Observation of electrostatic fluctuations driven by runaway electrons in EAST disruption

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Electrostatic fluctuations driven by runaway electrons (REs) are observed after thermal quench in EAST disruptions triggered by massive gas injection (MGI). The fluctuations can be clearly recognized in the signals of SXR and AXUV, but not in Mirnov coils, indicating it should be electrostatic fluctuations. Clear RE loss is confirmed according to HXR (shown in Fig. 1) and amplitude of the HXR fluctuation is almost proportional to the mode frequency.

Fluctuations are only observed with argon and neon injection but not with helium injection, which suggests that the fluctuation is driven by REs. With argon injection, an electrostatic fluctuation with frequency varying from 10 to 40 kHz is observed within ~5 ms duration. The frequencies are proportional to amount of injected gases, and finally tend to be saturated. With neon injection, two separated modes with firstly lower frequency of 10-15 kHz and latter higher frequency of 30-40 kHz are found, both of them can last only ~1 ms.

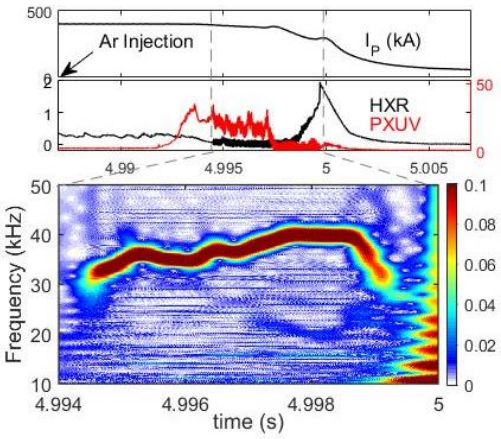

Fig. 1 fluctuations observed in the HXR and AXUV signals after thermal quench

Clear phase difference is detected in the signals of the XUV arrays and mode structure is identified as (m, n) = (1, 0) by SXR arrays, supporting that GAM is proposed as the candidate instability. The calculated GAM frequency after thermal quench is consistent with the observed fluctuation. Moreover, the possibility of GAM driven by REs is discussed and the barely-trapped/passing electrons can contribute to drive the mode. This observation will further deepen the understanding of RE losses in EAST and be an important part of RE mitigation or avoidance research in future.