Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

High efficiency on-chip three wave parametric frequency conversion and its applications in both classical and quantum optics XIANG GUO, CHANGLING ZOU, CARSTEN SCHUCK, HOJOONG JUNG, RISHENG CHENG, HONG X. TANG, Yale Univ — Second order nonlinearity (?(2)) is one of the most widely explored properties in photonics. Integrating nonlinear devices on a photonic chip attracts more and more attention due to the devices small foot-print and large scalability. However, ?(2) nonlinearity in a scalable platform is normally believed to be weak due to difficulties in finding a suitable material with both high nonlinearity and compatibility with advanced nanofabrication technologies. Aluminum nitride is newly developed as a material combining such two properties: high nonlinearity in low-loss, small foot-print waveguide circuits. In experiment, we fabricate microring resonator devices supporting both telecom and visible modes and achieve exceptionally large second harmonic generation efficiency. High quality photon pair generation is further demonstrated with a generation rate of 3 MHz/mW for degenerate photon pair and 5.8 MHz/mW for non-degenerate photon pair. Furthermore, the strong nonlinearity results in coherent interaction between two spectraly far-away modes which manifest as a nonlinear optic induced transparency and efficient frequency converter. We envision more interesting and important applications in the AlN platform combining its outstanding linear and nonlinear properties.

Xiang Guo
Yale Univ

Date submitted: 06 Nov 2015 Electronic form version 1.4