

Abstract Submitted  
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**Enhanced RF Losses and Field Enhancements Due to Surface Roughness**<sup>1</sup> PENG ZHANG, Y.Y. LAU, R.M. GILGENBACH, University of Michigan - Ann Arbor — Metal-based metamaterials support a variety of electromagnetic modes with a complex interplay between the RF electric and RF magnetic field. One such interplay is exemplified by surface roughness. This paper presents an accurate evaluation of the power absorption, and of field enhancements, due to small surface roughness on a metallic structure. Absorption through both the RF electric field and RF magnetic field components of the electromagnetic mode are accounted for, self-consistently. The surface roughness is assumed to be hemispherical, with a radius much less than the free space wavelength of the electromagnetic mode. This roughness may assume an arbitrary value of permittivity, conductivity, and permeability, however. Simple scaling laws for the power absorbed, and for the RF electric field and RF magnetic field enhancements, are given in terms of the surface roughness' skin depth, which may assume an arbitrary value ranging from zero (perfect conductor) to infinity (insulator). [Zhang et al., J. Appl. Phys. 105, 114908 (2009)].

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Peng Zhang  
University of Michigan - Ann Arbor

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