Signal from a single neutron from a current-biased kinetic inductance detector made of superconducting Nb nanowire

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A current-biased kinetic inductance detector (CB-KID) [1] is a novel sort of superconducting detector to sense a change in kinetic inductivity in the superconducting nanowire biased by DC current I_b. The change would be caused by various different external sources. The signal can be obtained by monitoring a voltage V across the nanowire. The signal voltage V depends on a change in kinetic inductance ΔL_k and a period of Δt as following the equation $V = I_b \Delta L_k / \Delta t$. We combine three different meander lines of Nb wire (3 μm, 1 μm and 0.6 μm in width) [2] with ^{10}B film to sense a neutron with the aid of nuclear reaction ^{10}B(n, ^{4}He) ^{7}Li. We irradiated a 20-ps pulsed laser of 1.5 μm wave length on the nanowires and confirmed a submicron spatial resolution using 0.6 μm meander line and a laser-spot scanning system. Superconducting neutron detector was reported to apply cold neutrons from nuclear reactor [2]. In the present work, we succeeded in detecting a clear signal from a single neutron at BL10 NOBORU using the CB-KID for the first time. Details of signal response of the CB-KID detector will be discussed at the conference. A mega imager of neutrons using the CB-KIDs is under development [3].

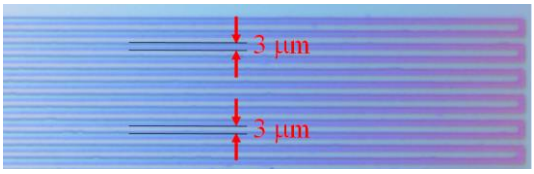

Fig. 1 Nb CB-KID (line & space 3 μm)

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