

Abstract Submitted
for the OSF15 Meeting of
The American Physical Society

Room-Temperature Radio Frequency Bolometer based on Carbon Nanotube Thin Films¹ MICHAEL GASPER, RYAN TOONEN, University of Akron, SAMUEL HIRSCH, MATHEW IVILL, U.S. Army Research Laboratory, HENNING RICHTER, RAMESH SIVARAJAN, Nano-C, Inc. — Carbon nanotube (CNT) thin films deposited on sapphire substrates have been used to realize a microwave power sensor that operates at and above room temperature. The detector includes a power-sensitive resistor (provided by a CNT-based device) that has been incorporated into a voltage divider circuit. Using lock-in detection, experiments were performed with 915 MHz test signals that showed detection over the power range of -45 dBm to 0 dBm – with 0 dBm being limited by the maximum level attainable from available equipment. A sensitivity of 0.36 mV/mW was achieved with a slightly-cooled device held at a temperature of 15 C. Additional experiments (which included static and pulsed current versus voltage measurements) indicate that the primary physical mechanism responsible for power detection near room temperature is Joule heating (a resistance change due to self-heating). Since the techniques involved in producing the CNT-based devices is relatively inexpensive, we believe that technology based on our observations could reduce the cost of biomedical instrumentation that relies on the detection of microwave power from the industrial, scientific and medical (ISM) radio frequency band of 902MHz to 928MHz.

¹The solid state devices used in this study resulted from a separate effort that was sponsored by the Institute for Soldier Nanotechnologies.

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Date submitted: 25 Sep 2015

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