



Contribution ID: 78

Type: **Oral Presentation**

High quality Proximity-Coupled Al/Au bilayer Kinetic Inductance Detectors

Friday, 26 July 2019 13:00 (15 minutes)

Kinetic Inductance Detector (KID) is an appealing technology due to its straightforward fabrication in comparison to other detector technologies and the possibility it offers in multiplexing large detector arrays. The proximity effect can be used to optimally tune the property of a superconductor in a superconductor-normal bilayer structure. For the first time to our knowledge, we have successfully fabricated and characterized a proximity-coupled Al/Au bilayer Lumped element KIDs (LeKID).

We will discuss the fabrication process and the experimental characterization. The Al/Au bilayer is evaporated on a silicon substrate with a thickness of 30nm and 10nm, respectively. The measured average internal quality factor of the resonances is around 27,000. The critical temperature is 0.8K and the kinetic inductance is estimated to be around 2pH/square, which is about three time higher than the 30nm aluminum. The minimum detectable frequency of the chip is estimated to be around 60GHz. The critical temperature can be further tuned by optimizing the thicknesses of the aluminum and gold. The Al/Au KIDs represent an excellent choice for detection lower than 88GHz. This work opens the compelling possibilities of exploiting the proximity effect to further improve the KIDs performance and to develop new bilayer KIDs.

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

Y

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Session Classification: Orals LM 003

Track Classification: Low Temperature Detector fabrication techniques and materials