Polarimetry of thermal Rb vapour: Magnetic field gradients and cascaded cells

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Weak probe polarimetry in birefringent hot alkali metal vapours relies on optical rotation. Light input is decomposed into the two eigenmodes of the system, with refractive indices n_1 and n_2, which slow and attenuate the two polarisations [1]. Typically, this has been studied in either the Faraday geometry [2, 3] where the magnetic field is directed parallel to the light k-vector entering the vapour cell or the Voigt geometry [4, 5] where the magnetic field is directed perpendicularly. Our theoretical model *ElecSus* [6, 7] has recently been updated resulting in greatly reduced computation times. The new model has been particularly useful in analysing arbitrary geometry setups (neither Faraday or Voigt), magnetic field gradients and cascaded cells. Initial investigations has lead to the uncovering of novel optical rotation effects including, for example, light changing hand on propagation. We present some theoretical predictions highlighting the importance of self-similar trajectories on the Poincaré sphere.

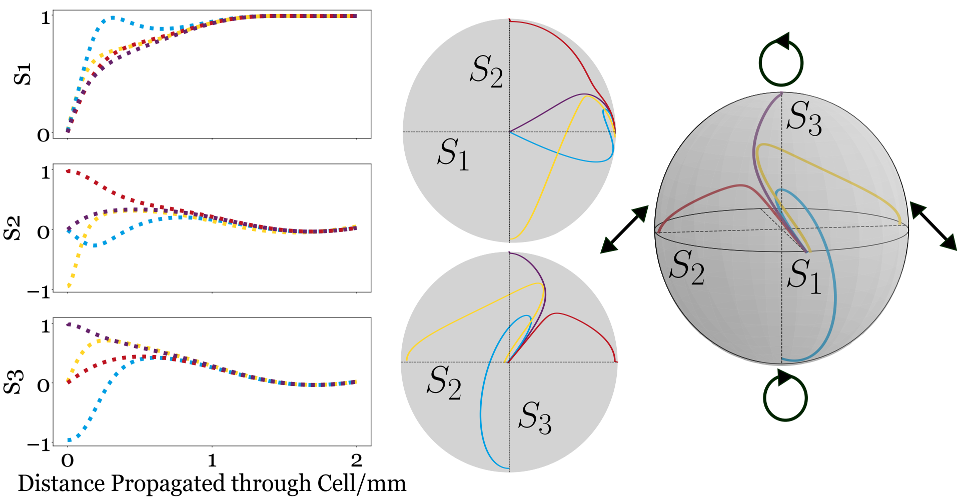

Figure 1. The normalised Stokes vectors of four input polarisations; left handed circular (purple), right handed circular (blue), linear +45° (red) and linear −45° (yellow) which converge towards similar optical paths on the Poincaré sphere. The diagrams correspond to an Rb single cell setup in arbitrary geometry with a magnetic field gradient.

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