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Effects of longitudinal electric fields on carbon nanotube photoluminescence[1] Y. KUMAMOTO, M. YOSHIDA, A. YOKOYAMA, S. YASUKOCHI, Y. K. KATO, The University of Tokyo — We investigate modulation of single-walled carbon nanotube photoluminescence with electric fields along the tube axis by using field-effect transistor structures. The nanotubes are synthesized with chemical vapor deposition, and measurements are performed on as-grown tubes suspended over trenches formed between source and drain electrodes. As gate-voltage induced carrier doping causes peak shifts and quenching of photoluminescence,[2] care must be taken to identify the effects of longitudinal electric fields. In order to suppress the doping effects at the center of the nanotubes, we apply symmetric bias voltages between source and drain while keeping the gate at zero voltage. In addition, we use Si substrates with 1-μm thick oxide layer to reduce the gate effects at the ends of the nanotubes. After identification of individual nanotubes by photoluminescence imaging and excitation spectroscopy, we collect luminescence spectra as a function of bias voltage. As the bias is increased, we observe moderate reduction of emission intensity whose voltage dependence cannot be accounted for by gate-induced quenching. Furthermore, broadening of nanotube emission peak with increasing bias voltage is also observed.

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[2]S. Yasukochi *et al.*, Phys. Rev. B 84, 121409(R) (2011).

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