

# Curriculum Vitae

as of July 14th 2016

## Michael P. McCumber, PhD

Subatomic Physics P-25, MS H846  
Los Alamos National Laboratory  
Los Alamos, NM 87545, USA

Lab: 505-667-6866  
Mobile: 505-709-8161  
Email: mccumber@bnl.gov

## Primary Research Interest

The study of energy loss and medium characteristics of the quark-gluon plasma produced by heavy ion collisions with special focus on hard scattered probes and jet properties.

## Employment

Frederick Reines Distinguished Post-doctoral Fellow at Los Alamos National Laboratory, 2014 -  
Director's Post-doctoral Fellow at LANL, 2013  
Post-doctoral Researcher at the University of Colorado, 2009 - 2012

## Education

Ph.D. in Experimental Nuclear Physics, Stony Brook University, August 2009  
Measurement of Fast Parton Interactions with Hot Dense Nuclear Matter via Two-Particle Correlations at PHENIX, Dissertation Advisor: Barbara V. Jacak  
Master of Art in Physics, Stony Brook University, May 2006  
Bachelor of Science in Astronomy, Physics, and Mathematics, University of Arizona, December 2002

## Awards, Grants & Recognitions

Los Alamos National Laboratory Directed Research Grant (\$5M), 2016  
LANL Frederick Reines Distinguished Post-doctoral Fellowship, 2014  
Young PHENIXian Recognition, 2014  
LANL Director's Postdoctoral Fellowship, 2013  
Relativistic Heavy Ion Collider & Alternating Gradient Synchrotron Best Experimental Thesis, 2010

## Invited Talks & Seminars

"Silicon II: MAPS Physics, Technology, Status, and Plans"  
2nd sPHENIX Collaboration Meeting, BNL, New York, 2016  
Role: Presented plans for an improved silicon pixel detector for sPHENIX

"PHENIX results on reconstructed jets in p+p, d+Au, and Cu+Au collisions"  
Winter Workshop on Nuclear Dynamics, Deshaies, Guadeloupe, 2016  
Role: Presented a summary of PHENIX jet results to heavy ion community

"MAPS pixel option and potential R&D"  
Inaugural sPHENIX Collaboration Meeting, New Brunswick, New Jersey, 2015  
Role: Presented plans for an improved silicon pixel detector for sPHENIX

"SiStrip Electronics R&D and Prototyping"  
BNL sPHENIX Cost and Schedule Review 2015, Upton, New York, 2015  
Role: Presented status of silicon strip detector prototyping to review committee

"PHENIX Future Plans and Prospects"  
ICNFP 2015, Kolybari, Crete, Greece, 2015  
Role: Presented plans for a future RHIC jet detector to particle physics community

"Future b-jet Measurements with sPHENIX"  
RHIC & AGS Users Meeting, Upton, NY, 2015  
Role: Presented b-jet capabilities for a future RHIC jet detector to heavy ion community

"Updated Jet Performance and Algorithm Approaches"  
Final sPHENIX DOE Science Review, Upton, NY, 2015  
Role: Presented jet background estimations and extended physics case to review panel

**“sPHENIX Jet Physics”**

High  $p_T$  Physics in the RHIC and LHC era, Nantes, France, 2014

Role: Presented overview of future RHIC jet detector upgrades to hard physics community

**“sPHENIX: Direct Photons and Fragmentation Functions”**

sPHENIX DOE Science Review, Upton, NY, 2014

Role: Presented photon and intra-jet observables for RHIC jet detector to review panel

**“sPHENIX Plans and Physics”**

RHIC & AGS Users Meeting, Upton, NY, 2014

Role: Presented overview of future RHIC jet detector upgrades to heavy ion community

**“A Big Surprise in Small Drops of Quark-Gluon Plasma at RHIC”**

Moriond QCD and High Energy Interactions, La Thuile, Italy, 2014

Role: Presented recent flow results in small systems to particle physics community

**“Hard Probes from RHIC to LHC Energies”**

XXXIII international symposium on Physics in Collision

Beijing, China, September 2013

Role: Presented an overview of heavy ion hard probes results to particle physics community

**“Future PHENIX Detector Upgrades”**

Nuclear Physics Seminar, Los Alamos National Laboratory, LANL, 2013

Role: Presented future RHIC physics opportunities at forward rapidity

**“PHENIX Results from High Transverse Momentum Probes of the Quark-Gluon Plasma”**

23th International Conference on Nucleus-Nucleus Collisions (Quark Matter)

Washington, DC, August 2012

Role: Presented latest PHENIX results on hard probes to heavy ion community

**“sPHENIX Stage I: The Future of Jet Physics at the RHIC”**

Nuclear Physics Seminar, Los Alamos National Laboratory, LANL, 2012

Role: Presented future RHIC physics opportunities at mid-rapidity

**“Back-to-back pair suppression at large transverse momentum**

**in  $\sqrt{s_{NN}} = 200$  GeV Au+Au collisions at PHENIX”**

4th international Conference on Hard and Electromagnetic Probes of

High-Energy Nuclear Collisions (Hard Probes), Eilat, Israel, 2010

Role: Presented recent jet energy loss results to an expert audience

**“Fluctuating Initial Conditions in Heavy Ion Collisions”**

Joint Center for Analysis and Theory of Heavy Ion Experiments (CATHIE)

and Theory-Experiment Collaboration for Hot QCD Matter (TECHQM) Workshop

Brookhaven National Laboratory, New York, 2009

Role: Presented early push for the incorporation of fluctuations into hydrodynamic models

**“The Absolute Normalization: Using the two-source model without a ZYAM assumption”**

Joint Center for Analysis and Theory of Heavy Ion Experiments (CATHIE)

and Rikagaku Kenkyūjo (RIKEN) Workshop, Columbia University, New York, 2009

Role: Presented mathematical basis for an alternative normalization of backgrounds

**“Energy Loss and Medium Response via Two Particle Correlations at PHENIX”**

25th Winter Workshop on Nuclear Dynamics, Big Sky, Montana, 2009

Role: Presented review of thesis results on jet energy loss

**“Probing the Medium with Fast Partons in Heavy Ion Collisions”**

University of Colorado Nuclear Physics Seminar, Boulder, Colorado, 2009

Role: Presented an overview of two particle correlations results from thesis work

**“The ‘Shoulder’ and the ‘Ridge’ in PHENIX: Medium Response to Fast Partons**

**in Heavy Ion Collisions via Di-hadron Correlations”**

20th International Conference on Nucleus-Nucleus Collisions (Quark Matter), Jaipur, India, 2008

Role: Presented review of recent two-particle results to an expert audience

## Selected Publications

- “Phi Meson Production in the forward/backward rapidity region in Cu+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”**  
A. Adare, et.al. (PHENIX), arXiv:1509.06337, Phys. Rev. C 93, 024904 (2016)  
Role: Background subtraction technique and soft physics interpretation
- “Centrality-dependent modification of jet-production rates in deuteron-gold collisions at  $\sqrt{s_{NN}} = 200$  GeV”**  
A. Adare, et.al. (PHENIX), arXiv:1509.04657, accepted by PRL, 2016  
Role: Interpretation and manuscript contributions
- “Single Electron Yields from Semi-Leptonic Charm and Bottom Hadron Decay in Au+Au Collisions at  $\sqrt{s_{NN}} = 200$  GeV”**  
A. Adare, et.al. (PHENIX), arXiv:1509.04662, submitted to PRC, 2015  
Role: Internal review committee on final result, early contributor to analysis technique
- “Future Opportunities in p+p and p+A Collisions at RHIC with the Forward sPHENIX Detector”**  
The PHENIX Collaboration, <http://www.phenix.bnl.gov/plans.html>, 2014  
Role: Jet physics case, simulations, manuscript contributions
- “Exploiting Intrinsic Triangular Geometry in Relativistic He<sup>3</sup>+Au Collisions to Disentangle Medium Properties”**  
J. Nagle, et. al., arXiv:1312.4565, Phys. Rev. Lett. 113 112301 (2014)  
Role: Simulation construction, cross-checks, manuscript contributions
- “Tests of the Quark-Gluon Plasma Coupling Strength at Early Times with Heavy Quarks”**  
A. Adare, M. McCumber, J. Nagle, P. Romatschke, arXiv:1307.2188, PRC 90 024911, 2014  
Role: Simulation analysis, interpretation, manuscript contributions
- “Quadrupole Anisotropy in Dihadron Azimuthal Correlations in Central d+Au Collisions at  $\sqrt{s_{NN}} = 200$  GeV”**  
A. Adare, et.al. (PHENIX), arXiv:1303.1794, PRL 111 212301, 2013  
Role: Analysis, interpretation, manuscript contributions
- “sPHENIX: An Upgrade Proposal from the PHENIX Collaboration”**  
A. Adare, et. al. (PHENIX), arXiv:1207.6378, submitted for DOE review, 2012  
Role: Provided jet analysis, calorimeter performance simulations, physics arguments, manuscript contributions
- “Jet-Underlying Event Separation Method for Heavy Ion Collisions at the Relativistic Heavy Ion Collider”**  
J. A. Hanks, et.al., Physical Review C 86:024908, 2012  
Role: Provided jet simulations, analysis algorithms, interpretation
- “The PHENIX Experiment at RHIC: Decadal Plan 2011-2020”**  
B. Jacak, et. al. (PHENIX), <http://www.phenix.bnl.gov/plans.html>, 2010  
Role: Provided jet analysis and simulations, physics arguments, manuscript contributions
- “Heavy Ion Initial Conditions and Correlations Between Higher Moments in the Spatial Anisotropy”**  
J. L. Nagle and M. P. McCumber, Physical Review C 83:044908, 2011  
Role: Provided simulations and manuscript contributions
- “Suppression of away-side jet fragments with respect to the reaction plane in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”**  
A. Adare, et. al. (PHENIX), Physical Review C 84:024904, 2011  
Role: Provided all analysis, interpretation, and manuscript
- “Back-to-back pair suppression at large transverse momentum in  $\sqrt{s_{NN}} = 200$  GeV Au+Au collisions at PHENIX”**  
M. P. McCumber, et. al. (PHENIX), Nuclear Physics A 855:408-411, 2011  
Role: Provided analysis, interpretation, and proceedings
- “Transition in Yield and Azimuthal Shape Modification in Dihadron Correlations in Relativistic Heavy Ion Collisions”**  
A. Adare, et al. (PHENIX), Physical Review Letters 04:252301, 2010  
Role: Provided assistance finalizing analysis, interpreting results, manuscript contributions

**“Extraction of Correlated Jet Pair Signals in Relativistic Heavy Ion Collisions”**

A. Sickles, M. P. McCumber, and A. Adare, Physical Review C 81:014908, 2010

Role: Provided mathematical framework and understanding, manuscript contributions

**“Energy Loss and Medium Response via Two Particle Correlations in Heavy Ion Collisions”**

M. McCumber, et al. (PHENIX), Proc. 25th Winter Workshop on Nuclear Dynamics, 2009

Role: Provided analysis, interpretation, proceedings

**“The 'shoulder' and the 'ridge' in PHENIX”**

M. McCumber, et al. (PHENIX), Journal of Physics G: Nuclear and

Particle Physics 35:104081, 2008

Role: Provided analysis, interpretation, Quark Matter conference proceedings

**“Dihadron azimuthal correlations in Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV”**

A. Adare, et al. (PHENIX), Physical Review C 78:014901, 2008

Role: Provided supporting analysis, cross-checks, and manuscript contributions

**“System Size and Energy Dependence of Jet-Induced Hadron Pair Correlation Shapes in Cu+Cu and Au+Au Collisions at  $\sqrt{s_{NN}} = 200$  and 62.4 GeV”**

A. Adare, et al. (PHENIX), Physical Review Letters 98:232302, 2007

Role: Provided primary analysis, and authorship

**“The Future of Quark Matter at RHIC”**

B. V. Jacak, and M. P. McCumber, Journal of Physics G: Nuclear and

Particle Physics 34:S543-S550, 2007

Role: Provided calculations of projected yields and manuscript contributions

**“Stellar Populations in the Wing of the Small Magellanic Cloud from Hubble Space Telescope Photometry”**

M. P. McCumber, D. R. Garnett, and R. J. Dufour, Astronomical Journal 130:1083-1096, 2005

Role: Primary author and analyzer, publication of undergraduate research

## **Contributed Talks**

**“An Opportunity for Forward Jet Single Spin Asymmetry Measurements at RHIC”**

6th Workshop on APS Topical Group on Hadron Physics, Baltimore, Maryland, 2015

Role: Presented spin physics case for charge-selected forward jet asymmetries

**“sPHENIX: Forward Jet and Drell-Yan Single Spin Asymmetries at RHIC”**

Joint Nuclear Physics Division Meeting of the APS and JPS, Waikoloa, Hawaii, 2014

Role: Presented spin physics case for additional forward instrumentation in sPHENIX

**“Near- and Away-side Long-Range Angular Correlations in d+Au Collisions at  $\sqrt{s_{NN}} = 200$  GeV”**

APS Spring Meeting, Denver, Colorado, 2013

Role: Presented latest two-particle correlations results implying collective behavior in d+Au

**“Jet Probes in sPHENIX”**

National Nuclear Physics Summer School: Quantifying the Properties of

Hot QCD Matter, Seattle, Washington, 2010

Role: Presented physics case for the sPHENIX upgrade

**“High  $p_T$  Pair Correlations with Respect to the Reaction Plane”**

Relativistic Heavy Ion Collider and Alternating Gradient Synchrotron Users Meeting

Brookhaven National Laboratory, New York, 2010

Role: Presented jet energy loss results as a function of medium path-length

**“Jet, Di-jet, and Gamma-jet Probes in PHENIX”**

National Nuclear Physics Summer School: Quantifying the Properties of

Hot QCD Matter, Seattle, Washington, 2010

Role: Presented a review of recent PHENIX hard probes results

**“Parton-Medium Interactions via Two Particle Correlations”**

Relativistic Heavy Ion Collider and Alternating Gradient Synchrotron Users Meeting

Brookhaven National Laboratory, New York, 2009

Role: Presented a review of jet energy loss results from thesis work

## Scientific Service

### sPHENIX MAPS Inner Barrel Tracker Project Lead

Management of inner barrel tracker project from conception to funding. Responsibilities include organizing planning, collaboration, proposals, and review presentations.  
2015 - present

### sPHENIX Heavy Flavor Jet Convener

Management of heavy flavor jet physics topics collaboration-wide. Responsibilities include organizing ongoing simulation and hardware projects, managing detector design  
2016 - present

### sPHENIX Institutional Board Member

Representative for LANL for sPHENIX, voting member on collaboration decisions  
2015 - present

### PHENIX Speakers Bureau

Selection of speakers for PHENIX + sPHENIX invited talks  
2015 - present

### PHENIX Hard Scattering, Heavy Flavor, and Jets Physics Working Group Convener

Management of hard process physics topics collaboration-wide. Responsibilities include advising ongoing analysis projects, approving preliminary results and publications.  
2012 - 2015

### Data Collection Module II Upgrade and Support

New detector installations require an order of magnitude improvement in data acquisition bandwidth. Responsibilities include software construction, hardware testing and integration, and data acquisition operation. Successfully integrated new detectors in 2011 despite late arrival of hardware. Full bandwidth achieved in first year, ahead of schedule and on budget.  
2010 - present

### Journal Referee

Physical Review Letters and Physical Review C Articles  
2011 - present

### Conference and Workshop Organization

Head Organizer for sPHENIX MAPS Cost and Schedule Workshop, March 2016  
Organizer for Santa Fe Jet and Heavy Flavor Workshop, January 2016  
Organizer for Pre-DNP sPHENIX Tracking Workshop 2015  
Session Chair at Joint Division of Nuclear Physics of the APS and JPS 2014 & APS-DNP 2015  
Organizer for Forward sPHENIX workshop in Santa Fe 2014

## References

### Division Director Barbara V. Jacak

Email: [BVJacak@lbl.gov](mailto:BVJacak@lbl.gov) Phone: 510-486-6608  
Relation: Former PHENIX Spokesperson, Dissertation Advisor

### Professor James Nagle

Email: [jamie.nagle@colorado.edu](mailto:jamie.nagle@colorado.edu) Phone: 303-735-3560  
Relation: PHENIX Co-Spokesperson, Former Employer

### Dr. John Haggerty

Email: [haggerty@bnl.gov](mailto:haggerty@bnl.gov) Phone: 631-344-8415  
Relation: Former PHENIX Data Acquisition Group Leader

### Dr. Patrick McGaughey

Email: [plm@lanl.gov](mailto:plm@lanl.gov) Phone: 505-667-1594  
Relation: Current Mentor