German University developing real-time quantum-optical spectroscopy seeks partners for system integration and applied spectroscopy to apply for EU calls

Summary

Profile type	Company's country	POD reference
Technology offer	**Germany**	**TODE20240731009**
Profile status	**Type of partnership**	**Targeted countries**
PUBLISHED	**Research and development cooperation agreement** **Commercial agreement with technical assistance**	**• World**
Contact Person	**Term of validity**	**Last update**
Johannes BÖHMER	**8 Aug 2024** **8 Aug 2025**	**8 Aug 2024**

General Information

Short summary

An experimental physics group at an outstanding German Technical University with in depth expertise in the fields of photonics, quantum optics and laser spectroscopy, is interested in joint projects with European academic or commercial partners in the area of ultrafast quantum optics and nanophotonics, e.g. in information and communication technology, to apply for grants in the upcoming EU calls.

Full description

The experimental physics group at the German Technical University has in depth expertise in the fields of photonics, quantum optics, laser spectroscopy and is interested in joint projects with European academic or commercial partners in the area of ultrafast quantum optics and nanophotonics, e.g. in information and communication technology, to apply for grants in the upcoming EU calls.

The main activity of the group involves developing quantum optical measurement techniques such as measuring photon number noise or phase space distributions. A strong focus is on speeding up the measurements and the data analysis so that real-time data acquisition and feedback become possible. Real-time quantum optical measurements have significant application potential in spectroscopy, particle size determination, materials science, photonics and quantum communication.

They would like to carry out a project to establish real-time quantum optical measurements for concrete applications in material analysis, analysis of optical signals, quantum random number generation or similar topics. As such, the group is seeking to form consortia to develop cutting edge in-situ materials analysis protocols, dynamic light scattering, real-time quantum light field analysis tools or high-entropy quantum random number generators.

Depending on the target application, the university is looking for academic or corporate partners that work on system integration and high-speed electronic devices, material science, particle size measurements via dynamic light scattering, real-time electronics, neural networks, predictive maintenance and simulations.

At the hardware and software level the research group is open to collaborate with any partner who is interested in realizing ultrafast homodyne detection in a certain wavelength range of interest, system integration or realizing real-time adaptive feedback and real-time data analysis.

At the application level, the university seeks collaborations with academic or corporate to utilize quantum noise properties of light fields as benchmarks in their applications. This may, e.g., include in-situ material testing, on-chip testing of optical devices or particle size monitoring through dynamic light scattering.

Advantages and innovations

The research group has pioneered cutting edge ultrafast continuous-variable quantum-optical detection techniques, e.g. by demonstrating of kHz-rate g(2)-measurements in the visible spectral range – orders of magnitude faster than what common Hanbury Brown-Twiss measurements can achieve.

The research works demonstrated the high application potential of our detection techniques for quantum technologies by rigorous benchmarking of the quantum coherence of light fields or identifying security threats arising through side-information in quantum random number generators.

The standout benefit of the developed quantum technologies is the possibility to perform real-time data acquisition and possibly also adaptive feedback based on the quantum noise of light fields, which is useful in any field, where the light field noise carries information, such as molecular particle size measurements or on-chip testing of semiconductor light sources.

Technical specification or expertise sought

Stage of development

Under development

Sustainable Development goals

- **Goal 9: Industry, Innovation and Infrastructure**
- **Goal 17: Partnerships to achieve the Goal**

IPR Status

No IPR applied

IPR Notes

Partner Sought

Expected role of the partner

At the hardware and software level the university is open to collaborate with any partner who is interested in realizing ultrafast homodyne detection in a certain wavelength range of interest, system integration or realizing real-time adaptive feedback and real-time data analysis.

At the application level, collaborations with academic or corporate partners to utilize quantum noise properties of light fields as benchmarks in their applications are sought. This may, e.g., include in-situ material testing, on-chip testing of optical devices or particle size monitoring through dynamic light scattering.

Type of partnership

Research and development cooperation agreement

Commercial agreement with technical assistance

Type and size of the partner

- **Other**
- **Big company**
- **SME 11-49**
- **R&D Institution**
- **SME <=10**
- **University**
- **SME 50 - 249**

Dissemination

Technology keywords

- **01003005 - Computer Hardware**
- **01002001 - Micro and Nanotechnology related to Electronics and Microelectronics**
- **01001002 - Digital Systems, Digital Representation**

Market keywords

- **03005 - Laser Related**
- **03001009 - Other electronics related (including keyboards)**
- **03001001 - Semiconductors**
- **03008004 - Other electronics related (including alarm systems)**
- **03006 - Fibre Optics**

Targeted countries

- **World**

Sector groups involved

- **Electronics**
- **Digital**
- **Energy-Intensive Industries**