First Pellet Injection Experiment in Support of Runaway Electron Investigation at the COMPASS tokamak

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The runaway electrons (RE) pose a major threat for future tokamak facilities due to their detrimental effects on the first wall of tokamak and this issue needs to be resolved for successful operation of future experimental facilities. In the recent years, mitigation techniques based on massive material injection were investigated on several devices and the COMPASS tokamak has been used as a safe test bed for runaway electron physics research \cite{Mlynar2019} with the good coverage of RE dedicated diagnostics (e.g. calorimetric head, Cherenkov detector) and with a reliable scenario for generation of RE beams. Thanks to the improved position control feedback \cite{Ficker2019} the beams of runaway electrons up to 150 kA can be sustained for sufficiently long time ($\approx$ 100 ms) to allow studies of their properties. In order to study properties of RE beams and its interaction with solid materials, the room temperature solid state pellet injector (RTSP) \cite{Lang1994} was borrowed from ASDEX Upgrade tokamak. RTSP is a single stage light gas gun, which is capable of launching pellets with 2 Hz repetition frequency. For successful operation of RTSP at the COMPASS tokamak, a new vacuum system was designed and built to reduce the propellant gas throughput and thus suppress influence of propellant gas at the plasma performance. In this contribution the design and tests of the pellet injector will be presented as well as the first results from experiments with the graphite pellets ($\varnothing$ 1.5 \times 2 mm) fired into RE beams or RE populated discharges at the COMPASS. The interaction of graphite pellets with RE beam was clearly observed and effect of fast particles on ablation of the pellets will be analysed.

References

\begin{itemize}
\item \cite{Mlynar2019} Mlynar J. et. al. 2019 \textit{Pils. Phys. Contr. Fusion} \textbf{61} 014010
\item \cite{Ficker2019} Ficker O. et. al. 2019 \textit{Nucl. Fusion} \textbf{59} 096036
\item \cite{Lang1994} Lang P. T. et. al 1994 \textit{Rev. Sci. Instrum.} \textbf{65} 2316
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