

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Single photon generation through exciton-exciton annihilation in air-suspended carbon nanotubes¹ AKIHIRO ISHII, TAKUSHI UDA, RIKEN and The University of Tokyo, YUICHIRO K. KATO, RIKEN — Carbon nanotubes have great potential for single photon sources as they have stable exciton states even at room temperature and their emission wavelengths cover the telecommunication bands. In recent years, single photon emission from carbon nanotubes has been achieved by creating localized states of excitons. In contrast to such an approach, here we utilize mobile excitons and show that single photons can be generated in air-suspended carbon nanotubes, where exciton diffusion length is as long as several hundred nanometers and exciton-exciton annihilation is efficient.² We perform photoluminescence microscopy on as-grown air-suspended carbon nanotubes in order to determine their chirality and suspended length. Photon correlation measurements are performed on nanotube emission at room temperature using a Hanbury-Brown-Twiss setup with InGaAs/InP single photon detectors. We observe antibunching with a clear excitation power dependence, where we obtain $g^{(2)}(0)$ value less than 0.5 at low excitation powers, indicating single photon generation. We show such $g^{(2)}(0)$ data with different chiralities and suspended lengths, and the effects of exciton diffusion on single photon generation processes are discussed.

¹Work supported by KAKENHI (26610080, 16H05962), The Canon Foundation, and MEXT (Photon Frontier Network Program, Nanotechnology Platform). A.I. is supported by MERIT and JSPS Research Fellowship, and T.U. is supported by ALPS.

²A. Ishii et al. Phys. Rev. B 91, 125427 (2015).

Akihiro Ishii
RIKEN and The University of Tokyo

Date submitted: 09 Nov 2016

Electronic form version 1.4