Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Aluminum Plasmonic Nanoantennas[1] HENRY EVERITT, Army Aviation & Missile RD&E Center, and Dept. of Physics, Duke University, MARK KNIGHT, Dept. of Electrical and Computer Engineering, Rice University, LIFEI LIU, Dept. of Physics & Astronomy, Rice University, YUMIN YANG, Dept. of Electrical and Computer Engineering, Rice University, LISA BROWN, SHAUNAK MUKHERJEE, Dept. of Chemistry, Rice University, NICHOLAS KING, Dept. of Physics & Astronomy, Rice University, PETER NORDLANDER, NAOMI HALAS, Dept. of Electrical and Computer Engineering, Rice University — We have explored the plasmonic properties of individual Al nanorod antennas fabricated by planar lithography on lightly doped n-type silicon. Energy-resolved cathodoluminescence was used to image the local density of optical states with a spatial resolution of $\sim$ 20 nm and thereby identify the radiative modes of these nanostructures. Al nanoantenna emission exhibited highly tunable plasmonic resonances from the deep UV through the visible region of the spectrum. The dependence of the radiative dipolar and quadrupolar plasmon modes on antenna length and photon energy agreed well with finite difference time domain-based analysis of these nanostructures. The results herald nano-structured aluminum as a practical and highly promising material system for the design and implementation of UV and visible frequency plasmonics, broadening the range of potential applications of plasmonics into areas where complementary metal−oxide−semiconductor (CMOS) compatibility or low-cost, mass producibility are desired.

[1]This work was partially supported by the Army, Air Force, NSF, and Robert A. Welch Foundation.

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Date submitted: 16 Nov 2012 Electronic form version 1.4