Evidence of O-X-B heating on CHS

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O-X-B mode conversion technique is the most promising way to heat overdense plasmas by EC-waves. Theoretical and experimental investigations on the technique have been performed at most plasma confining devices especially at devices with low magnetic field such as spherical tokamaks. However, so far apparent experimental demonstration of O-X-B heating was performed only on W7-AS.

In my presentation recent experimental results which show an evidence of O-X-B heating on Compact Helical System are presented. The 54.5 GHz ECH system on CHS furnishes 2-D steerable beam injection mirror antenna. Using the antenna, the EC-wave beam of 415 kW was obliquely injected to high density plasmas over 4x10e19 /m3 (line-averaged) sustained with 540 kW NBI. Here, the cut-off density for the 54.5 GHz wave is 3.8x10e19 /m3. According to a beam direction scanning, leak power from the CHS vacuum vessel varied systematically. The leak power level is considered as a measure of mode conversion and/or power absorption. At around the beam direction where the leak power became minimum, the plasma stored energy showed evident increase. Among the 4 variations (left-hand and right-hand circular, two orthogonal directions of linear) of polarization with the optimized beam direction, left-hand circular polarization showed the best performance. Also, by normal (k//=0) beam injection aiming at fundamental resonance surface at plasma peripheral region where the density is less than that for cut-off, no heating effect was observed. Then the increase of stored energy should be attributed to O-X-B heating, not to cyclotron resonance heating.