1. **Research Title: SDR Technology for Cognitive Phased-Array Applications**

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Electrical/Computer Engineering / RFIC Design, AI/ML Algorithm Development (MS or Ph.D. level)

4. **Objectives:** Develop ultra-wideband RF front-end components and sub-systems in conjunction with advanced AI/ML techniques to significantly advance future radar and EW capabilities. A research area of particular focus entails development of GaN & silicon 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, circuit topologies, & AI/ML techniques are sought to enable passive sensing with the capability to sense the EM spectrum and dynamically adapt for interference mitigation receiver capabilities. Additional AI/ML techniques are sought to develop array calibration for efficient operation.

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 AI/ML algorithms to realize leap-ahead RF technologies to produce an integrated radar and electronic warfare systems. Research may include system architecture exploration for state-of-the-art (SOA) software defined radio (SDR) implementation. Interests also include radio frequency integrated circuit (RFIC) design across the semiconductor technology spectrum. Digital circuits, and efficient AI/ML algorithms for dynamic control of RF front-end. Other interests include heterogeneous integration techniques and efficient thermal management approaches. AFRL will provide access to the AFRL/RY SDR Lab and support characterization.

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

7. **Eligible Research Institutions:**

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