

## Current Drive by Electron Bernstein Waves

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In overdense plasmas as found in stellarators, spherical tori and some tokamaks, the electromagnetic electron cyclotron waves (X and O modes) may be cut off near the plasma edge so that they cannot be used to drive currents in the core of the plasma. Under some conditions, the X and O modes may be mode-converted to Electron Bernstein waves (EBWs), which can propagate in the plasma without density limits. From the characteristics of EBWs it is established that efficient current drive using EBWs is possible and depends strongly upon whether the cyclotron resonance is approached from the high- or low-field side [1]. Using the fully relativistic codes R2D2 [2] and LUKE [3] to calculate the wave properties and the electron distribution function, respectively, the characteristics of EBW current drive are studied in details. The role of wave properties such as the parallel index of refraction and the wave power, and plasma properties such as the temperature and the fraction of trapped particles, on the current drive efficiency is determined.

[1] J. Decker and A.K. Ram, *Phys. Plasmas* **13**; 112503 (2006)

[2] A.K. Ram et al., *J. Plasma Phys.* **71**, 675 (2005)

[3] J. Decker and Y. Peysson, Report EUR-CEA-FC-1736 (2004)