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Study on the noise temperature of Josephson Parametric Amplifier (JPA) used in the axion dark matter search experiment at CAPP/IBS in KAIST

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In an axion dark matter search haloscope experiment, the noise temperature of a linear amplifier is a crucial component that seriously affects the sensitivity of the dark matter axion search. In the CAPP18T experiment at CAPP/IBS in KAIST, we use a cryogenically cooled Josephson Parametric Amplifier (JPA) in order to amplify weak RF signals from a resonant cavity. In this presentation, we describe a method to obtain an accurate and repeatable input noise temperature of the JPA: We use a device with a cryogenic attenuator co-located with the amplifier. A dilution refrigerator (˜20mK) and a cryogenic High Electron Mobility Transistor are used for this measurement. We will also discuss the calibration techniques.

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