Contribution ID: **111** Type: **Poster**

ITR/P1-09: On the Use of Lower Hybrid Waves at ITER Relevant Density

Tuesday, 9 October 2012 08:30 (4 hours)

Collisional Absorption (CA), Parametric Instabilities (PI) and Scattering from Density Fluctuations (SDF) can preclude the penetration of Lower Hybrid (LH) waves, dissipating the power in the plasma periphery. A multi-machine assessment started at the end of 2009 under the coordination of ITPA-IOS group. It aims at understanding the complex physics underlying the phenomenon and increasing confidence in LH modeling for ITER's advanced scenarios. Results from C Mod, FTU, HT-7, JET and Tore Supra will be reported, while results from EAST are expected in the near future. The reported experiments have relevant plasma and waves parameters that encompass ITER's. Limiter and divertor operations are included, as well as operation with metallic and carbon walls, with plasma edge conditioned by wall boronisation and, on FTU, by using liquid lithium. Experiments on FTU show that LH waves at 8 GHz does penetrate bulk plasmas, with density profiles even higher than those expected in ITER, only if operating with the increased edge electron temperature provided by operating with lithized walls. The reduced broadening of the launched spectrum, as detected by loop antennas, suggests a PI influence. C-Mod detects an improved penetration of LH waves at 4.6 GHz, at relatively high density, when edge electron temperature is higher and absorption condition is closer to single-pass. This trend is qualitatively reproduced in both ray tracing and full wave model as reduced effect of CA due to increased single pass absorption. A gradual shift of 3.7 GHz LH power deposition to the periphery, is observed in JET with increasing density. Reduced density and increased pedestal temperature lead to broader but still very peripheral absorption. Decrease of LH effects, at 3.7 GHz in Tore Supra, correlates with increasing edge fluctuations, suggesting a role of SDF. LH experiments at the lowest frequency of 2.45 GHz on HT-7 did not find anomalies, at moderate density, in discharges with Li and B coatings. From the available information a preliminary conclusion on encouraging trend can be inferred for ITER. There will be a high edge temperature that helps avoid PI and SDF while LH waves will clearly be in single pass regime, minimising CA. A strong modelling effort is nevertheless progressing to reproduce the experimental evidence with physics models to strengthen the prediction for ITER.

Country or International Organization of Primary Author

Italy

Collaboration (if applicable, e.g., International Tokamak Physics Activities)

International Tokamak Physics Activities

Primary author: Mr TUCCILLO, Angelo A. (Italy)

Co-authors: Mr CARDINALI, Alessandro (ENEA); Mrs HUBBARD, Amanda E. (MIT); Mrs EKEDAHL, Annika (CEA); Mr DING, B. J. (Hefei IPP); Mr WAN, B. N. (Hefei - IPP); Mr CASTALDO, Carmine (ENEA); Mrs BARBATO,

Emilia (ENEA); Mr MIRIZZI, F. C. (ENEA); Mr SANTINI, F. (ENEA); Mr DI NAPOLI, Francesco (ENEA); Mr WALLACE, G. (MIT); Mr BERGER-BY, Gilles (CEA); Mr CALABRÒ, Giuseppe (ENEA); Mr DECKER, J. (CEA); Mr ARTAUD, J. F. (CEA); Mr GUNN, J. (CEA); Mr HILLAIRET, J. (CEA); Mrs MAILLOUX, Joelle (CCFE); Mr KIROV, K. (CCFE); Mr AMICUCCI, Luca (ENEA); Mr GONICHE, Marc (CEA); Mr MENEGHINI, Orso (MIT); Mr BONOLI, Paul (MIT); Mr PARKER, R. (MIT); Mr CESARIO, Roberto (ENEA); Mr BAEK, S. G. (MIT); Mr SHIRAIWA, S. (MIT); Mr CECCUZZI, Silvio (ENEA); Mr BASIUK, V. (CEA); Mr PERICOLI-RIDOLFINI, Vincenzo (ENEA); Mr PEYSSON, Y. (CEA); Mr BARANOV, Yuriy (CCFE)

Presenter: Mr TUCCILLO, Angelo A. (Italy)

Session Classification: Poster: P1

Track Classification: ITR - ITER Activities