

Joseph D. Osborn

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Education

University of Michigan, 06/2013-06/2018. M.S. and Ph.D. in Physics, 2018.

University of Kentucky, 01/2011-05/2013. B.S. in Physics, B.S. in Mathematics, 2013.

University of Rochester, 08/2009-1/2011.

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

Research Software Engineering group at Oak Ridge National Laboratory

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

Peer Reviewed Publications with Significant Contribution

Full publication list at end of CV

1. I. Helenius, J. Lajoie, J. D. Osborn, P. Paakkinen, H. Paukkunen, “Nuclear gluons at RHIC in a multi-observable approach.” arXiv:1904.09921. Submitted to Phys. Rev. D.
2. A. Aaij et al. (LHCb Collaboration), “Measurement of charged-hadron production in Z -tagged jets in proton-proton collisions at $\sqrt{s} = 8$ TeV.” arXiv:1904.08878. Submitted to Phys. Rev. Lett.
3. 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).
4. J. D. Osborn for the PHENIX Collaboration, “PHENIX results on jet modification with π^0 - and photon-triggered two particle correlations in $p+p$, $p(d)+\text{Au}$, and $\text{Au}+\text{Au}$ collisions.” Nuclear Physics A 982, 591-594 (2019).
5. 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).
6. C. Aidala et al. (PHENIX Collaboration), “Single-spin asymmetry of J/ψ production in $p+p$, $p+\text{Al}$, and $p+\text{Au}$ collisions with transversely polarized proton beams at $\sqrt{s_{NN}} = 200$ GeV.” Phys. Rev. D 98, 012006 (2018).
7. 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).
8. 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. D 95, 072002 (2017).

Other Public Notes with Significant Contribution

1. Detector design study for an EIC detector around the sPHENIX solenoid. Aidala et al. <https://indico.bnl.gov/event/5283/>
2. sPHENIX medium energy barrel physics. The sPHENIX Collaboration. <https://indico.bnl.gov/event/3866/>
3. T1044-2017 sPHENIX test beam EMCAL analysis. J. D. Osborn and J. Huang. <https://indico.bnl.gov/event/3854/>
4. sPHENIX modest forward upgrade LOI. The sPHENIX Collaboration. <https://indico.bnl.gov/event/3867/>

Invited Conference and Workshop Presentations

1. 13th International Workshop on High p_T Physics in the RHIC/LHC Era, March 19-22, 2019. “Jet hadronization at LHCb.”
2. 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.”
3. Workshop on the Definition of Jets, Brookhaven National Laboratory, June 25-27, 2018. “Probing effects from QCD color with photon-jet and dijet correlations.”
4. CMS SMP-J Workshop Annual Workshop, January 25, 2017. “Color entanglement and color coherence.”

Seminars and Colloquia

1. University of Michigan HEP/Astro/Nuclear Seminar, April 8, 2019. “Jet substructure at RHIC and the LHC.”
2. Oak Ridge National Laboratory Seminar, February 18, 2019. “Peering inside protons and nuclei.”
3. Wayne State University PAN Seminar, September 14, 2018. “Effects from color flow in proton-proton and proton-nucleus collisions.”
4. Paul Laurence Dunbar High School Senior Seminar, August 31, 2018. “Career paths with a physics degree.”
5. University of Illinois HEP/MEP Colloquium, October 23, 2017. “Effects from color entanglement in proton-proton and proton-nucleus collisions.”
6. University of Michigan HEP/Astro/Nuclear Seminar, November 21, 2016. “Recent experimental results on QCD factorization breaking at RHIC.”
7. Brookhaven National Laboratory Nuclear Seminar Series, October 25, 2016. “Recent experimental results on QCD factorization breaking at RHIC.”
8. Seminar at Columbia University, October 24, 2016. “Recent experimental results on QCD factorization breaking at RHIC.”

Conference and Workshop Presentations

1. sPHENIX Collaboration Meeting, Brookhaven National Laboratory, June 5-6, 2018. “Photons and clustering in sPHENIX.”
2. 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.”
3. PHENIX Collaboration Meeting, Brookhaven National Laboratory, December 1-3, 2017. “High p_T correlations analysis highlights and future plans.”

4. RHIC Users Meeting Proton Structure Workshop, Brookhaven National Lab, June 20-23, 2017. “Partonic structure of nucleons and nuclei at sPHENIX.”
5. 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.”
6. 22nd International Spin Symposium, Urbana, IL, September 25-30, 2016. “Nonperturbative transverse momentum effects in dihadron and direct photon-hadron angular correlations.”
7. 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.”
8. 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.”
9. American Physical Society Division of Particles and Fields Meeting, Ann Arbor, MI, August 3-7, 2015. “Parton dynamics at PHENIX.”
10. Physics Graduate Student Symposium, July 8, 2015. “Partonic dynamics in high energy proton-proton collisions at PHENIX.”
11. American Physical Society Southeastern Section Meeting, Tallahassee, FL, November 14-17, 2012. “Noise analysis of the Forward GEM Tracker at STAR.”
12. 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.”

Workshops Attended (No presentations given)

1. TMD Summer School. Temple University, June 22-28, 2017.
2. Emerging Spin and Transverse Momentum Effects in $p+p$ and $p+A$ Collisions. RBRC Workshop. Brookhaven National Laboratory, Upton, NY, February 8-10, 2016.
3. PHENIX SpinFest 2014. University of Illinois, July 14-31, 2014.

Student Advising and Mentorship

Graduate Students Supervised

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

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| 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. Spin and EIC workshops at the RHIC All Users Meeting, Brookhaven National Laboratory, June 2-5, 2019.
2. Scientific Secretary, American Physical Society Division of Particles and Fields Meeting, Ann Arbor, MI, August 3-7, 2015.

Other Experience

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

Papers Submitted for Publication or on arXiv

1. ***Nuclear gluons at RHIC in a multi-observable approach.*** I. Helenius, J. Lajoie, J. D. Osborn, P. Paakkinen, H. Paukkunen. arXiv:1904.09921. Submitted to Phys. Rev. D.

PHENIX and LHCb Collaboration Papers

(significant contribution made to those in ***bold italic text***)

1. Amplitude analysis of the $B_{(s)}^0 \rightarrow K^{*0} \bar{K}^{*0}$ decay and measurement of its relative branching fraction relative to the $B_s^0 \rightarrow K^{*0} \bar{K}^{*0}$. R. Aaij et al. arXiv:1905.06662. Submitted to JHEP.
2. Search for the lepton-flavour-violating decays $B_s^0 \rightarrow \tau^\pm \mu^\mp$ and $B^0 \rightarrow \tau^\pm \mu^\mp$. R. Aaij et al. arXiv:1905.06614. Submitted to Phys. Rev. Lett.
3. Measurement of CP -violating and mixing-induced observables in $B_s^0 \rightarrow \phi \gamma$ decays. R. Aaij et al. arXiv:1905.06284. Submitted to Phys. Rev. Lett.
4. A search for $\Xi_{cc}^{++} \rightarrow D^+ p K^- \pi^+$ decays. R. Aaij et al. arXiv:1905.02421. Submitted to JHEP.
5. ***Measurement of charged-hadron production in Z -tagged jets in proton-proton collisions at $\sqrt{s} = 8$ TeV.*** R. Aaij et al. arXiv:1904.08878. Submitted to Phys. Rev. Lett.
6. First observation of the radiative decay $\Lambda_b^0 \rightarrow \Lambda \gamma$. R. Aaij et al. arXiv:1904.06697. Submitted to Phys. Rev. Lett.
7. Observation of a narrow pentaquark state, $P_c(4312)^+$, and of two-peak structure of the $P_c(4450)^+$. R. Aaij et al. arXiv:1904.03947. Submitted to Phys. Rev. Lett.
8. Observation of an excited B_c^+ state. R. Aaij et al. arXiv:1904.00081. Submitted to Phys. Rev. Lett.
9. Near-threshold $D\bar{D}$ spectroscopy and observation of a new charmonium state. R. Aaij et al. arXiv:1903.12240. Submitted to JHEP.
10. Observation of CP violation in charm decays. R. Aaij et al. arXiv:1903.08726. Submitted to Phys. Rev. Lett.
11. Nuclear dependence of the transverse single-spin asymmetry in the production of charged hadrons at forward rapidity in polarized $p + p$, $p + \text{Al}$, and $p + \text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. C. Aidala et al. arXiv:1903.07422. Submitted to Phys. Rev. Lett.
12. Measurement of the mass difference between neutral charm-meson eigenstates. R. Aaij et al. arXiv:1903.03074. Submitted to Phys. Rev. Lett.
13. 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.

14. Beam-energy and centrality dependence of direct-photon emission from ultra-relativistic heavy-ion collisions. A. Adare et al. arXiv:1805.04084. Accepted by Phys. Rev. Lett.
15. An Upgrade Proposal from the PHENIX Collaboration. A. Adare et al. (PHENIX Collaboration). arXiv:1501.06197.
16. Concept for an Electron Ion Collider (EIC) detector built around the BaBar solenoid. A. Adare et al. (PHENIX Collaboration). arXiv:1402.1209.

Publications in Peer-Reviewed Journals

1. ***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).
2. ***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 CP violation in $D_s^+ \rightarrow K_s^0 \pi^+$, $D^+ \rightarrow K_s^0 K^+$, and $D^+ \rightarrow \phi \pi^+$ decays. Phys. Rev. Lett. 122, 191803 (2019).
2. Search for lepton-universality violation in $B^+ \rightarrow K^+ \ell^+ \ell^-$ decays. Phys. Rev. Lett. 122, 191801 (2019).
3. 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. C 99, 054903 (2019).
4. 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).
5. ***Nonperturbative transverse momentum broadening in dihadron angular correlations in $\sqrt{s_{NN}} = 200$ GeV proton-nucleus collisions***. Phys. Rev. C 99, 044912 (2019).
6. 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)
7. 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).
8. Pseudorapidity dependence of particle production and elliptic flow in asymmetric nuclear collisions of $p+Al$, $p+Au$, $d+Au$, and ^3He+Au at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. Lett. 121, 222301 (2018).
9. Production of π^0 and η mesons in Cu+Au collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C 98, 054903 (2018).

10. 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).
11. ***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).
12. Creating small circular, elliptical, and triangular droplets of quark-gluon plasma. Nature Phys. 15, 214-220 (2019).
13. 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).
14. Cross section and longitudinal single-spin asymmetry A_L for forward $W^\pm \rightarrow \mu^\pm \nu$ production in polarized $p+p$ collisions at $\sqrt{s}=510$ GeV. Phys. Rev. D 98, 032007 (2018).
15. ***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).
16. 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).
17. Measurements of mass-dependent azimuthal anisotropy in central $p+Au$, $d+Au$, and ^3He+Au collisions at $\sqrt{s_{NN}}=200$ GeV. Phys. Rev. C 97, 064904 (2018).
18. Lévy-stable two-pion Bose-Einstein correlations in $\sqrt{s_{NN}}=200$ GeV Au+Au collisions. Phys. Rev. C 97, 064911 (2018).
19. Measurements of multiparticle correlations in $d+Au$ collisions at 200, 62.4, 39, and 19.6 GeV and $p+Au$ collisions at 200 GeV and implications for collective behavior. Phys. Rev. Lett. 120, 062302 (2018).
20. Nuclear dependence of the transverse-single-spin asymmetry for forward neutron production in polarized $p+A$ collisions at $\sqrt{s_{NN}}=200$ GeV. Phys. Rev. Lett. 120, 022001 (2017).
21. Measurements of azimuthal anisotropy and charged-particle multiplicity in $d+Au$ collisions at $\sqrt{s_{NN}}=200, 62.4, 39$, and 19.6 GeV. Phys. Rev. C 96, 064905 (2017).
22. B-meson production at forward and backward rapidity in $p+p$ and Cu+Au collisions at $\sqrt{s_{NN}}=200$ GeV. Phys. Rev. C 96, 064901 (2017).
23. Measurements of e^+e^- pairs from open heavy flavor in $p+p$ and $d+A$ collisions at $\sqrt{s_{NN}}=200$ GeV. Phys. Rev. C 96, 024907 (2017).
24. Cross section and transverse single-spin asymmetry of muons from open heavy-flavor decays in polarized $p+p$ collisions at $\sqrt{s}=200$ GeV. Phys. Rev. D 95, 112001 (2017).
25. Measurements of $B \rightarrow J/\psi$ at forward rapidity in $p+p$ collisions at $\sqrt{s}=510$ GeV. Phys. Rev. D 95, 092002 (2017).
26. Angular decay coefficients of J/ψ mesons at forward rapidity from $p+p$ collisions at $\sqrt{s}=510$ GeV. Phys. Rev. D 95, 092003 (2017).

27. *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).
28. Measurement of long-range angular correlations and azimuthal anisotropies in high-multiplicity $p+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C95, 034910 (2017).
29. Measurement of the relative yields of $\psi(2S)$ to $\psi(1S)$ mesons produced at forward and backward rapidity in $p+p$, $p+\text{Al}$, $p+\text{Au}$, and $^3\text{He}+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C95, 034904 (2017).
30. Measurements of double-helicity asymmetries in inclusive J/ψ production in longitudinally polarized $p+p$ collisions at $\sqrt{s}=510$ GeV. Phys. Rev. D94, 112008 (2016).
31. Azimuthally anisotropic emission of low-momentum direct photons in $\text{Au}+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C94, 064901 (2016).
32. Measurements of directed, elliptic, and triangular flow in $\text{Cu}+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C94, 054910 (2016).
33. Inclusive cross section and double-helicity asymmetry for π^0 production at midrapidity in $p+p$ collisions at $\sqrt{s}=510$ GeV. Phys. Rev. D93, 011501 (2016).
34. Scaling properties of fractional momentum loss of high- p_T hadrons in nucleus-nucleus collisions at $\sqrt{s_{NN}}$ from 62.4 GeV to 2.76 TeV. Phys. Rev. C93, 024911 (2016).
35. Transverse energy production and charged-particle multiplicity at midrapidity in various systems from $\sqrt{s_{NN}} = 7.7$ to 200 GeV. Phys. Rev. C93, 024901 (2016).
36. ϕ meson production in the forward/backward rapidity region in $\text{Cu}+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C93, 024904 (2016).
37. Forward J/ψ production in $\text{U}+\text{U}$ collisions at $\sqrt{s_{NN}}=193$ GeV. Phys. Rev. C93, 034903 (2016).
38. Dielectron production in $\text{Au}+\text{Au}$ collisions at $\sqrt{s_{NN}}=200$ GeV. Phys. Rev. C93, 014904 (2016).
39. Single electron yields from semileptonic charm and bottom hadron decays in $\text{Au}+\text{Au}$ collisions at $\sqrt{s_{NN}}=200$ GeV. Phys. Rev. C93, 034904 (2016).
40. Centrality-dependent modification of jet-production rates in $d+\text{Au}$ collisions at $\sqrt{s_{NN}}=200$ GeV. Phys. Rev. Lett. 116, 122301 (2016).
41. Measurements of elliptic and triangular flow in high-multiplicity $^3\text{He}+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200\text{GeV}$. Phys. Rev. Lett 115, 142301(2015).
42. ϕ meson production in $d+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C92, 044909(2015).
43. Measurement of parity-violating spin asymmetries in W^\pm production at midrapidity in longitudinally polarized $p+p$ collisions. Phys. Rev. D 93, 051103 (2015).
44. Systematic study of charged-pion and kaon femtoscopy in $\text{Au}+\text{Au}$ collisions at $\sqrt{s_{NN}} = 200$ GeV. Phys. Rev. C92, 034914 (2015).

Conference Proceedings

1. **Jet hadronization at LHCb.** Proceedings for the 13th 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.