

Contributed Talk

Toward Mega-pixel Neutron Imager using Current-Biased Kinetic Inductance Detectors of Nb nanowires with ^{10}B Converter

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We propose a superconducting nanowire detector with ^{10}B conversion layer for sensing a single neutron. We use ^7Li ion and ^4He ion emitted as two independent heat sources, which appear in opposite direction in nuclear reaction. The operating principle is to probe a change in the kinetic inductance L_k coming from inertia of the Cooper pairs, and our detector is named as a current-biased kinetic inductance detector (CB-KID)^[1]. The signal from a nanowire detector fed by bias current I_b appears as a pulsed voltage $V = I_b dL_k/dt$ across the detector. We use two sets of meanderline of Nb wire with superconducting readout taps to monitor local signal. In between the X meander and the Y meander, we inserted ^{10}B layer as a conversion layer for neutrons. We plan to fabricate a mega-pixel neutron imager by a couple of 10 bit linear position-sensitive arrays along the X and Y directions. The single flux quantum (SFQ) circuits are used to identify the X and Y addresses.

[1] N. Yoshioka, I. Yagi, H. Shishido, T. Yotsuya, S. Miyajima, A. Fujimaki, S. Miki, Z. Wang, T. Ishida, IEEE Trans. Appl. Supercon., DOI: 10.1109/TASC.2013.2243812.

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