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Microwave kinetic inductance detector (MKID) provides a way to built large ground based instruments such as NIKA and AMKID. Therefore, it becomes important to understand and improve the calibration of MKID response. We propose to use the MKID readout frequency response to determine the MKID responsivity to an input RF source power. A signal can be measured in a KID as a change in the phase of the readout signal. Consequently, we assume that the responsivity is proportional to the first derivative of the resonator phase vs. readout frequency. In this paper we check under which operating condition this assumption still holds experimentally.
We used a test system created for AMKID that allow us to measure the readout phase and readout frequency of an external chopped RF source. We show that the responsivity predicted by using the readout frequency matches well the one measured using the

chopped RF source. Moreover, we repeat these measurements with different readout frequencies to check that also the general shape of the responsivity is well predicted. In addiction we analyze the same relation by applying different readout powers.
This calibration method has two particular advantages. First, it is fast enough to be used to calibrate large arrays like AMKID, that counts thousand of pixels. Second, it can be done without applying the RF source in front of the array.
Future analysis and developments will allow us to apply this method directly to AMKID instrument.