Some observational implications of direction-dependent polarization leakage in dish-based radio telescopes

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All dish-based dual-feed radio antennae used in radio astronomy exhibit a certain degree of *polarization leakage*, which manifests itself as unwanted signal from each polarization mode being registered by the nominally orthogonal feed. This effect can have a direction-independent component (arising in the receiver) and a direction-dependent one (described by off-diagonal elements of the antenna primary beam pattern).

We discuss how this effect can limit the telescope performance even when accurate polarimetry is not part of the science goals. Two particular scenarios are presented: (a) so-called *intensity mapping* experiments, where the telescope is used in single dish mode to map out large-scale spectral line emission across the sky, and (b) high dynamic range imaging, where deep observations of a particular field require very accurate modelling and removal of bright sources that would otherwise contaminate the signal.

We show how unmodelled polarization leakage limits both types of observations, and discuss how models of the primary beam can be used to correct for the effect. We also discuss intrinsic limitations of such corrections, both numerical, and those due to inaccuracies in the primary beam model.