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6.45 Application of a hall sensor to pulse magnetic field measurement in the FAT-CM FRC experiments

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Collisional merging experiments of a field-reversed configuration (FRC) at super-Alfvénic velocity have been conducted in the FAT-CM device. In the experiments, two FRCs accelerated to the velocity of 150 – 200 km/s are collided and merged in the confinement section with a quasi-static confinement magnetic field. Therefore, it is necessary to measure high-frequency pulse magnetic field superposed on a quasi-stationary signal. The magnetic field is generally measured by a magnetic coil in the pulse discharge experiments, however the coil has nonlinear characteristics in the wide frequency of the conducted experiments. Therefore, a hall sensor has been applied as a wideband magnetic field measurement in the FAT-CM experiments. On a magnetic field measurement in the confinement section, it is confirmed that the sensor has the response speed and linear characteristic for the magnetic field with the rising time of about 40 ms and its output voltage does not saturate in the magnetic field of about 0.09 T. Combination of the hall sensor and the magnetic coil realizes complete measurements of the magnetic field in the range of the FAT-CM experiments. In this work, dynamic process of collisional merging in the FAT-CM has been measured by the combined magnetic diagnostic system.

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