



IAEA FEC 2014

Contribution ID: 221

Type: Poster

Progress in Long Pulse Production of Powerful Negative Ion Beams for JT-60SA and ITER

Thursday, October 16, 2014 8:30 AM (4 hours)

The long pulse generation of the powerful negative ion beams of 500 keV, 22 A (130 A/m^2) and 1MeV, 40 A (200 A/m^2) is the essential challenge to realize the negative-ion-based neutral beam injectors (NBIs) for JT-60SA and ITER, where 10 MW D0 beam for 100 s and a 16.5 MW for 3600 s are designed, respectively. In Japan Atomic Energy Agency (JAEA), after the achievements of the beam current density and energy required for JT-60SA and ITER with a short pulse duration, the target of R&D is focused on the extension of the pulse duration in JT-60 negative ion source and the MeV accelerator.

Significant progress in the extension of pulse duration of the powerful negative ion beams has been made to realize the neutral beams injectors for JT-60SA and ITER. The pulse duration and the current density of the JT-60 negative ion source has been successfully improved from 30 s at 80 A/m^2 in the previous operation to 100 s at $120\text{-}130 \text{ A/m}^2$, which satisfy the rated values for JT-60SA. This progress has been achieved by controlling the negative ion production via the surface temperature of the plasma grid. The pulse duration of the MeV class negative ion beams for ITER has been also extended by more than an order of magnitude in the MeV accelerator. A long pulse acceleration of 8.7 s has been achieved at 880 keV, 130 A/m^2 by improving the cooling capability of the extraction grid where the aperture displacement for the beamlet steering is also modified, so there is no limitation to increase the power density and the pulse duration. This is the longest pulse duration of the MeV-class negative ion beams in the world.

Paper Number

FIP/2-5Rb

Country or International Organisation

Japan

Primary author: Dr KOJIMA, Atsushi (Japan Atomic Energy Agency)

Co-authors: Mr YAMANAKA, Haruhiko (Japan Atomic Energy Agency); Dr TOBARI, Hiroyuki (Japan Atomic Energy Agency); Mr MOGAKI, Kazuhiko (Japan Atomic Energy Agency); Dr WATANABE, Kazuhiro (Japan Atomic Energy Agency); Dr OHASA, Kazumi (Japan Atomic Energy Agency); Dr GRISHAM, Larry (Princeton Plasma Physics Laboratory); Dr YOSHIDA, Masafumi (Japan Atomic Energy Agency); Mr KOMATA, Masao (Japan Atomic Energy Agency); Mr HANADA, Masaya (Japan Atomic Energy Agency); Mr DAIRAKU, Masayuki (Japan Atomic Energy Agency); Dr KASHIWAGI, Mieko (Japan Atomic Energy Agency); Dr UMEDA, Naotaka (Japan Atomic Energy Agency); Mr AKINO, Noboru (Japan Atomic Energy Agency); Mr SEKI, Norikatsu (Japan Atomic Energy Agency); Mr NEMOTO, Shuji (Japan Atomic Energy Agency); Mr SASAKI, Shunichi (Japan Atomic Energy Agency); Mr SHIMIZU, Tatsuo (Japan Atomic Energy Agency); Mr ENDO, Yasuei (Japan Atomic Energy Agency)

Presenter: Dr KOJIMA, Atsushi (Japan Atomic Energy Agency)

Session Classification: Poster 5