

Abstract Submitted  
for the SES09 Meeting of  
The American Physical Society

**Hi-Q whispering gallery mode resonators in nonlinear crystals**

MATTHEW SIMONS, EUGENIY MIKHAILOV, IRINA NOVIKOVA, College of William & Mary — We report on the progress of developing nonlinear crystal-based whispering gallery mode resonators, which are circular cavities that support long-lived optical modes along their inside surface via total internal reflection. We have been refining our optical polishing techniques to produce lithium niobate ( $LiNbO_3$ ) disks of  $< 1cm$  in diameter and  $1mm$  in height. We have also been optimizing the process of coupling light into whispering gallery modes using frustrated total internal reflection from a rutile prism. In a  $LiNbO_3$  disk with free spectral range of  $5.1 GHz$  coupled to a frequency-scanned diode laser centered around  $\lambda = 795nm$ , we achieved a quality factor on the order of  $Q = 10^7$ . This Q-factor is limited by the quality of polish on the surface, which we estimate to be 20/5 scratch/dig. However, this is sufficiently high to support our goal of low-threshold non-critically phase-matched frequency conversion at near-infrared wavelengths.

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Date submitted: 14 Aug 2009

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