

Report on E084 ESR experiment

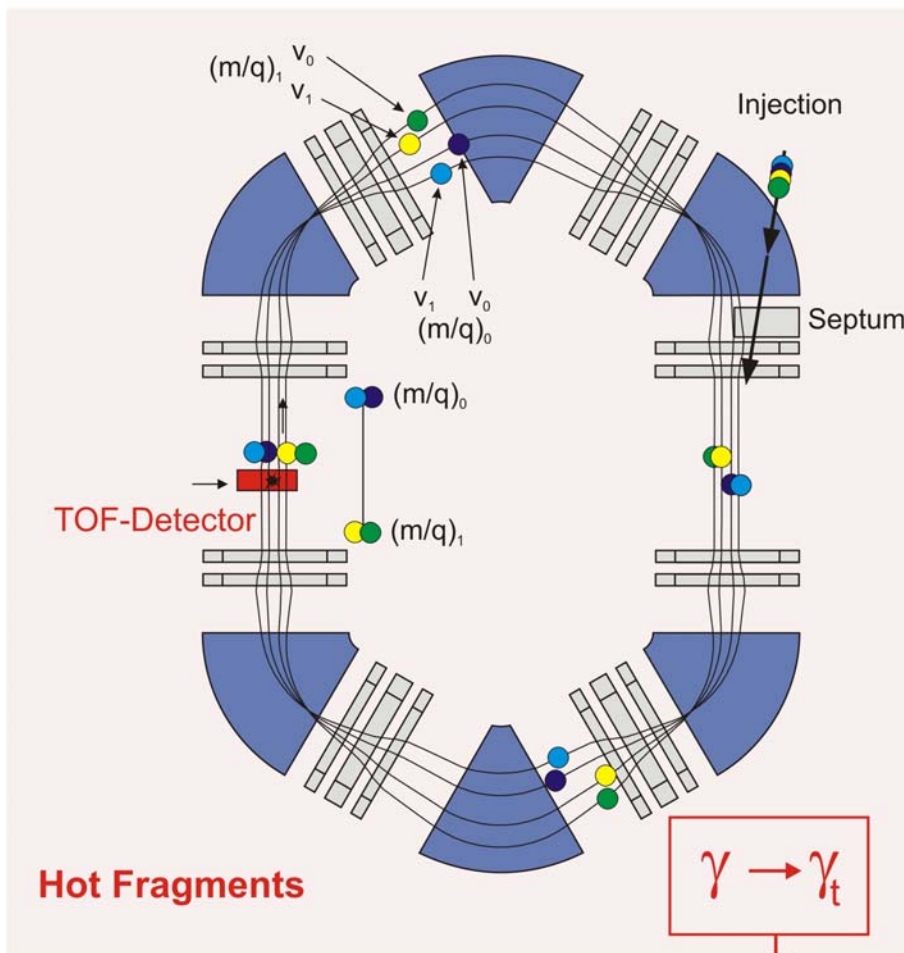
Ronja Knöbel
for the
FRS – ESR – Collaboration

Experimental Proposal E084

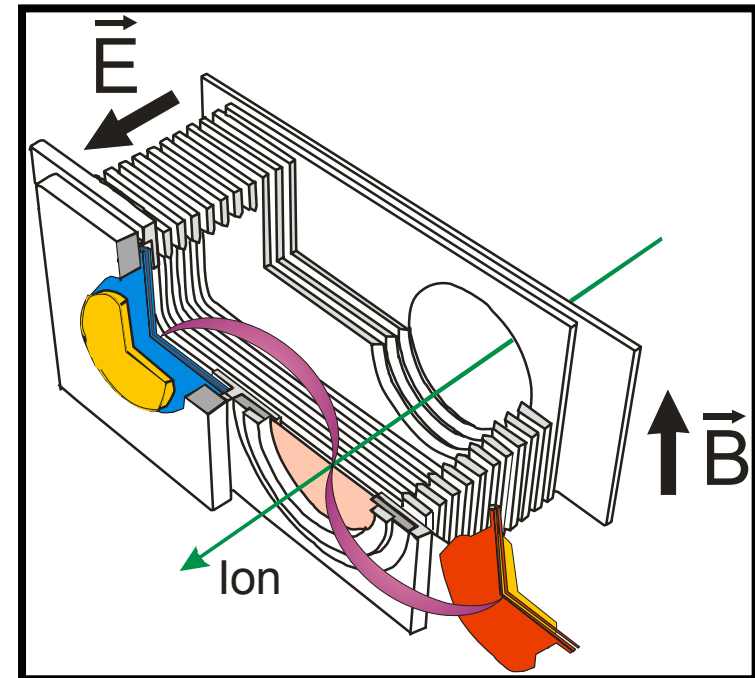
- Title “Mass measurements of
- Spokesperson: R. Knöbel (GSI), B. Sun (JLU Gießen)
- GSI Contact Person: R. Knöbel (GSI)
- Year of Approval: 2008
- Shifts: 42 approved (main)
- Scheduled: 15.07.2010 – 28.07.2010

Isochronous Mass Spectrometry (IMS)

ISOCHRONOUS MASS SPECTROMETRY



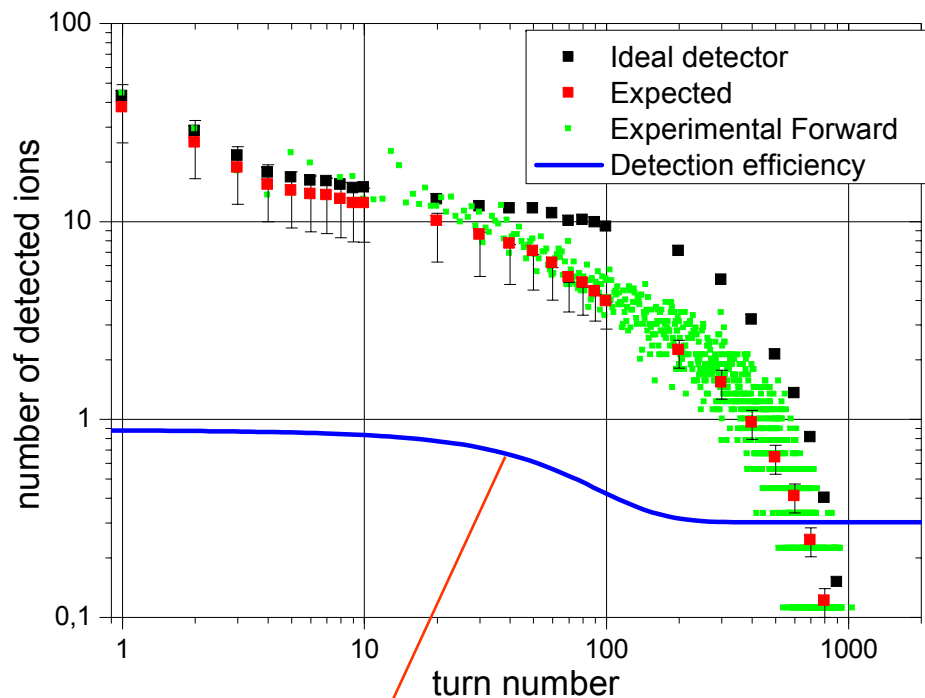
$$\frac{\Delta f}{f} = -\frac{1}{\gamma_t^2} \frac{\Delta(m/q)}{m/q} + \frac{\Delta v}{v} \left(1 - \frac{\gamma^2}{\gamma_t^2}\right)$$



- no cooling needed
- access to masses of very short-lived exotic nuclei
- known and unknown masses within one spectrum

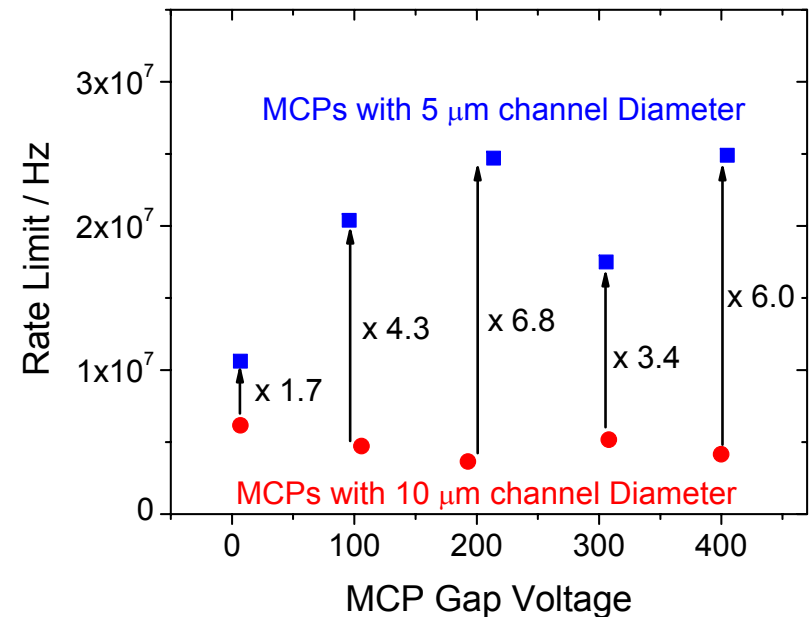
Offline - and Online - Tests

Revolution frequency: ~ 2 MHz
→ 50 particles generate 10^8 hits / s



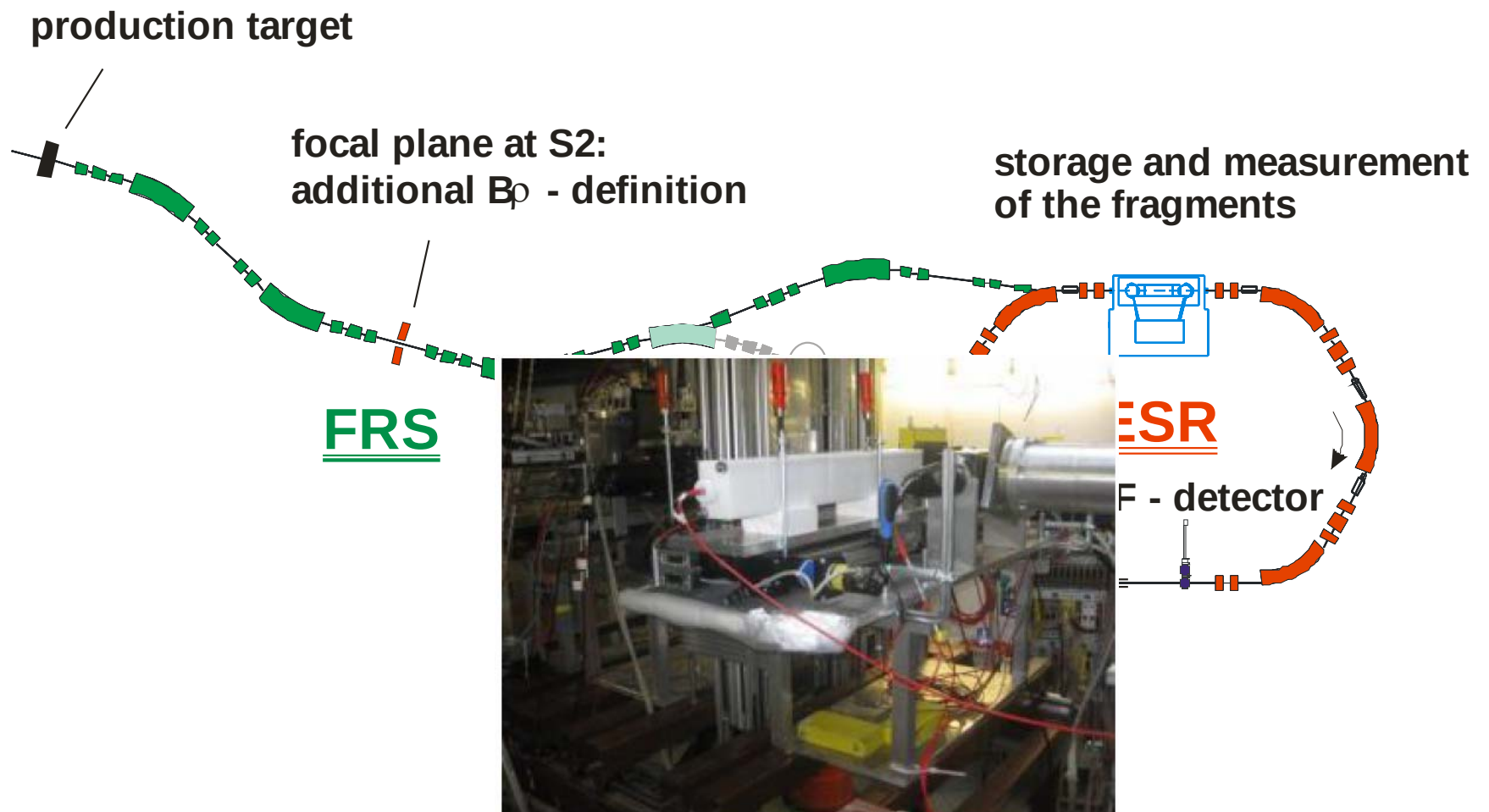
High rate limits detection efficiency

Recent Development Results:



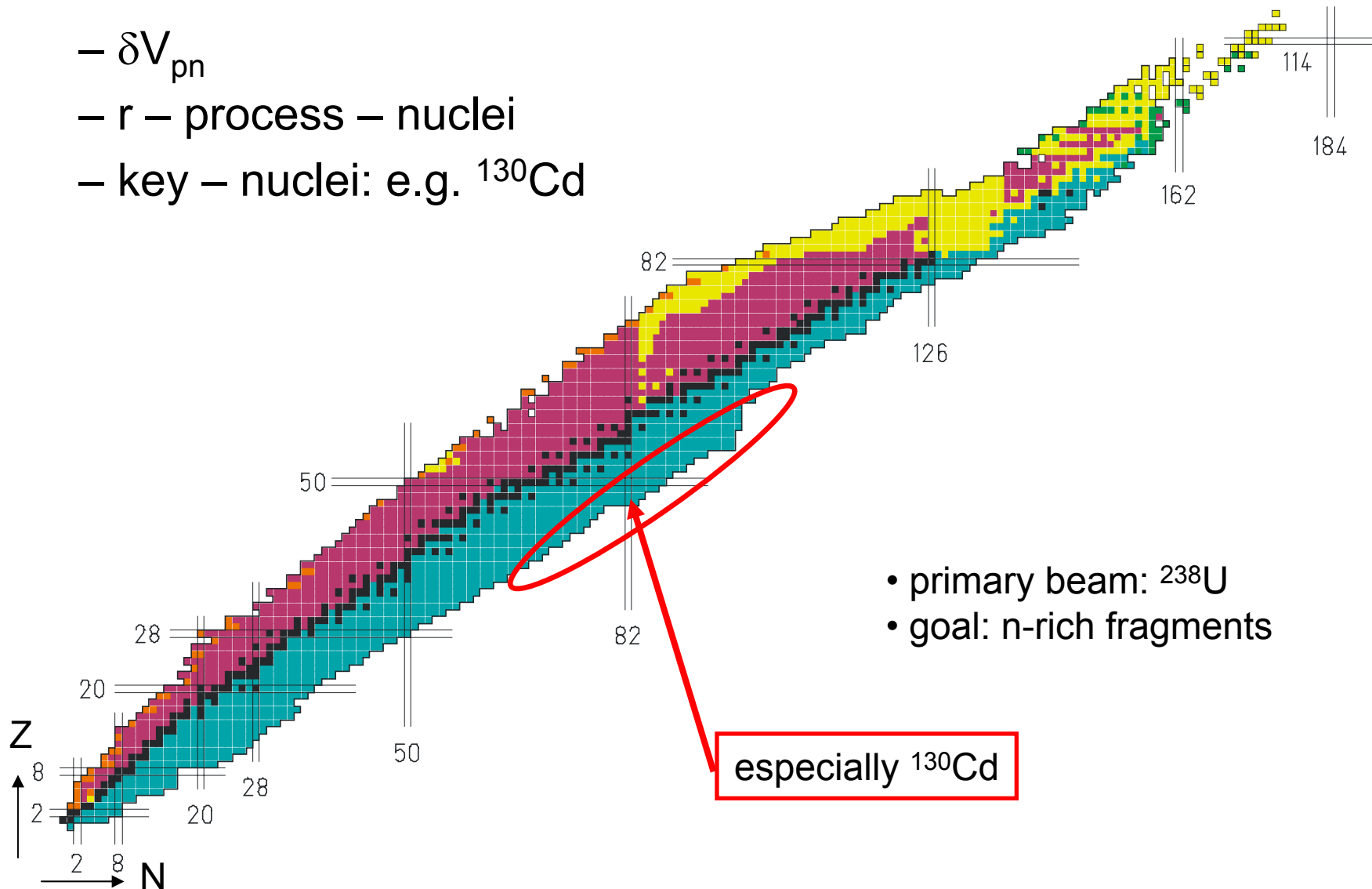
MCPs with smaller pore size
→ rate capability increased
by a factor of 4

Experimental Setup

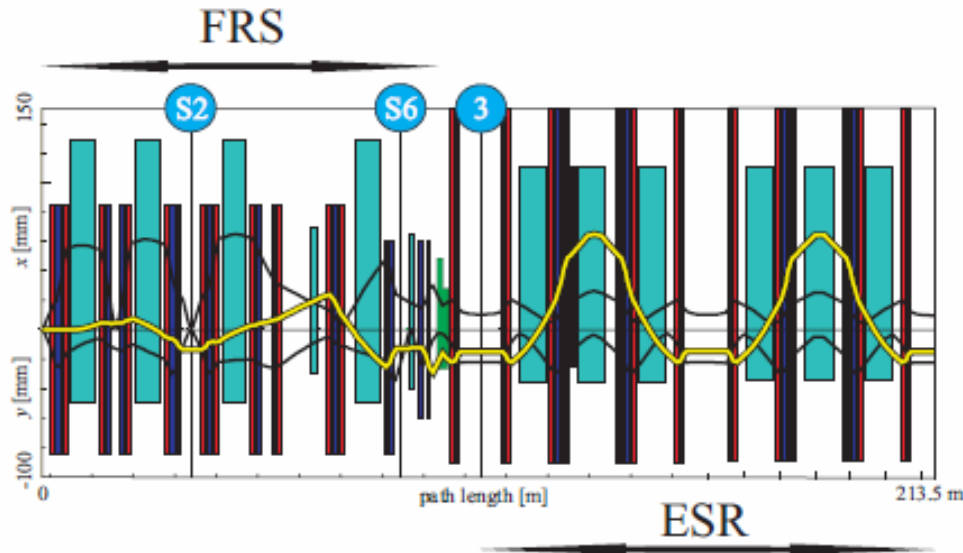


Physics Motivation

- δV_{pn}
- r – process – nuclei
- key – nuclei: e.g. ^{130}Cd



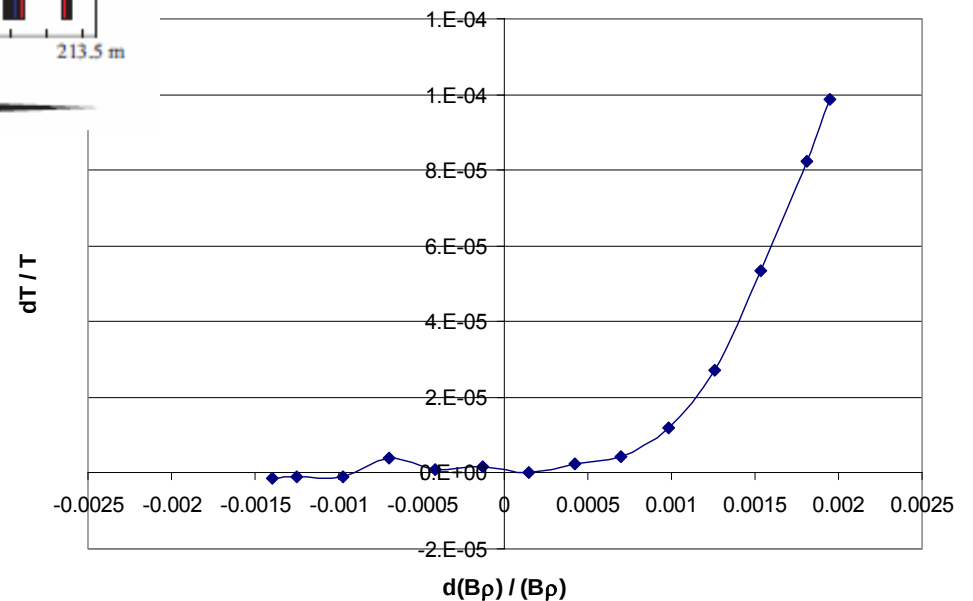
Measurements Ionoptical Developments



better matching from FRS to ESR

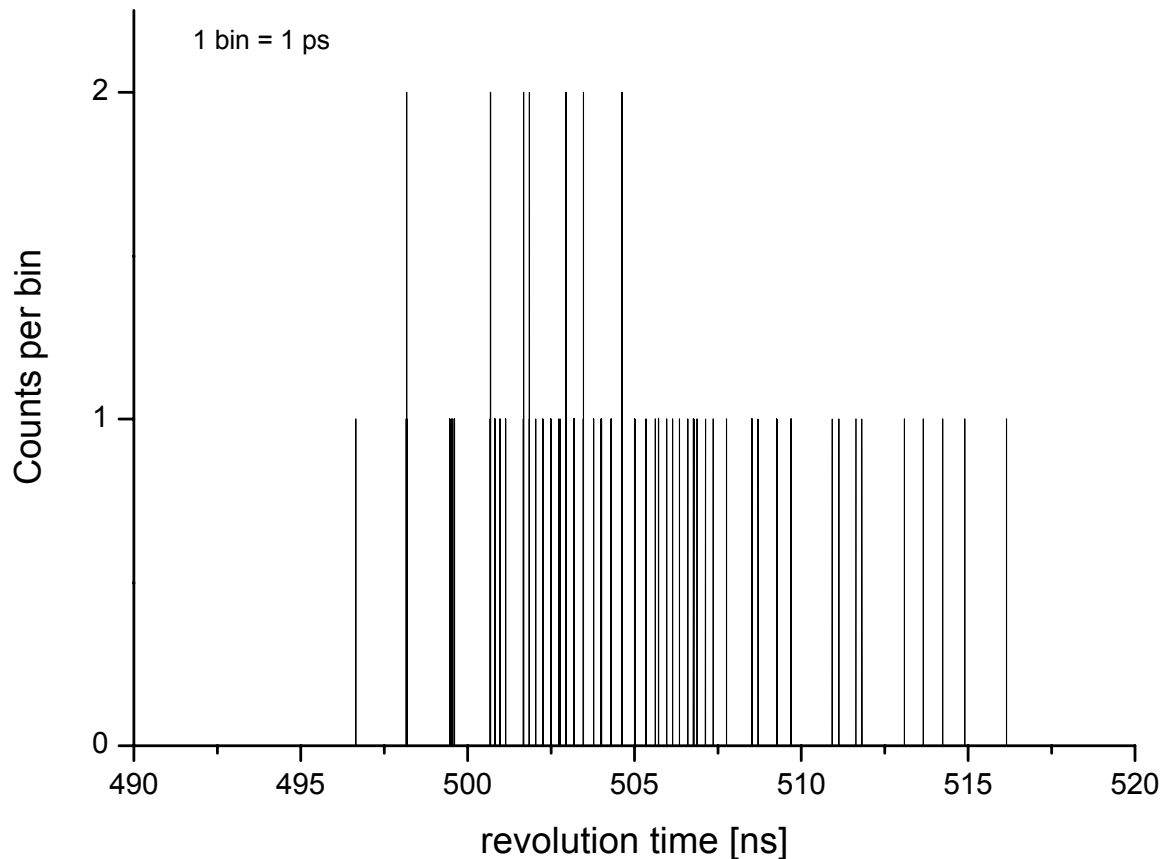
PhD S. Litvinov

improved and new isochronous mode



Measurements

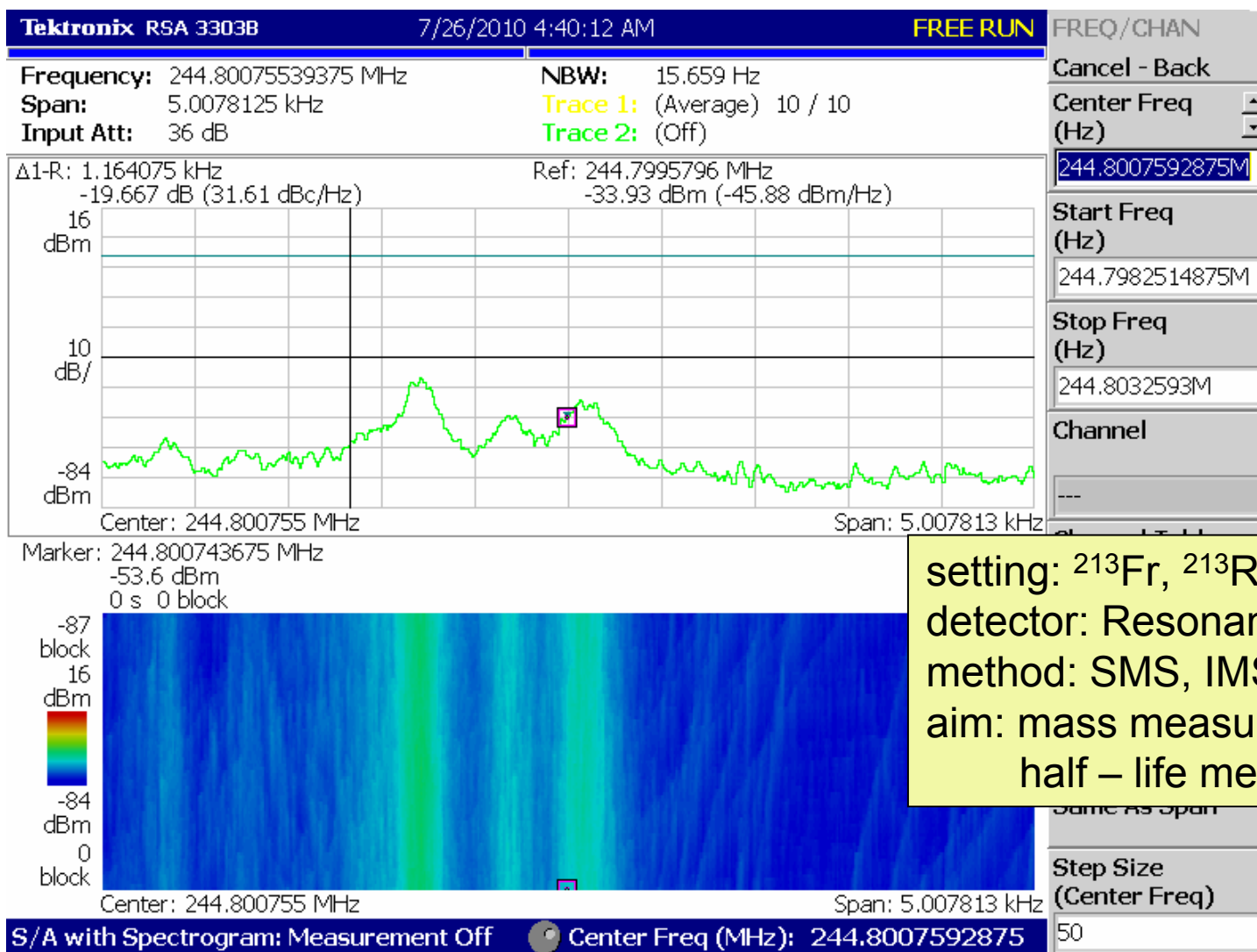
Time – of – Flight – spectrum



setting: ^{128}Cd
detector: ToF - detector
method: IMS
aim: mass measurements

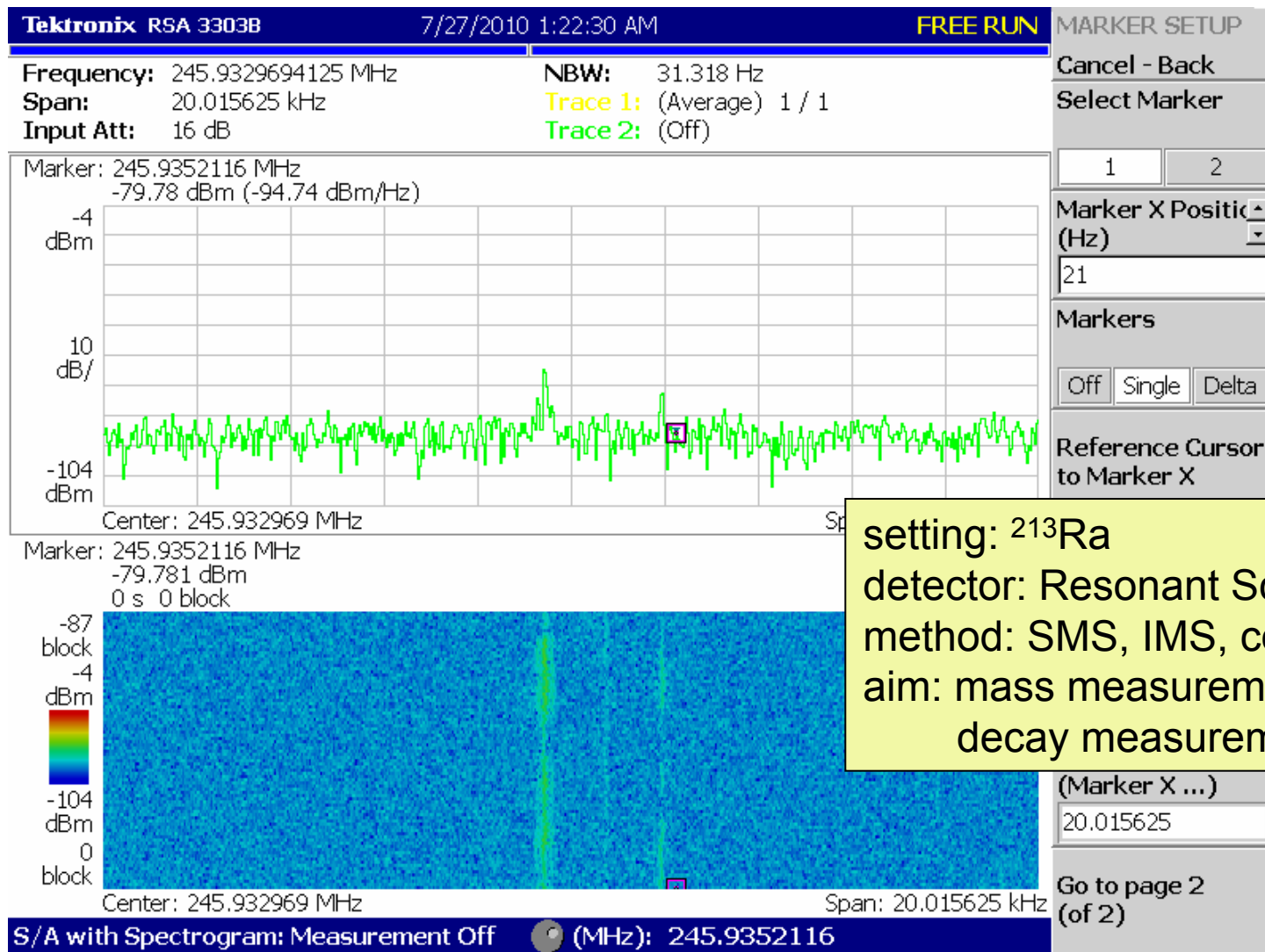
Measurements

α - emitter



Measurements

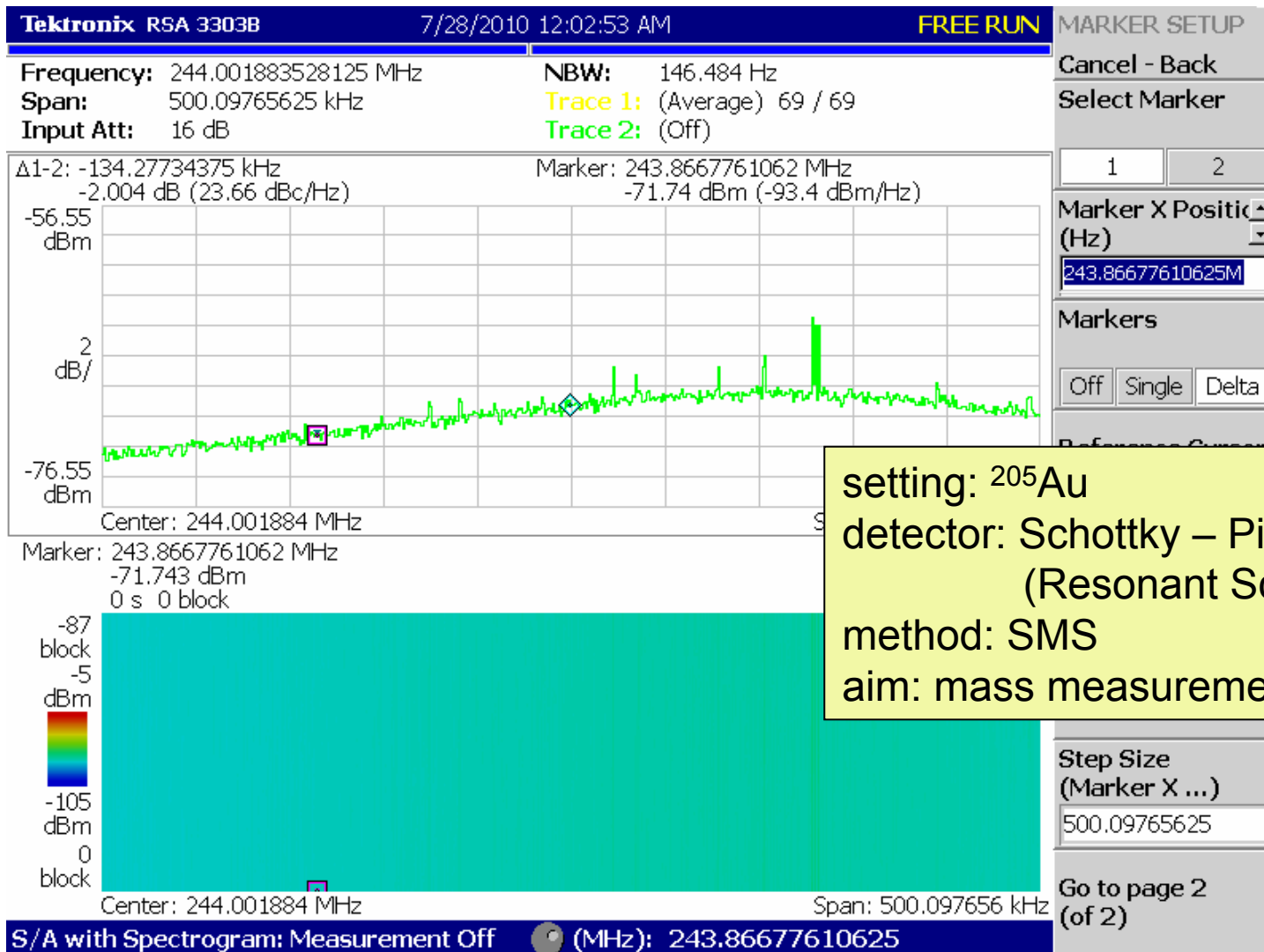
^{213}Ra , EC



setting: ^{213}Ra
detector: Resonant Schottky Pickup
method: SMS, IMS, cooled, uncooled
aim: mass measurements,
decay measurements

Measurements

Time – of – Flight – spectrum



setting: ^{205}Au
detector: Schottky – Pickups
(Resonant Schottky – Pickups)
method: SMS
aim: mass measurements

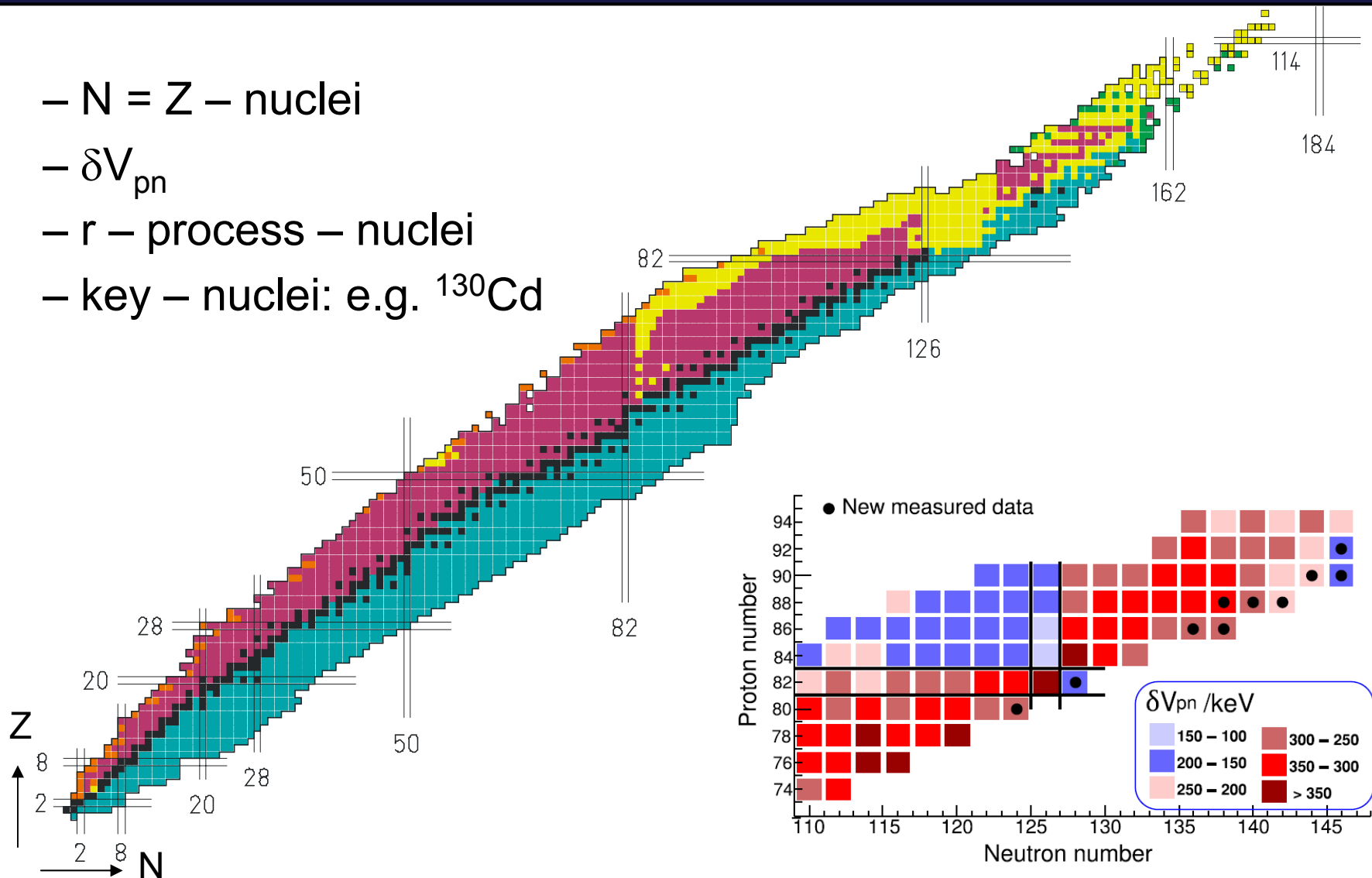
Summary

Performed activities during the E084 – experiment in July 2010

- **mass measurements**
(IMS and SMS)
- **measurement of the production cross – section of ^{130}Cd at S4**
(→ talk by C. Nociforo)
- **first half – life measurement of highly – ionized (H – like) α – emitter stored in the ESR**
(→ talk by F. Farinon)
- **5 days of ionoptical developments (collaboration with the ESR – group)**
- **test of Belen**

Future Plans for SMS and IMS

- $N = Z$ – nuclei
- δV_{pn}
- r – process – nuclei
- key – nuclei: e.g. ^{130}Cd



The collaboration

S. Ayet, F. Bosch, D. Boutin, C. Brandau, R. Caballero, R. Cakirli, L. Chen, I. Cullen, I. Dillmann, C. Dimopoulou, A. Dolinskii, A. Estrade, B. Fabian, F. Farinon, T. Fleckenstein, B. Franczak, H. Geissel, M. Hausmann, C. Jesch, R. Knöbel, C. Kozhuharov, J. Kurcewicz, N. Kuzminchuk, S.A. Litvinov, Yu.A. Litvinov, I. Mukha, A. Musumarra, S. Nakajima, C. Nociforo, F. Nolden, T. Ohtsubo, A. Ozawa, Z. Patyk, S. Pietri, W.R. Plaß, A. Prochazka, M. Reed, C. Scheidenberger, M. Steck, B. Sun, T. Suzuki, S. Terashima, P.M. Walker, H. Weick, N. Winckler, J. Winfield, M. Winkler, T. Yamaguchi

