# Planck First Polarization Results – Comparison of dust polarized emission at 353 GHz with starlight polarization

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The Planck survey provides an unprecedented full-sky coverage of the submillimetre polarized emission from Galactic dust. In addition to the information on the direction of the Galactic magnetic field, this also brings new constraints on the properties of dust. The dust grains that emit the radiation seen by Planck in the submillimetre also extinguish and polarize starlight in the optical. Comparison of the polarization of the emission and the extinction on selected lines of sight toward stars provides unique new diagnostics of the emission and light scattering properties of dust, and therefore ultimately of the important model parameters, composition, size, shape, and alignment. Using ancillary catalogs of interstellar polarization and extinction of starlight, we obtain the degree of polarization $p_V$, its orientation, and the optical depth in the V band to the star, $\tau_V$. We extract the submillimetre polarized intensity, $P_S$, and total intensity, $I_S$, measured toward these stars by the Planck 353 GHz channel. We compare the polarization direction measured in the optical with that measured at 353 GHz, and compare the column density inferred from $\tau_V$ with that inferred from the *Planck* product map of the submillimeter dust optical depth. For those lines of sight with little CO integrated intensity, polarization directions close to perpendicular and comparable column density estimates, we correlate the projected polarization fractions in emission, $Q_S/I_S$ and $U_S/I_S$, with that in extinction, $q_V/\tau_V$ and $u_V/\tau_V$, to measure the polarization ratio $R_{S/V} = (P_S/I_S)/(p_V/\tau_V)$ which can be compared to predictions of models. We find a polarization ratio compatible with current dust models for the diffuse interstellar medium. This adds confidence to the basis for further interpretation of the *Planck* thermal dust polarization.