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Broadband SHS: A new technique for velocity resolved measurements of diffuse emission line sources

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Visible-UV Spatial Heterodyne Spectroscopy (SHS) is a powerful technique for the study of faint, diffuse emission line sources. SHS combines large étendue and resolving powers equal to or better than the best space-borne grating spectrometers in a very compact format suitable for use in remote spacecraft. From such a vantage point SHS can provide new insight into atmospheric dynamics and the properties of ions and neutrals in planetary near space environments. The primary caveat to employing SHS is its limited spectral range of typically no more than 1-2 nm, which restricts the instrument to only a single line or group of lines. We describe here two methods to expand the SHS spectral response to broadband coverage exceeding 100 nm. One of these, the tunable SHS (TSHS), operates by using precision optical rotation to translate its narrow bandpass across the visible spectrum. The TSHS has been developed to the prototype stage and is undergoing field-testing. The second method, the multi-line SHS (MSHS), operates in a manner comparable to an Echelle spectrometer to cover large spectral ranges simultaneously without moving parts. We will discuss the technical challenges in the MSHS design and the status of its early-stage development.