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Temperature Measurement of Carbon Nanotube FETs by Raman Spectroscopy HOOTAN FARHAT, HYUNGBIN SON, YING FENG, MILDRED DRESSELHAUS, JING KONG, MIT — Heat dissipation is an important concern for nanoscale electronic devices. Freely suspended carbon nanotubes experience self heating during electron transport due to a lack dissipation channels for acoustic phonons[1]. Nanotubes lying on a SiO2 substrate, however, are often assumed to be in good thermal contact with the underlying substrate [2]. In this work we show that there is substantial self-heating in nanotubes lying on a SiO2 substrate. We use Raman spectroscopy to monitor the temperature of carbon nanotube field effect transistors (FETs) as a function of the applied bias voltage. The temperature is determined from the shift in frequency and the broadening of the high energy Raman modes. Our results suggest that nanotubes FETs on a substrate can reach temperatures upwards of 700K before saturation. [1] Pop et al., PRL 95, 155505 (2005) [2] Lazzeri et al., PRB 73, 165419 (2006)

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