NCU Astronomy Colloquium

Graduate Institute of Astronomy, NCU
國立中央大學天文研究所

"Evolution of Helicity Property of Relic Neutrinos and Implications on Their Detection"

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Neutrinos in the early Universe decoupled essentially in helicity eigenstates. As they propagate through the Universe, their helicities could be modified via two effects. First, neutrinos with a finite magnetic moment would rotate their spins with respect to their momenta as they encounter cosmic magnetic fields, modifying their helicities. Second, the bending of neutrino's spin by a gravitational field lags the bending of its momentum, again modifying its helicity. We study both effects and investigate the implications of the helicity modification on the detection of relic neutrinos using the Inverse Tritium Beta Decay (ITBD) reaction. We find that the ITBD rate depends sensitively on the neutrino mass hierarchy and on the Dirac or Majorana nature of the neutrinos. This talk is based on several recent papers in collaboration with Gordon Baym.