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A Gallium Nitride Single-Photon Source STEPHAN GOETZINGER, CHARLES SANTORI, YOSHIHISA YAMAMOTO, Stanford University, SATOSHI KAKO, KATSUYUKI HOSHINO, YASUHIKO ARAKAWA, University of Tokyo — Nitride semiconductors have emerged as important materials for blue and ultraviolet light-emitting diodes with numerous commercial applications. However, their large bandgaps make these materials also interesting for quantum information applications, such as quantum cryptography. We report on a single-photon source based on a gallium nitride semiconductor quantum dot emitting at a record-short wavelength of 357 nm. The power dependence of the second order coherence function suggests a two-level model for photon antibunching, where the antibunching timescale converges to the exciton decay time in the weak-excitation limit. This is supported by fluorescence lifetime measurements on single quantum dots. In temperature dependent measurements, photon antibunching was observed up to about 75 K. At higher temperatures, spectral broadening, which is likely enhanced by the large built-in electric field, eliminates the possibility of isolating a single optical transition. In a pulsed experiment at 10 K, we estimated a suppression of the two-photon emission probability to about 25% compared to a poissonian source.

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