Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Terahertz Generation by Polar Nanowires Subjected to a Perpendicular Magnetic Field GARY PENNINGTON, UMD — Experiment and theory have indicated the generation of coherent terahertz (THz) radiation in III-V semiconductors electronically biased so that charge carriers enter a streaming distribution. [1] Under such conditions, the large polar optical phonon scattering rate of these materials allows for phonon emission assisted transit-time resonance (TTR). Since acoustic phonon scattering acts to de-phase TTR current oscillations, generation typically occurs at low temperatures (<10K). A reduction of the acoustic phonon scattering rate would enable TTR based THz generation at higher temperatures. A possible mechanism for such a reduction may be found using III-V nanowires which are subjected to a perpendicular magnetic field. The field would allow transport in skipping orbits along the nanowire edges with suppressed acoustic phonon backscattering.[2] To investigate such an effect, Monte Carlo simulations of carrier transport are employed. The effect of an applied magnetic field is accounted for within the confined electronic sub-band energy levels. Charge carrier scattering by confined and surface phonons are considered. [1] L. E. Vorob'ev et al., JETP Lett. 73, 219 (2001); P. Shiktorov et al., Acta Phys. Polonica A 113, 795 (2008) [3] A. Svizhenko et al., Phys. Rev. B 57, 4687 (1998)

Gary Pennington
UMD

Date submitted: 29 Nov 2009 Electronic form version 1.4