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Systematic studies of a sapphire bolometer with phonon pulses in the temperature range of 10-100 mK

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An experiment to search for neutrinoless double beta decay in ^{124}Sn has been initiated in India [1]. It is envisaged to use a superconducting tin-based cryogenic bolometer (*TIN.TIN*) operating at ∼10 mK for this purpose. It is important to study various systematics related to the cryogenic bolometer with a relatively simpler and well-studied absorber material before making a superconducting tin bolometer. With this motivation, a cryogenic bolometer is made with a sapphire absorber (∼0.7 g) and indigenously made NTD Ge sensor [2]. A systematic study of the bolometer performance in the temperature range of 10-100 mK is performed with phonon pulses of energy equivalent to 0.3 - 5 MeV. A C++ and ROOT based pulse analysis program is developed implementing Savitzky-Golay filtering technique for analysing the bolometer signal. In this paper, response of the sapphire bolometer to phonon pulses in the temperature range of 10-100 mK will be presented. Performance of the bolometer with the addition of a moderate size tin sample (∼0.6 g) to the sapphire substrate is studied. Response of the bolometer, when tested with a ^{241}Am-^{239}Pu alpha source will be presented. Impact of vibration on the bolometer will also be discussed.

1. V. Nanal, EPJ Web of Conferences **66** (2014) 08005.
2. A. Garai et al. Journal of Low Temperature Physics **184** (2016) 609.

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

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