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Signal Enhancement in Resonant Raman Spectra from Suspended Carbon Nanotubes[1] A. WALSH, Y. YIN, B. GOLDBERG, Department of Physics, Boston University, S. CRONIN, S. STOLYAROV, M. TINKHAM, Department of Physics, Harvard University, A. SWAN, S. UNLU, Department of ECE, Boston University, W BACSA, Department of Physics, Universite Paul Sabatier —
Suspended SWNTs are grown over trenches on a quartz substrate. Resonance Raman spectra from individual tubes or small bundles are mapped spatially, near resonance, using a tunable Ti:Sappire laser. A strong signal is found either exclusively over the trench or with a factor of 5-10 enhancement compared to the substrate. This effect is observed in the radial breathing modes (RBM) Stokes, anti-Stokes, and G-band Stokes processes, and is too large to be ascribed to an electric-field standing-wave enhancement over the trench. Several resonant tubes are indicated by the presence of more than one RBM. Occasionally, in addition to a RBM in the range of 180-250 cm-1, a low energy phonon mode is observed in the range 350-410 cm-1 with the same spatial extent and resonance maxima as the RBM. RBMs with these phonon energies are unlikely to be produced by the chemical vapor deposition growth process with an iron catalyst. This implies that tube-tube interactions, higher order, or other symmetry allowed Raman modes might be responsible.

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