IAEA FEC 201

Contribution ID: **356** Type: **Poster**

Investigation of turbulence rotation in limiter plasmas at W7-X with a new installed Poloidal Correlation Reflectometry

Thursday, 20 October 2016 08:30 (4 hours)

For the first operation phase of the optimized stellarator W7-X, a heterodyn poloidal correlation reflectometry (PCR) diagnostic is installed and in operation. The PCR system consists
of an antennae array with one launching and four receiving antennae. The system is operated in a frequency range 22 GHz to 40 GHz. With the selected O-mode polarization of the system a density range of 0.6 × 10e19m−3 to 2.0 × 10e19m−3 is accessible. To achieve a fast scan of the full frequency range a microwave synthesizer is used where any switch in the frequency is performed in < 100 µs. The sight lines of all five antennae intersect at R = 6 m in the equatorial plane.
The aim of the diagnostic is the measurement of the turbulence velocity in the gradient and
edge region of the plasmas at W7-X. Therefore the delay time (Δt) of any antennae combination is calculated by means of cross correlation technique. With the knowledge of poloidal and toroidal separation at the cut off position in the plasma the velocity is calculated. The turbulence velocity is a superposition of E×B- and phase velocity. The phase velocity is small compared to E×B velocity and can be neglected and allows the estimation of the radial electric field.
Turbulence properties in the gradient and edge region are monitored with the PCR diagnostic as well. With respect to the local magnetic field the perpendicular correlation length and decorrelation time are calculated. The ratio of the delay times for equal poloidal and toroidal separation is used to calculate the magnetic field line pitch angle, assuming that turbulence structures are fully aligned along the magnetic field line.
First measurements show the expected increase in Δt with increasing poloidal separation. Different Δt for the same poloidal and toroidal separation could be measured and allow to determine the magnetic pitch angle. With the density profiles from Thomson scattering the radial position of the measurement is estimated. The poloidal plasma velocity is studied in Helium and Hydrogen plasmas with different amounts of ECRH heating. A change in the direction of the velocity is observed at the plasma edge, indicating the existence of a shear layer in the plasma. First investigations of the underlying physics of this transition are studied and reported.

Paper Number

EX/P5-4

Country or International Organization

Germany

Primary author: Dr KRÄMER-FLECKEN, Andreas (DeFJ)

Co-authors: Dr CZYMEK, Guntram (DeFJ); KNAUP, Martin (DeFJ); Dr HIRSCH, Matthias (DeMPIPGrif); Dr GRULKE, Olaf (DeMPIPGrif); Dr NEUBAUER, Olaf (DeFJ); DREWS, Philipp (DeFJ); Dr WINDISCH, Thomas (DeMPIPGrif); Dr BEHR, Wilfried (DeFJ); Prof. LIANG, Yunfeng (DeFJ)

Presenter: Dr KRÄMER-FLECKEN, Andreas (DeFJ)

Session Classification: Poster 5

Track Classification: EXD - Magnetic Confinement Experiments: Plasma–material interactions; divertors; limiters; scrape-off layer (SOL)