SPAD Measurements

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Abstract

This report documents the experimental setup for the characterization of Single Photon Avalanche Diodes (SPADs). The objectives are to measure the timing jitter of the detectors and to perform coincidence detection experiments. Measurements are conducted using a femtosecond pulsed laser and a continuous-wave pseudothermal light source. This document outlines the hardware configuration, optical pathways, and data acquisition parameters required for the lab session.

Introduction

This is the introduction. Describe the background and motivation for the work here. This is an example of a citation [Einstein, 1905].

Theoretical Framework

Equipment and Materials

LASER and Light Sources

- Pulsed LASER
  - **NKT Photonics**
  - Model: [Origami XP / Origami HP] (Femtosecond)
  - Wavelength: [ ] nm (e.g., 1030 nm or 515 nm)
  - Pulse Duration: [ ] fs
  - Repetition Rate: 50 MHz
- **Continuous Wave (CW) LASER**
  - Brand / Model: [ ]
  - Wavelength: [ ] nm
  - Operating Power: [ ] mW
- **Pseudothermal Light Simulator**
  - Components: Rotating ground glass diffuser and pinhole aperture.
  - Diffuser Motor Speed / Coherence Time: [ ] ms

Timing Electronics

- Swabian Instruments Time Tagger
  - Connection: USB 3.0
  - Max Data Transfer Rate: 90 MTags/s
  - Max Input Frequency: 475 MHz
  - Dead Time: 2.1 ns
  - Base Jitter: 42 ps RMS (100 ps FWHM)
  - Physical Inputs: 4 (50 Ω impedance)
  - Trigger Level Range: -2.5 V to +2.5 V
- **Fast Photodiode (Laser Clock)**
  - Brand / Model: [ ]
  - Function: Generates the 50 MHz electrical clock signal from the pulsed laser.
  - Bandwidth / Rise Time: [ ] GHz / [ ] ps

Detectors and Optical Components

- **Single Photon Avalanche Diodes (SPADs)**
  - Brand / Model: [ ]
  - Active Area: [ ] μm
- **Neutral Density (ND) Filters**
  - Optical Density (OD) values applied: [ ]
- **Connectivity**
  - Type: High-bandwidth SMA Cables
  - Impedance: 50 Ω

Methodology

Results

Conclusion

References

[Einstein, 1905] Einstein, A. (1905). On the electrodynamics of moving bodies. *Annalen der Physik*, 17:891–921.