



IAEA FEC 2014

Contribution ID: 431

Type: **Poster**

On the Measurement of the Threshold Electric Field for Runaway Electron Generation in FTU

Tuesday 14 October 2014 14:00 (4h 45m)

The determination of the threshold density value to be achieved by means of massive gas injection for runaway electron (RE) suppression in ITER relies on the relativistic collisional theory of RE generation which predicts that, below a critical electric field (E_R), no runaway electrons can be generated. No account of additional loss mechanisms, that may reduce the critical density, is usually made in the above treatment.

Past experiments by means of electron-cyclotron-resonance heating in the flat-top phase of FTU discharges had shown that runaway suppression is found to occur at electric fields substantially larger than those predicted by the relativistic collisional theory of runaway generation. This was found to be consistent with an increase of E_R due to the electron synchrotron radiation losses, which lead to a new electric field threshold (E_{R_rad}).

The main aim of this work is to verify whether the earlier finding that synchrotron radiation losses play a role in runaway generation is also confirmed in FTU discharges with no additional heating. Recent experiments in FTU have systematically investigated the conditions for RE generation in stationary and reproducible conditions (flat top of ohmic discharges) for a wide range of plasma parameter values: toroidal magnetic field ($B_t=3-7.2$ T), plasma current ($I_p=0.35-0.5$ MA) and Z_{eff} (1.5-15).

The threshold electric field for RE generation was measured using feedforward gas programming to obtain a decreasing electron density until RE are generated. The results indicate that the measured threshold electric field is larger by a factor $\sim 5-10$ than expected according to the purely collisional theory and is very close to the new threshold calculated including synchrotron radiation losses ($\sim 2E_{R_rad}$).

Country or International Organisation

Italy

Paper Number

EX/P2-50

Author: Mr ESPOSITO, Basilio (ENEA)

Co-authors: Mrs ROMANO, Afra (ENEA); Mr BOTRUGNO, Antonio (ENEA - Unità Tecnica Fusione); Mr CIANFARANI, Cesidio (ENEA); Mrs MAZZOTTA, Cristina (ENEA); Dr MAROCCO, Daniele (ENEA); Dr BELLI, Francesco (ENEA); Dr ARTASERSE, Giovanni (ENEA); Mr RAMOGIDA, Giuseppe (ENEA); Dr MARTIN-SOLIS, Jose Ramon (Universidad Carlos III de Madrid); Mr PANACCIONE, Luigi (ENEA); Mr RIVA, Marco (ENEA); Mr TUDISCO, Onofrio (ENEA); Mr PODDA, Salvatore (ENEA); Mr COCILOVO, Valter (ENEA); Mrs POPOVIC, Zana (Universidad Carlos III de Madrid)

Presenter: Mr ESPOSITO, Basilio (ENEA)

Session Classification: Poster 2