# Bernstein mode current drive in spherical tokamaks

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Bernstein modes are being investigated as a way of heating and driving current in spherical tokamaks because the density in these machines is above the limit for propagation of the electromagnetic O and X modes at low harmonics of the cyclotron frequency. Bernstein modes, on the other hand, propagate with no density limit and are strongly absorbed near cyclotron harmonics. Assuming that they can be generated at the plasma edge, a problem which we do not address here, they promise to be useful for producing localised heating and current drive near cyclotron resonances.

To obtain quantitative estimates of current drive efficiency we adapt the Green's function technique given by Lin-Liu, Chan and Prater (Physics of Plasmas, **10,** 4064, 2003). This uses fully relativistic dynamics and takes account of trapping in general toroidal geometry in the low collisionality regime. These authors discussed the regime in which the perpendicular wavelength is much greater than the Larmor radius, as appropriate for cyclotron heating by the O or X mode. In the case of Bernstein modes the perpendicular refractive index may reach large values and this limit is not valid. We will present results for a range of parameters relevant to the MAST experiment and compare them with results obtained using the BANDIT Fokker-Planck code which has been developed at Culham.

This work is supported by the UK Engineering and Physical Sciences Research Council and by EURATOM.