

Physics Colloquium

Michigan Technological University

Tuesday, October 23, 2007

(Note: different day and time)

11:00 am

Room 139, Fisher Hall

On the Limits of Transparency of Optical Crystals

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Abstract:

Fundamental as well as practical restrictions of the transparency of optical crystals are discussed. An example of calcium fluoride is used to show that spontaneous as well as stimulated Raman scattering is the main limitation of the material transparency at low temperatures. The spontaneous Brillouin scattering as well as stimulated Raman scattering, not spontaneous Raman scattering, determine the attenuation of the material under realistic conditions at room temperature. We also show that the intrinsic as well as extrinsic impurities determine the residual infrared optical transparency and photorefractive response of congruent nominally undoped lithium niobate crystals. We estimate the magnitude of those effects assuming that the photorefractive phenomena are triggered primarily by small polarons, bipolarons, as well as iron defects. We obtain the infrared optical response of the defects by extrapolation from their response in visible. We show that the steady state magnitude of the light-induced changes of the optical properties only slightly depends on the wavelength of the light.