Phys.B **863** (2012) [arXiv:1201.1590], doi:10.1016/j.nuclphysb.2012.05.024

19.27 Type: 1 Citation: R. Loll, Class.Quant.Grav. **37** (2020) 013002 [arXiv:1905.08669], doi:10.1088/1361-6382/ab57c7

19.28 Type: 0 Citation: Andreas Nink, Martin Reuter, JHEP **02** (2016) 167 [arXiv:1512.06805], doi:10.1007/JHEP02(2016)167

19.29 Type: 0 Citation: Benedikt Krüger

19.30 Type: 0 Citation: Stefan Zohren, arXiv:0905.0213

19.31 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, Phys.Rept. **519** (2012) [arXiv:1203.3591], doi:10.1016/j.physrep.2012.03.007

19.32 Type: 0 Citation: Andreas Nink, arXiv:1701.08344, doi:10.25358/openscience-2790

20. Konstantinos N. Anagnostopoulos, Masanori Hanada, Jun Nishimura, Shingo Takeuchi, "*Monte Carlo studies of supersymmetric matrix quantum mechanics with sixteen supercharges at finite temperature*", Phys.Rev.Lett. **100** (2008) 021601 [arXiv:0707.4454], [doi:10.1103/PhysRevLett.100.021601]. Cited by 215 (151) articles

We present the first Monte Carlo results for supersymmetric matrix quantum mechanics with sixteen supercharges at finite temperature. The recently proposed non-lattice simulation enables us to include the effects of fermionic matrices in a transparent and reliable manner. The internal energy nicely interpolates the weak coupling behavior obtained by the high temperature expansion, and the strong coupling behavior predicted from the dual black hole geometry. The Polyakov line takes large values even at low temperature suggesting the absence of a phase transition in sharp contrast to the bosonic case. These results provide highly non-trivial evidences for the gauge/gravity duality.

20.1 Type: 0 Citation: □□ □□, Soryushiron Kenkyu Electron. **117** (2009) A49, doi:10.24532/soken.117.1_A49

20.2 Type: 0 Citation: Simon Catterall, Toby Wiseman, PoS **LATTICE2007** (2007) 051 [arXiv:0709.3497], doi:10.22323/1.042.0051

20.3 Type: 0 Citation: Zbigniew Ambroziński, Piotr Korcyl, PoS **LATTICE2014** (2015) 253 [arXiv:1411.6904], doi:10.22323/1.214.0253

20.4 Type: 0 Citation: Daisuke Kadoh, Syo Kamata, PoS **LATTICE2012** (2012) 064 [arXiv:1212.4919], doi:10.22323/1.164.0064

20.5 Type: 1 Citation: Jun Nishimura, Int.J.Mod.Phys.A **23** (2008) , doi:10.1142/S0217751X08040706

20.6 Type: 0 Citation: Daisuke Kadoh, Syo Kamata, PoS **LATTICE2013** (2014) 343, doi:10.22323/1.187.0343

20.7 Type: 1 Citation: Evan Berkowitz, Enrico Rinaldi, Masanori Hanada, Goro Ishiki, Shinji Shimasaki, Pavlos Vranas, arXiv:1606.04948

20.8 Type: 1 Citation: Masanori Hanada, Fortsch.Phys. **62** (2014) [arXiv:1407.5322], doi:10.1002/prop.201400047

20.9 Type: 0 Citation: Issaku Kanamori, Hiroshi Suzuki, Fumihiko Sugino, Phys.Rev.D **77** (2008) 091502 [arXiv:0711.2099], doi:10.1103/PhysRevD.77.091502

20.10 Type: 0 Citation: Yu Aikawa, Takeshi Morita, Kota Yoshimura, Phys.Rev.D **105** (2022) 085017 [arXiv:2109.02701],
doi:10.1103/PhysRevD.105.085017

20.11 Type: 0 Citation: Navdeep Singh Dhindsa, Raghav G. Jha, Anosh Joseph, David Schaich, PoS **LATTICE2021** (2022) 433 [arXiv:2109.01001],
doi:10.22323/1.396.0433

20.12 Type: 0 Citation: Evan Berkowitz, PoS **LATTICE2016** (2016) 238 [arXiv:1608.01951],
doi:10.22323/1.256.0238

20.13 Type: 0 Citation: Simon Catterall, Joel Giedt, arXiv:2202.08154

20.14 Type: 0 Citation: Veselin G. Filev, Denjoe O'Connor, J.Phys.Conf.Ser. **965** (2018) 012015 [arXiv:1710.02565],
doi:10.1088/1742-6596/965/1/012015

20.15 Type: 1 Citation: Tatsuo Azeyanagi, Masanori Hanada, Hikaru Kawai, Yoshinori Matsuo, Nucl.Phys.B **816** (2009) [arXiv:0812.1453],
doi:10.1016/j.nuclphysb.2009.03.012

20.16 Type: 0 Citation: Stratos Pateloudis, EPJ Web Conf. **274** (2022) 08009,
doi:10.1051/epjconf/202227408009

20.17 Type: 0 Citation: David Baumgartner, Urs Wenger, PoS **Lattice2010** (2014) 245 [arXiv:1104.0213],
doi:10.22323/1.105.0245

20.18 Type: 0 Citation: Omid Saremi, arXiv:1412.3859

20.19 Type: 0 Citation: Simon Catterall, Joel Giedt, Goksu Can Toga, JHEP **12** (2020) 140 [arXiv:2009.07334],
doi:10.1007/JHEP12(2020)140

20.20 Type: 1 Citation: Evan Berkowitz, Masanori Hanada, Jonathan Maltz, Int.J.Mod.Phys.D **25** (2016) 1644002 [arXiv:1603.03055],
doi:10.1142/S0218271816440028

20.21 Type: 1 Citation: Masanori Hanada, Yoshifumi Hyakutake, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **102** (2009) 191602 [arXiv:0811.3102],
doi:10.1103/PhysRevLett.102.191602

20.22 Type: 0 Citation: Yuhma Asano, Veselin G. Filev, Samuel Kováčik, Denjoe O'Connor, JHEP **01** (2017) 113 [arXiv:1605.05597],
doi:10.1007/JHEP01(2017)113

20.23 Type: 0 Citation: Yuhma Asano, Veselin G. Filev, Samuel Kováčik, Denjoe O'Connor, JHEP **03** (2018) 055 [arXiv:1612.09281],
doi:10.1007/JHEP03(2018)055

20.24 Type: 0 Citation: Xizhi Han, Sean A. Hartnoll, Jorrit Kruthoff, Phys.Rev.Lett. **125** (2020) 041601 [arXiv:2004.10212],
doi:10.1103/PhysRevLett.125.041601

20.25 Type: 0 Citation: Yuhma Asano, Veselin G. Filev, Samuel Kováčik, Denjoe O'Connor, Springer Proc.Math.Stat. **255** (2017) ,
doi:10.1007/978-981-13-2179-5_12

20.26 Type: 0 Citation: Piotr Korcyl, Acta Phys.Polon.B **41** (2010) 795 [arXiv:0912.5265]

20.27 Type: 1 Citation: Evan Berkowitz, Enrico Rinaldi, Masanori Hanada, Goro Ishiki, Shinji Shimasaki, Pavlos Vranas, Phys.Rev.D **94** (2016) 094501 [arXiv:1606.04951],
doi:10.1103/PhysRevD.94.094501

20.28 Type: 1 Citation: Jun Nishimura, arXiv:2308.00345

20.29 Type: 0 Citation: Simon Catterall, Toby Wiseman, Phys.Rev.D **78** (2008) 041502 [arXiv:0803.4273],
doi:10.1103/PhysRevD.78.041502

20.30 Type: 1 Citation: Sinya Aoki, Masanori Hanada, Norihiro Iizuka, JHEP **07** (2015) 029 [arXiv:1503.05562],
doi:10.1007/JHEP07(2015)029

20.31 Type: 1 Citation: Masanori Hanada, Goro Ishiki, Hiromasa Watanabe, PoS **LATTICE2019** (2019) 055 [arXiv:1911.11465],
doi:10.22323/1.363.0055

20.32 Type: 0 Citation: Simon Catterall, Joel Giedt, Goksu Can Toga, arXiv:2303.16025

20.33 Type: 0 Citation: Issaku Kanamori, Phys.Rev.D **79** (2009) 115015 [arXiv:0902.2876], doi:10.1103/PhysRevD.79.115015

20.34 Type: 0 Citation: Takeshi Morita, Shotaro Shiba, JHEP **07** (2013) 100 [arXiv:1305.0789], doi:10.1007/JHEP07(2013)100

20.35 Type: 0 Citation: Daisuke Kadoh, Int.J.Mod.Phys.A **32** (2017) 1747018, doi:10.1142/S0217751X17470182

20.36 Type: 0 Citation: Denjoe O'Connor, Veselin G. Filev, PoS **CORFU2015** (2016) 111 [arXiv:1605.01611], doi:10.22323/1.263.0111

20.37 Type: 0 Citation: David Berenstein, Daisuke Kawai, Phys.Rev.D **95** (2017) 106004 [arXiv:1608.08972], doi:10.1103/PhysRevD.95.106004

20.38 Type: 0 Citation: Hikaru Kawai, Shinji Shimasaki, Asato Tsuchiya, Int.J.Mod.Phys.A **25** (2010) [arXiv:0912.1456], doi:10.1142/S0217751X10049396

20.39 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **99** (2007) 161602 [arXiv:0706.1647], doi:10.1103/PhysRevLett.99.161602

20.40 Type: 0 Citation: Simon Catterall, Anosh Joseph, Phys.Rev.D **77** (2008) 094504 [arXiv:0712.3074], doi:10.1103/PhysRevD.77.094504

20.41 Type: 2 Citation: Jun Nishimura, Konstantinos N. Anagnostopoulos, Masanori Hanada, Shingo Takeuchi, PoS **LATTICE2007** (2007) 059 [arXiv:0801.4205], doi:10.22323/1.042.0059

20.42 Type: 0 Citation: Daisuke Kadoh, PoS **LATTICE2016** (2017) 033 [arXiv:1702.01615], doi:10.22323/1.256.0033

20.43 Type: 0 Citation: Kyle Steinhauer, Urs Wenger, JHEP **12** (2014) 044 [arXiv:1410.0235], doi:10.1007/JHEP12(2014)044

20.44 Type: 1 Citation: Goro Ishiki, Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, Phys.Rev.Lett. **102** (2009) 111601 [arXiv:0810.2884], doi:10.1103/PhysRevLett.102.111601

20.45 Type: 0 Citation: Koji Hashimoto, Wataru Sasaki, Takayuki Sumimoto, JHEP **12** (2019) 138 [arXiv:1905.02632], doi:10.1007/JHEP12(2019)138

20.46 Type: 0 Citation: David Berenstein, Yueshu Guan, Int.J.Mod.Phys.A **36** (2021) 2150219 [arXiv:2105.04577], doi:10.1142/S0217751X21502195

20.47 Type: 0 Citation: Paul Riggins, Vatche Sahakian, Phys.Rev.D **86** (2012) 046005 [arXiv:1205.3847], doi:10.1103/PhysRevD.86.046005

20.48 Type: 0 Citation: Simon Catterall, Joel Giedt, Raghav G. Jha, Phys.Rev.D **98** (2018) 095017 [arXiv:1808.04735], doi:10.1103/PhysRevD.98.095017

20.49 Type: 0 Citation: Veselin G. Filev, Denjoe O'Connor, JHEP **05** (2016) 167 [arXiv:1506.01366], doi:10.1007/JHEP05(2016)167

20.50 Type: 1 Citation: Stratos Pateloudis, Georg Bergner, Norbert Bodendorfer, Masanori Hanada, Enrico Rinaldi, Andreas Schäfer, JHEP **08** (2022) 178 [arXiv:2205.06098], doi:10.1007/JHEP08(2022)178

20.51 Type: 1 Citation: Tatsuo Azeyanagi, Masanori Hanada, Tomoyoshi Hirata, Tomomi Ishikawa, JHEP **01** (2008) 025 [arXiv:0711.1925], doi:10.1088/1126-6708/2008/01/025

20.52 Type: 0 Citation: Ying-Hsuan Lin, Xi Yin, JHEP **11** (2015) 027 [arXiv:1402.0055], doi:10.1007/JHEP11(2015)027

20.53 Type: 0 Citation: Simon Catterall, Anosh Joseph, Toby Wiseman, J.Phys.Conf.Ser. **462** (2013) 012022 [arXiv:1009.0529], doi:10.1088/1742-6596/462/1/012022

20.54 Type: 0 Citation: David Berenstein, Eric Dzienkowski, arXiv:1311.1168

20.55 Type: 0 Citation: Goro Ishiki, Takaki Matsumoto, Hisayoshi Muraki, JHEP **08** (2016) 042 [arXiv:1603.09146],
doi:10.1007/JHEP08(2016)042

20.56 Type: 1 Citation: Ippei Danshita, Masanori Hanada, Masaki Tezuka, arXiv:1709.07189

20.57 Type: 1 Citation: Stratos Pateloudis, Georg Bergner, Masanori Hanada, Enrico Rinaldi, Andreas Schäfer, Pavlos Vranas, Hiromasa Watanabe, Norbert Bodendorfer, JHEP **03** (2023) 071 [arXiv:2210.04881],
doi:10.1007/JHEP03(2023)071

20.58 Type: 0 Citation: Raghav G. Jha, Simon Catterall, David Schaich, Toby Wiseman, EPJ Web Conf. **175** (2018) 08004 [arXiv:1710.06398],
doi:10.1051/epjconf/201817508004

20.59 Type: 0 Citation: Takehiro Azuma, Pallab Basu, Prasant Samantray, JHEP **09** (2017) 071 [arXiv:1707.02898],
doi:10.1007/JHEP09(2017)071

20.60 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, Phys.Rev.Lett. **104** (2010) 151601 [arXiv:0911.1623],
doi:10.1103/PhysRevLett.104.151601

20.61 Type: 0 Citation: Nick Heller, Vatche Sahakian, Phys.Rev.D **105** (2022) 026012 [arXiv:2108.08872],
doi:10.1103/PhysRevD.105.026012

20.62 Type: 0 Citation: Goro Ishiki, Phys.Rev.D **92** (2015) 046009 [arXiv:1503.01230],
doi:10.1103/PhysRevD.92.046009

20.63 Type: 0 Citation: Simon Catterall, Greg van Anders, JHEP **09** (2010) 088 [arXiv:1003.4952],
doi:10.1007/JHEP09(2010)088

20.64 Type: 1 Citation: Masanori Hanada, Yoshifumi Hyakutake, Goro Ishiki, Jun Nishimura, Science **344** (2014) [arXiv:1311.5607],
doi:10.1126/science.1250122

20.65 Type: 0 Citation: Gautam Mandal, Manavendra Mahato, Takeshi Morita, JHEP **02** (2010) 034 [arXiv:0910.4526],
doi:10.1007/JHEP02(2010)034

20.66 Type: 0 Citation: Yuhma Asano, Veselin G. Filev, Samuel Kováčik, Denjoe O'Connor, JHEP **07** (2018) 152 [arXiv:1805.05314],
doi:10.1007/JHEP07(2018)152

20.67 Type: 0 Citation: Henry W. Lin, JHEP **06** (2023) 038 [arXiv:2302.04416],
doi:10.1007/JHEP06(2023)038

20.68 Type: 0 Citation: Simon Catterall, J.Phys.Conf.Ser. **462** (2013) 012006 [arXiv:1005.5346],
doi:10.1088/1742-6596/462/1/012006

20.69 Type: 0 Citation: Junji Kato, Yoshi Kondo, Akiko Miyake, JHEP **09** (2011) 019 [arXiv:1104.1252],
doi:10.1007/JHEP09(2011)019

20.70 Type: 0 Citation: Tsunehide Kuroki, Fumihiko Sugino, Nucl.Phys.B **830** (2010) [arXiv:0909.3952],
doi:10.1016/j.nuclphysb.2009.12.021

20.71 Type: 1 Citation: Masanori Hanada, So Matsuura, Jun Nishimura, Daniel Robles-Llana, JHEP **02** (2011) 060 [arXiv:1012.2913],
doi:10.1007/JHEP02(2011)060

20.72 Type: 0 Citation: Simon Catterall, PoS **LATTICE2010** (2010) 002 [arXiv:1010.6224],
doi:10.22323/1.105.0002

20.73 Type: 0 Citation: Takehiro Azuma, Pallab Basu, Spenta R. Wadia, Phys.Lett.B **659** (2008) [arXiv:0710.5873],
doi:10.1016/j.physletb.2007.11.088

20.74 Type: 0 Citation: Daisuke Kadoh, Syo Kamata, arXiv:1503.08499

20.75 Type: 0 Citation: Simon Catterall, JHEP **01** (2009) 040 [arXiv:0811.1203],
doi:10.1088/1126-6708/2009/01/040

20.76 Type: 1 Citation: Masanori Hanada, Akitsugu Miwa, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **102** (2009) 181602 [arXiv:0811.2081],
doi:10.1103/PhysRevLett.102.181602

20.77 Type: 0 Citation: Ying-Hsuan Lin, Shu-Heng Shao, Yifan Wang, Xi Yin, JHEP **05** (2015) 136 [arXiv:1304.1593],
doi:10.1007/JHEP05(2015)136

20.78 Type: 0 Citation: Veselin G. Filev, Denjoe O'Connor, JHEP **05** (2016) 122 [arXiv:1512.02536],
doi:10.1007/JHEP05(2016)122

20.79 Type: 1 Citation: Masazumi Honda, Goro Ishiki, Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, PoS **LATTICE2010** (2010) 253 [arXiv:1011.3904],
doi:10.22323/1.105.0253

20.80 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Shingo Takeuchi, JHEP **12** (2007) 103 [arXiv:0710.2188],
doi:10.1088/1126-6708/2007/12/103

20.81 Type: 0 Citation: K. Başkan, Seckin Kurkcuoglu, O. Oktay, C. Taşcı, PoS **CORFU2021** (2022) 294 [arXiv:2204.10391],
doi:10.22323/1.406.0294

20.82 Type: 1 Citation: Ippei Danshita, Masanori Hanada, Masaki Tezuka, PTEP **2017** (2017) 083I01 [arXiv:1606.02454],
doi:10.1093/ptep/ptx108

20.83 Type: 1 Citation: Masanori Hanada, Yoshifumi Hyakutake, Goro Ishiki, Jun Nishimura, Phys.Rev.D **94** (2016) 086010 [arXiv:1603.00538],
doi:10.1103/PhysRevD.94.086010

20.84 Type: 0 Citation: K. Başkan, S. Kürkçüo□lu, O. Oktay, C. Taşcı, JHEP **10** (2020) 003 [arXiv:1912.00932],
doi:10.1007/JHEP10(2020)003

20.85 Type: 0 Citation: Óscar J.C. Dias, Jorge E. Santos, Benson Way, Phys.Rev.Lett. **117** (2016) 151101 [arXiv:1605.04911],
doi:10.1103/PhysRevLett.117.151101

20.86 Type: 1 Citation: Masazumi Honda, Goro Ishiki, Jun Nishimura, Asato Tsuchiya, PoS **LATTICE2011** (2011) 244 [arXiv:1112.4274],
doi:10.22323/1.139.0244

20.87 Type: 0 Citation: K. Başkan, S. Kürkçüoğlu, C. Taşcı, Phys.Rev.D **107** (2023) 066006 [arXiv:2203.08240],
doi:10.1103/PhysRevD.107.066006

20.88 Type: 0 Citation: Goro Ishiki, Shinji Shimasaki, Asato Tsuchiya, Phys.Rev.D **80** (2009) 086004 [arXiv:0908.1711],
doi:10.1103/PhysRevD.80.086004

20.89 Type: 0 Citation: A.V. Smilga, Nucl.Phys.B **818** (2009) [arXiv:0812.4753],
doi:10.1016/j.nuclphysb.2009.03.023

20.90 Type: 0 Citation: Miguel S. Costa, Lauren Greenspan, Joao Penedones, Jorge Santos, JHEP **03** (2015) 069 [arXiv:1411.5541],
doi:10.1007/JHEP03(2015)069

20.91 Type: 1 Citation: Evan Berkowitz, Masanori Hanada, Enrico Rinaldi, Pavlos Vranas, JHEP **06** (2018) 124 [arXiv:1802.02985],
doi:10.1007/JHEP06(2018)124

20.92 Type: 0 Citation: A. Pinzul, A. Stern, Phys.Rev.D **96** (2017) 066019 [arXiv:1707.04816],
doi:10.1103/PhysRevD.96.066019

20.93 Type: 0 Citation: Norihiro Iizuka, Daniel Kabat, Shubho Roy, Debajyoti Sarkar, Phys.Rev.D **87** (2013) 126010 [arXiv:1303.7278],
doi:10.1103/PhysRevD.87.126010

20.94 Type: 1 Citation: Guy Gur-Ari, Masanori Hanada, Stephen H. Shenker, JHEP **02** (2016) 091 [arXiv:1512.00019],
doi:10.1007/JHEP02(2016)091

20.95 Type: 1 Citation: Masanori Hanada, Hiromasa Watanabe, Eur.Phys.J.ST **232** (2023) [arXiv:2210.11216],
doi:10.1140/epjs/s11734-022-00709-0

20.96 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504],
doi:10.1103/PhysRevD.83.054504

20.97 Type: 0 Citation: Simon Catterall, Toby Wiseman, JHEP **04** (2010) 077 [arXiv:0909.4947], doi:10.1007/JHEP04(2010)077

20.98 Type: 0 Citation: Ü.H. Coşkun, S. Kurkcuoglu, G.C. Toga, G. Unal, JHEP **12** (2018) 015 [arXiv:1806.10524], doi:10.1007/JHEP12(2018)015

20.99 Type: 0 Citation: Navdeep Singh Dhindsa, Raghav G. Jha, Anosh Joseph, Abhishek Samlodia, David Schaich, JHEP **05** (2022) 169 [arXiv:2201.08791], doi:10.1007/JHEP05(2022)169

20.100 Type: 0 Citation: Vatche Sahakian, Yossathorn Tawabutr, Cynthia Yan, JHEP **08** (2017) 140 [arXiv:1705.01128], doi:10.1007/JHEP08(2017)140

20.101 Type: 1 Citation: Evan Berkowitz, Masanori Hanada, Jonathan Maltz, Phys.Rev.D **94** (2016) 126009 [arXiv:1602.01473], doi:10.1103/PhysRevD.94.126009

20.102 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531], doi:10.22323/1.139.0181

20.103 Type: 0 Citation: Zbigniew Ambrozinski, arXiv:1409.7435

20.104 Type: 0 Citation: David Berenstein, Eric Dzienkowski, Phys.Rev.D **86** (2012) 086001 [arXiv:1204.2788], doi:10.1103/PhysRevD.86.086001

20.105 Type: 0 Citation: Issaku Kanamori, Hiroshi Suzuki, Nucl.Phys.B **811** (2009) [arXiv:0809.2856], doi:10.1016/j.nuclphysb.2008.11.021

20.106 Type: 0 Citation: David Berenstein, Yuichiro Nakada, arXiv:1001.4509

20.107 Type: 0 Citation: Juan Maldacena, Alexey Milekhin, JHEP **04** (2018) 084 [arXiv:1802.00428], doi:10.1007/JHEP04(2018)084

20.108 Type: 0 Citation: Bruno Balthazar, Victor A. Rodriguez, Xi Yin, JHEP **08** (2019) 100 [arXiv:1610.07275], doi:10.1007/JHEP08(2019)100

20.109 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957], doi:10.22323/1.105.0167

20.110 Type: 0 Citation: Takeshi Morita, Shotaro Shiba, Toby Wiseman, Benjamin Withers, Class.Quant.Grav. **31** (2014) 085001 [arXiv:1311.6540], doi:10.1088/0264-9381/31/8/085001

20.111 Type: 0 Citation: Alexey Milekhin, SciPost Phys. **11** (2021) 094 [arXiv:2008.12869], doi:10.21468/SciPostPhys.11.5.094

20.112 Type: 0 Citation: So Matsuura, JHEP **07** (2008) 127 [arXiv:0805.4491], doi:10.1088/1126-6708/2008/07/127

20.113 Type: 1 Citation: Masanori Hanada, So Matsuura, Fumihiko Sugino, Prog.Theor.Phys. **126** (2011) [arXiv:1004.5513], doi:10.1143/PTP.126.597

20.114 Type: 0 Citation: Issaku Kanamori, Nucl.Phys.B **841** (2010) [arXiv:1006.2468], doi:10.1016/j.nuclphysb.2010.08.010

20.115 Type: 1 Citation: Georg Bergner, Norbert Bodendorfer, Masanori Hanada, Enrico Rinaldi, Andreas Schäfer, Pavlos Vranas, JHEP **01** (2020) 053 [arXiv:1909.04592], doi:10.1007/JHEP01(2020)053

20.116 Type: 0 Citation: Yoshifumi Hyakutake, Phys.Rev.D **98** (2018) 046023 [arXiv:1801.07869], doi:10.1103/PhysRevD.98.046023

20.117 Type: 0 Citation: Simon Catterall, Anosh Joseph, Toby Wiseman, JHEP **12** (2010) 022 [arXiv:1008.4964], doi:10.1007/JHEP12(2010)022

20.118 Type: 1 Citation: Jun Nishimura, PoS **LAT2009** (2009) 016 [arXiv:0912.0327], doi:10.22323/1.091.0016

20.119 Type: 1 Citation: David E. Berenstein, Masanori Hanada, Sean A. Hartnoll, JHEP **02** (2009) 010 [arXiv:0805.4658], doi:10.1088/1126-6708/2009/02/010

20.120 Type: 0 Citation: Thomas Ortiz, Henning Samtleben, JHEP **01** (2013) 183 [arXiv:1210.4266], doi:10.1007/JHEP01(2013)183

20.121 Type: 0 Citation: Xizhi Han, Sean A. Hartnoll, Phys.Rev.X **10** (2020) 011069 [arXiv:1906.08781], doi:10.1103/PhysRevX.10.011069

20.122 Type: 1 Citation: Masanori Hanada, arXiv:1808.08490

20.123 Type: 0 Citation: David Berenstein, AIP Conf.Proc. **1318** (2010) [arXiv:1010.3270], doi:10.1063/1.3531637

20.124 Type: 0 Citation: Zbigniew Ambrozinski, arXiv:1408.2655

20.125 Type: 0 Citation: Amr Ahmadain, Alexander Frenkel, Krishnendu Ray, Ronak M. Soni, arXiv:2210.11493

20.126 Type: 1 Citation: Masanori Hanada, Hidehiko Shimada, Nico Wintergerst, JHEP **08** (2021) 039 [arXiv:2001.10459], doi:10.1007/JHEP08(2021)039

20.127 Type: 0 Citation: Simon Catterall, Anosh Joseph, Comput.Phys.Commun. **183** (2012) [arXiv:1108.1503], doi:10.1016/j.cpc.2012.01.024

20.128 Type: 1 Citation: Masanori Hanada, Lorenzo Mannelli, Yoshinori Matsuo, JHEP **11** (2009) 087 [arXiv:0907.4937], doi:10.1088/1126-6708/2009/11/087

20.129 Type: 0 Citation: Anosh Joseph, Int.J.Mod.Phys.A **30** (2015) 1530054 [arXiv:1509.01440], doi:10.1142/S0217751X15300549

20.130 Type: 1 Citation: Jun Nishimura, Katsuta Sakai, Atis Yosprakob, arXiv:2307.11199

20.131 Type: 0 Citation: Ingmar Kanitscheider, Kostas Skenderis, Marika Taylor, JHEP **09** (2008) 094 [arXiv:0807.3324], doi:10.1088/1126-6708/2008/09/094

20.132 Type: 0 Citation: Eric Giguère, Daisuke Kadoh, JHEP **05** (2015) 082 [arXiv:1503.04416], doi:10.1007/JHEP05(2015)082

20.133 Type: 0 Citation: Toby Wiseman, JHEP **07** (2013) 101 [arXiv:1304.3938], doi:10.1007/JHEP07(2013)101

20.134 Type: 1 Citation: Masanori Hanada, Issaku Kanamori, JHEP **01** (2011) 058 [arXiv:1010.2948], doi:10.1007/JHEP01(2011)058

20.135 Type: 1 Citation: Masanori Hanada, Issaku Kanamori, So Matsuura, Fumihiko Sugino, PoS **LATTICE2011** (2011) 243 [arXiv:1111.1824], doi:10.22323/1.139.0243

20.136 Type: 0 Citation: Goro Ishiki, Shinji Shimasaki, Asato Tsuchiya, Nucl.Phys.B **834** (2010) [arXiv:1001.4917], doi:10.1016/j.nuclphysb.2010.02.026

20.137 Type: 0 Citation: Raghav Govind Jha, SciPost Phys.Lect.Notes **46** (2022) 1 [arXiv:2111.02410], doi:10.21468/SciPostPhysLectNotes.46

20.138 Type: 1 Citation: Tatsuo Azeyanagi, Masanori Hanada, Mithat Unsal, Ran Yacoby, Phys.Rev.D **82** (2010) 125013 [arXiv:1006.0717], doi:10.1103/PhysRevD.82.125013

20.139 Type: 0 Citation: Yuhma Asano, Goro Ishiki, Takashi Okada, Shinji Shimasaki, Phys.Rev.D **85** (2012) 106003 [arXiv:1203.0559], doi:10.1103/PhysRevD.85.106003

20.140 Type: 1 Citation: Masanori Hanada, So Matsuura, Fumihiko Sugino, Nucl.Phys.B **857** (2012) [arXiv:1109.6807], doi:10.1016/j.nuclphysb.2011.12.014

20.141 Type: 0 Citation: Goro Ishiki, Shinji Shimasaki, Asato Tsuchiya, JHEP **11** (2011) 036 [arXiv:1106.5590], doi:10.1007/JHEP11(2011)036

20.142 Type: 0 Citation: So Matsuura, Fumihiko Sugino, PTEP **2016** (2016) 043B01 [arXiv:1508.00707], doi:10.1093/ptep/ptw014

20.143 Type: 0 Citation: Tarek Anous, Joanna L. Karczmarek, Eric Mintun, Mark Van Raamsdonk, Benson Way, SciPost Phys. **8** (2020) 057 [arXiv:1911.11145], doi:10.21468/SciPostPhys.8.4.057

20.144 Type: 0 Citation: Vatche Sahakian, arXiv:1601.07791

20.145 Type: 1 Citation: Masanori Hanada, arXiv:1011.1284

20.146 Type: 1 Citation: Masanori Hanada, JHEP **11** (2010) 112 [arXiv:1009.0901], doi:10.1007/JHEP11(2010)112

20.147 Type: 0 Citation: Robert de Mello Koch, Antal Jevicki, Xianlong Liu, Kagiso Mathaba, João P. Rodrigues, JHEP **01** (2022) 168 [arXiv:2108.08803], doi:10.1007/JHEP01(2022)168

20.148 Type: 0 Citation: Tomohisa Takimi, JHEP **08** (2012) 069 [arXiv:1205.7038], doi:10.1007/JHEP08(2012)069

20.149 Type: 0 Citation: Simon Catterall, Joel Giedt, Raghav G. Jha, David Schaich, Toby Wiseman, Phys.Rev.D **102** (2020) 106009 [arXiv:2010.00026], doi:10.1103/PhysRevD.102.106009

20.150 Type: 0 Citation: Takaaki Ishii, Goro Ishiki, Shinji Shimasaki, Asato Tsuchiya, Phys.Rev.D **78** (2008) 106001 [arXiv:0807.2352], doi:10.1103/PhysRevD.78.106001

20.151 Type: 0 Citation: Biel Cardona, Pau Figueras, JHEP **11** (2018) 120 [arXiv:1806.11129], doi:10.1007/JHEP11(2018)120

20.152 Type: 1 Citation: Enrico Rinaldi, Evan Berkowitz, Masanori Hanada, Jonathan Maltz, Pavlos Vranas, JHEP **02** (2018) 042 [arXiv:1709.01932], doi:10.1007/JHEP02(2018)042

20.153 Type: 0 Citation: Takeshi Morita, Shotaro Shiba, Toby Wiseman, Benjamin Withers, JHEP **07** (2015) 047 [arXiv:1412.3939], doi:10.1007/JHEP07(2015)047

20.154 Type: 0 Citation: Yuhma Asano, Eur.Phys.J.ST **232** (2023) , doi:10.1140/epjs/s11734-022-00718-z

20.155 Type: 1 Citation: P.V. Buividovich, M. Hanada, A. Schäfer, Phys.Rev.D **99** (2019) 046011 [arXiv:1810.03378], doi:10.1103/PhysRevD.99.046011

20.156 Type: 0 Citation: Issaku Kanamori, Fumihiko Sugino, Hiroshi Suzuki, Prog.Theor.Phys. **119** (2008) [arXiv:0711.2132], doi:10.1143/PTP.119.797

20.157 Type: 1 Citation: Hiromasa Watanabe, Georg Bergner, Norbert Bodendorfer, Shotaro Shiba Funai, Masanori Hanada, Enrico Rinaldi, Andreas Schäfer, Pavlos Vranas, JHEP **02** (2021) 004 [arXiv:2005.04103], doi:10.1007/JHEP02(2021)004

20.158 Type: 1 Citation: Masanori Hanada, Lorenzo Mannelli, Yoshinori Matsuo, Phys.Rev.D **80** (2009) 125001 [arXiv:0905.2995], doi:10.1103/PhysRevD.80.125001

20.159 Type: 0 Citation: Juan Maldacena, Dario Martelli, Yuji Tachikawa, JHEP **10** (2008) 072 [arXiv:0807.1100], doi:10.1088/1126-6708/2008/10/072

20.160 Type: 0 Citation: Dionysios Anninos, Tarek Anous, Paul de Lange, George Konstantinidis, JHEP **03** (2015) 066 [arXiv:1310.7929], doi:10.1007/JHEP03(2015)066

20.161 Type: 0 Citation: David Berenstein, Diego Trancanelli, Phys.Rev.D **83** (2011) 106001 [arXiv:1011.2749], doi:10.1103/PhysRevD.83.106001

20.162 Type: 0 Citation: Óscar J.C. Dias, Jorge E. Santos, Benson Way, JHEP **06** (2017) 029 [arXiv:1702.07718], doi:10.1007/JHEP06(2017)029

20.163 Type: 1 Citation: Masanori Hanada, Issaku Kanamori, Phys.Rev.D **80** (2009) 065014 [arXiv:0907.4966], doi:10.1103/PhysRevD.80.065014

20.164 Type: 0 Citation: Eric Giguère, doi:10.14943/doctoral.k11989

20.165 Type: 1 Citation: Georg Bergner, Norbert Bodendorfer, Masanori Hanada, Stratos Pateloudis, Enrico Rinaldi, Andreas Schäfer, Pavlos Vranas, Hiromasa Watanabe, JHEP **05** (2022) 096 [arXiv:2110.01312],
doi:10.1007/JHEP05(2022)096

20.166 Type: 0 Citation: Toby Wiseman, Benjamin Withers, JHEP **10** (2008) 037 [arXiv:0807.0755],
doi:10.1088/1126-6708/2008/10/037

20.167 Type: 1 Citation: Tatsuo Azeyanagi, Masanori Hanada, Tomoyoshi Hirata, Hidehiko Shimada, JHEP **03** (2009) 121 [arXiv:0901.4073],
doi:10.1088/1126-6708/2009/03/121

20.168 Type: 1 Citation: Goro Ishiki, Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, JHEP **09** (2009) 029 [arXiv:0907.1488],
doi:10.1088/1126-6708/2009/09/029

20.169 Type: 0 Citation: Greg van Anders

20.170 Type: 1 Citation: Tatsuo Azeyanagi, Masanori Hanada, Tomoyoshi Hirata, Phys.Rev.D **78** (2008) 105017 [arXiv:0806.3252],
doi:10.1103/PhysRevD.78.105017

20.171 Type: 0 Citation: Keiju Murata, Tatsuma Nishioka, Norihiro Tanahashi, Hikaru Yumisaki, Prog.Theor.Phys. **120** (2008) [arXiv:0806.2314],
doi:10.1143/PTP.120.473

20.172 Type: 0 Citation: Ben Craps, Oleg Evnin, Kévin Nguyen, JHEP **02** (2017) 041 [arXiv:1610.05333],
doi:10.1007/JHEP02(2017)041

20.173 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534],
doi:10.1007/JHEP10(2011)126

20.174 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, JHEP **12** (2011) 020 [arXiv:1108.5153],
doi:10.1007/JHEP12(2011)020

20.175 Type: 0 Citation: Simon Catterall, Raghav G. Jha, David Schaich, Toby Wiseman, Phys.Rev.D **97** (2018) 086020 [arXiv:1709.07025],
doi:10.1103/PhysRevD.97.086020

20.176 Type: 0 Citation: Lauren Greenspan

20.177 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135],
doi:10.1007/JHEP11(2013)009

20.178 Type: 0 Citation: Anosh Joseph, Int.J.Mod.Phys.A **26** (2011) [arXiv:1110.5983],
doi:10.1142/S0217751X11054863

20.179 Type: 0 Citation: Pallab Basu

20.180 Type: 0 Citation: Debajyoti Sarkar

20.181 Type: 0 Citation: Adam Tropper, Tianli Wang, JHEP **07** (2023) 150 [arXiv:2303.14200],
doi:10.1007/JHEP07(2023)150

20.182 Type: 0 Citation: Anosh Joseph

20.183 Type: 0 Citation: Joao Penedones, arXiv:1608.04948,
doi:10.1142/9789813149441_0002

20.184 Type: 0 Citation: Kazuhiro Nagata, JHEP **10** (2008) 036 [arXiv:0805.4235],
doi:10.1088/1126-6708/2008/10/036

20.185 Type: 1 Citation: Masanori Hanada, PoS **LATTICE2012** (2012) 019 [arXiv:1212.2814],
doi:10.22323/1.164.0019

20.186 Type: 0 Citation: Kazuhiro Nagata, JHEP **01** (2008) 041 [arXiv:0710.5689],
doi:10.1088/1126-6708/2008/01/041

20.187 Type: 1 Citation: Masazumi Honda, Goro Ishiki, Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, JHEP **11** (2013) 200 [arXiv:1308.3525],
doi:10.1007/JHEP11(2013)200

20.188 Type: 1 Citation: Jun Nishimura, PTEP **2012** (2012) 01A101 [arXiv:1205.6870], doi:10.1093/ptep/pts004

20.189 Type: 0 Citation: Kazuhiro Nagata, Yong-Shi Wu, Phys.Rev.D **78** (2008) 065002 [arXiv:0803.4339], doi:10.1103/PhysRevD.78.065002

20.190 Type: 0 Citation: Suvrat Raju

20.191 Type: 1 Citation: Hrant Gharibyan, Masanori Hanada, Masazumi Honda, Junyu Liu, JHEP **07** (2021) 140 [arXiv:2011.06573], doi:10.1007/JHEP07(2021)140

20.192 Type: 0 Citation: Atis Yosprakob

20.193 Type: 0 Citation: Alexey Milekhin

20.194 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176], doi:10.22323/1.263.0099

20.195 Type: 1 Citation: Masanori Hanada, Int.J.Mod.Phys.A **31** (2016) 1643006 [arXiv:1604.05421], doi:10.1142/S0217751X16430065

20.196 Type: 0 Citation: Xizhi Han

20.197 Type: 0 Citation: Simon Catterall, David B. Kaplan, Mithat Unsal, Phys.Rept. **484** (2009) [arXiv:0903.4881], doi:10.1016/j.physrep.2009.09.001

20.198 Type: 0 Citation: Paul de Lange

20.199 Type: 0 Citation: Daisuke Kadoh, PoS **LATTICE2015** (2016) 017 [arXiv:1607.01170], doi:10.22323/1.251.0017

20.200 Type: 0 Citation: Ingmar Kanitscheider

20.201 Type: 0 Citation: Hiromasa Watanabe

20.202 Type: 0 Citation: Raghav Govind Jha

20.203 Type: 0 Citation: David Schaich, PoS **LATTICE2018** (2019) 005 [arXiv:1810.09282], doi:10.22323/1.334.0005

20.204 Type: 0 Citation: Marco Panero, PoS **LATTICE2012** (2012) 010 [arXiv:1210.5510], doi:10.22323/1.164.0010

20.205 Type: 0 Citation: Eric Michael Dzienkowski

20.206 Type: 0 Citation: David Schaich, Eur.Phys.J.ST **232** (2023) [arXiv:2208.03580], doi:10.1140/epjs/s11734-022-00708-1

20.207 Type: 0 Citation: George Konstantinidis Coss

20.208 Type: 0 Citation: Dionysios Anninos, Beatrix Mühlmann, J.Stat.Mech. **2008** (2020) 083109 [arXiv:2004.01171], doi:10.1088/1742-5468/aba499

20.209 Type: 0 Citation: Efstratios Pateloudis, doi:10.5283/epub.53625

20.210 Type: 0 Citation: Harold Erbin

20.211 Type: 0 Citation: Rajesh Gopakumar, Eric Perlmutter, Silviu S. Pufu, Xi Yin, arXiv:2202.07163

20.212 Type: 0 Citation: Biel Cardona Rotger

20.213 Type: 0 Citation: Badis Ydri, arXiv:1708.00734

20.214 Type: 0 Citation: Biagio Lucini, Marco Panero, Prog.Part.Nucl.Phys. **75** (2014) [arXiv:1309.3638], doi:10.1016/j.ppnp.2014.01.001

20.215 Type: 0 Citation: Elias Kiritsis

21. Jun Nishimura, Konstantinos N. Anagnostopoulos, Masanori Hanada, Shingo Takeuchi, "*Putting M theory on a computer*", PoS **LATTICE2007** (2007) 059 [arXiv:0801.4205], [doi:10.22323/1.042.0059]. Cited by 9 (6) articles

We propose a non-lattice simulation for studying supersymmetric matrix quantum mechanics in a non-perturbative manner. In particular, our method enables us to put M theory on a computer based on its matrix formulation proposed by Banks, Fischler, Shenker and Susskind. Here we present Monte Carlo results of the same matrix model but in a different parameter region, which corresponds to the 't Hooft large-N limit at finite temperature. In the strong coupling limit the model has a dual description in terms of the N D0-brane solution in 10d type IIA supergravity. Our results provide highly nontrivial evidences for the conjectured duality. In particular, the energy (and hence the entropy) of the non-extremal black hole has been reproduced by solving directly the strongly coupled dynamics of the D0-brane effective theory.

21.1 Type: 1 Citation: Jun Nishimura, Int.J.Mod.Phys.A **23** (2008) , doi:10.1142/S0217751X08040706

21.2 Type: 1 Citation: Ippei Danshita, Masanori Hanada, Masaki Tezuka, arXiv:1709.07189

21.3 Type: 1 Citation: Jun Nishimura, PoS **LAT2009** (2009) 016 [arXiv:0912.0327], doi:10.22323/1.091.0016

21.4 Type: 0 Citation: David Berenstein, Diego Trancanelli, Phys.Rev.D **83** (2011) 106001 [arXiv:1011.2749], doi:10.1103/PhysRevD.83.106001

21.5 Type: 0 Citation: Kazuhiro Nagata, JHEP **10** (2008) 036 [arXiv:0805.4235], doi:10.1088/1126-6708/2008/10/036

21.6 Type: 0 Citation: Kazuhiro Nagata, Yong-Shi Wu, Phys.Rev.D **78** (2008) 065002 [arXiv:0803.4339], doi:10.1103/PhysRevD.78.065002

21.7 Type: 0 Citation: Simon Catterall, David B. Kaplan, Mithat Unsal, Phys.Rept. **484** (2009) [arXiv:0903.4881], doi:10.1016/j.physrep.2009.09.001

21.8 Type: 0 Citation: Badis Ydri, arXiv:1203.0906

21.9 Type: 0 Citation: Badis Ydri, Lect.Notes Phys. **929** (2017) [arXiv:1603.00924], doi:10.1007/978-3-319-46003-1

22. Konstantinos N. Anagnostopoulos, Takehiro Azuma, Keiichi Nagao, Jun Nishimura, "*Impact of supersymmetry on the nonperturbative dynamics of fuzzy spheres*", JHEP **09** (2005) 046 [arXiv:hep-th/0506062], [doi:10.1088/1126-6708/2005/09/046].
Cited by 27 (21) articles

We study a 4d supersymmetric matrix model with a cubic term, which incorporates fuzzy spheres as classical solutions, using Monte Carlo simulations and perturbative calculations. The fuzzy sphere in the supersymmetric model turns out to be always stable if the large-N limit is taken in such a way that various correlation functions scale. This is in striking contrast to analogous bosonic models, where the fuzzy sphere decays into the pure Yang-Mills vacuum due to quantum effects when the coefficient of the cubic term becomes smaller than a critical value. We also find that the power-law tail of the eigenvalue distribution, which exists in the supersymmetric model without the cubic term, disappears in the presence of the fuzzy sphere in the large-N limit. Coincident fuzzy spheres turn out to be unstable, which implies that the dynamically generated gauge group is U(1).

22.1 Type: 0 Citation: Jan Volkholz, Wolfgang Bietenholz, PoS **LATTICE2007** (2007) 283 [arXiv:0808.2387], doi:10.22323/1.042.0283

22.2 Type: 0 Citation: Badis Ydri, Int.J.Mod.Phys.A **22** (2007) [arXiv:0708.3065], doi:10.1142/S0217751X07038062

22.3 Type: 0 Citation: T. Aoyama, Tsunehide Kuroki, Y. Shibusa, Phys.Rev.D **74** (2006) 106004 [arXiv:hep-th/0608031], doi:10.1103/PhysRevD.74.106004

22.4 Type: 0 Citation: Yoshihisa Kitazawa, Shun'ya Mizoguchi, Osamu Saito, Phys.Rev.D **74** (2006) 046003 [arXiv:hep-th/0603189], doi:10.1103/PhysRevD.74.046003

22.5 Type: 0 Citation: Xizhi Han, Sean A. Hartnoll, Phys.Rev.X **10** (2020) 011069 [arXiv:1906.08781], doi:10.1103/PhysRevX.10.011069

22.6 Type: 0 Citation: Badis Ydri, Int.J.Mod.Phys.A **30** (2014) 1450197 [arXiv:1410.4884], doi:10.1142/S0217751X14501978

22.7 Type: 0 Citation: Badis Ydri, Int.J.Mod.Phys.A **27** (2012) 1250088 [arXiv:1206.6375], doi:10.1142/S0217751X12500881

22.8 Type: 0 Citation: Mithat Unsal, JHEP **04** (2006) 002 [arXiv:hep-th/0510004], doi:10.1088/1126-6708/2006/04/002

22.9 Type: 0 Citation: Julieta Medina, Wolfgang Bietenholz, Denjoe O'Connor, JHEP **04** (2008) 041 [arXiv:0712.3366],
doi:10.1088/1126-6708/2008/04/041

22.10 Type: 0 Citation: Masanori Hanada, Lorenzo Mannelli, Yoshinori Matsuo, Phys.Rev.D **80** (2009) 125001 [arXiv:0905.2995],
doi:10.1103/PhysRevD.80.125001

22.11 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534],
doi:10.1007/JHEP10(2011)126

22.12 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Jun Nishimura, JHEP **03** (2008) 035 [arXiv:0712.0646],
doi:10.1088/1126-6708/2008/03/035

22.13 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Kentaroh Yoshida, JHEP **06** (2006) 052 [arXiv:hep-th/0601170],
doi:10.1088/1126-6708/2006/06/052

22.14 Type: 0 Citation: Tatsuo Azeyanagi, Masanori Hanada, Tomoyoshi Hirata, Phys.Rev.D **78** (2008) 105017 [arXiv:0806.3252],
doi:10.1103/PhysRevD.78.105017

22.15 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 047 [arXiv:hep-th/0506205],
doi:10.1088/1126-6708/2005/09/047

22.16 Type: 0 Citation: Marco Panero, SIGMA **2** (2006) 081 [arXiv:hep-th/0609205],
doi:10.3842/SIGMA.2006.081

22.17 Type: 0 Citation: Ahlam ROUAG

22.18 Type: 0 Citation: Marco Panero, JHEP **05** (2007) 082 [arXiv:hep-th/0608202],
doi:10.1088/1126-6708/2007/05/082

22.19 Type: 0 Citation: Kostas Filippas, arXiv:2212.11340

22.20 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **10** (2007) 024 [arXiv:hep-th/0604093],
doi:10.1088/1126-6708/2007/10/024

22.21 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176],
doi:10.22323/1.263.0099

22.22 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **02** (2007) 033 [arXiv:hep-th/0602078],
doi:10.1088/1126-6708/2007/02/033

22.23 Type: 0 Citation: Xizhi Han

22.24 Type: 0 Citation: Badis Ydri, arXiv:1203.0906

22.25 Type: 0 Citation: Badis Ydri, Lect.Notes Phys. **929** (2017) [arXiv:1603.00924],
doi:10.1007/978-3-319-46003-1

22.26 Type: 0 Citation: Badis Ydri, arXiv:1708.00734

22.27 Type: 0 Citation: Wolfgang Bietenholz, Fortsch.Phys. **56** (2008) [arXiv:hep-lat/0611030],
doi:10.1002/prop.200710397

23. Jan Ambjorn, Konstantinos N. Anagnostopoulos, Jun Nishimura, Jacobus J.M. Verbaarschot, "*Non-commutativity of the zero chemical potential limit and the thermodynamic limit in finite density systems*", Phys.Rev.D **70** (2004) 035010 [arXiv:hep-lat/0402031], [doi:10.1103/PhysRevD.70.035010].
Cited by 14 (4) articles

Monte Carlo simulations of finite density systems are often plagued by the complex action problem. We point out that there exists certain non-commutativity in the zero chemical potential limit and the thermodynamic limit when one tries to study such systems by reweighting techniques. This is demonstrated by explicit calculations in a Random Matrix Theory, which is thought to be a simple qualitative model for finite density QCD. The factorization method allows us to understand how the non-commutativity, which appears at the intermediate steps, cancels in the end results for physical observables.

23.1 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950], doi:10.22323/1.164.0226

23.2 Type: 0 Citation: Jacques C.R. Bloch, Tilo Wettig, JHEP **03** (2009) 100 [arXiv:0812.0324], doi:10.1088/1126-6708/2009/03/100

23.3 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504], doi:10.1103/PhysRevD.83.054504

23.4 Type: 0 Citation: Zoltan Fodor, Sandor D. Katz, Christian Schmidt, JHEP **03** (2007) 121 [arXiv:hep-lat/0701022], doi:10.1088/1126-6708/2007/03/121

23.5 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531], doi:10.22323/1.139.0181

23.6 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957], doi:10.22323/1.105.0167

23.7 Type: 0 Citation: G. Endrodi, Z. Fodor, S.D. Katz, D. Sexty, K.K. Szabo, Cs. Torok, Phys.Rev.D **98** (2018) 074508 [arXiv:1807.08326], doi:10.1103/PhysRevD.98.074508

23.8 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, Prog.Theor.Phys. **114** (2005) [arXiv:hep-th/0412194], doi:10.1143/PTP.114.487

23.9 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537, doi:10.1140/epjs/s11734-023-00849-x

23.10 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534], doi:10.1007/JHEP10(2011)126

23.11 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135], doi:10.1007/JHEP11(2013)009

23.12 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

23.13 Type: 0 Citation: Adrian Dumitru, Robert D. Pisarski, Detlef Zschiesche, Phys.Rev.D **72** (2005) 065008 [arXiv:hep-ph/0505256], doi:10.1103/PhysRevD.72.065008

23.14 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

24. Jan Ambjorn, Konstantinos N. Anagnostopoulos, Jun Nishimura, Jacobus J.M. Verbaarschot, "*The Factorization method for simulating systems with a complex action*", arXiv:hep-lat/0310004, [doi:10.1142/9789812702845 Cited by 1 (0) articles

We propose a method for Monte Carlo simulations of systems with a complex action. The method has the advantages of being in principle applicable to any such system and provides a solution to the overlap problem. We apply it in random matrix theory of finite density QCD where we compare with analytic results. In this model we find non–commutativity of the limits muto 0 and Ntoinfty which could be of relevance in QCD at finite density.

24.1 Type: 2 Citation: Jan Ambjorn, Konstantinos N. Anagnostopoulos, Jun Nishimura, Jacobus J.M. Verbaarschot, Phys.Rev.D **70** (2004) 035010 [arXiv:hep-lat/0402031], doi:10.1103/PhysRevD.70.035010

25. J. Ambjorn, K.N. Anagnostopoulos, J. Nishimura, J.J.M. Verbaarschot, "*The Factorization method for systems with a complex action: A Test in random matrix theory for finite density QCD*", JHEP **10** (2002) 062 [arXiv:hep-lat/0208025], [doi:10.1088/1126-6708/2002/10/062].
Cited by 101 (73) articles

Monte Carlo simulations of systems with a complex action are known to be extremely difficult. A new approach to this problem based on a factorization property of distribution functions of observables has been proposed recently. The method can be applied to any system with a complex action, and it eliminates the so-called overlap problem completely. We test the new approach in a Random Matrix Theory for finite density QCD, where we are able to reproduce the exact results for the quark number density. The achieved system size is large enough to extract the thermodynamic limit. Our results provide a clear understanding of how the expected first order phase transition is induced by the imaginary part of the action.

25.1 Type: 2 Citation: Jan Ambjorn, Konstantinos N. Anagnostopoulos, Jun Nishimura, Jacobus J.M. Verbaarschot, arXiv:hep-lat/0310004,
doi:10.1142/9789812702845_0030

25.2 Type: 0 Citation: V. Azcoiti, G. Di Carlo, A. Galante, V. Laliena, Phys.Lett.B **563** (2003) [arXiv:hep-lat/0305005],
doi:10.1016/S0370-2693(03)00601-4

25.3 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, J. Nishimura, J.J.M. Verbaarschot, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0309076],
doi:10.1016/S0920-5632(03)02631-8

25.4 Type: 0 Citation: Vicente Azcoiti, Giuseppe Di Carlo, Angelo Galante, Victor Laliena, Phys.Rev.Lett. **89** (2002) 141601 [arXiv:hep-lat/0203017],
doi:10.1103/PhysRevLett.89.141601

25.5 Type: 0 Citation: Vicente Azcoiti, Giuseppe Di Carlo, Angelo Galante, Victor Laliena, Nucl.Phys.B Proc.Suppl. **119** (2003) [arXiv:hep-lat/0210004],
doi:10.1016/S0920-5632(03)01746-8

25.6 Type: 0 Citation: Jacques Bloch, Phys.Rev.Lett. **107** (2011) 132002 [arXiv:1103.3467],
doi:10.1103/PhysRevLett.107.132002

25.7 Type: 0 Citation: Slavo Kratochvila, Philippe de Forcrand, Nucl.Phys.B Proc.Suppl. **140** (2005) [arXiv:hep-lat/0409072],
doi:10.1016/j.nuclphysbps.2004.11.148

25.8 Type: 0 Citation: G. Akemann, T. Wettig, arXiv:hep-lat/0301017,
doi:10.1142/9789812704498_0023

25.9 Type: 1 Citation: Jun Nishimura, arXiv:hep-lat/0305015,
doi:10.1142/9789812795120_0020

25.10 Type: 1 Citation: Jun Nishimura, arXiv:hep-lat/0310018,
doi:10.1142/9789812702845_0024

25.11 Type: 0 Citation: Christian Schmidt, Zoltan Fodor, Sandor D. Katz, PoS **LAT2005** (2006) 163 [arXiv:hep-lat/0510087],
doi:10.22323/1.020.0163

25.12 Type: 1 Citation: M.P. Lombardo, K. Splittorff, J.J.M. Verbaarschot, PoS **LAT2009** (2009) 171 [arXiv:0912.3109],
doi:10.22323/1.091.0171

25.13 Type: 0 Citation: Gernot Akemann, Tilo Wettig, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0309037],
doi:10.1016/S0920-5632(03)02630-6

25.14 Type: 0 Citation: Jeff Greensite, Joyce C. Myers, K. Splittorff, Phys.Rev.D **88** (2013) 031502 [arXiv:1306.3085],
doi:10.1103/PhysRevD.88.031502

25.15 Type: 0 Citation: Frank James

25.16 Type: 0 Citation: Masahiro Imachi, Yasuhiko Shinno, Hiroshi Yoneyama, arXiv:hep-lat/0506032

25.17 Type: 0 Citation: Masahiro Imachi, Yasuhiko Shinno, Hiroshi Yoneyama, Prog.Theor.Phys. **111** (2004) [arXiv:hep-lat/0309156],
doi:10.1143/PTP.111.387

25.18 Type: 0 Citation: Christian Schmidt, Zoltan Fodor, Sandor D. Katz, arXiv:hep-lat/0512032

25.19 Type: 0 Citation: James C. Osborn, Phys.Rev.Lett. **93** (2004) 222001 [arXiv:hep-th/0403131], doi:10.1103/PhysRevLett.93.222001

25.20 Type: 0 Citation: T. Aoyama, H. Kawai, Prog.Theor.Phys. **116** (2006) [arXiv:hep-th/0603146], doi:10.1143/PTP.116.405

25.21 Type: 0 Citation: Vicente Azcoiti, Eduardo Follana, Alejandro Vaquero, Nucl.Phys.B **851** (2011) [arXiv:1105.1020], doi:10.1016/j.nuclphysb.2011.05.023

25.22 Type: 0 Citation: Liu-Jun Luo, Song Shi, Hong-Shi Zong, Mod.Phys.Lett.A **28** (2013) 1350105, doi:10.1142/S0217732313501058

25.23 Type: 2 Citation: Jan Ambjorn, Konstantinos N. Anagnostopoulos, Jun Nishimura, Jacobus J.M. Verbaarschot, Phys.Rev.D **70** (2004) 035010 [arXiv:hep-lat/0402031], doi:10.1103/PhysRevD.70.035010

25.24 Type: 0 Citation: Thomas Boyer, Wolfgang Bietenholz, Jair Wuilloud, Int.J.Mod.Phys.C **18** (2007) [arXiv:cond-mat/0701331], doi:10.1142/S0129183107011510

25.25 Type: 0 Citation: Gernot Akemann, Tilo Wettig, Phys.Rev.Lett. **92** (2004) 102002 [arXiv:hep-lat/0308003], doi:10.1103/PhysRevLett.92.102002

25.26 Type: 0 Citation: Shinya Aoki, Masanori Hanada, Atsushi Nakamura, JHEP **05** (2015) 071 [arXiv:1410.7421], doi:10.1007/JHEP05(2015)071

25.27 Type: 0 Citation: Vicente Azcoiti, Eduardo Follana, Alejandro Vaquero, Giuseppe Di Carlo, JHEP **08** (2009) 008 [arXiv:0905.0639], doi:10.1088/1126-6708/2009/08/008

25.28 Type: 2 Citation: K.N. Anagnostopoulos, J. Nishimura, Phys.Rev.D **66** (2002) 106008 [arXiv:hep-th/0108041], doi:10.1103/PhysRevD.66.106008

25.29 Type: 1 Citation: K. Splittorff, J.J.M. Verbaarschot, PoS **LATTICE2008** (2008) 182 [arXiv:0809.5259], doi:10.22323/1.066.0182

25.30 Type: 0 Citation: Joel Giedt, Nucl.Phys.B **674** (2003) [arXiv:hep-lat/0307024], doi:10.1016/j.nuclphysb.2003.09.045

25.31 Type: 0 Citation: Tetsuya Takaishi, Prog.Theor.Phys.Suppl. **153** (2004) [arXiv:hep-lat/0405010], doi:10.1143/PTPS.153.277

25.32 Type: 0 Citation: Masahiro Imachi, Yasuhiko Shinno, Hiroshi Yoneyama, Prog.Theor.Phys. **115** (2006) [arXiv:hep-lat/0602009], doi:10.1143/PTP.115.931

25.33 Type: 0 Citation: Jacques Bloch, Phys.Rev.D **86** (2012) 074505 [arXiv:1205.5500], doi:10.1103/PhysRevD.86.074505

25.34 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950], doi:10.22323/1.164.0226

25.35 Type: 0 Citation: T. Aoyama, Y. Shibusa, Nucl.Phys.B **754** (2006) [arXiv:hep-th/0604211], doi:10.1016/j.nuclphysb.2006.07.019

25.36 Type: 0 Citation: C. Schmidt, arXiv:hep-lat/0408047, doi:10.1142/9789812702159_0006

25.37 Type: 0 Citation: Tetsuya Takaishi, Mod.Phys.Lett.A **19** (2004) [arXiv:hep-lat/0312038], doi:10.1142/S0217732304013805

25.38 Type: 0 Citation: L.L. Salcedo, J.Phys.A **40** (2007) 9399 [arXiv:0706.4359], doi:10.1088/1751-8113/40/31/016

25.39 Type: 0 Citation: Jacques C.R. Bloch, Tilo Wettig, JHEP **03** (2009) 100 [arXiv:0812.0324], doi:10.1088/1126-6708/2009/03/100

25.40 Type: 0 Citation: Vicente Azcoiti, Giuseppe Di Carlo, Eduardo Follana, Matteo Giordano, Phys.Rev.D **86** (2012) 096009 [arXiv:1207.4905],
doi:10.1103/PhysRevD.86.096009

25.41 Type: 0 Citation: Zoltan Fodor, Sandor D. Katz, Christian Schmidt, JHEP **03** (2007) 121 [arXiv:hep-lat/0701022],
doi:10.1088/1126-6708/2007/03/121

25.42 Type: 0 Citation: H. Saito, S. Ejiri, S. Aoki, K. Kanaya, Y. Nakagawa, H. Ohno, K. Okuno, T. Umeda, Phys.Rev.D **89** (2014) 034507 [arXiv:1309.2445],
doi:10.1103/PhysRevD.89.034507

25.43 Type: 0 Citation: Shinji Ejiri, Phys.Rev.D **78** (2008) 074507 [arXiv:0804.3227],
doi:10.1103/PhysRevD.78.074507

25.44 Type: 0 Citation: Z. Fodor, S.D. Katz, JHEP **04** (2004) 050 [arXiv:hep-lat/0402006],
doi:10.1088/1126-6708/2004/04/050

25.45 Type: 0 Citation: Massimo D'Elia, Maria Paola Lombardo, Phys.Rev.D **70** (2004) 074509 [arXiv:hep-lat/0406012],
doi:10.1103/PhysRevD.70.074509

25.46 Type: 0 Citation: Shinji Ejiri, Phys.Rev.D **77** (2008) 014508 [arXiv:0706.3549],
doi:10.1103/PhysRevD.77.014508

25.47 Type: 0 Citation: Sourendu Gupta, Phys.Lett.B **588** (2004) [arXiv:hep-lat/0307007],
doi:10.1016/j.physletb.2004.03.018

25.48 Type: 0 Citation: Gert Aarts, PoS **CPOD2014** (2015) 012 [arXiv:1502.01850],
doi:10.22323/1.217.0012

25.49 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504],
doi:10.1103/PhysRevD.83.054504

25.50 Type: 0 Citation: Gert Aarts, Frank A. James, JHEP **01** (2012) 118 [arXiv:1112.4655],
doi:10.1007/JHEP01(2012)118

25.51 Type: 0 Citation: G. Endrodi, Z. Fodor, S.D. Katz, D. Sexty, K.K. Szabo, Cs. Torok, Phys.Rev.D **98** (2018) 074508 [arXiv:1807.08326],
doi:10.1103/PhysRevD.98.074508

25.52 Type: 1 Citation: M.P. Lombardo, K. Splittorff, J.J.M. Verbaarschot, arXiv:0912.4410

25.53 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531],
doi:10.22323/1.139.0181

25.54 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, Prog.Theor.Phys. **114** (2005) [arXiv:hep-th/0412194],
doi:10.1143/PTP.114.487

25.55 Type: 0 Citation: Shinji Ejiri, Eur.Phys.J.A **49** (2013) 86 [arXiv:1306.0295],
doi:10.1140/epja/i2013-13086-7

25.56 Type: 0 Citation: Shinji Ejiri, Phys.Rev.D **69** (2004) 094506 [arXiv:hep-lat/0401012],
doi:10.1103/PhysRevD.69.094506

25.57 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957],
doi:10.22323/1.105.0167

25.58 Type: 0 Citation: G. Akemann, Y.V. Fyodorov, G. Vernizzi, Nucl.Phys.B **694** (2004) [arXiv:hep-th/0404063],
doi:10.1016/j.nuclphysb.2004.06.017

25.59 Type: 0 Citation: Marco Cristoforetti, Francesco Di Renzo, Luigi Scorzato, Phys.Rev.D **86** (2012) 074506 [arXiv:1205.3996],
doi:10.1103/PhysRevD.86.074506

25.60 Type: 0 Citation: N.G. Antoniou, F.K. Diakonos, A.S. Kapoyannis, Nucl.Phys.A **759** (2005) [arXiv:hep-ph/0503176],
doi:10.1016/j.nuclphysa.2005.05.156

25.61 Type: 0 Citation: Paolo Cea, Leonardo Cosmai, Massimo D'Elia, Alessandro Papa, JHEP **02** (2007) 066 [arXiv:hep-lat/0612018],
doi:10.1088/1126-6708/2007/02/066

25.62 Type: 1 Citation: K. Splittorff, J.J.M. Verbaarschot, Phys.Rev.D **77** (2008) 014514 [arXiv:0709.2218],
doi:10.1103/PhysRevD.77.014514

25.63 Type: 0 Citation: Massimo D'Elia, Maria-Paola Lombardo, Phys.Rev.D **67** (2003) 014505 [arXiv:hep-lat/0209146],
doi:10.1103/PhysRevD.67.014505

25.64 Type: 0 Citation: Paolo Cea, Leonardo Cosmai, Alessandro Papa, Phys.Rev.D **89** (2014) 074512 [arXiv:1403.0821],
doi:10.1103/PhysRevD.89.074512

25.65 Type: 0 Citation: F. Csikor, G.I. Egri, Z. Fodor, S.D. Katz, K.K. Szabo, A.I. Toth, arXiv:hep-lat/0301027,
doi:10.1142/9789812704498_0001

25.66 Type: 0 Citation: Christian Schmidt, PoS **LAT2006** (2006) 021 [arXiv:hep-lat/0610116],
doi:10.22323/1.032.0021

25.67 Type: 0 Citation: Maria Paola Lombardo, Prog.Theor.Phys.Suppl. **153** (2004) [arXiv:hep-lat/0401021],
doi:10.1143/PTPS.153.26

25.68 Type: 0 Citation: Gert Aarts, K. Splittorff, JHEP **08** (2010) 017 [arXiv:1006.0332],
doi:10.1007/JHEP08(2010)017

25.69 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

25.70 Type: 1 Citation: B. Klein, D. Toublan, J.J.M. Verbaarschot, Phys.Rev.D **68** (2003) 014009 [arXiv:hep-ph/0301143],
doi:10.1103/PhysRevD.68.014009

25.71 Type: 1 Citation: K. Splittorff, J.J.M. Verbaarschot, arXiv:0809.4503,
doi:10.1142/9789812838667_0014

25.72 Type: 1 Citation: M.P. Lombardo, K. Splittorff, J.J.M. Verbaarschot, Phys.Rev.D **81** (2010) 045012 [arXiv:0910.5482],
doi:10.1103/PhysRevD.81.045012

25.73 Type: 0 Citation: P. Dimopoulos, L. Dini, F. Di Renzo, J. Goswami, G. Nicotra, C. Schmidt, S. Singh, K. Zambello, F. Ziesché, Phys.Rev.D **105** (2022) 034513 [arXiv:2110.15933],
doi:10.1103/PhysRevD.105.034513

25.74 Type: 0 Citation: Jan M. Pawlowski, Manuel Scherzer, Christian Schmidt, Felix P.G. Ziegler, Felix Ziesché, Phys.Rev.D **103** (2021) 094505 [arXiv:2101.03938],
doi:10.1103/PhysRevD.103.094505

25.75 Type: 1 Citation: L. Ravagli, J.J.M. Verbaarschot, Phys.Rev.D **76** (2007) 054506 [arXiv:0704.1111],
doi:10.1103/PhysRevD.76.054506

25.76 Type: 0 Citation: Gert Aarts, Frank A. James, JHEP **08** (2010) 020 [arXiv:1005.3468],
doi:10.1007/JHEP08(2010)020

25.77 Type: 1 Citation: K. Splittorff, J.J.M. Verbaarschot, Phys.Rev.D **75** (2007) 116003 [arXiv:hep-lat/0702011],
doi:10.1103/PhysRevD.75.116003

25.78 Type: 1 Citation: M.P. Lombardo, K. Splittorff, J.J.M. Verbaarschot, Phys.Rev.D **80** (2009) 054509 [arXiv:0904.2122],
doi:10.1103/PhysRevD.80.054509

25.79 Type: 0 Citation: Paolo Cea, Leonardo Cosmai, Alessandro Papa, Phys.Rev.D **93** (2016) 014507 [arXiv:1508.07599],
doi:10.1103/PhysRevD.93.014507

25.80 Type: 0 Citation: M.P. Lombardo, Mod.Phys.Lett.A **22** (2007) [arXiv:hep-lat/0509180],
doi:10.1142/S0217732307023055

25.81 Type: 0 Citation: S.D. Katz, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0310051], doi:10.1016/S0920-5632(03)02507-6

25.82 Type: 1 Citation: Jun Nishimura, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0310019], doi:10.1016/S0920-5632(03)02513-1

25.83 Type: 0 Citation: M. Stephanov, J.Phys.Conf.Ser. **27** (2005) , doi:10.1088/1742-6596/27/1/016

25.84 Type: 0 Citation: Mikhail A. Stephanov, Prog.Theor.Phys.Suppl. **153** (2004) [arXiv:hep-ph/0402115], doi:10.1142/S0217751X05027965

25.85 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534], doi:10.1007/JHEP10(2011)126

25.86 Type: 0 Citation: M.P. Lombardo, PoS **CPOD2006** (2006) 003 [arXiv:hep-lat/0612017], doi:10.22323/1.029.0003

25.87 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

25.88 Type: 0 Citation: M. Stephanov, Acta Phys.Polon.B **35** (2004)

25.89 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, JHEP **12** (2011) 020 [arXiv:1108.5153], doi:10.1007/JHEP12(2011)020

25.90 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135], doi:10.1007/JHEP11(2013)009

25.91 Type: 0 Citation: Thomas Kaltenbrunner

25.92 Type: 0 Citation: Shinji Ejiri, Kazuyuki Kanaya, Takashi Umeda, PTEP **2012** (2012) 01A104 [arXiv:1205.5347], doi:10.1093/ptep/pts005

25.93 Type: 0 Citation: Adrian Dumitru, Robert D. Pisarski, Detlef Zschiesche, Phys.Rev.D **72** (2005) 065008 [arXiv:hep-ph/0505256], doi:10.1103/PhysRevD.72.065008

25.94 Type: 0 Citation: Kenji Fukushima, Marco Ruggieri, Raoul Gatto, Phys.Rev.D **81** (2010) 114031 [arXiv:1003.0047], doi:10.1103/PhysRevD.81.114031

25.95 Type: 0 Citation: G. Akemann, Int.J.Mod.Phys.A **22** (2007) [arXiv:hep-th/0701175], doi:10.1142/S0217751X07036154

25.96 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

25.97 Type: 0 Citation: Gert Aarts, J.Phys.Conf.Ser. **706** (2016) 022004 [arXiv:1512.05145], doi:10.1088/1742-6596/706/2/022004

25.98 Type: 0 Citation: Shin Muroya, Atsushi Nakamura, Chiho Nonaka, Tetsuya Takaishi, Prog.Theor.Phys. **110** (2003) [arXiv:hep-lat/0306031], doi:10.1143/PTP.110.615

25.99 Type: 0 Citation: Yiming Cai

25.100 Type: 0 Citation: Rajarshi Ray, Nucl.Phys.A **862-863** (2011) , doi:10.1016/j.nuclphysa.2011.05.029

25.101 Type: 0 Citation: Kenji Fukushima, Tetsuo Hatsuda, Rept.Prog.Phys. **74** (2011) 014001 [arXiv:1005.4814], doi:10.1088/0034-4885/74/1/014001

26. K.N. Anagnostopoulos, Wolfgang Bietenholz, J. Nishimura, "*The Area law in matrix models for large N QCD strings*", Int.J.Mod.Phys.C **13** (2002) [arXiv:hep-lat/0112035], [doi:10.1142/S0129183102003334]. Cited by 7 (1) articles

We study the question whether matrix models obtained in the zero volume limit of 4d Yang-Mills theories can describe large N QCD strings. The matrix model we use is a variant of the Eguchi-Kawai model in terms of Hermitian matrices, but without any twists or quenching. This model was originally proposed as a toy model of the IIB matrix model. In contrast to common expectations, we do observe the area law for Wilson loops in a significant range of scale of the loop area. Numerical simulations show that this range is stable as N increases up to 768, which strongly suggests that it persists in the large N limit. Hence the equivalence to QCD strings may hold for length scales inside a finite regime.

26.1 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2002) 043 [arXiv:hep-th/0205253],
doi:10.1088/1126-6708/2002/10/043

26.2 Type: 0 Citation: Peter Austing, Graziano Vernizzi, John F. Wheater, JHEP **09** (2003) 023 [arXiv:hep-th/0309026],
doi:10.1088/1126-6708/2003/09/023

26.3 Type: 1 Citation: Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, JHEP **09** (2002) 009 [arXiv:hep-th/0203151],
doi:10.1088/1126-6708/2002/09/009

26.4 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2003) 057 [arXiv:hep-th/0309262],
doi:10.1088/1126-6708/2003/10/057

26.5 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Atsushi Yamaguchi, JHEP **06** (2007) 076 [arXiv:hep-th/0703209],
doi:10.1088/1126-6708/2007/06/076

26.6 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

26.7 Type: 1 Citation: Jun Nishimura, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0310019],
doi:10.1016/S0920-5632(03)02513-1

27. J. Ambjorn, K.N. Anagnostopoulos, A. Krasnitz, "*Real time dynamics of a hot Yang-Mills theory: A Numerical analysis*", Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110092], [doi:10.1016/S0920-5632(01)01775-3].
Cited by 1 (1) articles

We discuss recent results obtained from simulations of high temperature, classical, real time dynamics of SU(2) Yang-Mills theory at temperatures of the order of the electroweak scale. Measurements of gauge covariant and gauge invariant autocorrelations of the fields indicate that the ASY-Bodecker scenario is irrelevant at these temperatures.

27.1 Type: 0 Citation: Laurence G. Yaffe, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-th/0111058],
doi:10.1016/S0920-5632(01)01650-4

28. K.N. Anagnostopoulos, M. Axenides, E.G. Floratos, N. Tetradis, "*Large gauged Q balls*", Phys.Rev.D **64** (2001) 125006 [arXiv:hep-ph/0109080], [doi:10.1103/PhysRevD.64.125006].
Cited by 42 (42) articles

We study Q-balls associated with local U(1) symmetries. Such Q-balls are expected to become unstable for large values of their charge because of the repulsion mediated by the gauge force. We consider the possibility that the repulsion is eliminated through the presence in the interior of the Q-ball of fermions with charge opposite to that of the scalar condensate. Another possibility is that two scalar condensates of opposite charge form in the interior. We demonstrate that both these scenaria can lead to the existence of classically stable, large, gauged Q-balls. We present numerical solutions, as well as an analytical treatment of the "thin-wall" limit.

28.1 Type: 0 Citation: H. Arodz, J. Lis, Phys.Rev.D **79** (2009) 045002 [arXiv:0812.3284],
doi:10.1103/PhysRevD.79.045002

28.2 Type: 0 Citation: Thomas S. Levi, Marcelo Gleiser, Phys.Rev.D **66** (2002) 087701 [arXiv:hep-ph/0110395],
doi:10.1103/PhysRevD.66.087701

28.3 Type: 0 Citation: Gregory Gabadadze, Rachel A. Rosen, Phys.Lett.B **666** (2008) [arXiv:0801.0228], doi:10.1016/j.physletb.2008.06.071

28.4 Type: 0 Citation: E.I. Guendelman, John R. Morris, Phys.Rev.D **68** (2003) 045008 [arXiv:hep-th/0307012], doi:10.1103/PhysRevD.68.045008

28.5 Type: 0 Citation: Vladimir Dzhunushaliev, Arislan Makhmudov, Konstantin G. Zloshchastiev, Phys.Rev.D **94** (2016) 096012 [arXiv:1611.02105], doi:10.1103/PhysRevD.94.096012

28.6 Type: 0 Citation: M. Deshaies-Jacques, R. MacKenzie, Can.J.Phys. **85** (2007) [arXiv:hep-th/0606258], doi:10.1139/p07-063

28.7 Type: 0 Citation: Marcelo Gleiser, Damian Sowinski, Phys.Lett.B **727** (2013) [arXiv:1307.0530], doi:10.1016/j.physletb.2013.10.005

28.8 Type: 0 Citation: V. Loiko, I. Perapechka, Ya. Shnir, Phys.Rev.D **98** (2018) 045018 [arXiv:1805.11929], doi:10.1103/PhysRevD.98.045018

28.9 Type: 0 Citation: A. Alonso-Izquierdo, C. Garzon Sanchez, Phys.Rev.D **107** (2023) 125004 [arXiv:2303.01537], doi:10.1103/PhysRevD.107.125004

28.10 Type: 0 Citation: A. Yu. Loginov, Phys.Rev.D **91** (2015) 105028, doi:10.1103/PhysRevD.91.105028

28.11 Type: 0 Citation: M. Deshaies-Jacques, R. MacKenzie, Phys.Rev.D **74** (2006) 025006 [arXiv:hep-th/0604036], doi:10.1103/PhysRevD.74.025006

28.12 Type: 0 Citation: A. Yu. Loginov, V.V. Gauzshtein, Phys.Rev.D **99** (2019) 065011 [arXiv:1901.00272], doi:10.1103/PhysRevD.99.065011

28.13 Type: 0 Citation: Takashi Tamaki, Nobuyuki Sakai, arXiv:1401.0996

28.14 Type: 0 Citation: A.Yu. Loginov, V.V. Gauzshtein, Eur.Phys.J.C **79** (2019) 780 [arXiv:1906.02447], doi:10.1140/epjc/s10052-019-7302-6

28.15 Type: 0 Citation: Marcelo Gleiser, Joel Thorarinson, Phys.Rev.D **73** (2006) 065008 [arXiv:hep-th/0505251], doi:10.1103/PhysRevD.73.065008

28.16 Type: 0 Citation: A.Yu. Loginov, arXiv:2307.00282

28.17 Type: 0 Citation: Paweł Klimas, Nobuyuki Sawado, Shota Yanai, Phys.Rev.D **99** (2019) 045015 [arXiv:1812.08363], doi:10.1103/PhysRevD.99.045015

28.18 Type: 0 Citation: A. Yu Loginov, V.V. Gauzshtein, Eur.Phys.J.C **80** (2020) 1123 [arXiv:2009.12818], doi:10.1140/epjc/s10052-020-08715-z

28.19 Type: 0 Citation: Victor Loiko, Yakov Shnir, Phys.Rev.D **106** (2022) 045021 [arXiv:2207.02646], doi:10.1103/PhysRevD.106.045021

28.20 Type: 0 Citation: A. Yu. Loginov, V.V. Gauzshtein, Phys.Rev.D **102** (2020) 025010 [arXiv:2004.03446], doi:10.1103/PhysRevD.102.025010

28.21 Type: 0 Citation: M. Mohammadi, R. Gheisari, Phys.Scripta **95** (2020) 015301 [arXiv:1901.10910], doi:10.1088/1402-4896/ab2c7b

28.22 Type: 0 Citation: Mohammad Mohammadi, Iran.J.Sci.Technol.A **43** (2019) [arXiv:1906.08049], doi:10.1007/s40995-019-00704-6

28.23 Type: 0 Citation: A.Yu. Loginov, Nucl.Phys.B **984** (2022) 115964 [arXiv:2207.02055], doi:10.1016/j.nuclphysb.2022.115964

28.24 Type: 0 Citation: V. Loiko, Ya Shnir, Phys.Lett.B **797** (2019) 134810 [arXiv:1906.01943], doi:10.1016/j.physletb.2019.134810

28.25 Type: 0 Citation: Mohammad Mohammadi, Nematollah Riazi, Mohammad Hassan Dhegihani, Annals Phys. **440** (2022) 168820 [arXiv:1912.08625], doi:10.1016/j.aop.2022.168820

28.26 Type: 0 Citation: J. Kunz, V. Loiko, Ya. Shnir, Phys.Rev.D **105** (2022) 085013 [arXiv:2112.06626], doi:10.1103/PhysRevD.105.085013

28.27 Type: 0 Citation: L. Campanelli, M. Ruggieri, Phys.Rev.D **80** (2009) 036006 [arXiv:0904.4802], doi:10.1103/PhysRevD.80.036006

28.28 Type: 0 Citation: Hideki Ishihara, Tatsuya Ogawa, Phys.Rev.D **99** (2019) 056019 [arXiv:1901.08799], doi:10.1103/PhysRevD.99.056019

28.29 Type: 0 Citation: Takashi Tamaki, Nobuyuki Sakai, Phys.Rev.D **90** (2014) 085022, doi:10.1103/PhysRevD.90.085022

28.30 Type: 0 Citation: Nobuyuki Sawado, Shota Yanai, Phys.Rev.D **102** (2020) 045007 [arXiv:2006.03424], doi:10.1103/PhysRevD.102.045007

28.31 Type: 0 Citation: Viktor Loiko, Ilya Perapechka, Yakov Shnir, EPL **133** (2021) 41001 [arXiv:2012.01052], doi:10.1209/0295-5075/133/41001

28.32 Type: 0 Citation: D. Bazeia, L. Losano, M.A. Marques, R. Menezes, Phys.Lett.B **765** (2017) [arXiv:1612.04442], doi:10.1016/j.physletb.2016.12.033

28.33 Type: 0 Citation: A. Alonso-Izquierdo, C. Garzon Sanchez, Physica D: Nonlinear Phenomena **449** (2023) 133764 [arXiv:2301.10739], doi:10.1016/j.physd.2023.133764

28.34 Type: 0 Citation: Mohammad Mohammadi, Phys.Scripta **95** (2020) 045302 [arXiv:1909.10078], doi:10.1088/1402-4896/ab6527

28.35 Type: 0 Citation: Yves Brihaye, Adolfo Cisterna, Betti Hartmann, Gabriel Luchini, Phys.Rev.D **92** (2015) 124061 [arXiv:1511.02757], doi:10.1103/PhysRevD.92.124061

28.36 Type: 0 Citation: Mohammad Mohammadi, Annals Phys. **422** (2020) 168304 [arXiv:1902.02648], doi:10.1016/j.aop.2020.168304

28.37 Type: 0 Citation: Mohammad Mohammadi, Annals Phys. **414** (2020) 168099 [arXiv:1811.06088], doi:10.1016/j.aop.2020.168099

28.38 Type: 0 Citation: Mitsuo I. Tsumagari, Edmund J. Copeland, Paul M. Saffin, Phys.Rev.D **78** (2008) 065021 [arXiv:0805.3233], doi:10.1103/PhysRevD.78.065021

28.39 Type: 0 Citation: Yakov Shnir, arXiv:2204.06374

28.40 Type: 0 Citation: Eric Welch Cotner

28.41 Type: 0 Citation: Anupam Mazumdar, Graham White, Rept.Prog.Phys. **82** (2019) 076901 [arXiv:1811.01948], doi:10.1088/1361-6633/ab1f55

28.42 Type: 0 Citation: Kari Enqvist, Anupam Mazumdar, Phys.Rept. **380** (2003) [arXiv:hep-ph/0209244], doi:10.1016/S0370-1573(03)00119-4

29. K.N. Anagnostopoulos, J. Nishimura, "*New approach to the complex action problem and its application to a nonperturbative study of superstring theory*", Phys.Rev.D **66** (2002) 106008 [arXiv:hep-th/0108041], [doi:10.1103/PhysRevD.66.106008].
Cited by 121 (68) articles

Monte Carlo simulations of a system whose action has an imaginary part are considered to be extremely difficult. We propose a new approach to this 'complex-action problem', which utilizes a factorization property of distribution functions. The basic idea is quite general, and it removes the so-called overlap problem completely. Here we apply the method to a nonperturbative study of superstring theory using its matrix formulation. In this particular example, the distribution function turns out to be positive definite, which allows us to reduce the problem even further. Our numerical results suggest an intuitive explanation for the dynamical generation of 4d space-time.

29.1 Type: 2 Citation: Jan Ambjorn, Konstantinos N. Anagnostopoulos, Jun Nishimura, Jacobus J.M. Verbaarschot, arXiv:hep-lat/0310004, doi:10.1142/9789812702845_0030

29.2 Type: 0 Citation: Vicente Azcoiti, Giuseppe Di Carlo, Angelo Galante, Victor Laliena, Nucl.Phys.B Proc.Suppl. **119** (2003) [arXiv:hep-lat/0210004], doi:10.1016/S0920-5632(03)01746-8

29.3 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, J. Nishimura, J.J.M. Verbaarschot, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0309076], doi:10.1016/S0920-5632(03)02631-8

29.4 Type: 0 Citation: V. Azcoiti, G. Di Carlo, A. Galante, V. Laliena, Phys.Lett.B **563** (2003) [arXiv:hep-lat/0305005], doi:10.1016/S0370-2693(03)00601-4

29.5 Type: 0 Citation: Olmo Francesconi, Markus Holzmann, Biagio Lucini, Antonio Rago, Jarno Rantaharju, PoS **LATTICE2019** (2019) 200 [arXiv:1912.04190], doi:10.22323/1.363.0200

29.6 Type: 0 Citation: Vicente Azcoiti, Giuseppe Di Carlo, Angelo Galante, Victor Laliena, Phys.Rev.Lett. **89** (2002) 141601 [arXiv:hep-lat/0203017], doi:10.1103/PhysRevLett.89.141601

29.7 Type: 0 Citation: Olmo Francesconi, Markus Holzmann, Biagio Lucini, Antonio Rago, Acta Phys.Polon.Supp. **13** (2020) , doi:10.5506/APhysPolBSupp.13.121

29.8 Type: 0 Citation: Jacques Bloch, Phys.Rev.Lett. **107** (2011) 132002 [arXiv:1103.3467], doi:10.1103/PhysRevLett.107.132002

29.9 Type: 0 Citation: Dominik Hangleiter, Ingo Roth, Daniel Nagaj, Jens Eisert, Sci.Adv. **6** (2020) eabb8341 [arXiv:1906.02309], doi:10.1126/sciadv.abb8341

29.10 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2015** (2016) 307 [arXiv:1509.05079], doi:10.22323/1.251.0307

29.11 Type: 1 Citation: Jun Nishimura, arXiv:hep-lat/0305015, doi:10.1142/9789812795120_0020

29.12 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110094], doi:10.1016/S0920-5632(01)01899-0

29.13 Type: 1 Citation: Jun Nishimura, arXiv:hep-lat/0310018, doi:10.1142/9789812702845_0024

29.14 Type: 1 Citation: Jun Nishimura, Phys.Rev.D **65** (2002) 105012 [arXiv:hep-th/0108070], doi:10.1103/PhysRevD.65.105012

29.15 Type: 0 Citation: Hiromichi Kaneko, Yoshihisa Kitazawa, Koichiro Matsumoto, Phys.Rev.D **76** (2007) 084024 [arXiv:0706.1708], doi:10.1103/PhysRevD.76.084024

29.16 Type: 0 Citation: H. Kawai, Shoichi Kawamoto, Tsunehide Kuroki, T. Matsuo, S. Shinohara, Nucl.Phys.B **647** (2002) [arXiv:hep-th/0204240], doi:10.1016/S0550-3213(02)00908-2

29.17 Type: 0 Citation: Frank James

29.18 Type: 0 Citation: Biagio Lucini, Olmo Francesconi, Markus Holzmann, Antonio Rago, PoS **Confinement2018** (2019) 051 [arXiv:1901.07602], doi:10.22323/1.336.0051

29.19 Type: 0 Citation: Zdzislaw Burda, Bengt Petersson, Marc Wattenberg, JHEP **03** (2005) 058 [arXiv:hep-th/0503032], doi:10.1088/1126-6708/2005/03/058

29.20 Type: 0 Citation: T. Aoyama, H. Kawai, Prog.Theor.Phys. **116** (2006) [arXiv:hep-th/0603146], doi:10.1143/PTP.116.405

29.21 Type: 0 Citation: Olmo Francesconi, Markus Holzmann, Biagio Lucini, Antonio Rago, Phys.Rev.D **101** (2020) 014504 [arXiv:1910.11026], doi:10.1103/PhysRevD.101.014504

29.22 Type: 0 Citation: Takaaki Imai, Yoshihisa Kitazawa, Yastoshi Takayama, Dan Tomino, Nucl.Phys.B **679** (2004) [arXiv:hep-th/0307007],
doi:10.1016/j.nuclphysb.2003.11.038

29.23 Type: 1 Citation: Jun Nishimura, Fumihiko Sugino, JHEP **05** (2002) 001 [arXiv:hep-th/0111102],
doi:10.1088/1126-6708/2002/05/001

29.24 Type: 0 Citation: Takaaki Imai, Yastoshi Takayama, Nucl.Phys.B **686** (2004) [arXiv:hep-th/0312241],
doi:10.1016/j.nuclphysb.2004.03.008

29.25 Type: 2 Citation: Jan Ambjorn, Konstantinos N. Anagnostopoulos, Jun Nishimura, Jacobus J.M. Verbaarschot, Phys.Rev.D **70** (2004) 035010 [arXiv:hep-lat/0402031],
doi:10.1103/PhysRevD.70.035010

29.26 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, J. Nishimura, J.J.M. Verbaarschot, JHEP **10** (2002) 062 [arXiv:hep-lat/0208025],
doi:10.1088/1126-6708/2002/10/062

29.27 Type: 0 Citation: Jeff Greensite, Joyce C. Myers, K. Splittorff, PoS **LATTICE2013** (2014) 023 [arXiv:1311.4568],
doi:10.22323/1.187.0023

29.28 Type: 0 Citation: Shinya Aoki, Masanori Hanada, Atsushi Nakamura, JHEP **05** (2015) 071 [arXiv:1410.7421],
doi:10.1007/JHEP05(2015)071

29.29 Type: 2 Citation: Jun Nishimura, Konstantinos N. Anagnostopoulos, Masanori Hanada, Shingo Takeuchi, PoS **LATTICE2007** (2007) 059 [arXiv:0801.4205],
doi:10.22323/1.042.0059

29.30 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Jun Nishimura, Phys.Rev.D **72** (2005) 066005 [arXiv:hep-th/0504217],
doi:10.1103/PhysRevD.72.066005

29.31 Type: 0 Citation: Akira Ohnishi, Terukazu Ichihara, PoS **LATTICE2015** (2016) 191 [arXiv:1512.08458],
doi:10.22323/1.251.0191

29.32 Type: 0 Citation: Zhenning Cai, Xiaoyu Dong, Yang Kuang, arXiv:2007.10198

29.33 Type: 0 Citation: Joel Giedt, Nucl.Phys.B **674** (2003) [arXiv:hep-lat/0307024],
doi:10.1016/j.nuclphysb.2003.09.045

29.34 Type: 0 Citation: Jeff Greensite, Joyce C. Myers, K. Splittorff, JHEP **10** (2013) 192 [arXiv:1308.6712],
doi:10.1007/JHEP10(2013)192

29.35 Type: 0 Citation: Jacques Bloch, Phys.Rev.D **86** (2012) 074505 [arXiv:1205.5500],
doi:10.1103/PhysRevD.86.074505

29.36 Type: 1 Citation: J. Nishimura, Fortsch.Phys. **62** (2014) [arXiv:1405.5904],
doi:10.1002/prop.201400040

29.37 Type: 0 Citation: H. Kawai, Shoichi Kawamoto, Tsunehide Kuroki, S. Shinohara, Prog.Theor.Phys. **109** (2003) [arXiv:hep-th/0211272],
doi:10.1143/PTP.109.115

29.38 Type: 0 Citation: Vicente Azcoiti, Giuseppe Di Carlo, Eduardo Follana, Matteo Giordano, Phys.Rev.D **86** (2012) 096009 [arXiv:1207.4905],
doi:10.1103/PhysRevD.86.096009

29.39 Type: 0 Citation: L.L. Salcedo, J.Phys.A **40** (2007) 9399 [arXiv:0706.4359],
doi:10.1088/1751-8113/40/31/016

29.40 Type: 1 Citation: Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, Phys.Rev.D **86** (2012) 027901 [arXiv:1110.4803],
doi:10.1103/PhysRevD.86.027901

29.41 Type: 1 Citation: Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, Phys.Rev.Lett. **108** (2012) 011601 [arXiv:1108.1540],
doi:10.1103/PhysRevLett.108.011601

29.42 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2002) 043 [arXiv:hep-th/0205253],
doi:10.1088/1126-6708/2002/10/043

29.43 Type: 0 Citation: T. Aoyama, Y. Shibusa, Nucl.Phys.B **754** (2006) [arXiv:hep-th/0604211], doi:10.1016/j.nuclphysb.2006.07.019

29.44 Type: 0 Citation: Jan Ambjorn, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0201012], doi:10.1016/S0920-5632(01)01644-9

29.45 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **11** (2003) 009 [arXiv:hep-th/0310170], doi:10.1088/1126-6708/2003/11/009

29.46 Type: 0 Citation: Zoltan Fodor, Sandor D. Katz, Christian Schmidt, JHEP **03** (2007) 121 [arXiv:hep-lat/0701022],
doi:10.1088/1126-6708/2007/03/121

29.47 Type: 0 Citation: Yoshihisa Kitazawa, Koichiro Matsumoto, Phys.Rev.D **79** (2009) 065003 [arXiv:0811.0529],
doi:10.1103/PhysRevD.79.065003

29.48 Type: 1 Citation: Masanori Hanada, Akitsugu Miwa, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **102** (2009) 181602 [arXiv:0811.2081],
doi:10.1103/PhysRevLett.102.181602

29.49 Type: 0 Citation: H. Saito, S. Ejiri, S. Aoki, K. Kanaya, Y. Nakagawa, H. Ohno, K. Okuno, T. Umeda, Phys.Rev.D **89** (2014) 034507 [arXiv:1309.2445],
doi:10.1103/PhysRevD.89.034507

29.50 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2011) 135 [arXiv:1108.1293],
doi:10.1007/JHEP10(2011)135

29.51 Type: 1 Citation: Yuta Ito, Jun Nishimura, JHEP **12** (2016) 009 [arXiv:1609.04501],
doi:10.1007/JHEP12(2016)009

29.52 Type: 0 Citation: Shinji Ejiri, Phys.Rev.D **78** (2008) 074507 [arXiv:0804.3227],
doi:10.1103/PhysRevD.78.074507

29.53 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957],
doi:10.22323/1.105.0167

29.54 Type: 0 Citation: Masanori Hanada, Carlos Hoyos, Andreas Karch, Laurence G. Yaffe, JHEP **08** (2012) 081 [arXiv:1201.3718],
doi:10.1007/JHEP08(2012)081

29.55 Type: 0 Citation: Subrata Bal, Masanori Hanada, Hikaru Kawai, Fukuichiro Kubo, Nucl.Phys.B **727** (2005) [arXiv:hep-th/0412303],
doi:10.1016/j.nuclphysb.2005.08.021

29.56 Type: 0 Citation: K. Langfeld, B. Lucini, A. Rago, R. Pellegrini, L. Bongiovanni, J.Phys.Conf.Ser. **631** (2015) 012063 [arXiv:1503.00450],
doi:10.1088/1742-6596/631/1/012063

29.57 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Masanori Hanada, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **100** (2008) 021601 [arXiv:0707.4454],
doi:10.1103/PhysRevLett.100.021601

29.58 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841],
doi:10.22323/1.347.0065

29.59 Type: 0 Citation: Takehiro Azuma, Pallab Basu, Spenta R. Wadia, Phys.Lett.B **659** (2008) [arXiv:0710.5873],
doi:10.1016/j.physletb.2007.11.088

29.60 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504],
doi:10.1103/PhysRevD.83.054504

29.61 Type: 0 Citation: Shinji Ejiri, Phys.Rev.D **77** (2008) 014508 [arXiv:0706.3549],
doi:10.1103/PhysRevD.77.014508

29.62 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, Prog.Theor.Phys. **114** (2005) [arXiv:hep-th/0412194],
doi:10.1143/PTP.114.487

29.63 Type: 0 Citation: M.P. Lombardo, K. Splittorff, J.J.M. Verbaarschot, arXiv:0912.4410

29.64 Type: 1 Citation: Tatsumi Aoyama, Jun Nishimura, Toshiyuki Okubo, Prog.Theor.Phys. **125** (2011) [arXiv:1007.0883],
doi:10.1143/PTP.125.537

29.65 Type: 0 Citation: Shinji Ejiri, Eur.Phys.J.A **49** (2013) 86 [arXiv:1306.0295],
doi:10.1140/epja/i2013-13086-7

29.66 Type: 0 Citation: Shun'ichi Shinohara

29.67 Type: 1 Citation: Jun Nishimura, Soo-Jong Rey, Fumihiko Sugino, JHEP **02** (2003) 032 [arXiv:hep-lat/0301025],
doi:10.1088/1126-6708/2003/02/032

29.68 Type: 1 Citation: Jun Nishimura, Int.J.Mod.Phys.A **28** (2013) 1340002 [arXiv:1209.6386],
doi:10.1142/S0217751X13400022

29.69 Type: 0 Citation: G. Endrodi, Z. Fodor, S.D. Katz, D. Sexty, K.K. Szabo, Cs. Torok, Phys.Rev.D **98** (2018) 074508 [arXiv:1807.08326],
doi:10.1103/PhysRevD.98.074508

29.70 Type: 0 Citation: Shoichi Kawamoto

29.71 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2003) 057 [arXiv:hep-th/0309262],
doi:10.1088/1126-6708/2003/10/057

29.72 Type: 1 Citation: Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, JHEP **10** (2012) 147 [arXiv:1208.0711],
doi:10.1007/JHEP10(2012)147

29.73 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, JHEP **02** (2018) 151 [arXiv:1712.07562],
doi:10.1007/JHEP02(2018)151

29.74 Type: 1 Citation: Yuta Ito, Jun Nishimura, Asato Tsuchiya, JHEP **11** (2015) 070 [arXiv:1506.04795],
doi:10.1007/JHEP11(2015)070

29.75 Type: 0 Citation: Yoshihisa Kitazawa, Shun'ya Mizoguchi, Osamu Saito, Phys.Rev.D **74** (2006) 046003 [arXiv:hep-th/0603189],
doi:10.1103/PhysRevD.74.046003

29.76 Type: 0 Citation: Marco Cristoforetti, Francesco Di Renzo, Luigi Scorzato, Phys.Rev.D **86** (2012) 074506 [arXiv:1205.3996],
doi:10.1103/PhysRevD.86.074506

29.77 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, JHEP **03** (2022) 067 [arXiv:2107.11512],
doi:10.1007/JHEP03(2022)067

29.78 Type: 0 Citation: Maria Paola Lombardo, Prog.Theor.Phys.Suppl. **153** (2004) [arXiv:hep-lat/0401021],
doi:10.1143/PTPS.153.26

29.79 Type: 0 Citation: Toshiharu Maeda

29.80 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

29.81 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Atsushi Yamaguchi, JHEP **06** (2007) 076 [arXiv:hep-th/0703209],
doi:10.1088/1126-6708/2007/06/076

29.82 Type: 1 Citation: Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **06** (2005) 081 [arXiv:hep-th/0410263],
doi:10.1088/1126-6708/2005/06/081

29.83 Type: 0 Citation: M.P. Lombardo, K. Splittorff, J.J.M. Verbaarschot, Phys.Rev.D **81** (2010) 045012 [arXiv:0910.5482],
doi:10.1103/PhysRevD.81.045012

29.84 Type: 0 Citation: Yuta Ito

29.85 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **07** (2004) 066 [arXiv:hep-th/0405096],
doi:10.1088/1126-6708/2004/07/066

29.86 Type: 0 Citation: Gert Aarts, Frank A. James, JHEP **08** (2010) 020 [arXiv:1005.3468],
doi:10.1007/JHEP08(2010)020

29.87 Type: 1 Citation: Yuta Ito, Sang-Woo Kim, Yuki Koizuka, Jun Nishimura, Asato Tsuchiya, PTEP **2014** (2014) 083B01 [arXiv:1312.5415],
doi:10.1093/ptep/ptu101

29.88 Type: 0 Citation: M.P. Lombardo, K. Splittorff, J.J.M. Verbaarschot, Phys.Rev.D **80** (2009) 054509 [arXiv:0904.2122],
doi:10.1103/PhysRevD.80.054509

29.89 Type: 0 Citation: Muxin Han, Zichang Huang, Hongguang Liu, Dongxue Qu, Yidun Wan, Phys.Rev.D **103** (2021) 084026 [arXiv:2012.11515],
doi:10.1103/PhysRevD.103.084026

29.90 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2006) 061 [arXiv:hep-th/0405277],
doi:10.1088/1126-6708/2006/05/061

29.91 Type: 0 Citation: M.P. Lombardo, Mod.Phys.Lett.A **22** (2007) [arXiv:hep-lat/0509180],
doi:10.1142/S0217732307023055

29.92 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 047 [arXiv:hep-th/0506205],
doi:10.1088/1126-6708/2005/09/047

29.93 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Jun Nishimura, JHEP **03** (2008) 035 [arXiv:0712.0646],
doi:10.1088/1126-6708/2008/03/035

29.94 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534],
doi:10.1007/JHEP10(2011)126

29.95 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567],
doi:10.22323/1.376.0183

29.96 Type: 0 Citation: Dominik Hangleiter, arXiv:2012.07905,
doi:10.17169/refubium-28790

29.97 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Shingo Takeuchi, JHEP **05** (2007) 091 [arXiv:0704.3183],
doi:10.1088/1126-6708/2007/05/091

29.98 Type: 0 Citation: Olmo Francesconi

29.99 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Kentaroh Yoshida, JHEP **06** (2006) 052 [arXiv:hep-th/0601170],
doi:10.1088/1126-6708/2006/06/052

29.100 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, JHEP **12** (2011) 020 [arXiv:1108.5153],
doi:10.1007/JHEP12(2011)020

29.101 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 046 [arXiv:hep-th/0506062],
doi:10.1088/1126-6708/2005/09/046

29.102 Type: 0 Citation: Thomas Kaltenbrunner

29.103 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **04** (2009) 055 [arXiv:0810.5234],
doi:10.1088/1126-6708/2009/04/055

29.104 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135],
doi:10.1007/JHEP11(2013)009

29.105 Type: 0 Citation: Adrian Dumitru, Robert D. Pisarski, Detlef Zschiesche, Phys.Rev.D **72** (2005) 065008 [arXiv:hep-ph/0505256],
doi:10.1103/PhysRevD.72.065008

29.106 Type: 0 Citation: Olmo Francesconi

29.107 Type: 0 Citation: Shinji Ejiri, Kazuyuki Kanaya, Takashi Umeda, PTEP **2012** (2012) 01A104 [arXiv:1205.5347],
doi:10.1093/ptep/pts005

29.108 Type: 0 Citation: Lorenzo Bongiovanni, arXiv:1603.06458

29.109 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410],
doi:10.1007/JHEP06(2020)069

29.110 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2004) 005 [arXiv:hep-th/0401038],
doi:10.1088/1126-6708/2004/05/005

29.111 Type: 1 Citation: Jun Nishimura, PTEP **2012** (2012) 01A101 [arXiv:1205.6870],
doi:10.1093/ptep/pts004

29.112 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **10** (2007) 024 [arXiv:hep-th/0604093],
doi:10.1088/1126-6708/2007/10/024

29.113 Type: 0 Citation: Shin Muroya, Atsushi Nakamura, Chiho Nonaka, Tetsuya Takaishi, Prog.Theor.Phys. **110** (2003) [arXiv:hep-lat/0306031],
doi:10.1143/PTP.110.615

29.114 Type: 1 Citation: Wolfgang Bietenholz, Jun Nishimura, Yoshiaki Susaki, Jan Volkholz, JHEP **10** (2006) 042 [arXiv:hep-th/0608072],
doi:10.1088/1126-6708/2006/10/042

29.115 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176],
doi:10.22323/1.263.0099

29.116 Type: 0 Citation: Katsuta Sakai,
doi:10.14989/doctor.k22243

29.117 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **02** (2007) 033 [arXiv:hep-th/0602078],
doi:10.1088/1126-6708/2007/02/033

29.118 Type: 0 Citation: Rajarshi Ray, Nucl.Phys.A **862-863** (2011) ,
doi:10.1016/j.nuclphysa.2011.05.029

29.119 Type: 0 Citation: Kenji Fukushima, Tetsuo Hatsuda, Rept.Prog.Phys. **74** (2011) 014001 [arXiv:1005.4814],
doi:10.1088/0034-4885/74/1/014001

29.120 Type: 0 Citation: Badis Ydri, arXiv:1708.00734

29.121 Type: 0 Citation: Heinz J. Rothe,
doi:10.1142/8229

30. Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, "*On the spontaneous breakdown of Lorentz symmetry in matrix models of superstrings*", Phys.Rev.D **65** (2002) 086001 [arXiv:hep-th/0104260], [doi:10.1103/PhysRevD.65.086001].
Cited by 54 (16) articles

In string or M theories, the spontaneous breaking of 10D or 11D Lorentz symmetry is required to describe our space-time. A direct approach to this issue is provided by the IIB matrix model. We study its 4D version, which corresponds to the zero volume limit of 4D super SU(N) Yang-Mills theory. Based on the moment of inertia as a criterion, spontaneous symmetry breaking (SSB) seems to occur, so that only one extended direction remains, as first observed by Bialas, Burda et al. However, using Wilson loops as probes of space-time we do not observe any sign of SSB in Monte Carlo simulations where N is as large as 48. This agrees with an earlier observation that the phase of the fermionic integral, which is absent in the 4D model, should play a crucial role if SSB of Lorentz symmetry really occurs in the 10D IIB matrix model.

30.1 Type: 0 Citation: Zdzislaw Burda, Bengt Petersson, Marc Wattenberg, Acta Phys.Polon.B **34** (2003) [arXiv:hep-th/0308194]

30.2 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110094],
doi:10.1016/S0920-5632(01)01899-0

30.3 Type: 1 Citation: Jun Nishimura, Phys.Rev.D **65** (2002) 105012 [arXiv:hep-th/0108070], doi:10.1103/PhysRevD.65.105012

30.4 Type: 0 Citation: T. Aoyama, H. Kawai, Prog.Theor.Phys. **116** (2006) [arXiv:hep-th/0603146], doi:10.1143/PTP.116.405

30.5 Type: 0 Citation: Zdzislaw Burda, Bengt Petersson, Marc Wattenberg, JHEP **03** (2005) 058 [arXiv:hep-th/0503032], doi:10.1088/1126-6708/2005/03/058

30.6 Type: 1 Citation: Jun Nishimura, Fumihiko Sugino, JHEP **05** (2002) 001 [arXiv:hep-th/0111102], doi:10.1088/1126-6708/2002/05/001

30.7 Type: 2 Citation: K.N. Anagnostopoulos, J. Nishimura, Phys.Rev.D **66** (2002) 106008 [arXiv:hep-th/0108041], doi:10.1103/PhysRevD.66.106008

30.8 Type: 0 Citation: Hajime Aoki, Satoshi Iso, Takao Suyama, Nucl.Phys.B **634** (2002) [arXiv:hep-th/0203277], doi:10.1016/S0550-3213(02)00295-X

30.9 Type: 0 Citation: Z. Burda, J. Erdmann, B. Petersson, M. Wattenberg, Phys.Rev.E **67** (2003) 026105 [arXiv:cond-mat/0207459], doi:10.1103/PhysRevE.67.026105

30.10 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950], doi:10.22323/1.164.0226

30.11 Type: 0 Citation: T. Aoyama, Y. Shibusa, Nucl.Phys.B **754** (2006) [arXiv:hep-th/0604211], doi:10.1016/j.nuclphysb.2006.07.019

30.12 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.Lett. **93** (2004) 131301 [arXiv:hep-th/0404156], doi:10.1103/PhysRevLett.93.131301

30.13 Type: 0 Citation: Fumihiko Sugino, JHEP **07** (2001) 014 [arXiv:hep-th/0105284], doi:10.1088/1126-6708/2001/07/014

30.14 Type: 0 Citation: Giovanni M. Cicuta, Luca Molinari, Graziano Vernizzi, J.Phys.A **35** (2002) [arXiv:hep-th/0109160], doi:10.1088/0305-4470/35/4/102

30.15 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **99** (2007) 161602 [arXiv:0706.1647], doi:10.1103/PhysRevLett.99.161602

30.16 Type: 0 Citation: Marc Wattenberg

30.17 Type: 0 Citation: Takehiro Azuma, Pallab Basu, Spenta R. Wadia, Phys.Lett.B **659** (2008) [arXiv:0710.5873], doi:10.1016/j.physletb.2007.11.088

30.18 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2002) 043 [arXiv:hep-th/0205253], doi:10.1088/1126-6708/2002/10/043

30.19 Type: 1 Citation: Jan Ambjorn, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0201012], doi:10.1016/S0920-5632(01)01644-9

30.20 Type: 0 Citation: Peter Austing, Graziano Vernizzi, John F. Wheater, JHEP **09** (2003) 023 [arXiv:hep-th/0309026], doi:10.1088/1126-6708/2003/09/023

30.21 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **11** (2003) 009 [arXiv:hep-th/0310170], doi:10.1088/1126-6708/2003/11/009

30.22 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504], doi:10.1103/PhysRevD.83.054504

30.23 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531], doi:10.22323/1.139.0181

30.24 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Masanori Hanada, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **100** (2008) 021601 [arXiv:0707.4454],
doi:10.1103/PhysRevLett.100.021601

30.25 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2011) 135 [arXiv:1108.1293],
doi:10.1007/JHEP10(2011)135

30.26 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841],
doi:10.22323/1.347.0065

30.27 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, JHEP **09** (2005) 040 [arXiv:hep-th/0505178],
doi:10.1088/1126-6708/2005/09/040

30.28 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957],
doi:10.22323/1.105.0167

30.29 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, Prog.Theor.Phys. **114** (2005) [arXiv:hep-th/0412194],
doi:10.1143/PTP.114.487

30.30 Type: 1 Citation: Tatsumi Aoyama, Jun Nishimura, Toshiyuki Okubo, Prog.Theor.Phys. **125** (2011) [arXiv:1007.0883],
doi:10.1143/PTP.125.537

30.31 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2003) 057 [arXiv:hep-th/0309262],
doi:10.1088/1126-6708/2003/10/057

30.32 Type: 1 Citation: Jun Nishimura, PTEP **2012** (2012) 01A101 [arXiv:1205.6870],
doi:10.1093/ptep/pts004

30.33 Type: 0 Citation: Gautam Mandal, Soo-Jong Rey, Spenta R. Wadia, Eur.Phys.J.C **24** (2002) [arXiv:hep-th/0111059],
doi:10.1007/s100520200939

30.34 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **07** (2004) 066 [arXiv:hep-th/0405096],
doi:10.1088/1126-6708/2004/07/066

30.35 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

30.36 Type: 1 Citation: Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **06** (2005) 081 [arXiv:hep-th/0410263],
doi:10.1088/1126-6708/2005/06/081

30.37 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2006) 061 [arXiv:hep-th/0405277],
doi:10.1088/1126-6708/2006/05/061

30.38 Type: 0 Citation: Graziano Vernizzi, John F. Wheater, Phys.Rev.D **66** (2002) 085024 [arXiv:hep-th/0206226],
doi:10.1103/PhysRevD.66.085024

30.39 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534],
doi:10.1007/JHEP10(2011)126

30.40 Type: 1 Citation: Jun Nishimura, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0310019],
doi:10.1016/S0920-5632(03)02513-1

30.41 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 047 [arXiv:hep-th/0506205],
doi:10.1088/1126-6708/2005/09/047

30.42 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Shingo Takeuchi, JHEP **05** (2007) 091 [arXiv:0704.3183],
doi:10.1088/1126-6708/2007/05/091

30.43 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567], doi:10.22323/1.376.0183

30.44 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 046 [arXiv:hep-th/0506062], doi:10.1088/1126-6708/2005/09/046

30.45 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135], doi:10.1007/JHEP11(2013)009

30.46 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2004) 005 [arXiv:hep-th/0401038], doi:10.1088/1126-6708/2004/05/005

30.47 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

30.48 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **10** (2007) 024 [arXiv:hep-th/0604093], doi:10.1088/1126-6708/2007/10/024

30.49 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176], doi:10.22323/1.263.0099

30.50 Type: 1 Citation: Wolfgang Bietenholz, Jun Nishimura, Yoshiaki Susaki, Jan Volkholz, JHEP **10** (2006) 042 [arXiv:hep-th/0608072], doi:10.1088/1126-6708/2006/10/042

30.51 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **02** (2007) 033 [arXiv:hep-th/0602078], doi:10.1088/1126-6708/2007/02/033

30.52 Type: 1 Citation: Wolfgang Bietenholz, Phys.Rept. **505** (2011) [arXiv:0806.3713], doi:10.1016/j.physrep.2011.04.002

30.53 Type: 0 Citation: Badis Ydri, arXiv:1708.00734

30.54 Type: 1 Citation: Wolfgang Bietenholz, Fortsch.Phys. **56** (2008) [arXiv:hep-lat/0611030], doi:10.1002/prop.200710397

31. Jan Ambjorn, K.N. Anagnostopoulos, A. Krasnitz, "*High temperature, classical, real time dynamics of nonAbelian gauge theories as seen by a computer*", JHEP **06** (2001) 069 [arXiv:hep-ph/0101309], [doi:10.1088/1126-6708/2001/06/069].
Cited by 6 (4) articles

We test at the electroweak scale the recently proposed elaborate theoretical scenario for real-time dynamics of non-abelian gauge theories at high temperature. We see no sign of the predicted behavior. This indicates that perturbative concepts like color conductivity and Landau damping might be irrelevant at temperatures corresponding to the electroweak scale.

31.1 Type: 0 Citation: Jacek Wosiek, arXiv:hep-th/0204243

31.2 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, A. Krasnitz, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110092], doi:10.1016/S0920-5632(01)01775-3

31.3 Type: 0 Citation: J. Wosiek, Nucl.Phys.B **644** (2002) [arXiv:hep-th/0203116], doi:10.1016/S0550-3213(02)00810-6

31.4 Type: 0 Citation: Laurence G. Yaffe, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-th/0111058], doi:10.1016/S0920-5632(01)01650-4

31.5 Type: 1 Citation: D. Kharzeev, A. Krasnitz, R. Venugopalan, Phys.Lett.B **545** (2002) [arXiv:hep-ph/0109253], doi:10.1016/S0370-2693(02)02630-8

31.6 Type: 0 Citation: Agostino Butti, Davide Forcella, Amihay Hanany, David Vegh, Alberto Zaffaroni, JHEP **11** (2007) 092 [arXiv:0705.2771], doi:10.1088/1126-6708/2007/11/092

32. K.N. Anagnostopoulos, J. Nishimura, P. Olesen, *"Noncommutative string world sheets from matrix models"*, JHEP **04** (2001) 024 [arXiv:hep-th/0012061], [doi:10.1088/1126-6708/2001/04/024].
Cited by 10 (6) articles

We study dynamical effects of introducing noncommutativity on string worldsheets by using a matrix model obtained from the zero-volume limit of four-dimensional SU(N) Yang-Mills theory. Although the dimensionless noncommutativity parameter is of order 1/N, its effect is found to be non-negligible even in the large N limit due to the existence of higher Fourier modes. We find that the Poisson bracket grows much faster than the Moyal bracket as we increase N, which means in particular that the two quantities do not coincide in the large N limit. The well-known instability of bosonic worldsheets is shown to be cured by the noncommutativity, leading to a well-defined bosonic string theory, which may be interpreted as a theory for QCD strings.

32.1 Type: 1 Citation: Poul Olesen, arXiv:hep-th/0201137

32.2 Type: 0 Citation: Naofumi Kitsunezaki, Shozo Uehara, arXiv:hep-th/0310127

32.3 Type: 0 Citation: Naofumi Kitsunezaki, Shozo Uehara, JHEP **10** (2001) 033 [arXiv:hep-th/0108181],
doi:10.1088/1126-6708/2001/10/033

32.4 Type: 0 Citation: Naofumi Kitsunezaki, Shozo Uehara, JHEP **10** (2002) 024 [arXiv:hep-th/0206157],
doi:10.1088/1126-6708/2002/10/024

32.5 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Phys.Rev.D **65** (2002) 086001 [arXiv:hep-th/0104260],
doi:10.1103/PhysRevD.65.086001

32.6 Type: 2 Citation: K.N. Anagnostopoulos, Wolfgang Bietenholz, J. Nishimura, Int.J.Mod.Phys.C **13** (2002) [arXiv:hep-lat/0112035],
doi:10.1142/S0129183102003334

32.7 Type: 0 Citation: Martin Petrov Vachovski

32.8 Type: 1 Citation: Jun Nishimura, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0310019],
doi:10.1016/S0920-5632(03)02513-1

32.9 Type: 0 Citation: Norma Mankoc Borstnik, Colin D. Froggatt, Dragan Lukman, arXiv:hep-ph/0212221

32.10 Type: 0 Citation: Richard J. Szabo, Phys.Rept. **378** (2003) [arXiv:hep-th/0109162],
doi:10.1016/S0370-1573(03)00059-0

33. Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, *"Simulating simplified versions of the IKKT matrix model"*, Nucl.Phys.B Proc.Suppl. **94** (2001) [arXiv:hep-lat/0009030], [doi:10.1016/S0920-5632(01)00877-5].
Cited by 9 (7) articles

We simulate a supersymmetric matrix model obtained from dimensional reduction of 4d SU(N) super Yang-Mills theory (a 4d counter part of the IKKT model or IIB matrix model). The eigenvalue distribution determines the space structure. The measurement of Wilson loop correlators reveals a universal large N scaling. Eguchi-Kawai equivalence may hold in a finite range of scale, which is also true for the bosonic case. We finally report on simulations of a low energy approximation of the 10d IKKT model, where we omit the phase of the Pfaffian and look for evidence for a spontaneous Lorentz symmetry breaking.

33.1 Type: 0 Citation: S. Horata, H.S. Egawa, Phys.Rev.Lett. **86** (2001) [arXiv:hep-lat/0010051],
doi:10.1103/PhysRevLett.86.4455

33.2 Type: 0 Citation: R.A. Janik, J. Wosiek, Nucl.Phys.B Proc.Suppl. **94** (2001) [arXiv:hep-lat/0011031],
doi:10.1016/S0920-5632(01)00887-8

33.3 Type: 0 Citation: Z. Burda, B. Petersson, J. Tabaczek, Nucl.Phys.B **602** (2001) [arXiv:hep-lat/0012001],
doi:10.1016/S0550-3213(01)00114-6

33.4 Type: 0 Citation: Giovanni M. Cicuta, Luca Molinari, Graziano Vernizzi, J.Phys.A **35** (2002) [arXiv:hep-th/0109160],
doi:10.1088/0305-4470/35/4/102

33.5 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Phys.Rev.D **65** (2002) 086001 [arXiv:hep-th/0104260], doi:10.1103/PhysRevD.65.086001

33.6 Type: 2 Citation: K.N. Anagnostopoulos, Wolfgang Bietenholz, J. Nishimura, Int.J.Mod.Phys.C **13** (2002) [arXiv:hep-lat/0112035], doi:10.1142/S0129183102003334

33.7 Type: 0 Citation: Elias Kiritsis, Corneliu Sochichiu, arXiv:hep-th/0202065

33.8 Type: 0 Citation: Martin Petrov Vachovski

33.9 Type: 0 Citation: Washington Taylor, Rev.Mod.Phys. **73** (2001) [arXiv:hep-th/0101126], doi:10.1103/RevModPhys.73.419

34. Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, "*Monte Carlo studies of the IIB matrix model at large N*", JHEP **07** (2000) 011 [arXiv:hep-th/0005147], [doi:10.1088/1126-6708/2000/07/011].
Cited by 110 (55) articles

The low-energy effective theory of the IIB matrix model developed by H. Aoki et al. is written down explicitly in terms of bosonic variables only. The effective theory is then studied by Monte Carlo simulations in order to investigate the possibility of a spontaneous breakdown of Lorentz invariance. The imaginary part of the effective action, which causes the so-called sign problem in the simulation, is dropped by hand. The extent of the eigenvalue distribution of the bosonic matrices shows a power-law large N behavior, consistent with a simple branched-polymer prediction. We observe, however, that the eigenvalue distribution becomes more and more isotropic in the ten-dimensional space-time as we increase N. This suggests that if the spontaneous breakdown of Lorentz invariance really occurs in the IIB matrix model, a crucial role must be played by the imaginary part of the effective action.

34.1 Type: 0 Citation: Zdzislaw Burda, Bengt Petersson, Marc Wattenberg, Acta Phys.Polon.B **34** (2003) [arXiv:hep-th/0308194]

34.2 Type: 0 Citation: Daniel N. Kabat, Gilad Lifschytz, David A. Lowe, Int.J.Mod.Phys.A **16** (2001) [arXiv:hep-th/0007051], doi:10.1103/PhysRevLett.86.1426

34.3 Type: 0 Citation: S. Horata, H.S. Egawa, Phys.Rev.Lett. **86** (2001) [arXiv:hep-lat/0010051], doi:10.1103/PhysRevLett.86.4455

34.4 Type: 0 Citation: S. Horata, H.S. Egawa, T. Yukawa, Nucl.Phys.B Proc.Suppl. **94** (2001) 708 [arXiv:hep-th/0005157], doi:10.1016/S0920-5632(01)00884-2

34.5 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110094], doi:10.1016/S0920-5632(01)01899-0

34.6 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, Nucl.Phys.B Proc.Suppl. **94** (2001) [arXiv:hep-lat/0009030], doi:10.1016/S0920-5632(01)00877-5

34.7 Type: 0 Citation: Z. Burda, B. Petersson, J. Tabaczek, Nucl.Phys.B **602** (2001) [arXiv:hep-lat/0012001], doi:10.1016/S0550-3213(01)00114-6

34.8 Type: 0 Citation: T. Aoyama, H. Kawai, Y. Shibusa, Prog.Theor.Phys. **115** (2006) [arXiv:hep-th/0602244], doi:10.1143/PTP.115.1179

34.9 Type: 0 Citation: Nikhil Tanwar, arXiv:2007.14998

34.10 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2015** (2016) 307 [arXiv:1509.05079], doi:10.22323/1.251.0307

34.11 Type: 0 Citation: Arpith Kumar, Anosh Joseph, Piyush Kumar, PoS **LATTICE2022** (2023) 213 [arXiv:2209.10494], doi:10.22323/1.430.0213

34.12 Type: 0 Citation: Werner Krauth, Matthias Staudacher, PoS **tmr2000** (2000) 025 [arXiv:cond-mat/0010127],
doi:10.22323/1.006.0025

34.13 Type: 1 Citation: Jun Nishimura, Phys.Rev.D **65** (2002) 105012 [arXiv:hep-th/0108070],
doi:10.1103/PhysRevD.65.105012

34.14 Type: 0 Citation: H. Kawai, Shoichi Kawamoto, Tsunehide Kuroki, T. Matsuo, S. Shinohara, Nucl.Phys.B **647** (2002) [arXiv:hep-th/0204240],
doi:10.1016/S0550-3213(02)00908-2

34.15 Type: 0 Citation: P. Bialas, J. Wosiek, arXiv:hep-lat/0109031,
doi:10.1142/9789812778352_0022

34.16 Type: 0 Citation: Zdzislaw Burda, Bengt Petersson, Marc Wattenberg, JHEP **03** (2005) 058 [arXiv:hep-th/0503032],
doi:10.1088/1126-6708/2005/03/058

34.17 Type: 1 Citation: Jun Nishimura, Graziano Vernizzi, Phys.Rev.Lett. **85** (2000) [arXiv:hep-th/0007022],
doi:10.1103/PhysRevLett.85.4664

34.18 Type: 0 Citation: David Berenstein, Randel Cotta, Rodrigo Leonardi, Phys.Rev.D **78** (2008) 025008 [arXiv:0801.2739],
doi:10.1103/PhysRevD.78.025008

34.19 Type: 0 Citation: T. Aoyama, H. Kawai, Prog.Theor.Phys. **116** (2006) [arXiv:hep-th/0603146],
doi:10.1143/PTP.116.405

34.20 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, arXiv:2009.08682

34.21 Type: 1 Citation: Jun Nishimura, Fumihiko Sugino, JHEP **05** (2002) 001 [arXiv:hep-th/0111102],
doi:10.1088/1126-6708/2002/05/001

34.22 Type: 2 Citation: K.N. Anagnostopoulos, J. Nishimura, Phys.Rev.D **66** (2002) 106008 [arXiv:hep-th/0108041],
doi:10.1103/PhysRevD.66.106008

34.23 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, J. Nishimura, J.J.M. Verbaarschot, JHEP **10** (2002) 062 [arXiv:hep-lat/0208025],
doi:10.1088/1126-6708/2002/10/062

34.24 Type: 2 Citation: Jun Nishimura, Konstantinos N. Anagnostopoulos, Masanori Hanada, Shingo Takeuchi, PoS **LATTICE2007** (2007) 059 [arXiv:0801.4205],
doi:10.22323/1.042.0059

34.25 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.Lett. **93** (2004) 131301 [arXiv:hep-th/0404156],
doi:10.1103/PhysRevLett.93.131301

34.26 Type: 0 Citation: P. Bialas, Z. Burda, B. Petersson, J. Tabaczek, Nucl.Phys.B **592** (2001) [arXiv:hep-lat/0007013],
doi:10.1016/S0550-3213(00)00583-6

34.27 Type: 0 Citation: Satsuki Oda, Fumihiko Sugino, JHEP **03** (2001) 026 [arXiv:hep-th/0011175],
doi:10.1088/1126-6708/2001/03/026

34.28 Type: 0 Citation: Z. Burda, J. Erdmann, B. Petersson, M. Wattenberg, Phys.Rev.E **67** (2003) 026105 [arXiv:cond-mat/0207459],
doi:10.1103/PhysRevE.67.026105

34.29 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950],
doi:10.22323/1.164.0226

34.30 Type: 0 Citation: Takehiro Azuma, Satoshi Iso, Hikaru Kawai, Yuhi Ohwashi, Nucl.Phys.B **610** (2001) [arXiv:hep-th/0102168],
doi:10.1016/S0550-3213(01)00324-8

34.31 Type: 0 Citation: Fumihiko Sugino, JHEP **07** (2001) 014 [arXiv:hep-th/0105284],
doi:10.1088/1126-6708/2001/07/014

34.32 Type: 0 Citation: T. Aoyama, Y. Shibusa, Nucl.Phys.B **754** (2006) [arXiv:hep-th/0604211], doi:10.1016/j.nuclphysb.2006.07.019

34.33 Type: 0 Citation: Daiji Ennyu, Hiroshi Kawabe, Naohito Nakazawa, JHEP **01** (2003) 025 [arXiv:hep-th/0212044], doi:10.1088/1126-6708/2003/01/025

34.34 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Phys.Rev.D **65** (2002) 086001 [arXiv:hep-th/0104260], doi:10.1103/PhysRevD.65.086001

34.35 Type: 0 Citation: Giovanni M. Cicuta, Luca Molinari, Graziano Vernizzi, J.Phys.A **35** (2002) [arXiv:hep-th/0109160], doi:10.1088/0305-4470/35/4/102

34.36 Type: 0 Citation: Govind S. Krishnaswami, arXiv:hep-th/0310110

34.37 Type: 0 Citation: Veselin G. Filev, Denjoe O'Connor, JHEP **08** (2014) 003 [arXiv:1402.2476], doi:10.1007/JHEP08(2014)003

34.38 Type: 0 Citation: H. Kawai, Shoichi Kawamoto, Tsunehide Kuroki, S. Shinohara, Prog.Theor.Phys. **109** (2003) [arXiv:hep-th/0211272], doi:10.1143/PTP.109.115

34.39 Type: 0 Citation: Stefano Profumo, Ettore Vicari, JHEP **05** (2002) 014 [arXiv:hep-th/0203155], doi:10.1088/1126-6708/2002/05/014

34.40 Type: 0 Citation: Naofumi Kitsunezaki

34.41 Type: 2 Citation: K.N. Anagnostopoulos, Wolfgang Bietenholz, J. Nishimura, Int.J.Mod.Phys.C **13** (2002) [arXiv:hep-lat/0112035], doi:10.1142/S0129183102003334

34.42 Type: 0 Citation: Marc Wattenberg

34.43 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2002) 043 [arXiv:hep-th/0205253], doi:10.1088/1126-6708/2002/10/043

34.44 Type: 0 Citation: Takehiro Azuma, Pallab Basu, Spenta R. Wadia, Phys.Lett.B **659** (2008) [arXiv:0710.5873], doi:10.1016/j.physletb.2007.11.088

34.45 Type: 1 Citation: Jan Ambjorn, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0201012], doi:10.1016/S0920-5632(01)01644-9

34.46 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **11** (2003) 009 [arXiv:hep-th/0310170], doi:10.1088/1126-6708/2003/11/009

34.47 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2011) 135 [arXiv:1108.1293], doi:10.1007/JHEP10(2011)135

34.48 Type: 0 Citation: Peter Austing, arXiv:hep-th/0108128

34.49 Type: 1 Citation: Masanori Hanada, Akitsugu Miwa, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **102** (2009) 181602 [arXiv:0811.2081], doi:10.1103/PhysRevLett.102.181602

34.50 Type: 0 Citation: Peter Austing, Graziano Vernizzi, John F. Wheater, JHEP **09** (2003) 023 [arXiv:hep-th/0309026], doi:10.1088/1126-6708/2003/09/023

34.51 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **04** (2001) 019 [arXiv:hep-th/0103159], doi:10.1088/1126-6708/2001/04/019

34.52 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, arXiv:2209.01255

34.53 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Masanori Hanada, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **100** (2008) 021601 [arXiv:0707.4454], doi:10.1103/PhysRevLett.100.021601

34.54 Type: 0 Citation: J. Wosiek, Nucl.Phys.B **644** (2002) [arXiv:hep-th/0203116], doi:10.1016/S0550-3213(02)00810-6

34.55 Type: 2 Citation: K.N. Anagnostopoulos, J. Nishimura, P. Olesen, JHEP **04** (2001) 024 [arXiv:hep-th/0012061],
doi:10.1088/1126-6708/2001/04/024

34.56 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841],
doi:10.22323/1.347.0065

34.57 Type: 1 Citation: Jun Nishimura, Int.J.Mod.Phys.A **28** (2013) 1340002 [arXiv:1209.6386],
doi:10.1142/S0217751X13400022

34.58 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531],
doi:10.22323/1.139.0181

34.59 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504],
doi:10.1103/PhysRevD.83.054504

34.60 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, JHEP **02** (2018) 151 [arXiv:1712.07562],
doi:10.1007/JHEP02(2018)151

34.61 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957],
doi:10.22323/1.105.0167

34.62 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, Prog.Theor.Phys. **114** (2005) [arXiv:hep-th/0412194],
doi:10.1143/PTP.114.487

34.63 Type: 2 Citation: Mitsuaki Hirasawa, Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Jun Nishimura, Stratos Papadoudis, Asato Tsuchiya, arXiv:2307.01681

34.64 Type: 1 Citation: Tatsumi Aoyama, Jun Nishimura, Toshiyuki Okubo, Prog.Theor.Phys. **125** (2011) [arXiv:1007.0883],
doi:10.1143/PTP.125.537

34.65 Type: 0 Citation: Shun'ichi Shinohara

34.66 Type: 0 Citation: Shoichi Kawamoto

34.67 Type: 0 Citation: Matteo Beccaria, Arkady A. Tseytlin, JHEP **04** (2021) 265 [arXiv:2102.07696],
doi:10.1007/JHEP04(2021)265

34.68 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2003) 057 [arXiv:hep-th/0309262],
doi:10.1088/1126-6708/2003/10/057

34.69 Type: 1 Citation: Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, JHEP **10** (2012) 147 [arXiv:1208.0711],
doi:10.1007/JHEP10(2012)147

34.70 Type: 0 Citation: Yoshihisa Kitazawa, Shun'ya Mizoguchi, Osamu Saito, Phys.Rev.D **74** (2006) 046003 [arXiv:hep-th/0603189],
doi:10.1103/PhysRevD.74.046003

34.71 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, arXiv:2210.07288

34.72 Type: 0 Citation: Simon Catterall, Toby Wiseman, JHEP **12** (2007) 104 [arXiv:0706.3518],
doi:10.1088/1126-6708/2007/12/104

34.73 Type: 1 Citation: Yuta Ito, Jun Nishimura, Asato Tsuchiya, JHEP **11** (2015) 070 [arXiv:1506.04795],
doi:10.1007/JHEP11(2015)070

34.74 Type: 0 Citation: Yuta Ito

34.75 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

34.76 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Atsushi Yamaguchi, JHEP **06** (2007) 076 [arXiv:hep-th/0703209],
doi:10.1088/1126-6708/2007/06/076

34.77 Type: 1 Citation: Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **06** (2005) 081 [arXiv:hep-th/0410263],
doi:10.1088/1126-6708/2005/06/081

34.78 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **07** (2004) 066 [arXiv:hep-th/0405096],
doi:10.1088/1126-6708/2004/07/066

34.79 Type: 0 Citation: George Savvidy, Int.J.Mod.Phys.A **37** (2022) 2230001 [arXiv:2202.09846],
doi:10.1142/S0217751X22300010

34.80 Type: 1 Citation: Yuta Ito, Sang-Woo Kim, Yuki Koizuka, Jun Nishimura, Asato Tsuchiya, PTEP **2014** (2014) 083B01 [arXiv:1312.5415],
doi:10.1093/ptep/ptu101

34.81 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2006) 061 [arXiv:hep-th/0405277],
doi:10.1088/1126-6708/2006/05/061

34.82 Type: 0 Citation: Masanori Hanada, Lorenzo Mannelli, Yoshinori Matsuo, Phys.Rev.D **80** (2009) 125001 [arXiv:0905.2995],
doi:10.1103/PhysRevD.80.125001

34.83 Type: 0 Citation: Suddhasattwa Brahma, Robert Brandenberger, Samuel Laliberte, JHEP **09** (2022) 031 [arXiv:2206.12468],
doi:10.1007/JHEP09(2022)031

34.84 Type: 1 Citation: Jun Nishimura, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0310019],
doi:10.1016/S0920-5632(03)02513-1

34.85 Type: 0 Citation: Takehiro Azuma, arXiv:hep-th/0401120

34.86 Type: 0 Citation: Toby Wiseman, Benjamin Withers, JHEP **10** (2008) 037 [arXiv:0807.0755],
doi:10.1088/1126-6708/2008/10/037

34.87 Type: 0 Citation: Graziano Vernizzi, John F. Wheater, Phys.Rev.D **66** (2002) 085024 [arXiv:hep-th/0206226],
doi:10.1103/PhysRevD.66.085024

34.88 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534],
doi:10.1007/JHEP10(2011)126

34.89 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567],
doi:10.22323/1.376.0183

34.90 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 047 [arXiv:hep-th/0506205],
doi:10.1088/1126-6708/2005/09/047

34.91 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Kentaroh Yoshida, JHEP **06** (2006) 052 [arXiv:hep-th/0601170],
doi:10.1088/1126-6708/2006/06/052

34.92 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, JHEP **12** (2011) 020 [arXiv:1108.5153],
doi:10.1007/JHEP12(2011)020

34.93 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Shingo Takeuchi, JHEP **05** (2007) 091 [arXiv:0704.3183],
doi:10.1088/1126-6708/2007/05/091

34.94 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135],
doi:10.1007/JHEP11(2013)009

34.95 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 046 [arXiv:hep-th/0506062],
doi:10.1088/1126-6708/2005/09/046

34.96 Type: 0 Citation: Thomas Kaltenbrunner

34.97 Type: 0 Citation: George Savvidy, arXiv:2204.08933

34.98 Type: 0 Citation: Georgios Savvidy, PoS **CORFU2021** (2022) 123, doi:10.22323/1.406.0123

34.99 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410], doi:10.1007/JHEP06(2020)069

34.100 Type: 1 Citation: Jun Nishimura, PTEP **2012** (2012) 01A101 [arXiv:1205.6870], doi:10.1093/ptep/pts004

34.101 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2004) 005 [arXiv:hep-th/0401038], doi:10.1088/1126-6708/2004/05/005

34.102 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **10** (2007) 024 [arXiv:hep-th/0604093], doi:10.1088/1126-6708/2007/10/024

34.103 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176], doi:10.22323/1.263.0099

34.104 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **02** (2007) 033 [arXiv:hep-th/0602078], doi:10.1088/1126-6708/2007/02/033

34.105 Type: 1 Citation: Wolfgang Bietenholz, Jun Nishimura, Yoshiaki Susaki, Jan Volkholz, JHEP **10** (2006) 042 [arXiv:hep-th/0608072], doi:10.1088/1126-6708/2006/10/042

34.106 Type: 0 Citation: Badis Ydri, arXiv:1203.0906

34.107 Type: 0 Citation: Robert Brandenberger, arXiv:2306.12458

34.108 Type: 0 Citation: Badis Ydri, arXiv:1708.00734

34.109 Type: 1 Citation: Wolfgang Bietenholz, Phys.Rept. **505** (2011) [arXiv:0806.3713], doi:10.1016/j.physrep.2011.04.002

34.110 Type: 1 Citation: Wolfgang Bietenholz, Fortsch.Phys. **56** (2008) [arXiv:hep-lat/0611030], doi:10.1002/prop.200710397

35. Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, "*Monte Carlo studies of the dimensionally reduced 4-D SU(N) superYang-Mills theory*", arXiv:hep-th/0101084.
Cited by 7 (5) articles

We simulate a supersymmetric matrix model obtained from dimensional reduction of 4d SU(N) super Yang-Mills theory. The model is well defined for finite N and it is found that the large N limit obtained by keeping g2 N fixed gives rise to well defined operators which represent string amplitudes. The space-time structure which arises dynamically from the eigenvalues of the bosonic matrices is discussed, as well as the effect of supersymmetry on the dynamical properties of the model. Eguchi-Kawai equivalence of this model to ordinary gauge theory does hold within a finite range of scale. We report on new simulations of the bosonic model for N up to 768 that confirm this property, which comes as a surprise since no quenching or twist is introduced.

35.1 Type: 0 Citation: Takehiro Azuma, Satoshi Iso, Hikaru Kawai, Yuhi Ohwashi, Nucl.Phys.B **610** (2001) [arXiv:hep-th/0102168], doi:10.1016/S0550-3213(01)00324-8

35.2 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Phys.Rev.D **65** (2002) 086001 [arXiv:hep-th/0104260], doi:10.1103/PhysRevD.65.086001

35.3 Type: 0 Citation: Peter Austing, arXiv:hep-th/0108128

35.4 Type: 2 Citation: K.N. Anagnostopoulos, Wolfgang Bietenholz, J. Nishimura, Int.J.Mod.Phys.C **13** (2002) [arXiv:hep-lat/0112035], doi:10.1142/S0129183102003334

35.5 Type: 0 Citation: Peter Austing, Graziano Vernizzi, John F. Wheater, JHEP **09** (2003) 023 [arXiv:hep-th/0309026], doi:10.1088/1126-6708/2003/09/023

35.6 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **04** (2001) 019 [arXiv:hep-th/0103159], doi:10.1088/1126-6708/2001/04/019

35.7 Type: 0 Citation: Matteo Beccaria, Arkady A. Tseytlin, JHEP **04** (2021) 265 [arXiv:2102.07696], doi:10.1007/JHEP04(2021)265

36. Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, "*Large N dynamics of dimensionally reduced 4-D SU(N) superYang-Mills theory*", JHEP **07** (2000) 013 [arXiv:hep-th/0003208], [doi:10.1088/1126-6708/2000/07/013].
Cited by 123 (64) articles

We perform Monte Carlo simulations of a supersymmetric matrix model, which is obtained by dimensional reduction of 4D SU(N) super Yang-Mills theory. The model can be considered as a four-dimensional counterpart of the IIB matrix model. We extract the space-time structure represented by the eigenvalues of bosonic matrices. In particular we compare the large N behavior of the space-time extent with the result obtained from a low energy effective theory. We measure various Wilson loop correlators which represent string amplitudes and we observe a nontrivial universal scaling in N. We also observe that the Eguchi-Kawai equivalence to ordinary gauge theory does hold at least within a finite range of scale. Comparison with the results for the bosonic case clarifies the role of supersymmetry in the large N dynamics. It does affect the multi-point correlators qualitatively, but the Eguchi-Kawai equivalence is observed even in the bosonic case.

36.1 Type: 0 Citation: Zdzislaw Burda, Bengt Petersson, Marc Wattenberg, Acta Phys.Polon.B **34** (2003) [arXiv:hep-th/0308194]

36.2 Type: 0 Citation: S. Horata, H.S. Egawa, Phys.Rev.Lett. **86** (2001) [arXiv:hep-lat/0010051], doi:10.1103/PhysRevLett.86.4455

36.3 Type: 0 Citation: S. Horata, H.S. Egawa, T. Yukawa, Nucl.Phys.B Proc.Suppl. **94** (2001) 708 [arXiv:hep-th/0005157],
doi:10.1016/S0920-5632(01)00884-2

36.4 Type: 0 Citation: Corneliu Sochichiu, JHEP **05** (2000) 026 [arXiv:hep-th/0004062], doi:10.1088/1126-6708/2000/05/026

36.5 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110094],
doi:10.1016/S0920-5632(01)01899-0

36.6 Type: 1 Citation: Jun Nishimura, Asato Tsuchiya, PTEP **2013** (2013) 043B03 [arXiv:1208.4910], doi:10.1093/ptep/ptt015

36.7 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, Nucl.Phys.B Proc.Suppl. **94** (2001) [arXiv:hep-lat/0009030],
doi:10.1016/S0920-5632(01)00877-5

36.8 Type: 0 Citation: Z. Burda, B. Petersson, J. Tabaczek, Nucl.Phys.B **602** (2001) [arXiv:hep-lat/0012001],
doi:10.1016/S0550-3213(01)00114-6

36.9 Type: 1 Citation: Jun Nishimura, Graziano Vernizzi, JHEP **04** (2000) 015 [arXiv:hep-th/0003223], doi:10.1088/1126-6708/2000/04/015

36.10 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2015** (2016) 307 [arXiv:1509.05079],
doi:10.22323/1.251.0307

36.11 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **02** (2001) 028 [arXiv:hep-th/0101071], doi:10.1088/1126-6708/2001/02/028

36.12 Type: 0 Citation: Werner Krauth, Matthias Staudacher, PoS **tmr2000** (2000) 025 [arXiv:cond-mat/0010127],
doi:10.22323/1.006.0025

36.13 Type: 0 Citation: Werner Krauth, Matthias Staudacher, Nucl.Phys.B **584** (2000) [arXiv:hep-th/0004076],
doi:10.1016/S0550-3213(00)00382-5

36.14 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, arXiv:hep-th/0101084

36.15 Type: 0 Citation: Oleg Evnin, Nucl.Phys.B **853** (2011) [arXiv:1101.5686], doi:10.1016/j.nuclphysb.2011.08.007

36.16 Type: 1 Citation: Jun Nishimura, Phys.Rev.D **65** (2002) 105012 [arXiv:hep-th/0108070], doi:10.1103/PhysRevD.65.105012

36.17 Type: 1 Citation: Jun Nishimura, Graziano Vernizzi, Phys.Rev.Lett. **85** (2000) [arXiv:hep-th/0007022],
doi:10.1103/PhysRevLett.85.4664

36.18 Type: 0 Citation: Joel Giedt, Nucl.Phys.B **668** (2003) [arXiv:hep-lat/0304006], doi:10.1016/j.nuclphysb.2003.07.006

36.19 Type: 0 Citation: Naofumi Kitsunezaki, Shozo Uehara, Prog.Theor.Phys. **105** (2001) [arXiv:hep-th/0010038],
doi:10.1143/PTP.105.515

36.20 Type: 0 Citation: Zdzislaw Burda, Bengt Petersson, Marc Wattenberg, JHEP **03** (2005) 058 [arXiv:hep-th/0503032],
doi:10.1088/1126-6708/2005/03/058

36.21 Type: 1 Citation: Jun Nishimura, Fumihiko Sugino, JHEP **05** (2002) 001 [arXiv:hep-th/0111102], doi:10.1088/1126-6708/2002/05/001

36.22 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, arXiv:2009.08682

36.23 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, J. Nishimura, J.J.M. Verbaarschot, JHEP **10** (2002) 062 [arXiv:hep-lat/0208025],
doi:10.1088/1126-6708/2002/10/062

36.24 Type: 2 Citation: K.N. Anagnostopoulos, J. Nishimura, Phys.Rev.D **66** (2002) 106008 [arXiv:hep-th/0108041],
doi:10.1103/PhysRevD.66.106008

36.25 Type: 2 Citation: Jun Nishimura, Konstantinos N. Anagnostopoulos, Masanori Hanada, Shingo Takeuchi, PoS **LATTICE2007** (2007) 059 [arXiv:0801.4205],
doi:10.22323/1.042.0059

36.26 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.Lett. **93** (2004) 131301 [arXiv:hep-th/0404156],
doi:10.1103/PhysRevLett.93.131301

36.27 Type: 0 Citation: Yoshihisa Kitazawa, Nucl.Phys.B **642** (2002) [arXiv:hep-th/0207115], doi:10.1016/S0550-3213(02)00682-X

36.28 Type: 0 Citation: Frans R. Klinkhamer, PoS **CORFU2021** (2022) 259 [arXiv:2203.15779], doi:10.22323/1.406.0259

36.29 Type: 0 Citation: Takehiro Azuma, Satoshi Iso, Hikaru Kawai, Yuhi Ohwashi, Nucl.Phys.B **610** (2001) [arXiv:hep-th/0102168],
doi:10.1016/S0550-3213(01)00324-8

36.30 Type: 0 Citation: Avinash Dhar, Yoshihisa Kitazawa, JHEP **02** (2001) 004 [arXiv:hep-th/0012170], doi:10.1088/1126-6708/2001/02/004

36.31 Type: 0 Citation: P. Bialas, Z. Burda, B. Petersson, J. Tabaczek, Nucl.Phys.B **592** (2001) [arXiv:hep-lat/0007013],
doi:10.1016/S0550-3213(00)00583-6

36.32 Type: 0 Citation: Z. Burda, J. Erdmann, B. Petersson, M. Wattenberg, Phys.Rev.E **67** (2003) 026105 [arXiv:cond-mat/0207459],
doi:10.1103/PhysRevE.67.026105

36.33 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2012** (2012) 226 [arXiv:1211.0950],
doi:10.22323/1.164.0226

36.34 Type: 0 Citation: Daiji Ennyu, Hiroshi Kawabe, Naohito Nakazawa, JHEP **01** (2003) 025 [arXiv:hep-th/0212044],
doi:10.1088/1126-6708/2003/01/025

36.35 Type: 0 Citation: Fumihiko Sugino, JHEP **07** (2001) 014 [arXiv:hep-th/0105284], doi:10.1088/1126-6708/2001/07/014

36.36 Type: 0 Citation: Satsuki Oda, Fumihiko Sugino, JHEP **03** (2001) 026 [arXiv:hep-th/0011175], doi:10.1088/1126-6708/2001/03/026

36.37 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **99** (2007) 161602 [arXiv:0706.1647], doi:10.1103/PhysRevLett.99.161602

36.38 Type: 0 Citation: Avinash Dhar, Yoshihisa Kitazawa, Clay Math.Proc. **1** (2002)

36.39 Type: 0 Citation: Joel Giedt, Nucl.Phys.B **674** (2003) [arXiv:hep-lat/0307024], doi:10.1016/j.nuclphysb.2003.09.045

36.40 Type: 0 Citation: Giovanni M. Cicuta, Luca Molinari, Graziano Vernizzi, J.Phys.A **35** (2002) [arXiv:hep-th/0109160], doi:10.1088/0305-4470/35/4/102

36.41 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, Phys.Rev.D **65** (2002) 086001 [arXiv:hep-th/0104260], doi:10.1103/PhysRevD.65.086001

36.42 Type: 0 Citation: Edward Witten, JHEP **04** (2002) 012 [arXiv:hep-th/0012054], doi:10.1088/1126-6708/2002/04/012

36.43 Type: 0 Citation: Veselin G. Filev, Denjoe O'Connor, JHEP **08** (2014) 003 [arXiv:1402.2476], doi:10.1007/JHEP08(2014)003

36.44 Type: 0 Citation: Naofumi Kitsunezaki

36.45 Type: 0 Citation: Stefano Profumo, Ettore Vicari, JHEP **05** (2002) 014 [arXiv:hep-th/0203155], doi:10.1088/1126-6708/2002/05/014

36.46 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2002) 043 [arXiv:hep-th/0205253], doi:10.1088/1126-6708/2002/10/043

36.47 Type: 2 Citation: K.N. Anagnostopoulos, Wolfgang Bietenholz, J. Nishimura, Int.J.Mod.Phys.C **13** (2002) [arXiv:hep-lat/0112035], doi:10.1142/S0129183102003334

36.48 Type: 0 Citation: Marc Wattenberg

36.49 Type: 1 Citation: Jan Ambjorn, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0201012], doi:10.1016/S0920-5632(01)01644-9

36.50 Type: 1 Citation: Masanori Hanada, So Matsuura, Jun Nishimura, Daniel Robles-Llana, JHEP **02** (2011) 060 [arXiv:1012.2913], doi:10.1007/JHEP02(2011)060

36.51 Type: 0 Citation: Takehiro Azuma, Pallab Basu, Spenta R. Wadia, Phys.Lett.B **659** (2008) [arXiv:0710.5873], doi:10.1016/j.physletb.2007.11.088

36.52 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **11** (2003) 009 [arXiv:hep-th/0310170], doi:10.1088/1126-6708/2003/11/009

36.53 Type: 0 Citation: Peter Austing, arXiv:hep-th/0108128

36.54 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2011) 135 [arXiv:1108.1293], doi:10.1007/JHEP10(2011)135

36.55 Type: 0 Citation: Yoshihisa Kitazawa, JHEP **04** (2002) 004 [arXiv:hep-th/0201218], doi:10.1088/1126-6708/2002/04/004

36.56 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Masanori Hanada, Jun Nishimura, Shingo Takeuchi, Phys.Rev.Lett. **100** (2008) 021601 [arXiv:0707.4454], doi:10.1103/PhysRevLett.100.021601

36.57 Type: 0 Citation: Peter Austing, Graziano Vernizzi, John F. Wheater, JHEP **09** (2003) 023 [arXiv:hep-th/0309026], doi:10.1088/1126-6708/2003/09/023

36.58 Type: 0 Citation: Peter Austing, John F. Wheater, JHEP **04** (2001) 019 [arXiv:hep-th/0103159], doi:10.1088/1126-6708/2001/04/019

36.59 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, JHEP **09** (2005) 040 [arXiv:hep-th/0505178], doi:10.1088/1126-6708/2005/09/040

36.60 Type: 2 Citation: K.N. Anagnostopoulos, J. Nishimura, P. Olesen, JHEP **04** (2001) 024 [arXiv:hep-th/0012061],
doi:10.1088/1126-6708/2001/04/024

36.61 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, PoS **CORFU2018** (2019) 065 [arXiv:1906.01841],
doi:10.22323/1.347.0065

36.62 Type: 1 Citation: Jun Nishimura, Int.J.Mod.Phys.A **28** (2013) 1340002 [arXiv:1209.6386],
doi:10.1142/S0217751X13400022

36.63 Type: 0 Citation: Mina Aganagic, Rajesh Gopakumar, Shiraz Minwalla, Andrew Strominger, JHEP **04** (2001) 001 [arXiv:hep-th/0009142],
doi:10.1088/1126-6708/2001/04/001

36.64 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, Phys.Rev.D **83** (2011) 054504 [arXiv:1009.4504],
doi:10.1103/PhysRevD.83.054504

36.65 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2011** (2011) 181 [arXiv:1110.6531],
doi:10.22323/1.139.0181

36.66 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, JHEP **02** (2018) 151 [arXiv:1712.07562],
doi:10.1007/JHEP02(2018)151

36.67 Type: 0 Citation: Badis Ydri, AIP Conf.Proc. **1295** (2010) [arXiv:1007.4829],
doi:10.1063/1.3518330

36.68 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, PoS **LATTICE2010** (2010) 167 [arXiv:1010.0957],
doi:10.22323/1.105.0167

36.69 Type: 0 Citation: Kazuyuki Furuuchi, Phys.Rev.D **74** (2006) 045027 [arXiv:hep-th/0506183],
doi:10.1103/PhysRevD.74.045027

36.70 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, Prog.Theor.Phys. **114** (2005) [arXiv:hep-th/0412194],
doi:10.1143/PTP.114.487

36.71 Type: 0 Citation: Avinash Dhar, Yoshihisa Kitazawa, Phys.Rev.D **63** (2001) 125005 [arXiv:hep-th/0010256],
doi:10.1103/PhysRevD.63.125005

36.72 Type: 1 Citation: Tatsumi Aoyama, Jun Nishimura, Toshiyuki Okubo, Prog.Theor.Phys. **125** (2011) [arXiv:1007.0883],
doi:10.1143/PTP.125.537

36.73 Type: 1 Citation: Sang-Woo Kim, Jun Nishimura, Asato Tsuchiya, JHEP **10** (2012) 147 [arXiv:1208.0711],
doi:10.1007/JHEP10(2012)147

36.74 Type: 1 Citation: Jun Nishimura, Toshiyuki Okubo, Fumihiko Sugino, JHEP **10** (2003) 057 [arXiv:hep-th/0309262],
doi:10.1088/1126-6708/2003/10/057

36.75 Type: 0 Citation: David E. Berenstein, Masanori Hanada, Sean A. Hartnoll, JHEP **02** (2009) 010 [arXiv:0805.4658],
doi:10.1088/1126-6708/2009/02/010

36.76 Type: 0 Citation: Allan Adams, Michal Fabinger, JHEP **04** (2002) 006 [arXiv:hep-th/0111079],
doi:10.1088/1126-6708/2002/04/006

36.77 Type: 1 Citation: Wolfgang Bietenholz, F. Hofheinz, J. Nishimura, JHEP **09** (2002) 009 [arXiv:hep-th/0203151],
doi:10.1088/1126-6708/2002/09/009

36.78 Type: 0 Citation: Barak Bringoltz, Stephen R. Sharpe, Phys.Rev.D **80** (2009) 065031 [arXiv:0906.3538],
doi:10.1103/PhysRevD.80.065031

36.79 Type: 0 Citation: Elias Kiritsis, Corneliu Sochichiu, arXiv:hep-th/0202065

36.80 Type: 0 Citation: Yoshihisa Kitazawa, Shun'ya Mizoguchi, Osamu Saito, Phys.Rev.D **74** (2006) 046003 [arXiv:hep-th/0603189],
doi:10.1103/PhysRevD.74.046003

36.81 Type: 0 Citation: Avinash Dhar, Yoshihisa Kitazawa, Nucl.Phys.B **613** (2001) [arXiv:hep-th/0104021],
doi:10.1016/S0550-3213(01)00437-0

36.82 Type: 0 Citation: Masanori Hanada, Issaku Kanamori, JHEP **01** (2011) 058 [arXiv:1010.2948],
doi:10.1007/JHEP01(2011)058

36.83 Type: 0 Citation: Arundhati Dasgupta, Hermann Nicolai, Jan Plefka, JHEP **05** (2000) 007 [arXiv:hep-th/0003280],
doi:10.1088/1126-6708/2000/05/007

36.84 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, JHEP **07** (2000) 011 [arXiv:hep-th/0005147],
doi:10.1088/1126-6708/2000/07/011

36.85 Type: 1 Citation: Yuta Ito, Jun Nishimura, Asato Tsuchiya, JHEP **11** (2015) 070 [arXiv:1506.04795],
doi:10.1007/JHEP11(2015)070

36.86 Type: 0 Citation: Yuta Ito

36.87 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Atsushi Yamaguchi, JHEP **06** (2007) 076 [arXiv:hep-th/0703209],
doi:10.1088/1126-6708/2007/06/076

36.88 Type: 0 Citation: Badis Ydri, Int.J.Mod.Phys.A **27** (2012) 1250088 [arXiv:1206.6375],
doi:10.1142/S0217751X12500881

36.89 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Kohta Hatakeyama, Mitsuaki Hirasawa, Yuta Ito, Jun Nishimura, Stratos Kovalkov Papadoudis, Asato Tsuchiya, arXiv:2210.17537,
doi:10.1140/epjs/s11734-023-00849-x

36.90 Type: 1 Citation: Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **06** (2005) 081 [arXiv:hep-th/0410263],
doi:10.1088/1126-6708/2005/06/081

36.91 Type: 0 Citation: George Savvidy, Int.J.Mod.Phys.A **37** (2022) 2230001 [arXiv:2202.09846],
doi:10.1142/S0217751X22300010

36.92 Type: 1 Citation: Yuta Ito, Sang-Woo Kim, Yuki Koizuka, Jun Nishimura, Asato Tsuchiya, PTEP **2014** (2014) 083B01 [arXiv:1312.5415],
doi:10.1093/ptep/ptu101

36.93 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2006) 061 [arXiv:hep-th/0405277],
doi:10.1088/1126-6708/2006/05/061

36.94 Type: 0 Citation: Masanori Hanada, Lorenzo Mannelli, Yoshinori Matsuo, Phys.Rev.D **80** (2009) 125001 [arXiv:0905.2995],
doi:10.1103/PhysRevD.80.125001

36.95 Type: 0 Citation: Masanori Hanada, Issaku Kanamori, Phys.Rev.D **80** (2009) 065014 [arXiv:0907.4966],
doi:10.1103/PhysRevD.80.065014

36.96 Type: 0 Citation: Yuji Okawa, Hirosi Ooguri, arXiv:hep-th/0103124

36.97 Type: 0 Citation: Tatsuo Azeyanagi, Masanori Hanada, Tomoyoshi Hirata, Hidehiko Shimada, JHEP **03** (2009) 121 [arXiv:0901.4073],
doi:10.1088/1126-6708/2009/03/121

36.98 Type: 0 Citation: Takehiro Azuma, arXiv:hep-th/0401120

36.99 Type: 1 Citation: Jun Nishimura, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0310019],
doi:10.1016/S0920-5632(03)02513-1

36.100 Type: 0 Citation: Graziano Vernizzi, John F. Wheater, Phys.Rev.D **66** (2002) 085024 [arXiv:hep-th/0206226],
doi:10.1103/PhysRevD.66.085024

36.101 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **10** (2011) 126 [arXiv:1108.1534],
doi:10.1007/JHEP10(2011)126

36.102 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 047 [arXiv:hep-th/0506205],
doi:10.1088/1126-6708/2005/09/047

36.103 Type: 1 Citation: Masanori Hanada, Jun Nishimura, Yasuhiro Sekino, Tamiaki Yoneya, JHEP **12** (2011) 020 [arXiv:1108.5153],
doi:10.1007/JHEP12(2011)020

36.104 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, PoS **CORFU2019** (2020) 183 [arXiv:2005.12567],
doi:10.22323/1.376.0183

36.105 Type: 1 Citation: Naoyuki Kawahara, Jun Nishimura, Shingo Takeuchi, JHEP **05** (2007) 091 [arXiv:0704.3183],
doi:10.1088/1126-6708/2007/05/091

36.106 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Jun Nishimura, JHEP **11** (2013) 009 [arXiv:1306.6135],
doi:10.1007/JHEP11(2013)009

36.107 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Keiichi Nagao, Jun Nishimura, JHEP **09** (2005) 046 [arXiv:hep-th/0506062],
doi:10.1088/1126-6708/2005/09/046

36.108 Type: 0 Citation: Thomas Kaltenbrunner

36.109 Type: 0 Citation: Joel Giedt, Int.J.Mod.Phys.A **21** (2006) [arXiv:hep-lat/0602007],
doi:10.1142/S0217751X06031752

36.110 Type: 0 Citation: George Savvidy, arXiv:2204.08933

36.111 Type: 0 Citation: Georgios Savvidy, PoS **CORFU2021** (2022) 123,
doi:10.22323/1.406.0123

36.112 Type: 1 Citation: Jun Nishimura, PTEP **2012** (2012) 01A101 [arXiv:1205.6870],
doi:10.1093/ptep/pts004

36.113 Type: 1 Citation: Takehiro Azuma, Subrata Bal, Keiichi Nagao, Jun Nishimura, JHEP **05** (2004) 005 [arXiv:hep-th/0401038],
doi:10.1088/1126-6708/2004/05/005

36.114 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Takehiro Azuma, Yuta Ito, Jun Nishimura, Toshiyuki Okubo, Stratos Kovalkov Papadoudis, JHEP **06** (2020) 069 [arXiv:2002.07410],
doi:10.1007/JHEP06(2020)069

36.115 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **10** (2007) 024 [arXiv:hep-th/0604093],
doi:10.1088/1126-6708/2007/10/024

36.116 Type: 0 Citation: Marco Panero, PoS **CORFU2015** (2016) 099 [arXiv:1601.01176],
doi:10.22323/1.263.0099

36.117 Type: 1 Citation: Wolfgang Bietenholz, Jun Nishimura, Yoshiaki Susaki, Jan Volkholz, JHEP **10** (2006) 042 [arXiv:hep-th/0608072],
doi:10.1088/1126-6708/2006/10/042

36.118 Type: 1 Citation: Hajime Aoki, Jun Nishimura, Yoshiaki Susaki, JHEP **02** (2007) 033 [arXiv:hep-th/0602078],
doi:10.1088/1126-6708/2007/02/033

36.119 Type: 0 Citation: Badis Ydri, arXiv:1203.0906

36.120 Type: 0 Citation: Badis Ydri, Lect.Notes Phys. **929** (2017) [arXiv:1603.00924],
doi:10.1007/978-3-319-46003-1

36.121 Type: 1 Citation: Wolfgang Bietenholz, Phys.Rept. **505** (2011) [arXiv:0806.3713],
doi:10.1016/j.physrep.2011.04.002

36.122 Type: 0 Citation: Badis Ydri, arXiv:1708.00734

36.123 Type: 1 Citation: Wolfgang Bietenholz, Fortsch.Phys. **56** (2008) [arXiv:hep-lat/0611030],
doi:10.1002/prop.200710397

37. R. Loll, Jan Ambjorn, K.N. Anagnostopoulos, "*Making the gravitational path integral more Lorentzian, or life beyond Liouville gravity*", Nucl.Phys.B Proc.Suppl. **88** (2000) [arXiv:hep-th/9910232], [doi:10.1016/S0920-5632(00)00776-3].
Cited by 7 (5) articles

In two space-time dimensions, there is a theory of Lorentzian quantum gravity which can be defined by a rigorous, non-perturbative path integral and is inequivalent to the well-known theory of (Euclidean) quantum Liouville gravity. It has a number of appealing features: i) its quantum geometry is non-fractal, ii) it remains consistent when coupled to matter, even beyond the c=1 barrier, iii) it is closer to canonical quantization approaches than previous path-integral formulations, and iv) its construction generalizes to higher dimensions.

37.1 Type: 0 Citation: Giovanni Amelino-Camelia, arXiv:gr-qc/0001100

37.2 Type: 0 Citation: Jonathan Maltz, Leonard Susskind, Phys.Rev.Lett. **118** (2017) 101602 [arXiv:1611.00360], doi:10.1103/PhysRevLett.118.101602

37.3 Type: 0 Citation: Giovanni Amelino-Camelia, arXiv:gr-qc/0104005

37.4 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Contemp.Phys. **47** (2006) [arXiv:hep-th/0509010], doi:10.1080/00107510600603344

37.5 Type: 0 Citation: Giovanni Amelino-Camelia, Mod.Phys.Lett.A **17** (2002) [arXiv:gr-qc/0204051], doi:10.1142/S0217732302007612

37.6 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124], doi:10.1007/978-94-011-4303-5_9

37.7 Type: 0 Citation: Jonathan Maltz, Phys.Rev.D **95** (2017) 066006 [arXiv:1611.03491], doi:10.1103/PhysRevD.95.066006

38. Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, "*Crossing the c = 1 barrier in 2-D Lorentzian quantum gravity*", Phys.Rev.D **61** (2000) 044010 [arXiv:hep-lat/9909129], [doi:10.1103/PhysRevD.61.044010]. Cited by 49 (17) articles

In an extension of earlier work we investigate the behaviour of two-dimensional Lorentzian quantum gravity under coupling to a conformal field theory with c>1. This is done by analyzing numerically a system of eight Ising models (corresponding to c=4) coupled to dynamically triangulated Lorentzian geometries. It is known that a single Ising model couples weakly to Lorentzian quantum gravity, in the sense that the Hausdorff dimension of the ensemble of two-geometries is two (as in pure Lorentzian quantum gravity) and the matter behaviour is governed by the Onsager exponents. By increasing the amount of matter to 8 Ising models, we find that the geometry of the combined system has undergone a phase transition. The new phase is characterized by an anomalous scaling of spatial length relative to proper time at large distances, and as a consequence the Hausdorff dimension is now three. In spite of this qualitative change in the geometric sector, and a very strong interaction between matter and geometry, the critical exponents of the Ising model retain their Onsager values. This provides evidence for the conjecture that the KPZ values of the critical exponents in 2d Euclidean quantum gravity are entirely due to the presence of baby universes. Lastly, we summarize the lessons learned so far from 2d Lorentzian quantum gravity.

38.1 Type: 2 Citation: R. Loll, Jan Ambjorn, K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **88** (2000) [arXiv:hep-th/9910232], doi:10.1016/S0920-5632(00)00776-3

38.2 Type: 0 Citation: W. Westra, S. Zohren, Class.Quant.Grav. **29** (2012) 095021 [arXiv:1106.1460], doi:10.1088/0264-9381/29/9/095021

38.3 Type: 1 Citation: Dario Benedetti, R. Loll, Physica A **377** (2007) [arXiv:hep-lat/0603013], doi:10.1016/j.physa.2006.11.032

38.4 Type: 1 Citation: J. Ambjørn, A. Görlich, J. Jurkiewicz, H. Zhang, Phys.Lett.B **746** (2015) [arXiv:1503.01636], doi:10.1016/j.physletb.2015.05.026

38.5 Type: 1 Citation: R. Loll, W. Westra, Class.Quant.Grav. **23** (2006) [arXiv:hep-th/0306183], doi:10.1088/0264-9381/23/2/011

38.6 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.Lett. **85** (2000) [arXiv:hep-th/0002050], doi:10.1103/PhysRevLett.85.924

38.7 Type: 1 Citation: Jan Ambjorn, Acta Phys.Polon.B **42** (2011) [arXiv:1105.1741], doi:10.5506/APhysPolB.42.923

38.8 Type: 1 Citation: J. Ambjorn, A. Ipsen, Phys.Rev.D **88** (2013) 067502 [arXiv:1305.3148], doi:10.1103/PhysRevD.88.067502

38.9 Type: 0 Citation: Max R. Atkin, Stefan Zohren, AIP Conf.Proc. **1483** (2012) [arXiv:1209.6563], doi:10.1063/1.4756977

38.10 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **60** (1999) 104035 [arXiv:hep-th/9904012], doi:10.1103/PhysRevD.60.104035

38.11 Type: 1 Citation: R. Loll, W. Westra, Acta Phys.Polon.B **34** (2003) [arXiv:hep-th/0309012]

38.12 Type: 0 Citation: Fotini Markopoulou, Lee Smolin, Nucl.Phys.B **739** (2006) [arXiv:hep-th/0409057], doi:10.1016/j.nuclphysb.2006.01.009

38.13 Type: 1 Citation: R. Loll, Nucl.Phys.B Proc.Suppl. **94** (2001) [arXiv:hep-th/0011194], doi:10.1016/S0920-5632(01)00957-4

38.14 Type: 0 Citation: L. Bogacz, Z. Burda, J. Jurkiewicz, Acta Phys.Polon.B **34** (2003) [arXiv:hep-lat/0306033]

38.15 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Hongguang Zhang, Phys.Lett.B **743** (2015) [arXiv:1412.3873], doi:10.1016/j.physletb.2015.03.008

38.16 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.D **64** (2001) 044011 [arXiv:hep-th/0011276], doi:10.1103/PhysRevD.64.044011

38.17 Type: 1 Citation: Jan Ambjørn, Yuki Sato, Tomo Tanaka, Phys.Rev.D **101** (2020) 106019 [arXiv:2003.08524], doi:10.1103/PhysRevD.101.106019

38.18 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, R. Loll, I. Pushkina, Nucl.Phys.B **807** (2009) [arXiv:0806.3506], doi:10.1016/j.nuclphysb.2008.08.030

38.19 Type: 1 Citation: Renate Loll, Lect.Notes Phys. **631** (2003) [arXiv:hep-th/0212340], doi:10.1007/978-3-540-45230-0_4

38.20 Type: 0 Citation: Max R. Atkin, Stefan Zohren, Phys.Lett.B **712** (2012) [arXiv:1202.4322], doi:10.1016/j.physletb.2012.05.017

38.21 Type: 1 Citation: Dario Benedetti, R. Loll, Gen.Rel.Grav. **39** (2007) [arXiv:gr-qc/0611075], doi:10.1007/s10714-007-0425-3

38.22 Type: 0 Citation: Yuki Sato, Tomo Tanaka, Phys.Rev.D **98** (2018) 026026 [arXiv:1710.03402], doi:10.1103/PhysRevD.98.026026

38.23 Type: 1 Citation: J. Brunekreef, R. Loll, Phys.Rev.D **104** (2021) 126024 [arXiv:2110.11100], doi:10.1103/PhysRevD.104.126024

38.24 Type: 1 Citation: J. Ambjørn, B. Durhuus, J.F. Wheater, J.Phys.A **47** (2014) 365001 [arXiv:1405.6782], doi:10.1088/1751-8113/47/36/365001

38.25 Type: 1 Citation: J. Ambjorn, arXiv:gr-qc/0201028, doi:10.1142/9789812776556_0001

38.26 Type: 1 Citation: Renate Loll, Ben Ruijl, Phys.Rev.D **92** (2015) 084002 [arXiv:1507.04566], doi:10.1103/PhysRevD.92.084002

38.27 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, arXiv:1004.0352

38.28 Type: 1 Citation: Jan Ambjorn, Lisa Glaser, Andrzej Gorlich, Yuki Sato, Phys.Lett.B **712** (2012) [arXiv:1202.4435], doi:10.1016/j.physletb.2012.04.047

38.29 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, Nucl.Phys.B **610** (2001) [arXiv:hep-th/0105267], doi:10.1016/S0550-3213(01)00297-8

38.30 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Hongguang Zhang, Mod.Phys.Lett.A **30** (2015) 1550077 [arXiv:1412.3434], doi:10.1142/S0217732315500777

38.31 Type: 0 Citation: J.A. Nieto, Phys.Lett.A **288** (2001) [arXiv:hep-th/0107038], doi:10.1016/S0375-9601(01)00553-9

38.32 Type: 1 Citation: J. Ambjorn, R. Loll, Y. Watabiki, W. Westra, S. Zohren, Phys.Lett.B **670** (2008) [arXiv:0810.2408], doi:10.1016/j.physletb.2008.11.003

38.33 Type: 1 Citation: J. Ambjorn, R. Loll, W. Westra, S. Zohren, Phys.Lett.B **678** (2009) [arXiv:0905.2108], doi:10.1016/j.physletb.2009.06.031

38.34 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Contemp.Phys. **47** (2006) [arXiv:hep-th/0509010], doi:10.1080/00107510600603344

38.35 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, G. Vernizzi, JHEP **09** (2001) 022 [arXiv:hep-th/0106082], doi:10.1088/1126-6708/2001/09/022

38.36 Type: 1 Citation: Jan Ambjorn, Renate Loll, Yoshiyuki Watabiki, Willem Westra, Stefan Zohren, JHEP **05** (2008) 032 [arXiv:0802.0719], doi:10.1088/1126-6708/2008/05/032

38.37 Type: 1 Citation: J. Brunekreef, R. Loll, Phys.Rev.D **107** (2023) 026011 [arXiv:2208.12718], doi:10.1103/PhysRevD.107.026011

38.38 Type: 0 Citation: Dario Benedetti, arXiv:0707.3070

38.39 Type: 0 Citation: Martin Weigel, Wolfhard Janke, Nucl.Phys.B **719** (2005) [arXiv:hep-lat/0409028], doi:10.1016/j.nuclphysb.2005.04.041

38.40 Type: 0 Citation: Lee Smolin, arXiv:hep-th/0507235

38.41 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124], doi:10.1007/978-94-011-4303-5_9

38.42 Type: 1 Citation: R. Loll, Class.Quant.Grav. **37** (2020) 013002 [arXiv:1905.08669], doi:10.1088/1361-6382/ab57c7

38.43 Type: 0 Citation: Andreas Nink, Martin Reuter, JHEP **02** (2016) 167 [arXiv:1512.06805], doi:10.1007/JHEP02(2016)167

38.44 Type: 0 Citation: Stefan Zohren, arXiv:0905.0213

38.45 Type: 0 Citation: Andreas Nink, arXiv:1701.08344, doi:10.25358/openscience-2790

38.46 Type: 0 Citation: Lee Smolin, arXiv:hep-th/0408048, doi:10.1142/9789812702340_0078

38.47 Type: 0 Citation: Lee Smolin, arXiv:hep-th/0303185

38.48 Type: 0 Citation: Thomas Thiemann, arXiv:gr-qc/0110034

38.49 Type: 0 Citation: Thomas Thiemann, doi:10.1017/CBO9780511755682

39. Jan Ambjorn, K.N. Anagnostopoulos, J. Jurkiewicz, "*Abelian gauge fields coupled to simplicial quantum gravity*", JHEP **08** (1999) 016 [arXiv:hep-lat/9907027], [doi:10.1088/1126-6708/1999/08/016]. Cited by 37 (25) articles

We study the coupling of Abelian gauge theories to four-dimensional simplicial quantum gravity. The gauge fields live on dual links. This is the correct formulation if we want to compare the effect of gauge fields on geometry with similar effects studied so far for scalar fields. It shows that gauge fields couple equally weakly to geometry as scalar fields, and it offers an understanding of the relation between measure factors and Abelian gauge fields observed so-far.

39.1 Type: 1 Citation: Jan Ambjorn, P. Bialas, J. Jurkiewicz, Nucl.Phys.B Proc.Suppl. **83** (2000) [arXiv:hep-lat/9910002], doi:10.1016/S0920-5632(00)91791-2

39.2 Type: 0 Citation: Piotr Bialas, Nucl.Phys.B **575** (2000) [arXiv:cond-mat/0001386], doi:10.1016/S0550-3213(00)00202-9

39.3 Type: 0 Citation: Hiroto So, Masashi Hayakawa, Hiroshi Suzuki, PoS **LAT2006** (2006) 047 [arXiv:hep-lat/0610033],
doi:10.22323/1.032.0047

39.4 Type: 1 Citation: J. Ambjorn, A. Ipsen, Phys.Rev.D **88** (2013) 067502 [arXiv:1305.3148],
doi:10.1103/PhysRevD.88.067502

39.5 Type: 0 Citation: R. Loll, Nucl.Phys.B Proc.Suppl. **94** (2001) [arXiv:hep-th/0011194],
doi:10.1016/S0920-5632(01)00957-4

39.6 Type: 0 Citation: Giuseppe Clemente, Alessandro Candido, Massimo D'Elia, Federico Rottoli, PoS **LATTICE2021** (2022) 254 [arXiv:2112.03157],
doi:10.22323/1.396.0254

39.7 Type: 0 Citation: Hua Chen, Naoki Sasakura, Yuki Sato, Phys.Rev.D **95** (2017) 066008 [arXiv:1609.01946],
doi:10.1103/PhysRevD.95.066008

39.8 Type: 1 Citation: J. Ambjorn, arXiv:gr-qc/0201028,
doi:10.1142/9789812776556_0001

39.9 Type: 0 Citation: Hua Chen, Naoki Sasakura, Yuki Sato, Phys.Rev.D **93** (2016) 064071 [arXiv:1601.04232],
doi:10.1103/PhysRevD.93.064071

39.10 Type: 0 Citation: Alessandro Candido, Giuseppe Clemente, Massimo D'Elia, Federico Rottoli, JHEP **04** (2021) 184 [arXiv:2010.15714],
doi:10.1007/JHEP04(2021)184

39.11 Type: 0 Citation: Jan Smit, arXiv:2101.01028

39.12 Type: 0 Citation: I. Khavkine, R. Loll, P. Reska, Class.Quant.Grav. **27** (2010) 185025 [arXiv:1002.4618],
doi:10.1088/0264-9381/27/18/185025

39.13 Type: 1 Citation: Jan Ambjørn, Jakub Gizbert-Studnicki, Andrzej Görlich, Jerzy Jurkiewicz, JHEP **06** (2014) 034 [arXiv:1403.5940],
doi:10.1007/JHEP06(2014)034

39.14 Type: 0 Citation: Gaurav Narain, Naoki Sasakura, Yuki Sato, JHEP **01** (2015) 010 [arXiv:1410.2683],
doi:10.1007/JHEP01(2015)010

39.15 Type: 0 Citation: Naoki Sasakura, Yuki Sato, JHEP **10** (2015) 109 [arXiv:1506.04872],
doi:10.1007/JHEP10(2015)109

39.16 Type: 1 Citation: J. Ambjorn, L. Glaser, A. Goerlich, J. Jurkiewicz, JHEP **10** (2013) 100 [arXiv:1307.2270],
doi:10.1007/JHEP10(2013)100

39.17 Type: 0 Citation: Jan Smit, arXiv:2301.07081

39.18 Type: 0 Citation: Jan Smit, JHEP **08** (2013) 016 [arXiv:1304.6339],
doi:10.1007/JHEP08(2013)016

39.19 Type: 0 Citation: Joachim Tabaczek, arXiv:hep-lat/0108023

39.20 Type: 0 Citation: J. Laiho, S. Bassler, D. Coumbe, D. Du, J.T. Neelakanta, Phys.Rev.D **96** (2017) 064015 [arXiv:1604.02745],
doi:10.1103/PhysRevD.96.064015

39.21 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, arXiv:1007.2560

39.22 Type: 0 Citation: F. Paccetti Correia, Michael G. Schmidt, Zurab Tavartkiladze, Nucl.Phys.B **751** (2006) [arXiv:hep-th/0602173],
doi:10.1016/j.nuclphysb.2006.06.007

39.23 Type: 0 Citation: Yiwen Pan, JHEP **01** (2015) 145 [arXiv:1406.5236],
doi:10.1007/JHEP01(2015)145

39.24 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Renate Loll, arXiv:1302.2173,
doi:10.1007/978-3-642-41992-8_34

39.25 Type: 1 Citation: J. Ambjorn, A.T. Goerlich, J. Jurkiewicz, H.-G. Zhang, Nucl.Phys.B **863** (2012) [arXiv:1201.1590],
doi:10.1016/j.nuclphysb.2012.05.024

39.26 Type: 0 Citation: Zbigniew Drogosz, arXiv:2112.02156

39.27 Type: 1 Citation: Jan Ambjørn, Zbigniew Drogosz, Jakub Gizbert-Studnicki, Andrzej Görlich, Jerzy Jurkiewicz, D.ániel Németh, Class.Quant.Grav. **38** (2021) 195030 [arXiv:2105.10086], doi:10.1088/1361-6382/ac2135

39.28 Type: 0 Citation: Eric Bergshoeff, Sorin Cucu, Tim De Wit, Jos Gheerardyn, Rein Halbersma, Stefan Vandoren, Antoine Van Proeyen, JHEP **10** (2002) 045 [arXiv:hep-th/0205230], doi:10.1088/1126-6708/2002/10/045

39.29 Type: 0 Citation: Gabriele Honecker, Fortsch.Phys. **60** (2012) [arXiv:1109.3192], doi:10.1002/prop.201100087

39.30 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124], doi:10.1007/978-94-011-4303-5_9

39.31 Type: 0 Citation: Jakub Gizbert-Studnicki, arXiv:1510.08719

39.32 Type: 0 Citation: Masashi Hayakawa, Hiroto So, Hiroshi Suzuki, Prog.Theor.Phys. **116** (2006) [arXiv:hep-lat/0604003], doi:10.1143/PTP.116.197

39.33 Type: 0 Citation: P.M Reska

39.34 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, Phys.Rept. **519** (2012) [arXiv:1203.3591], doi:10.1016/j.physrep.2012.03.007

39.35 Type: 0 Citation: Fleur Versteegen, doi:10.11588/heidok.00027383

39.36 Type: 0 Citation: Andreas G.A. Pithis, arXiv:1903.07735

39.37 Type: 0 Citation: A. Addazi, J. Alvarez-Muniz, R. Alves Batista, G. Amelino-Camelia, V. Antonelli, M. Arzano, M. Asorey, J.-L. Atteia, S. Bahamonde, F. Bajardi, A. Ballesteros, B. Baret, D.M. Barreiros, S. Basilakos, D. Benisty, O. Birnholtz, J.J. Blanco-Pillado, D. Blas, J. Bolmont, D. Boncioli, P. Bosso, G. Calcagni, S. Capozziello, J.M. Carmona, S. Cerci, M. Chernyakova, S. Clesse, J.A.B. Coelho, S.M. Colak, J.L. Cortes, S. Das, V. D'Esposito, M. Demirci, M.G. Di Luca, A. di Matteo, D. Dimitrijevic, G. Djordjevic, D. Dominis Prester, A. Eichhorn, J. Ellis, C. Escamilla-Rivera, G. Fabiano, S.A. Franchino-Viñas, A.M. Frassino, D. Frattulillo, S. Funk, A. Fuster, J. Gamboa, A. Gent, L.Á. Gergely, M. Giammarchi, K. Giesel, J.-F. Glicenstein, J. Gracia-Bondía, R. Gracia-Ruiz, G. Gubitosi, E.I. Guendelman, I. Gutierrez-Sagredo, L. Haegel, S. Heefer, A. Held, F.J. Herranz, T. Hinderer, J.I. Illana, A. Ioannisian, P. Jetzer, F.R. Joaquim, K.-H. Kampert, A. Karasu Uysal, T. Katori, N. Kazarian, D. Kerszberg, J. Kowalski-Glikman, S. Kuroyanagi, C. Lämmerzahl, J. Levi Said, S. Liberati, E. Lim, I.P. Lobo, M. López-Moya, G.G. Luciano, M. Manganaro, A. Marcianò, P. Martín-Moruno, Manel Martinez, Mario Martinez, H. Martínez-Huerta, P. Martínez-Miravé, M. Masip, D. Mattingly, N. Mavromatos, A. Mazumdar, F. Méndez, F. Mercati, S. Micanovic, J. Mielczarek, A.L. Miller, M. Milosevic, D. Minic, L. Miramonti, V.A. Mitsou, P. Moniz, S. Mukherjee, G. Nardini, S. Navas, M. Niechciol, A.B. Nielsen, N.A. Obers, F. Oikonomou, D. Oriti, C.F. Paganini, S. Palomares-Ruiz, R. Pasechnik, V. Pasic, C. Pérez de los Heros, C. Pfeifer, M.P. Pieroni, T. Piran, A. Platania, S. Rastgoo, J.J. Relancio, M.A. Reyes, A. Ricciardone, M. Risse, M.D. Rodriguez Frias, G. Rosati, D. Rubiera-Garcia, H. Sahlmann, M. Sakellariadou, F. Salamida, E.N. Saridakis, P. Satunin, M. Schiffer, F. Schüssler, G. Sigl, J. Sitarek, J. Solà Peracaula, C.F. Sopuerta, T.P. Sotiriou, M. Spurio, D. Staicova, N. Stergioulas, S. Stoica, J. Strišković, T. Stuttard, D. Sunar Cerci, Y. Tavakoli, C.A. Ternes, T. Terzić, T. Thiemann, P. Tinyakov, M.D.C. Torri, M. Tórtola, C. Trimarelli, T. Trześniewski, A. Tureanu, F.R. Urban, E.C. Vagenas, D. Vernieri, V. Vitagliano, J.-C. Wallet, J.D. Zornoza, Prog.Part.Nucl.Phys. **125** (2022) 103948 [arXiv:2111.05659], doi:10.1016/j.ppnp.2022.103948

40. Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, "*On the phase diagram of 2-d Lorentzian quantum gravity*", Nucl.Phys.B Proc.Suppl. **83** (2000) [arXiv:hep-lat/9908054], [doi:10.1016/S0920-5632(00)91790-0].
Cited by 8 (3) articles

The phase diagram of 2d Lorentzian quantum gravity (LQG) coupled to conformal matter is studied. A phase transition is observed at c=crm crit (1/2<crm crit<4) which can be thought of as the analogue of the c=1 barrier of Euclidean quantum gravity (EQG). The non–trivial properties of the quantum geometry are discussed.

40.1 Type: 2 Citation: R. Loll, Jan Ambjorn, K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **88** (2000) [arXiv:hep-th/9910232],
doi:10.1016/S0920-5632(00)00776-3

40.2 Type: 1 Citation: Dario Benedetti, R. Loll, Physica A **377** (2007) [arXiv:hep-lat/0603013],
doi:10.1016/j.physa.2006.11.032

40.3 Type: 1 Citation: Dario Benedetti, R. Loll, Gen.Rel.Grav. **39** (2007) [arXiv:gr-qc/0611075],
doi:10.1007/s10714-007-0425-3

40.4 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Contemp.Phys. **47** (2006) [arXiv:hep-th/0509010],
doi:10.1080/00107510600603344

40.5 Type: 0 Citation: Dario Benedetti, arXiv:0707.3070

40.6 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124],
doi:10.1007/978-94-011-4303-5_9

40.7 Type: 0 Citation: Thomas Thiemann, arXiv:gr-qc/0110034

40.8 Type: 0 Citation: Thomas Thiemann,
doi:10.1017/CBO9780511755682

41. Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, *"A New perspective on matter coupling in 2-D quantum gravity"*, Phys.Rev.D **60** (1999) 104035 [arXiv:hep-th/9904012], [doi:10.1103/PhysRevD.60.104035].
Cited by 66 (27) articles

We provide compelling evidence that a previously introduced model of non-perturbative 2d Lorentzian quantum gravity exhibits (two-dimensional) flat-space behaviour when coupled to Ising spins. The evidence comes from both a high-temperature expansion and from Monte Carlo simulations of the combined gravity-matter system. This weak-coupling behaviour lends further support to the conclusion that the Lorentzian model is a genuine alternative to Liouville quantum gravity in two dimensions, with a different, and much 'smoother' critical behaviour.

41.1 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Nucl.Phys.B Proc.Suppl. **83** (2000) [arXiv:hep-lat/9908054],
doi:10.1016/S0920-5632(00)91790-0

41.2 Type: 2 Citation: R. Loll, Jan Ambjorn, K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **88** (2000) [arXiv:hep-th/9910232],
doi:10.1016/S0920-5632(00)00776-3

41.3 Type: 0 Citation: P. Di Francesco, E. Guitter, C. Kristjansen, Nucl.Phys.B **608** (2001) [arXiv:hep-th/0010259],
doi:10.1016/S0550-3213(01)00239-5

41.4 Type: 0 Citation: Valentin Sisko, Anatoly Yambartsev, Stefan Zohren, Braz.J.Probab.Statist. **32** (2018) ,
doi:10.1214/17-BJPS356

41.5 Type: 0 Citation: José Cerda-Hernández, Anatoly Yambartsev, Stefan Zohren, Braz.J.Probab.Statist. **31** (2017) ,
doi:10.1214/16-BJPS310

41.6 Type: 0 Citation: J.Cerda Hernández, J.Math.Phys. **58** (2017) 123303 [arXiv:1603.04333],
doi:10.1063/1.5017125

41.7 Type: 0 Citation: Norman S. Israel, John F. Lindner, Results Phys. **2** (2012) ,
doi:10.1016/j.rinp.2012.10.001

41.8 Type: 0 Citation: Thomas Filk, Class.Quant.Grav. **18** (2001) [arXiv:gr-qc/0102088],
doi:10.1088/0264-9381/18/14/311

41.9 Type: 0 Citation: D.P. Rideout, R.D. Sorkin, Phys.Rev.D **61** (2000) 024002 [arXiv:gr-qc/9904062],
doi:10.1103/PhysRevD.61.024002

41.10 Type: 0 Citation: George M. Napolitano, Tatyana Turova, J.Statist.Phys. **162** (2016) [arXiv:1504.03828],
doi:10.1007/s10955-015-1430-7

41.11 Type: 1 Citation: Dario Benedetti, R. Loll, Physica A **377** (2007) [arXiv:hep-lat/0603013],
doi:10.1016/j.physa.2006.11.032

41.12 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.Lett. **85** (2000) [arXiv:hep-th/0002050],
doi:10.1103/PhysRevLett.85.924

41.13 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **61** (2000) 044010 [arXiv:hep-lat/9909129],
doi:10.1103/PhysRevD.61.044010

41.14 Type: 0 Citation: J. Cerda-Hernández, J.Stat.Mech. **1702** (2017) 023209,
doi:10.1088/1742-5468/aa528a

41.15 Type: 0 Citation: P. Di Francesco, E. Guitter, C. Kristjansen, Nucl.Phys.B **567** (2000) [arXiv:hep-th/9907084],
doi:10.1016/S0550-3213(99)00661-6

41.16 Type: 0 Citation: Bergfinnur Durhuus, Thordur Jonsson, John Wheater, arXiv:2211.15247

41.17 Type: 1 Citation: Jan Ambjorn, Acta Phys.Polon.B **42** (2011) [arXiv:1105.1741],
doi:10.5506/APhysPolB.42.923

41.18 Type: 0 Citation: Max R. Atkin, Stefan Zohren, arXiv:1209.6562,
doi:10.1088/1742-6596/410/1/012131

41.19 Type: 0 Citation: Max R. Atkin, Stefan Zohren, AIP Conf.Proc. **1483** (2012) [arXiv:1209.6563],
doi:10.1063/1.4756977

41.20 Type: 1 Citation: J. Ambjorn, A. Ipsen, Phys.Rev.D **88** (2013) 067502 [arXiv:1305.3148],
doi:10.1103/PhysRevD.88.067502

41.21 Type: 0 Citation: Lisa Glaser, Class.Quant.Grav. **35** (2018) 084001 [arXiv:1802.02519],
doi:10.1088/1361-6382/aab139

41.22 Type: 1 Citation: R. Loll, W. Westra, Acta Phys.Polon.B **34** (2003) [arXiv:hep-th/0309012]

41.23 Type: 0 Citation: David P Rideout, arXiv:gr-qc/0212064

41.24 Type: 0 Citation: L. Bogacz, Z. Burda, J. Jurkiewicz, Acta Phys.Polon.B **34** (2003) [arXiv:hep-lat/0306033]

41.25 Type: 1 Citation: R. Loll, Nucl.Phys.B Proc.Suppl. **94** (2001) [arXiv:hep-th/0011194],
doi:10.1016/S0920-5632(01)00957-4

41.26 Type: 0 Citation: Fotini Markopoulou, arXiv:hep-th/0006199

41.27 Type: 0 Citation: D.A. Johnston, Phys.Lett.B **463** (1999) [arXiv:cond-mat/9812169],
doi:10.1016/S0370-2693(99)00948-X

41.28 Type: 1 Citation: Renate Loll, Lect.Notes Phys. **631** (2003) [arXiv:hep-th/0212340],
doi:10.1007/978-3-540-45230-0_4

41.29 Type: 0 Citation: Bergfinnur Durhuus, Xavier Poncini, J.ørgen Rasmussen, Meltem Ünel, J.Stat.Mech. **2111** (2021) 113102 [arXiv:2104.14176],
doi:10.1088/1742-5468/ac2dfa

41.30 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.D **64** (2001) 044011 [arXiv:hep-th/0011276],
doi:10.1103/PhysRevD.64.044011

41.31 Type: 0 Citation: A. Krzywicki, Nucl.Phys.B Proc.Suppl. **83** (2000) [arXiv:hep-lat/9907012],
doi:10.1016/S0920-5632(00)91604-9

41.32 Type: 1 Citation: Dario Benedetti, R. Loll, Gen.Rel.Grav. **39** (2007) [arXiv:gr-qc/0611075],
doi:10.1007/s10714-007-0425-3

41.33 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Hongguang Zhang, Phys.Lett.B **743** (2015) [arXiv:1412.3873],
doi:10.1016/j.physletb.2015.03.008

41.34 Type: 1 Citation: Jan Ambjørn, Yuki Sato, Tomo Tanaka, Phys.Rev.D **101** (2020) 106019 [arXiv:2003.08524],
doi:10.1103/PhysRevD.101.106019

41.35 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, R. Loll, I. Pushkina, Nucl.Phys.B **807** (2009) [arXiv:0806.3506],
doi:10.1016/j.nuclphysb.2008.08.030

41.36 Type: 0 Citation: Max R. Atkin, Stefan Zohren, Phys.Lett.B **712** (2012) [arXiv:1202.4322], doi:10.1016/j.physletb.2012.05.017

41.37 Type: 1 Citation: R. Loll, arXiv:2306.13782

41.38 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, Phys.Rev.D **78** (2008) 063544 [arXiv:0807.4481], doi:10.1103/PhysRevD.78.063544

41.39 Type: 0 Citation: Yuki Sato, Tomo Tanaka, Phys.Rev.D **98** (2018) 026026 [arXiv:1710.03402], doi:10.1103/PhysRevD.98.026026

41.40 Type: 1 Citation: J. Ambjørn, B. Durhuus, J.F. Wheater, J.Phys.A **47** (2014) 365001 [arXiv:1405.6782], doi:10.1088/1751-8113/47/36/365001

41.41 Type: 1 Citation: J. Brunekreef, R. Loll, Phys.Rev.D **104** (2021) 126024 [arXiv:2110.11100], doi:10.1103/PhysRevD.104.126024

41.42 Type: 1 Citation: J. Ambjorn, arXiv:gr-qc/0201028, doi:10.1142/9789812776556_0001

41.43 Type: 1 Citation: R. Loll, A. Silva, Phys.Rev.D **107** (2023) 086013 [arXiv:2302.10256], doi:10.1103/PhysRevD.107.086013

41.44 Type: 1 Citation: Renate Loll, Ben Ruijl, Phys.Rev.D **92** (2015) 084002 [arXiv:1507.04566], doi:10.1103/PhysRevD.92.084002

41.45 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, arXiv:1004.0352

41.46 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Hongguang Zhang, Mod.Phys.Lett.A **30** (2015) 1550077 [arXiv:1412.3434], doi:10.1142/S0217732315500777

41.47 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, Acta Phys.Polon.B **39** (2008)

41.48 Type: 1 Citation: Jan Ambjorn, Lisa Glaser, Andrzej Gorlich, Yuki Sato, Phys.Lett.B **712** (2012) [arXiv:1202.4435], doi:10.1016/j.physletb.2012.04.047

41.49 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, Nucl.Phys.B **610** (2001) [arXiv:hep-th/0105267], doi:10.1016/S0550-3213(01)00297-8

41.50 Type: 0 Citation: Dario Benedetti, Joe Henson, Class.Quant.Grav. **32** (2015) 215007 [arXiv:1410.0845], doi:10.1088/0264-9381/32/21/215007

41.51 Type: 1 Citation: J. Ambjorn, R. Loll, Y. Watabiki, W. Westra, S. Zohren, Phys.Lett.B **670** (2008) [arXiv:0810.2408], doi:10.1016/j.physletb.2008.11.003

41.52 Type: 1 Citation: Jan Ambjorn, J. Jurkiewicz, R. Loll, G. Vernizzi, JHEP **09** (2001) 022 [arXiv:hep-th/0106082], doi:10.1088/1126-6708/2001/09/022

41.53 Type: 1 Citation: J. Ambjorn, R. Loll, W. Westra, S. Zohren, Phys.Lett.B **678** (2009) [arXiv:0905.2108], doi:10.1016/j.physletb.2009.06.031

41.54 Type: 1 Citation: Jan Ambjorn, Renate Loll, Yoshiyuki Watabiki, Willem Westra, Stefan Zohren, JHEP **05** (2008) 032 [arXiv:0802.0719], doi:10.1088/1126-6708/2008/05/032

41.55 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Contemp.Phys. **47** (2006) [arXiv:hep-th/0509010], doi:10.1080/00107510600603344

41.56 Type: 1 Citation: J. Brunekreef, R. Loll, Phys.Rev.D **107** (2023) 026011 [arXiv:2208.12718], doi:10.1103/PhysRevD.107.026011

41.57 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, arXiv:1007.2560

41.58 Type: 1 Citation: Jan Ambjorn, Jerzy Jurkiewicz, Renate Loll, Lect.Notes Phys. **807** (2010) [arXiv:0906.3947], doi:10.1007/978-3-642-11897-5_2

41.59 Type: 1 Citation: J. Ambjorn, A.T. Goerlich, J. Jurkiewicz, H.-G. Zhang, Nucl.Phys.B **863** (2012) [arXiv:1201.1590], doi:10.1016/j.nuclphysb.2012.05.024

41.60 Type: 0 Citation: Dario Benedetti, arXiv:0707.3070

41.61 Type: 0 Citation: Jakub Gizbert-Studnicki, arXiv:1510.08719

41.62 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124],
doi:10.1007/978-94-011-4303-5_9

41.63 Type: 1 Citation: R. Loll, Class.Quant.Grav. **37** (2020) 013002 [arXiv:1905.08669],
doi:10.1088/1361-6382/ab57c7

41.64 Type: 0 Citation: Dario Benedetti, arXiv:2212.11043

41.65 Type: 0 Citation: Stefan Zohren, arXiv:0905.0213

41.66 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, Phys.Rept. **519** (2012) [arXiv:1203.3591],
doi:10.1016/j.physrep.2012.03.007

42. Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, Y. Watabiki, "*Quantum geometry and diffusion*", JHEP **11** (1998) 022 [arXiv:hep-lat/9808027], [doi:10.1088/1126-6708/1998/11/022].
Cited by 22 (16) articles

We study the diffusion equation in two-dimensional quantum gravity, and show that the spectral dimension is two despite the fact that the intrinsic Hausdorff dimension of the ensemble of two-dimensional geometries is very different from two. We determine the scaling properties of the quantum gravity averaged diffusion kernel.

42.1 Type: 0 Citation: Christophe Garban, Remi Rhodes, Vincent Vargas, Annals Probab. **44** (2016) [arXiv:1301.2876],
doi:10.1214/15-AOP1042

42.2 Type: 0 Citation: F. Viniegra, M. Peardon, S.M. Ryan, PoS **LAT2005** (2006) 257,
doi:10.22323/1.020.0257

42.3 Type: 0 Citation: Pascal Maillard, Rémi Rhodes, Vincent Vargas, Ofer Zeitouni, Ann.Inst.H.Poincare Probab.Statist. **52** (2016) [arXiv:1406.0491],
doi:10.1214/15-AIHP676

42.4 Type: 0 Citation: Bergfinnur Durhuus, Thordur Jonsson, John F. Wheater, J.Statist.Phys. **128** (2007) 1237 [arXiv:math-ph/0607020],
doi:10.1007/s10955-007-9348-3

42.5 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.Lett. **95** (2005) 171301 [arXiv:hep-th/0505113],
doi:10.1103/PhysRevLett.95.171301

42.6 Type: 0 Citation: Da-qing Liu, arXiv:hep-lat/0512034

42.7 Type: 0 Citation: Rémi Rhodes, Vincent Vargas, Probab.Surv. **11** (2014) [arXiv:1305.6221],
doi:10.1214/13-PS218

42.8 Type: 0 Citation: Ewain Gwynne, Jason Miller, Annals Probab. **49** (2021) ,
doi:10.1214/20-AOP1471

42.9 Type: 0 Citation: Georgios Giasemidis, John F. Wheater, Stefan Zohren, J.Phys.A **45** (2012) 355001 [arXiv:1202.6322],
doi:10.1088/1751-8113/45/35/355001

42.10 Type: 2 Citation: K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809012],
doi:10.1016/S0920-5632(99)85203-7

42.11 Type: 0 Citation: Nathanael Berestycki, Ewain Gwynne, Commun.Math.Phys. **395** (2022) [arXiv:2003.10320],
doi:10.1007/s00220-022-04482-y

42.12 Type: 1 Citation: J. Ambjørn, T. Budd, Acta Phys.Polon.B **44** (2013) [arXiv:1310.8552],
doi:10.5506/APhysPolB.44.2537

42.13 Type: 1 Citation: J. Ambjorn, J. Barkley, T.G. Budd, Nucl.Phys.B **858** (2012) [arXiv:1110.4649],
doi:10.1016/j.nuclphysb.2012.01.010

42.14 Type: 0 Citation: Rémi Rhodes, Vincent Vargas, arXiv:1311.5847

42.15 Type: 0 Citation: Marcus Berg, Michael Haack, Wolfgang Mueck, Nucl.Phys.B **789** (2008) [arXiv:hep-th/0612224],
doi:10.1016/j.nuclphysb.2007.07.012

42.16 Type: 0 Citation: Joe Henson, J.Phys.Conf.Ser. **174** (2009) 012020 [arXiv:0901.4009],
doi:10.1088/1742-6596/174/1/012020

42.17 Type: 0 Citation: Wolfhard Janke, Ramon Villanova, Phys.Rev.B **66** (2002) 134208 [arXiv:cond-mat/0211446],
doi:10.1103/PhysRevB.66.134208

42.18 Type: 0 Citation: Tsutomu Kobayashi, Yu-ichi Takamizu, Class.Quant.Grav. **25** (2007) 015007 [arXiv:0707.0894],
doi:10.1088/0264-9381/25/1/015007

42.19 Type: 0 Citation: Eleftherios Papantonopoulos, Antonios Papazoglou, Vassilios Zamarias, Nucl.Phys.B **797** (2008) [arXiv:0707.1396],
doi:10.1016/j.nuclphysb.2007.12.031

42.20 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.D **72** (2005) 064014 [arXiv:hep-th/0505154],
doi:10.1103/PhysRevD.72.064014

42.21 Type: 0 Citation: Orchidea Maria Lecian, Technol. **5** (2017) 56 [arXiv:1708.07895],
doi:10.3390/technologies5030056

42.22 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, Phys.Rept. **519** (2012) [arXiv:1203.3591],
doi:10.1016/j.physrep.2012.03.007

43. K.N. Anagnostopoulos, P. Bialas, G. Thorleifsson, "*The Ising model on a quenched ensemble of c = -5 gravity graphs*", J.Statist.Phys. **94** (1999) [arXiv:cond-mat/9804137], [doi:10.1023/A:1004583901498]. Cited by 13 (9) articles

We study with Monte Carlo methods an ensemble of c=-5 gravity graphs, generated by coupling a conformal field theory with central charge c=-5 to two-dimensional quantum gravity. We measure the fractal properties of the ensemble, such as the string susceptibility exponent gammas and the intrinsic fractal dimensions dH. We find gammas = -1.5(1) and dH = 3.36(4), in reasonable agreement with theoretical predictions. In addition, we study the critical behavior of an Ising model on a quenched ensemble of the c=-5 graphs and show that it agrees, within numerical accuracy, with theoretical predictions for the critical behavior of an Ising model coupled dynamically to two-dimensional quantum gravity, provided the total central charge of the matter sector is c=-5. From this we conjecture that the critical behavior of the Ising model is determined solely by the average fractal properties of the graphs, the coupling to the geometry not playing an important role.

43.1 Type: 0 Citation: N. Kawamoto, K. Yotsuji, Nucl.Phys.B Proc.Suppl. **129** (2004) ,
doi:10.1016/S0920-5632(03)02715-4

43.2 Type: 0 Citation: Wolfhard Janke, Desmond A. Johnston, Phys.Lett.B **460** (1999) [arXiv:hep-lat/9905016],
doi:10.1016/S0370-2693(99)00814-X

43.3 Type: 0 Citation: Bertrand Duplantier, Scott Sheffield, Phys.Rev.Lett. **102** (2009) 150603 [arXiv:0901.0277],
doi:10.1103/PhysRevLett.102.150603

43.4 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, Y. Watabiki, JHEP **11** (1998) 022 [arXiv:hep-lat/9808027],
doi:10.1088/1126-6708/1998/11/022

43.5 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **61** (2000) 044010 [arXiv:hep-lat/9909129],
doi:10.1103/PhysRevD.61.044010

43.6 Type: 2 Citation: K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809012],
doi:10.1016/S0920-5632(99)85203-7

43.7 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **60** (1999) 104035 [arXiv:hep-th/9904012],
doi:10.1103/PhysRevD.60.104035

43.8 Type: 0 Citation: Wolfhard Janke, Martin Weigel, Phys.Rev.B **69** (2004) 144208 [arXiv:cond-mat/0310269],
doi:10.1103/PhysRevB.69.144208

43.9 Type: 0 Citation: Wolfhard Janke, Desmond A. Johnston, Nucl.Phys.B **578** (2000) [arXiv:hep-lat/9907026],
doi:10.1016/S0550-3213(00)00047-X

43.10 Type: 0 Citation: Jerome Barkley, Timothy Budd, Class.Quant.Grav. **36** (2019) 244001 [arXiv:1908.09469],
doi:10.1088/1361-6382/ab4f21

43.11 Type: 0 Citation: Noboru Kawamoto, Kenji Yotsuji, Nucl.Phys.B **644** (2002) [arXiv:hep-lat/0207007],
doi:10.1016/S0550-3213(02)00822-2

43.12 Type: 0 Citation: Wolfhard Janke, Ramon Villanova, Phys.Rev.B **66** (2002) 134208 [arXiv:cond-mat/0211446],
doi:10.1103/PhysRevB.66.134208

43.13 Type: 0 Citation: Juri Rolf, arXiv:hep-th/9810027

44. Jan Ambjorn, K.N. Anagnostopoulos, J. Jurkiewicz, C.F. Kristjansen, "*The Concept of time in 2-D gravity*", JHEP **04** (1998) 016 [arXiv:hep-th/9802020], [doi:10.1088/1126-6708/1998/04/016].
Cited by 12 (3) articles

We show that the "time" ts defined via spin clusters in the Ising model coupled to 2d gravity leads to a fractal dimension dh(s) = 6 of space-time at the critical point, as advocated by Ishibashi and Kawai. In the unmagnetized phase, however, this definition of Hausdorff dimension breaks down. Numerical measurements are consistent with these results. The same definition leads to dh(s)=16 at the critical point when applied to flat space. The fractal dimension dh(s) is in disagreement with both analytical prediction and numerical determination of the fractal dimension dh(g), which is based on the use of the geodesic distance tg as "proper time". There seems to be no simple relation of the kind ts = tgdh(g)/dh(s), as expected by dimensional reasons.

44.1 Type: 0 Citation: Hiroyuki Fuji, Yuki Sato, Yoshiyuki Watabiki, Phys.Lett.B **704** (2011) [arXiv:1108.0552],
doi:10.1016/j.physletb.2011.09.032

44.2 Type: 2 Citation: K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809012],
doi:10.1016/S0920-5632(99)85203-7

44.3 Type: 1 Citation: P. Di Francesco, E. Guitter, C. Kristjansen, Nucl.Phys.B **567** (2000) [arXiv:hep-th/9907084],
doi:10.1016/S0550-3213(99)00661-6

44.4 Type: 1 Citation: J. Ambjorn, J.A. Gesser, Phys.Lett.B **659** (2008) [arXiv:0707.3431],
doi:10.1016/j.physletb.2007.12.003

44.5 Type: 1 Citation: J. Ambjorn, J. Barkley, T. Budd, R. Loll, Phys.Lett.B **706** (2011) [arXiv:1110.3998],
doi:10.1016/j.physletb.2011.10.062

44.6 Type: 1 Citation: J. Ambjørn, T. Budd, Phys.Lett.B **724** (2013) [arXiv:1305.3674],
doi:10.1016/j.physletb.2013.06.009

44.7 Type: 1 Citation: Jan Ambjorn, Jens Anders Gesser, Acta Phys.Polon.B **38** (2007) [arXiv:0709.3106]

44.8 Type: 1 Citation: Jan Ambjorn, Jens A. Gesser, Phys.Lett.B **653** (2007) [arXiv:0706.3231],
doi:10.1016/j.physletb.2007.08.024

44.9 Type: 2 Citation: K.N. Anagnostopoulos, P. Bialas, G. Thorleifsson, J.Statist.Phys. **94** (1999) [arXiv:cond-mat/9804137],
doi:10.1023/A:1004583901498

44.10 Type: 0 Citation: Jens A. Gesser, arXiv:1010.5006

44.11 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124],
doi:10.1007/978-94-011-4303-5_9

44.12 Type: 0 Citation: John R. Hiller, Stanley J. Brodsky, Phys.Rev.D **59** (1999) 016006 [arXiv:hep-ph/9806541],
doi:10.1103/PhysRevD.59.016006

45. Jan Ambjorn, K.N. Anagnostopoulos, G. Thorleifsson, "*The quantum space-time of $c > 0$ 2-D gravity*", Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9709025], [doi:10.1016/S0920-5632(97)00890-6].
Cited by 6 (6) articles

We review recent developments in the understanding of the fractal properties of quantum spacetime of 2d gravity coupled to c>0 conformal matter. In particular we discuss bounds put by numerical simulations using dynamical triangulations on the value of the Hausdorff dimension dH obtained from scaling properties of two point functions defined in terms of geodesic distance. Further insight to the fractal structure of spacetime is obtained from the study of the loop length distribution function which reveals that the 0<c<= 1 system has similar geometric properties with pure gravity, whereas the branched polymer structure becomes clear for c >= 5.

45.1 Type: 0 Citation: Takayuki Nakajima, Jun Nishimura, Nucl.Phys.B **528** (1998) [arXiv:hep-th/9802082], doi:10.1016/S0550-3213(98)00472-6

45.2 Type: 0 Citation: Wolfhard Janke, Desmond A. Johnston, Nucl.Phys.B **578** (2000) [arXiv:hep-lat/9907026], doi:10.1016/S0550-3213(00)00047-X

45.3 Type: 0 Citation: Mark J. Bowick, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9710005], doi:10.1016/S0920-5632(97)00699-3

45.4 Type: 0 Citation: Wolfhard Janke, Ramon Villanova, Phys.Rev.B **66** (2002) 134208 [arXiv:cond-mat/0211446], doi:10.1103/PhysRevB.66.134208

45.5 Type: 0 Citation: Martin Weigel, Wolfhard Janke, Nucl.Phys.B **719** (2005) [arXiv:hep-lat/0409028], doi:10.1016/j.nuclphysb.2005.04.041

45.6 Type: 0 Citation: Zdzislaw Burda, Acta Phys.Polon.B **29** (1998) [arXiv:hep-lat/9712007]

46. Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, "*Complex zeros of the 2-D Ising model on dynamical random lattices*", Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9708014], [doi:10.1016/S0920-5632(97)00893-1].
Cited by 5 (5) articles

We study the zeros in the complex plane of the partition function for the Ising model coupled to 2d quantum gravity for complex magnetic field and for complex temperature. We compute the zeros by using the exact solution coming from a two matrix model and by Monte Carlo simulations of Ising spins on dynamical triangulations. We present evidence that the zeros form simple one-dimensional patterns in the complex plane, and that the critical behaviour of the system is governed by the scaling of the distribution of singularities near the critical point.

46.1 Type: 0 Citation: W. Janke, D.A. Johnston, M. Stathakopoulos, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110100], doi:10.1016/S0920-5632(01)01905-3

46.2 Type: 0 Citation: W. Janke, D.A. Johnston, M. Stathakopoulos, J.Phys.A **35** (2002) [arXiv:cond-mat/0201496], doi:10.1088/0305-4470/35/35/302

46.3 Type: 0 Citation: Luiz C. de Albuquerque, Nelson A. Alves, D. Dalmazi, Nucl.Phys.B **580** (2000) [arXiv:hep-th/9912270], doi:10.1016/S0550-3213(00)00290-X

46.4 Type: 0 Citation: Luiz C. de Albuquerque, D. Dalmazi, Phys.Rev.E **67** (2003) 066108 [arXiv:cond-mat/0206489], doi:10.1103/PhysRevE.67.066108

46.5 Type: 0 Citation: W. Janke, D.A. Johnston, M. Stathakopoulos, Nucl.Phys.B **614** (2001) [arXiv:cond-mat/0107013], doi:10.1016/S0550-3213(01)00422-9

47. Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, "*Intrinsic geometric structure of c = -2 quantum gravity*", Nucl.Phys.B Proc.Suppl. **63** (1998)

[arXiv:hep-lat/9709063], [doi:10.1016/S0920-5632(97)00892-X].
Cited by 3 (1) articles

We couple c=-2 matter to 2-dimensional gravity within the framework of dynamical triangulations. We use a very fast algorithm, special to the c=-2 case, in order to test scaling of correlation functions defined in terms of geodesic distance and we determine the fractal dimension dH with high accuracy. We find dH=3.58(4), consistent with a prediction coming from the study of diffusion in the context of Liouville theory, and that the quantum space-time possesses the same fractal properties at all distance scales similarly to the case of pure gravity.

47.1 Type: 1 Citation: J. Ambjorn, T.G. Budd, Phys.Lett.B **718** (2012) [arXiv:1209.6031], doi:10.1016/j.physletb.2012.10.012

47.2 Type: 1 Citation: J. Ambjorn, J. Barkley, T.G. Budd, Nucl.Phys.B **858** (2012) [arXiv:1110.4649], doi:10.1016/j.nuclphysb.2012.01.010

47.3 Type: 0 Citation: Mark J. Bowick, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9710005], doi:10.1016/S0920-5632(97)00699-3

48. Jan Ambjorn, K. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, "*The Quantum space-time of c = -2 gravity*", Nucl.Phys.B **511** (1998) [arXiv:hep-lat/9706009], [doi:10.1016/S0550-3213(97)00659-7].
Cited by 37 (11) articles

We study the fractal structure of space-time of two-dimensional quantum gravity coupled to c=-2 conformal matter by means of computer simulations. We find that the intrinsic Hausdorff dimension dH = 3.58 +/- 0.04. This result supports the conjecture dH = -2 alpha1/alpha-1, where alphan is the gravitational dressing exponent of a spinless primary field of conformal weight (n+1,n+1), and it disfavours the alternative prediction dH = 2/|gamma|. On the other hand <ln> r2n for n>1 with good accuracy, i.e. the the boundary length l has an anomalous dimension relative to the area of the surface.

48.1 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9709063], doi:10.1016/S0920-5632(97)00892-X

48.2 Type: 1 Citation: N. Kawamoto, K. Yotsuji, Nucl.Phys.B Proc.Suppl. **129** (2004) , doi:10.1016/S0920-5632(03)02715-4

48.3 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, G. Thorleifsson, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9709025], doi:10.1016/S0920-5632(97)00890-6

48.4 Type: 1 Citation: Jan Ambjorn, Dimitrij Boulatov, Jakob L. Nielsen, Juri Rolf, Yoshiyuki Watabiki, JHEP **02** (1998) 010 [arXiv:hep-th/9801099], doi:10.1088/1126-6708/1998/02/010

48.5 Type: 1 Citation: Jan Ambjørn, Timothy Budd, Nucl.Phys.B **889** (2014) [arXiv:1405.3424], doi:10.1016/j.nuclphysb.2014.10.029

48.6 Type: 0 Citation: Martin G. Harris, John F. Wheater, Phys.Lett.B **448** (1999) [arXiv:hep-th/9811205], doi:10.1016/S0370-2693(99)00046-5

48.7 Type: 0 Citation: Martin G. Harris, John F. Wheater, Nucl.Phys.B **586** (2000) [arXiv:hep-th/9911189], doi:10.1016/S0550-3213(00)00432-6

48.8 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, Y. Watabiki, JHEP **11** (1998) 022 [arXiv:hep-lat/9808027], doi:10.1088/1126-6708/1998/11/022

48.9 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **61** (2000) 044010 [arXiv:hep-lat/9909129], doi:10.1103/PhysRevD.61.044010

48.10 Type: 0 Citation: Thordur Jonsson, John F. Wheater, Nucl.Phys.B **515** (1998) [arXiv:hep-lat/9710024], doi:10.1016/S0550-3213(98)00027-3

48.11 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, J. Jurkiewicz, C.F. Kristjansen, JHEP **04** (1998) 016 [arXiv:hep-th/9802020],
doi:10.1088/1126-6708/1998/04/016

48.12 Type: 2 Citation: K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809012],
doi:10.1016/S0920-5632(99)85203-7

48.13 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **60** (1999) 104035 [arXiv:hep-th/9904012],
doi:10.1103/PhysRevD.60.104035

48.14 Type: 1 Citation: J. Ambjørn, T. Budd, Phys.Lett.B **724** (2013) [arXiv:1305.3674],
doi:10.1016/j.physletb.2013.06.009

48.15 Type: 1 Citation: Jan Ambjorn, P. Bialas, J. Jurkiewicz, JHEP **02** (1999) 005 [arXiv:hep-lat/9812015],
doi:10.1088/1126-6708/1999/02/005

48.16 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, J. Jurkiewicz, JHEP **08** (1999) 016 [arXiv:hep-lat/9907027],
doi:10.1088/1126-6708/1999/08/016

48.17 Type: 1 Citation: J. Ambjorn, T.G. Budd, Phys.Lett.B **718** (2012) [arXiv:1209.6031],
doi:10.1016/j.physletb.2012.10.012

48.18 Type: 1 Citation: J. Ambjorn, J. Barkley, T. Budd, R. Loll, Phys.Lett.B **706** (2011) [arXiv:1110.3998],
doi:10.1016/j.physletb.2011.10.062

48.19 Type: 0 Citation: Bertrand Duplantier, arXiv:1108.3327

48.20 Type: 1 Citation: J. Ambjørn, Sh. Khachatryan, A. Sedrakyan, Phys.Rev.D **92** (2015) 026002 [arXiv:1407.0076],
doi:10.1103/PhysRevD.92.026002

48.21 Type: 2 Citation: K.N. Anagnostopoulos, P. Bialas, G. Thorleifsson, J.Statist.Phys. **94** (1999) [arXiv:cond-mat/9804137],
doi:10.1023/A:1004583901498

48.22 Type: 0 Citation: Jerome Barkley, Timothy Budd, Class.Quant.Grav. **36** (2019) 244001 [arXiv:1908.09469],
doi:10.1088/1361-6382/ab4f21

48.23 Type: 1 Citation: Jan Ambjorn, Lisa Glaser, Andrzej Gorlich, Yuki Sato, Phys.Lett.B **712** (2012) [arXiv:1202.4435],
doi:10.1016/j.physletb.2012.04.047

48.24 Type: 1 Citation: J. Ambjorn, J. Barkley, T.G. Budd, Nucl.Phys.B **858** (2012) [arXiv:1110.4649],
doi:10.1016/j.nuclphysb.2012.01.010

48.25 Type: 1 Citation: Noboru Kawamoto, Kenji Yotsuji, Nucl.Phys.B **644** (2002) [arXiv:hep-lat/0207007],
doi:10.1016/S0550-3213(02)00822-2

48.26 Type: 1 Citation: Issaku Kanamori, Noboru Kawamoto, Int.J.Mod.Phys.A **19** (2004) [arXiv:hep-th/0305094],
doi:10.1142/S0217751X04017628

48.27 Type: 0 Citation: Mark J. Bowick, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9710005],
doi:10.1016/S0920-5632(97)00699-3

48.28 Type: 1 Citation: Noboru Kawamoto, Noriaki Sato, Yukiya Uchida, Nucl.Phys.B **574** (2000) [arXiv:hep-th/9911228],
doi:10.1016/S0550-3213(00)00017-1

48.29 Type: 0 Citation: J. Brunekreef, R. Loll, Phys.Rev.D **107** (2023) 026011 [arXiv:2208.12718],
doi:10.1103/PhysRevD.107.026011

48.30 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.D **72** (2005) 064014 [arXiv:hep-th/0505154],
doi:10.1103/PhysRevD.72.064014

48.31 Type: 0 Citation: Martin Weigel, Wolfhard Janke, Nucl.Phys.B **719** (2005) [arXiv:hep-lat/0409028],
doi:10.1016/j.nuclphysb.2005.04.041

48.32 Type: 0 Citation: Juri Rolf, arXiv:hep-th/9810027

48.33 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124],
doi:10.1007/978-94-011-4303-5_9

48.34 Type: 1 Citation: Noboru Kawamoto, Prog.Theor.Phys.Suppl. **134** (1999) [arXiv:hep-th/9904089],
doi:10.1143/PTPS.134.84

48.35 Type: 1 Citation: Alessandro D'Adda, Issaku Kanamori, Noboru Kawamoto, Kazuhiro Nagata, Nucl.Phys.B **707** (2005) [arXiv:hep-lat/0406029],
doi:10.1016/j.nuclphysb.2004.11.046

48.36 Type: 0 Citation: Zdzislaw Burda, Acta Phys.Polon.B **29** (1998) [arXiv:hep-lat/9712007]

48.37 Type: 0 Citation: Gianluca Calcagni, JHEP **01** (2012) 065 [arXiv:1107.5041],
doi:10.1007/JHEP01(2012)065

49. Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, "*Singularities of the partition function for the Ising model coupled to 2-D quantum gravity*", Mod.Phys.Lett.A **12** (1997) [arXiv:hep-lat/9705004], [doi:10.1142/S0217732397001643].
Cited by 11 (10) articles

We study the zeros in the complex plane of the partition function for the Ising model coupled to 2d quantum gravity for complex magnetic field and real temperature, and for complex temperature and real magnetic field, respectively. We compute the zeros by using the exact solution coming from a two matrix model and by Monte Carlo simulations of Ising spins on dynamical triangulations. We present evidence that the zeros form simple one-dimensional curves in the complex plane, and that the critical behaviour of the system is governed by the scaling of the distribution of the singularities near the critical point. Despite the small size of the systems studied, we can obtain a reasonable estimate of the (known) critical exponents.

49.1 Type: 0 Citation: W. Janke, D.A. Johnston, R. Kenna, PoS **LAT2005** (2006) 244 [arXiv:hep-lat/0512022],
doi:10.22323/1.020.0244

49.2 Type: 0 Citation: W. Janke, D.A. Johnston, M. Stathakopoulos, Nucl.Phys.B Proc.Suppl. **106** (2002) [arXiv:hep-lat/0110100],
doi:10.1016/S0920-5632(01)01905-3

49.3 Type: 0 Citation: W. Janke, D.A. Johnston, M. Stathakopoulos, J.Phys.A **35** (2002) [arXiv:cond-mat/0201496],
doi:10.1088/0305-4470/35/35/302

49.4 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9708014],
doi:10.1016/S0920-5632(97)00893-1

49.5 Type: 0 Citation: Luiz C. de Albuquerque, Nelson A. Alves, D. Dalmazi, Nucl.Phys.B **580** (2000) [arXiv:hep-th/9912270],
doi:10.1016/S0550-3213(00)00290-X

49.6 Type: 0 Citation: Luiz C. de Albuquerque, D. Dalmazi, Phys.Rev.E **67** (2003) 066108 [arXiv:cond-mat/0206489],
doi:10.1103/PhysRevE.67.066108

49.7 Type: 0 Citation: W. Janke, D.A. Johnston, M. Stathakopoulos, Nucl.Phys.B **614** (2001) [arXiv:cond-mat/0107013],
doi:10.1016/S0550-3213(01)00422-9

49.8 Type: 0 Citation: W. Janke, D.A. Johnston, R. Kenna, Nucl.Phys.B **736** (2006) [arXiv:cond-mat/0512352],
doi:10.1016/j.nuclphysb.2005.12.013

49.9 Type: 0 Citation: Sean M. Carroll, Miguel E. Ortiz, Washington Taylor, Phys.Rev.D **58** (1998) 046006 [arXiv:hep-th/9711008],
doi:10.1103/PhysRevD.58.046006

49.10 Type: 0 Citation: D.A. Johnston, J.Phys.A **31** (1998) [arXiv:hep-lat/9801026],
doi:10.1088/0305-4470/31/26/005

49.11 Type: 0 Citation: Abdou Abdel-Rehim, Deirdre Black, Amir H. Fariborz, Salah Nasri, Joseph Schechter, Phys.Rev.D **68** (2003) 013008 [arXiv:hep-ph/0305083],
doi:10.1103/PhysRevD.68.013008

50. Jan Ambjorn, K.N. Anagnostopoulos, *"Quantum geometry of 2-D gravity coupled to unitary matter"*, Nucl.Phys.B **497** (1997) [arXiv:hep-lat/9701006], [doi:10.1016/S0550-3213(97)00259-9].
Cited by 60 (27) articles

We show that there exists a divergent correlation length in 2d quantum gravity for the matter fields close to the critical point provided one uses the invariant geodesic distance as the measure of distance. The corresponding reparameterization invariant two-point functions satisfy all scaling relations known from the ordinary theory of critical phenomena and the KPZ exponents are determined by the power-like fall off of these two-point functions. The only difference compared to flat space is the appearance of a dynamically generated fractal dimension dh in the scaling relations. We analyze numerically the fractal properties of space-time for Ising and three-states Potts model coupled to 2d dimensional quantum gravity using finite size scaling as well as small distance scaling of invariant correlation functions. Our data are consistent with dh=4, but we cannot rule out completely the conjecture dH = -2alpha1/alpha-1, where alpha-n is the gravitational dressing exponent of a spin-less primary field of conformal weight (n+1,n+1). We compute the moments <L n> and the loop-length distribution function and show that the fractal properties associated with these observables are identical, with good accuracy, to the pure gravity case.

50.1 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9708014],
doi:10.1016/S0920-5632(97)00893-1

50.2 Type: 0 Citation: Chao Hu, Vagif S. Guliyev, Weibin Qiu, Simon Catterall, Weijie Wu, Mark J. Bowick, Liqiang Zhu, Simeon Warner, Nucl.Phys.B **614** (2001) [arXiv:hep-lat/0105002],
doi:10.1016/S0550-3213(01)00405-9

50.3 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, G. Thorleifsson, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9709025],
doi:10.1016/S0920-5632(97)00890-6

50.4 Type: 0 Citation: G.G. Athanasiu, E.G. Floratos, G.K. Savvidy, Int.J.Mod.Phys.C **8** (1997) [arXiv:physics/9703024],
doi:10.1142/S0129183197000448

50.5 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.Lett. **95** (2005) 171301 [arXiv:hep-th/0505113],
doi:10.1103/PhysRevLett.95.171301

50.6 Type: 0 Citation: P. Di Francesco, E. Guitter, C. Kristjansen, Nucl.Phys.B **567** (2000) [arXiv:hep-th/9907084],
doi:10.1016/S0550-3213(99)00661-6

50.7 Type: 0 Citation: Martin G. Harris, John F. Wheater, Nucl.Phys.B **586** (2000) [arXiv:hep-th/9911189],
doi:10.1016/S0550-3213(00)00432-6

50.8 Type: 1 Citation: J. Ambjorn, S. Arianos, J.A. Gesser, Shoichi Kawamoto, Phys.Lett.B **599** (2004) [arXiv:hep-th/0406108],
doi:10.1016/j.physletb.2004.08.033

50.9 Type: 0 Citation: E.B. Gregory, S.M. Catterall, G. Thorleifsson, Nucl.Phys.B **541** (1999) [arXiv:hep-lat/9809136],
doi:10.1016/S0550-3213(98)00771-8

50.10 Type: 0 Citation: Thordur Jonsson, John F. Wheater, Nucl.Phys.B **515** (1998) [arXiv:hep-lat/9710024],
doi:10.1016/S0550-3213(98)00027-3

50.11 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, Y. Watabiki, JHEP **11** (1998) 022 [arXiv:hep-lat/9808027],
doi:10.1088/1126-6708/1998/11/022

50.12 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **61** (2000) 044010 [arXiv:hep-lat/9909129],
doi:10.1103/PhysRevD.61.044010

50.13 Type: 2 Citation: K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809012],
doi:10.1016/S0920-5632(99)85203-7

50.14 Type: 0 Citation: Lisa Glaser, Class.Quant.Grav. **38** (2021) 145017 [arXiv:2011.13875],
doi:10.1088/1361-6382/abf1c5

50.15 Type: 0 Citation: Mirah Gary, Steven B. Giddings, Phys.Rev.D **75** (2007) 104007 [arXiv:hep-th/0612191],
doi:10.1103/PhysRevD.75.104007

50.16 Type: 0 Citation: N. Klitgaard, R. Loll, Phys.Rev.D **97** (2018) 106017 [arXiv:1802.10524],
doi:10.1103/PhysRevD.97.106017

50.17 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, J. Jurkiewicz, C.F. Kristjansen, JHEP **04** (1998) 016 [arXiv:hep-th/9802020],
doi:10.1088/1126-6708/1998/04/016

50.18 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, J. Jurkiewicz, JHEP **08** (1999) 016 [arXiv:hep-lat/9907027],
doi:10.1088/1126-6708/1999/08/016

50.19 Type: 1 Citation: Jan Ambjorn, P. Bialas, J. Jurkiewicz, JHEP **02** (1999) 005 [arXiv:hep-lat/9812015],
doi:10.1088/1126-6708/1999/02/005

50.20 Type: 0 Citation: Wolfhard Janke, Adriaan M.J. Schakel, arXiv:1003.2878

50.21 Type: 1 Citation: J. Ambjørn, T. Budd, Phys.Lett.B **724** (2013) [arXiv:1305.3674],
doi:10.1016/j.physletb.2013.06.009

50.22 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, R. Loll, Phys.Rev.D **60** (1999) 104035 [arXiv:hep-th/9904012],
doi:10.1103/PhysRevD.60.104035

50.23 Type: 1 Citation: J. Ambjørn, T. Budd, Acta Phys.Polon.B **44** (2013) [arXiv:1310.8552],
doi:10.5506/APhysPolB.44.2537

50.24 Type: 1 Citation: J. Ambjørn, A. Görlich, J. Jurkiewicz, R. Loll, Phys.Rev.D **92** (2015) 024013 [arXiv:1504.01065],
doi:10.1103/PhysRevD.92.024013

50.25 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, Phys.Lett.B **690** (2010) [arXiv:1001.4581],
doi:10.1016/j.physletb.2010.05.062

50.26 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, Phys.Rev.D **78** (2008) 063544 [arXiv:0807.4481],
doi:10.1103/PhysRevD.78.063544

50.27 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, Mod.Phys.Lett.A **12** (1997) [arXiv:hep-lat/9705004],
doi:10.1142/S0217732397001643

50.28 Type: 0 Citation: Ignatios Antoniadis, Pawel O. Mazur, Emil Mottola, Phys.Lett.B **444** (1998) [arXiv:hep-th/9808070],
doi:10.1016/S0370-2693(98)01375-6

50.29 Type: 0 Citation: William Donnelly, Steven B. Giddings, Phys.Rev.D **94** (2016) 104038 [arXiv:1607.01025],
doi:10.1103/PhysRevD.94.104038

50.30 Type: 1 Citation: J. Ambjorn, J. Barkley, T.G. Budd, Nucl.Phys.B **858** (2012) [arXiv:1110.4649],
doi:10.1016/j.nuclphysb.2012.01.010

50.31 Type: 0 Citation: Steven B. Giddings, Martin S. Sloth, Phys.Rev.D **86** (2012) 083538 [arXiv:1109.1000],
doi:10.1103/PhysRevD.86.083538

50.32 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, arXiv:1305.6680,
doi:10.1142/9789814623995_0008

50.33 Type: 0 Citation: Wolfhard Janke, Desmond A. Johnston, Nucl.Phys.B **578** (2000) [arXiv:hep-lat/9907026],
doi:10.1016/S0550-3213(00)00047-X

50.34 Type: 0 Citation: R. Loll, A. Silva, Phys.Rev.D **107** (2023) 086013 [arXiv:2302.10256], doi:10.1103/PhysRevD.107.086013

50.35 Type: 2 Citation: K.N. Anagnostopoulos, P. Bialas, G. Thorleifsson, J.Statist.Phys. **94** (1999) [arXiv:cond-mat/9804137], doi:10.1023/A:1004583901498

50.36 Type: 2 Citation: Jan Ambjorn, K. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, Nucl.Phys.B **511** (1998) [arXiv:hep-lat/9706009], doi:10.1016/S0550-3213(97)00659-7

50.37 Type: 1 Citation: J. Ambjorn, arXiv:gr-qc/0201028, doi:10.1142/9789812776556_0001

50.38 Type: 1 Citation: J. Ambjørn, L. Chekhov, Y. Makeenko, Nucl.Phys.B **928** (2018) [arXiv:1712.03879], doi:10.1016/j.nuclphysb.2018.01.008

50.39 Type: 1 Citation: Jan Ambjorn, Lisa Glaser, Andrzej Gorlich, Yuki Sato, Phys.Lett.B **712** (2012) [arXiv:1202.4435], doi:10.1016/j.physletb.2012.04.047

50.40 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, Acta Phys.Polon.B **39** (2008)

50.41 Type: 0 Citation: Noboru Kawamoto, Kenji Yotsuji, Nucl.Phys.B **644** (2002) [arXiv:hep-lat/0207007], doi:10.1016/S0550-3213(02)00822-2

50.42 Type: 1 Citation: Jan Ambjørn, Jakub Gizbert-Studnicki, Andrzej Görlich, Jerzy Jurkiewicz, JHEP **06** (2014) 034 [arXiv:1403.5940], doi:10.1007/JHEP06(2014)034

50.43 Type: 1 Citation: Jan Ambjorn, S. Jordan, J. Jurkiewicz, R. Loll, Phys.Rev.D **85** (2012) 124044 [arXiv:1205.1229], doi:10.1103/PhysRevD.85.124044

50.44 Type: 0 Citation: Mark J. Bowick, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9710005], doi:10.1016/S0920-5632(97)00699-3

50.45 Type: 0 Citation: Wolfhard Janke, Ramon Villanova, Phys.Rev.B **66** (2002) 134208 [arXiv:cond-mat/0211446], doi:10.1103/PhysRevB.66.134208

50.46 Type: 0 Citation: Steven B. Giddings, Donald Marolf, Phys.Rev.D **76** (2007) 064023 [arXiv:0705.1178], doi:10.1103/PhysRevD.76.064023

50.47 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, arXiv:1007.2560

50.48 Type: 1 Citation: Jan Ambjorn, Jerzy Jurkiewicz, Renate Loll, Lect.Notes Phys. **807** (2010) [arXiv:0906.3947], doi:10.1007/978-3-642-11897-5_2

50.49 Type: 0 Citation: Steven B. Giddings, Mod.Phys.Lett.A **22** (2007) [arXiv:0705.2197], doi:10.1142/S0217732307025923

50.50 Type: 0 Citation: Steven B. Giddings, Donald Marolf, James B. Hartle, Phys.Rev.D **74** (2006) 064018 [arXiv:hep-th/0512200], doi:10.1103/PhysRevD.74.064018

50.51 Type: 1 Citation: J. Ambjorn, J. Jurkiewicz, R. Loll, Phys.Rev.D **72** (2005) 064014 [arXiv:hep-th/0505154], doi:10.1103/PhysRevD.72.064014

50.52 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Renate Loll, arXiv:1302.2173, doi:10.1007/978-3-642-41992-8_34

50.53 Type: 0 Citation: Martin Weigel, Wolfhard Janke, Nucl.Phys.B **719** (2005) [arXiv:hep-lat/0409028], doi:10.1016/j.nuclphysb.2005.04.041

50.54 Type: 0 Citation: Juri Rolf, arXiv:hep-th/9810027

50.55 Type: 0 Citation: Samo Jordan

50.56 Type: 0 Citation: Jakub Gizbert-Studnicki, arXiv:1510.08719

50.57 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124],
doi:10.1007/978-94-011-4303-5_9

50.58 Type: 0 Citation: Markus B. Fröb, Class.Quant.Grav. **35** (2018) 035005 [arXiv:1706.01891],
doi:10.1088/1361-6382/aa9ad1

50.59 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, Phys.Rept. **519** (2012) [arXiv:1203.3591],
doi:10.1016/j.physrep.2012.03.007

50.60 Type: 0 Citation: Renate Loll, Giuseppe Fabiano, Domenico Frattulillo, Fabian Wagner, PoS **CORFU2021** (2022) 316 [arXiv:2206.06762],
doi:10.22323/1.406.0316

51. Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, "*Quantum geometry of topological gravity*", Phys.Lett.B **397** (1997) [arXiv:hep-lat/9611032], [doi:10.1016/S0370-2693(97)00183-4].
Cited by 29 (6) articles

We study a c=-2 conformal field theory coupled to two-dimensional quantum gravity by means of dynamical triangulations. We define the geodesic distance r on the triangulated surface with N triangles, and show that dim[r dH]= dim[N], where the fractal dimension dH = 3.58 +/- 0.04. This result lends support to the conjecture dH = -2alpha1/alpha-1, where alpha-n is the gravitational dressing exponent of a spin-less primary field of conformal weight (n+1,n+1), and it disfavors the alternative prediction dH = -2/gammastr. On the other hand, we find dim[l] = dim[r 2] with good accuracy, where l is the length of one of the boundaries of a circle with (geodesic) radius r, i.e. the length l has an anomalous dimension relative to the area of the surface. It is further shown that the spectral dimension ds = 1.980 +/- 0.014 for the ensemble of (triangulated) manifolds used. The results are derived using finite size scaling and a very efficient recursive sampling technique known previously to work well for c=-2.

51.1 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9709063],
doi:10.1016/S0920-5632(97)00892-X

51.2 Type: 1 Citation: N. Kawamoto, K. Yotsuji, Nucl.Phys.B Proc.Suppl. **129** (2004) ,
doi:10.1016/S0920-5632(03)02715-4

51.3 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, Y. Watabiki, JHEP **11** (1998) 022 [arXiv:hep-lat/9808027],
doi:10.1088/1126-6708/1998/11/022

51.4 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, G. Thorleifsson, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9709025],
doi:10.1016/S0920-5632(97)00890-6

51.5 Type: 1 Citation: Jan Ambjorn, Dimitrij Boulatov, Jakob L. Nielsen, Juri Rolf, Yoshiyuki Watabiki, JHEP **02** (1998) 010 [arXiv:hep-th/9801099],
doi:10.1088/1126-6708/1998/02/010

51.6 Type: 1 Citation: Jan Ambjorn

51.7 Type: 2 Citation: K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809012],
doi:10.1016/S0920-5632(99)85203-7

51.8 Type: 1 Citation: J. Ambjorn, J. Barkley, T. Budd, R. Loll, Phys.Lett.B **706** (2011) [arXiv:1110.3998],
doi:10.1016/j.physletb.2011.10.062

51.9 Type: 1 Citation: J. Ambjørn, T. Budd, Phys.Lett.B **724** (2013) [arXiv:1305.3674],
doi:10.1016/j.physletb.2013.06.009

51.10 Type: 1 Citation: Jan Ambjorn, P. Bialas, J. Jurkiewicz, JHEP **02** (1999) 005 [arXiv:hep-lat/9812015],
doi:10.1088/1126-6708/1999/02/005

51.11 Type: 1 Citation: J. Ambjorn, T.G. Budd, Phys.Lett.B **718** (2012) [arXiv:1209.6031],
doi:10.1016/j.physletb.2012.10.012

51.12 Type: 1 Citation: J. Ambjørn, Sh. Khachatryan, A. Sedrakyan, Phys.Rev.D **92** (2015) 026002 [arXiv:1407.0076],
doi:10.1103/PhysRevD.92.026002

51.13 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Nucl.Phys.B **497** (1997) [arXiv:hep-lat/9701006],
doi:10.1016/S0550-3213(97)00259-9

51.14 Type: 1 Citation: J. Ambjorn, J. Barkley, T.G. Budd, Nucl.Phys.B **858** (2012) [arXiv:1110.4649],
doi:10.1016/j.nuclphysb.2012.01.010

51.15 Type: 1 Citation: Jan Ambjorn, Lisa Glaser, Andrzej Gorlich, Yuki Sato, Phys.Lett.B **712** (2012) [arXiv:1202.4435],
doi:10.1016/j.physletb.2012.04.047

51.16 Type: 1 Citation: Noboru Kawamoto, Kenji Yotsuji, Nucl.Phys.B **644** (2002) [arXiv:hep-lat/0207007],
doi:10.1016/S0550-3213(02)00822-2

51.17 Type: 2 Citation: Jan Ambjorn, K. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, Nucl.Phys.B **511** (1998) [arXiv:hep-lat/9706009],
doi:10.1016/S0550-3213(97)00659-7

51.18 Type: 1 Citation: Issaku Kanamori, Noboru Kawamoto, Int.J.Mod.Phys.A **19** (2004) [arXiv:hep-th/0305094],
doi:10.1142/S0217751X04017628

51.19 Type: 1 Citation: Noboru Kawamoto, Noriaki Sato, Yukiya Uchida, Nucl.Phys.B **574** (2000) [arXiv:hep-th/9911228],
doi:10.1016/S0550-3213(00)00017-1

51.20 Type: 0 Citation: Mark J. Bowick, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9710005],
doi:10.1016/S0920-5632(97)00699-3

51.21 Type: 0 Citation: B. Krusche, AIP Conf.Proc. **1257** (2010) ,
doi:10.1063/1.3483312

51.22 Type: 0 Citation: Martin Weigel, Wolfhard Janke, Nucl.Phys.B **719** (2005) [arXiv:hep-lat/0409028],
doi:10.1016/j.nuclphysb.2005.04.041

51.23 Type: 0 Citation: Juri Rolf, arXiv:hep-th/9810027

51.24 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124],
doi:10.1007/978-94-011-4303-5_9

51.25 Type: 1 Citation: Noboru Kawamoto, Prog.Theor.Phys.Suppl. **134** (1999) [arXiv:hep-th/9904089],
doi:10.1143/PTPS.134.84

51.26 Type: 1 Citation: Alessandro D'Adda, Issaku Kanamori, Noboru Kawamoto, Kazuhiro Nagata, Nucl.Phys.B **707** (2005) [arXiv:hep-lat/0406029],
doi:10.1016/j.nuclphysb.2004.11.046

51.27 Type: 0 Citation: Zdzislaw Burda, Acta Phys.Polon.B **29** (1998) [arXiv:hep-lat/9712007]

51.28 Type: 0 Citation: Gianluca Calcagni, JHEP **01** (2012) 065 [arXiv:1107.5041],
doi:10.1007/JHEP01(2012)065

51.29 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, Phys.Rept. **519** (2012) [arXiv:1203.3591],
doi:10.1016/j.physrep.2012.03.007

52. Mark J. Bowick, S.M. Catterall, M. Falcioni, G. Thorleifsson, K. Anagnostopoulos, "*The Flat phase of fixed connectivity membranes*", Nucl.Phys.B Proc.Suppl. **53** (1997) [arXiv:hep-lat/9608044], [doi:10.1016/S0920-5632(96)00771-2].
Cited by 2 (2) articles

The statistical mechanics of flexible two-dimensional surfaces (membranes) appears in a wide variety of physical settings. In this talk we discuss the simplest case of fixed-connectivity surfaces. We first review the current theoretical understanding of the remarkable flat phase of such membranes. We then summarize the results of a recent large scale Monte Carlo simulation of the simplest conceivable discrete realization of this system citeBCFTA. We verify the existence of long-range order, determine the associated critical exponents of the flat phase and compare the results to the predictions of various theoretical models.

52.1 Type: 0 Citation: I. Endo, H. Koibuchi, Nucl.Phys.B **732** (2006) [arXiv:cond-mat/0510799], doi:10.1016/j.nuclphysb.2005.10.037

52.2 Type: 0 Citation: B. Amorim, A. Cortijo, F. de Juan, A.G. Grushin, F. Guinea, A. Gutiérrez-Rubio, H. Ochoa, V. Parente, R. Roldán, P. San-José, J. Schiefele, M. Sturla, M.A.H. Vozmediano, Phys.Rept. **617** (2016) [arXiv:1503.00747], doi:10.1016/j.physrep.2015.12.006

53. Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, G. Thorleifsson, "*Geometrical interpretation of the KPZ exponents*", Phys.Lett.B **388** (1996) [arXiv:hep-lat/9606012], [doi:10.1016/S0370-2693(96)01222-1].
Cited by 36 (13) articles

We provide evidence that the KPZ exponents in two-dimensional quantum gravity can be interpreted as scaling exponents of correlation functions which are functions of the invariant geodesic distance between the fields.

53.1 Type: 1 Citation: E. Gregory, S.M. Catterall, G. Thorleifsson, Nucl.Phys.B Proc.Suppl. **53** (1997) [arXiv:hep-lat/9608077], doi:10.1016/S0920-5632(96)00775-X

53.2 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, G. Thorleifsson, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9709025], doi:10.1016/S0920-5632(97)00890-6

53.3 Type: 0 Citation: A.I. Veselov, M.A. Zubkov, Nucl.Phys.B Proc.Suppl. **129** (2004) [arXiv:hep-lat/0308025], doi:10.1016/S0920-5632(03)02716-6

53.4 Type: 0 Citation: A.I. Veselov, M.A. Zubkov, Phys.Lett.B **591** (2004) 311 [arXiv:hep-lat/0306030], doi:10.1016/j.physletb.2004.04.047

53.5 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9708014], doi:10.1016/S0920-5632(97)00893-1

53.6 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, Y. Watabiki, JHEP **11** (1998) 022 [arXiv:hep-lat/9808027], doi:10.1088/1126-6708/1998/11/022

53.7 Type: 2 Citation: K.N. Anagnostopoulos, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809012], doi:10.1016/S0920-5632(99)85203-7

53.8 Type: 0 Citation: Mirah Gary, Steven B. Giddings, Phys.Rev.D **75** (2007) 104007 [arXiv:hep-th/0612191], doi:10.1103/PhysRevD.75.104007

53.9 Type: 0 Citation: P. Di Francesco, E. Guitter, C. Kristjansen, Nucl.Phys.B **567** (2000) [arXiv:hep-th/9907084], doi:10.1016/S0550-3213(99)00661-6

53.10 Type: 0 Citation: S. Catterall, R. Renken, John B. Kogut, Phys.Lett.B **416** (1998) [arXiv:hep-lat/9709007], doi:10.1016/S0370-2693(97)01349-X

53.11 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, Phys.Lett.B **397** (1997) [arXiv:hep-lat/9611032], doi:10.1016/S0370-2693(97)00183-4

53.12 Type: 1 Citation: Jan Ambjorn, C. Kristjansen, Y. Watabiki, Nucl.Phys.B **504** (1997) [arXiv:hep-th/9705202], doi:10.1016/S0550-3213(97)00525-7

53.13 Type: 1 Citation: Jan Ambjorn, P. Bialas, J. Jurkiewicz, JHEP **02** (1999) 005 [arXiv:hep-lat/9812015], doi:10.1088/1126-6708/1999/02/005

53.14 Type: 0 Citation: Jun Yan, Gen.Rel.Grav. **55** (2023) 85, doi:10.1007/s10714-023-03133-4

53.15 Type: 0 Citation: Bertrand Duplantier, arXiv:1108.3327

53.16 Type: 2 Citation: J. Ambjorn, K.N. Anagnostopoulos, R. Loll, I. Pushkina, Nucl.Phys.B **807** (2009) [arXiv:0806.3506],
doi:10.1016/j.nuclphysb.2008.08.030

53.17 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, Mod.Phys.Lett.A **12** (1997) [arXiv:hep-lat/9705004],
doi:10.1142/S0217732397001643

53.18 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, Phys.Rev.D **78** (2008) 063544 [arXiv:0807.4481],
doi:10.1103/PhysRevD.78.063544

53.19 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, arXiv:1305.6680,
doi:10.1142/9789814623995_0008

53.20 Type: 0 Citation: Wolfhard Janke, Desmond A. Johnston, Nucl.Phys.B **578** (2000) [arXiv:hep-lat/9907026],
doi:10.1016/S0550-3213(00)00047-X

53.21 Type: 0 Citation: Mark J. Bowick, Varghese John, Gudmar Thorleifsson, Phys.Lett.B **403** (1997) [arXiv:hep-th/9608030],
doi:10.1016/S0370-2693(97)00531-5

53.22 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Nucl.Phys.B **497** (1997) [arXiv:hep-lat/9701006],
doi:10.1016/S0550-3213(97)00259-9

53.23 Type: 2 Citation: Jan Ambjorn, K. Anagnostopoulos, T. Ichihara, L. Jensen, N. Kawamoto, Y. Watabiki, K. Yotsuji, Nucl.Phys.B **511** (1998) [arXiv:hep-lat/9706009],
doi:10.1016/S0550-3213(97)00659-7

53.24 Type: 1 Citation: J. Ambjorn, arXiv:gr-qc/0201028,
doi:10.1142/9789812776556_0001

53.25 Type: 1 Citation: Jan Ambjorn, Lisa Glaser, Andrzej Gorlich, Yuki Sato, Phys.Lett.B **712** (2012) [arXiv:1202.4435],
doi:10.1016/j.physletb.2012.04.047

53.26 Type: 1 Citation: J. Ambjørn, L. Chekhov, Y. Makeenko, Nucl.Phys.B **928** (2018) [arXiv:1712.03879],
doi:10.1016/j.nuclphysb.2018.01.008

53.27 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, Acta Phys.Polon.B **39** (2008)

53.28 Type: 0 Citation: D.A. Johnston, Nucl.Phys.B Proc.Suppl. **53** (1997) [arXiv:hep-lat/9607021],
doi:10.1016/S0920-5632(96)00598-1

53.29 Type: 0 Citation: Steven B. Giddings, Donald Marolf, Phys.Rev.D **76** (2007) 064023 [arXiv:0705.1178],
doi:10.1103/PhysRevD.76.064023

53.30 Type: 0 Citation: Mark J. Bowick, Nucl.Phys.B Proc.Suppl. **63** (1998) [arXiv:hep-lat/9710005],
doi:10.1016/S0920-5632(97)00699-3

53.31 Type: 1 Citation: J. Ambjorn, A. Gorlich, J. Jurkiewicz, R. Loll, arXiv:1007.2560

53.32 Type: 1 Citation: Jan Ambjorn, Jerzy Jurkiewicz, Renate Loll, Lect.Notes Phys. **807** (2010) [arXiv:0906.3947],
doi:10.1007/978-3-642-11897-5_2

53.33 Type: 0 Citation: Steven B. Giddings, Mod.Phys.Lett.A **22** (2007) [arXiv:0705.2197],
doi:10.1142/S0217732307025923

53.34 Type: 1 Citation: Jan Ambjørn, Andrzej Görlich, Jerzy Jurkiewicz, Renate Loll, arXiv:1302.2173,
doi:10.1007/978-3-642-41992-8_34

53.35 Type: 1 Citation: Jan Ambjørn, J. Jurkiewicz, R. Loll, NATO Sci.Ser.C **556** (2000) [arXiv:hep-th/0001124],
doi:10.1007/978-94-011-4303-5_9

53.36 Type: 1 Citation: J. Ambjorn, A. Goerlich, J. Jurkiewicz, R. Loll, Phys.Rept. **519** (2012) [arXiv:1203.3591],
doi:10.1016/j.physrep.2012.03.007

54. Jan Ambjorn, K.N. Anagnostopoulos, Ulrika Magnea, G. Thorleifsson, "*Spin spin correlation functions of spin systems coupled to 2-d quantum gravity for 0 < c < 1*", Nucl.Phys.B Proc.Suppl. **53** (1997)

[arXiv:hep-lat/9608022], [doi:10.1016/S0920-5632(96)00765-7].
Cited by 2 (1) articles

We perform Monte Carlo simulations of 2-d dynamically triangulated surfaces coupled to Ising and three–states Potts model matter. By measuring spin-spin correlation functions as a function of the geodesic distance we provide substantial evidence for a diverging correlation length at betac. The corresponding scaling exponents are directly related to the KPZ exponents of the matter fields as conjectured in [4] (NPB454(1995)313).

54.1 Type: 0 Citation: Sean M. Carroll, Miguel E. Ortiz, Washington Taylor, Phys.Rev.D **58** (1998) 046006 [arXiv:hep-th/9711008], doi:10.1103/PhysRevD.58.046006

54.2 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Nucl.Phys.B **497** (1997) [arXiv:hep-lat/9701006], doi:10.1016/S0550-3213(97)00259-9

55. Mark J. Bowick, Simon M. Catterall, Marco Falcioni, Gudmar Thorleifsson, Konstantinos N. Anagnostopoulos, "*The Flat phase of crystalline membranes*", J.Phys.I(France) **6** (1996) [arXiv:cond-mat/9603157], [doi:10.1051/jp1:1996139].
Cited by 9 (6) articles

We present the results of a high-statistics Monte Carlo simulation of a phantom crystalline (fixed-connectivity) membrane with free boundary. We verify the existence of a flat phase by examining lattices of size up to 128 2. The Hamiltonian of the model is the sum of a simple spring pair potential, with no hard-core repulsion, and bending energy. The only free parameter is the the bending rigidity kappa. In-plane elastic constants are not explicitly introduced. We obtain the remarkable result that this simple model dynamically generates the elastic constants required to stabilise the flat phase. We present measurements of the size (Flory) exponent nu and the roughness exponent zeta. We also determine the critical exponents eta and etau describing the scale dependence of the bending rigidity (kappa(q) sim q -eta) and the induced elastic constants (lambda(q) sim mu(q) sim q etau).

55.1 Type: 0 Citation: S. Metayer, D. Mouhanna, S. Teber, J.Phys.Conf.Ser. **2438** (2023) 012141 [arXiv:2210.04309], doi:10.1088/1742-6596/2438/1/012141

55.2 Type: 0 Citation: Andrey Pikelner, EPL **138** (2022) 17002 [arXiv:2112.07340], doi:10.1209/0295-5075/ac6441

55.3 Type: 0 Citation: M. Baig, J. Clua, A. Jaramillo, Mod.Phys.Lett.A **13** (1998) [arXiv:hep-lat/9607039], doi:10.1142/S0217732398002254

55.4 Type: 1 Citation: David Yllanes, Sourav S. Bhabesh, David R. Nelson, Mark J. Bowick, Nature Commun. **8** (2017) 1381 [arXiv:1705.07379], doi:10.1038/s41467-017-01551-y

55.5 Type: 0 Citation: I. Endo, H. Koibuchi, Nucl.Phys.B **732** (2006) [arXiv:cond-mat/0510799], doi:10.1016/j.nuclphysb.2005.10.037

55.6 Type: 0 Citation: S. Metayer, D. Mouhanna, S. Teber, Phys.Rev.E **105** (2022) L012603 [arXiv:2109.03796], doi:10.1103/PhysRevE.105.L012603

55.7 Type: 0 Citation: O. Coquand, D. Mouhanna, S. Teber, Phys.Rev.E **101** (2020) 062104 [arXiv:2003.13973], doi:10.1103/PhysRevE.101.062104

55.8 Type: 1 Citation: Mark J. Bowick, Alex Travesset, Phys.Rept. **344** (2001) [arXiv:cond-mat/0002038], doi:10.1016/S0370-1573(00)00128-9

55.9 Type: 1 Citation: Gudmar Thorleifsson, Nucl.Phys.B Proc.Suppl. **73** (1999) [arXiv:hep-lat/9809131], doi:10.1016/S0920-5632(99)85013-0

56. K.N. Anagnostopoulos, Mark J. Bowick, S.M. Catterall, M. Falcioni, G. Thorleifsson, "*The Phase diagram of crystalline surfaces*", arXiv:hep-lat/9509074, [doi:10.1016/0920-5632(96)00187-9].
Cited by 2 (2) articles

We report the status of a high-statistics Monte Carlo simulation of non-self-avoiding crystalline surfaces with extrinsic curvature on lattices of size up to 128 2 nodes. We impose free boundary conditions. The free energy is a gaussian spring tethering potential together with a normal-normal bending energy. Particular emphasis is given to the behavior of the model in the cold phase where we measure the decay of the normal-normal correlation function.

56.1 Type: 0 Citation: I. Endo, H. Koibuchi, Nucl.Phys.B **732** (2006) [arXiv:cond-mat/0510799], doi:10.1016/j.nuclphysb.2005.10.037

56.2 Type: 0 Citation: D. Espriu, A. Travesset, Nucl.Phys.B **468** (1996) [arXiv:hep-lat/9601005], doi:10.1016/0550-3213(96)00154-X

57. Konstantinos Anagnostopoulos, Mark J. Bowick, Paul Coddington, Marco Falcioni, Le-ping Han, Geoffrey R. Harris, Enzo Marinari, "*Fluid random surfaces with extrinsic curvature. 2.*", Phys.Lett.B **317** (1993) [arXiv:hep-th/9308091], [doi:10.1016/0370-2693(93)91577-A].
Cited by 14 (12) articles

We present the results of an extension of our previous work on large-scale simulations of dynamically triangulated toroidal random surfaces embedded in R 3 with extrinsic curvature. We find that the extrinsic-curvature specific heat peak ceases to grow on lattices with more than 576 nodes and that the location of the peak lamc also stabilizes. The evidence for a true crumpling transition is still weak. If we assume it exists we can say that the finite-size scaling exponent frac alpha nu d is very close to zero or negative. On the other hand our new data does rule out the observed peak as being a finite-size artifact of the persistence length becoming comparable to the extent of the lattice.

57.1 Type: 0 Citation: S. Bilke, arXiv:hep-lat/9902001

57.2 Type: 0 Citation: I. Endo, H. Koibuchi, Nucl.Phys.B **732** (2006) [arXiv:cond-mat/0510799], doi:10.1016/j.nuclphysb.2005.10.037

57.3 Type: 0 Citation: Omar Zanusso, Phys.Rev.E **90** (2014) 052110 [arXiv:1408.0741], doi:10.1103/PhysRevE.90.052110

57.4 Type: 0 Citation: Jan Ambjorn, Z. Burda, J. Jurkiewicz, B. Petersson, Phys.Lett.B **341** (1995) [arXiv:hep-th/9408118], doi:10.1016/0370-2693(94)01281-G

57.5 Type: 0 Citation: D. Espriu, A. Travesset, Nucl.Phys.B **468** (1996) [arXiv:hep-lat/9601005], doi:10.1016/0550-3213(96)00154-X

57.6 Type: 0 Citation: P. Teotonio-Sobrinho, Nucl.Phys.B **452** (1995) [arXiv:hep-th/9505028], doi:10.1016/0550-3213(95)00387-8

57.7 Type: 0 Citation: Jan Ambjorn, J. Jurkiewicz, P. Bialas, Z. Burda, B. Petersson, Nucl.Phys.B Proc.Suppl. **42** (1995) , doi:10.1016/0920-5632(95)00355-D

57.8 Type: 0 Citation: Jan Ambjorn, Nucl.Phys.B Proc.Suppl. **42** (1995) [arXiv:hep-lat/9412006], doi:10.1016/0920-5632(95)00181-8

57.9 Type: 2 Citation: K.N. Anagnostopoulos, J. Nishimura, P. Olesen, JHEP **04** (2001) 024 [arXiv:hep-th/0012061], doi:10.1088/1126-6708/2001/04/024

57.10 Type: 2 Citation: Jan Ambjorn, K.N. Anagnostopoulos, Wolfgang Bietenholz, T. Hotta, J. Nishimura, JHEP **07** (2000) 011 [arXiv:hep-th/0005147], doi:10.1088/1126-6708/2000/07/011

57.11 Type: 0 Citation: Sven Bilke, arXiv:hep-lat/9805006

57.12 Type: 0 Citation: J.F. Wheater, Nucl.Phys.B Proc.Suppl. **34** (1994) , doi:10.1016/0920-5632(94)90317-4

57.13 Type: 0 Citation: Jan Ambjorn, Class.Quant.Grav. **12** (1995) , doi:10.1088/0264-9381/12/9/002

57.14 Type: 0 Citation: Jan Ambjorn, arXiv:hep-th/9411179

58. Konstantinos N. Anagnostopoulos, Mark J. Bowick, "*Unitary one matrix models: String equation and flows*", arXiv:hep-th/9203005.
Cited by 1 (1) articles

We review the Symmetric Unitary One Matrix Models. In particular we discuss the string equation in the operator formalism, the mKdV flows and the Virasoro Constraints. We focus on the t-function formalism for the flows and we describe its connection to the (big cell of the) Sato Grassmannian Gr via the Plucker embedding of Gr into a fermionic Fock space. Then the space of solutions to the string equation is an explicitly computable subspace of GrtimesGr which is invariant under the flows. (Invited talk delivered by M. J. Bowick at the Vth Regional Conference on Mathematical Physics, Edirne, Turkey; December 15-22, 1991.)

58.1 Type: 0 Citation: Takeshi Oota, Nucl.Phys.B **976** (2022) 115718 [arXiv:2112.14441], doi:10.1016/j.nuclphysb.2022.115718

59. Konstantinos N. Anagnostopoulos, Mark J. Bowick, Albert S. Schwarz, "*The Solution space of the unitary matrix model string equation and the Sato Grassmannian*", Commun.Math.Phys. **148** (1992) [arXiv:hep-th/9112066], [doi:10.1007/BF02096545].
Cited by 8 (7) articles

The space of all solutions to the string equation of the symmetric unitary one-matrix model is determined. It is shown that the string equation is equivalent to simple conditions on points V1 and V2 in the big cell Gr of the Sato Grassmannian Gr. This is a consequence of a well-defined continuum limit in which the string equation has the simple form lb cp ,cq- rb =hboxrm 1, with cp and cq- 2times 2 matrices of differential operators. These conditions on V1 and V2 yield a simple system of first order differential equations whose analysis determines the space of all solutions to the string equation. This geometric formulation leads directly to the Virasoro constraints Ln,(ngeq 0), where Ln annihilate the two modified-KdV t-functions whose product gives the partition function of the Unitary Matrix Model.

59.1 Type: 0 Citation: Martin Luu, Matej Penciak, arXiv:1511.07466

59.2 Type: 0 Citation: Martin T. Luu, Matej Penciak, Commun.Math.Phys. **357** (2018) , doi:10.1007/s00220-017-3040-5

59.3 Type: 0 Citation: Robert W. Carroll, arXiv:hep-th/9410063

59.4 Type: 0 Citation: A. Mironov, A. Morozov, G.W. Semenoff, Int.J.Mod.Phys.A **11** (1996) [arXiv:hep-th/9404005],
doi:10.1142/S0217751X96002339

59.5 Type: 0 Citation: Joanna L. Karczmarek, Gordon W. Semenoff, JHEP **10** (2011) 066 [arXiv:1108.2712], doi:10.1007/JHEP10(2011)066

59.6 Type: 2 Citation: Konstantinos Anagnostopoulos

59.7 Type: 0 Citation: Alexander Alexandrov, Adv.Theor.Math.Phys. **22** (2018) [arXiv:1608.01627], doi:10.4310/ATMP.2018.v22.n6.a1

59.8 Type: 0 Citation: Takeshi Oota, Nucl.Phys.B **976** (2022) 115718 [arXiv:2112.14441], doi:10.1016/j.nuclphysb.2022.115718

60. K.N. Anagnostopoulos, Mark J. Bowick, N. Ishibashi, "*An Operator formalism for unitary matrix models*", Mod.Phys.Lett.A **6** (1991) , [doi:10.1142/S0217732391003183].
Cited by 8 (4) articles

We analyze the double scaling limit of unitary matrix models in terms of trigonometric orthogonal polynomials on the circle. In particular we find a compact formulation of the string equation at the kth multicritical point in terms of pseudodifferential operators and a corresponding action principle. We also relate this approach to the mKdV hierarchy which appears in the analysis in terms of conventional orthogonal polynomials on the circle.

60.1 Type: 0 Citation: Manuel Manas, Partha Guha, Commun.Math.Phys. **161** (1994) [arXiv:hep-th/9307016],
doi:10.1007/BF02099775

60.2 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Mark J. Bowick

60.3 Type: 0 Citation: Francisco Guil, Manuel Manas, J.Phys.A **27** (1994) [arXiv:hep-th/9307017], doi:10.1088/0305-4470/27/6/034

60.4 Type: 0 Citation: Robert W. Carroll, arXiv:hep-th/9410063

60.5 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Mark J. Bowick, arXiv:hep-th/9203005

60.6 Type: 2 Citation: Konstantinos N. Anagnostopoulos, Mark J. Bowick, Albert S. Schwarz, Commun.Math.Phys. **148** (1992) [arXiv:hep-th/9112066], doi:10.1007/BF02096545

60.7 Type: 2 Citation: Konstantinos Anagnostopoulos

60.8 Type: 0 Citation: Takeshi Oota, Nucl.Phys.B **976** (2022) 115718 [arXiv:2112.14441], doi:10.1016/j.nuclphysb.2022.115718

Total Citations: 1546
Citations: 847
Self Citations by Collaborators: 444
Self Citations: 255