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RF Ion Source Development for Neutron Generation and for Material Modification*

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RF driven multicusp ion sources have been successfully used in various different applications. Lately the Plasma and Ion Source Technology Group at Lawrence Berkeley National Laboratory has been developing a compact RF-ion source for neutron production and a high current density cw-operated ion source for SIMOX-application.

A small, portable, neutron generator incorporating a source and an accelerator is very useful in many applications. Low power consumption is also desirable. The group has developed a small ion source, which consists of a quartz plasma chamber, an external RF-antenna, an extraction electrode and a target assembly, all in a tube that is approximately 25 cm in length and 5 cm in diameter. The neutron generator that is currently in use operates at 1% duty cycle, 80kV and 15 mA of deuterium beam. The neutron yield measured from the generator are $2 - 3 \times 10^6$ n/s.

For oxygen implantation the group has been developing a source which could provide high percentage of O^+ and at the same time high current density at cw-operation. Specifications for the source were 100 mA/cm² current density and beam purity of more than 90% O^+ . These specifications required that the source would have to be used at 4 – 5 kW of RF-power. A dual antenna set-up was developed for the source to ensure a reliable long life-time operation. A pair of coaxial titanium /quartz antennas was used.

The development and the measurements of these two sources will be discussed in this presentation.

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