Sustainable Land Imaging – Technology: Integrated Photonic Imaging Spectrometer
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**Objective**
- Develop next-generation compact SLI instrument based on photonic waveguides.
- Reduce instrument volume 25 times and mass 7 times compared to current multispectral approach.
- Enable new science and data products through hyperspectral imaging (HSI) while preserving SLI data continuity through band aggregation.
- Build and test a heterogeneously integrated photonic instrument covering two SLI bands:
  - Band 9 (1.36 – 1.39\(\mu\)m at 3nm resolution).
  - Band 6 (1.56 – 1.66\(\mu\)m at 6nm resolution) with scalability to all SLI VNIR and SWIR bands.
- Demonstrate integrated instrument performance in a relevant environment.

**Approach**
- Leverage prior technical investments to execute prototype instrument development in SWIR wavelengths – Advance TRL 3 waveguide and detector designs.
- Evaluate multiple Readout Integrated Circuit (ROIC) approaches including photons-to-bits technique, down select and fabricate custom ROIC for integration with detection layers.
- Integrate Waveguides, Detectors, and ROIC arrays into Photonic Spectrometer Elements (PSEs) and stack multiple PSEs to form a photonic HSI instrument.
- Procure lenslet array and align with stacked PSEs.
- Integrate fore optic and demonstrate instrument performance; test instrument in a relevant environment.

**Key Milestones**
- Demonstrate integrated detection layer/ROIC 09/17
- Characterize SWIR detector layer 09/18
- Complete integration-ready ROIC 02/19
- Demonstrate integrated device with ROIC 09/19
- Complete fore optic and lenslet build 04/20
- Demonstrate preliminary performance 09/20
- Opto-mechanical integration 12/21
- Complete environmental testing 09/22

\(\text{TRL}_{\text{in}} = 3 \quad \text{TRL}_{\text{Current}} = 3\)