RY19-9

1. **Research Title: Reconfigurable Radio Frequency (RF) Technology for Adaptable Phased-Arrays and Cognitive Electronic Warfare (EW) Applications**

2. **Individual Sponsor:**

Tony K. Quach	Ryan Wolfarth
AFRL/RYDI, BLDG 600	AFLCMC/EZAD
2241 Avionics Circle	BLDG 28
WPAFB, OH 45433	WPAFB, OH 45433
Phone: 937-713-8903	937-904-7847
Tony.Quach@us.af.mil	ryan.wolfarth.1@us.af.mil

3. **Academic Area/Field and Education Level:** Electrical/Computer Engineering / RFIC and System Architecture Design (MS or Ph.D. level)

4. **Objectives:** Develop adaptable RF systems based on reconfigurable RF technologies to significantly advance future phased-arrays and EW systems. A research area of particular focus entails development of reconfigurable RF components with autonomous operation by adopting Machine Learning (ML) techniques. This agile RF architecture will enable frequency agility, power scaling, and waveform diversity while simultaneously reduce system cost, size, weight, and power (CSWAP). Novel system architectures and circuit topologies are sought that enable diverse waveforms to be simultaneously transmitted and received (STAR) from the same aperture; spanning radar, communication and EW systems.

5. **Description:** The development of AF systems follows legacy design approaches where systems and circuits are optimized for specific applications and requirements. However, the cost of realizing new technologies for future generation phased-arrays and EW systems is becoming prohibitive due to long development cycles in conjunction with rapid electronics obsolescence. In addition, separate systems for each desired function will limit the capabilities of smaller platforms due to size and weight constraints. Projects are sought to investigate novel system architectures, circuit techniques, and algorithms to realize reconfigurable RF technologies to produce an integrated radar, communication, and electronic warfare systems transceiver. Research may include system architecture exploration for reconfigurable/adaptable RF capabilities; reconfigurable RF components investigation based on tunable RF building blocks; and system/component characterization. Interests also include radio frequency integrated circuit (RFIC) design across the semiconductor technology spectrum. Digital circuits and efficient ML algorithms for autonomous reconfigurable RF components and systems are desirable. Other interests include heterogeneous integration techniques and efficient thermal management approaches. AFRL will provide access to III-V and advanced silicon design kits and support with characterization.

6. **Research Classification/Restrictions:** This research is unclassified.

7. **Eligible Research Institutions:**

X Universities (DAGSI) ☐ AFIT (only) ☐ USAFA