Objective

• Develop next-generation compact SLI instrument based on NGAS photonic waveguides
• Reduce instrument volume by \(x25\), mass by \(x7\) 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) and 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 NGAS technical investments to execute prototype instrument development in SWIR wavelengths – Advance TRL 3 waveguide and detector designs
• Evaluate multiple ROIC approaches including NGAS photons-to-bits technique – downselect 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 PSEs
• Integrate foreoptic and demonstrate instrument performance; test instrument in a relevant environment

Key Milestones

- Demonstrate spectrometer with integrated detectors 09/17
- Demonstrate functional spectrometer with integrated mechanical ROIC 11/19
- Complete waveguide photolithography process dev 09/20
- Complete lenslet design, fabrication, and thinning 04/21
- Complete preliminary env testing of integrated device 09/21
- Complete integration-ready ROIC fab (Round 2) 04/22
- Complete optimized waveguide/filter fabrication 06/22
- Complete ROIC test circuit integration 10/23
- Demonstrate ROIC functionality 12/23
- Demonstrate spectrometer with integrated ROICs 02/24
- Optimize and fabricate updated waveguides and filters 05/24
- Demonstrate integrated spectrometer with updated design 09/24

\(\text{T}_\text{RL}_{\text{in}} = 3\) \(\text{T}_\text{RL}_{\text{current}} = 4\)