Joseph (Joe) D. Osborn

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Research Interests

High-energy experimental nuclear physics, software and computing in high-energy physics.

Education

University of Michigan, M.S. and Ph.D. in Physics, 2018.
University of Kentucky, B.S. in Physics, B.S. in Mathematics, 2013.

Software and Computational Fluency

Languages: C/C++, Java, Python, LaTeX, Bash
Tools: git, Jenkins, Linux, UML, Doxygen, Docker, Singularity, Serverless/FaaS
HEP Packages: ROOT, ACTS, GEANT, Fun4All, RooUnfold

Ph.D. Thesis

Nonperturbative factorization breaking and color entanglement effects in dihadron and direct photon-hadron angular correlations in p+p and p+A collisions. J. D. Osborn, University of Michigan, May 29, 2018. hep-ex/1806.07763.

Research Positions

Postdoctoral Research Associate, Oak Ridge National Laboratory

07/2019-present
Application Engineering at Oak Ridge National Laboratory
A Common Tracking Software (ACTS) Collaboration, sPHENIX experiment at the Relativistic Heavy Ion Collider

Visiting Scholar, University of Michigan

06/2019-06/2020
LHCb experiment at the Large Hadron Collider, PHENIX and sPHENIX experiment at the Relativistic Heavy Ion Collider

Postdoctoral Research Fellow, University of Michigan

06/2018-06/2019
LHCb experiment at the Large Hadron Collider, PHENIX and sPHENIX experiments at the Relativistic Heavy Ion Collider

Graduate Research Assistant, University of Michigan

07/2013-06/2018
Thesis advisor: Christine Aidala
PHENIX and sPHENIX experiments at the Relativistic Heavy Ion Collider

Undergraduate Research Assistant, University of Kentucky
05/2012-05/2013
Thesis advisor: Renee Fatemi
STAR experiment at the Relativistic Heavy Ion Collider

Undergraduate Research Assistant, University of Kentucky
Summer 2011
Advisor: Ron Wilhelm
Sloan Digital Sky Survey search for blue giant stars

High School Senior Research Assistant, University of Kentucky
01/2008-05/2009
Thesis advisor: James McDonough
Hydrodynamic simulations of type IIa supernovae

Research Funding

1. Oak Ridge National Laboratory subcontract through Brookhaven National Laboratory. *Software Development for sPHENIX*. 03/2020-03/2021. PI, $132k.

Peer Reviewed Publications with Significant Contribution

Full publication list at end of CV

1. J. D. Osborn for the sPHENIX Collaboration, "Requirements, status, and plans for track reocnstruction at the sPHENIX experiment." arXiv:2007.00771, peer reviewed Connecting the Dots 2020 Workshop proceedings.

2. U. Acharya et. al. (PHENIX Collaboration) "Measurement of jet-medium interactions via direct photon-hadron correlations in Au+Au and d+Au collisions at $\sqrt{s_{NN}} = 200$ GeV." Phys. Rev. C 102, 054910 (2020).

3. C. A. Aidala et al. "Design and beam test results for the 2D projective sPHENIX electromagnetic calorimeter prototype." arXiv:2003.13685, accepted by IEEE TNS.

4. I. Helenius, J. Lajoie, J. D. Osborn, P. Paakkinen, H. Paukkunen, "Nuclear gluons at RHIC in a multi-observable approach." Phys. Rev. D 100, 014004 (2019).

5. A. Aaij et al. (LHCb Collaboration), "Measurement of charged-hadron production in Z-tagged jets in proton-proton collisions at $\sqrt{s} = 8$ TeV." Phys. Rev. Lett. 123, 232001 (2019).

6. C. Aidala et al. (PHENIX Collaboration), "Nonperturbative transverse momentum broadening in dihadron angular correlations in $\sqrt{s_{NN}}$= 200 GeV proton-nucleus collisions." Phys. Rev. C 99, 044912 (2019).

7. J. D. Osborn for the PHENIX Collaboration, "PHENIX results on jet modification with π^0- and photon-triggered two particle correlations in p+p, $p(d)$+Au, and Au+Au collisions." Nuclear Physics A 982, 591-594 (2019).

8. C. Aidala et al. (PHENIX Collaboration), "Nonperturbative transverse momentum dependent effects in dihadron and direct photon-hadron angular correlations in p+p collisions at $\sqrt{s} = 200$ GeV." Phys. Rev. D 98, 072004 (2018).

9. C. Aidala et al. (PHENIX Collaboration), "Single-spin asymmetry of J/ψ production in p+p, p+Al, and p+Au collisions with transversely polarized proton beams at $\sqrt{s_{NN}} = 200$ GeV." Phys. Rev. D 98, 012006 (2018).

10. J. D. Osborn for the PHENIX Collaboration, "Study of cold and hot nuclear matter effects on jets with direct photon triggered correlations from PHENIX." Nuclear Physics A 967, 476-479 (2017).

11. A. Adare et al. (PHENIX Collaboration), "Nonperturbative-transverse-momentum effects and evolution in dihadron and direct photon-hadron angular correlations in p+p collisions at $\sqrt{s} = 510$ GeV." Phys. Rev. D95, 072002 (2017).

Conference Proceedings

1. **Jet hadronization at LHCb.** Proceedings for the 13^{th} International Workshop on High-p_T Physics in the RHIC/LHC Era, Knoxville, TN, March 19-22, 2019. arXiv:1905.11894.

2. **Nonperturbative transverse momentum effects in dihadron and direct photon-hadron angular correlations**, J. D. Osborn for the PHENIX Collaboration. Proceedings for the SPIN 2016 Symposium, Urbana, IL, September 25-30 2016. arXiv:1701:00681.

3. **Parton dynamics at PHENIX**, J. D. Osborn for the PHENIX Collaboration. Proceedings for the American Physical Society Division of Particles and Fields Conference, Ann Arbor, MI, August 4-8 2015. arXiv:1511.00016.

Other Public Notes with Significant Contribution

1. sPHENIX Conceptual Design Report (CDR). The sPHENIX Collaboration. https://indico.bnl.gov/event/4640, 2018.

2. Detector design study for an EIC detector around the sPHENIX solenoid. C. Aidala et al. https://indico.bnl.gov/event/5283/, 2018.

3. sPHENIX medium energy barrel physics. The sPHENIX Collaboration. https://indico.bnl.gov/event/3866/, 2017.

4. T1044-2017 sPHENIX test beam EMCal analysis. J. D. Osborn and J. Huang. https://indico.bnl.gov/event/3854/, 2017.

5. sPHENIX modest forward upgrade LOI. The sPHENIX Collaboration. https://indico.bnl.gov/event/3867, 2017.

Invited Conference and Workshop Presentations

1. Resummation, Evolution, Factorization Workshop, December 7-11, 2020. "Experimental perspective on hadronization."
2. Jets for 3D Imaging Workshop, November 23-25, 2020. "Jet substructure at the EIC."
3. ACTS Workshop, May 25-29, 2020. "sPHENIX Experience with Acts."
4. Second EIC Yellow Report Workshop at Pavia University, May 20-22, 2020. "Inclusive and heavy flavor jet substructure at the EIC."
5. Connecting The Dots Workshop, April 22-24, 2020. "Requirements, status and plans for track reconstruction of the sPHENIX experiment."
6. 3^{rd} JETSCAPE Workshop, March 18-20, 2020. "Hadronization and jet substructure at RHIC and the LHC."
7. 13^{th} International Workshop on High p_T Physics in the RHIC/LHC Era, March 19-22, 2019. "Jet hadronization at LHCb."
8. Workshop on Novel Probes of the Nucleon Structure in SIDIS, e+e- and pp (FF2019), March 14-16, 2019. "Factorization breaking, color entanglement, and hadronization of jets."
9. Workshop on the Definition of Jets, Brookhaven National Laboratory, June 25-27, 2018. "Probing effects from QCD color with photon-jet and dijet correlations."
10. CMS SMP-J Workshop Annual Workshop, January 25, 2017. "Color entanglement and color coherence."

Seminars and Colloquia

1. Workflow Workshop Seminar Series, August 14, 2020. "Data processing workflows at scattering user facilities."
2. University of Tennessee HEP/Nuclear/Astro Seminar, February 3, 2020. "Jet substructure at RHIC and the LHC."
3. University of Kentucky HEP/Nuclear Seminar, November 7, 2019. "Hadronization and jet substructure at RHIC and the LHC."
4. University of Michigan HEP/Astro/Nuclear Seminar, April 8, 2019. "Jet substructure at RHIC and the LHC."
5. Oak Ridge National Laboratory Seminar, February 18, 2019. "Peering inside protons and nuclei."
6. Wayne State University PAN Seminar, September 14, 2018. "Effects from color flow in proton-proton and proton-nucleus collisions."
7. Paul Laurence Dunbar High School Senior Seminar, August 31, 2018. "Career paths with a physics degree."

8. University of Illinois HEP/MEP Colloquium, October 23, 2017. "Effects from color entanglement in proton-proton and proton-nucleus collisions."

9. University of Michigan HEP/Astro/Nuclear Seminar, November 21, 2016. "Recent experimental results on QCD factorization breaking at RHIC."

10. Brookhaven National Laboratory Nuclear Seminar Series, October 25, 2016. "Recent experimental results on QCD factorization breaking at RHIC."

11. Seminar at Columbia University, October 24, 2016. "Recent experimental results on QCD factorization breaking at RHIC."

Conference and Workshop Presentations

1. sPHENIX Collaboration Meeting, Boulder, Colorado (virtual), July 6, 2020. "ACTS Tracking Progress."

2. sPHENIX Collaboration Summer Projects Workshop, June 11, 2020. "ACTS in sPHENIX."

3. sPHENIX Software Mega-Workfest, Brookhaven National Laboratory, January 13-17, 2020. "Building a Fun4All Analysis Package Tutorial."

4. sPHENIX Collaboration Meeting, Brookhaven National Laboratory, June 5-6, 2018. "Photons and clustering in sPHENIX."

5. Quark Matter 2018, Lido, Italy, May 13-19, 2018. "PHENIX results on jet modification with π^0- and photon-triggered two particle correlations in p+p, p(d)+Au, and Au(Cu)+Au collisions."

6. PHENIX Collaboration Meeting, Brookhaven National Laboratory, December 1-3, 2017. "High p_T correlations analysis highlights and future plans."

7. RHIC Users Meeting Proton Structure Workshop, Brookhaven National Lab, June 20-23, 2017. "Partonic structure of nucleons and nuclei at sPHENIX."

8. Quark Matter 2017, Chicago, Illinois, February 5-11, 2017. "Study of cold and hot nuclear matter effects on jets with direct photon-triggered correlations from PHENIX."

9. 22^{nd} International Spin Symposium, Urbana, IL, September 25-30, 2016. "Nonperturbative transverse momentum effects in dihadron and direct photon-hadron angular correlations."

10. 4th Workshop on the QCD Structure of the Nucleon (QCD-N'16), Getxo, Spain, July 11-15, 2016. "Nonperturbative transverse momentum effects in dihadron and direct photon-hadron angular correlations."

11. American Physical Society Division of Nuclear Physics Meeting, Sante Fe, NM, October 28-31, 2015. "Measuring intrinsic partonic transverse momentum via two-particle correlations in PHENIX."

12. American Physical Society Division of Particles and Fields Meeting, Ann Arbor, MI, August 3-7, 2015. "Parton dynamics at PHENIX."

13. Physics Graduate Student Symposium, July 8, 2015. "Partonic dynamics in high energy proton-proton collisions at PHENIX."

14. American Physical Society Southeastern Section Meeting, Tallahassee, FL, November 14-17, 2012. "Noise analysis of the Forward GEM Tracker at STAR."

15. P.L. Dunbar Math Science and Technology Research Symposium, Lexington, KY, April 26, 2009. "Neutrinos and shock reignition in the gain region of type IIa supernovae."

Student Advising and Mentorship

Graduate Students Supervised
Dillon Fitzgerald - Jet Substructure and Hadronization at the EIC.
Kara Mattioli - Heavy flavor jet tagging and substructure at LHCb.
Jordan Roth - Z^0-hadron and Z^0-jet correlations analysis in LHCb $\sqrt{s} = 13$ TeV p+p.
Nicole Lewis - Direct photon single spin asymmetry analysis in PHENIX $\sqrt{s} = 200$ GeV p+p.

University Research Opportunity Program (UROP) at University of Michigan, 09/2018-05/2019
Propose and guide a research project to an undergraduate student. Supervised Brandon Liang in a jet substructure Monte Carlo study to better understand nonperturbative contributions to jets.

Additional Undergraduate Students Supervised
Nikhil Shankar, Hayden Hansen, Ezra Lesser, Nick Melekian, Ruby Araj, Emily Camras, Robert Read, Robert Cernak, Aaron White.

Teaching

University of Michigan

1. Physics for the Life Sciences Laboratory 1: Fall 2013, Spring 2014, Fall 2014, Fall 2017

University of Kentucky

1. Physics 241 - General University Physics Laboratory: Fall 2012
2. Arts and Sciences Wired Course - Measuring Science: Fall 2011

Awards and Fellowships

RHIC/AGS Users' Executive Committee Merit Award	05/2019
Young PHENIXian award	12/2015
Michigan Graduate 1^{st} Year Fellowship	08/2013-08/2014
Summa Cum Laude honors upon graduation from University of Kentucky	05/2013
Sigma Pi Sigma Physics Honor Society	05/2013
University of Kentucky Outstanding Senior Award	05/2013

Conference Organization

1. LHCP Conference QCD Organizing Committee, Paris, France, June 7-12, 2021.
2. Spin and EIC workshops at the RHIC All Users Meeting, Brookhaven National Laboratory, June 2-5, 2019.
3. Scientific Secretary, American Physical Society Division of Particles and Fields Meeting, Ann Arbor, MI, August 3-7, 2015.

Collaboration and Research Community Service

DOE Office of NP SBIR Proposal Reviewer
Review SBIR proposals related to computing in Nuclear Physics.

Nuclear Physics Day on Capitol Hill, 04/2018.
Met with staff members of Michigan Senators and Representatves to discuss funding for nuclear physics research.

Elected member, PHENIX Executive Council, 01/2016-01/2017.
The Executive Council is responsible for establishing scientific priorities for the experiment. Two junior members are elected for their commitment to the experiment and representation of junior members, defined as graduate students, postdocs, and early term faculty members.

Complete Publication List

For the most up-to-date list, search 'find a J. D. Osborn' on inspirehep.net

Papers Submitted for Peer Reviewed Publication or on arXiv

PHENIX and LHCb Collaboration Papers
(significant contribution made to those in ***bold italic text***)

1. Searches for 25 rare and forbidden decays of $D^+D_s^+$ mesons. R. Aaij et al, arXiv:2011.00217. Submitted to JHEP.
2. First observation of the decay $\Lambda_b^0 \to \eta_c(1S)pK^-$. R. Aaij et al, arXiv:2007.11292. Submitted to Phys. Rev. D.
3. Production of π^0, η, and K_S mesons in U+U collisions at $\sqrt{s_{NN}} = 192$ GeV. U. Acharya et. al. arXiv:2005.14686. Submitted to Phys. Rev. C.
4. Measurement of the branching fractions for $B^+ \to D^{*+}D^-K^+$, $B^+ \to D^{*-}D^+K^+$, and $B^0 \to D^{*-}D^0K^+$ decays. R. Aaij et al. arXiv:2005.10264. Submitted to JHEP.
5. Measurement of the shape of the $B_s^0 \to D_s^{*-}\mu^+\nu_\mu$ differential decay rate. R. Aaij et al. arXiv:2003.08453. Submitted to JHEP.
6. Strong constraints on the $K_s^0 \to \mu^+\mu^-$ branching fraction. R. Aaij et al. arXiv:2001.10354. Submitted to Phys. Rev. Lett.
7. Correlations of $\mu\mu$, $e\mu$, and ee pairs in p+p collisions at $\sqrt{s} = 200$ GeV and implications for $c\bar{c}$ and $b\bar{b}$ production mechanisms. C. Aidala et al. arXiv:1805.04075. Submitted to Phys. Rev. D.
8. An Upgrade Proposal from the PHENIX Collaboration. A. Adare et al. (PHENIX Collaboration). arXiv:1501.06197.
9. Concept for an Electron Ion Collider (EIC) detector built around the BaBar solenoid. A. Adare et al. (PHENIX Collaboration). arXiv:1402.1209.

Peer Reviewed Publications

1. ***Design and beam test results for the 2D projective sPHENIX electromagnetic calorimeter prototype.*** C. A. Aidala et al. arXiv:2003.13685. Accepted by IEEE TNS.
2. ***Requirements, status, and plans for track reconstruction at the sPHENIX experiment***. J. D. Osborn for the sPHENIX Collaboration, arXiv:2007.00771. Proceedings of Connecting the Dots Workshop 2020.
3. ***Nuclear gluons at RHIC in a multi-observable approach.*** I. Helenius, J. Lajoie, J. D. Osborn, P. Paakkinen, H Paukkunen. Phys. Rev. D 100, 014004 (2019).

4. ***PHENIX results on jet modification with π^0- and photon-triggered two particle correlations in p+p, $p(d)$+Au, and Au+Au collisions,*** J. D. Osborn for the PHENIX Collaboration. Nuclear Physics A 982, 591-594 (2019).

5. ***Study of cold and hot nuclear matter effects on jets with direct photon triggered correlations from PHENIX,*** J. D. Osborn for the PHENIX Collaboration. Nuclear Physics A 967, 476-479 (2017).

PHENIX and LHCb Collaboration Papers
(significant contribution made to those in ***bold italic text***)

1. Search for the doubly heavy Ξ_{bc}^0 baryon via decays to D^0pK^-D. JHEP 11, 095 (2020).

2. Observation of enhanced double parton scattering in proton-lead collisions at $\sqrt{s_{\rm NN}}$ =8.16 TeV. Phys. Rev. Lett. 125, 212001 (2020).

3. Searches for low-mass dimuon resonances. JHEP 10, 156 (2020).

4. Observation of structure in the J/ψ-pair mass spectrum. Science Bulletin 65, 23, 1983-1993 (2020).

5. Search for CP violation in $\Xi_c^+ \to pK^-\pi^+$ decays using model-independent techniques. Eur. Phys. J. C 80 (2020) 10, 986.

6. ***Measurement of jet-medium interactions via direct photon-hadron correlations in Au+Au and d+Au collisions at $\sqrt{s_{NN}} = 200$ GeV.*** Phys. Rev. C 102, 054910 (2020).

7. Polarization and cross section of midrapidity J/ψ production in proton-proton collisions at $\sqrt{s} = 510$ GeV. Phys.Rev.D 102, 072008 (2020)

8. Production of $b\bar{b}$ at forward rapidity in p+p collisions at $\sqrt{s}$ =510 GeV. Phys.Rev.D 102, 092002 (2020).

9. Study of the lineshape of the $\chi_{c1}(3872)$ state. Phys.Rev.D 102, 092005 (2020).

10. First branching fraction measurement of the suppressed decay $\Xi_c^0 \to \pi^-\Lambda_c^+$. Phys. Rev. D 102, 071101 (2020).

11. First observation of the decay $B^0 \to D^0\bar{D}^0K^+\pi^-$. Phys. Rev. D 102, 051102 (2020).

12. Study of the $\psi_2(3823)$ and $\chi_{c1}(3872)$ states in $B^+ \to (J/\psi\pi^+\pi^-)K^-$ decays. JHEP 08, 123 (2020).

13. Precision measurement of the B_c^+ meson mass. JHEP 07, 123 (2020).

14. Measurement of the $\Lambda_b^0 \to J/\psi\Lambda$ angular distribution and the Λ_b^0 polarisation in pp collisions. JHEP 06, 110 (2020).

15. Observation of new Ξ_c^0 baryons decaying to $\Lambda_c^+K^-$. Phys. Rev. Lett. 124, 222001 (2020).

16. Measurement of CP averaged observables in the $B^0 \to K^{*0}\mu^=\mu^-$ decay. Phys. Rev. Lett. 125, 011802 (2020).

17. Search for the lepton flavour violating decay $B^+ \to K^+\mu^-\tau^+$ using B^{*0}_{s2} decays. JHEP 06, 129 (2020).

18. Search for the rare decays $B^0_s \to e^+e^-$ and $B^0 \to e^+e^-$. Phys. Rev. Lett. 124, 211802 (2020).

19. Measurement of charged pion double spin asymmetries at midrapidity in longitudinally polarized p+p collisions at $\sqrt{s} = 510$ GeV. Phys. Rev. D 102, 032001 (2020).

20. Measurement of CP observables in $B^\pm \to DK^\pm$ and $B^\pm \to D\pi^\pm$ with $D \to K^0_s K^\pm \pi^\mp$ decays. JHEP 06, 058 (2020).

21. Observation of a new baryon state in the $\Lambda^0_b\pi^+\pi^-$ mass spectrum. JHEP 06, 136 (2020).

22. Search for CP violation and observation of P violation in $\Lambda^0_b \to p\pi^-\pi^+\pi^-$ decays. Phys. Rev. D 102, 051101 (2020).

23. Measurement of the branching fraction of the decay $B^0_s \to K^0_s K^0_s$. Phys. Rev. D 102, 012011 (2020)

24. Measurement of J/ψ at forward and backward rapidity in p+p, p+Al, p+Au, and ^{3}He+Au collisions at $\sqrt{s_{NN}}$=200 GeV. Phys. Rev. C .102, 014902 (2020).

25. Measurement of $|V_{cb}|$ with $B^0_s \to D^{(*)-}_s \mu^+\nu_\mu$ decays. Phys. Rev. D 101, 072004 (2020).

26. Test of lepton universality with $\Lambda^0_b \to pK^-\ell^+\ell^-$ decays. JHEP 20, 040 (2020).

27. Measurement of CP violation in $B^0 \to D^{*\pm}D^\mp$ decays. JHEP 03, 147 (2020).

28. Observation of the semileptonic decay $B^+ \to p\bar{p}\mu^+\nu_\mu$. JHEP 03, 146 (2020).

29. Measurement of f_s/f_u variation with proton-proton collision energy and kinematics. Phys. Rev. Lett. 124, 122002 (2020).

30. First observation of excited Ω^-_b states. Phys. Rev. Lett. 124, 082002 (2020).

31. J/ψ and $\psi(2S)$ production at forward rapidity in p+p collisions at $\sqrt{s} = 510$ GeV. Phys. Rev. D 101, 052006 (2020).

32. Isospin amplitudes in $\Lambda^0_b \to J/\psi\Lambda(\Sigma^0)$ and $\Xi^0_b \to J/\psi\Xi^0(\Lambda)$ decays. Phys. Rev. Lett. 124, 111802 (2020).

33. Precision measurement of the Ξ^{++}_{cc} mass. JHEP 2002, 049 (2020).

34. Determination of quantum numbers for several excited charmed mesons observed in $B^- \to D^{*+}\pi^-\pi^-$ decays. Phys. Rev. D 101, 032005 (2020).

35. Measurement of the $\eta_c(1S)$ production cross-section in pp collisions at $\sqrt{s} = 13$ TeV. Eur. Phys. J. C 80, 191 (2020).

36. Nuclear modification factor of charged hadrons at forward and backward rapidity in p+Al and p+Au collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C 101, 034910 (2020).

37. Updated measurement of decay-time-dependent CP asymmetries in $D^0 \to K^+K^-$ and $D^0 \to \pi^+\pi^-$ decays. R. Aaij et al. Phys.Rev. D101, 012005 (2020).

38. Measurement of Ξ_{cc}^{++} production in pp collisions at $\sqrt{s} = 13$ TeV. Chin. Phys. C 44, 022001 (2020).

39. Amplitude analysis of the $B^+ \to \pi^+\pi^+\pi^-$ decay. R. Aaij et al. Phys.Rev. D 101, 012006 (2020).

40. Observation of several sources of CP violation in $B^+ \to \pi^+\pi^+\pi^-$ decays. R. Aaij et al. Phys.Rev.Lett. 124, 031801 (2020).

41. Search for $A' \to \mu^+\mu^-$ decays. R. Aaij et al. Phys. Rev. Lett. 124, 041801 (2020).

42. Search for the doubly charmed baryon Ξ_{cc}^+. Sci. China Phys. Mech. Astron. 63, 221062 (2020).

43. Measurement of the electron reconstruction efficiency at LHCb. JINST 14, P11023 (2019).

44. Measurement of the B_c^- meson production fraction asymmetry in 7 and 13 TeV pp collisions. R. Aaij et al. Phys.Rev. D 100, 112006 (2019).

45. Search for the lepton-flavour violating decays $B^+ \to K^+\mu^\pm e^\mp$. R. Aaij et al. Phys.Rev.Lett. 123, 241802 (2019).

46. Measurement of CP violation in the $B_s^0 \to \phi\phi$ decay and search for the $B^0 \to \phi\phi$ decay. R. Aaij et al. JHEP 1909, 028 (2019).

47. ***Measurement of charged-hadron production in Z-tagged jets in proton-proton collisions at $\sqrt{s} = 8$ TeV.*** Phys. Rev. Lett. 123, 232001 (2019).

48. Observation of new resonances in the $\Lambda_b^0\pi^+\pi^-$ system. Phys. Rev. Lett. 123, 152001 (2019)

49. Search for the lepton-flavour-violating decays $B_s^0 \to \tau^\pm\mu^\mp$ and $B^0 \to \tau^\pm\mu^\mp$. Phys. Rev. Lett. 123, 211801 (2019).

50. A search for $\Xi_{cc}^{++} \to D^+pK^-\pi^+$ decays. JHEP 1910, 124 (2019).

51. Observation of the $\Lambda_b^0 \to \chi_{c1}(3872)pK^-$ decay. JHEP 1909, 028 (2019).

52. Measurement of CP observables in the process $B^0 \to DK^{*0}$ with two- and four-body D decays. JHEP 1909, 041 (2019).

53. Updated measurement of time-dependent CP-violating observables in $B_s^0 \to J/\psi K^+K^-$ decays. Eur. Phys. J. C 79, 706 (2019).

54. Precision measurement of the Λ_c^+, Ξ_c^+, and Ξ_c^0 baryon lifetimes. Phys. Rev. D 100, 032001 (2019).

55. Measurement of CP-violating and mixing-induced observables in $B_s^0 \to \phi\gamma$ decays. Phys. Rev. Lett. 123, 081802 (2019).

56. First observation of the radiative decay $\Lambda_b^0 \to \Lambda\gamma$. Phys. Rev. Lett. 123, 031801 (2019).

57. Nuclear dependence of the transverse single-spin asymmetry in the production of charged hadrons at forward rapidity in polarized $p+p$, p+Al, and p+Au collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. Lett. 123, 122001 (2019).

58. Amplitude analysis of the $B^0_{(s)} \to K^{*0}\bar{K}^{*0}$ decay and measurement of its relative branching fraction relative to the $B^0_s \to K^{*0}\bar{K}^{*0}$. JHEP 1907, 032 (2019).

59. Near-threshold $D\bar{D}$ spectroscopy and observation of a new charmonium state. JHEP 1907, 035 (2019).

60. Measurement of the mass difference between neutral charm-meson eigenstates. Phys. Rev. Lett. 122, 231802 (2019).

61. Beam-energy and centrality dependence of direct-photon emission from ultra-relativistic heavy-ion collisions. Phys. Rev. Lett. 123, 022301 (2019).

62. Observation of an excited B_c^+ state. Phys. Rev. Lett. 122, 232001 (2019).

63. Observation of a narrow pentaquark state, $P_C(4312)^+$, and of two-peak structure of the $P_c(4450)^+$. Phys. Rev. Lett. 122, 222001 (2019).

64. Observation of CP violation in charm decays. R. Aaij et al. Phys. Rev. Lett. 122, 211803 (2019).

65. Search for CP violation in $D_s^+ \to K_s^0\pi^+$, $D^+ \to K_s^0K^+$, and $D^+ \to \phi\pi^+$ decays. Phys. Rev. Lett. 122, 191803 (2019).

66. Search for lepton-universality violation in $B^+ \to K^+\ell^+\ell^-$ decays. Phys. Rev. Lett. 122, 191801 (2019).

67. Measurement of two-particle correlations with respect to second- and third-order event planes in Au+Au collisions at $\sqrt{s_{_{NN}}} = 200$ GeV. Phys. Rev. C99, 054903 (2019).

68. Measurement of charm and bottom production from semileptonic hadron decays in p+p collisions at $\sqrt{s_{_{NN}}} = 200$ GeV. Phys. Rev. D 99, 092003 (2019).

69. ***Nonperturbative transverse momentum broadening in dihadron angular correlations in $\sqrt{s_{_{NN}}}$= 200 GeV proton-nucleus collisions.*** Phys. Rev. C 99, 044912 (2019).

70. Measurements of $\mu\mu$ pairs from open heavy flavor and Drell-Yan in p+p collisions at $\sqrt{s} = 200$ GeV. Phys. Rev. D 99, 072003 (2019)

71. Multi-particle azimuthal correlations for extracting event-by-event elliptic and triangular flow in Au+Au collisions at $\sqrt{s_{_{NN}}} = 200$ GeV. Phys. Rev. C 99, 024903 (2019).

72. Pseudorapidity dependence of particle production and elliptic flow in asymmetric nuclear collisions of p+Al, p+Au, d+Au, and ^{3}He+Au at $\sqrt{s_{_{NN}}}$= 200 GeV. Phys. Rev. Lett. 121, 222301 (2018).

73. Production of π^0 and η mesons in Cu+Au collisions at $\sqrt{s_{_{NN}}} = 200$ GeV. Phys. Rev. C 98, 054903 (2018).

74. Measurement of ϕ-meson production at forward rapidity in p+p collisions at $\sqrt{s}$=510 GeV and energy dependence of σ_ϕ from $\sqrt{s}$ =200 GeV to 7 TeV. Phys. Rev. D 98, 092006 (2018).

75. ***Nonperturbative transverse-momentum-dependent effects in dihadron and direct photon-hadron angular correlations in*** p+p ***collisions at*** $\sqrt{s} = 200$ ***GeV***. Phys. Rev. D 98, 072004 (2018).

76. Creating small circular, elliptical, and triangular droplets of quark-gluon plasma. Nature Phys. 15, 214-220 (2019).

77. Low-momentum direct photon measurements in Cu+Cu collisions at $\sqrt{s_{NN}} = 200$ GeV. A. Adare et al. Phys. Rev. C 98, 054902 (2018).

78. Cross section and longitudinal single-spin asymmetry A_L for forward $W^{\pm} \to \mu^{\pm}\nu$ production in polarized p+p collisions at $\sqrt{s} = 510$ GeV. Phys. Rev. D 98, 032007 (2018).

79. ***Single-spin asymmetry of*** J/ψ ***production in*** p+p***,*** p***+Al, and p+Au collisions with transversely polarized proton beams at*** $\sqrt{s_{NN}}$***=200 GeV***. Phys. Rev. D 98, 012006 (2018).

80. Measurement of emission angle anisotropy via long-range angular correlations with high p_T hadrons in d+Au and p+p collisions at $\sqrt{s_{NN}} = 200$ GeV. A. Adare et al. Phys. Rev. C 98, 014912 (2018).

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