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4.49 Polarisation-based suppression of background emission in visible light spectroscopy

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Contamination of plasma line emission by bright scattered background radiation poses a great challenge for spectroscopy-based diagnostics in metal wall machines such as ITER. It can be the case that the diffusely scattered background component will be largely unpolarised. This is because the light scattered from a roughened wall surface is the summation of light received from a range of incident angles and having varying degrees of polarisation, and polarisation states depending on the plasma emission properties and path integration effects. We propose and demonstrate the utility of polarisation sensitive spectral imaging for helping to separate the Zeeman-polarised local plasma emission (Stokes vector) from unwanted diffusely scattered background contamination. It has been shown recently that the Zeeman Stokes components can be related in a well-defined way to weighted line integrals of plasma flow and temperature in the case of Doppler effect spectroscopy. The weights depend on the local magnetic field structure. To explore these issues, we have installed an imaging polarimeter-interferometer for Doppler spectroscopy on the H-1 Helic. We observe that background reflections dominate the unpolarized image but are largely absent in the polarised Stokes vector components.

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