1. **Research Title:** Defect Analysis of Ultra-wide bandgap (UWBG) materials for electronic applications
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 PhD. Level)
4. **Objectives:** Study the fundamental properties of defects in ultra-wide bandgap (UWBG) semiconductors (e.g. AlN, Ga_2O_3, diamond, c-BN) and how to optimize thin film UWBG materials to mitigate their impact for electronic applications.
5. **Description:** UWBG semiconductors have been of interest as their large band gaps result in large breakdown voltages which are useful for high power handling devices. However, how defects form during growth, their effect on electrical performance, and methods to mitigate them during growth are not well understood. It is vital to understand defect states as they can impact the electrical performance of devices made from these films. This information can be used to optimize growth parameters of thin film UWBG materials. Therefore, in this topic, we investigate defects in UWBG materials through various characterization techniques that all us to learn more about these defects, their role in the band structure and physically. The characterization techniques for these studies include but are not limited to cathodoluminescence spectroscopy, photoluminescence spectroscopy, scanning tunneling microscopy, deep level transient spectroscopy, deep level optical spectroscopy, surface photovoltage spectroscopy, Hall-Effect measurements, and capacitance spectroscopy. The goal of this project is to generate critical knowledge to further develop and optimize the growth of UWBG semiconductor thin films for the interest of the 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

NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval #

AFRL has completed the review process for your case on 14 Sep 2022:

Subject: Defect Analysis of Ultra-wide bandgap (UWBG) materials for electronic applications (Research)

Originator Reference Number: RX22-0834
Case Reviewer: Mary Allen
Case Number: AFRL-2022-4396

The material was assigned a clearance of CLEARED on 14 Sep 2022. If you have any questions concerning your case, please contact Mary Allen mary.allen.2@us.af.mil.