Contribution ID: **373**   Type: **Poster**

Noise Model of cryogenic High Electron Mobility Transistor, feasibility study of low threshold and high discrimination efficiency low temperature semiconductor detector for Coherent Electron Elastic Neutrino Nucleus Scattering (CENNS) and low mass Dark Matter direct detection experiments

Thursday, 25 July 2019 18:45 (15 minutes)

We present a noise model of the cryogenic High Electron Mobility Transistor developed at C2N laboratory. The model is based on dedicated measurement of voltage and current noises at temperature in the 1K-10K range. The model shows that 10 eV rms and 20 eVee rms could be obtained on the heat channel and ionization channel of massive semiconductor detector operated at low temperature.

Such performance is of high interest for both Coherent Electron Elastic Neutrino Nucleus Scattering (CENNS) experiment such as Ricochet and Dark Matter direct detection experiment such as EDELWEISS. It would allow to probe sub-keV nuclear recoils as induced by sub-GeV/c2 WIMPs and MeV neutrinos from nuclear reactor while retaining electromagnetic background discrimination.

Less than 5 years of experience since completion of Ph.D

N

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Session Classification: Poster session

Track Classification: Detector readout, signal processing, and related technologies