Electroluminescence Spectral Shape in Carbon Nanotube Field Effect Transistors under High Bias Conditions

MEGUMI KINOSHITA, Stony Brook University, VASILI PEREBEINOS, MATHIAS STEINER, PHAEDON AVOURIS, IBM THOMAS WATSON RESEARCH CENTER TEAM — In carbon nanotube field effect transistors, electroluminescence excited by intra-nanotube impact excitation at high source-drain bias reveals strongly broadened electronic transitions (FWHM ~150 to ~300 meV for the lowest energy peak observed) in the $E_{11}$ to $E_{22}$ energy range. Through the bias and polarization dependence of the spectra, we investigate the production mechanism of these states and consider possible causes for their bias-dependent broad lineshapes, including exciton-exciton annihilation, and high electron and phonon temperatures.

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