

AFRL RESEARCH TOPIC CALL FOR FY13

1. **Research Title: Physics-Based Models for Sensor Environment**
2. **Individual Sponsor:** Dr. Saba Mudaliar, AFRL/RVHE
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3. **Academic Area/Field and Education Level:** Electrical Engineering, Physics, or Applied Mathematics / Wave phenomenology, stochastic models and analysis (M.S. or Ph.D. level)
4. **Objectives:** Develop physics-based models for sensor environment to facilitate sensing system performance evaluation
5. **Description:** The primary goal is to develop physics-based models for sensor environments. A secondary goal is to relate the statistics of sensor signals with the statistics of the model parameters. There are several subtopics involved in model development. Some of them are: waves in random media (discrete and continuum models), radiative transfer theory and remote sensing, scattering from randomly rough surfaces, polarimetric scattering, inverse scattering and parameter retrieval from measured data, physics-based models for scattering from terrain and ocean, scattering from media with space-time fluctuations, monostatic and bistatic models for clutter, combined random media and rough surface scattering, spectral density of scattered signals, scattering and propagation of signals through turbulence in atmosphere and ionosphere, and models for subsurface sensing. Most studies in the literature on these topics are on the derivation of the average scattering coefficients or propagation constants. However, we are interested in more detailed statistics such as probability density function and spectral density of the scattered signals. Often the signals will be of wide bandwidth and hence we are interested in the characteristics of scattered signals over a wide range of frequencies. Also of interest are studies on the scattering of targets embedded in complex environment and polarimetric techniques for detecting such targets. The targets may be stationary, mobile, or fluctuating. Of particular interest is the location and imaging of targets embedded in a complex environment.
6. **Research Classification/Restrictions:** Basic research in this area is unclassified.
7. **Eligible Research Institutions:** Place an X in all that apply.
 Universities (DAGSI) AFIT (only) USAFA
8. **Interest in Summer USAFA Cadet (Avg Cost for USAF Cadet for 33 days was \$5000):**
Interested in sponsoring a USAF Cadet in summer of 2013 contingent on funding availability