NASA SBIR 2006 Phase I Solicitation

S6.01 Passive Optics and Stepping Motors for Spaceborne and Airborne Platforms

Lead Center: LaRC

Participating Center(s): GSFC

Passive optical remote sensing generally requires that deployed devices have large apertures and large throughput. NASA is interested primarily in instrument technologies suitable for aircraft or space flight platforms, and these inherently also prefer low mass, low power, fast measurement times, and a high degree of robustness to survive vibrations in flight or at launch. Wavelengths of interest range from ultraviolet through the far infrared. Development of techniques, components and instrument concepts that can be developed for use in actual deployed devices and systems within the next few years is highly encouraged.

Technologies and components that are not clearly suitable for use in high throughput remote sensing instruments are not applicable to this subtopic. The technology areas of primary interest are described below:

- Technology leading to significant improvements in capability, availability, or cost of large format (> 2.5 cm diameter), very narrow band (~1 full-width at half-maximum), polarization insensitive, high throughput infrared (6 - 15 μm) optical filters. These filters must be able to operate in vacuum at cryogenic temperatures.

- High performance four-band two-dimensional (2D) arrays (128x128 elements or more) in the 0.4 - 2.5 μm wavelength range with high quantum efficiencies (60%-80% or higher) in all spectral bands, low noise, and ambient temperature operation.

- Detector arrays with unusual 3-dimensional geometries. Of particular interest is the development of a photon counting system with multiple cylindrical detecting elements (detecting surface on the outside edge) formed into a stack connected through one end to the cable leading to the readout electronics. The stack should be 2 to 5 cm in length with at least 12, and up to 48, individual elements. The diameter of the stack/elements should be minimized and on the order of 0.5 cm or less. Each detector element should have a clear field of view for most of the 360 degrees perpendicular to the stack. Exact details for the sensitivity are negotiable at this early stage, but applications are for fluorescence type measurements.

- High performance 2-color array detectors (128x128 or higher) covering the 3 - 15 micron spectral range with high efficiencies, low noise and operating at relatively high temperatures (>150K desired, 80K minimum).
Improved cryogenic stepping motors with high running torques at 80K. The motors must operate in vacuum and at temperatures at or below 80K. It is desired that these motors have minimal size and power requirements, and especially important that they use minimal current. Typical torque values desired are in the range of 10 - 20 oz-inches. Proposed motors should have at least 200 steps per revolution of the axis.