Attachment 1 – DAGSI Research Topic Template

NOTE: Under the Cooperative Agreement, Technical Directorates have three options for topics. First, a topic can strictly be considered in the pool for the state allocation of funding. DAGSI will work across the TDs for this allocation. Second, the TD can be prepared to be a funding partner with the State of Ohio. This would include: providing additional funds to support additional recipients of a topic, or expand the proposers team to include additional members on a topic. Third, the TD may elect to fully fund a topic not selected for State of Ohio funding or to pursue University teams outside the State of Ohio. Contact lindsay.kotouch.2@us.af.mil for questions.

1. **Research Title:**

Connected Arrays with Artificial Dielectric Layers for Extreme Field of Views and Operating Bands

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level**

Electrical/Computer Engineering / Electromagnetics, Array Design (MS or Ph.D. level)

4. **Objectives:**

Develop antenna concepts capable of covering very wide frequency bands using a single flat radiating aperture with polarization agility for sensing and communications. This effort considers connected arrays of dipoles and slots with Artificial Dielectric Layers (ADL). We will leverage the connected arrays architecture and ADL layer design to develop antennas with a small profile operating over a wide bandwidth (e.g., 10:1) with a wide field of view (at least ±70°) to accommodate different communications and sensing needs from terrestrial (5G and beyond) to non-terrestrial networks (from LEO to GEO constellations). A mathematical framework based on the Green's function approach will be adopted to analyze the array with ADLs. Periodic and Aperiodic ADLs will be considered to control polarization, matching and avoid scan blindness while scanning in the band of interest. Research will include wideband feeding networks to control the elements of the array and the experimental validation of the concept.

5. **Description:**

Current planar wideband arrays are based on the Wheeler's concept of an infinite current sheet. Over the years, this concept has been implemented in different technologies, such as connected slot arrays, tightly coupled dipoles, continuous transverse stub arrays, and planar ultra-wideband

modular arrays. The performance of these state-of-the-art systems is limited to 6:1 band with an active reflection coefficient as high as -4dB. The proposed solution offers a versatile and compact antenna that is capable of operating in a wide frequency band for communication and sensing. The proposed activity will enable the analysis and design of connected arrays with ADLs, allowing for the full mastery of the benefits of the ADLs in adapting the array while scanning in the band of interest.

6. Research Classification/Restrictions:

This research is unclassified**.**

7. Eligible Research Institutions:

Universities (DAGSI)

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

PA Approval #

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