

HOLMES LAB

[Quantum Materials and Nanostructure Science]

Institute of Industrial Science, Institute for Nano Quantum Information Electronics

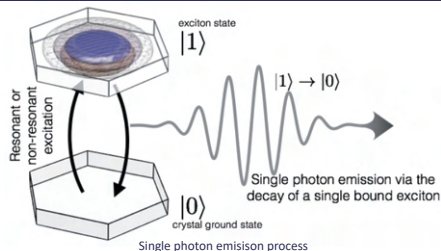
Department of Electrical Engineering and Information Systems, Graduate School of Engineering

<http://www.holmeslab.iis.u-tokyo.ac.jp>

Developing quantum light sources

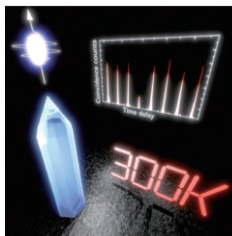
In the Holmes lab we are working on the development of single photon emission technologies, and gaining an understanding of the basic physical processes that occur in semiconductor nanostructures.

In particular we are currently investigating quantum dot and defect based nanostructures in the III-nitride material system (which is typically used in blue LEDs and laser diodes) for single photon emission. III-nitride materials have recently been shown to emit single photons, even when held at high temperatures. This may lead to the development of interesting quantum devices in future.

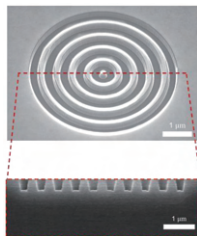


Experiments with advanced optical microscopes

In order to probe these materials, we employ a range of lasers (both continuous wave and ultrafast pulsed) and an advanced closed cycle helium cryostat with piezo positioners. Using this set up we are able to investigate the carrier dynamics in III-nitride nanostructures, and also measure fast single photon emission.



Example of room-temperature single photon emission



Bullseye structure used to enhance photon extraction

International collaborative research

The Holmes lab is based at the Institute of Industrial Science. In aiming at performing world leading research in the fields of nanophotonics and nano-optoelectronics, we are carrying out collaborative research both within the university (with the Arakawa and Iwamoto laboratories) and with several groups from around the world (including the U.K., Spain, Germany, and China). For more information please be sure to check the lab homepage.



Optical setup used for single-QD measurements

