1. **Research Title:** Ultra-wide bandgap (UWBG) materials for electronics and optoelectronics
2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** Electrical Engineering, Electrical and Computer Engineering, Physics, Materials Science and Engineering (M .S. or Ph.D. Level)

4. **Objectives:** Study the fundamental properties of ultra-wide bandgap (UWBG) semiconductormaterials (bandgap larger than 4 eV, e.g., AIN, Ga2O3, diamond, cubic boron nitride) includinggrowth, electronic transport measurement, defect information, photoluminescence, optical absorption, capacitance spectroscopy, etc. It will also involve the fabrication of the test structures for these measurements.

5. **Description:** UWBG semiconductors have the intrinsic advantages of large breakdown voltages for high power handling, emitting deep ultra-violet light, and providing stable single photon emission at room temperature due to their large band gaps. Fundamental studies need to be pursued to understand the basic properties of these materials due to the early stage of research and development we are at. Therefore, in this topic, we look into various ways to characterize the UWBG materials to gain important knowledge on their band structures, electronic transport properties, defect information, interface properties, and optical emission. The characterization techniques include but are not limited to Hall-effect measurements, voltage a current measurements, capacitance spectroscopy, photoluminescence, and optical absorption. Sample preparation and test structure fabrication will also be involved to produce the test samples. Thegoal of this project is to generate critical and novel knowledge to evaluate UWBG materials for the interests of AF and DoD.

6. **Research Classification/Restrictions:** This research is unclassified and has no ITAR restrictions.

7. **Eligible Research Institutions:** Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati.