

VINIS ION SOURCE: STATUS REPORT

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VINIS is an electron cyclotron resonance (ECR) two stage source of multiply charged ions. In the first stage the plasma is formed and in the second one the multiply charged ions are generated. The magnetic structure of the source consists of three solenoids and a hexapole. All these magnetic elements are superconducting. The resonant frequency in the first stage is 28 GHz and in the second 20 GHz; the corresponding values of the magnetic induction are 1.00 and 0.71 T. VINIS has two cryostats, one for the first solenoid and the other for the second and third solenoids and the hexapole. The estimated liquid helium consumption in the persistent mode of operation is $\sim 0.3 \text{ l h}^{-1}$. The dimensions of the discharge chamber are $0.8 \times 20 \text{ cm}$; the pressure in it in the case of neon is $1.3 \times 10^{-3} \text{ mbar}$. The interaction chamber has the dimensions $0.34 \times 105 \text{ cm}$; in the case of neon the pressure in it is $1.5 \times 10^{-7} \text{ mbar}$. The maximal microwave power in the first stage is 2 kW. The waves are right circularly polarized. The dimensions of the discharge chamber are adjusted in such a way that it represents a multimode resonator. In the case of neon the main characteristics of the plasma in this stage are:

- electron temperature and maximal electron density: 50 eV and $1.0 \times 10^{13} \text{ cm}^{-3}$;
- ion temperature and average ion charge: 2 eV and 1.1.

The maximal microwave power in the second stage is 4 kW. As in the first stage, the waves are right circularly polarized. The main characteristics of the plasma in this stage in the case of neon are:

- average electron energy and average electron density: 1-10 keV and $1.0 \times 10^{12} \text{ cm}^{-3}$;

- ion temperature, ion life-time and average ion charge: 20 eV, $\geq 1 \text{ ms}$ and 4.4.

It is estimated that the product of the electron density and the ion life-time in the second stage of VINIS will be up to $\sim 10^{10} \text{ cm}^{-3} \text{ s}$. This means that the source would produce completely stripped light heavy ions and that the intensity of the beams of these ions would be $\geq 400 \text{ pA}$, what is sufficient for nuclear experiments with cyclotrons.