



IAEA FEC 2014

Contribution ID: 274

Type: **Poster**

First Plasma Formation in Glass Spherical Tokamak (GLAST)

Wednesday 15 October 2014 14:00 (4h 45m)

GLAST is a small spherical tokamak having vacuum vessel of dielectric material (Pyrex glass) with aspect ratio of 1.67, $BT=0.4$ Tesla and discharge time=10ms. This device is indigenously developed in Pakistan and is designed to study the breakdown avalanche, plasma startup and current formation using inductive and non-inductive processes in the presence of dielectric walls of the vessel having no issues of the eddy currents.

As a starting point, we have studied the preionization, the transition from pre-ionization to breakdown avalanche and then to the plasma current column formation. We first obtained the pre-ionization using ECR and then build up plasma current by central solenoid and with small vertical magnetic field.

A 1.5kW, 2.45 GHz magnetron microwave system with a pulse of 5msec has been used to facilitate the startup of plasma current on GLAST spherical tokamak. The applied toroidal field was so adjusted for the ECR layer to form at the inboard side close to the central pipe. The width and the intensity of resonance layer were optimized by changing the gas pressure, orientation of the waveguide and relative delay between TF and microwave pulse. A high speed camera was used for these studies.

Two pairs of vertical field coils were used in series with the central solenoid to generate null magnetic flux inside the vessel at the center of the resonance layer ($R=6\text{cm}$). The ohmic heating system and the TF coil system were fired with suitable relative delays in the presence of pulsed microwave. A plasma current of about 2kA was produced for about 0.5msec. A small vertical field was then added with the help of three pairs of coil systems without changing other operating parameters. We were succeeded to enhance the plasma current with the maxima at 5kA by scanning the field in both directions and also by varying the current through the vertical coil system. The optimum values of the vertical magnetic field were experimentally determined and found to be between 40-50 gauss.

The direction of plasma current was changed with changing the direction of vertical field provided an evidence of plasma current by vertical field drift effect. The diagnostic systems such as Rogowski coil, flux loop, fast photo-diode, spectrometers and a high speed camera were used to record the signatures of plasma current and also to estimate some plasma parameters.

Country or International Organisation

Pakistan

Paper Number

EX/P4-22

Author: Dr HUSSAIN, Shahid (National Tokamak Fusion Program (NTFP) P O Box 3329, Pakistan)

Co-author: Dr VOROBYOV, G M (Saint Petersburg University Russia)

Presenter: Dr HUSSAIN, Shahid (National Tokamak Fusion Program (NTFP) P O Box 3329, Pakistan)

