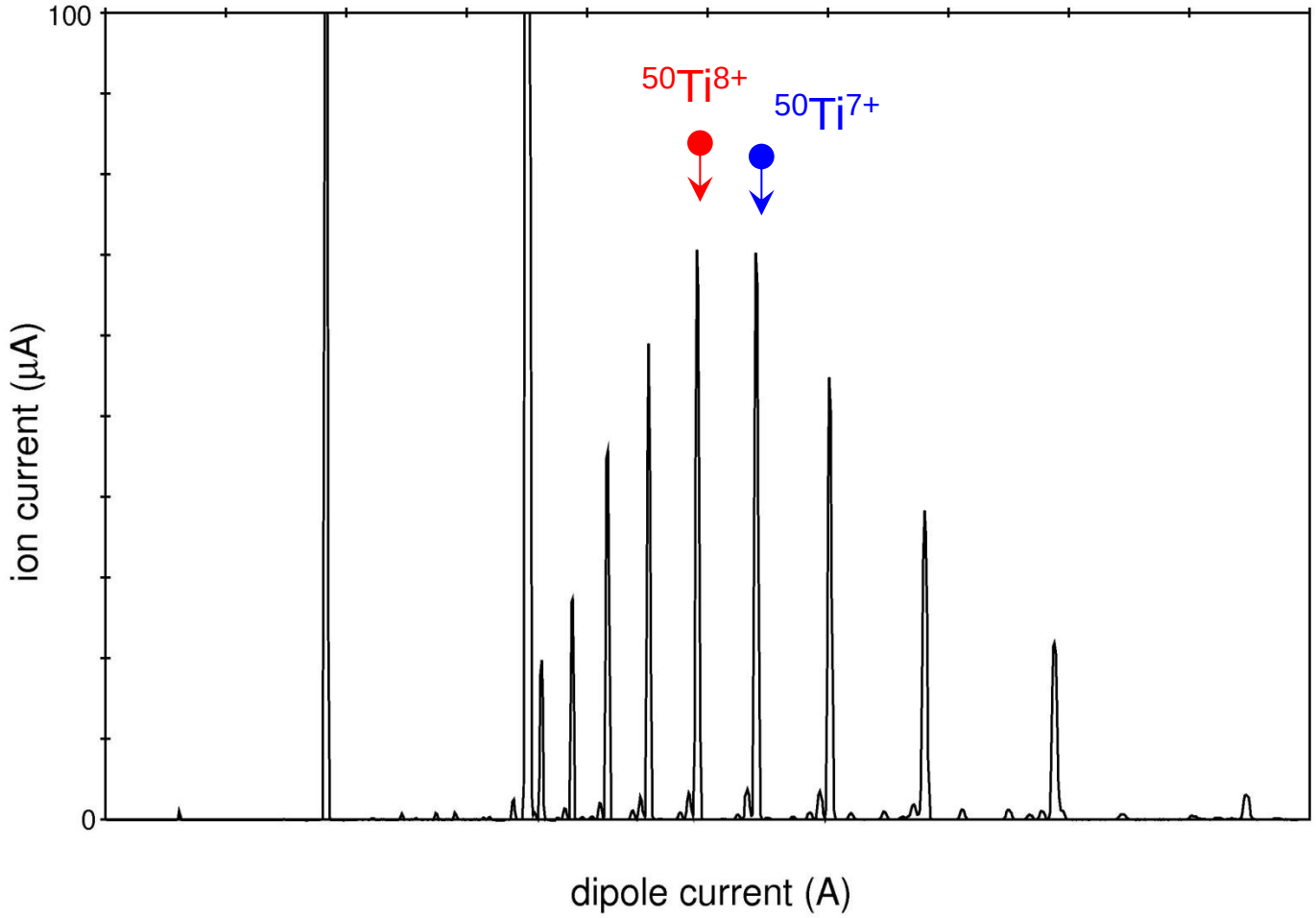
New techniques

HTO:

- Temperature limit extended to 2300 °C for TiO_2 evaporation, 560 W heating power
  ➔ 60 µA of Ti^{7+} for several hours before failure due to chemical reaction of the materials.
- Use of WL20 (W + 2% La_2O_3) for crucibles and for furnace.
  ➔ evaporation of La out of the metal matrix at elevated temperatures.
  ➔ La contamination in the spectrum in the order of several tens of µA.
- Heating power @ 250 W ➔ 1750 °C - lifetime 6 days.
- Heating power @ 360 W ➔ 1950 °C - lifetime 5 days.
- Test of different material qualities for the crucible, materials ordered from different companies.

- Development status ➔ tested for routine operation at the accelerator.

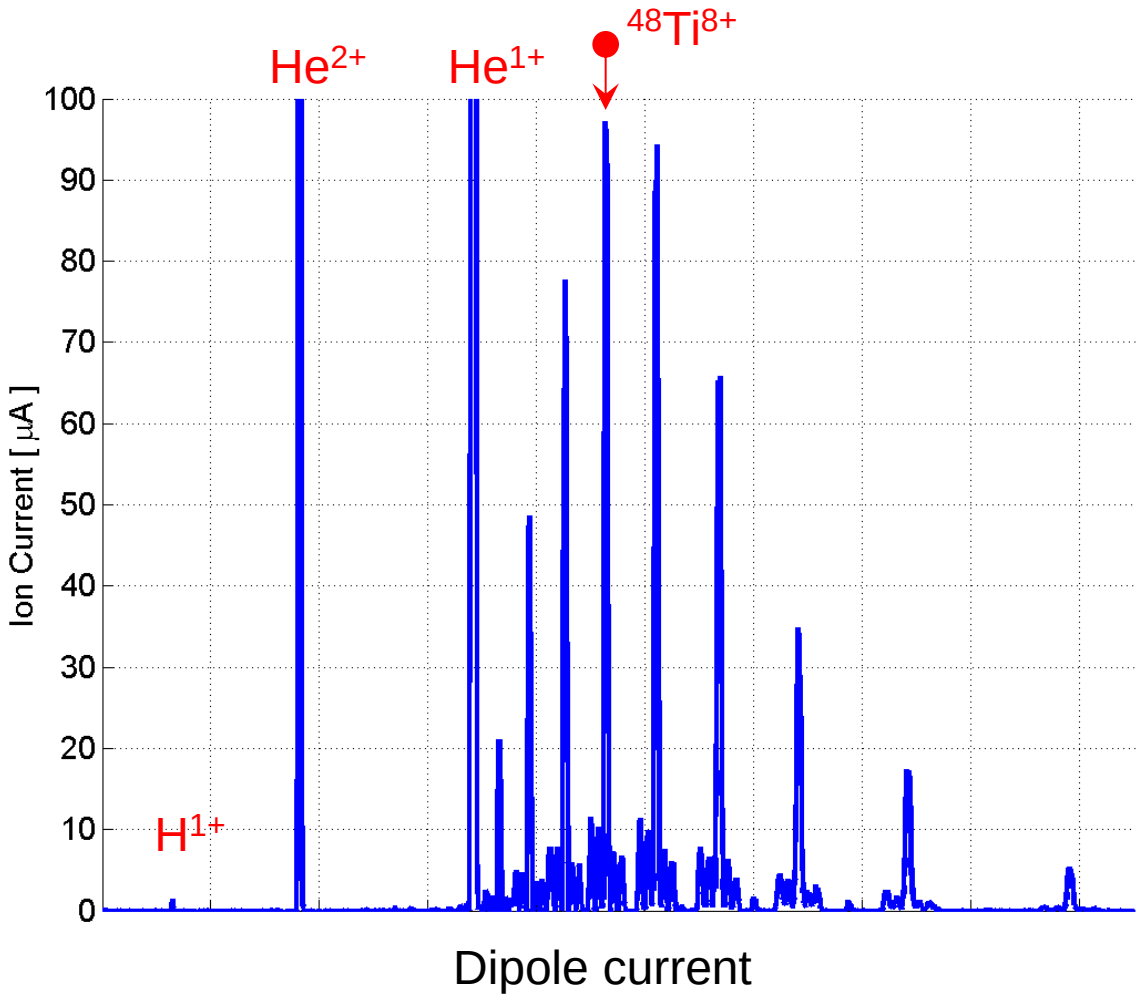
HTO – ^{50}Ti + He – standard Klystron microwave heating



f = 14.500 GHz

T = 1650 °C

HTO – ^{nat}Ti + He – TWTA microwave heating (tuned)



Inj-coil = 1237 A

Extr-coil = 1099 A

HTO = 10.2 V / 25.6 A

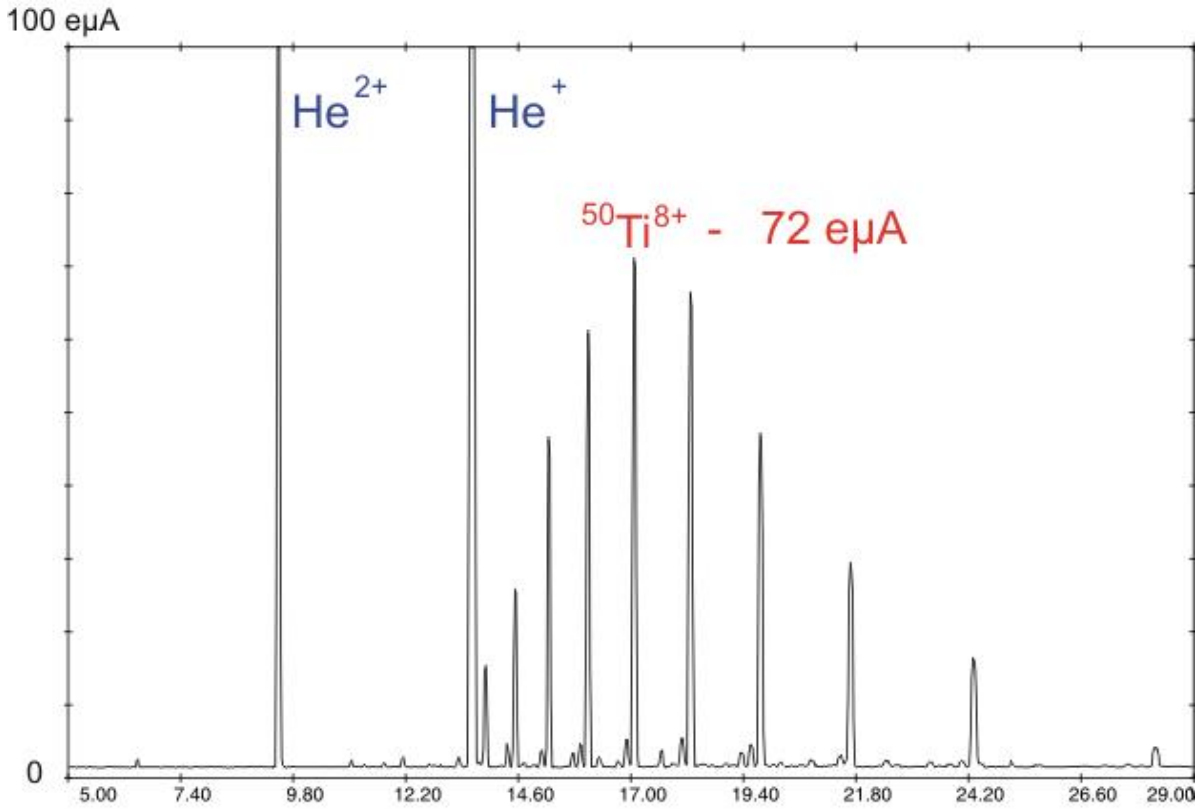
f = 14.5438 GHz

P_{fwd} = 234 W

P_{refl} = 95 W

T = 1650 °C

$^{50}Ti^{8+}$ beam time in May 2014 for SHE experiments



Duration: 406 hours

Average material consumption: 3.60 mg/h

Average intensity: ~ 50 eμA (80 eμA maximum)

Lifetime of one HTO: ~ 100 hours

Future Requirements and Prospects

Discussion on requirements for FAIR ion beams (ion species, intensities) is in progress; some basic points have been fixed.

- Acquisition of a high performance ECRIS and of the ancillary equipment
- Efficient microwave plasma coupling
- Optimization of extraction and beam transport (LEBT)
- Space charge compensation - further aspects
- Development of specific ion beams (metal ions) (according to FAIR requirements)
- Pulsed operation of ECRIS for high intensities