

# CURRICULUM VITÆ

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## GUILLEM DOMÈNECH FUERTES

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**EXECUTIVE SUMMARY:** I am a research associate at the Institute for Theoretical Physics, Heidelberg university, working on gravity and cosmology. I have 24 published articles with more than 440 citations in total. My research topics are:

*General Relativity; Early Universe Physics; Inflation; Modified Gravity; CMB Physics;  
Cosmological Perturbation Theory; Gravitational Waves; Euclidean Gravity; Dark Matter; Dark Energy.*

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### EDUCATION:

- 2014 - 2017 Doctor Course in Cosmology,**  
Yukawa Institute for Theoretical Physics, University of Kyoto, Japan  
Thesis: “Inflationary Cosmology in Scalar-Tensor Theories”  
Advisor: Prof. Misao Sasaki
- 2013 - 2014 Research student in Cosmology,**  
Yukawa Institute for Theoretical Physics, University of Kyoto, Japan  
Advisor: Prof. Misao Sasaki
- 2012 - 2013 Master of Physics in Astrophysics, Particle Physics and Cosmology,**  
University of Barcelona, Spain  
9.6/10 *First Class Honours* | Major: Cosmology and Particle Physics  
Thesis: *Canonical Halo Mass Definition and Universal Halo Mass Function*  
Advisor: Prof. Eduard Salvador-Solé
- 2008 - 2012 Bachelor in Physics**  
University of Barcelona, Spain  
9.1/10 *First Class Honours* | Major: Particle Physics
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### ACADEMIC POSITIONS:

- 10/2020 - present Marie-Curie Fellini Fellow**  
Istituto Nazionale di Fisica Nucleare, Padova University, Italy  
Host: Sabino Matarrese
- 10/2017 - 09/2020 Research Associate**  
Institute for Theoretical Physics, Heidelberg University, Germany  
Host: Christof Wetterich
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### SUPERVISION OF GRADUATE STUDENTS:

- 04/2018 - 03/2019 Co-supervised master student (w/ Javier Rubio): Julius Wons.  
Institute for Theoretical Physics, Heidelberg University, Germany  
Thesis: *Interacting spectator fields in the Primordial Universe*<sup>[P16]</sup>
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### INSTITUTIONAL RESPONSIBILITIES:

- 2018 - 2020 Seminar organiser of the cosmology group (Prof: Luca Amendola)  
ITP, Heidelberg University
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## FELLOWSHIPS AND AWARDS:

- 2020 Marie-Curie Fellini Fellow (European Union's Horizon 2020 research and innovation programme No.754496 and Istituto Nazionale di Fisica Nucleare.
  - 2020 Japan Society for the Promotion of Science (JSPS) Postdoctoral Fellowship (declined)
  - 2020 Participant of InvisiblesPlus programme, European Union's Horizon 2020 under the Marie Skłodowska-Curie grant agreement No.690575 (one month visit to Berkeley University)
  - 2019 Balzan Center for Cosmological Studies Program (one month visit to Johns Hopkins University)
  - 2014 Japanese Government Scholarship (MEXT) for Graduate Students (Doctor course)
  - 2012 Faculty of Physics Masters Scholarship (Catalunya Caixa)
  - 2008 Undergraduate degree Scholarship (Caixa Manresa)
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## TEACHING ACTIVITIES:

- 04/2019 - 07/2019 Tutoring for Advanced Quantum Field Theory (Prof: Christof Wetterich)  
ITP, Heidelberg University, Germany
  - 10/2018 - 03/2019 Co-coordinator of the Cosmology course (Prof: Luca Amendola)  
ITP, Heidelberg University, Germany
  - 04/2018 - 07/2018 Co-coordinator of the General Relativity course (Prof: Luca Amendola)  
ITP, Heidelberg University, Germany
  - 10/2017 - 03/2018 Tutoring for Theoretical Statistical Physics (Prof: Ulrich Schwarz)  
ITP, Heidelberg University, Germany
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## REFEREING EXPERIENCE:

- Journal of Cosmology and Astroparticle Physics: co-refereed 6 and refereed 12 papers.
  - Physics of the Dark Universe: refereed 2 papers.
  - International Journal of Modern Physics D: refereed 1 paper.
  - European Physics Journal C: refereed 1 paper.
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## CHAIRING EXPERIENCE:

- Chaired inflation session in Gravity and Cosmology 2018, February,  
YITP, Kyoto University, Japan.
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## OUTREACH ACTIVITIES:

- 02/2020 Outreach talk to bachelor students at University of San Marcos, Lima, Peru.
  - 12/2015 Outreach talk in Sunion high-school, Barcelona, Spain.
  - 05/2013 Outreach talk in Sunion high-school, Barcelona, Spain.
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## COMPUTATIONAL TOOLS:

- Boltzmann codes: CLASS (basic)
  - Monte Carlo codes: MontePython (basic)
  - Computer Languages: Python (intermediate) & Fortran (intermediate)
  - Scientific Software: Mathematica including xAct (tensor computation),  $\LaTeX$  & R
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## LANGUAGES:

Spanish: Native  
Catalan: Native  
English: Fluent  
Japanese: Intermediate

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## LIST OF PUBLICATIONS

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### Peer Reviewed Publications

- [P21] “*Planck residuals anomaly as a fingerprint of alternative scenarios to inflation*”  
Guillem Domènech, Xingang Chen, Abraham Loeb & Marc Kamionkowski.  
arXiv:2005.08998. **JCAP10(2020)005**
- [P20] “*Induced gravitational waves as a probe of thermal history of the universe*”  
Guillem Domènech, Shi Pi & Misao Sasaki.  
arXiv:2005.12314. **JCAP 08 (2020) 017**
- [P19] “*Induced gravitational waves in a general cosmological background*”  
Guillem Domènech.  
arXiv:1912.05583. **IJMPD Vol. 29, No. 03, 2050028 (2020)**
- [P18] “*Could the black hole singularity be a field singularity?*”  
Guillem Domènech, Atsushi Naruko, Misao Sasaki & Christof Wetterich.  
arXiv:1912.02845. **IJMPD Vol. 29, No. 03, 2050026 (2020)**
- [P17] “*Lensing anomaly and oscillations in the primordial power spectrum*”  
Guillem Domènech & Marc Kamionkowski  
arXiv:1905.04323. **JCAP11 (2019) 040**
- [P16] “*Mimicking features in alternatives to inflation with interacting spectator fields*”  
Guillem Domènech, Javier Rubio & Julius Wons,  
arXiv:1905.04323, **Phys.Lett. B790 (2019) 263-269**,
- [P15] “*Gravitational waves from global cosmic strings in quintessential inflation*”  
Dario Bettoni, Guillem Domènech & Javier Rubio,  
arXiv:1810.11117, **JCAP 1902 (2019) 034**,
- [P14] “*Vacuum birefringence and the Schwinger effect in (3+1) de Sitter*”  
Mariona Banyeres, Guillem Domènech & Jaume Garriga,  
arXiv:1809.08977, **Phys.Lett. B790 (2019) 263-269**,
- [P13] “*Vector disformal transformation of generalized Proca theory*”  
Guillem Domènech, Shinji Mukohyama, Ryo Namba & Vassilis Papadopoulos,  
arXiv:1807.06048, **Phys.Rev. D98 (2018) no.6, 064037**,
- [P12] “*Doppelgänger dark energy: modified gravity with non-universal couplings after GW170817*”  
Luca Amendola, Dario Bettoni, Guillem Domènech & Adalto R. Gomes,  
arXiv:1803.06368, **JCAP 1806 (2018) no.06, 029** ,
- [P11] “*Hamiltonian approach to second order gauge invariant cosmological perturbations*”  
Guillem Domènech & Misao Sasaki,  
arXiv:1709.09804, **Phys.Rev. D97 (2018) no.2, 023521**,

- [P10] “*Thermal activation of thin-shells in anti-de Sitter black hole spacetime*”  
Pisin Chen, Guillem Domènech, Misao Sasaki & Dong-han Yeom,  
arXiv:1704.04020, **JHEP 1707 (2017) 134**,
- [P9] “*CMB Scale Dependent Non-Gaussianity from Massive Gravity during Inflation*”  
Guillem Domènech, Takashi Hiramatsu, Chunshan Lin, Misao Sasaki, Maresuke Shiraishi & Yi Wang,  
arXiv:1701.05554, **JCAP 1705 (2017) no.05, 034**,
- [P8] “*Strongly scale-dependent CMB dipolar asymmetry from super-curvature fluctuations*”  
Christian Byrnes, Guillem Domènech, Misao Sasaki & Tomo Takahashi,  
arXiv:1610.02650, **JCAP 1612 (2016) no.12, 020**,
- [P7] “*Consistency relation and inflaton field redefinition in the delta N formalism*”  
Guillem Domenech, Jinn-Ouk Gong & Misao Sasaki,  
arXiv:1606.03343, **Phys.Lett. B769 (2017) 413-417**,
- [P6] “*Inflationary Magnetogenesis with Broken Local U(1) Symmetry*”  
Guillem Domènech, Chunshan Lin & Misao Sasaki,  
arXiv:1512.01108, **EPL 115 (2016) no.1, 19001**,
- [P5] “*Stationary bubbles and their tunneling channels toward trivial geometry*”  
Pisin Chen, Guillem Domènech, Misao Sasaki & Dong-han Yeom,  
arXiv:1512.00565, **JCAP 1604 (2016) no.04, 013**,
- [P4] “*Derivative-dependent metric transformation and physical degrees of freedom*”  
Guillem Domènech, Shinji Mukohyama, Ryo Namba, Atsushi Naruko, Rio Saitou & Yota Watanabe,  
arXiv:1507.05390, **Phys.Rev. D92 (2015) no.8, 084027**,
- [P3] “*Cosmological disformal invariance*”  
Guillem Domènech, Atsushi Naruko & Misao Sasaki,  
arXiv:1505.00174, **JCAP 1510 (2015) no.10, 067**,
- [P2] “*Conformal Frame Dependence of Inflation*”  
Guillem Domènech & Misao Sasaki,  
arXiv:1501.07699, **JCAP 1504 (2015) no.04, 022) 134**,
- [P1] “*Fixing a Rigorous Formalism for the Accurate Analytic Derivation of Halo Properties*”  
Enric Juan, Eduard Salvador-Solé, Guillem Domènech & Alberto Manrique,  
**Mon.Not.Roy.Astron.Soc. 439 (2014) no.1, 719-724**,
- [P0] “*Halo Mass Definition and Multiplicity Function*”  
Enric Juan, Eduard Salvador-Solé, Guillem Domènech & Alberto Manrique,  
**Mon.Not.Roy.Astron.Soc. 439 (2014) no.3, 3156-3167**,

## Submitted

- [P22] “*Neutrino masses, vacuum stability and quantum gravity prediction for the mass of the top quark*”  
Guillem Domènech, Mark Goodsell & Christof Wetterich.  
arXiv:2008.04310.

## Proceedings

- [C3] “*Inflationary Magnetogenesis with On-shell Local U(1) Symmetry*”  
Guillem Domènech, Chunshan Lin & Misao Sasaki,  
**J.Phys.Conf.Ser. 883 (2017) no.1, 012013**
- [C2] “*Conformal frames in cosmology*”  
Guillem Domènech & Misao Sasaki,  
arXiv:1602.06332, **Int.J.Mod.Phys. D25 (2016) no.13, 1645006**,

[C1] “Stationary bubbles: information loss paradox?”

Guillem Domènech & Misao Sasaki,

arXiv:1602.04969, **Everything about Gravity**, pp. 572-577 (2017),

## INTERNATIONAL TALKS:

### Conferences:

- 05/2020 Spring workshop in Gravity and Cosmology. Jagiellonian University, Poland.
- 05/2019 Spring workshop in Gravity and Cosmology. University of Warsaw, Poland.
- 07/2018 String Pheno 18. University of Warsaw, Poland.
- 02/2018 Gravity and Cosmology 2018. YITP, Japan.
- 08/2017 COSMO-17. APC, University Paris Diderot.
- 01/2017 Testing Gravity 2017. SFU, Canada.
- 10/2016 Gravitation and the Universe (HGU 2016). VAST, Vietnam.  
Workshop on General Relativity and Gravitation JGRG26, Osaka, Japan.
- 01/2016 Mini-Workshop on Cosmology. APCTP, Korea.
- 12/2015 2nd LeCosPA International Symposium: Everything about Gravity. LeCosPa, Taiwan.  
Workshop on General Relativity and Gravitation (JGRG25). YITP, Japan.
- 11/2015 2nd Mini-Workshop on Gravity and Cosmology. IAP, France.
- 12/2014 Workshop on General Relativity and Gravitation (JGRG24). IMPU, Japan.
- 10/2013 IX International Workshop, The Dark Side of the Universe. SISSA, Italy.

### Invited seminars:

- 07/2020 Padova university (webinar), Italy.
- 06/2020 McGill university (webinar), Canada.
- 01/2019 Johns Hopkins University, USA.
- 11/2018 ITP, Heidelberg, Germany.
- 10/2018 Warsaw University, Warsaw, Poland.
- 11/2017 ITP, Heidelberg, Germany.
- 09/2016 UPV-EHU, Bilbao, Spain.  
University of Barcelona, Spain.
- 05/2016 NCTS, Hsinchu, Taiwan.
- 04/2016 LeCosPa, Taipei, Taiwan.
- 12/2015 University of Barcelona, Spain.
- 11/2015 IAP, Paris, France.
- 03/2015 APTCP, Pohang, Korea.

### Poster presentations:

- 01/2017 Testing Gravity 2017. SFU, Vancouver, Canada.
- 06/2015 New Ideas Meet New Experimental Data. String Theory & Cosmology. Hong Kong

### Schools and workshops:

- 02/2016 School on Strings and Fields,  
Yukawa Institute for Theoretical Physics, Kyoto University, Japan
- 08/2015 Summer School on Cosmology and Particle Astrophysics,  
RESCEU APCosPA, Japan
- 05/2015 Molecular type Workshop: Black hole information loss paradox,  
Yukawa Institute for Theoretical Physics, Kyoto University, Japan