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Modeling polarization of propagating millimeter-waves in NSTX[1]

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— Magnetized plasma has an anisotropic index of refraction. For propagation perpendicular to the magnetic field, this leads to polarization elliptization via the Cotton-Mouton effect. In contrast, for propagation parallel to the field, the axis of the polarization ellipse rotates: this is known as Faraday rotation. In fusion plasmas millimeter-waves typically experience a combination of these two effects. To date, little attention has been given to the evolution of polarization for radial propagation in a spherical tokamak where a much greater variation of magnetic pitch angle and field strength exists in comparison to conventional tokamaks. This work investigates the polarization modification of millimeter-waves propagating radially in the National Spherical Torus eXperiment. Typical NSTX density and magnetic field profiles are utilized. The calculations provide the basis for optimization of the performance of a planned radial chord polarimeter. Future analysis will assess the sensitivity of polarization modifications to magnetic perturbations such as Alfven eigenmodes and tearing modes.

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