

2019 DAGSI Research Topic

1. **Research Title:** Optical and electrical characterization of topological materials
2. **Individual Sponsor:**

Dr. Arnold Kiefer
AFRL/RYPH Bldg 600
2241 Avionics Circle
WPAFB, OH 45433
arnold.kiefer@us.af.mil
3. **Academic Area/Field and Education Level**

MS or PhD level degree program in Physics, Electrical Engineering, Optical Engineering
4. **Objectives:** The goal of this research project is to characterize light-matter interactions in various topological materials or structures, to include, but not limited to, the circular photogalvanic effect, spectral response, and detectivity.
5. **Description:** Topological materials and structures manifest spin-momentum locked electronic states that produce spin-polarized currents when illuminated with circularly polarized light. These currents occur along with other optically and thermally generated currents. The application of electrical gating or magnetic fields may suppress or separate the various components allowing for better detection of spin-polarized currents. Understanding mechanisms to control spin-momentum locked currents will enable opto-spintronic devices for various sensing, communications, and computing applications. Facilities for conducting research include materials synthesis systems, device microfabrication tools, and sophisticated instrumentation for the characterization of the optical, electrical and magnetic properties of the materials and devices in varying magnetic fields (0-9T) and temperatures (1.6K - 300K).
6. **Research Classification/Restrictions:** Unclassified/U.S. citizenship required
7. **Eligible Research Institutions:** AFIT, University of Cincinnati, University of Dayton, The Ohio State University, University of Toledo, Wright State University, and Case Western Reserve University.