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10.56 Observation of dynamic processes in the collisional merging of field-reversed configurations

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Performance of the diagnostics suite device and initial observation results of collisional merging experiments in the FAT-CM device are presented. The FAT-CM device, consisting of two FRTP formation sections and a confinement section, has been developed to investigate the collisional merging process and the propagation properties of low-frequency wave in the high-beta compact toroid of field-reversed configurations (FRCs). In the FAT-FRC experiments, the dynamic process of collisional merging of FRCs at the relative velocity of 200-400km/s is observed by both magnetic and optical measurements. The typical parameters of merged FRC in the initial series of experiments are ~ 0.2 m in radius, ~ 2 m in length, electron density $\sim 1 \times 10^{20} \text{ m}^{-3}$, external magnetic field ~ 0.07 T and total temperature ~ 100 eV in the equilibrium phase. Electron density of the merged FRC measured by two movable interferometers is approximately 10 times higher than the previous research at C-2U FRC [H. Gota et al., Nucl. Fusion 57, 116021 (2017)]. Also, the oscillating signal on the line-integrated electron density represents the rotational instability with toroidal mode number $n = 2$ is observed as one of the evidence of the formation of high-density FRC plasmas.

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