

## Attachment 1 – Research Topic Template

1. **Research Title:** Electromagnetic Shielding of Nano-Enabled Coaxial Cables
2. **Individual Sponsor:**  
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3. **Academic Area/Field and Education Level:** Phd level, Materials Science & Engineering/  
 Mechanical Engineering
4. **Objectives:** Provide side by side comparison of coaxial cables developed utilizing novel nano-composite materials compared to traditional design commercial coaxial cables using heavy metallic shielding. Determine the material trade space for non-metallic nano-enabled cables for lightweight launch vehicles and satellite wiring.

Optimize the following characteristics of cable conductor and shielding materials:

1. Improve electromagnetic shielding over a broad band of frequencies, from .10kHz to 20GHz.
  2. Use low density composite / nano-enabled materials to reduce total cable weight.
  3. Diminish fatigue effects on electromagnetic shielding while preserving conduction capability.
  4. Reduce life cycle cable costs.
5. **Description:** Electromagnetic interference can occur due to natural phenomenon, such as lightning, or from more deliberate sources, such as an attack. Mitigating this interference is necessary to safe operation and ensuring proper transfer of information. Data and power cables need materials that can properly protect against a wide range of RF/microwave frequencies while keeping weight to a minimum. The U.S. Air Force requires materials that preform consistently throughout the life cycle, even after fatigue. Students should be familiar with testing equipment such as Network Analyzer, Scanning Electron Microscope, Tensile Test frames, and I-V Source Meters. The student should have an understanding of electromagnetics, a basic understanding of sensors and radar, as well as how to make shielding effectiveness measurements. The project should develop materials and applications that will result in an increase in performance of current and next generation aircraft and support ground structures.
  6. **Research Classification/Restrictions:** The research will be unclassified. However, specific aspects of the program are FOUO with ITAR restrictions.
  7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided.
    - DAGSI (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati)  
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