Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Solid-state ensemble of highly entangled photon sources at rubidium atomic transitions[1] MICHAEL ZOPF, ROBERT KEIL, YAN CHEN, BIANCA HFER, JIAXIANG ZHANG, FEI DING[2], OLIVER G. SCHMIDT[3], Institute for Integrative Nanosciences, IFW Dresden, Helmholtzstrae 20, 01069 Dresden, Germany — Semiconductor InAs/GaAs quantum dots grown by the Stranski-Krastanov method are among the leading candidates for the deterministic generation of polarization entangled photon pairs. Despite remarkable progress in the last twenty years, many challenges still remain for this material, such as the extremely low yield (¡ 1% quantum dots can emit entangled photons), the low degree of entanglement, and the large wavelength distribution. Here we show that, with an emerging family of GaAs/AlGaAs quantum dots grown by droplet etching and nanohole infilling, it is possible to obtain a large ensemble (close to 100%) of polarization-entangled photon emitters on a wafer without any post-growth tuning. Under pulsed resonant two-photon excitation, all measured quantum dots emit single pairs of entangled photons with ultra-high purity, high degree of entanglement (fidelity up to F=0.91, with a record high concurrence C=0.90), and ultra-narrow wavelength distribution at rubidium transitions. Therefore, a solid-state quantum repeater - among many other key enabling quantum photonic elements - can be practically implemented with this new material.

[1]Financially supported by BMBF Q.Com-H (16KIS0106) and the Euro- pean Union Seventh Framework Programme 209 (FP7/2007-2013) under Grant Agreement No. 601126 210 (HANAS)

[2]Institut fr Festkrperphysik, Leibniz Universitt Hannover, Appelstrae 2, 30167 Hannover, Germany

[3]Merge Technologies for Multifunctional Lightweight Structures, Technische Universitt Chemnitz, Germany

Michael Zopf
Institute for Integrative Nanosciences, IFW Dresden

Date submitted: 20 Nov 2016 Electronic form version 1.4