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Designing Quadruple Grating Spatial Heterodyne Spectrometer (QGSHS)

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The versatility and design adaptability of the Spatial Heterodyne Spectrometer (SHS) have proven to be beneficial in various disciplines, including analyses in atmospheric, astrophysical, elemental, and others [1]. A hybrid of interferometric and dispersive domains of the spectrometers is implemented in the single SHS spectrometer, providing high throughput and resolutions with design adaptiveness suitable for specific experiments. However, a disadvantage in such spectrometers is the inverse relationship between the wavelength bandwidth and the resolving power of the spectrometer, similar to Czerny-Terner spectrometers. Circumventing this inverse relationship, the current work proposes to partly compensate for the inverse relationship between wavelength bandwidth and the resolving power using a novel SHS design with two gratings in one arm of the SHS interferometer, i.e., Quadruple Grating SHS (QGSHS), providing simultaneous detection of two different regions of the spectrum. Additionally, the proposed work is already realised using a miniature design with maximum dimensions of 110 mm* 100 mm. More on such designs'applicability, in addition to the simulated design results and drawbacks, would be discussed at the conference.

Reference
[1] W. Li Zhang et al., Microchemical Journal 166 (2021), doi: 10.1016/j.microc.2021.106228.

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