

## Research Development Fund – Fall 2015 Application

**Application Title:** TEXAS A&M UNIVERSITY-PREEMINENT RESEARCH IN IMAGING DIAGNOSTICS FOR ENERGY FACILITY

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**Key Participating Units:** TEES - College of Engineering (COE)  
TAMU – College of Science (COS), College Geosciences (COG)  
AgriLife – College of Agriculture and Life Sciences (COALS)  
TAMUS Branch Campuses – Prairie View A&M, West Texas A&M

*Key Team: Dr. Rodney Bowersox (TEES), Dr. Eric Petersen (TEES), Dr. Simon North (TAMU), Dr. Vladislav Yakovlev (TAMU), Dr. Sergio Capareda (AgriLife), Dr. Emily Hunt (TAMUS)*

**Anticipated Request Amount:** \$1.67M

### **Executive Summary:**

We propose a state-of-the art, ultra-high-speed optical diagnostic and imaging facility be established within the TAMU-College Station campus in order to facilitate energy-related preeminent R&D needs in the general areas of combustion & propulsion, aerothermochemistry, fuels (traditional as well as alternative and biofuels), energetic materials, atmospheric chemistry, chemical analysis, and plasma technology. Progress in these fields requires characterization and modeling of high-speed phenomena such as rapid mixing and transport, hypersonic flow dynamics and turbulence, detonation physics, and reacting flow chemistry. Existing optical diagnostic and imaging facilities as well as faculty expertise are scattered among multiple research units and are also lacking the state-of-the-art instrumentation and synergy needed to tackle large-scale, multi-disciplinary research initiatives. The proposed, *Texas A&M University-Preeminent Research in Imaging Diagnostics for Energy facility* will be based on cutting-edge, ultra-high-repetition-rate (5kHz–1MHz), ‘burst-mode’ laser technology and ultra-high-speed imaging that have become commercially available in recent years. Such a facility will bring together inter-disciplinary teams to develop game-changing technologies in energy conversion processes such as ultra-lean combustion, advance aircraft and rocket propulsion, new biofuel blends, high-fidelity predictive model development, novel plasma processes, homeland security among others.

The proposed facility will be strategically placed in a central location on the TAMU main campus, allowing easy access for multiple research units. The required laboratory space, infrastructure, and funding support for a management/technical personnel have been committed by the key participating units, leaving the entire RDF budget for capital equipment. The modular structure will enable diagnostic platforms to be transported to and from other large-scale test facilities. A comprehensive management plan and user-structure are presented. The key team comprised of world-class experts with proven track records in attracting and managing large-scale research projects and facilities. *Nearly 20 PIs from four colleges and*

*two TAMU branch campuses have already committed their direct involvement.* The proposed facility will be one of the first such facilities in the nation and will be a unique addition to the growing fields of TAMUS research enterprise as evident by the attached support letters from a group of leading government and industry experts (*see Appendix II*). It will significantly increase our competitiveness in external funding from agencies such as DOD, DOE, USDA, NSF, NASA, and numerous private and industry partnerships while catalyzing new ventures to compete for exceptionally large projects, resulting in long-term sustainability and growth of the facility.