Title

Terahertz Radiation From Single Walled Carbon Nanotubes

Authors

Martin M. Muthee, *University of Massachusetts Amherst* Follow

Document Type

Open Access

Degree Program

Electrical & Computer Engineering

Degree Type

Master of Science in Electrical and Computer Engineering (M.S.E.C.E.)

Year Degree Awarded

2011

Month Degree Awarded

September

Keywords

Carbon Nanotubes, Terahertz Source, Micro/Nano Fabrication, Device characterization

Abstract

The Terahertz region of the electromagnetic spectrum is the region between microwaves and infra-red, dubbed the terahertz 'gap' due to its relative underdevelopment in terms of technology. This region is marked by expensive and inconvenient sources that are bulky or that require cryogenic cooling for normal operation, therefore creating a need for cheap and easy to use terahertz sources.

Carbon nanotubes have received considerable attention since their discovery due to their unique physical and electronic properties. Many applications have been proposed using especially Single-Walled Carbon Nanotubes (SWCNTs), and a number of commercial technologies exist. In this work, we have proposed to use SWCNTs as the basis for a cheap, compact and room temperature-operating Terahertz source.

We have characterized the SWCNT source, and we present results on transport characteristics (I–V curves), radiation patterns, spectra, polarization as well as optical, SEM and AFM imaging. We show that the radiation spectrum is vi determined by integrated antennas coupled to the SWCNTs, and preliminary power calibration indicates that the radiated power exceeds the power predicated by the Nyquist formula.

First Advisor

Sigfrid K. Yngvesson