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, DarkSide, 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
- Neutrinos at the High Energy Frontier
- The Electroweak Box
Neutron Lifetime

Determination of the Free 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

LHC LLP Community White Paper

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

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

• Testing Baryogenesis (Spring 2018)
Support

- **Seed funding from UMass Amherst**
- **Department of Energy Office of Nuclear Physics (2018+)**
- **National Science Foundation (NLDBD School)**
Meeting Logistics

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

- Provide experimentalists an opportunity to go more deeply into the physics of $0\nu\beta\beta$-decay
- Provide an opportunity to ask lots of questions
- Provide some background on connections to other areas of research: nuclear & hadronic structure, high energy physics, cosmology
- Challenge you to sharpen your presentation of the theoretical side (homework exercise)