Welcome to the ACFI!

LUX/LZ & DarkSide

ATLAS

EXO

Theory
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

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

- Testing CPV for Baryogenesis: March 2018
- Neutron & Nuclear Beta-Decay (Fall 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
- WS Dinner: Thurs, Sat: on own in Amherst Center, Fri @ Monkey Bar Bistro, 6:30 pm
- Schedule: online
- People: students, post-docs, staff (Brittany Bonenfant)
- Espresso!
This Workshop: Motivation & Goals

- Explaining the matter-antimatter asymmetry is a key open problem at the interface of nuclear & high energy physics with cosmology
- Advances in experimental CPV probes provide new opportunities to test baryogenesis scenarios
- Timely to share new ideas & developments in baryogenesis and to discuss possible experimental signatures