1. **Research Title:** 3D Gaussian Splatting (3DGS) for Radio Frequency Sensing/Imaging

2. **Individual Sponsor:**

Dr. Robert Ewing, AFRL/RYMS
2241 Avionics Circle
WPAFB, OH 45433-7333
robert.ewing.2@us.af.mil

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

Electrical Engineering and Computer Science/Systems Analysis, Operations Analysis, Mathematics Communications, Control and Signal Processing (MS or PhD level)

4. **Objectives:** Develop the novel algorithms and approaches for subthreshold signals using 3D splatting for numerous sensors; addressing improved size, weight and power (SWaP) in the application of RF Sensing/Imaging performance.

5. **Description:** Simulation toolboxes for the splatting technique to the mission domain of radio frequency/ imaging sensing integration is required. Overall, the solutions of Partial Differential Equations can be optimized and solved by special techniques through the use of non-Gaussian Radio Frequency signal sensing using 3D splatting, and optimal decision rules. Validation via analysis of modeling and simulation will include the following approaches for the simulation toolboxes:

(a) Optimizing the radio frequency spectrum detection and decision methods to model time-varying probability density functions for radiance field reconstruction.
(b) Developing parametric or non-parametric (data independent models) radio frequency detection methods via maximum likelihood and explore various array signal processing techniques, such as spiking neural networks.
(c) Explore the 3D sensing/imaging detection problem by the methodology of a digital twin.

6. **Research Classification/Restrictions:** U.S. Citizens

7. **Eligible Research Institutions:** Wright State University, Air Force Institute of Technology (AFIT), Ohio State University, University of Dayton, Miami University, Ohio University, Case Western Reserve University and University of Cincinnati

PA Release: AFRL-2025-4030