

Enhancing the transmittance of a subwavelength aperture close to the focus of a conventional lens

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Abstract

One-dimensional light harvesting structures nano-patterned on an opaque metallic film are optimized to render high transmission efficiencies when the system is illuminated by a conventional cylindrical lens. We consider the case of a finite slit-groove array (SGA) with a given number of grooves that are symmetrically distributed with respect to a central slit, see Fig. 1. A total transmittance of 80 % is achieved even for a single slit when (i) Fabry-Perot like modes are excited inside the slit and (ii) the effective cross section of the aperture becomes of the order of the full width at half maximum of the incident beam. A further enhancement is produced by the groove array. The optimal geometry for the groove array consists of a moderate number of grooves at either side of the slit, separated by a distance of half the incident wavelength. Grooves should be deeper than those typically reported for plane wave illumination in order to increase their scattering cross section. Further details can be found in Ref. [1].

References

[1] F. Villate-Guío et al., arXiv:1403.4968 (2014).

Figures

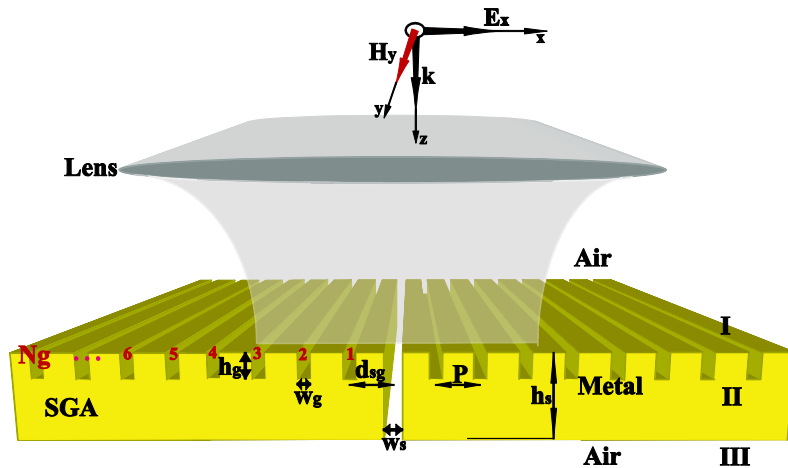


Figure 1. Schematic representation of the system under study.