

21st joint workshop on electron cyclotron emission (ECE) and electron cyclotron resonance heating (ECRH)

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Electron cyclotron heating assisted start-up in J-TEXT

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Electron cyclotron heating (ECH) breakdown and burn-through assist has been adopted to make the ITER start-up, which uses a low toroidal electric field of about 0.3 V/m, more robust. Related studies have been carried out on many fusion machines such as DIII-D, JT-60U, JET, Tore Supra and EAST. However, the required ECH power to ensure an effective breakdown assist at ITER is not yet clear. Experiment was also performed in J-TEXT to determine the minimum ECH requirements to assist breakdown and develop a better physics description of the process. The breakdown loop voltage for a successful shot was reduced from 34 to 3.7 V (corresponding to 0.56 V/m) by 300 kW ECH with X2-mode polarization, as shown in figure 1. The critical power for successful discharge is about 200 kW. When ECH power is higher, there seems to be strong plasma-wall interaction. The effect of different loop voltage and ECH time on start-up was also studied. Extremely low breakdown voltage leads to a higher toroidal field later when putting a capacity to continue discharging in J-TEXT. The earlier shutdown of ECH caused a failed discharge.

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