DE LA RECHERCHE À L'INDUSTRIE

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DETECTOR AND ELECTRONICS DEVELOPMENTS

FOCUS ON THE MUSIC DETECTORS

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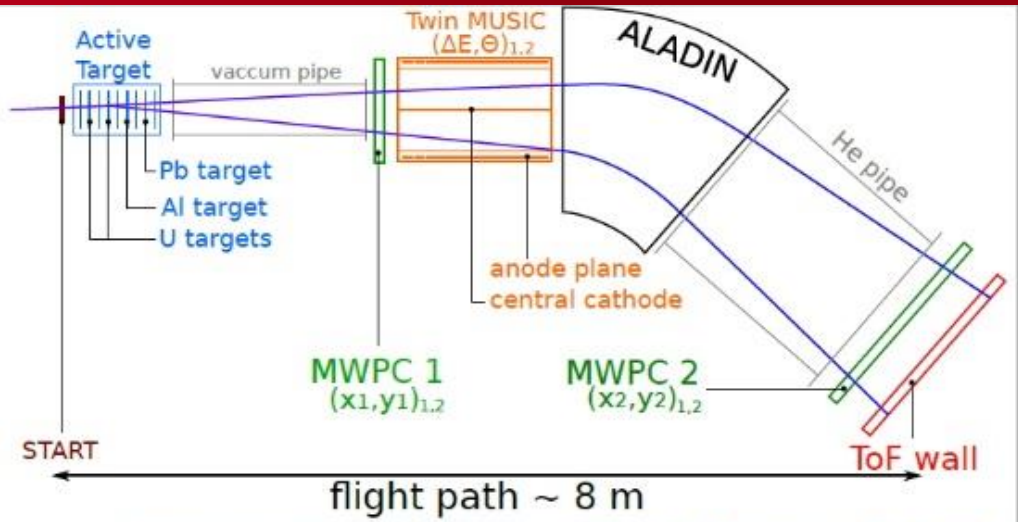
THE SOFIA TRACKING SYSTEM

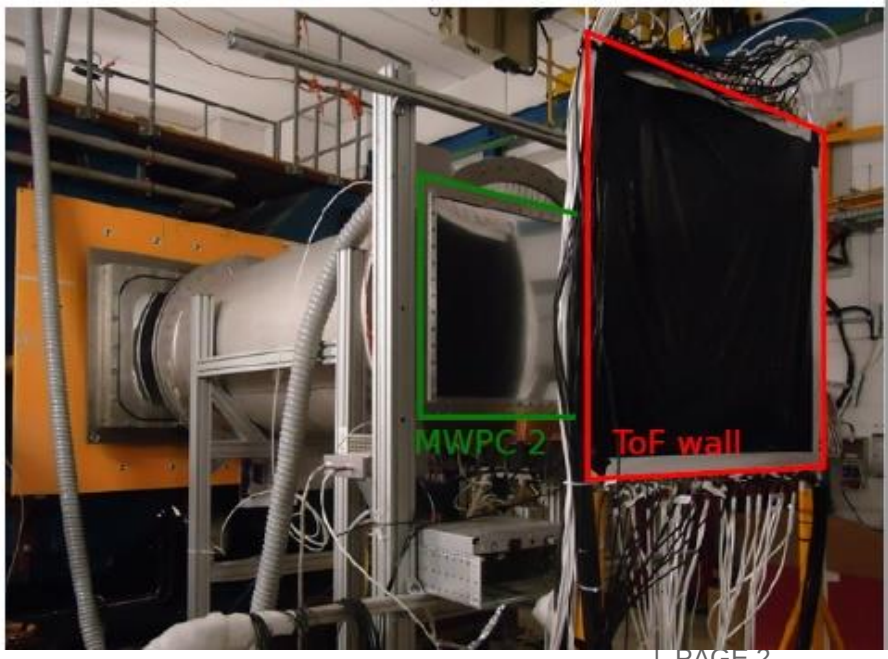
ΔE - Bρ - ToF method
A/Z = Bρ / ßɣ

Bρ: position from MWPCs
Θ from the Twin-MUSIC

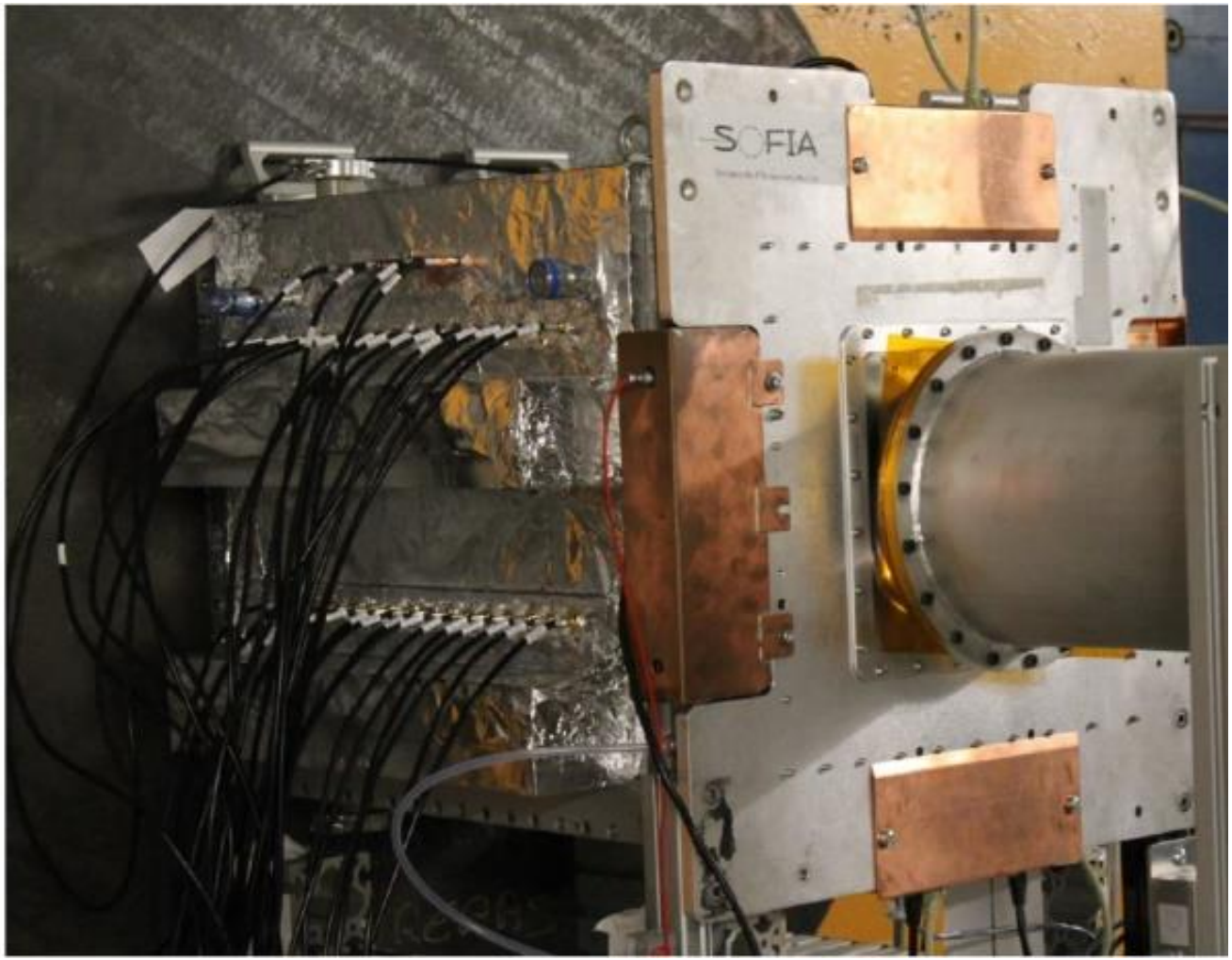
ΔE: from the Twin-MUSIC

ToF: between START and ToF-wall





THE SOFIA TWIN-MUSIC

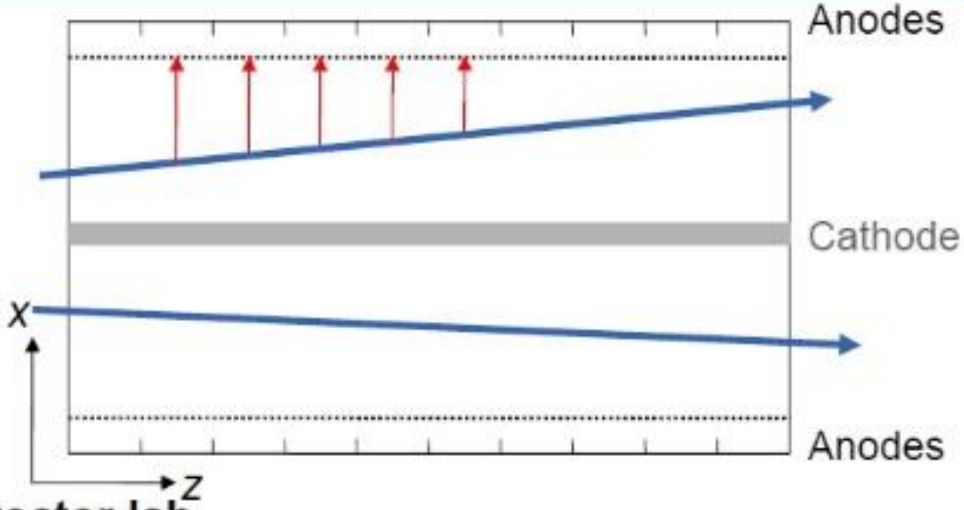


Design CEA-GSI , construction : GSI det. Lab.

The new Twin Music detector

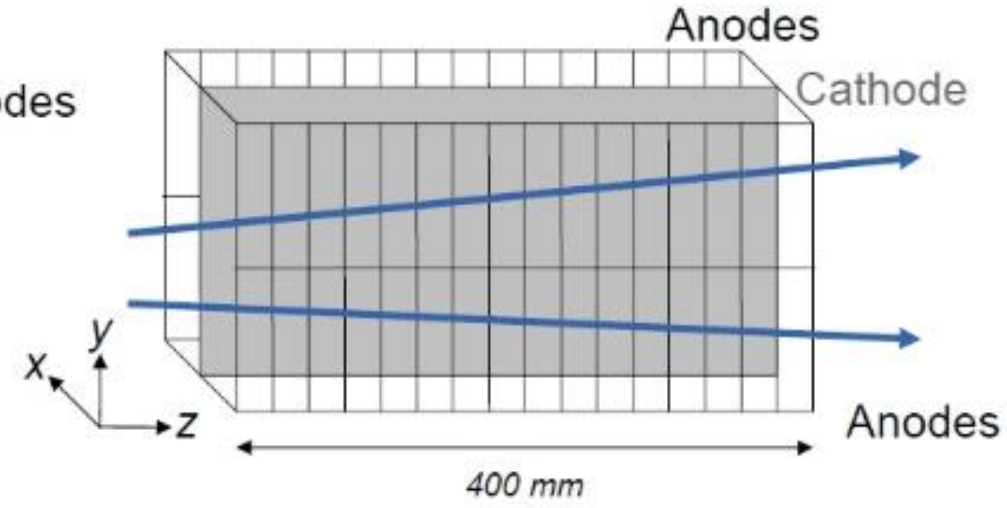
Measurement in the Twin Music :

- Drift time : Position and horizontal angle → **Bρ**
- Energy loss → **Z**



New TwiM constructed by the GSI detector lab

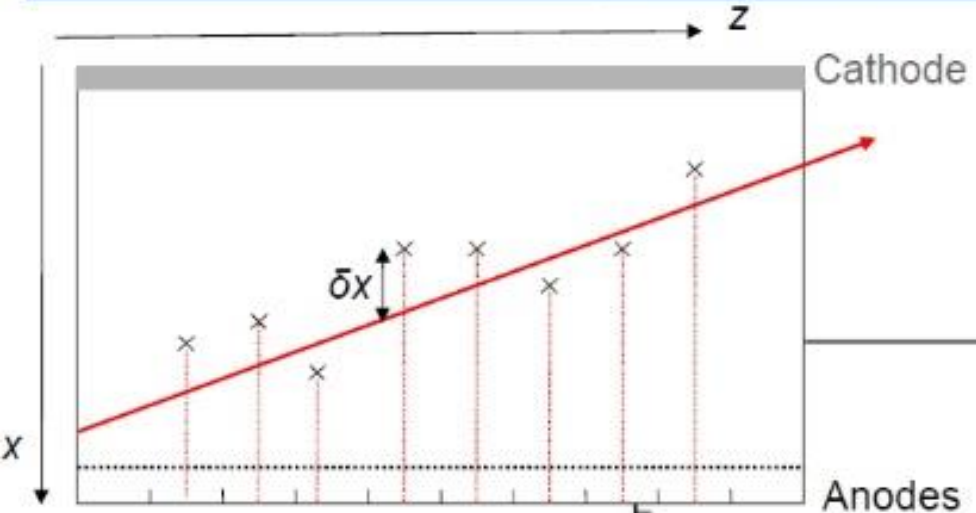
- **Higher longitudinal segmentation**
  10 anodes (50 mm long) → 16 anodes (25 mm long)
- **Shorter total length**
  50 cm → 40 cm
- **New Vertical segmentation :**
  2 rows → 4 rows



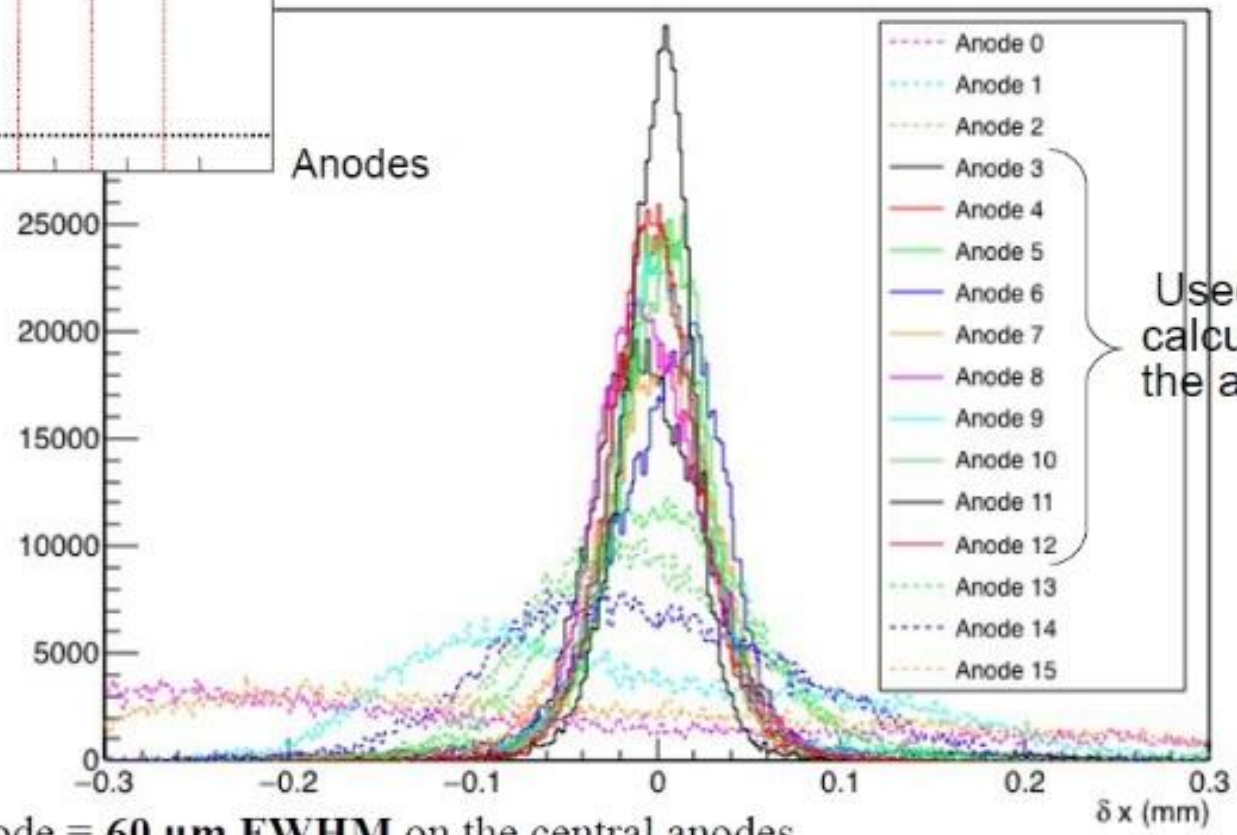
- **Gas** : 25% Ar and thicker cathode

→ Less angular straggling and possibility of recovering events with both fission fragments on the same side of the cathode.

Twin Music : Tracking



Position measurement in the TwiM

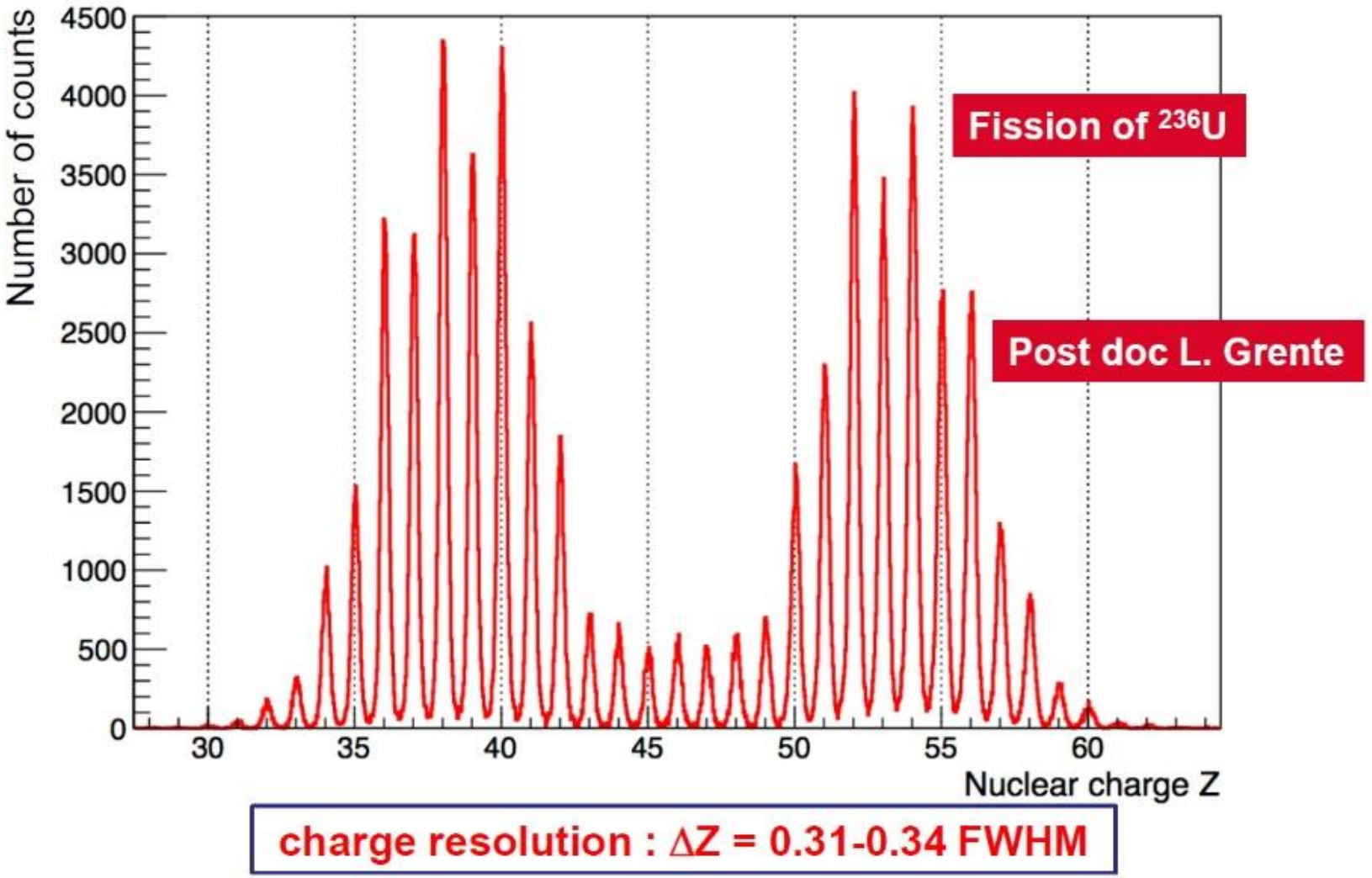


Used for the calculation o the angle

Mean x resolution per anode = **60 µm FWHM** on the central anodes

Resolution on the angle dominated by the angular straggling in the TwiM (≈ 0.3 mrad)

THE SOFIA TWIN-MUSIC- Z RESOLUTION (2014)



CEA-GSI-FINLAND COLLABORATIVE EFFORT ON MUSIC

- Based on our joint experience on MUSICs
  - Collaborative effort for the development of next generation MUSICs
    - Detector
    - Electronics : front-end read out
- Design a whole system which will measure better and faster
  - Improve the Z resolution
  - Increase the rate capability
  - extend the dynamic range (Z range)

- New major developments tested in the summer 2015 test beam time at FRS

SUMMER 2015 TEST STRATEGY

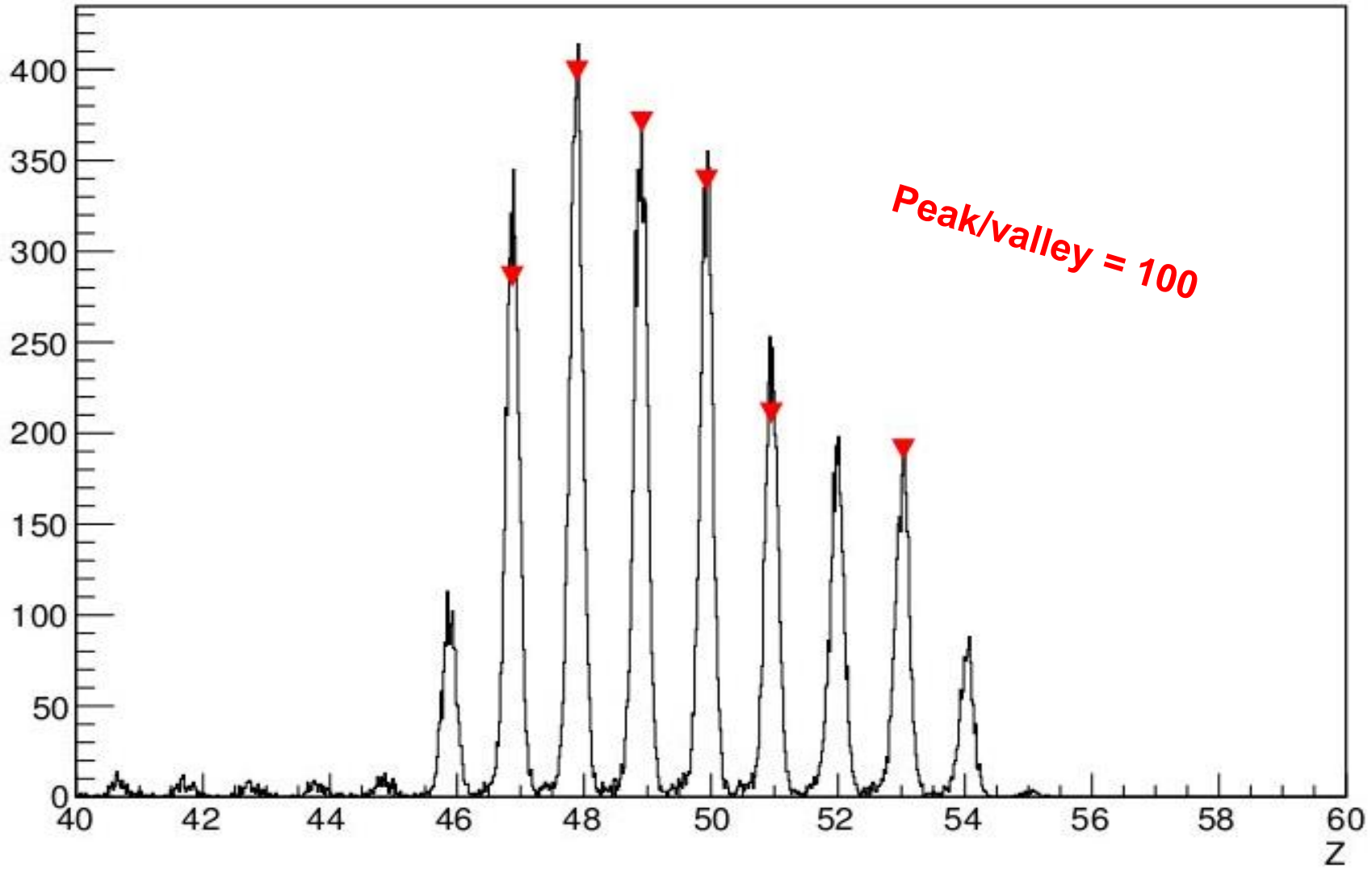
- Start from a known working worse : the SOFIA Twin-MUSIC
  - Adopt the newly developed preamplifiers (MUSAMP /CEA made)
    - Lowest noise
    - High rate capable,
    - Very short rise time
  - Test a VME new read out module from MESYTEC : MDPP-16
    - Low noise Analog input stage coupled to a high sensitivity digitizer
    - Multi hit ADC, TDC
    - Pile-up tagging, adjustable shaper, online processing

- Very promising on the paper

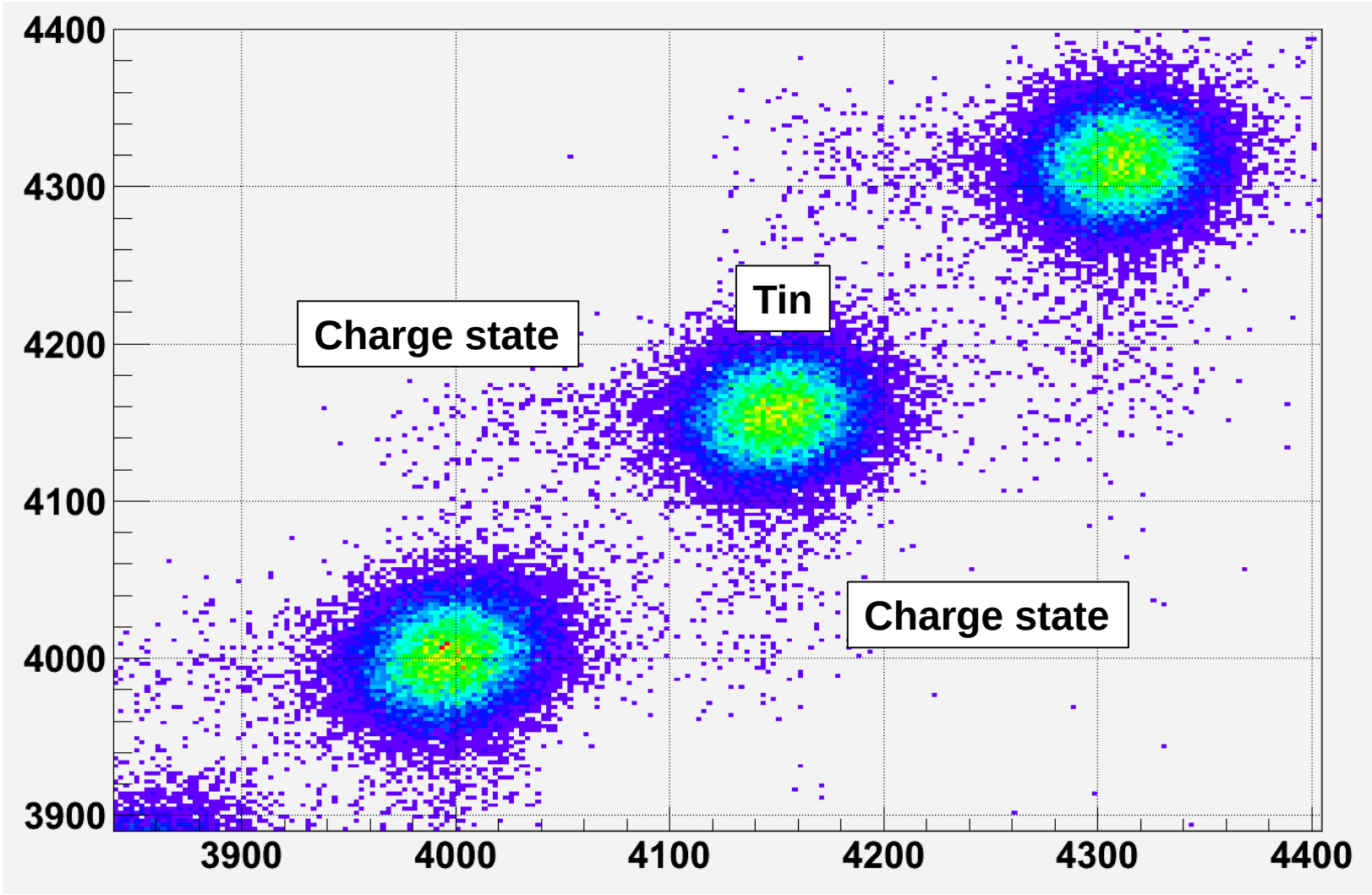
SUMMER 2015 BEAM TIMES

- 2 runs : Xenon and Carbon primary beams
- 600.A MeV primary beams
  - Runs with primary beam and fragments
    - 550.A MeV ions in the MUSIC for the Carbon run
    - 400.A MeV for the Xe run
- Various Z ranges
- Various intensities

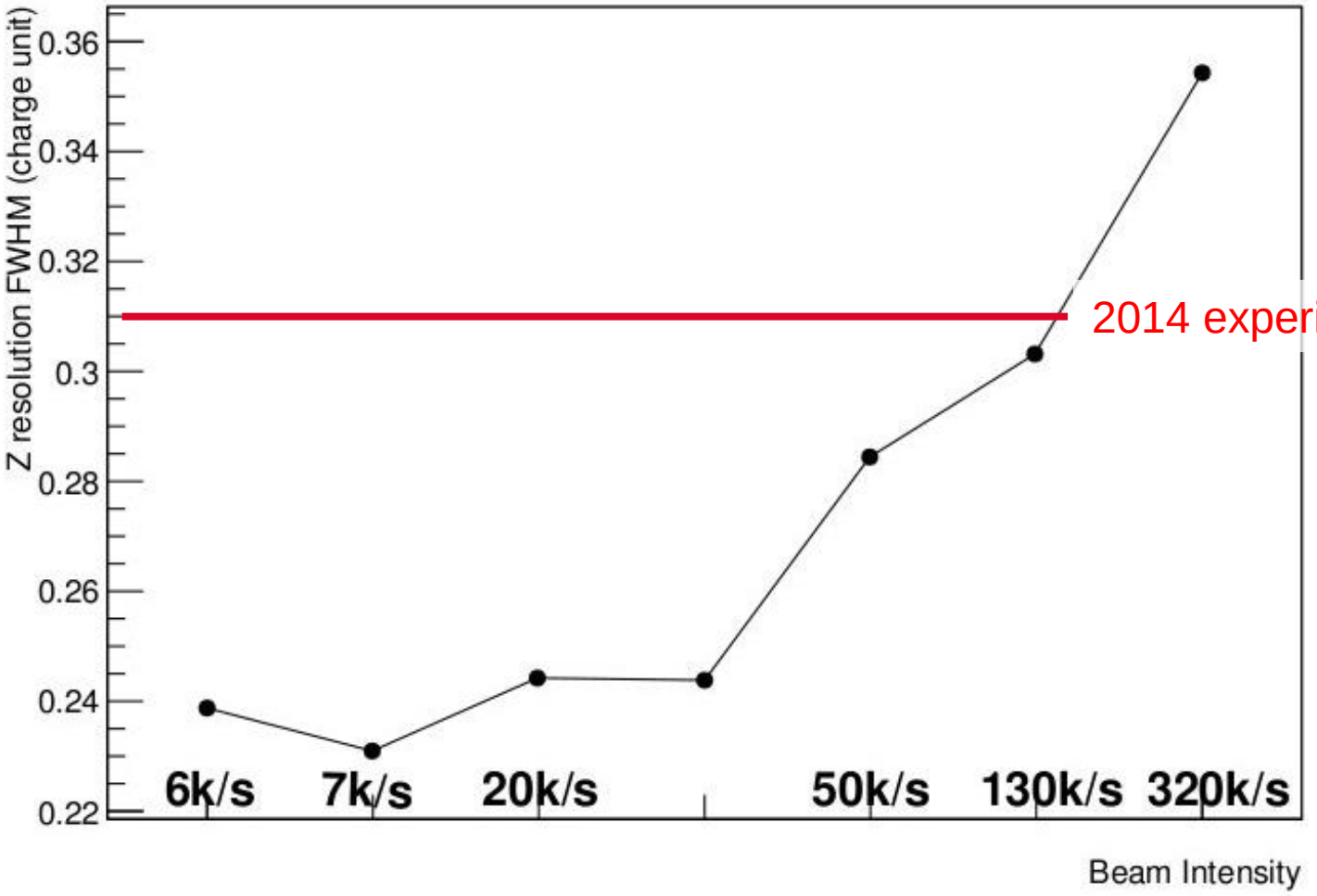
THE XENON FRAGMENTS RESULTS



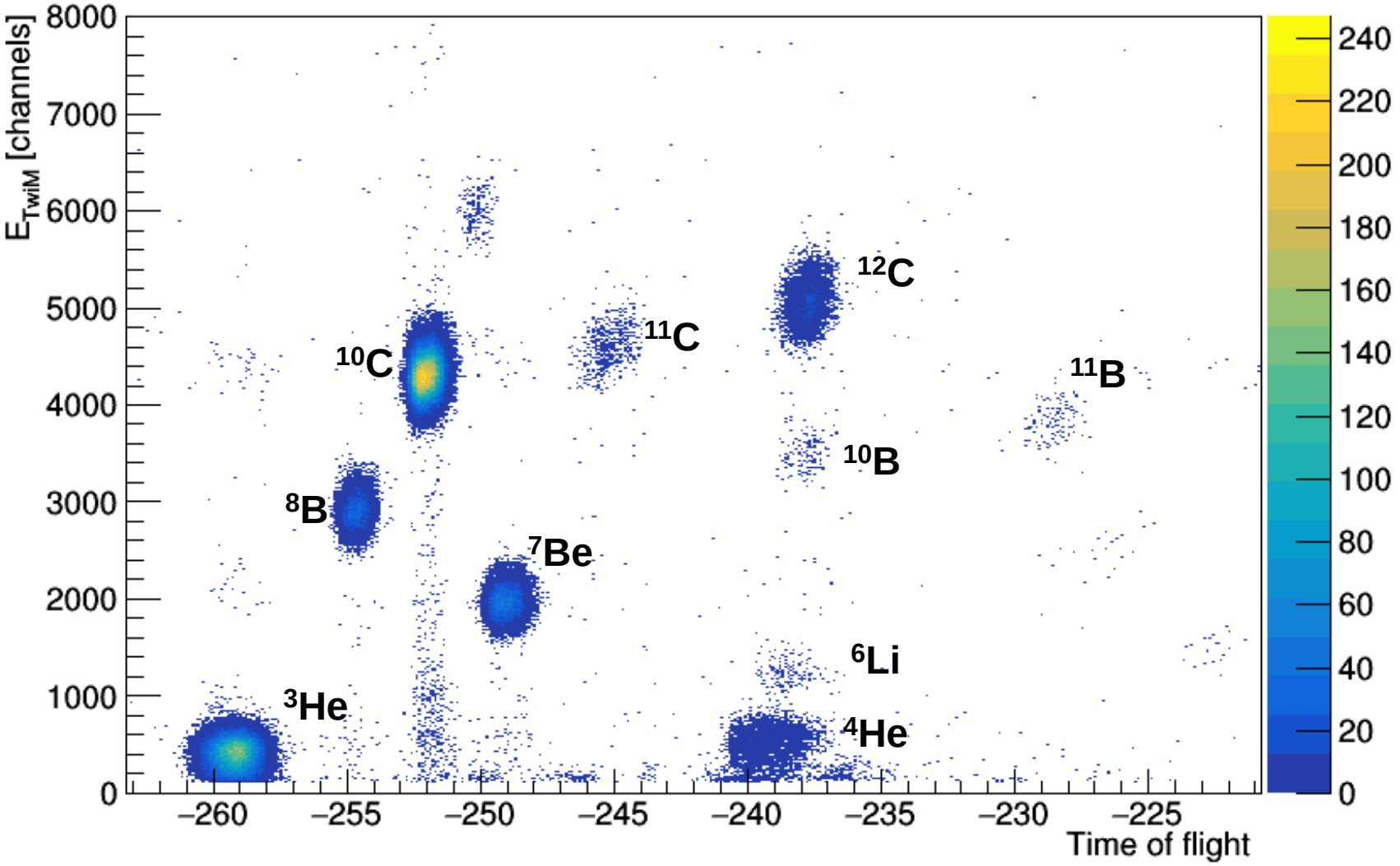
THE XENON RESULTS



THE RATE CAPABILITY



THE CARBON FRAGMENTS SETTING



CONCLUSION

- With the use of a modern MUSIC chamber design
- With low noise dedicaced preamplifier
- With a newly developed analog/digital module
- We demonstrate our capability to identify
- All fragments from Z=54 to Z=2
  - With an unprecedented resolution
  - With limited degradation of the charge resolution at very high rate.

The SOFIA collaboration