

TASiSpec

TASCA in Small Image Mode Spectroscopy

- * Introducing the set-up
- * TASCA SIM settings
- * Commissioning experiments
- * Characteristics
- * Future:
 - Missing parts / preparations
 - Experiments

TASCA 08

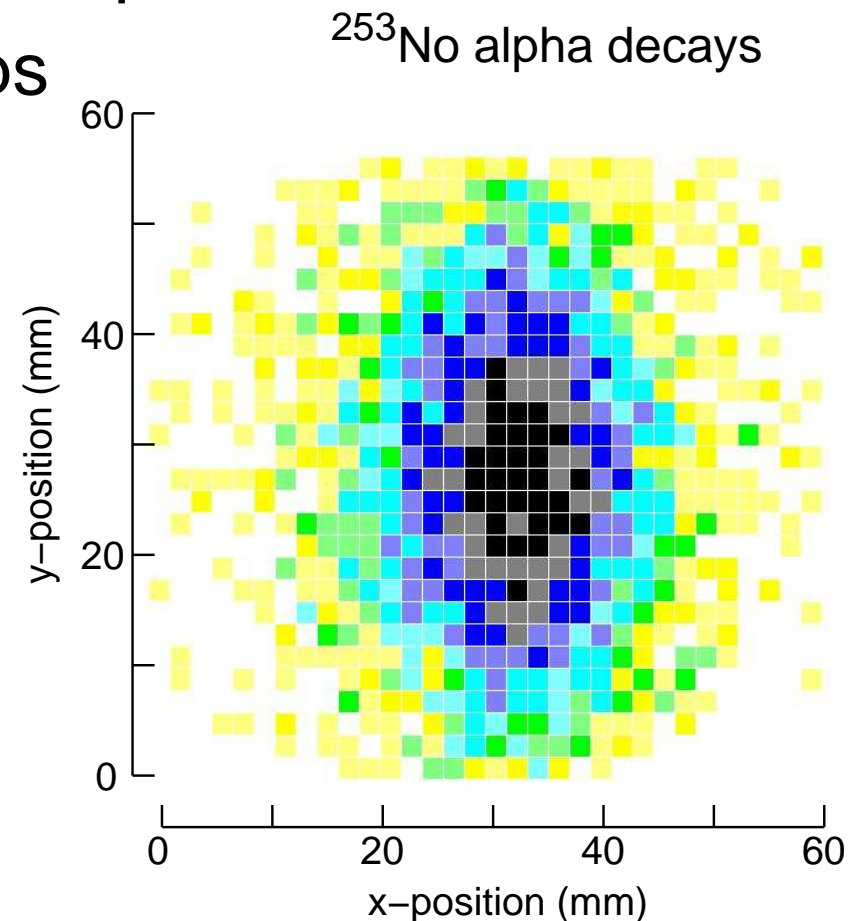


Why **TASiSpec** ?

A world unique set-up!

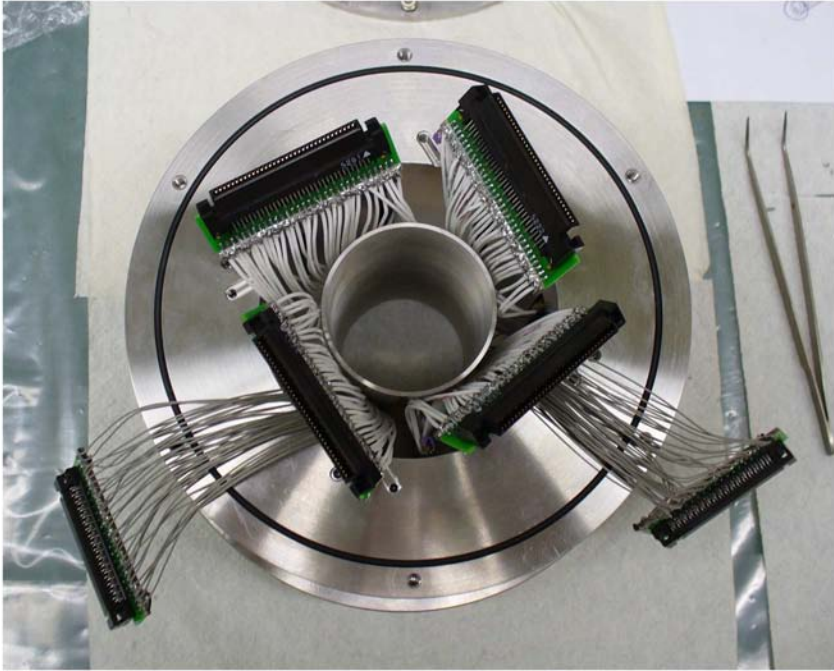
- * Small image mode => compact focal plane
- * High segmentation => Si 192 strips
 α -efficiency $\sim 80\%$
- * 4+1 segmented Ge detectors
 γ -efficiency $> 40\%$ @250keV
- * Multi coincidence possibilities

Isomer + decay spectroscopy
(Coulex inverse kinematics?)
(SHE Identification via X-rays?)



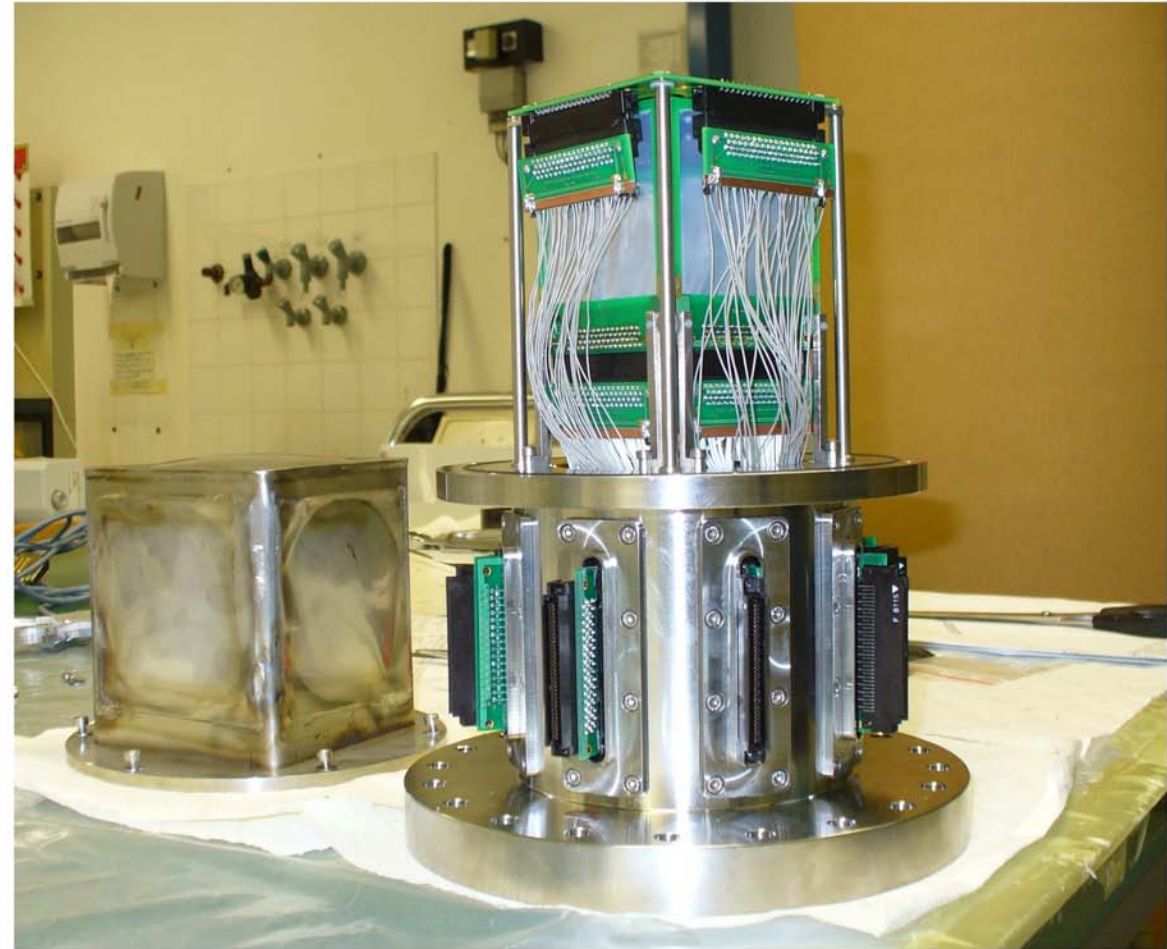
The Experimental Set-up

Internal structure of TASIpec



Set-up for the tests

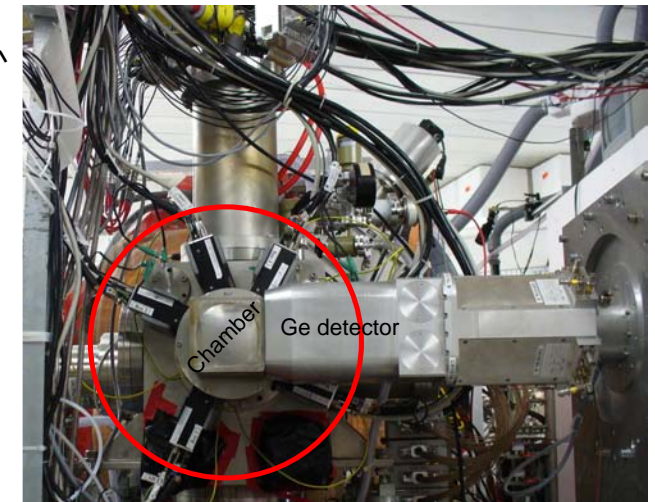
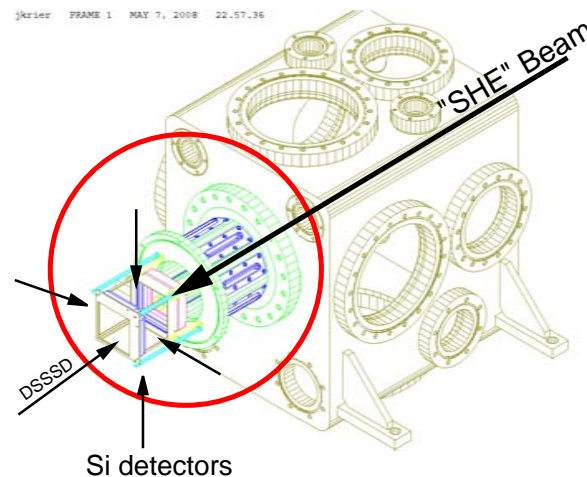
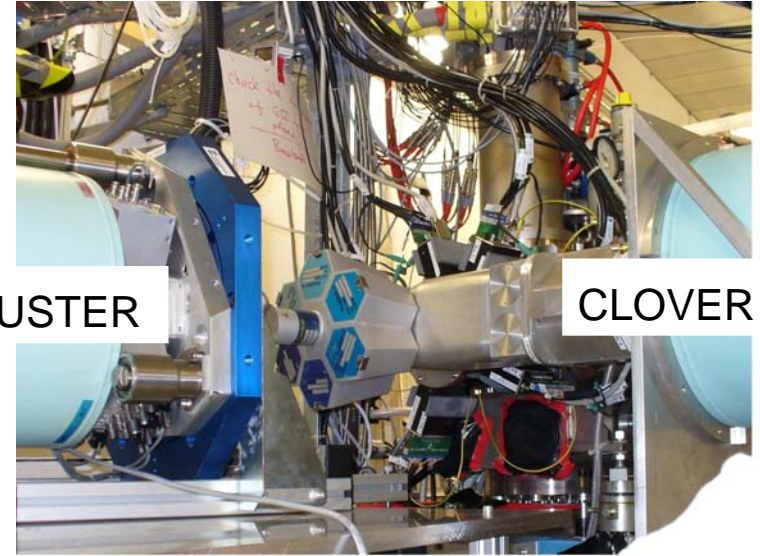
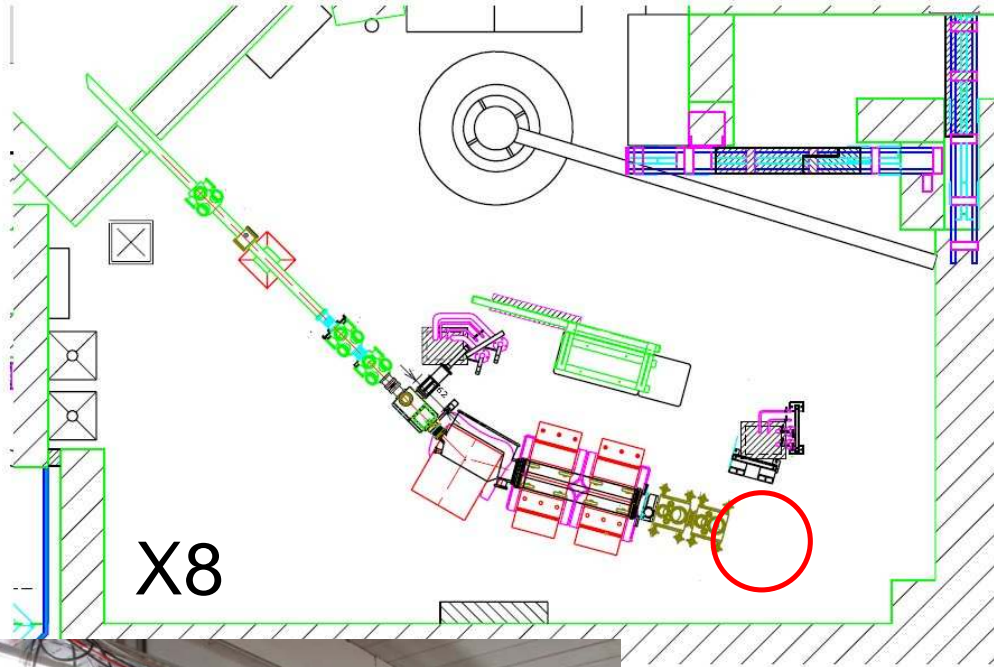
- 4 Single sided Si strip detectors
- 1 Double sided silicon strip detector
- 1 Ge cluster detector (7 crystals)
- 1 Ge clover detector (4 crystals)



Intention; 4 Ge clover detectors in final configuration

The Experimental Set-up

External structure, forming the "tail" of TASCAs



Test Experiments

Reactions August and October 2008

$^{207}\text{Pb} (^{48}\text{Ca}, 2n)^{253}\text{No}$ K-isomer test / $\alpha - \gamma(\gamma)$ test

$^{206}\text{Pb} (^{48}\text{Ca}, 2n)^{252}\text{No}$ Fission test

$^{244}\text{Pu} (^{48}\text{Ca}, Xn)^{292-X}_{114}$ Background test

$^{64}\text{Ni} + ^{150}\text{Nd} \longrightarrow ^{214}\text{Ra}^*$	}	Short-lived isomer tests
$^{64}\text{Ni} + ^{154}\text{Sm} \longrightarrow ^{218}\text{Th}^*$		$\alpha - \gamma(\gamma)$ tests
$^{64}\text{Ni} + ^{\text{nat}}\text{Gd} \longrightarrow ^{224}\text{U}^*$		Background tests
$^{64}\text{Ni} + ^{141}\text{Pr} \longrightarrow ^{205}\text{Fr}^*$		Reduced electronics noise?!

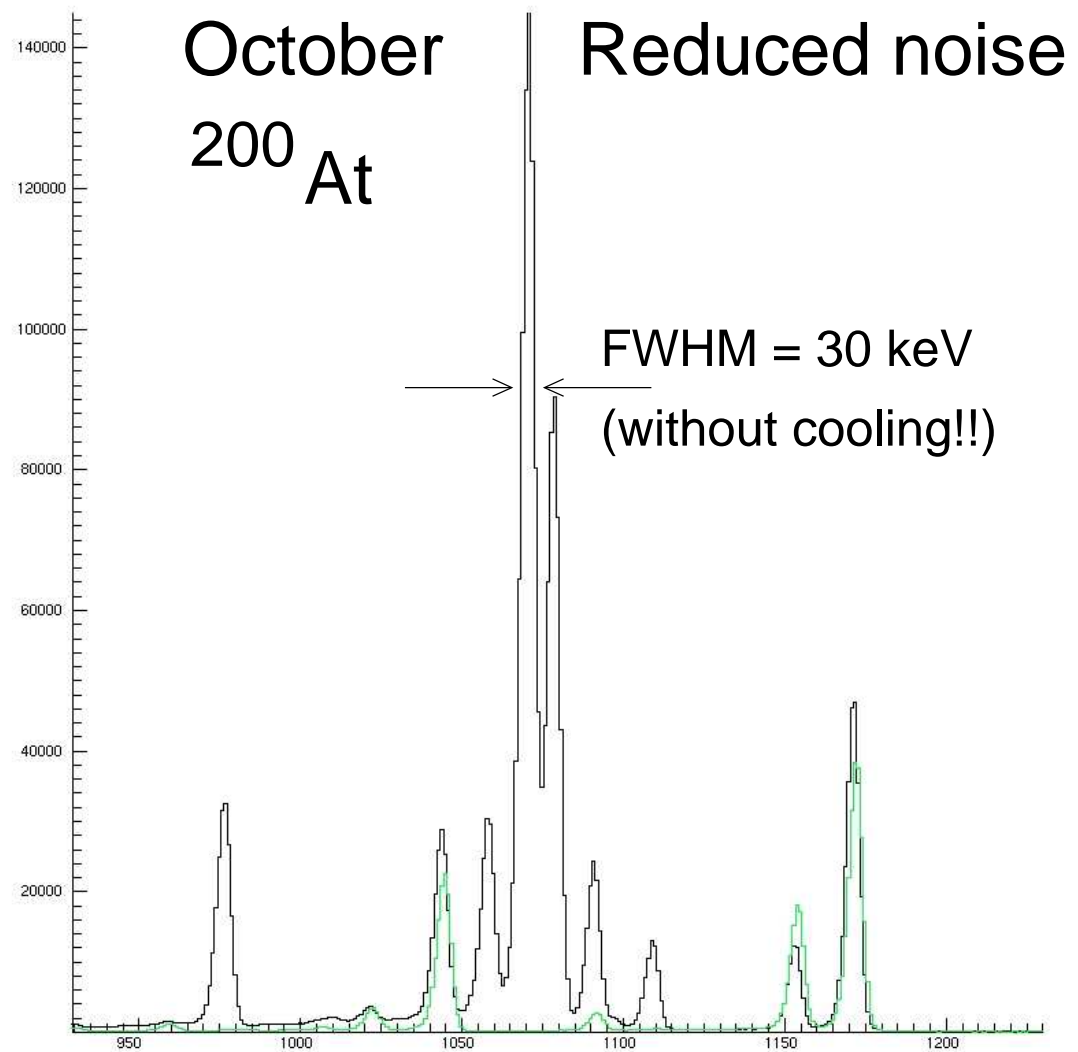
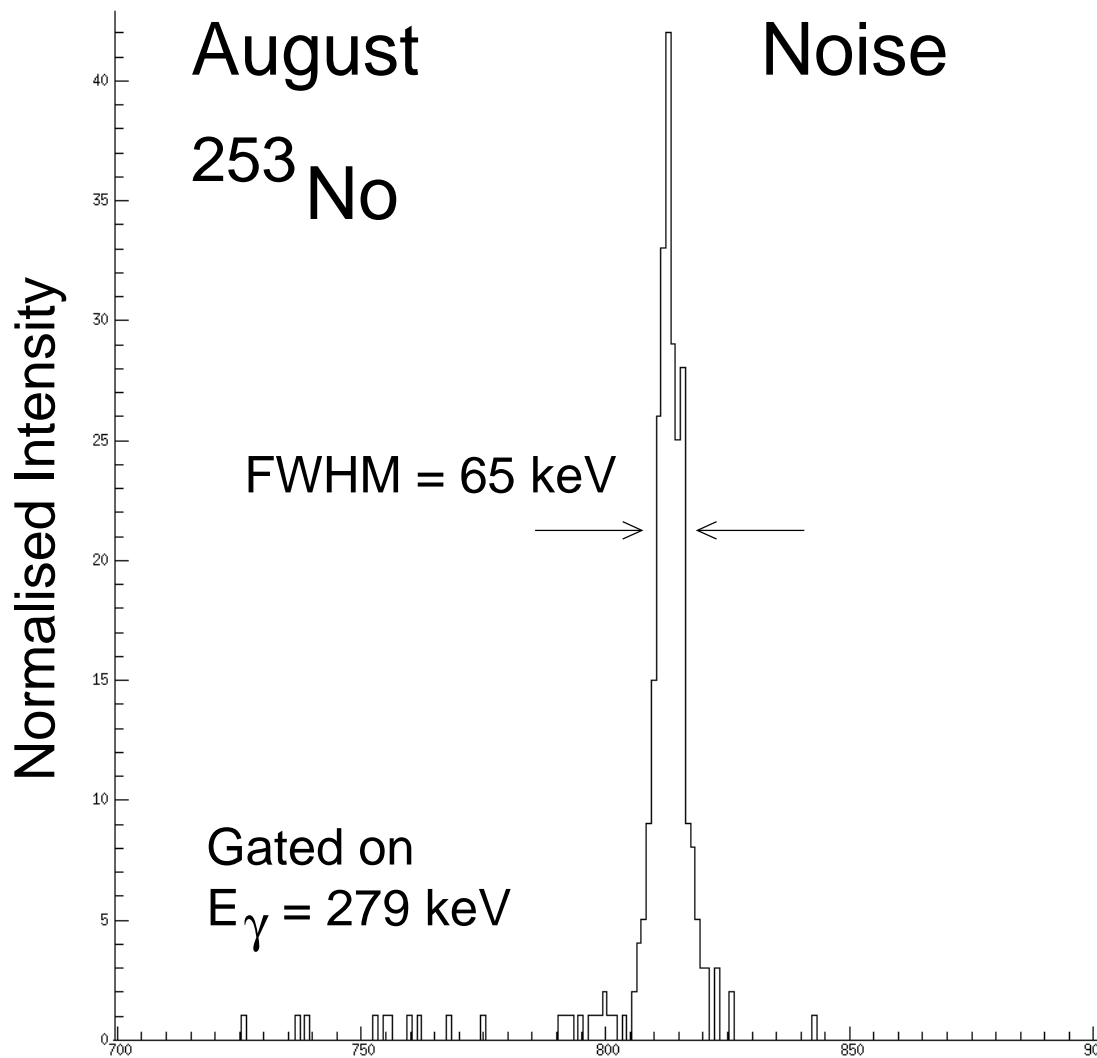
TASCA SIM Settings

Modifications from the nominal values

	Dipole	Quad1	Quad2	²⁵³ No transmission
Nominal	588	371	400	~17%
"Optimal"	597	400	465	~28%
Nominal	440	270	326	
"Optimal"	435	275	340	

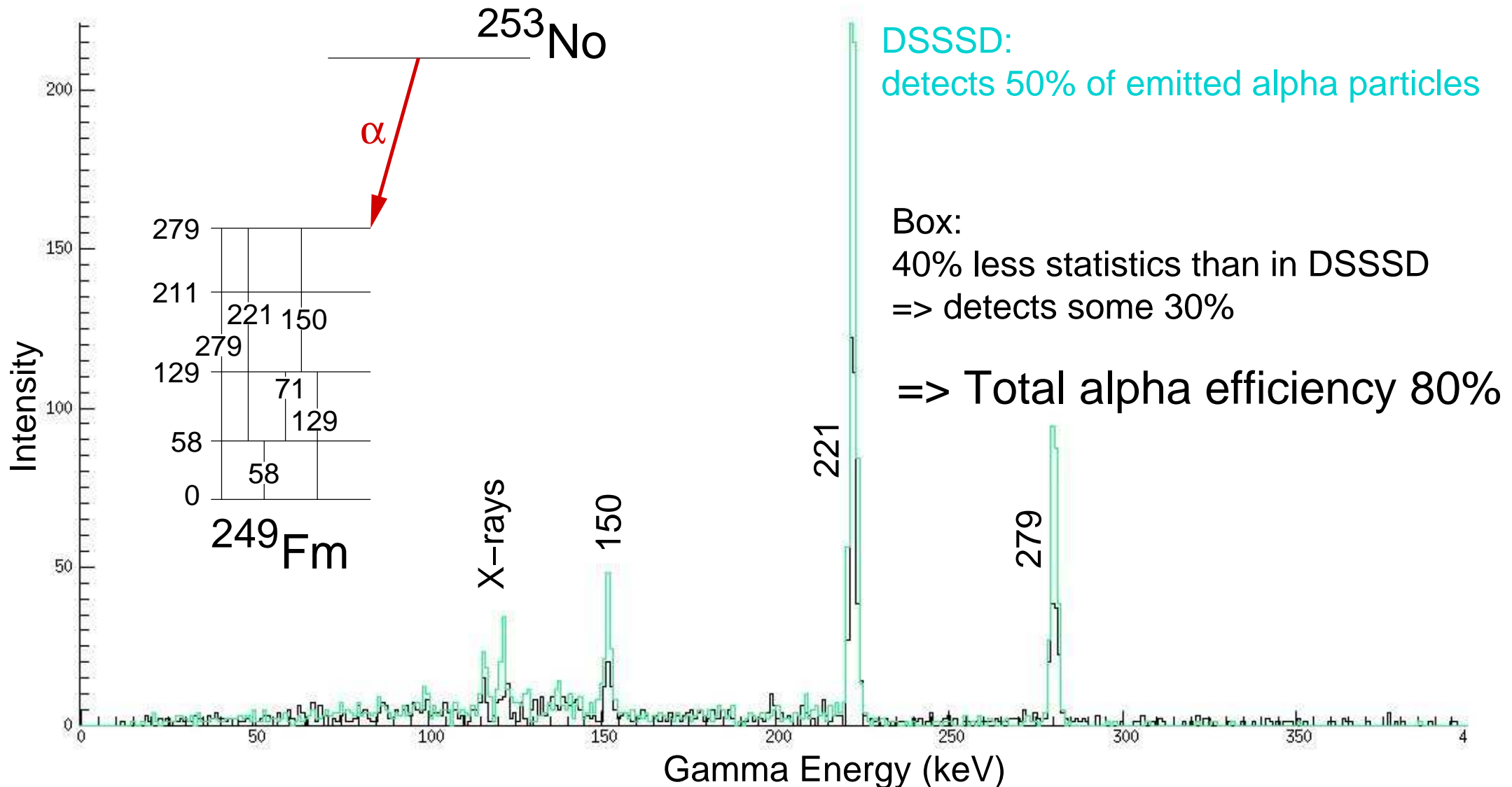
α -energy Resolution

Comparing the FWHM in the same DSSSD



Alpha Efficiency

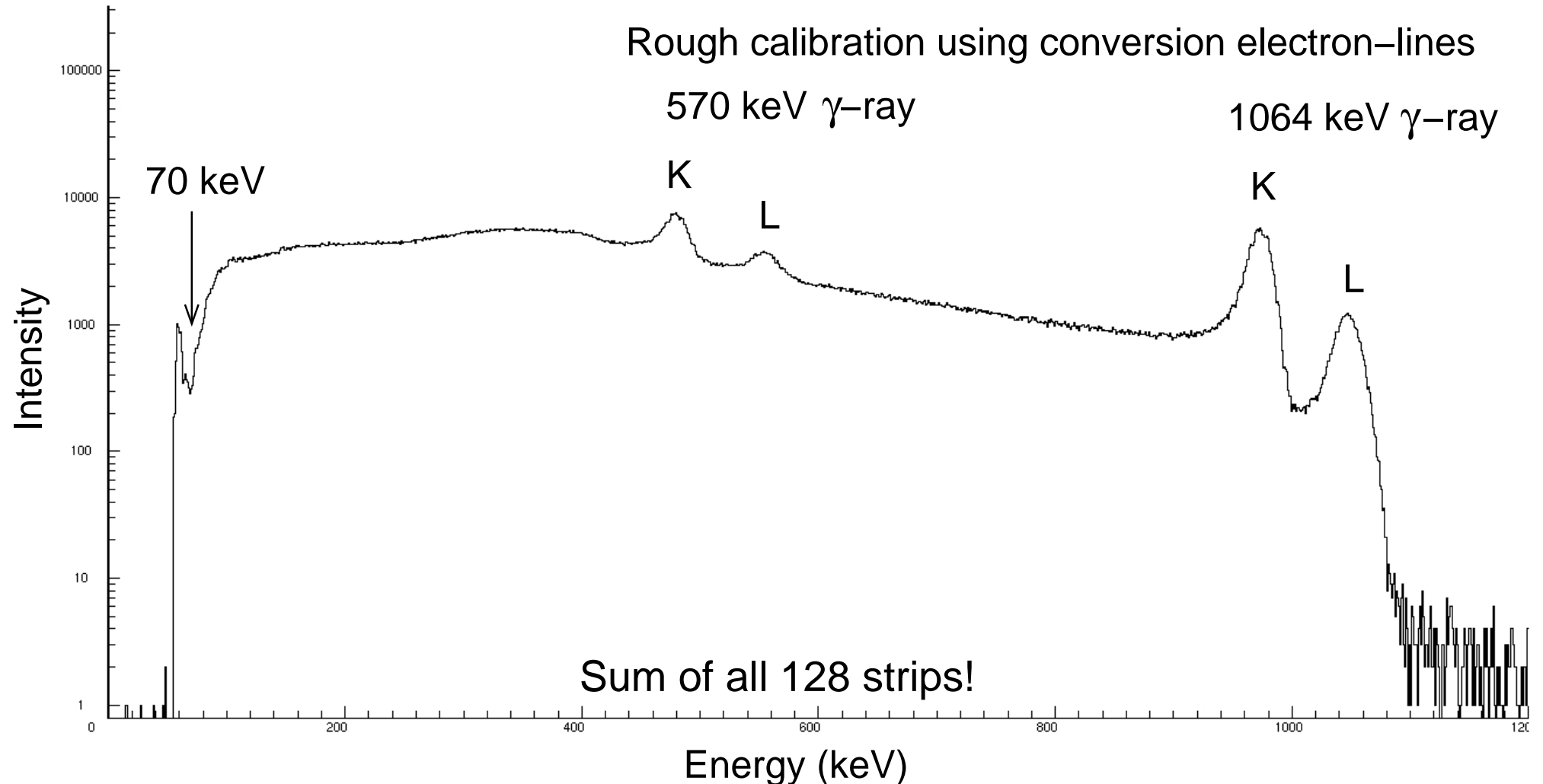
In total 80% of the emitted alpha particles are detected



Energy Threshold in Box

Using a ^{207}Bi source on the DSSSD dummy

October



Detection of the Emitted γ -rays

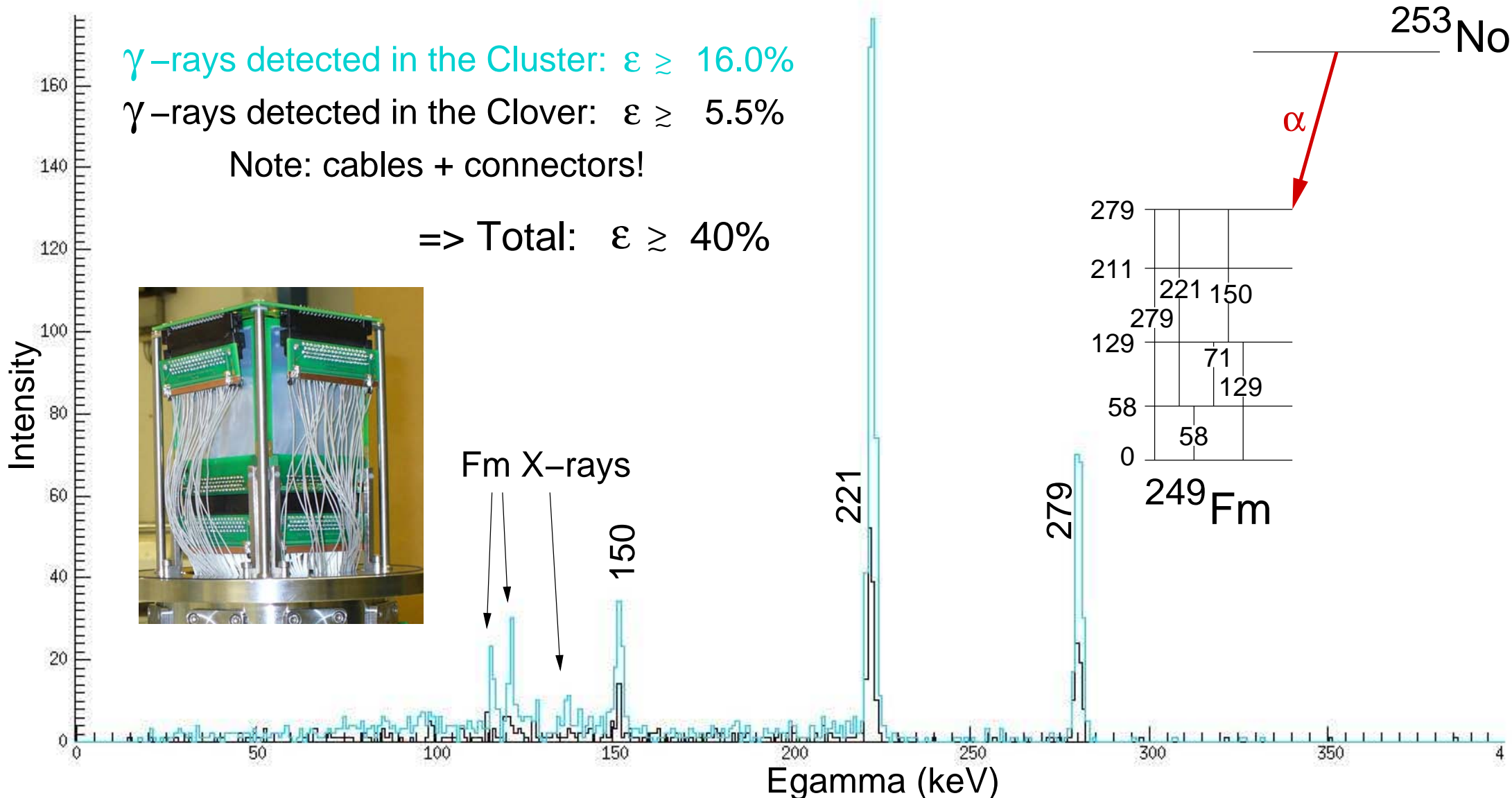
Comparison between the clover and the cluster detector

γ -rays detected in the Cluster: $\varepsilon \geq 16.0\%$

γ -rays detected in the Clover: $\varepsilon \geq 5.5\%$

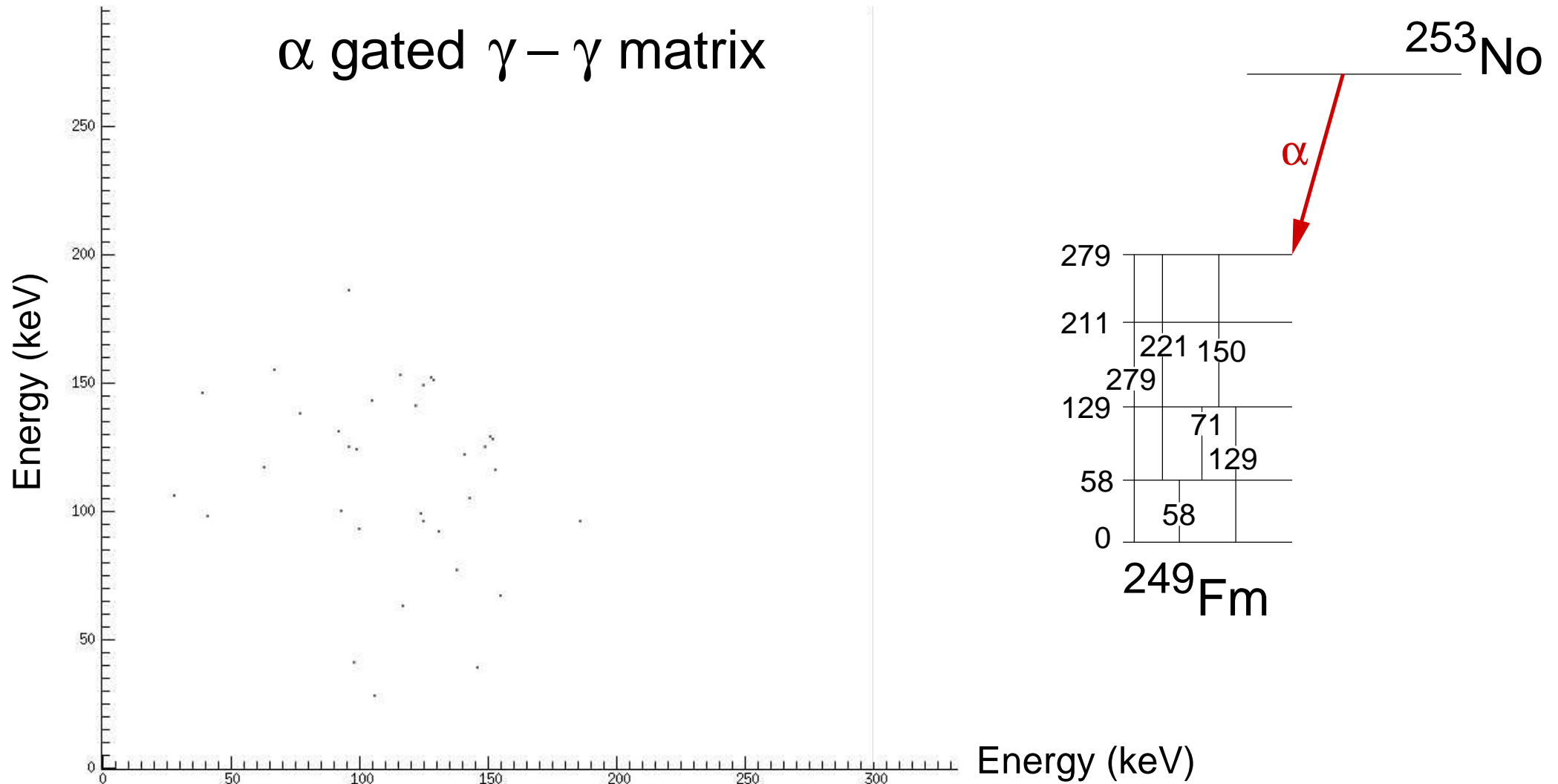
Note: cables + connectors!

=> Total: $\varepsilon \geq 40\%$



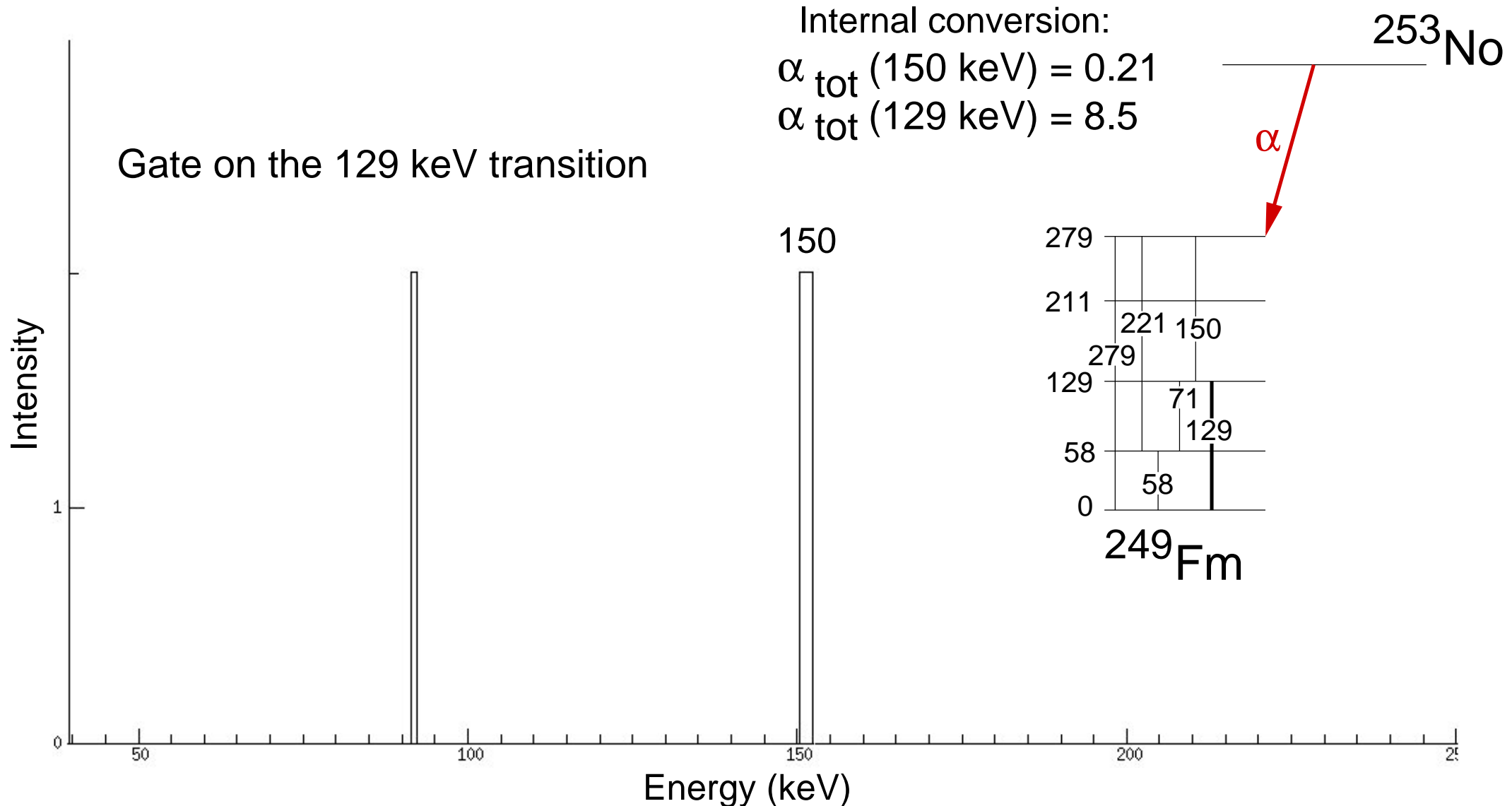
Comparison with Previous Results

$\gamma - \gamma$ correlations in ^{253}No



Comparison with Previous Results

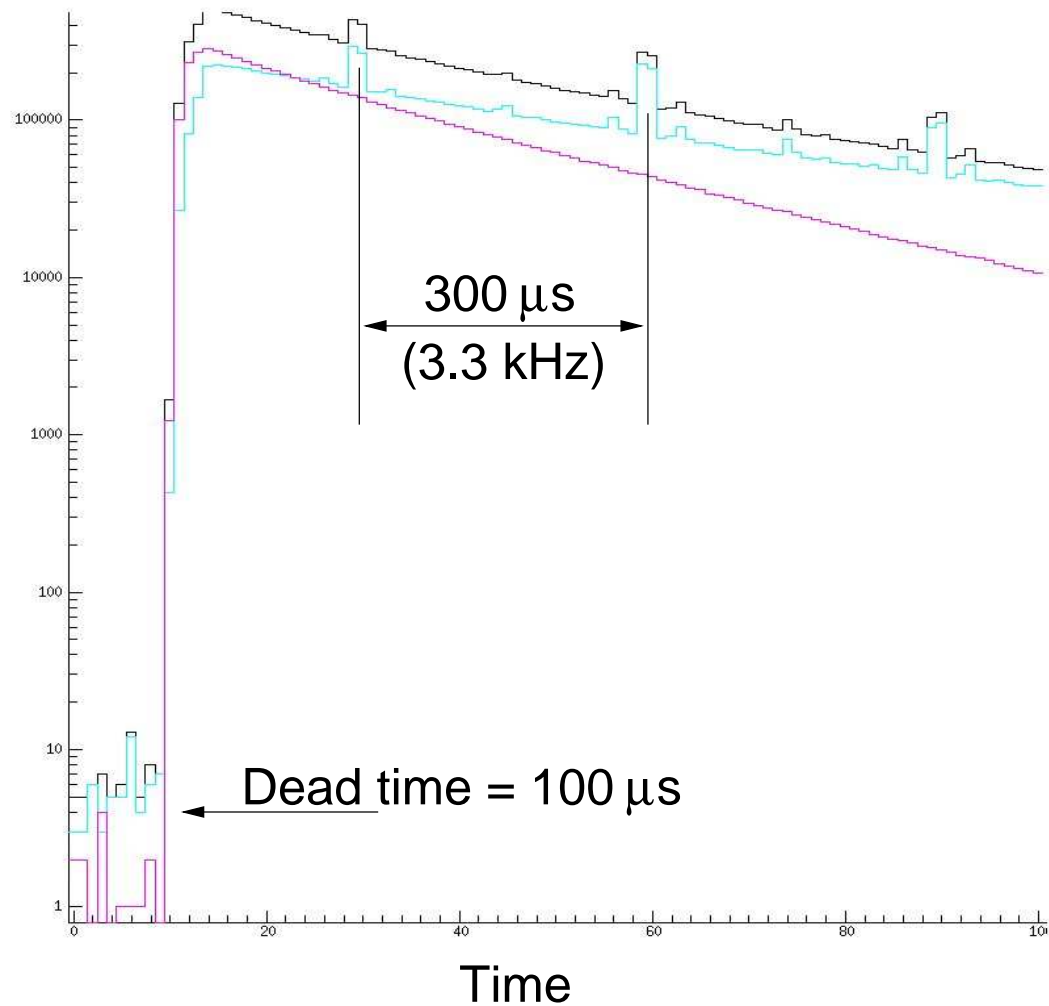
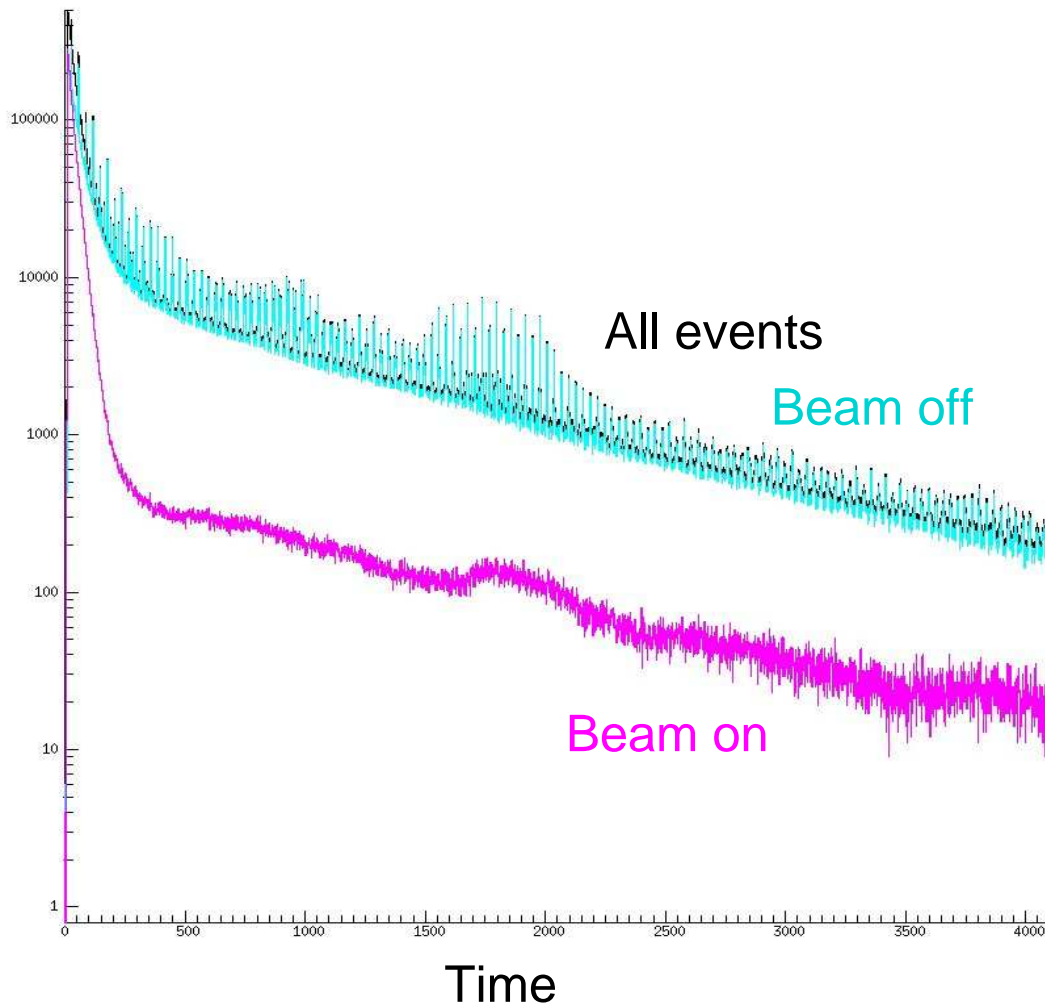
$\gamma - \gamma$ correlations in ^{253}No



Event Times

Time difference between two subsequent triggers

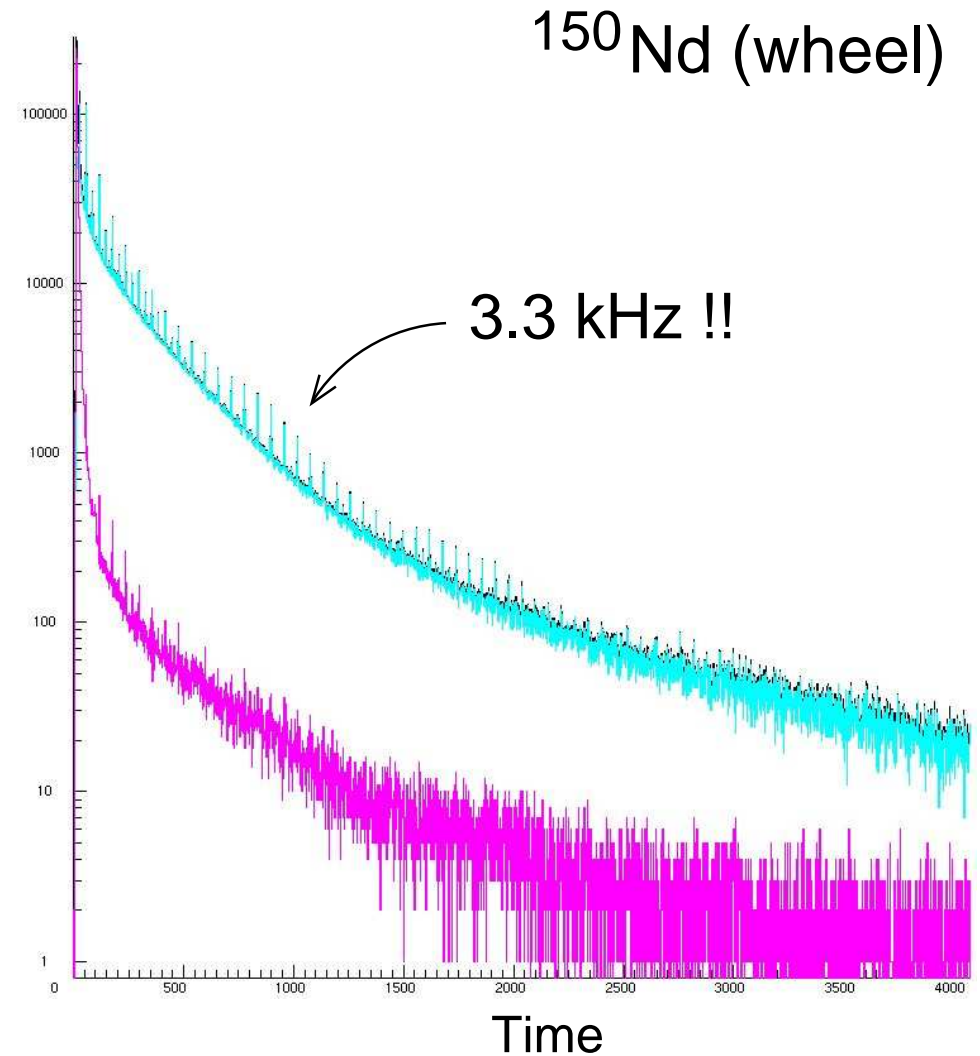
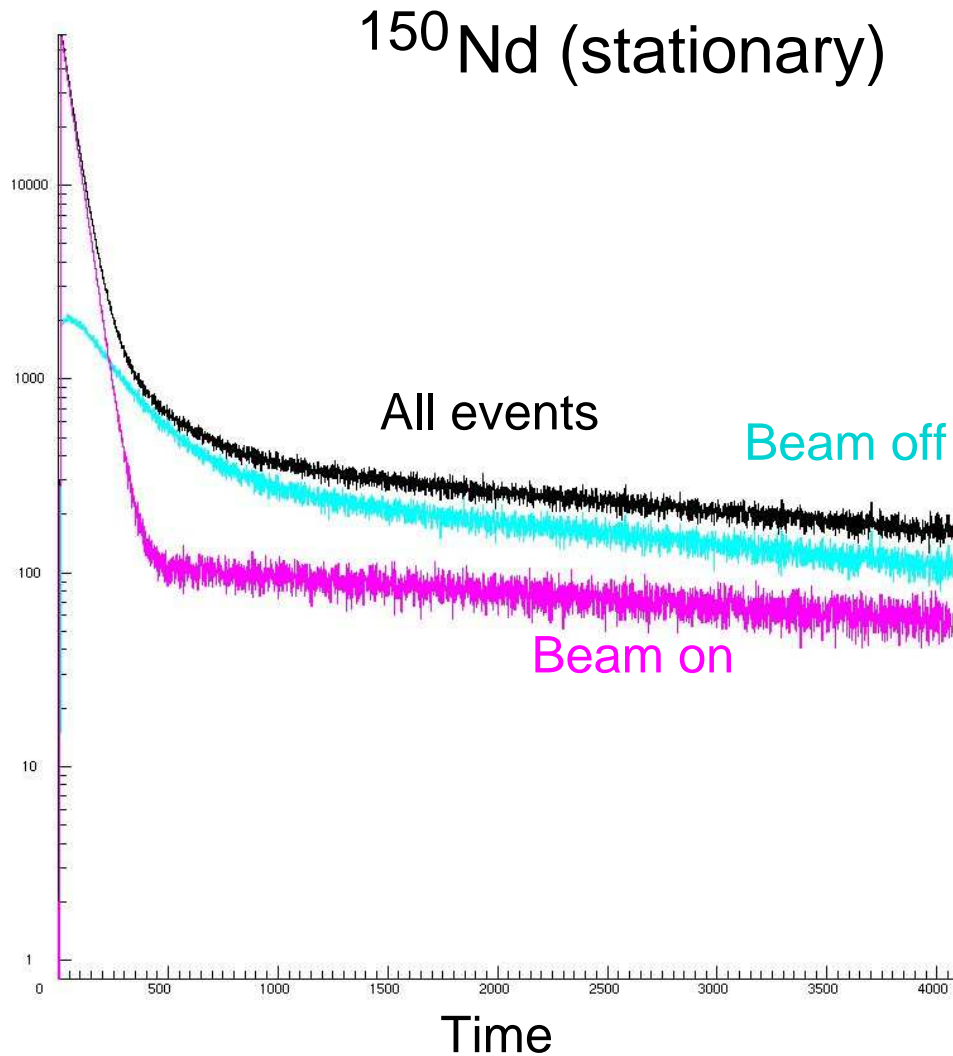
August



Event times

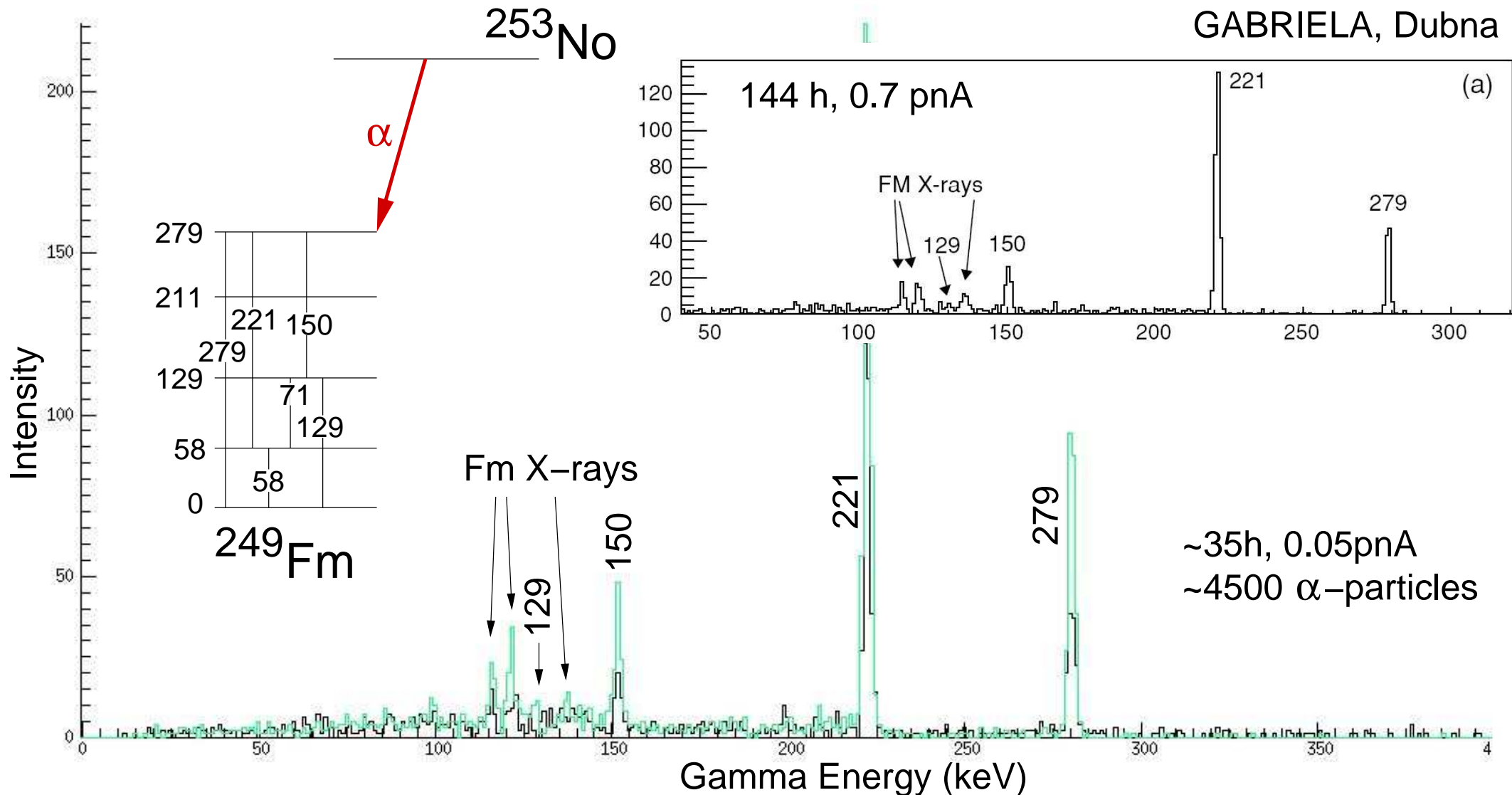
Time difference between two subsequent triggers

October



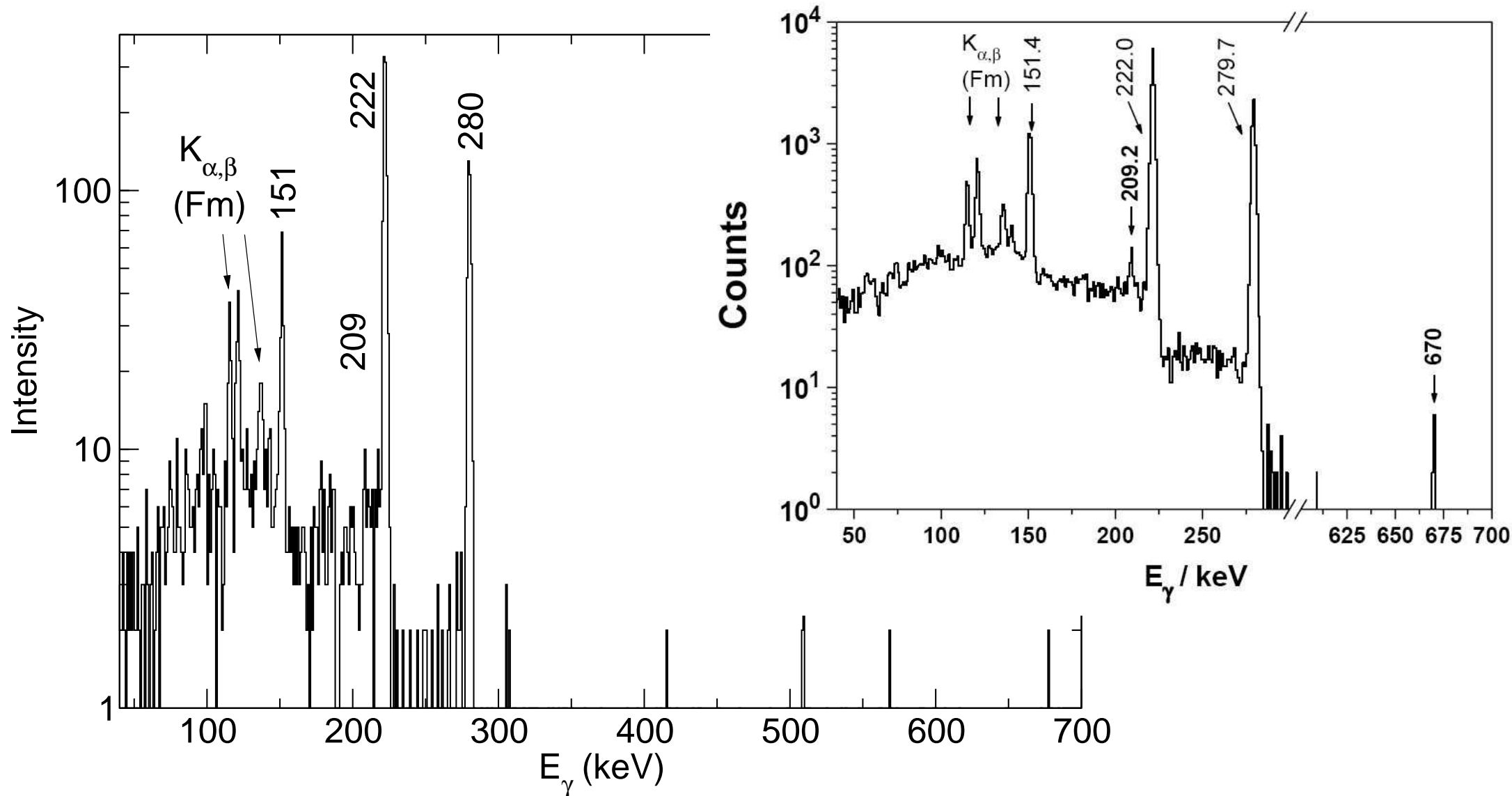
Comparison with Previous Results

A. Lopez-Martens et al. Phys Rev C 74, 044303 (2006)



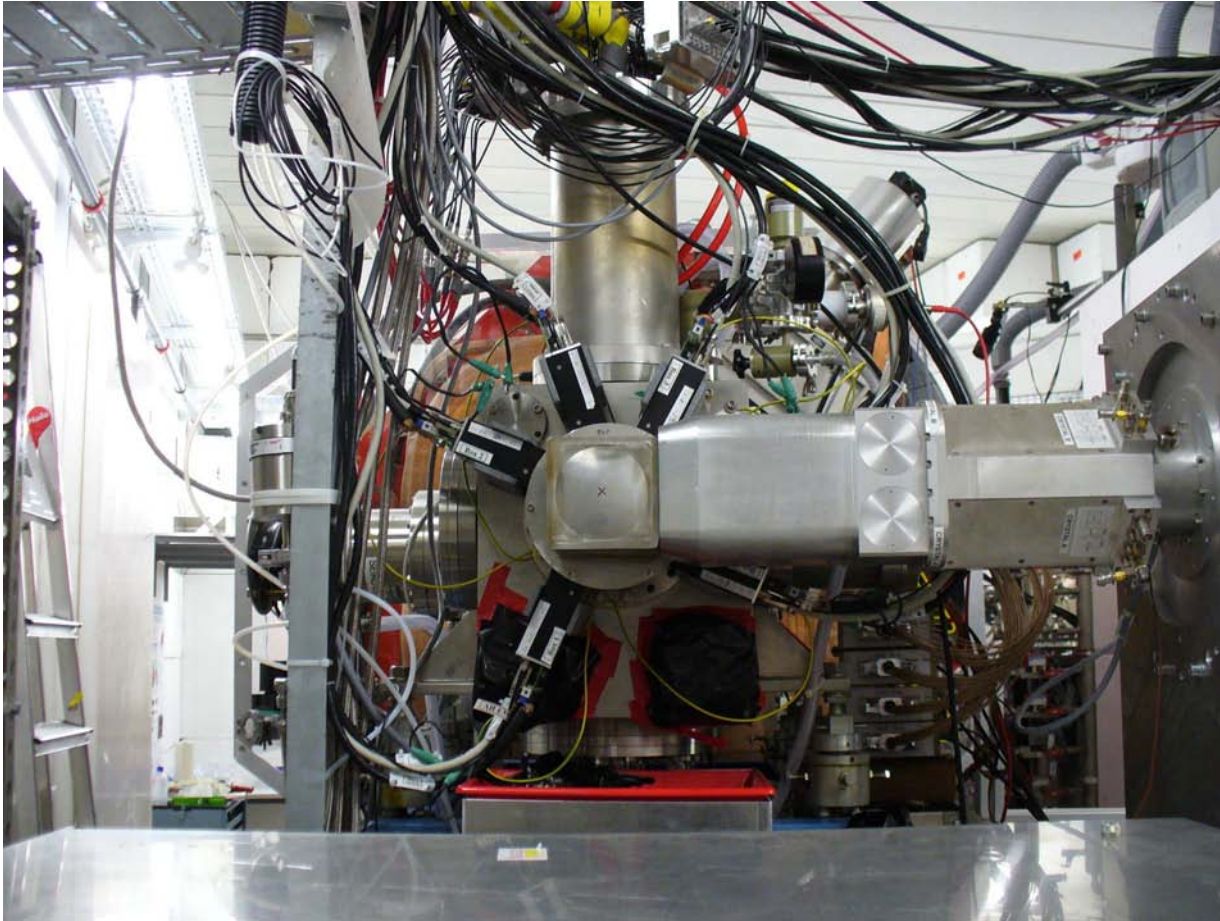
Comparison with Previous Results

F.P. Hessberger, Eur. Phys. J. D 45, 33–37 (2007).

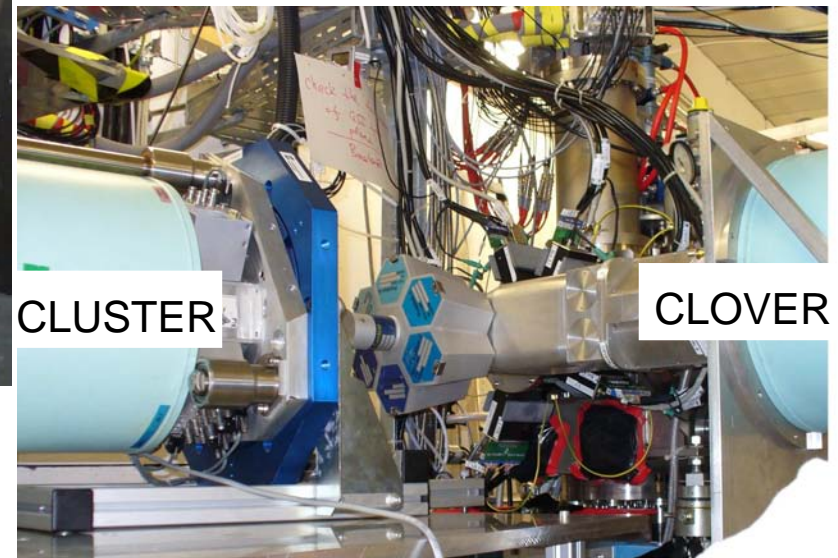


One Step Ahead...

Final step towards a configuration for experiments

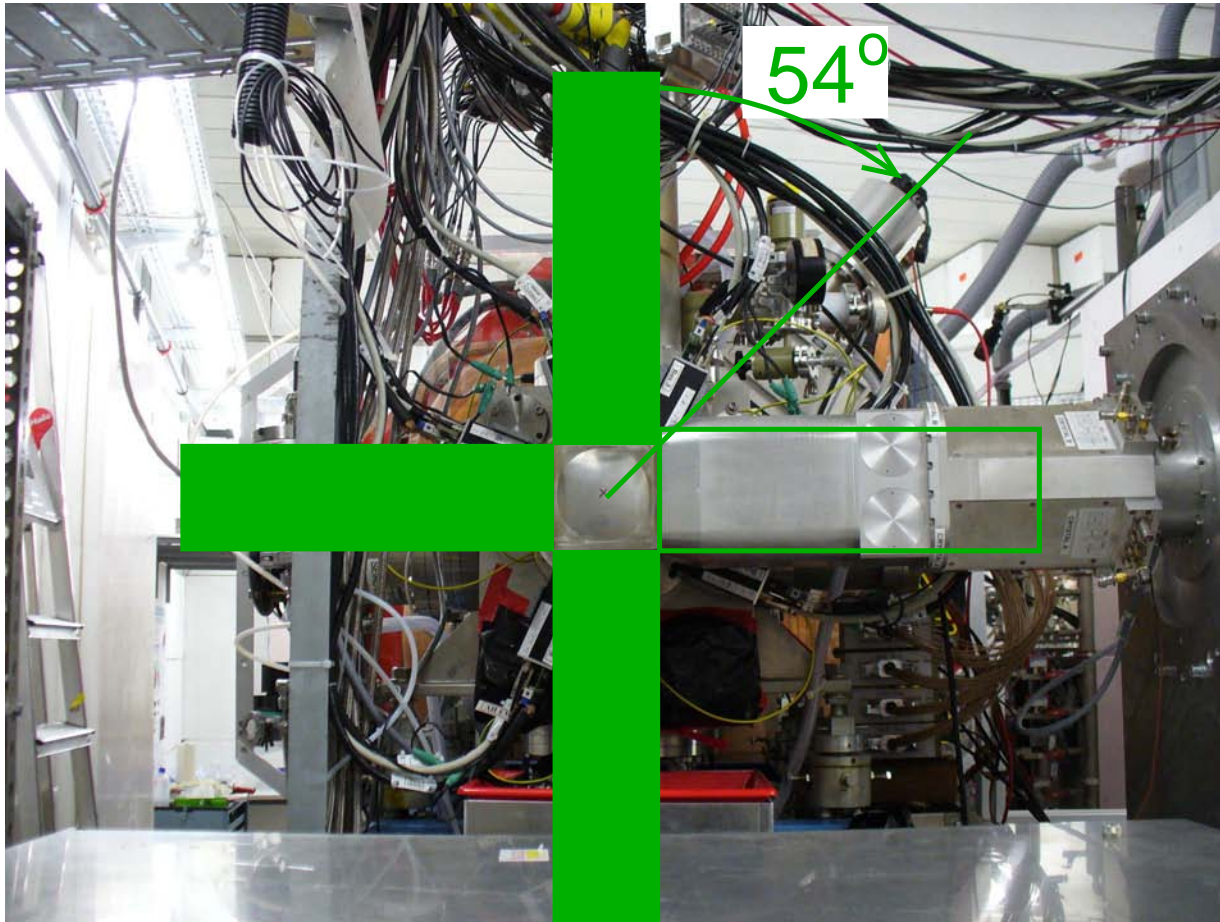


4 Ge Clover + 1 Cluster detectors
in final configuration



One Step Ahead...

Final step towards a configuration for experiments



4 Ge Clover + 1 Cluster detectors
in final configuration

Rebuild power + gas outlets!



Required: 4 Ge Clover holding
structure at the TASCA focal plane!

Planned Experiments

$^{207}\text{Pb} (^{48}\text{Ca}, 2n)^{253}\text{No}$ Characterisation of the K-isomer(s)
(multi-coincidences needed!)
June–July 2009; 10 days => 500000 $^{253}\text{No} \alpha$

$^{244}\text{Pu} (^{26}\text{Mg}, 5n)^{265}\text{Sg} \longrightarrow ^{261}\text{Rf} \longrightarrow ^{257}\text{No}$
2009–2010; 3 weeks => 40–80 ^{265}Sg

$^{226}\text{Ra} (^{48}\text{Ca}, 4n)^{270}\text{Hs}$ Search for the K-isomer
2010; 3 weeks

+ Parasitic beamtimes ~4 weeks 2009
 ~4 weeks 2010

(Reactions depending on available beams)

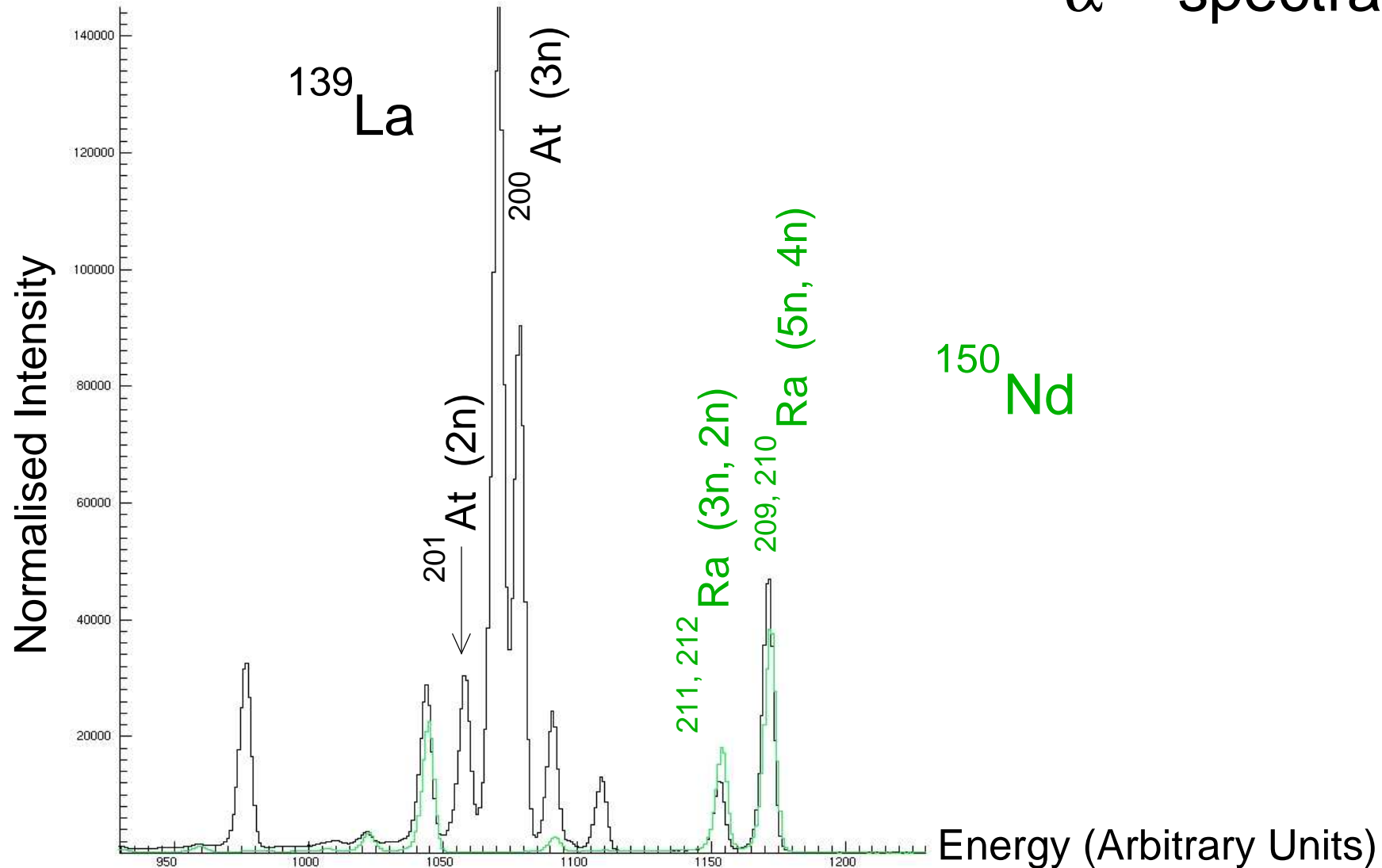
Example:

$^{20x}\text{Pb} (^{34}\text{S}, yn)^{24z}\text{Cf}$ decay spectroscopy (2009)

Facing Target Difficulties

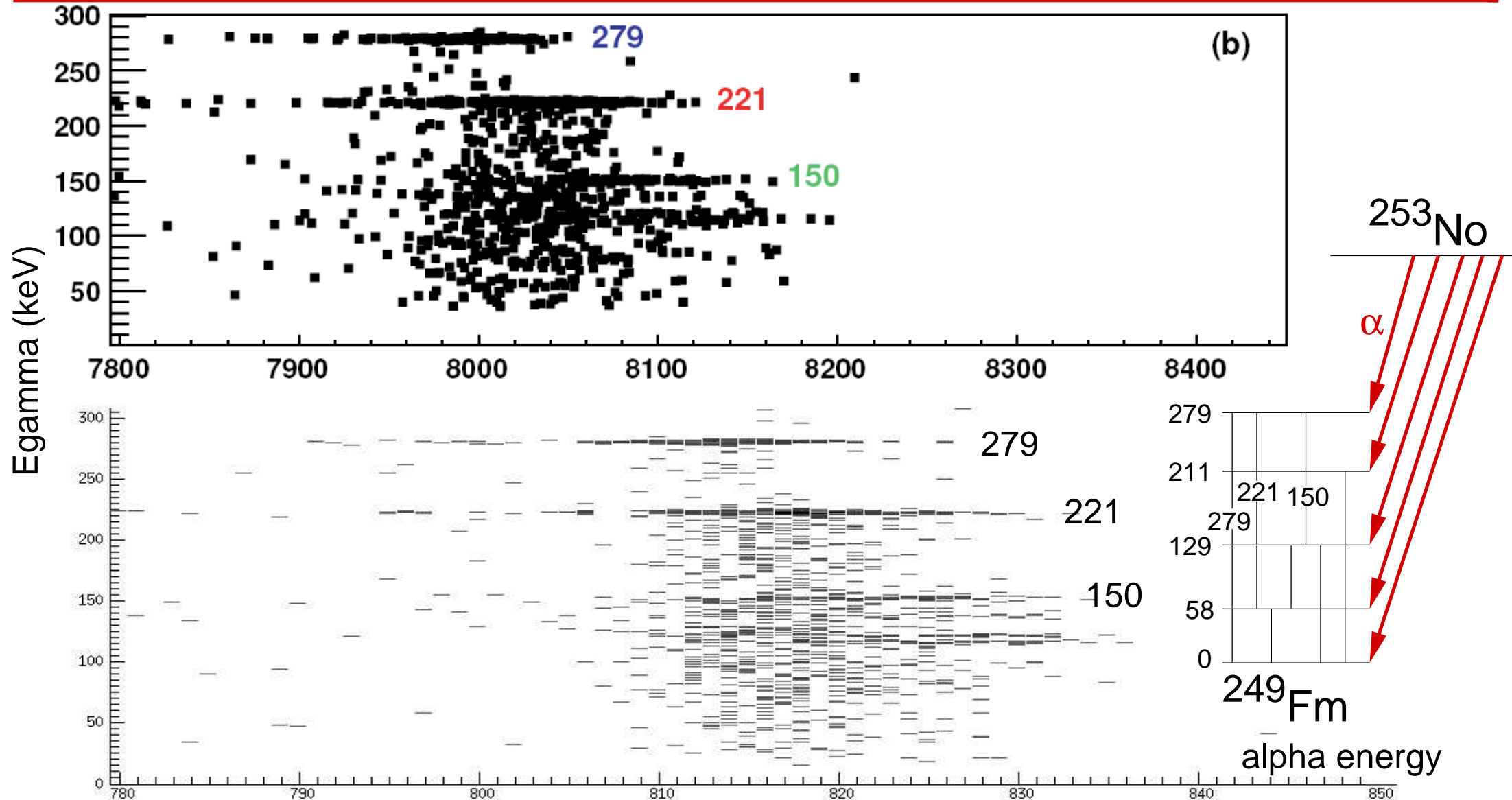
Using ^{150}Nd target wheel and **stationary target**

α – spectra



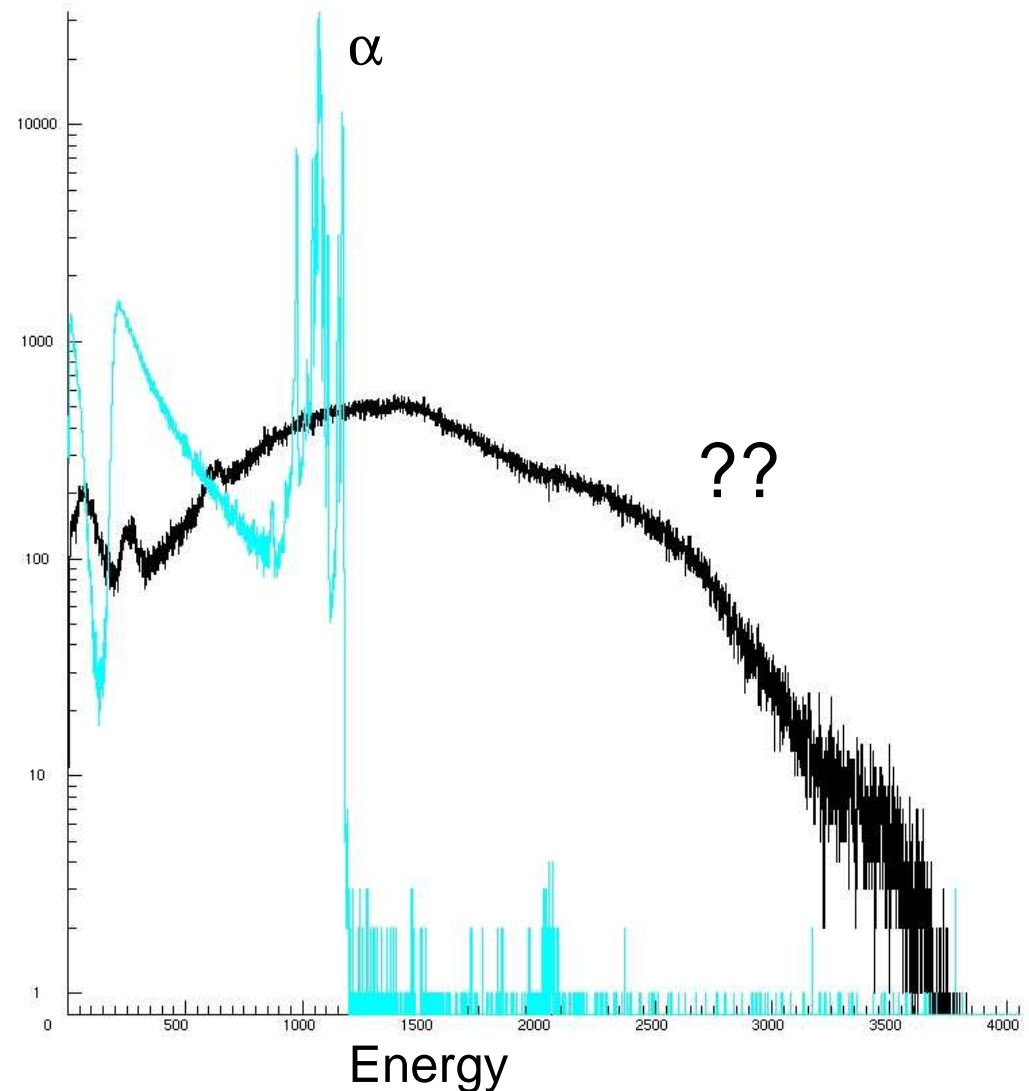
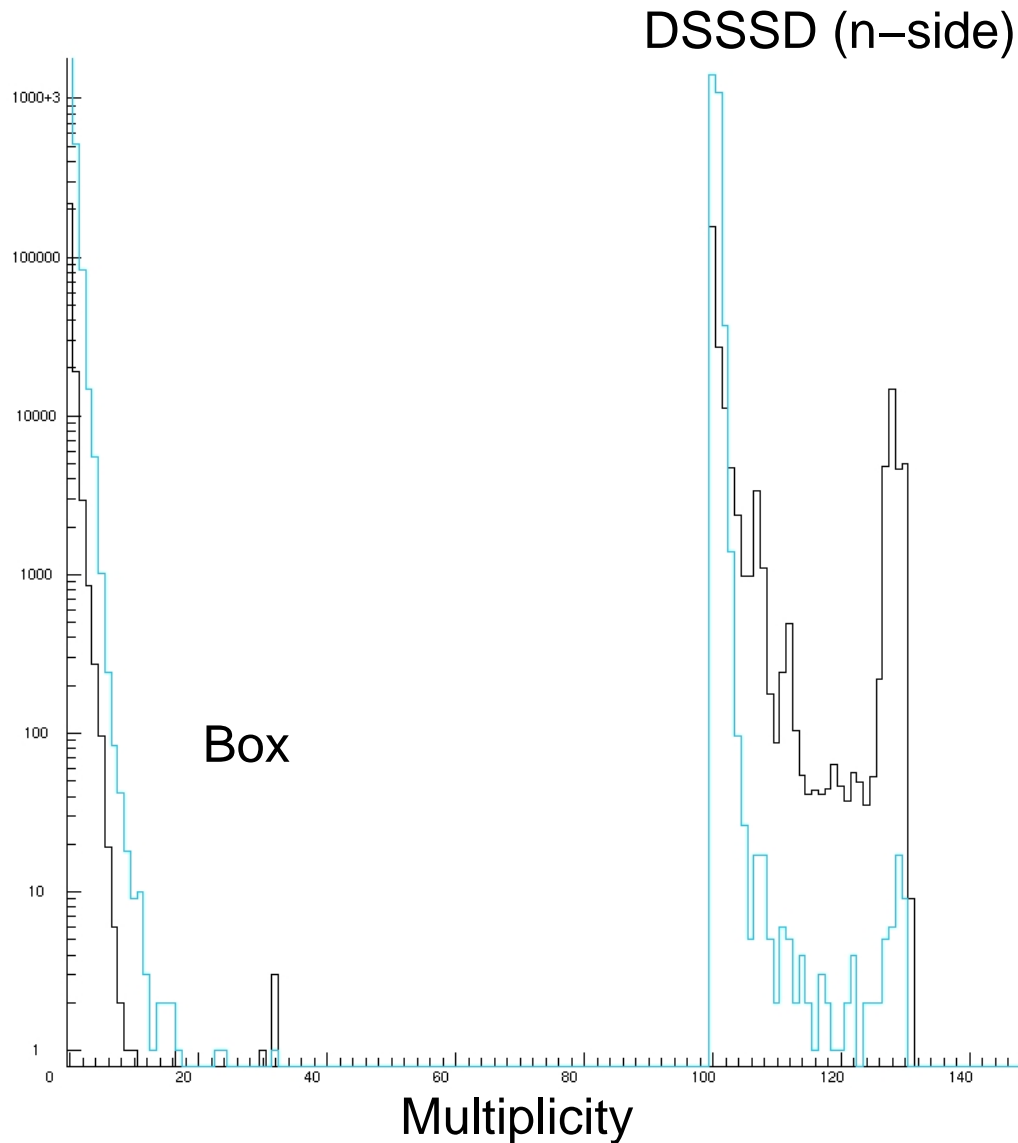
Comparison with Previous Results

A. Lopez-Martens et al. Phys Rev C 74, 044303 (2006)



Silicon Detector Multiplicity

Using natural Gd + 5 microns Ti backing and ^{150}Nd targets



Silicon Detector Multiplicity

Using natural Gd + 5 microns Ti backing and ^{150}Nd targets

