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Low frequency plasmons in thin-wire structures

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Abstract

A photonic structure consisting of an extended 3D network of thin wires is shown to behave like a low density plasma of very heavy charged particles with a plasma frequency in the GHz range. We show that the analogy with metallic behaviour in the visible is rather complete, and the picture is confirmed by three independent investigations: analytic theory, computer simulation and experiments on a model structure. The fact that the wires are thin is crucial to the validity of the picture. This new composite dielectric, which has the property of negative ϵ below the plasma frequency, opens new possibilities for GHz devices.

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