Welcome to the ACFI!
Our mission:

Advancing research in theoretical and experimental physics at the interface of the Energy, Intensity, and Cosmic frontiers.

http://www.physics.umass.edu/acfi/

We seek answers to key open questions about nature’s fundamental interactions, such as:

Why is there more matter than anti-matter in the Universe?

What additional forces were active during the first moments after the Big Bang?

How are protons and neutrons put together?
Activities

• **Core Research (in house):** ATLAS, EXO, LUX/LZ, J Lab parity & chiral, RHIC Spin, Borexino, Theory

• **Targeted Workshops:** Hadronic Probes, Lambda & Quasi Lambda, Higgs Portal,…

• **Visiting Researchers:** Ph.D. students (Australia, China), post-docs, faculty & senior researchers
Past Workshops

- Hadronic Probes of Fundamental Symmetries
- Lambda and Quasi-Lambda
- Unlocking the Higgs Portal
- Measuring the Neutron Lifetime
- Fundamental Symmetry Tests w/ Rare Isotopes
- Time-Reversal Tests in Nuclear & Hadronic Processes
- Hadronic Matrix Elements for Probes of CP-Violation
- The CP Nature of the Higgs Boson
- Probing the EW Phase Transition at a Next Gen PP Collider
- LHC Searches for Long-Live BSM Particles
- Neutrino Mass: From the Terrestrial Laboratory to the Cosmos
- Recent Developments in Semiclassical Probes of QFT’s
- Northeast Gravity Workshop
- Making the EWPT (Theoretically) Strong
Determination of the Free Neutron Lifetime

J. David Bowman,1 L. J. Broussard,2 S. M. Clayton,2 M. S. Dewey,3 N. Fomin,4 K. B. Grammer,4 C. L. Greener,4, 1, 1
P. R. Huffman,5 A. T. Holley,6 G. L. Jones,7 C.-Y. Liu,8 M. Makela,2 M. P. Mendenhall,9 C. L. Morris,2
J. Muiholland,4 K. M. Nollett,9, 10 R. W. Pattie, Jr.,11 S. Penttilä,1 M. Ramsey-Musolf,11 D. J. Salvat,8, 12
A. Saunders,2 S. J. Seestrom,2 W. M. Snow,8 A. Steyerl,12 F. E. Wietfeldt,13 A. R. Young,5 and A. T. Yue3

Neutron Lifetime

arXiv:1410.5311

Hadronic Probes

J Lab proposal & Physics Reports
EWPT @ 100 TeV  
arXiv: 1606.09408

Unlocking the Higgs Portal  
arXiv: 1604.05324

Long Lived Particles @ LHC

Collecting the efforts of several workshops

- “LLP Signatures” — UMass — Nov. 2015
- “Experimental Challenges” — KITP — May 2016
- LHC LLP Mini-Workshop — CERN — May 2016 & April 2017
Other Meetings & Events

• International Workshop on Baryon & Lepton Number Violation: 2015

• School on the Physics of Electric Dipole Moments: 2016

• Nuclear Theory Topical Collaboration: Neutrinoless Double Beta Decay & EDMs: 2017
Upcoming Workshops & Schools

• Neutrinos at the High Energy Frontier (July 18-20, 2017)

• The Electroweak Box (September 28-30, 2017)

• School on Neutrinoless Double Beta Decay (November 1-4, 2017)
Support

- Seed funding from UMass Amherst
- Department of Energy Office of Nuclear Physics (2018+)
Meeting Logistics

- Wireless Network: UMASS (usr & pw in packet)
- Lunch: on campus
- Workshop Dinner: Tues @ Monkey Bar Bistro, 6:30 pm
  Wed: on own in Amherst Center
- Schedule: online
- People: students, post-docs, staff (Brittany Bonenfant)
- Espresso!
This Workshop: Motivation & Goals

• What can studies at the high energy frontier teach us about the origin of neutrino mass & the nature of the neutrino?
• Are there important new directions for the LHC?
• What are the opportunities for prospective future high energy colliders (e+e-, pp, ep) & how are they complementary?
• How do energy frontier studies complement those at other frontiers?
• Possible outcomes: White paper roadmap, LPCC working group