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Optical Antenna Effect in Semiconducting Nanowires P.C. EKLUND, JIAN WU, G. CHEN, QIUJIE LU, H.R. GUTIERREZ, QIHUA XIONG, M.E. PELLEN, J.S. PETKO, D. WERNER — Using Raman scattering, we have observed strong optical antenna effects which we identify with internal standing wave photon modes of the wire. The antenna effects were probed in individual GaP NWs whose diameters are in the range 40<d<300 nm. The data and our calculations show that the nature of the backscattered light is critically dependent on the interplay between a photon confinement effect and bulk Raman scattering. At small diameter, d<65 nm, the NWs are found to act like a nearly perfect dipole antenna and the bulk Raman selection rules are masked leading to a polarized scattering intensity function $I_R \sim \cos^4\theta$. For larger wires, many other different polar patterns are found. Underscoring the importance of this work is the realization that a fundamental understanding of the "optical antenna effect" in semiconducting NWs is essential to the analysis of all electro-optic effects in small diameter filaments.

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