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Direct observation of Thermal contact resistance of a Carbon Nanotube heat spreader KAMAL HUSSAIN BALOCH, NORVIK VOSKANIAN, JOHN CUMINGS, University of Maryland College Park — For less than two decades the extraordinary thermal properties of carbon nanotubes (CNTs) have generated much interest in the scientific community. Even though they are a new material with one of the highest of thermal conductivities, the amount of heat CNTs can transport is limited by their thermal contact resistance. Several experiments have been performed to date to experimentally extract the thermal contact resistance of the CNTs. Thus far, all values reported in literature are extracted indirectly through models with assumptions about an uncharacterized heat source, typically Joule heating from within the nanotube itself. Values in the literature vary by more than an order of magnitude, suggesting fundamental uncertainties in the system. We report for the first time a direct in-situ observation of the thermal contact resistance of CNTs using Electron Thermal Microscopy, and we show that the strength of this thermal contact resistance can be manipulated through orders of magnitude. This study opens doors for using CNTs as effective nanoscale thermal transport devices in which the contact resistance of the CNTs could be controlled by design. Experimental results, simulations along with review of the experimental technique will be presented in this talk.

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