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Losses of runaway electrons in MHD-active plasmas of the COMPASS tokamak

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Significant role of MHD effects in mitigation and losses of Runaway Electrons (RE) was documented in dedicated experimental studies of RE at the COMPASS tokamak. The MHD activity analyses were based on data from the extensive magnetic diagnostic system of COMPASS, while the RE losses were monitored by the hard X-ray (HXR) scintillation detectors.

RE in COMPASS are normally produced in the current ramp-up phase due to the increased toroidal electric field. Role of this RE seed on subsequent RE population proved significant. Robust control of the ramp-up RE seed via fueling scenarios was achieved which allowed for systematic studies of RE confinement and loss in the current plateau phase
[J. Mlynar et al., ECA Vol.39E (2015) P4.102]. Among others, recent experiments with complete suppression of the RE seed and decreasing plasma density in the current plateau resulted in the standard estimate of the critical field.

The contribution focuses on studies of periodic oscillations in the HXR intensity. We show that frequencies of the oscillations are clearly coherent with magnetic data oscillations in the presence of tearing modes. Second, a strong relation between the HXR intensity oscillations and the coil current noise due to the COMPASS power supply (the flywheel generator frequency) is described. Both observations demonstrate that perturbations of the magnetic field result in enhanced losses of runaway electrons. This conclusion corresponds well with previous observation in DIII-D [R. A. Moyer et al., General Atomics Report GA-A27773]. Furthermore, our subsequent RE measurements at TCV tokamak show similar behaviour. The relevance of this work in respect of experiments on post-disruption RE confinement and mitigation will be discussed on the background of recent results from ASDEX Upgrade and JET.

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