# PLANE WAVE SCATTERING ON CHAIN OF SILVER NANOWIRES

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Over the last few years, much interest is devoted to metallic nanostructures and, in particular, to the strong electromagnetic enhancement they can provide via the excitations of plasmon resonances [1].

Noble-metal nanoparticles can interact strongly with visible light due to the resonance excitation of surface plasmon modes. These modes are characterized by spectrally selective scattering, and give rise to an enhancement of the local field with respect to the exciting light field [2].

The problem of electromagnetic interaction of two or more closely spaced nanoparticles is of great importance. Such configurations give rise to tunable spectral shifts of the plasmon bands and to exceptionally strong field enhancements. Indeed, the general interest in this field has strongly increased in recent years as improved nanofabrication methods now allow advanced control of nanoparticle shape and arrangement patterns of particle ensembles.

In this paper we consider H-polarized plane wave scattering on a linear chain of N identical infinite-long silver cylindrical nanowires. The main goal is to investigate the plasmon resonances of the structure. The Mie series expansion is used to derive the solution. For the refractive index value we use the experimental data obtained by Jonson and Christie [3] for bulk silver.

Spectral shift of the main plasmon resonance upon the growing of the number of nanowires has been estimated. Dependence of the plasmonic wavelength on separation distance between the nanowires has been obtained.

Fig. 1 illustrates the near-field and far-field distribution for the case of four coupled nanowires of 25 nm radii and 50 nm separation distance. Plasmonic resonance is at $\lambda = 382$ nm wavelength.

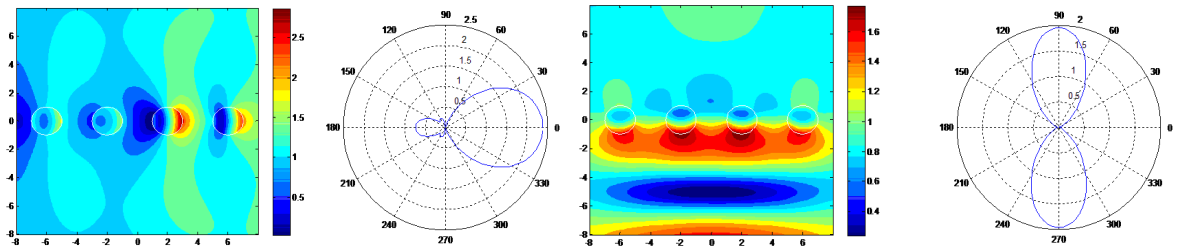

Figure 1. Incidence of a plane wave: (1)-(2) near-field and the far-field respectively (illumination along major axis); (3)-(4) near-field and the far-field respectively (illumination normal to the major axis).

[1] J.P. Kottmann, O.J.F. Martin, “Plasmon resonant coupling in metallic nanowires”, Optics Express, Vol. 8, No. 12, June 2001.

[2] U. Hohenester, J. Krenn, “Surface Plasmon resonances of single and coupled metallic nanoparticles: A boundary integral method approach”, Physical Review, 195429-1 – 195429-9, November 2005.

[3] P. Jonson and R. Christy, Optical constants of the noble metals, *Phys. Rev. B*, vol. 6, pp. 4370-4379, 1972.