

Fall 2019 Colloquium

Department of Physics & Astronomy, TAMU-Commerce

Sep 12, Thursday, 4-5 PM in Science Building 127

(coffee and cookies will be served at 3:50 PM)

Experimental Particle Physics

The Search for Neutrinoless Double Beta Decay

Dr. Benjamin Jones

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Dr. Jones earned his BS (2007) and MS (2008) degrees in Natural Sciences (specializing in Physics) at the University of Cambridge, UK, and a Ph.D. degree (2015) in Physics at the Massachusetts Institute of Technology. His Ph.D. research topics were searches for sterile neutrinos at Fermilab and the IceCube South Pole Neutrino Observatory, and his PhD thesis entitled “Sterile Neutrinos in Cold Climates” was awarded the Mitsuyoshi Tanaka Dissertation Award in Experimental Particle Physics from the American Physical Society. He worked as a post-doc at University of Texas at Arlington for one year, and from this position advanced to Assistant Professor of Physics in 2016. He is presently undertaking research in diverse areas of neutrino physics including the search for non-standard neutrino oscillation phenomena in atmospheric and astrophysical neutrinos with IceCube, and development of technologies to search for neutrinoless double beta decay in high pressure xenon gas with NEXT.

Abstract

Detection of neutrinoless double beta decay is the only known experimentally viable way to test for the possible Majorana nature of the neutrino. Observation of this decay, which may have a half-life in excess of 10^{27} years, would have existential implications: illuminating a possible explanation for the dominance of matter over antimatter in the Universe, making a definitive connection between standard model particles and ultra-high-scale physics, and demonstrating conclusively that lepton number is not a conserved quantity in nature. I will discuss the ongoing quest to detect neutrinoless double beta decay, with a focus on the NEXT program. NEXT plans to use high pressure xenon gas, eventually augmented with single molecule fluorescent imaging barium ion sensors, to extend experimental sensitivity to neutrinoless double beta decay into unprecedented new regimes.