

First Experiments with the Negative Ion Source NIO1

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Power efficiency of neutral beam injectors for DEMO reactor and other fusion applications critically depends on components, including a multiaperture negative ion source. Its optimization promotes the research of a rich variety of physical issues, for which reduced-size model sources may be of help. The ion source NIO1 (Negative Ion Optimization 1) built by Consorzio RFX and INFN aims to provide such model, and a versatile test bench for innovations and for simulation code validations. The modular design of source and accelerator column allows for replacement of improved parts and electrodes, and many ports are provided for beam diagnostics and pumping. Electrode design and power supplies are rated for a nominal beam current of 130 mA at -60 kV, divided into 9 beamlets with multiaperture extraction electrodes; a 2 MHz (tunable by +/-10 %) radiofrequency generator can provide up to 2.5 kW power in continuous regime, with a cooling system recently improved. Both hydrogen and air were used as feeding gas; the former loads significantly more the pumping system. The general status of the project is reported; conditions for transition to inductive plasma coupling roughly agree with results from a smaller plasma generator and their scaling is discussed. Information on specific physical issues (beam transport, cesium feeding, pumping, and spectrometry) is here summarized.