IAEA FEC 2014

Contribution ID: **790** Type: **Poster**

Disruption Mitigation System Developments and Design for ITER

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

Disruptions present a challenge for ITER to withstand the intense heat flux, the large forces from halo currents, and the potential first wall damage from multi-MeV runaway electrons. Injecting large quantities of material into the plasma when a disruption is detected will reduce the plasma energy and increase its resistivity and electron density to mitigate these effects and thus a system with this capability is needed for maintaining successful operation of ITER. A disruption mitigation system is under design for ITER to inject sufficient material deeply into the plasma for a rapid shutdown and runaway electron collisional suppression. Here we present progress on the development and design of both a shattered pellet injector that produces large solid cryogenic pellets to provide reliable deep penetration of material [1] and a fast opening high flow rate gas valve for massive gas injection.

The shattered pellet injector utilizes a multi-barrel pipe-gun type device that forms large cryogenic pellets in-situ in the barrels. The pellets are accelerated by a high pressure gas burst and are shattered when they impinge on a bend guide tube in the port plug shield block that is optimized to produce a spray of solid fragments mixed with gas and liquid at speeds approaching the sound speed of the propellant gas. A prototype injector has been fabricated and tested with deuterium pellets of 16 mm size for thermal mitigation and is being upgraded to test and characterize 25 mm size D2 and neon pellets for runaway electron suppression.

A fast opening high flow rate gas valve for massive gas injection has been designed for use in the ITER environment, which requires a novel eddy current flyer plate design and large diameter tritium compatible seat material as compared to earlier DMV designs by Juelich [2]. Modeling of the gas flows from the valves through guiding tubes gives a response time for the MGI design to be less than desired unless the valves are mounted within port plugs. Implications of the design with respect to response time and reliability are discussed.

[1] N. Commaux, et al., Nucl. Fusion 50 (2010) 112001.

[2] S.A. Bozhenkov, et al., Rev. Sci. Instrum. 78 (2007) 033503.

Country or International Organisation

USA

Paper Number

FIP/2-1

Author: Dr BAYLOR, Larry R. (Oak Ridge National Laboratory)

Presenter: Mr MARUYAMA, So (ITER Organization)

Session Classification: Poster 4