INVESTIGATION OF RUNAWAY ELECTRONS WITH SOLID STATE PELLET INJECTOR: DESIGN AND FIRST EXPERIMENTS

J. Cerovsky[1], O. Ficker[1,2], E. Macusova[3], J. Mlynar[1,2], M. Jerab[1], V. Weinzettl[1], J. Cavalier[1], A. Casolari[1], M. Farnik[1,2], J. Varju[1], P. Barton[1,3], N. Hoepfl[4,5], P. T. Lang[4], B. Ploeckl[4], R. Panek[1], M. Hron[1] and the COMPASS team

[1]Institute of Plasma Physics of the CAS, Prague, Czech Republic
[2]FNSPE, Czech Technical University in Prague, Prague, Czech Republic
[3]Faculty of Mathematics and Physics, Charles University, Prague, Czech Republic
[4]Max-Planck-Institute für Plasmaphysik Garching, Germany
[5]Munich University of Applied Sciences, München, Germany

The COMPASS tokamak [1] has been used in recent years as a testbed for runaway electron research [2] for its a relatively safe operation even during the presence of fast electrons. In support of runaway electron (RE) investigation at the COMPASS tokamak the first experiments with a room temperature solid state pellet injector (RTSP) [3] were designed and carried out. To investigate the interaction of solid state pellets with runaway electrons a RTSP has been borrowed from IPP Garching and adapted to the COMPASS tokamak experimental conditions. First, the performance of the RTSP was characterised in Garching. The focus of these tests was put on maximising the attainable pellet velocity and determination of the pellet scattering angle. The amount of propellant gas, entering the vacuum vessel with the pellet, was measured as well. Based on the obtained results and results from a simplified numerical model, a new vacuum system for the injector was designed, manufactured and assembled. It aims at minimising the deleterious influence of the propellant gas on the plasma while still ensuring reliable pellet delivery into the plasma. In this contribution, the vacuum system as finally assembled will be described. Its functionality will be demonstrated on data acquired during initial successful tests and the following experiments. Tests of the RTSP with its new vacuum system were performed at the IPP with graphite pellets (1 x 1. 5 mm), the same pellets as used later for experiments at the COMPASS tokamak. These pellets were launched with velocities about 300 m/s into plasmas at the presence of RE with a current dominantly carried by runaway electrons at the moment of forming of RE beam. Runaway beams have been induced by injecting Argon into a low density plasma with a substantial number of runaway electrons. Besides standard RE diagnostics such as scintillation HXR and neutron detectors, fast cameras were installed to observe the interaction of pellets with fast particles. An impact of pellet injection on the plasma performance was clearly observed. Some illustrative videos will be presented to demonstrate observed plasma/pellet interaction.

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