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P1.1011 Runaway electrons expulsion during tokamak instabilities

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See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.1011.pdf

The expulsion of runaway electrons (REs) in the presence of magnetic islands is studied for different island dynamics and different RE population fraction. Clear correlations are found between magnetic island size and RE diagnostics, in particular hard x-ray emission and a single-channel Cherenkov probe placed in the limiter shadow. The Cherenkov probe permits the detection of fast electrons expulsion with a high level of detail, presenting waveforms with 100% signal contrast during tearing mode growth and rotation, which implies strongly non-axisymmetric RE flux in the limiter shadow. Correlations between Cherenkov signal, hard x-ray emission and electron cyclotron emission also reveal the impulsive transfer of RE momentum from parallel to perpendicular degrees of freedom, which is likely due to pitch angle scattering on plasma waves, i.e., the so-called anomalous Doppler instability. The Cherenkov signal response to magnetic islands rotation changes dramatically as the RE pitch angle increases, in particular the peak amplitude increases and the phase shift with respect to the magnetic signal changes. These experimental observations provide both ideas and benchmark data to challenge the modelling of RE interaction with non-axisymmetric perturbations. For example, the ratio between Cherenkov and hard x-ray signals, which is indicative of the RE halo thickness in the limiter shadow, increases markedly with magnetic perturbation amplitude, and pulses of the same type but with different RE content (see figure) follow a common, non-linear trend.

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