Theory of Elementary Particles, Astroparticle Physics, and Phenomenology (TEPAPP) Seminar

*Wednesday, November 23rd @ 5:00PM*

*PAB 4-708*

“Strong Supernova 1987A Constraints on Bosons Decaying to Neutrinos”

Damiano F.G. Fiorillo (Niels Bohr Institutet, Københavns Universitet)

**Abstract:** Supernovae are an ideal testbed for the existence of feebly interacting particles, which can be produced in the dense and hot cores and escape the star. If the emission is so copious that it drains significant energy from the core, it would have shortened the duration of the neutrino burst observed from SN1987A at Kamiokande II and the Irvine-Michigan-Brookhaven (IMB) detectors. This allows to constrain novel particles using an energy-loss criterion. Here we show that, if the new particles are coupled to neutrinos, they lead to an additional distortion of the neutrino signal. Focusing on the example of Majoron-like particles, we show that they could have decayed outside the core, producing 100 MeV neutrinos. Using published and unpublished legacy data from Kamiokande II and IMB, we show that no such feature was observed in 1987, allowing us to constrain the new boson emission. Our constraints are more stringent than the ones coming from Big Bang Nucleosynthesis, and imply that the emission is 100 times smaller than the flux saturating the energy-loss criterion.