# Advanced Hyperspectral Zoom Optics System (AHZOS)

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**Abstract:**

Conventional hyperspectral solutions do not readily support zoom operations owing to a combination of optical factors, including aberrations, spectral concerns, and the like. Overcoming this often involves tradeoffs, such as reducing zoom capability to increase field of view, or decreasing spectral range to accommodate processing and optics limitations. Physical Optics Corporation (POC) recently completed Phase I development of the Advanced Hyperspectral Zoom Optics System (AHZOS) aimed at overcoming these fundamental limitations in existing solutions. AHZOS combines a unique optical design, with innovative software and hardware subsystems to offer wide field of view, scalable, high resolution, real-time, zoom-capable hyperspectral sensing in a compact form factor, suited for use on unmanned aerial vehicles (UAVs) and other platforms. In Phase I, POC developed the initial system design and a TRL-4 prototype system. The prototype is is built around innovative aberration-free optics that offer wide field of view, high resolution capability across a wide spectral range, including visible and IR. These are combined with COTS sensors, and a unique processing solution that removes hypercube redundancy from the mix, the Achilles hell of the current crop of hyperspectral sensing solutions. Our TRL-4 Phase I prototype was fabricated entirely from COTS components. It achieved coverage of the full VIS and IR spectra simultaneously with a FOV up to 60 degrees, up to 6x zoom, and spectral resolution of 12nm/mm. The prototype provided real time operation, with latency around 4-8ms.