

## **Extraordinary optical transmission through finite arrays of holes.**

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Extraordinary optical transmission (EOT) occurs in arrays of sub-wavelength apertures in metal films [1]. Theoretical studies have concentrated in the infinite array situation [2]. However, samples are always finite, and the problem of how large the system has to be in order to develop EOT has not been previously considered.

We present a formalism capable of analyzing the optical properties of even thousands of holes or dimples placed in arbitrary positions in a metal film. We show the evolution of EOT with number of holes (from 1 to infinite), and how EOT is already present in finite chains of holes [3], which can be considered as the basic entity showing EOT. Finally, near-field patterns of different structures are presented, and discuss their possible application to the field of plasmonic nanolithography.

[1] T. W. Ebbesen et al. *Nature* (London) **391**, 667 (1998)

[2] L. Martín-Moreno et al. *Phys. Rev. Lett.* **86**, 1114-1117 (2001)

[3] J. Bravo-Abad, F.J. García-Vidal and L. Martín-Moreno. *Phys. Rev. Lett.* **93**, 227401, (2004).