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Analysis and Simulation of Generating Terahertz Surface Waves in Laser-Assisted Field Emission MARK HAGMANN, NewPath Research L.L.C., GAGAN KUMAR, SHASHANK PANDEY, AJAY NAHATA, University of Utah — When the radiation from two lasers is focused on a field emission diode the electric field from the radiation is superimposed on the applied DC field, and the nonlinear dependence of the emitted current on the electric field causes the current to oscillate at the difference frequency for the two lasers. Finite Difference-Time Domain simulations and analytical solutions for a paraboloidal model of the field emission tip show that the current oscillations create a transverse-magnetic (TM) surface wave on the tip. The analytical solution for the TM fields in paraboloidal coordinates consists of products of regular and irregular Coulomb wave functions. The width of the tip is much smaller than the skin depth so interior and exterior solutions are required and a summation of the products is required to satisfy the boundary conditions at the surface of the tip. The simulations are consistent with the analytical solution and show that there is a quasi-stationary region near the apex, a transition region where the surface waves are formed, and the far-field where the waves propagate outward on the tip.

Mark Hagmann
NewPath Research L.L.C.

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