Detection of RF emission by runaway electrons

Detection of plasma waves emitted by runway electrons (RE) provides a sensitive monitor for RE kinetic instabilities, which can reduce energy attained by RE as well as RE confinement. Furthermore, understanding how to stimulate such kinetic instabilities can lead to the development of advanced RE mitigation methods. Emission of radio waves by runaway electrons has been measured on FTU under different regimes, including low-density plasmas during current ramp-up, in wave dispersion conditions similar to the ones expected for the ITER start-up phase [P Buratti et al 2021 Plasma Phys. Control. Fusion 63 095007].
The team built around FTU measurements has continued its activity during 2020 with measurements on TCV, by and ex-vessel antenna, and with a full experimental campaign on COMPASS, by means of a complex of in-vessel and ex-vessel antennas built in collaboration with the COMPASS team. Preliminary experiments on active wave injection have also been performed on COMPASS. New measurements on TCV, employing an in-vessel antenna, are foreseen in next months. The team also includes theoretical skills for the development of analysis and prediction tools. The experience gained with FTU, TCV and COMPASS experiments and analyses on RE-waves interactions can be capitalized to devise diagnostic and control settings to detect and possibly stimulate RE kinetic instabilities also in ITER.

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