Internal quantum efficiency (IQE) measurements of light-emitting diodes

Background: There are several techniques of indirectly measuring the IQE of LEDs. The most reliable technique seems to be based on measuring the light intensity around 10 K or below (see figure 1), and extracting the IQE from a comparison between a low and high temperature measurement.



Figure 1: Light intensity dependence on temperarture

Another technique which is more straightforward in terms of experimental setup and does not involve low temperature measurement is based on measuring the photoluminescence by varying the excitation power. Using a simple theoretical model the IQE can be extracted from the PL dependence on excitation power (see Figures 2a,b). However, the issues regarding this approach are the difficulty in ensuring that the assumptions of the model are fulfilled, and experimentally measuring the required parameters.



Figure 2a,b: Determination of internal quantum efficiency (IQE)

Object: The comparison between these techniques needs to be conducted, by measuring the IQE of multi quantum-well InGaN/GaN LEDs. Moreover, the effectiveness of measuring the photoluminescence by varying the excitation power is to be validated.

Contacts:

Haiyan Ou, building 345v, room 172, phone 4525 6374, haou@fotonik.dtu.dk

Ahmed Fadil, building 344, room 010, phone 45256345, afad@fotonik.dtu.dk