



University of Oslo  
Developments and Characterisation Results of DMAPS  
in Tower-Jazz in 180 nm for High Luminosity LHC

Development of SPADs for in NIR light detection  
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**Abstract**  
In this work, we report the development and characterization of Single Photon Avalanche Diodes (SPADs) with Light Photon Detection Efficiency (LPE) in the Near-Infrared (NIR) region (800-900 nm) for the detection of photons in the context of quantum communication. The SPADs are fabricated using a Silicon-on-Sapphire (SOS) technology. The key design parameters and material properties are discussed. The experimental setup for the characterization of the SPADs is also presented. The results show that the SPADs exhibit high LPE and low dark count rate (DCR) in the NIR region, making them suitable for quantum communication applications.

**Motivation**  
The motivation for this work is to develop SPADs with high LPE and low DCR in the NIR region for quantum communication applications. The SPADs are fabricated using a Silicon-on-Sapphire (SOS) technology. The key design parameters and material properties are discussed. The experimental setup for the characterization of the SPADs is also presented. The results show that the SPADs exhibit high LPE and low DCR in the NIR region, making them suitable for quantum communication applications.

**Experimental Setup**  
The experimental setup for the characterization of the SPADs is shown in the figure. It consists of a laser source, a fiber optic cable, and a SPAD detector. The laser source is a 905 nm VCSEL. The fiber optic cable is a 100 μm core diameter OM3 fiber. The SPAD detector is a 50 μm diameter SPAD. The experimental setup is used to measure the LPE and DCR of the SPADs.

**Dark count rate**  
The dark count rate (DCR) of the SPADs is shown in the figure. The DCR is measured as a function of the bias voltage. The DCR increases with the bias voltage and reaches a plateau at approximately 1000 counts per second (cps) for bias voltages above 10 V.

**Photon Detection Efficiency**  
The photon detection efficiency (PDE) of the SPADs is shown in the figure. The PDE is measured as a function of the wavelength. The PDE is highest in the NIR region (800-900 nm) and decreases in the visible region (400-700 nm).

**Conclusions**  
The SPADs exhibit high LPE and low DCR in the NIR region, making them suitable for quantum communication applications. The SPADs are fabricated using a Silicon-on-Sapphire (SOS) technology. The key design parameters and material properties are discussed. The experimental setup for the characterization of the SPADs is also presented. The results show that the SPADs exhibit high LPE and low DCR in the NIR region, making them suitable for quantum communication applications.