# The H⁻/D⁻ RF source at the edge towards large area beam extraction and long pulses

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On the "MANITU" testbed (<u>m</u>ulti <u>a</u>mpere <u>n</u>egative <u>i</u>on <u>t</u>est <u>u</u>nit) the experiments are focussed on large area beam extraction and operation in D⁻ with pulses of up to 3600 s.

In first experiments with pulses of few seconds' length the extraction area has been enlarged from the initially 74 cm$^2$ in two steps to 152 cm$^2$ and 306 cm$^2$. The electrically measured H⁻ current density showed no significant dependence on the extraction area; up to 9.7 A corresponding to 32 mA/cm$^2$ have been reached at 100 kW.

In order to demonstrate long pulse operation many components of the RF source had to be upgraded. The source cooling had to be improved and the temperature of the source body and of the plasma grid has been made controllable in order to optimize the H⁻/D⁻ yield and minimize the Caesium consumption. The problem of overheating the ferrites of the RF transformer, which separates the RF circuit from the power supply, has been solved by using ferrites with low losses, an optimized mechanical set-up and appropriate RF matching.

New power supplies for extraction- (15 kV, 35 A) and acceleration voltage (35 kV, 15 A) as well as a more powerful RF generator (180 kW, 1 MHz) suitable for cw operation have been commissioned.

The titanium evaporation pumps have been replaced two cryo pumps and a new long pulse calorimeter has been installed in the testbed. The deuterium operation requires radiation shielding: the source and the extraction system by 20 cm thick polyethylene walls, the calorimeter are shielded by 30 cm thick water tanks which are placed inside the vacuum chamber.

The paper will contain first results concerning extended pulse length and extraction area.