Amherst Center for Fundamental Interactions

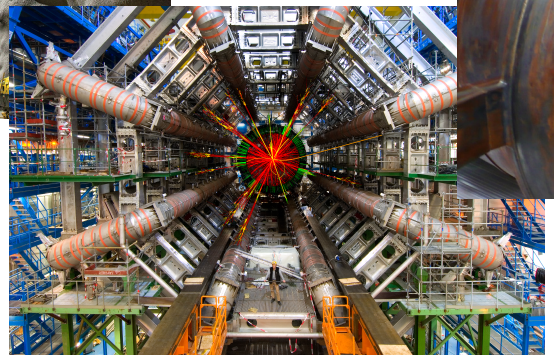
Physics at the interface: Energy, Intensity, and Cosmic frontiers

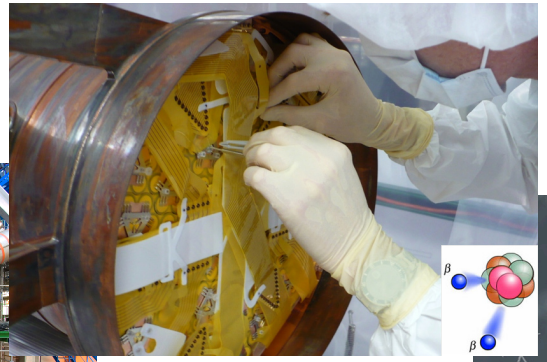
University of Massachusetts Amherst

Welcome to the ACFI !

LUZ/LZ

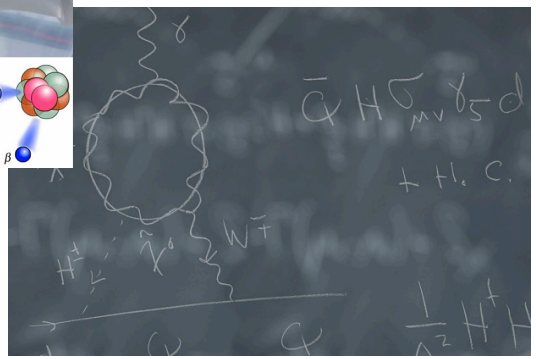
ATLAS





EXO

Theory



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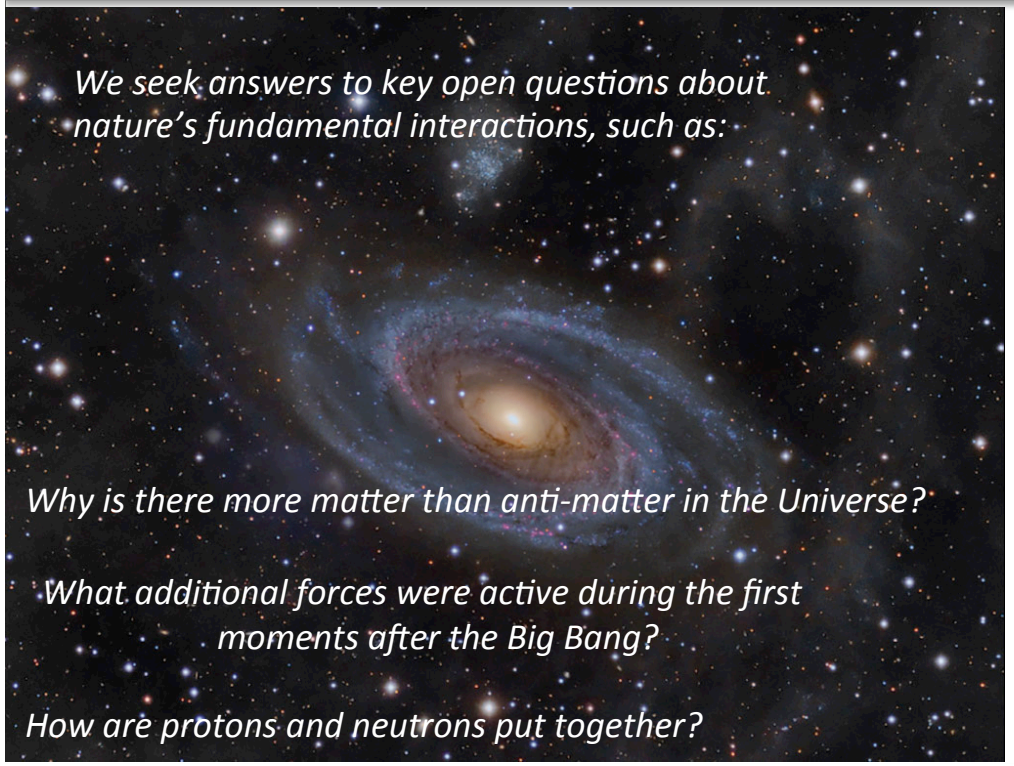

Our mission:

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, 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*

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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*

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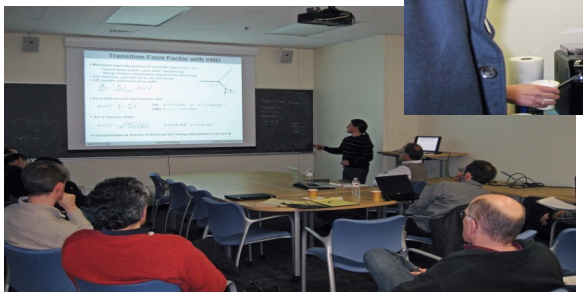
Neutron Lifetime

arXiv:1410.5311

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] G. L. Greene*,[4,1,†] P. R. Huffman,[5] A. T. Holley,[6] G. L. Jones,[7] C.-Y. Liu,[8] M. Makela,[2] M. P. Mendenhall,[3] C. L. Morris,[2] J. Mulholland,[4] K. M. Nollett,[9,10] R. W. Pattie, Jr.,[2] S. Penttilä,[1] M. Ramsey-Musolf,[11] D. J. Salvat,[8,2] 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. Yue[3]

Hadronic Probes



J Lab proposal & Physics Reports

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EWPT @ 100 TeV
arXiv: 1606.09408

CERN-TH-2016-11

Physics at a 100 TeV *pp* collider: Higgs and EW symmetry breaking studies

Editors:
R. Contino[1,2], D. Curtin[3], A. Katz[1,4], M. L. Mangano[1], G. Panico[5], M. J. Ramsey-Musolf[6,7], G. Zanderighi[1]

Unlocking the Higgs Portal
arXiv: 1604.05324

ACFI-T16-10

The Higgs Portal and Cosmology

Ketevi Assamagan,[a] Chien-Yi Chen,[b,c] John Paul Chou,[d] David Curtin,[e] Michael A. Fedderke,[f] Yuri Gershtein,[d] Xiao-Gang He,[g] Markus Klute,[h] Jonathan Kozaczuk,[i] Ashutosh Kotwal,[j] Steven Lowette,[k] Jose Miguel No,[l] Tilman Plehn,[m] Jianming Qian,[n] Michael Ramsey-Musolf,[o] Alexei Safonov,[p] Jessie Shelton,[q] Michael Spannowsky,[r] Shufang Su,[s] Devin G. E. Walker,[t] Stephane Willocq,[o] Peter Winslow[o]

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**

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Upcoming Workshops & Schools

- **The Electroweak Box (September 28-30, 2017)**
- **School on Neutrinoless Double Beta Decay (November 1-4, 2017)**
- **Testing Baryogenesis (Spring 2018)**

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Support

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

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Meeting Logistics

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

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This Workshop: Motivation & Goals

- **What is the path forward for improving our understanding of $\gamma\gamma$ exchange in semileptonic processes?**
- **How reliable are the present contributions of $Z\gamma$ and $W\gamma$ boxes for nucleons and nuclei ?**
- **What additional theoretical developments/computations are needed?**
- **Is there a program of experimental measurements that could be used to refine theoretical predictions ?**