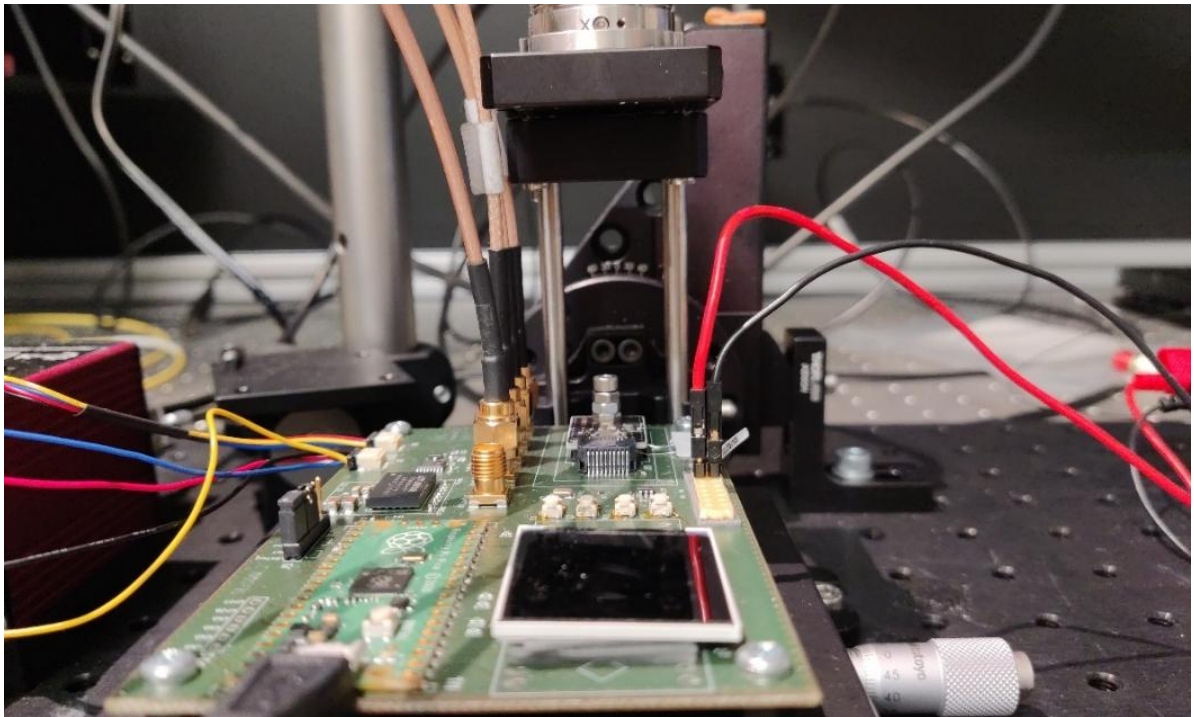


FRAUNHOFER INSTITUTE FOR INTEGRATED CIRCUITS IIS
DIVISION ENGINEERING OF ADAPTIVE SYSTEMS

SINGLE PHOTON AVALANCHE DIODE (SPAD) CHARACTERIZATION AT FRAUNHOFER IIS DRESDEN

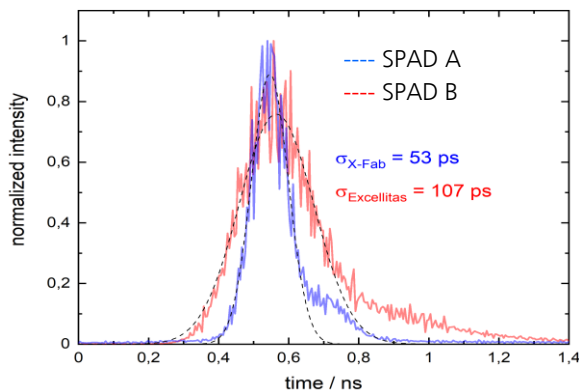


Quantum optics laboratories, quantum communication testbeds, and high-precision Time-Correlated Single Photon Counting (TCSPC) experiments rely on reliable single-photon detection across a range of wavelengths. Single-photon avalanche diodes (SPADs) offer the necessary picosecond-scale timing precision and high detection efficiencies for these applications. Comprehensive optical characterization is essential to fully exploit the potential of these semiconductor detectors.

Equipment

Our specialized measurement setup enables highly stable and flexibly configurable optical characterization and calibration:

- **Tunable laser sources:** Seamless coverage of broad wavelength ranges for analyzing wavelength dependence
- **Pivoting fiber-to-free-space coupling:** Adjustable alignment for precise angle- and position-resolved
- **Temperature control:** Stabilized test conditions for characterization under real operating conditions



Characterization & Calibration

We offer detailed measurements and calibrations to fully characterize the optical and temporal properties of your SPADs regarding:

- Photon Detection Efficiency (PDE)
- Dark Count Rate (DCR)
- Timing Jitter
- Dead Time
- Temperature Dependence
- Electrical Output Signal Form
- Spectral Response

SPAD chip and ASIC-design

Drawing on extensive expertise, we support you in the development of customized SPAD components and provide services for integrated electronics. Our portfolio includes the design of analog and digital ASIC modules, covering, for example, fast quenching, high-precision comparators, and universal system interfaces.

Your Benefits

- **Comprehensive technology qualification:** Reliable validation of SPAD behavior under varying temperature conditions and customized application requirements
- **Precise optical analysis:** Detailed mapping of incident angle dependencies and wavelength impacts for optimized light coupling.
- **Maximized SPAD performance:** Peak timing precision, detection efficiency (PDE), and minimized dead time through tailored ASIC and quenching electronics.
- **Efficient data collection & analysis**

About us

The Fraunhofer Institute for Integrated Circuits IIS is a world leader in research on microelectronic and IT system solutions. At its Dresden division, scientists develop key technologies for cutting-edge adaptive systems that independently detect, analyze, and evaluate environmental or internal changes using innovative algorithms and powerful sensors. Additional focus areas include the automatic analysis of large data volumes, artificial intelligence, IoT, and connected automation in production processes.

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