

AFRL/DAGSI Research Topic Call for FY20

1. **Research Title:** "Printed and Flexible Electronics and Photonics for USAF Sensor Applications"

2. **Individual Sponsor:**

Dr. Emily M. Heckman, AFRL/Rydi

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3. **Academic Area/Field and Education Level:** Electrical Engineering, Materials Science, Physics, Applied Physics, Optics, Electro-Optics, Chemistry, Additive Manufacturing of Printed Electronics (MS or PhD level)

4. **Objectives:** The goals of this research project are to utilize new and non-traditional fabrication techniques (aerosol jet printing, inkjet printing, microdispensing) for the creation of photonics, electronics, and opto-electronics (including packaging, interconnects, waveguides, and antenna structures) for sensor applications. This will include using both novel materials (graphene, carbon nanotubes, nanoparticle inks) and existing COTS materials to create sensor structures, and then analyze their performance against commonly produced and deployed counterparts (for example, III-V foundry fabrications of sensor structures). This research can also include exploiting the unique fabrication capabilities and ability to deposit non-tradition materials to enhance and develop new device capabilities. Areas of emphasis include, but are not limited to, infrared sensing, antennas, passive/active waveguiding and routing structures, and elements for building radiofrequency (RF) transceivers and components.

5. **Description:** This proposed project will explore the recent flourish of tools and processes that have been developed for 2-D and 3-D prototype manufacturing, such as ink jet printing, aerosol jet printing, microdispensing, nano-imprint lithography, and extrusion techniques to make large area, flexible electronic and photonic components. Initial efforts will focus on creation and testing of "standard" structures from the literature, and then attempt to increase performance via improved materials and fabrication techniques. It is anticipated that a multi-disciplinary academic background, drawing primarily from electrical engineering, materials science, and chemistry, will be needed for successful project completion.

6. **Research Classification/Restrictions:** The research performed on this project is anticipated to be fundamental in nature, with no inherent publication or presentation restrictions. There may be aspects of requirements analysis or comparison to state-of-the-art devices and components that are deemed FOUO and have public release or ITAR restrictions, although this is unlikely and these areas could be avoided if needed.

7. **Eligible Research Institutions:**

Universities (DAGSI); AFIT; USAFA