

Supplementary Material

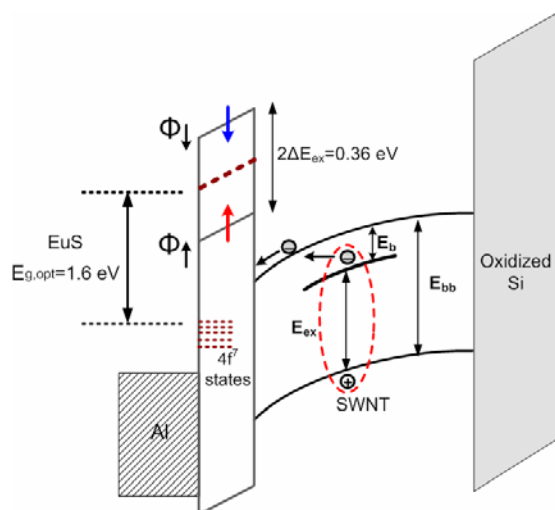


Figure S1 | Capacitive photocurrent generation mechanism for EuS coated single wall nanotubes The interband (E_{bb}) and bound exciton (E_{ex}) transition energies are indicated for an individual nanotube within the Al / EuS / SWNT / dielectric capacitor. A built-in potential exists at the EuS /SWNT interface due to the difference in work functions between the SWNT and EuS, and to the particular distribution of trapped charge existing at the interface. A bias V_{dc} applied across the capacitor can be used to vary the magnitude of the electric field, and hence the band bending at the EuS/SWNT interface. Under illumination, photon absorption results in the excitation of an electron from the ground state to form an electron-hole pair in the nanotube. If the excited charge carriers are free to move, the band bending at the EuS / SWNT interface will result in separation of the positive and negative charge, and a measurable displacement current across the capacitor. If, however, the photo-excited carriers form an exciton state, no displacement current will be measured unless the exciton first dissociates into available free carrier states.

Diameter (nm)	$^1E_{11}$ (meV)	$^3E_{11}$ (meV)	S_{11} (meV)	Δ_{ST} (meV)	$S_{11} - ^1E_{11}$ (meV)
1.44	611	588	866	23	255
1.5	573	553	680	20	107
1.63	586	569	710	17	124
1.82	729	715	-----	14	-----

Table S1 | Peak energies for EuS coated single wall nanotubes Table showing the singlet ($^1E_{11}$), triplet ($^3E_{11}$), interband (S_{11}), singlet-triplet splitting (Δ_{ST}) and singlet exciton binding energy ($S_{11} - ^1E_{11}$) for four different diameter EuS coated single wall nanotubes. The diameter is estimated from the average diameter of 15 nanotubes whose Raman spectra is taken for each sample.

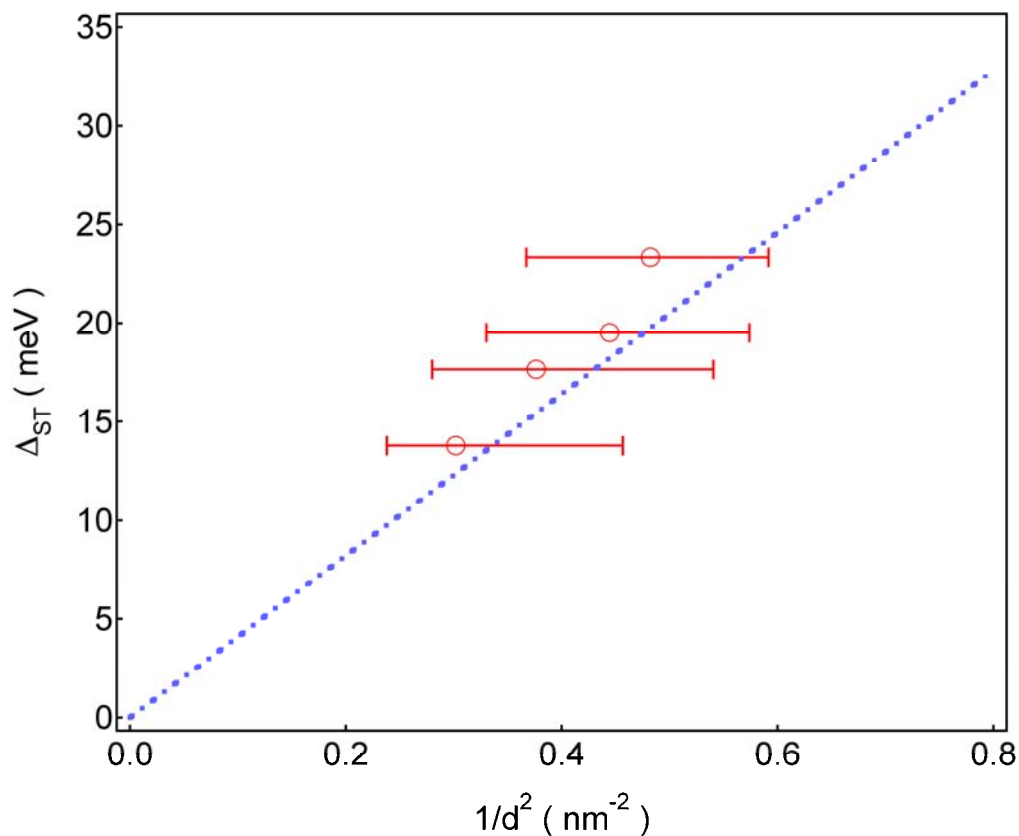


Figure S2 | Singlet-triplet splitting versus inverse diameter squared for EuS coated single wall nanotubes The measured singlet triplet splitting (Δ_{ST}) for each of the four measured EuS coated single wall nanotubes versus $1/d^2$. The error bars show the range of diameters out of the 15 measured for each sample, while the points show the average diameter. The dashed line is the theoretical prediction for the singlet-triplet splitting taken from: Capaz, R.B., Spataru, C.D., Ismail-Beigi, S. & Louie, S.G. Excitons in carbon nanotubes: Diameter and chirality trends. *Phys. Stat. Sol. (b)* **244**, 4016-4020 (2007).