Spectral response of the optical second-harmonic scattering from a metallic cylinder JESUS MAYTORENA, CLAUDIO VALENCIA, CCMC-UNAM, Ensenada B.C., Mexico — We study the scattering of second-harmonic (SH) radiation generated by an infinite cylinder of homogeneous, isotropic, centrosymmetric material and arbitrary radius illuminated perpendicularly to its axis with $p$- or $s$- polarized light. We derive analytical expressions for the SH radiated field and illustrate the theory for a simple metal cylinder. The nonlinear source polarization includes both a nonlocal bulk term and a dipole-allowed surface term which corresponds to the interfacial region where the inversion symmetry is broken. We consider the cylinder as locally flat and use the dipolar surface susceptibility resulting from a microscopic calculation based on the density functional formalism for a planar jellium surface. The frequency dependence of this surface contribution manifests itself in the spectral response. The calculated SH scattering cross section shows a separated peak corresponding to a surface-intrinsic collective mode in addition to peaks due to plasmon modes of the cylinder whose frequencies are determined by the linear optical properties at either fundamental or SH frequency.

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