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# LBNL Nuclear Physics Forum

**Thursday, December 15, 2016 @ 11am**

Building 88 Lounge (2nd floor)

*Cookies and coffee available from 10:45am*

**Dr. Stephan Friedrich**

Lawrence Livermore National Laboratory

**“Cryogenic Gamma-Ray Detectors with Ultra-High Energy Resolution”**

Magnetic microcalorimeter (MMCs) gamma-ray detectors with operating temperatures below 50 mK offer an order of magnitude higher energy resolution than semiconducting Ge and Si detectors. They are based on measuring the change in magnetization after gamma absorption increases the detector temperature. MMCs can have an energy resolution  $<50$  eV at 60 keV, and therefore detect isotopes whose gamma emissions are obscured by line overlap in conventional Ge detectors. The high energy resolution can greatly improve the accuracy of non-destructive analysis of nuclear materials for nuclear safeguards applications. MMCs can also enable new fundamental science experiments, and be used to increase the accuracy of nuclear data. We are currently developing arrays of MMC detectors to increase the detector sensitivity. We are also building refrigerators to make operating temperatures of 15 mK accessible fully automated and without the use of cryogenic liquids. This talk discusses the design and performance of MMC gamma detectors at LLNL, and outlines experiments for possible future collaborations.



Nuclear Science Division