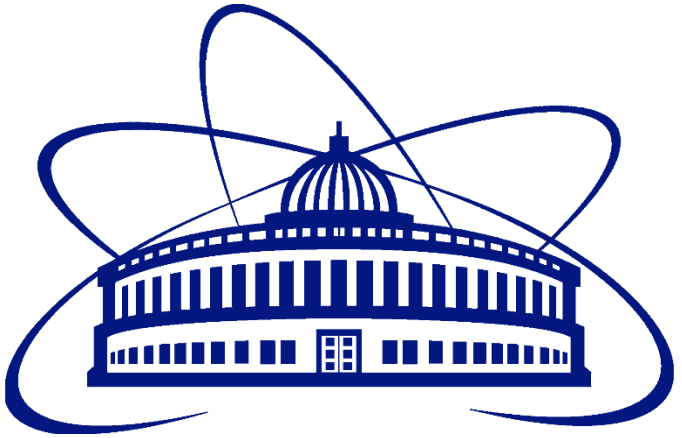


Production of ^{48}Ca and ^{48}Ti ion beams at the DC-280 cyclotron

Bogomolov S.L., Pugachev D.K., Mironov V.E., Efremov A.A., Loginov V.N., Lebedev A.N., Bondarchenko A.E., Kuzmenkov K.I.

Superheavy Elements (SHE) Factory – the Goals

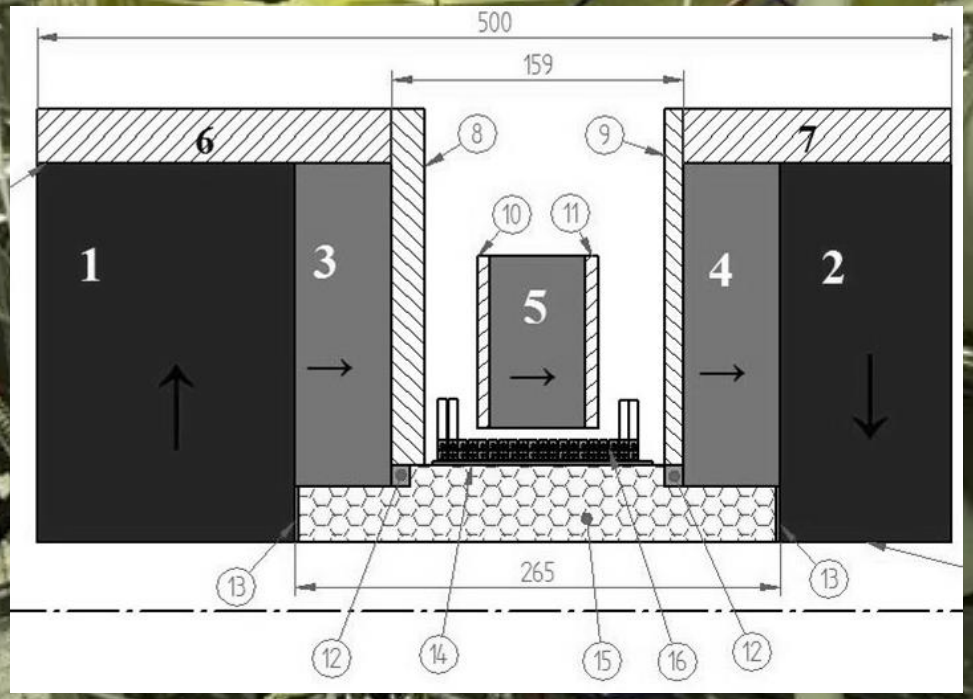
- **Experiments at the extremely low (σ<100 fb) cross sections:**
  - **Synthesis of new SHE in reactions with ^{50}Ti, ^{54}Cr ...;**
  - **Synthesis of new isotopes of SHE;**
  - **Study of decay properties of SHE;**

- **Experiments requiring high statistics:**
  - **Nuclear spectroscopy of SHE;**
  - **Study of chemical properties of SHE.**

To carry out the scientific program, the DC-280 has to provide the following parameters of ion beams:

Ion energies (smooth variation)	**4 - 8 MeV/n**
Ion masses	**10 - 238**
Intensities (A~50)	**>10 pμA**
Efficiency of beam transfer from ion source to physical facility	**>50%**

DECRIS-PM

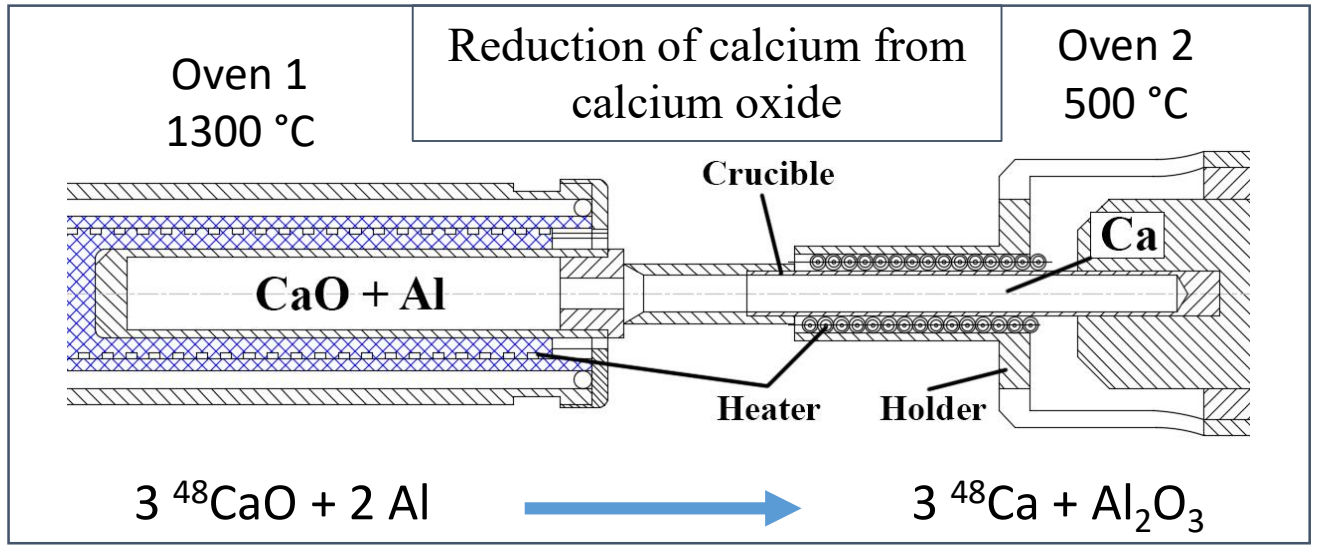


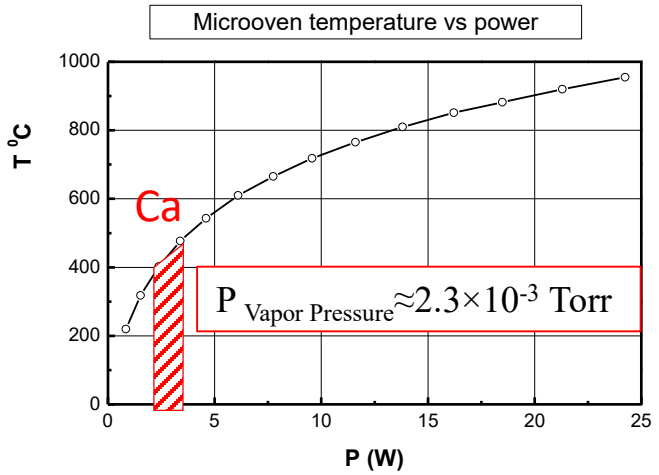
Magnetic structure of DERIS-PM.
1÷5 – PM rings; 6, 7 – soft iron rings;
8÷11 – soft iron plates,
12÷14 - auxiliary elements,
15 - hexapole, 16 – coil.

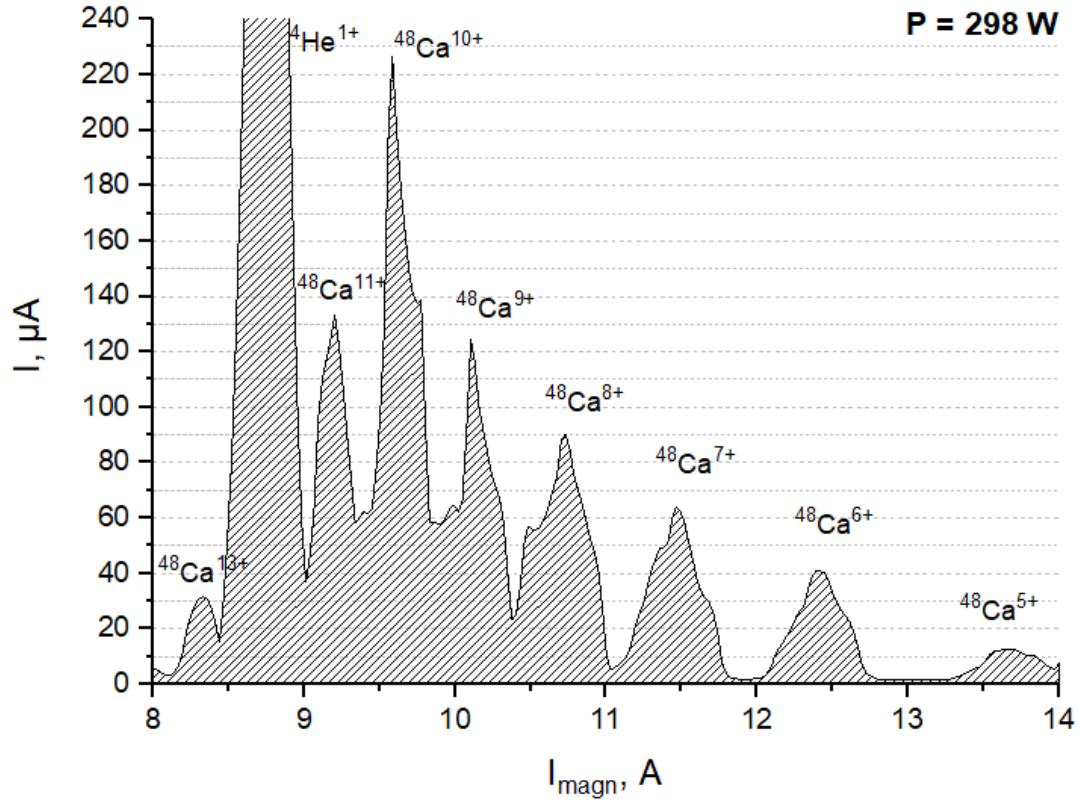
Main parameters	
UHF frequency	14 GHz
Binj	≥ 1.3 T
Bmin	0.4 T
Bextr	1.0 ÷1.1 T
Br	1.05÷1.15 T
Plasma chamber internal diameter	70 mm

Production of ^{48}Ca beam

Helium | Helium + Ca | Helium + Ca + UHF Power>300



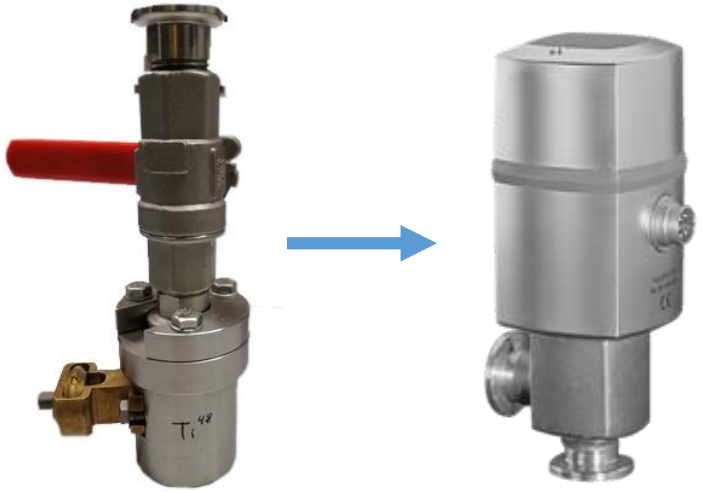


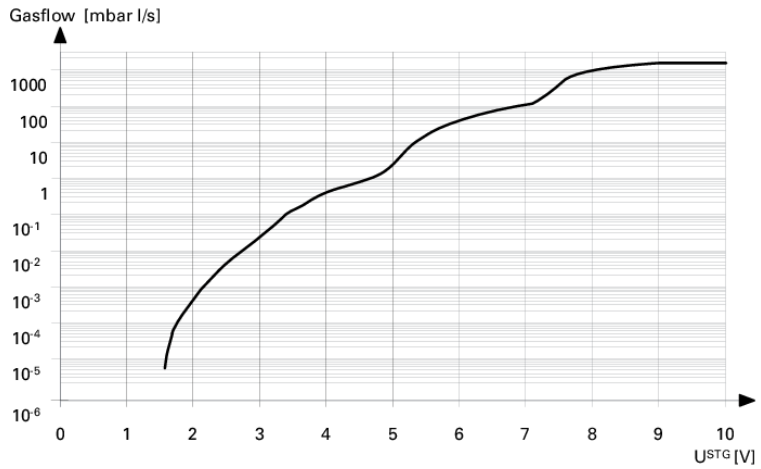


The ^{48}Ca ion spectrum, optimized for Ca^{10+}

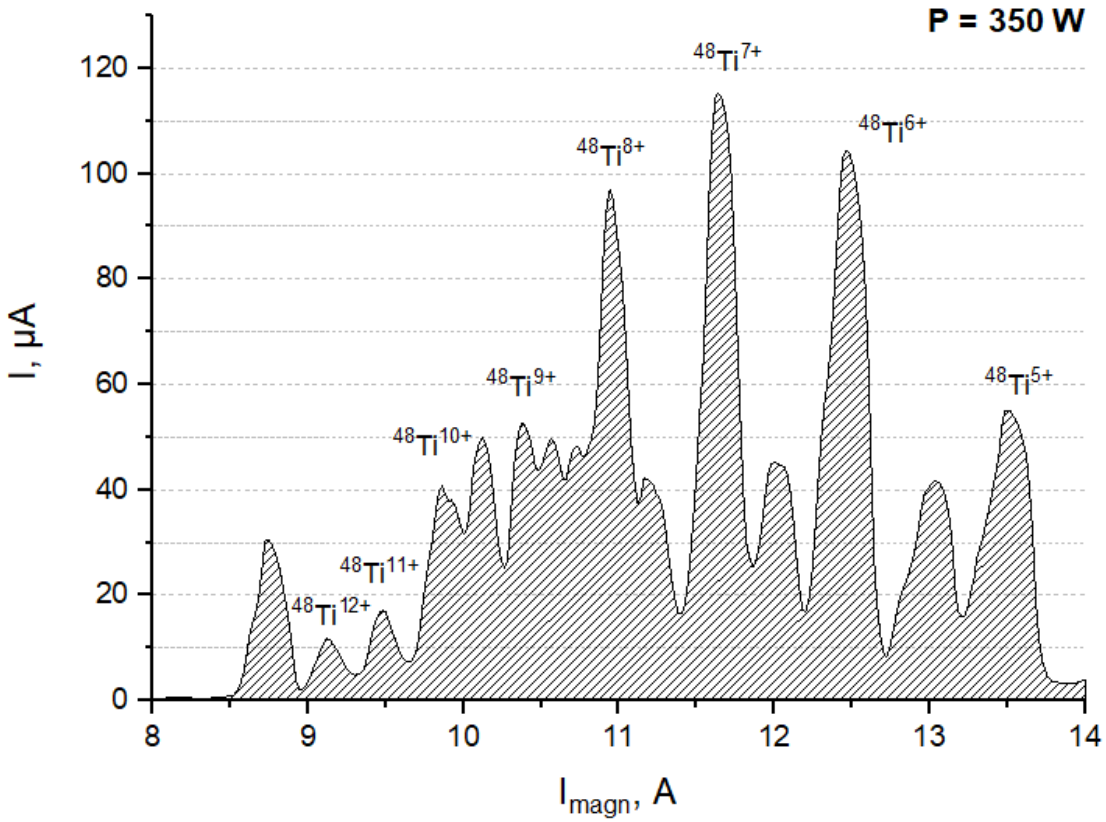
Production of ^{48}Ti beam

$(CH_3)_5C_5Ti(CH_3)_3$





^{48}Ti + UHF Power 350 W



The ^{48}Ti ion spectrum, optimized for Ti^{7+}

Conclusion

- During the work was obtained ^{48}Ca and ^{48}Ti. The ^{48}Ca beam was accelerated, the average extraction efficiency from the ion source to output from the cyclotron is ≈50%. The average consumption for the ^{48}Ca is 0.7 mg/h, for ^{48}Ti is 0.55-0.65 mg/h.

- The operation of the DECRIS-PM ion source was stable and reproducible.

- The intensity of the calcium and titanium beams produced by the DECRIS-PM meets the requirements of the DC-280 cyclotron.

Thank you for your attention!