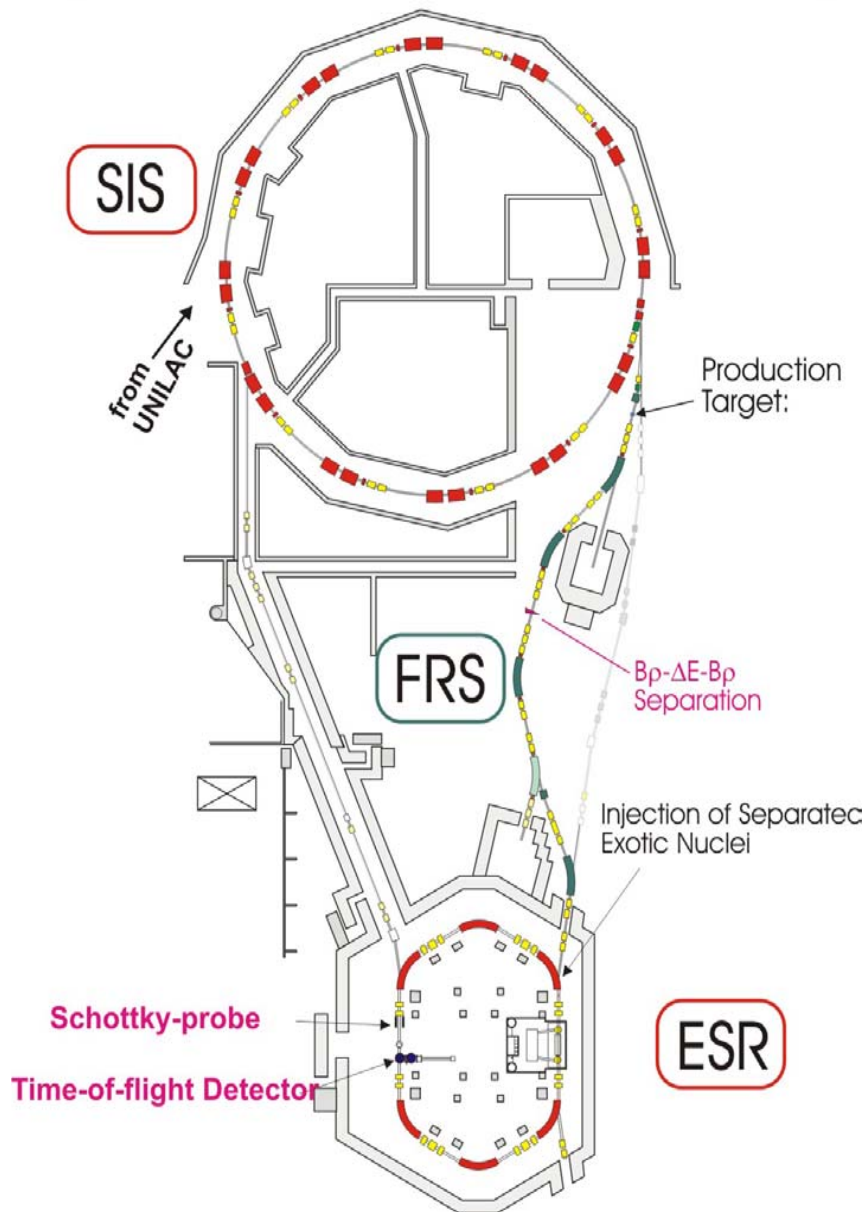


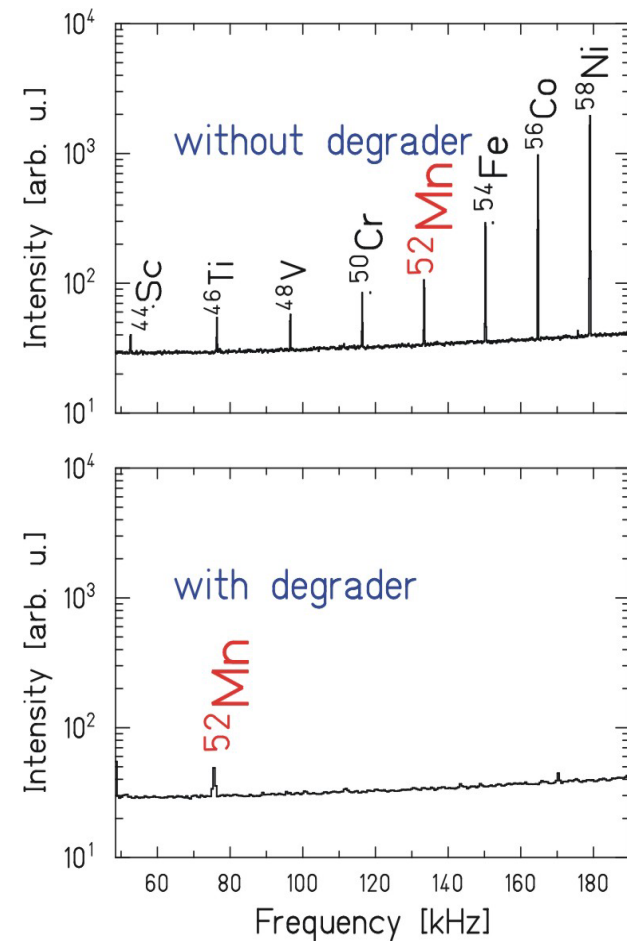
Mass Measurements

Schottky Mass Spectrometry (SMS) for Long-lived Fragments

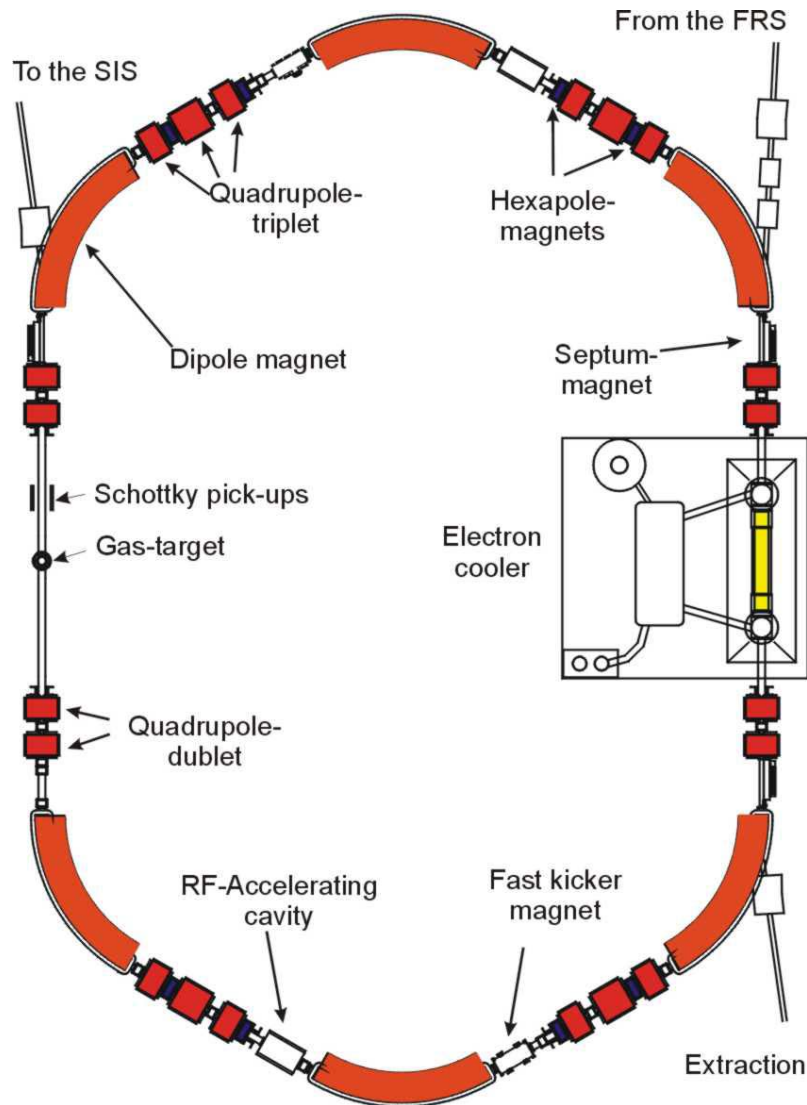
Precision Experiments with the combination of the FRS and the ESR



Monoisotopic Fragment Beams Stored in the ESR

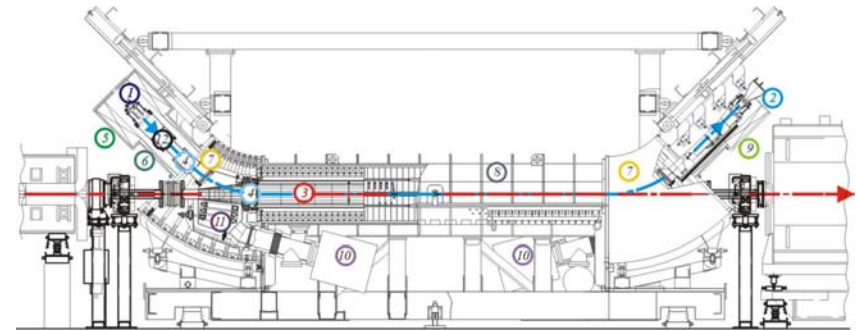


Schottky Mass Spectrometry (SMS)



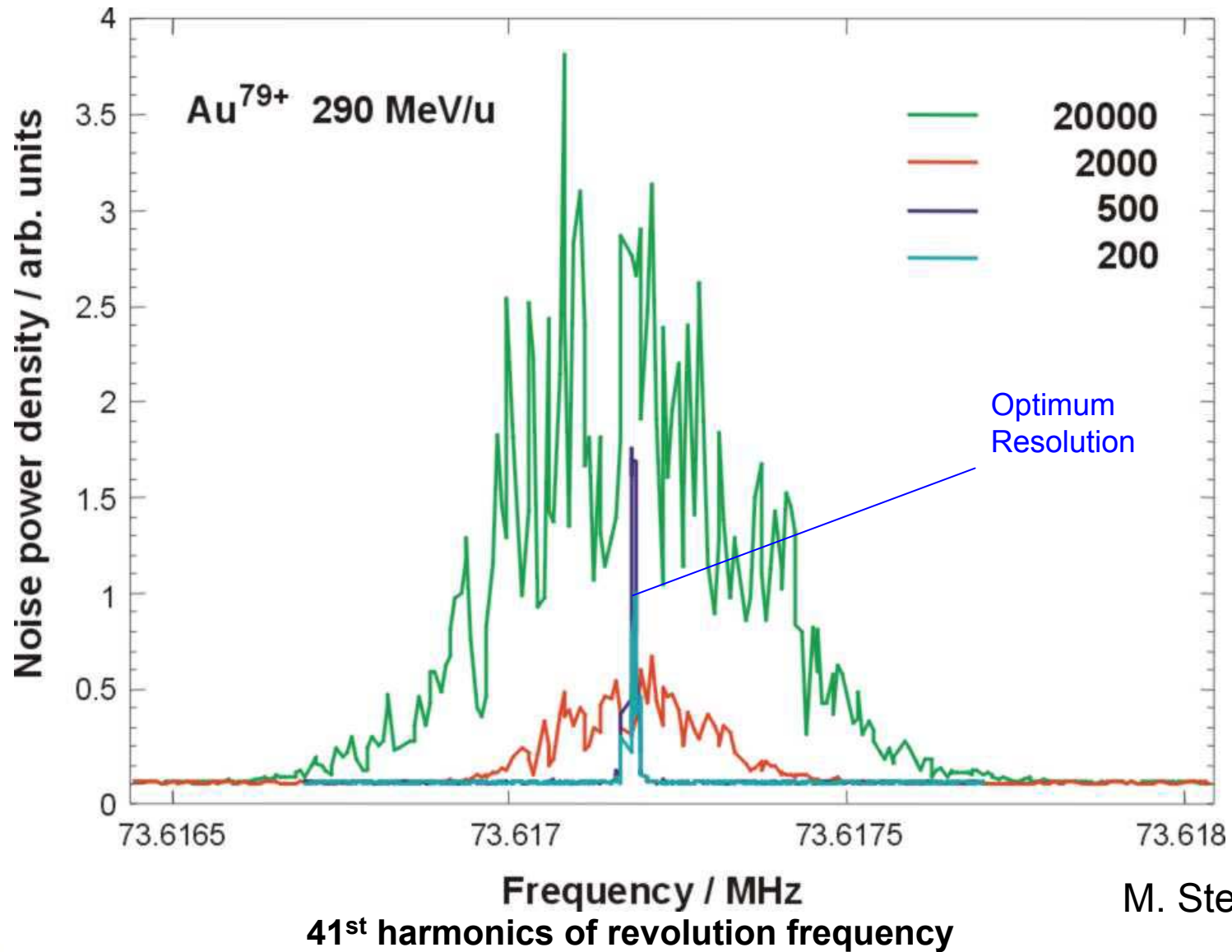
$$\frac{\Delta f}{f} = -\frac{\Delta t}{t} = -\frac{1}{\gamma_t^2} \frac{\Delta(m/q)}{(m/q)} - \left(\frac{\gamma^2}{\gamma_t^2} - 1 \right) \frac{\Delta v}{v}$$

$$\frac{\Delta v}{v} \rightarrow 0$$



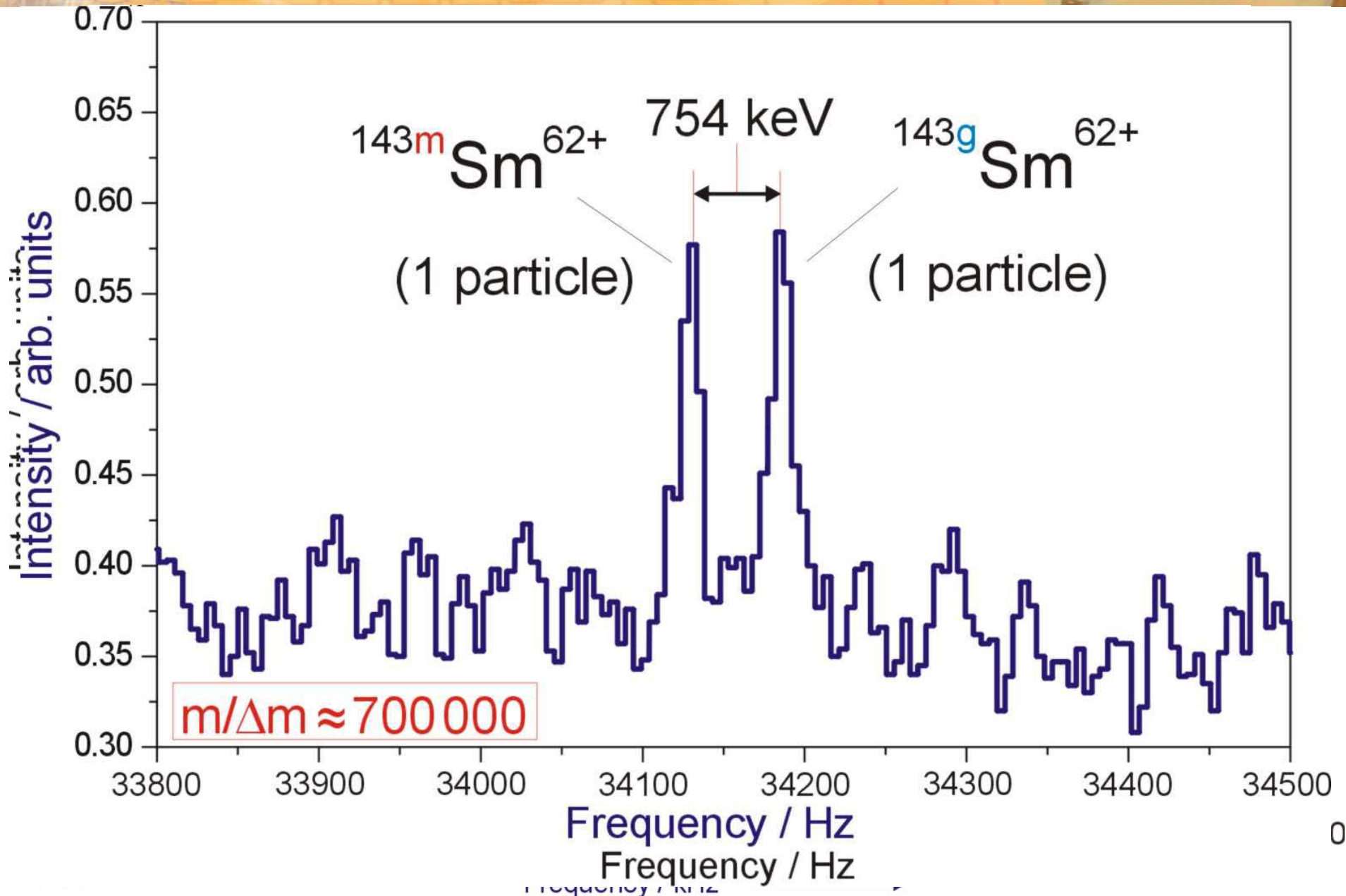
- | | | |
|-----------------------|----------------------|----------------------|
| 1 electron gun | 5 gun solenoid | 9 collector solenoid |
| 2 electron collector | 6 expansion solenoid | 10 sputter ion pumps |
| 3 central drift tube | 7 toroid | 11 NEG pumps |
| 4 clearing electrodes | 8 cooling solenoid | 12 Ti sublimators |

Electron Cooling



M. Steck

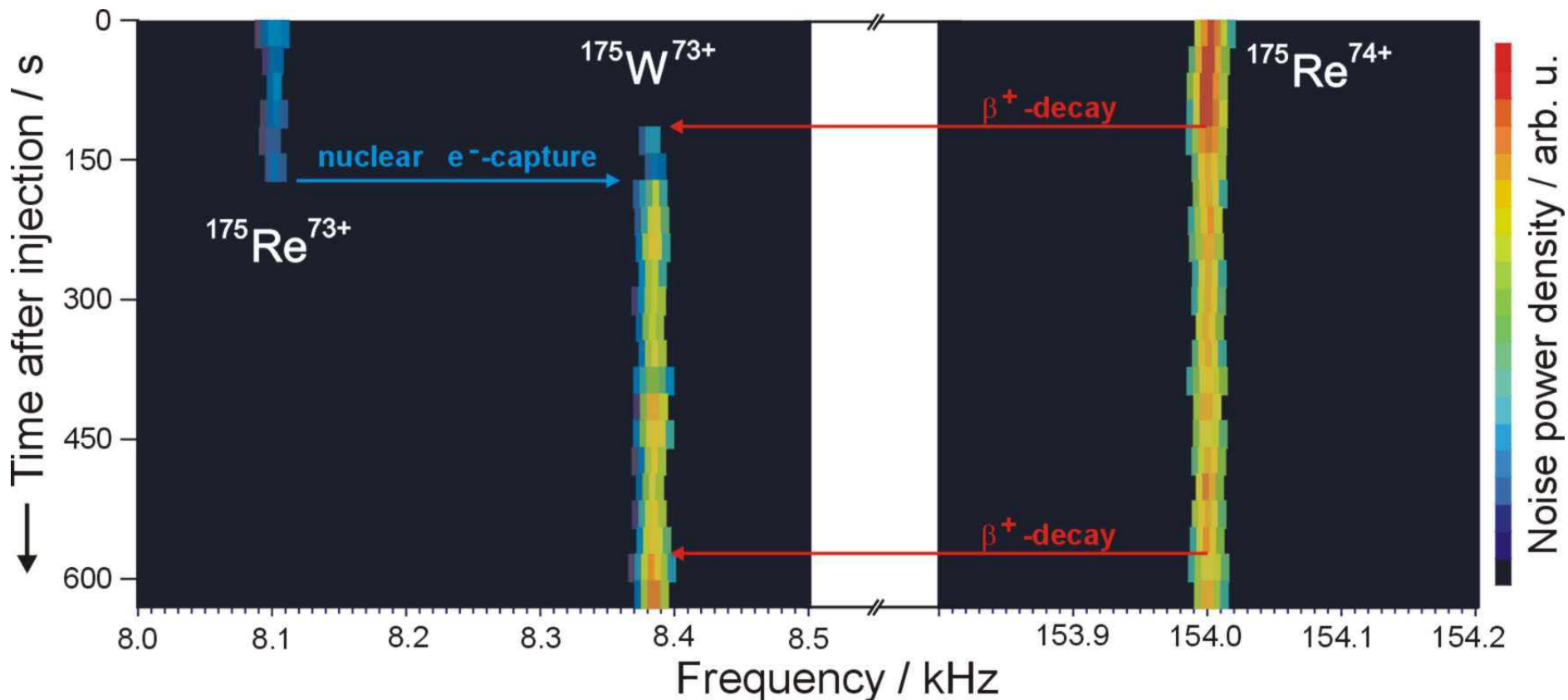
Broad-band Schottky Frequency Spectra



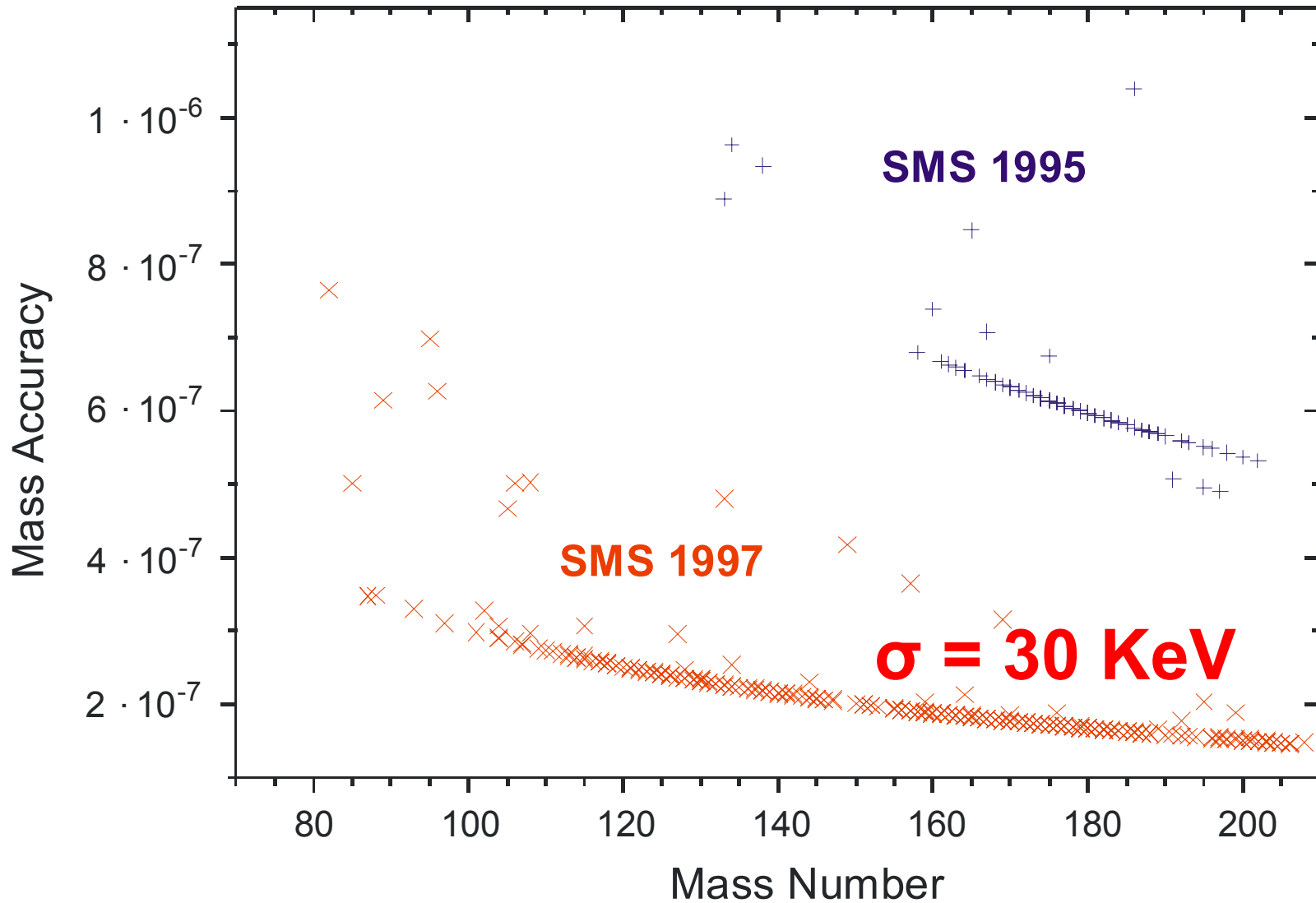
Nuclear decays Stored Single Atoms

Time-resolved SMS is a perfect tool to study dynamical processes in the ESR

Nuclear electron capture, β^+ , β^- and bound- β decays were observed

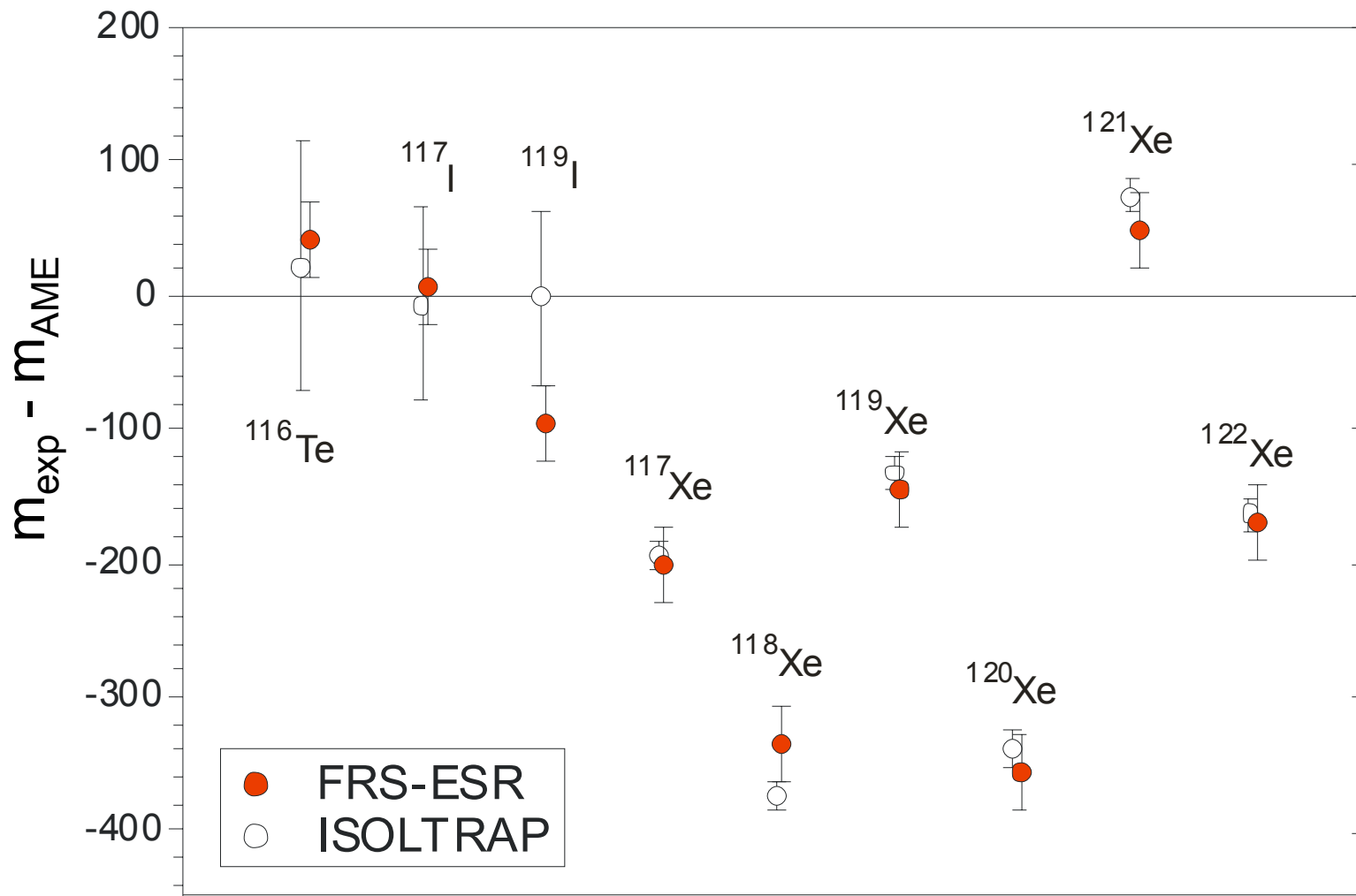


Accuracy of Schottky Mass Measurements



T. Radon, Yu. Litvinov

Accuracy of Schottky Mass Measurements



Mass Surface measured with the SMS

About **1/3** of all known masses
were measured **in one experiment**
Typical mass accuracy **$1.5 \cdot 10^{-7}$**
Mass resolving power **$2 \cdot 10^6$** reached
More than **300 new masses**
More than **200 improved values**

