Analysis of MGI disruptions and runaway electron beams at COMPASS using tomography and fast camera data

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The tomographic inversion of signals from SXR and AXUV detector arrays is a valuable tool in various operational scenarios on COMPASS. However, runaway electron (RE) beam generation and mitigation experiments conducted at COMPASS [1] present a challenge to this method as this scenario creates a very noisy environment and conditions far from the optimal design parameters of the detectors. The massive gas injection, subsequent disruption and RE beam generation and decay phases are a source of quickly changing intensities of radiation in a broad range of wavelengths (bremsstrahlung and line radiation of the gas atoms and ions). In particular, the semiconductor-based detectors are also strongly affected by the HXR radiation produced due to the interaction of relativistic electrons with the wall. On the other hand, the tomographic inversion in this scenario might be a valuable source of information about the gas penetration speed, beam position, total radiated power and profile of the beam-gas interaction which might be related to the beam current profile or electron energy. Values of some of these quantities, in particular the ones related to the gas transport, can be also derived from high-speed camera images that are usually only weakly affected by the HXR radiation. This contribution summarizes the difficulties of using tomography in this scenario and the different effect of various mitigation gases (Ar, Ne, D) on the radiation signals, including the high-speed camera data.

References

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