**Supplemental Information**

**Millimeter Long Carbon Nanotubes: Outstanding Electron Emitting Sources**

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## S1. Current density ($J$) vs. macroscopic mean electric field ($E_0$) plots

Plotting the current density, $J$, as a function of the mean macroscopic electric field, $E_0$, results in very interesting overlapping of the *J-E* characteristics for every measured vacuum gap between 1 and 5 mm for the same 2 mm long emitter pillar. This result is shown in Figure S2. Further investigation has to be made in order to relate such value to an intrinsic property of the nanotube emitter pillars.

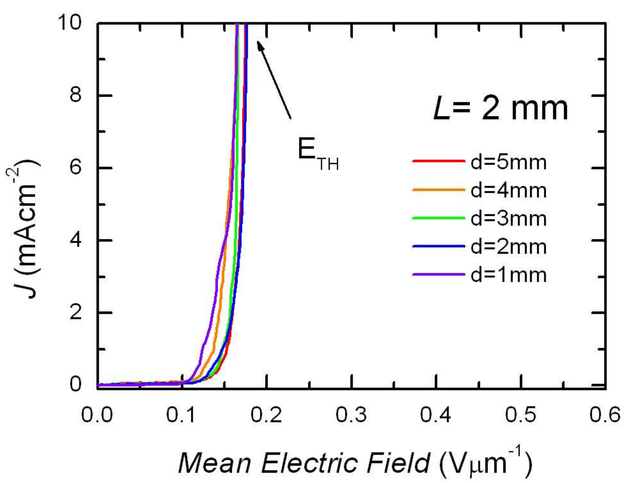


**Figure S1.** Overlapping *J-E* curves of a 2 mm CNT pillar measured at different vacuum gaps, *d*. All plots exhibit very similar turn on fiend and threshold ($E_{TH}$) values around 0.16 V/µm (mean field).

## S2. SIESTA calculations of open CNTs

For our study of open carbon nanotubes, we have used the SIESTA code,[1] which performs a fully self consistent density-functional (DFT) calculations solving the Standard Kohn-Sham (KS) equations. The KS orbitals are expanded using a linear combination of pseudoatomic orbitals as described by Junquera *et al.*.[2] We have used a double-zeta basis set with polarization function and the general gradient approximation (GGA) with the Perdew-Burke-Ernzerhof (PBE) parametrization.[3,4] Norm-conserving Troullier-Martins pseudopotentials in the Kleinman-Bylander non-local form were used to represent the core electrons.[5,6] A cutoff of 150 Ry for the grid integration was utilized to represent the charge density. The structural optimizations were performed using a conjugated gradient procedure until the maximum force was smaller than 0.04 eV/Å.

## S3. Microanalyses of the open CNT tips.

The microscopic features of the CNT-FE tips were observed by high magnification scanning transmission electron microscopy (STEM) images of pristine and used emitters were obtained in a FEI Tecnai F-30 microscope equipped with HAADF detector and an EDAX™ Energy Dispersive X-ray spectrometer. STEM micrographs were obtained from of pristine CNT pillar tips. Figure. S1 shows morphology of the nanotubes forming the emitter tip, which are open on the side because they were detached from the silicon substrate where they were grown. in addition to the open tips it was frequent to find encapsulated Fe catalyst nanoparticles near the open edge of the nanotube; EDX mapping of the particles is also shown confirming the particle chemical composition.

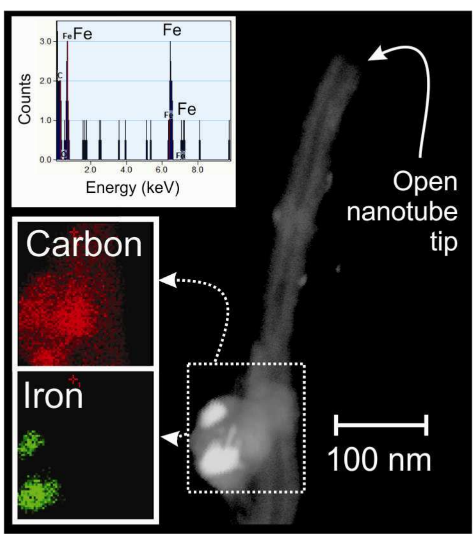


**Figure. S3.** STEM micrographs of the tips of a CNT field emitter. the CNT was freshly detached from the Si substrate, Iron catalyst nanoparticles can be found near the open edge of the CNT.

## Supplementary References

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