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Development of Cs-injection System for KFE RF hydrogen Negative Ion Beam Source

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A prototype radio frequency (RF) negative hydrogen ion beam source is developed in Korea Institute of Fusion Energy (KFE). The target is to extract negative ion beam with 200 keV, 0.5 A for 100 ms. The RF power supply of 400 kHz delivers over 40 kW to the ICP without the Faraday shield. The plasma is generated and turned off within 120 us, and the RF power supply is stabilized within tens of milliseconds. The negative ion beam is successfully extracted, and the negative ion beam and the co-extracted electron current are separately measured. Since the beam current is limited to only about 30 mA, Cs assist is needed for the beam current enhancement. The Cs vapor injector and the plasma grid heating system are prepared to Cs assisted negative ion beam extraction. The Cs dispenser and SID are installed for Cs injection and its amount measurement. The Galden oil heater and the circulation system are installed to heat the plasma grid over 200 Celsius degree to optimize the surface interaction. The plasma grid temperature is assumed by the supply and return oil temperature. The plasma grid is successfully heated, and the weaknesses such as vacuum sealing o-ring are protected by water cooling. The enhancement of the ion beam current and suppression of co-extracted electron current by Cs vapor injection will be presented.

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