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
- LHC Searches for Long-Live BSM Particles
- Probing the EW Phase Transition at a Next Gen PP Collider
- 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
- Testing CP-Violation for Baryogenesis
- Beta Decay as a Probe of New Physics
Neutron Lifetime

Determination of the Free Neutron Lifetime


arXiv:1410.5311

Hadronic Probes

J Lab proposal & Physics Reports
**Amherst Center for Fundamental Interactions**

*Physics at the interface: Energy, Intensity, and Cosmic frontiers*

University of Massachusetts Amherst

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**EWPT @ 100 TeV**

arXiv: 1606.09408

**Unlocking the Higgs Portal**

arXiv: 1604.05324

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**Long Lived Particles @ LHC**

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**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
- School on the Physics of Neutrinoless Double Beta Decay: 2017
Upcoming Workshops & Schools

- Theoretical issues and experimental opportunities in searches for time reversal invariance violation using neutrons (starts today!)

- > 5 for 2019: topics TBD
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) or eduroam
- Espresso!
- Lunch: on campus
- WS Dinner: Thursday @ Monkey Bar Bistro, 6:30 pm
- Amherst Center, Schedule: online
- People: students, post-docs, staff (Brittany Bonenfant)
This Workshop: Motivation & Goals

• *Tests of time reversal invariance with neutrons and nuclei continue to push the forefront of BSM sensitivity*

• *This workshop will explore the complementarity between different neutron probes and between neutron observables and those involving other systems*

• *Experimental strategies for advancing sensitivity and open theoretical challenges will be discussed*