

Abstract Submitted  
for the MAR10 Meeting of  
The American Physical Society

**NIR spectrometer based on frequency up-conversion technology**

LIJUN MA, OLIVER SLATTERY, XIAO TANG, National Institute of Standards and Technology — Due to high noise and low sensitivity of single photon detectors in near the infrared (NIR) range, the performance of NIR spectrometers is limited in comparison to that in visible region. We have implemented a NIR spectrometer based on a frequency up-conversion detector. This detector uses a periodically poled lithium niobate waveguide to convert signal photons at 1310 nm to 710 nm by using a pump laser around 1550 nm. The converted photons at 710 nm are then detected by a silicon-based avalanche photodiode. According to energy conservation condition in the conversion process, tuning the pump wavelength allows us to trace out the spectrum of the signal. We further developed a polarization independent NIR spectrometer with two up-conversion detectors and a polarizing beam splitter. The sensitivity of the spectrometer is better than -120 dBm, which is at least three orders-of-magnitude higher than that of any commercial optical spectrum analyzer in this range. The spectrometer can not only measure polarization-independent spectra, but also provide spectral components for two orthogonal polarization orientations. In this talk, we describe the NIR spectrometer based on frequency up-conversion detectors, and experimentally study its detection efficiency, sensitivity, resolution and its dynamic operation range.

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Date submitted: 10 Nov 2009

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