



# AMHERST CENTER FOR FUNDAMENTAL INTERACTIONS

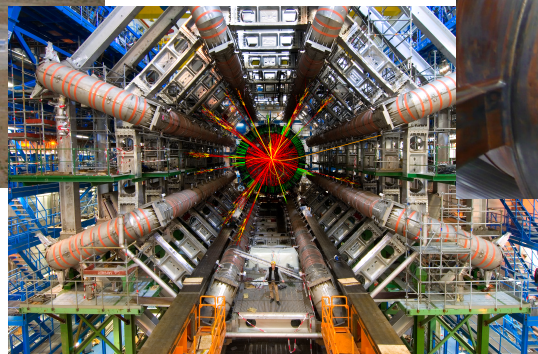
*Physics at the interface: Energy, Intensity, and Cosmic frontiers*

University of Massachusetts Amherst

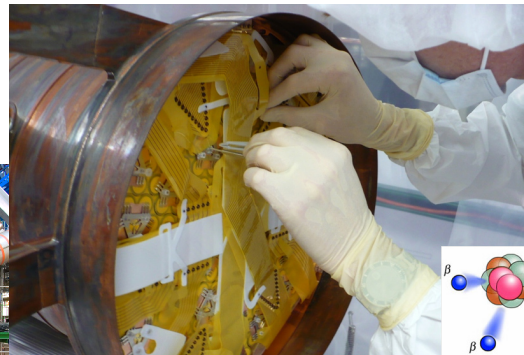
## Welcome to the ACFI !



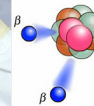
**LIGO**



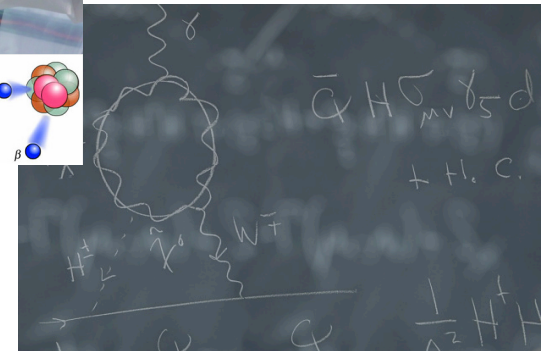
**ATLAS**



**EXO**



**Theory**





## AMHERST CENTER FOR FUNDAMENTAL INTERACTIONS

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

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*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?*

## ***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/>



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### Activities

- **Core Research (in house):** *ATLAS, EXO, 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*



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## **Past Workshops**

**Hadronic Probes of Fundamental Symmetries**

*Joint ACFI-Jefferson Lab Workshop*

March 6-8, 2014

U Mass Amherst



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## Past Workshops

**Lambda and Quasi-Lambda**

*ACFI Workshop*

April 10-12, 2014

U Mass Amherst



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## **Past Workshops**

### **Unlocking the Higgs Portal**

*ACFI Workshop*

May 1-3, 2014  
U Mass Amherst



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## **Past Workshops**

### **Measuring the Neutron Lifetime**

*ACFI Workshop*

September 19-21 , 2014

U Mass Amherst



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## Past Workshops

**Fundamental Symmetry Tests with Rare Isotopes**

*Joint ACFI-FRIB Workshop*

October 23-25, 2014

U Mass Amherst





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## **Past Workshops**

**Time-Reversal Tests in Nuclear and Hadronic Processes**

*ACFI Workshop*

November 6-8, 2014

U Mass Amherst



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## **Past Workshops**

**Hadronic Matrix Elements for Probes of CP Violation**

*ACFI Workshop*

January 22-24, 2015

U Mass Amherst



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## **Past Workshops**

**International Workshop on Baryon & Lepton Number  
Violation**

*ACFI Workshop/Conference*

April 26-30, 2015

U Mass Amherst



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## **Past Workshops**

**CP Nature of the Higgs Boson**

*ACFI Workshop*

May 7-9, 2015

U Mass Amherst



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## **Past Workshops**

**Probing the Electroweak Phase Transition with a Next  
Generation PP Collider**  
*ACFI Workshop*

September 17-19, 2015  
U Mass Amherst



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## **Past Workshops**

**LHC Searches for Long-Lived BSM Particles: Theory  
Meets Experiment**  
*ACFI Workshop*

November 12-14, 2015  
U Mass Amherst



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## **Upcoming Workshops**

**Neutrino Mass: From the Terrestrial Laboratory to the  
Cosmos**

*ACFI Workshop*

December 14-16, 2015

U Mass Amherst



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### **Meeting Logistics**

- **Wireless Network: UMASS (usr & pw in packet)**
- **Lunch: on campus**
- **Workshop Dinner: Tues @ Johnny's Tavern, 6:30 pm**  
**Monday: on own in Amherst Ctr**
- **Schedule: online**
- **People: students, post-docs, staff**
- **Espresso !**





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## Workshop Scientific Goals & Questions

- *What are the model assumptions and related uncertainties that enter cosmological determinations of the sum of the light neutrino masses?*
- *What early universe physics beyond the Standard Model might affect this determination?*
- *What are the prospective implications of cosmological mass determinations for the interpretation of kinematic mass measurements, neutrinoless double beta-decay searches, and mass hierarchy probes?*
- *What are the prospective implications of a positive signal in the next generation kinematic mass and double beta-decay searches for the interpretation of cosmological measurements?*