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Radiative Interband Transition of Cooper Pairs in a Semiconductor I. SUEMUNE, Y. ASANO, H. SASAKURA, C. HERMANNSTAEDTER, J.-H. HUH, Hokkaido Univ, K. TANAKA, Hamamatsu Photonics, T. AKAZAKI, NTT BRL, R. INOUE, H. TAKAYANAGI, Tokyo Univ of Science, H. KUMANO, Hokkaido Univ — Interactions of photons and superconductors have been a hot topic for superconducting (SC) qubit operations. The relevant photon energies were limited below the superconducting gap of superconductors, that is, microwave frequencies. The possibility of electron Cooper-pair interactions with photons with much higher energies was discussed theoretically [1]. In this talk we will demonstrate that Cooper pairs penetrated into a semiconductor from an adjacent superconductor by the proximity effect play a major role in interband radiative recombinations in the semiconductor experimentally. SC Nb electrodes were formed on an InGaAs/InP light emitting diode (LED) and electroluminescence (EL) around 1.55 μ m was observed from a slit formed on the surface Nb electrode. EL was drastically enhanced below the Nb SC critical temperature (T_c) of ~ 8 K [2]. The reduction of radiative recombination lifetime consistent with the observed EL enhancement was observed below T_c [3]. These results are well explained with the theory [1]. We will discuss the possibility of generating entangled photon pairs based on this new scheme. [1] Y. Asano et al., PRL 103 (2009) 187001. [2] Y. Hayashi et al., Appl. Phys. Express 1 (2008) 011701. [3] I. Suemune et al., APEX 3 (2010) 054001.

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