Contribution ID: **732** Type: **Poster**

Disruptions and Runaway Mitigation using ECRH and Inductive Power Supply Systems in the T-10 Tokamak

Friday 21 October 2016 14:00 (4h 45m)

Experiments in the T-10 tokamak (R=1.5m, a=0.3m) have demonstrated possibility of control of the plasma current decay and prevention of formation of the non-thermal (Eg>150keV) electron beams after an energy quench at the density limit disruption using electron cyclotron heating (ECRH) and pre-programmed Ohmic (OH) power supply system. Quasi-stable plasma operation with repetitive sawtooth oscillations can be restored after an energy quench using high auxiliary power (Pec > 2-5 Poh). Optimal conditions of the plasma discharge recovery after an energy quench using auxiliary heating are identified. A radial scan of the auxiliary power deposition location was provided by changing of the toroidal magnetic field. At high auxiliary power restoration of the plasma discharge can be provided with location of the EC resonance zone within the whole plasma cross section. The auxiliary power required for discharge restoration is minimal when the power is deposited around the m=2, n=1 magnetic island (close to the q=2 surface). At low plasma current disruptions can be avoided only when auxiliary power is deposited inside the q=2 surface. The threshold power increases linearly with plasma current. Numerical modeling has indicated that suppression of the non-thermal electrons can be connected with elimination of the bursting electric fields induced during periodic magnetic reconnections and reduction of the "equilibrium"electric field due to increase of the bulk plasma temperature due to ECRH. Possible strategy of the plasma discharge recovery after an energy quench in a tokamak reactor using auxiliary heating and controllable reduction of the plasma current is proposed.

Trigger conditions of the energy quench are studied in the T-10 tokamak using fast in-vessel movable magnetic probes. Experiments indicated that abrupt restructuring of the low-m MHD modes and inward plasma shift during an energy quench are accompanied by bursts of fast-scale (~0.5MHz) magnetic fields perturbations. Analysis has revealed possible connection of the magnetic bursts with plasma arching phenomena and non-thermal electrons induced during disruption.

The work is supported by ROSATOM (H.4f.45.90.11.1021).

Paper Number

EX/P8-35

Country or International Organization

Russian Federation

Author: Dr SAVRUKHIN, Petr (NRC Kurchatov Institute)

Co-authors: Mrs ERMOLAEVA, Anastasiya (NRC Kurchatov Institute); Mr SHESTAKOV, Evgeny (NRC Kurchatov Institute)

Presenter: Dr SAVRUKHIN, Petr (NRC Kurchatov Institute)

Session Classification: Poster 8

Track Classification: EXC - Magnetic Confinement Experiments: Confinement