

# The Galway astronomical Stokes polarimeter: an all-Stokes optical polarimeter with ultra-high time resolution

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**Abstract** Many astronomical objects emit polarised light, which can give information both about their source mechanisms, and about (scattering) geometry in their source regions. To date (mostly) only the linearly polarised components of the emission have been observed in stellar sources. Observations have been constrained because of instrumental considerations to periods of excellent observing conditions, and to steady, slowly or periodically-varying sources. This leaves a whole range of interesting objects beyond the range of observation at present. The Galway Astronomical Stokes Polarimeter (GASP) has been developed to enable us to make observations on these very sources. GASP measures four components of the Stokes vector simultaneously over a broad wavelength range 400–800nm., with a time resolution of order microseconds given suitable detectors and a bright source - this is possible because the optical design contains no moving or modulating components. The initial design of GASP is presented and we include some preliminary observational results demonstrating that components of the Stokes vector can be measured to  $< 1\%$  in conditions of poor atmospheric stability. Issues of efficiency and stability are addressed. An analysis of suitable astronomical targets, demanding the unique properties of GASP, is also presented.

**Keywords** Optical polarimetry · Astronomical polarimetry · Stokes polarimetry · High time resolution astrophysics

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