

Project

Fluorescence detection at the few-photon level using a silicon multi-pixel photon counter.

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Task: Si multi-pixel photon counters (often called silicon photomultipliers) are photon detectors that are based on arrays of Si avalanche photodiodes operated parallel. They are capable of detecting and counting individual photons, but suffer from a high dark-count rate ($\sim 10^6$ photons/s).

The goal of the project is to develop a data readout system capable of measuring slowly varying (with resolution on a scale of seconds) light levels in the range 10^2 – 10^5 photons/s) by using a Si MPPC combined with signal processing techniques.

The system will be used to measure fluorescence radiation induced by a 405 nm solid-state laser that may be pulsed.

The work involves testing a range of signal correlation techniques such as correlated detection and wavelet-based extraction of signals buried in noise as well as adaptive gain control based on noise signal analysis.