The Rayleigh Hypothesis and Scattering at Photonic Crystal Surfaces[1] PRABASAJ PAUL, KYAW NYEIN, ROBERT CHOUDURY, Denison University — We examine the Rayleigh hypothesis in the context of scattering of light off photonic crystal interfaces. First, the hypothesis – which was initially suggested for scattering of waves off rough surfaces between homogeneous media – is rephrased to apply to photonic crystal interfaces. Next, an exact and explicit functional form is presented that maps a class of plane photonic crystal surfaces to periodic rough surfaces in free space, so that known criteria for the validity of the Rayleigh hypothesis for scattering at rough surfaces can be applied directly to scattering at the photonic crystal surfaces. We present numerical results for scattering amplitudes at a photonic crystal surface using both an exact method (based on a surface integral formulation) and an approximate method (based on the Rayleigh hypothesis). The results are consistent with the analytical criteria for the range of validity of the approximate method.

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