Application Title: The First Pulsed EPR Facility in Texas

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Key Participating Units: College of Arts and Sciences, College of Agriculture, College of Engineering

RDF Amount Requested ($): 1,181,811

Executive Summary

This project will purchase a pulsed X- and Q-band electron paramagnetic resonance (EPR) spectrometer, **the first instrument of its type to be located in any user facility in the state of Texas**. EPR spectroscopy fills a critical need in the ability to measure electron spin interactions, local molecular structure, relaxation properties and related information. This information is required for the fundamental study of molecular and macromolecular structure and function in chemistry and biology, and for elucidating the behavior of nano and quantum materials. It also forms the basis of new research directions in harnessing the power of quantum states for information processing and storage through the precise manipulation and reading of coherences. The instrument will **directly support research in organometallic chemistry, biochemistry and structural biology, and quantum science hosted in three Colleges and five Departments at TAMU**. The research topics are part of current and future funding priorities of federal agencies such as the National Science Foundation (NSF) and the US Department of Energy including among others quantum information science, or the National Institutes of Health in enabling basic biological research for understanding the molecular basis of health disorders. The participating investigators are funded from a broad range of sources, including the above and in addition numerous other federal agencies and private foundations. The acquisition of the EPR spectrometer will **provide a new capability on campus, which will further catalyze new collaborations and open avenues to apply for new funding directions**. There is presently a single EPR spectrometer on campus, located in the Chemistry Department's Nuclear Magnetic Resonance (NMR) facility. This spectrometer only supports continuous wave (CW) operation in the X-band. Without pulses the instrument is only capable of acquiring basic EPR spectra. None of the described applications requiring the measurement of electron spin interactions and relaxation properties are possible with the existing instrument. The new instrument will be integrated into the same facility. **Operationally, it will benefit from existing protocols for user training, time allocation and billing**. The facility currently comprises three full-time staff members. The sustainable operation of the instrument will be ensured by cost recovery at the same level as the existing CW spectrometer. The modest cost structure is possible despite the state-of-the-art capability of the new instrument because of its design for closed-cycle operation that does not require external cryogens. The instrument will be accessible to internal and external users, broadly enabling the application of modern EPR techniques.