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Electromagnetic Pellet Injector for disruption mitigation on J-TEXT tokamak

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Disruption mitigation is essential for large scale tokamak device such as ITER. It will reach 1GJ thermal energy and magnetic energy when it operated with high performance. The current impurity injection speed of disruption mitigation systems (DMS) driven by high pressure gas is limited by the sound speed of the propellant gas. Thus the massive gas injection or the shattered pellet injection only reach a few hundred m/s. The fast time response DMS with high injection speed is essential for next generation devices. The

Electromagnetic Pellet Injection (EMI) system based on railgun concept has been developed on J-TEXT tokamak. It is constructed by two reverse concatenated railguns, EMI can not only accelerate the payload to over 1000m/s, but also keep the device from stricken by the high speed armature. The overall reaction time can also be lessened to 10 milliseconds considering a 6.3 meters injection tube length in the case of ITER. The preliminary test result has shown that the EMI system has a great potential to be the DMS of the large scale fusion devices.