

Research Development Fund – Cover Page  
Application Title: **Advanced Spectroscopic Facility**

**Lead contact for RDF Application:**

**Name: Alexei V. Sokolov**

**Department: Physics and Astronomy**

**Email address: [sokol@tamu.edu](mailto:sokol@tamu.edu), Phone number: 979-845-7733**

Key Participating Units: **College of Science** (PI: Sokolov, Physics&Astronomy), **College of Engineering** (Co-PI: Vlad Yakovlev, Biomedical Eng.), **College of Agriculture and Life Sciences** (Co-PI's: Dmitry Kurousky, Biochemistry&Biophysics, and Girish Agarwal, Biological&Agricultural Engineering).

**Anticipated Request Amount (\$): \$875,000**

**Executive summary of the intended application to utilize Research Development Funds:**

We propose to develop an experimental facility for advanced optical spectroscopy. The team of investigators (PI and co-PI's) will represent three major university units/colleges: Science, Engineering, and AgriLife. This broad representation signifies the broad impact this facility will have -- crossing departmental and college borders. The interdisciplinary nature is common to the field of optical spectroscopic characterization: optical instrumentation, which we intend to purchase, will be used in a broad range of agricultural, industrial, environmental, biomedical, security and forensic research.

This facility will leverage our recent DoD funding (a DURIP equipment grant from the Office of Naval Research, ONR). We will use the RDF funds to develop it into an interdisciplinary research facility, which goes beyond the single application it was originally intended for. In short: we are using \$575,000 (which includes the DURIP grant and matching funds from the Institute for Quantum Science and Engineering) to buy the most advanced femtosecond laser system equipped with optical parametric amplifiers capable of producing high-power laser pulses at wavelengths ranging from mid-infrared, through visible, and into the deep ultraviolet spectral range. We will be setting it up in the Large Laser Hall in the basement of Mitchel Physics Building. In addition to the laser system itself, the DoD funds will allow us to purchase and install some simple diagnostics equipment.

The RDF funds, if granted, will be used to supplement this system by a matching set of state-of-the-art spectroscopic equipment that will make the lab into a truly versatile facility to be used by a larger group of researchers for a diverse range of projects. This will immediately benefit a recently funded ERC (PI Dr. Cote, who is interested in a variety of polarimetry measurements and mid-infrared spectroscopy), the existing [National Center for Therapeutics Manufacturing](#) (PI Dr. Haridas) with recently received ARMI funding from DARPA for a number of projects related to large scale remote imaging / spectroscopic quality control, and a recently awarded NSF's UICRC on forensic science (Dr. Yakovlev, Co-PI).

We envision that this facility will also benefit a number of emerging research areas which are clearly aligned with the Texas A&M University strategic research initiatives: (1) Environmental sensing, *i.e.* developing modern techniques for detection and sensing of atmospheric pollutants, CO<sub>2</sub>, environmental toxins and pathogens such as black mold; (2) Agricultural detection and sensing, *i.e.* techniques for precision agriculture that will allow to identify and target spots of plant stress; (3) Energy-related research that will allow to detect and identify chemical leaks and gas composition in various industrial and safety applications.

Every one of these research directions will undoubtedly produce high-impact results and high-profile publications. Moreover, we envision using this facility to leverage larger external funding. Having this facility will allow us to obtain center-type (multi-million) grants from NSF, DoD, DARPA, DoE, NIH and other agencies.

In summary: We proposed to build upon the recent ONR equipment grant and bring the laboratory -- already being setup, with quality space provided -- to a level of user-friendly facility, which will allow a large number of investigators across the campus to collect unique spectroscopic data, which, otherwise, are not available not only at Texas A&M University, but also at the nearby academic institutions.