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Innovative Cesiation Deriving Incredible 145 mA Beam from J-PARC Cesiated RF-Driven H⁻ Ion Source

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In NIBS2022, the stable 8-hour operation of the J-PARC cesiated RF-driven H⁻ ion source in a test-stand with a 69.9 keV 120 mA beam and a beam duty factor of 4 % (1 ms x 40 Hz) was reported. However, the Cesiation condition was produced after many times and rather large amount of Cesium and H2Os injections. The necessary plasma electrode temperature (TPE) of 254 °C was also much higher than those not only for the J-PARC source (about 70 °C) but also for the standard cesiated H⁻ ion sources (180 ~ 200 °C).

In this paper, the novel Cesiation procedure (how to inject H2Os and Cesium), which reproduces the Cesium effects lasting not only for the high TPE but also for the high-density plasma bombardments, is presented. The innovative Cesiation derived a 76.5 keV 145 mA beam from the J-PARC source in the test-stand. The measured results of the 145 mA beam, extraction electrode current and RF waveforms, parameter trends of an 8-hour 145 mA operation and the transverse emittances are also presented. The available H⁻ ion intensity for the J-PARC source operation energy of 52.5 keV was increased from 72 mA to 83 mA, which was consistent with the 1.5 power law on the beam energy compared with 145 mA for 76.5 keV.

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Yes

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