# Runaway Electron Generation in EAST Helium Plasma

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The quiescent regime with generation of runaway electron (RE) has been observed during the helium ohmic plasma in EAST. The onset electron density for RE generation is ~ $0.9 \times 10^{19}$ $m^{-3}$ in helium plasma, in which the value is higher than in deuterium plasma [1]. HXR and ECE signals are further indicate that more RE are produced in helium plasma than deuterium plasma by comparing the parameters at the similar condition.

RE growth and decay in quiescent regime have been detailed studied. The growth rate of HXR in helium plasma is clearly higher than that of deuterium plasma with at the same electron density, which indicates that RE can more easily be dissipated due to collision in deuterium plasma. Besides, RE growth rate according to HXR signals both in helium and deuterium plasma is inversely proportional to electron density.

Simulation [2] study shows that RE formation exhibits extremely strong dependence on electron temperature and is enhanced at high temperature. The electron temperature which measured by Thomson scattering and ECE in helium plasma is both higher than deuterium plasma, supporting the simulation results. Further, the RE growth rate is less sensitive to $Z_{eff}$ compared with electron temperature.

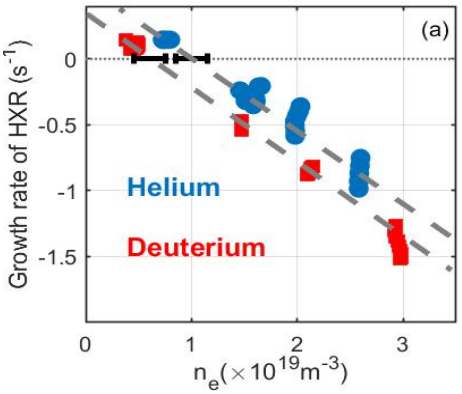


*Figure 1 Comparison of HXR growth rate vs electron density in helium and deuterium plasma.*

[1] X. Zhu, L. Zeng, Y. F. Liang *et al* Nucl. Fusion **60**, 084002 (2020)

[2] A. Stahl, E. Hirvijoki, J. Decker *et al* Phys. Rev. Lett. 114,115002 (2015)