DIPARTIMENTO DI FISICA "GIUSEPPE OCCHIALINI"
WPASM5
5th Workshop on the Physics and Applications of Superconducting Microresonators

Contribution ID: **12** Type: **Oral Contribution**

# Study of Microwave Kinetic Inductance Detectors made of Crystalline Niobium

*Wednesday, 22 June 2016 14:25 (25 minutes)*

During these last decades, MKIDs have been increasingly used in the field of astrophysics. These superconductive coplanar waveguide resonators continue to be developed to improve their sensitivity to radiation from submillimetre to X-ray wavelengths. The Advanced Technology Centre of NAOJ is developing MKIDs for astronomical observations such as CMB B-mode search.
One of the parameters that characterizes a MKID is the quality factor Q of the resonance peak. This Q factor, which is determined by the losses in the system, can reach values as high as 10^6. The maximum quality factor Q of superconducting resonators is often not limited by the superconducting material or radiation, but instead by dissipation due to an amorphous dielectric.
In this contribution, we would like to present our new study on MKIDs made of crystalline niobium. The realization of the detectors is all carried out in the ATC clean room. Nb layer is deposited on sapphire wafer by sputtering process using a direct target. During the deposition, the substrate is heated up to 800 ℃. The important parameters are the vacuum quality and the speed of the rate deposition in order to obtain the purest possible crystalline layer. Then, we fabricate MKIDs based on this crystalline Nb layer.
In a first step, the characterization of the crystalline Nb layer itself gave a critical temperature of 9,4 K and a resistivity of 15,8 µm.cm that are not far from the theoretical values. Most important was the result of the Residual Resistivity Ratio measurement. RRR reached values ranging from 50 up to 100.
In a second step, the MKIDs presented very nice resonance peaks with internal quality factor Qi up to 10^6. We will present a larger characterization of crystalline Nb MKID and compare our results to similar MKIDs that we already fabricated with Nb layer but not a crystalline one.

**Primary author:** Dr DOMINJON, Agnes (NAOJ)

**Co-authors:** KROUG, Matthias (NAOJ); SHU, Shibo (University of Tokyo); SEKIGUCHI, Shigeyuchi (University of Tokyo); Prof. NOGUCHI, Takashi (NAOJ); Dr NITTA, Tom (University of Tsukuba); Prof. SEKIMOTO, yutaro (NAOJ)

**Presenter:** Dr DOMINJON, Agnes (NAOJ)

**Session Classification:** Session 1: MKIDs for optical, infrared, and millimeter wave telescopes - Part 2

**Track Classification:** Physical effects in superconducting microresonators