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Decrease of H- ion beam emittance with increased frequency in RF discharge

Tuesday 27 August 2024 16:00 (2 hours)

In recent years significant progress in increase intensity of H- beam in RF surface plasma sources. H- beam intensity in RF SPS of J-Parc was increased up to 145 mA.Intensity of H- in RF SPS of SNS was increased up to 110 mA, which is enough for European spallation source storage ring. Reduction of beamlet divergence in RF negative ion source for NBI is one of high-priority targets to be solved. Minimum beamlet 1/e divergence in RF H- ion sources with low RF frequency (2-4 MHz), much higher than in ion sources with DC discharge.
- min. q div(FA) ≤ 5 mrad (obtained at NIFS and QST with DC discharge)
- min. q div(RF) ≤ 12 mrad (obtained at IPP and RFX RF ion sources)
- max. q div(ITER NB) < 7 mrad.In RF H- ion sources

In H- ion sources with low RF frequency (2-4 MHz) is observed significant modulation of beam intensity at first and second harmonic. This should lead for vibration of the meniscus shape and increase angle spread. Work with higher RF frequency (13,56 MHz) should decrease intensity modulation and decrease emittance to two times. RF SPS with a frequency 13.56 MHz could be a good solution for a European spallation source with a storage ring.

Footnotes

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