

# PRESPEC-AGATA: Coulomb excitation of the band-terminating $12^+$ yrast trap in $^{52}\text{Fe}$ . S433: Status of the Data Analysis

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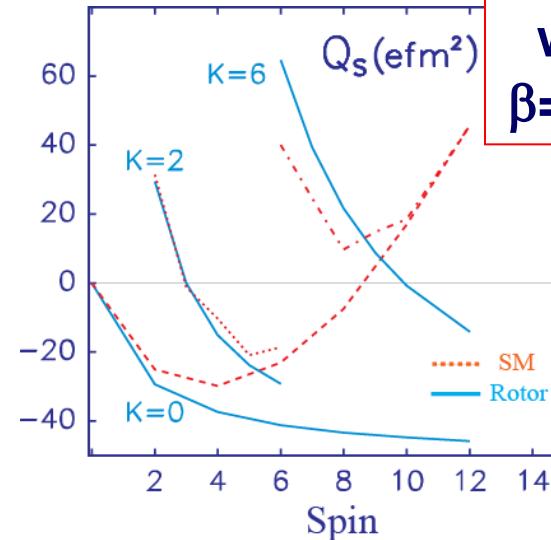
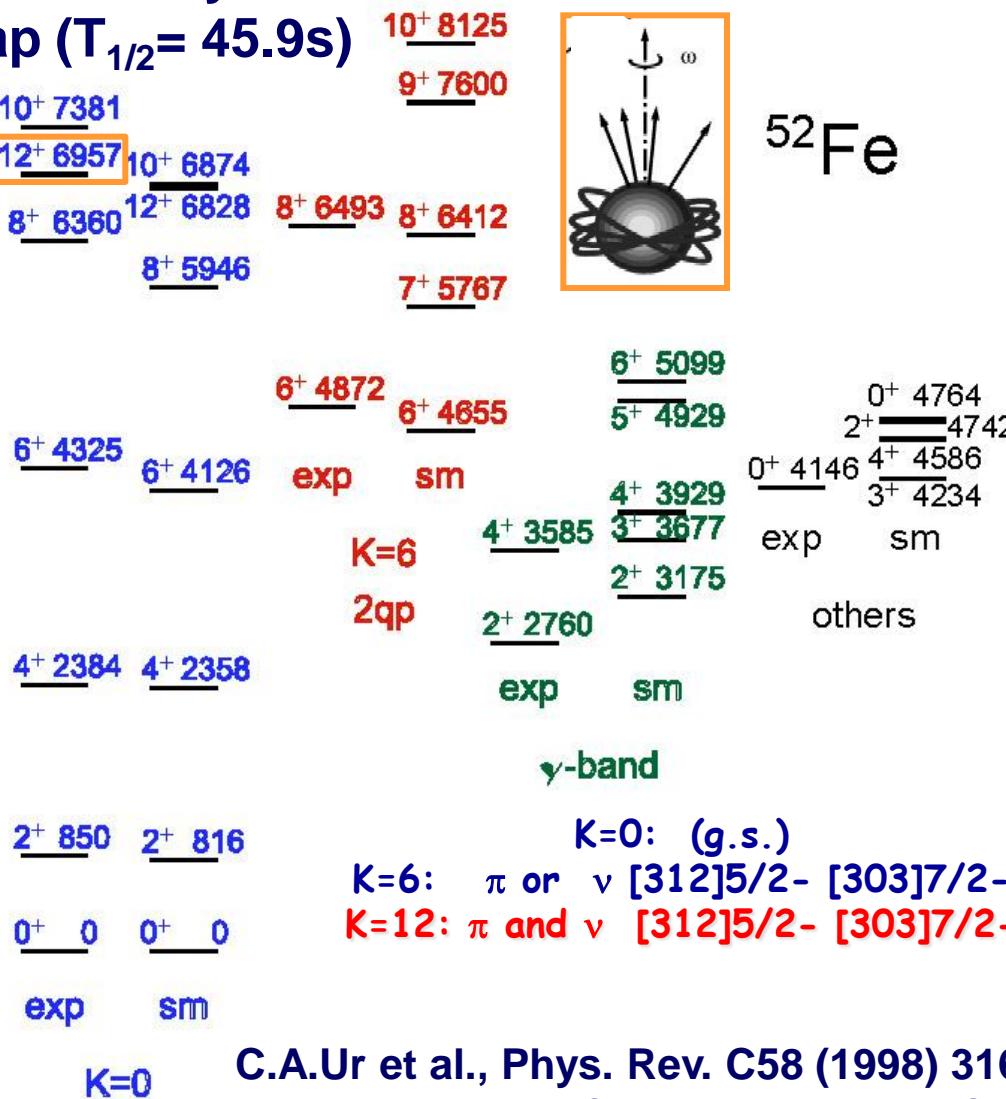
*GSI-Darmstadt, Germany*

*and the AGATA, PRESPEC, LYCCA and FRS collaborations*

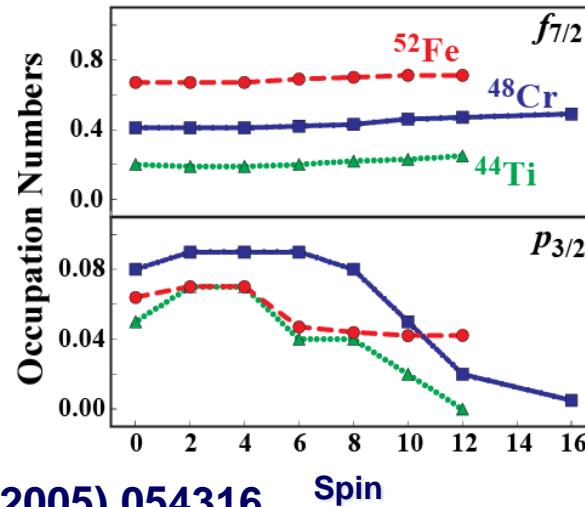
# The $^{52}\text{Fe}$ level scheme

Exp. GASP@LNL +MS@GSI

12<sup>+</sup> seniority  
isomer & yrast  
trap ( $T_{1/2} = 45.9\text{s}$ )



## LSSM with KB3G

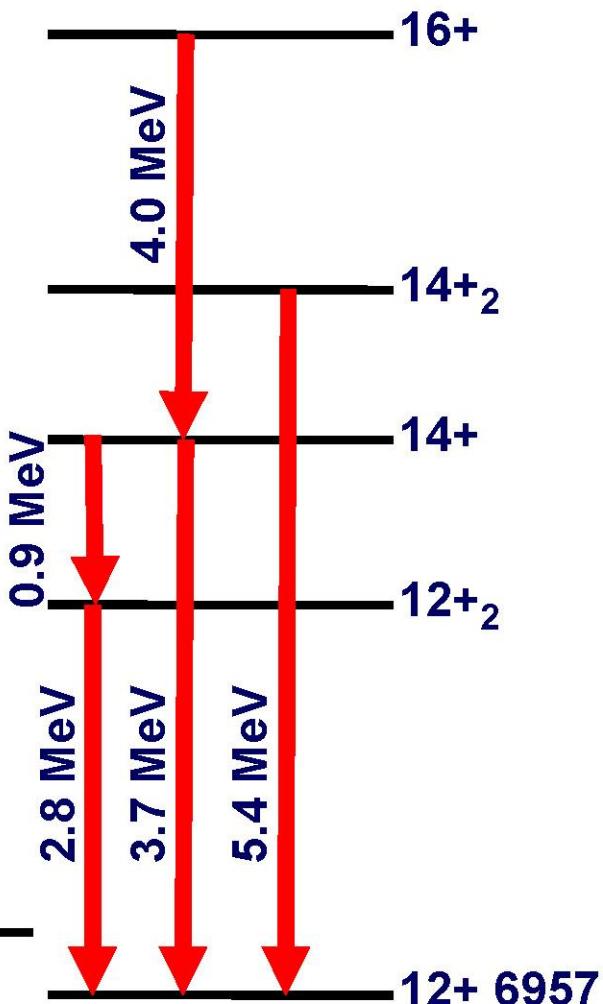


C.A.Ur et al., Phys. Rev. C58 (1998) 3163

F.Brandolini and C.A.Ur, Phys. Rev. C71 (2005) 054316

A.Gadea et al., Phys. Lett. B619 (2005) 88

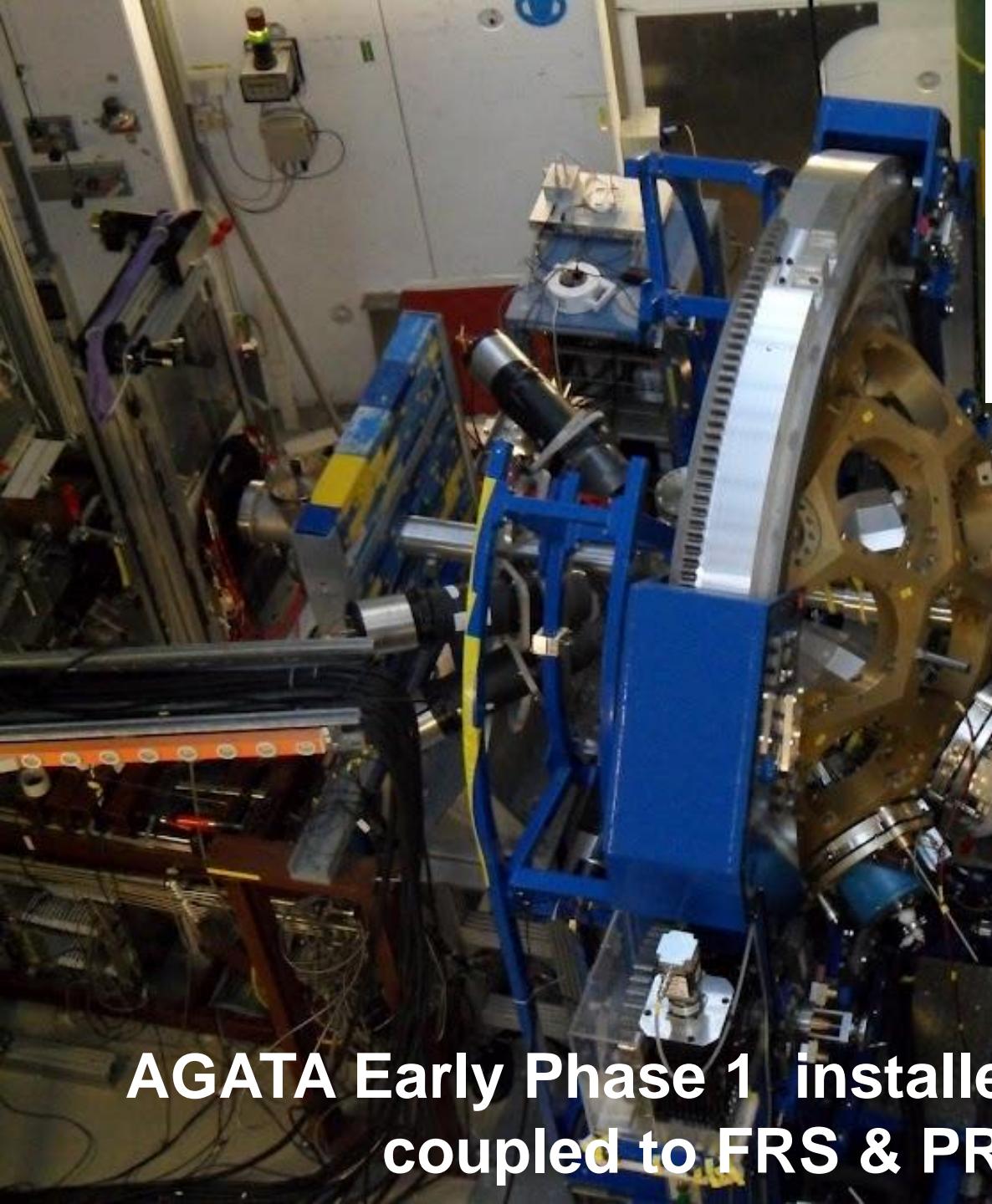
# *fp*-Shell LSSM Calculations



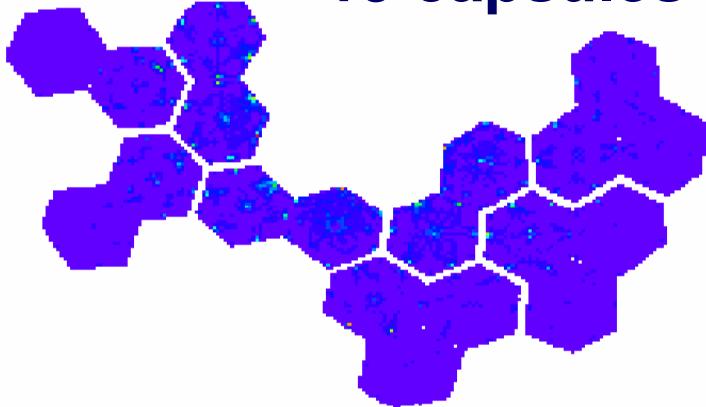
***fp*-Shell LSSM  
calculation performed  
with the GXPF1  
interaction and the code  
ANTOINE**

$$B(E2 \ 12_{-2}^{+} \rightarrow 12_{-1}^{+}) = 21 \text{ e}^2\text{fm}^4$$
$$B(E2 \ 14_{-1}^{+} \rightarrow 12_{-1}^{+}) = 27 \text{ e}^2\text{fm}^4$$
$$B(E2 \ 14_{-2}^{+} \rightarrow 12_{-1}^{+}) = 6 \text{ e}^2\text{fm}^4$$

Preliminary Beyond-Mean Field calculation suggest oblate deformation for the 12+ and 14+ states with quadrupole moments  $Q=-53 \text{ fm}^2$  and  $-218 \text{ fm}^2$

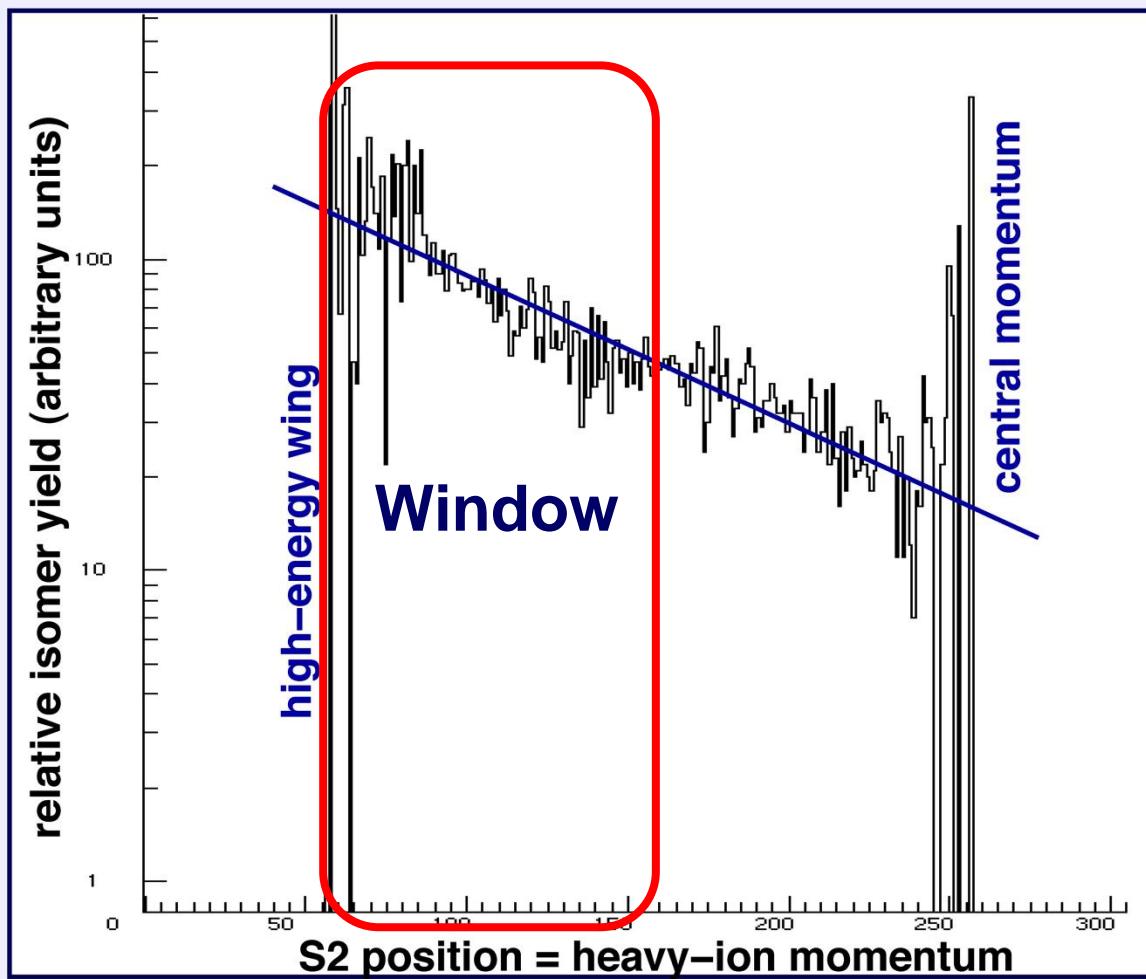


19 capsules



AGATA Early Phase 1 installed at GSI in 2012  
coupled to FRS & PRESPEC

# Isomeric Ratios – Momentum Dependence



**54 Ni**

(4–neutron removal)

Approximately a factor of 15 higher isomeric ratio in the high–energy wing of the momentum distribution compared to the center of the momentum distribution!

Similar to 3–nucleon removal towards  $^{43}\text{Sc}$ :

W.D. Schmidt-Ott *et al.*,  
Z. Phys. A 350, 215 (1994)

RNB7, Cortina d'Ampezzo, July 2006

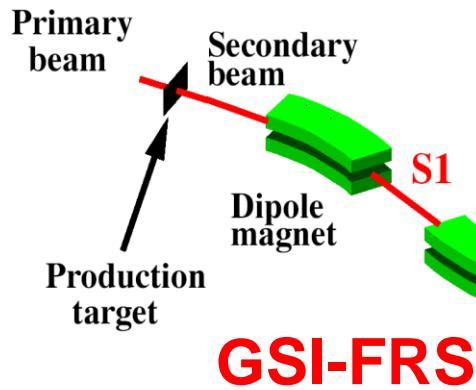
Dirk Rudolph

Nuclear  
Structure  
Group

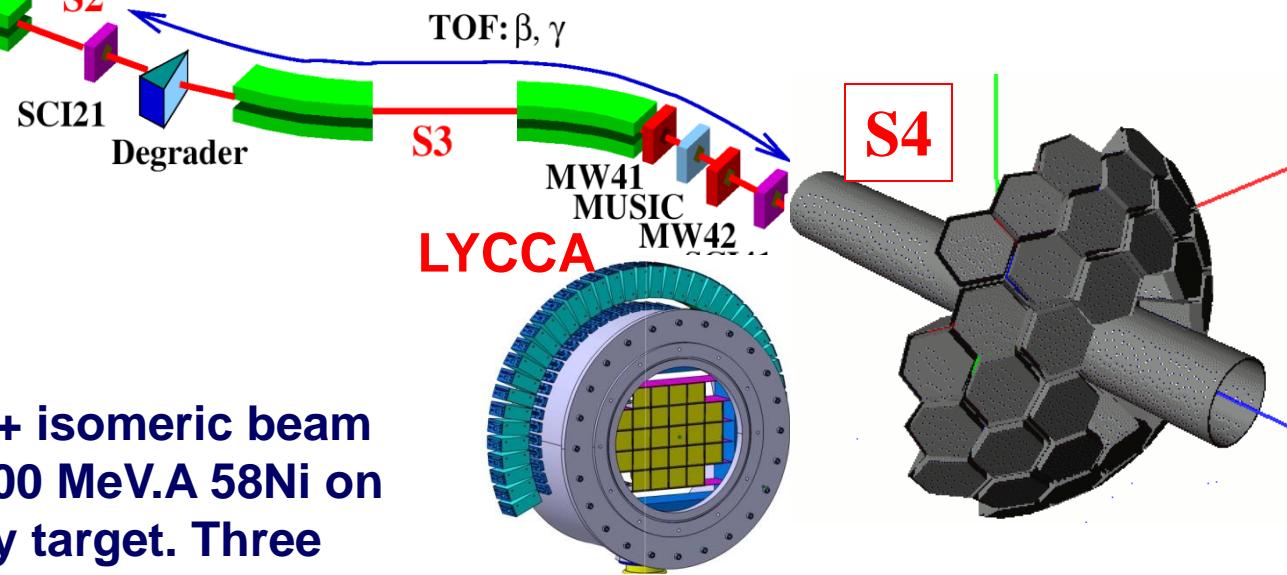


LUND  
UNIVERSITY

# Experimental Details

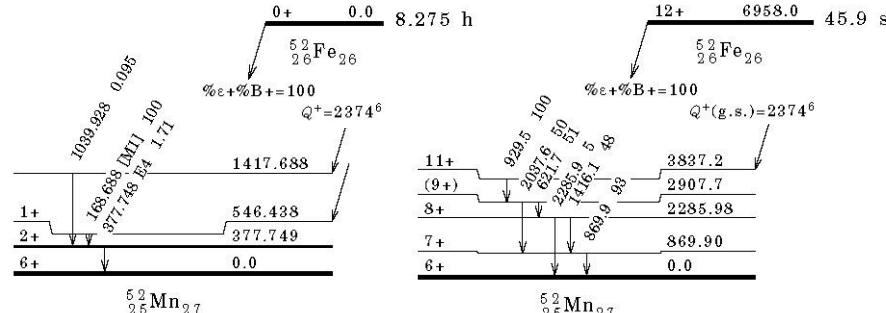


Experiment to be performed with the  
GSI-FRS secondary isomeric beam at  
the AGATA-PRESPEC setup

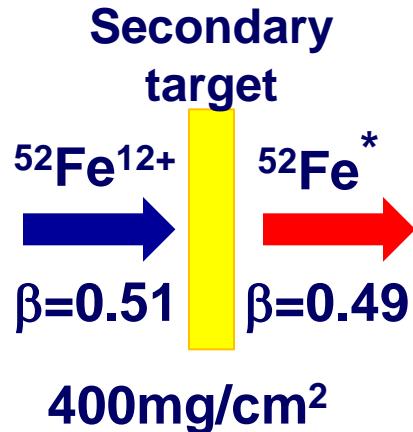


Production of the 12+ isomeric beam  
γ fragmentation of 600 MeV.A 58Ni on  
a 9Be 4g/cm<sup>2</sup> primary target. Three  
seconds Spill Secondary Target  
400mg/cm<sup>2</sup> Au (forward position)

Determination of isomeric ratio:  
 $\beta$ -decay with thick stopper: 10%



# Experimental Details

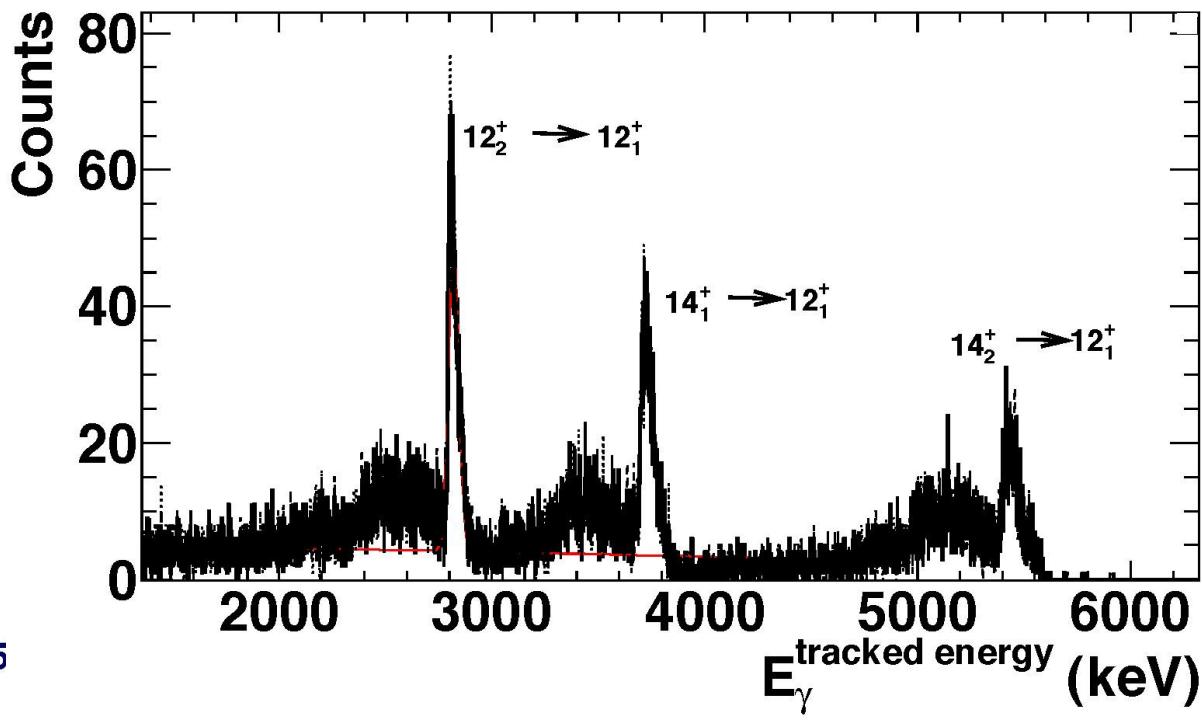
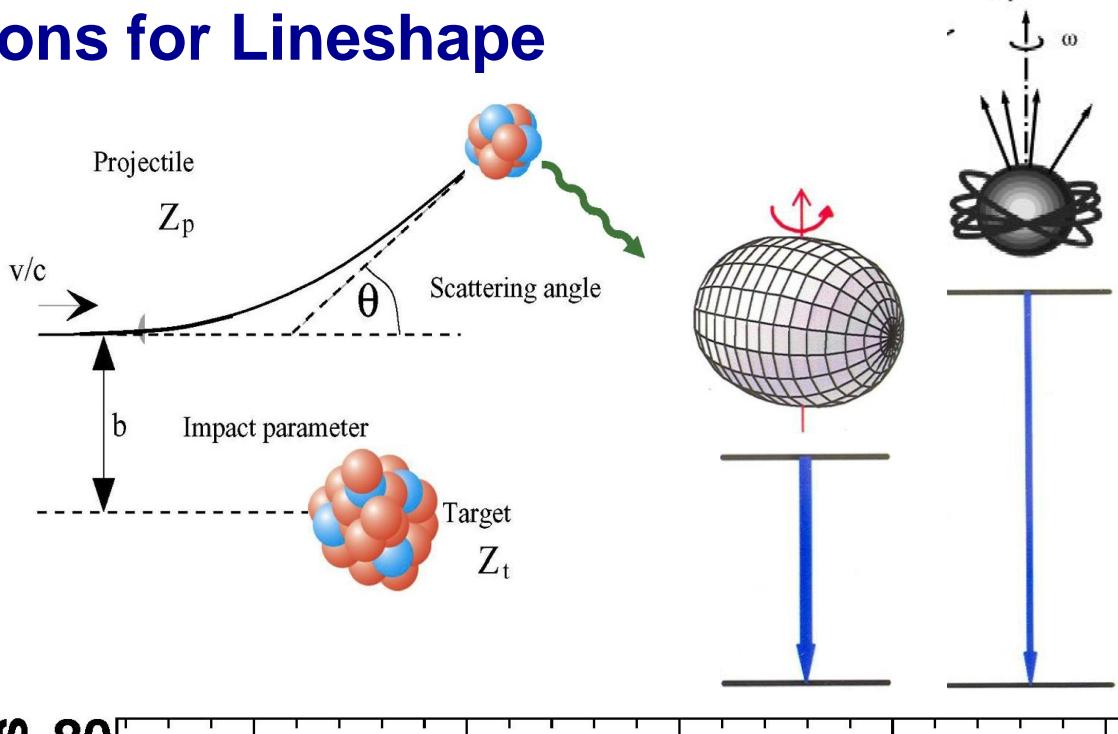
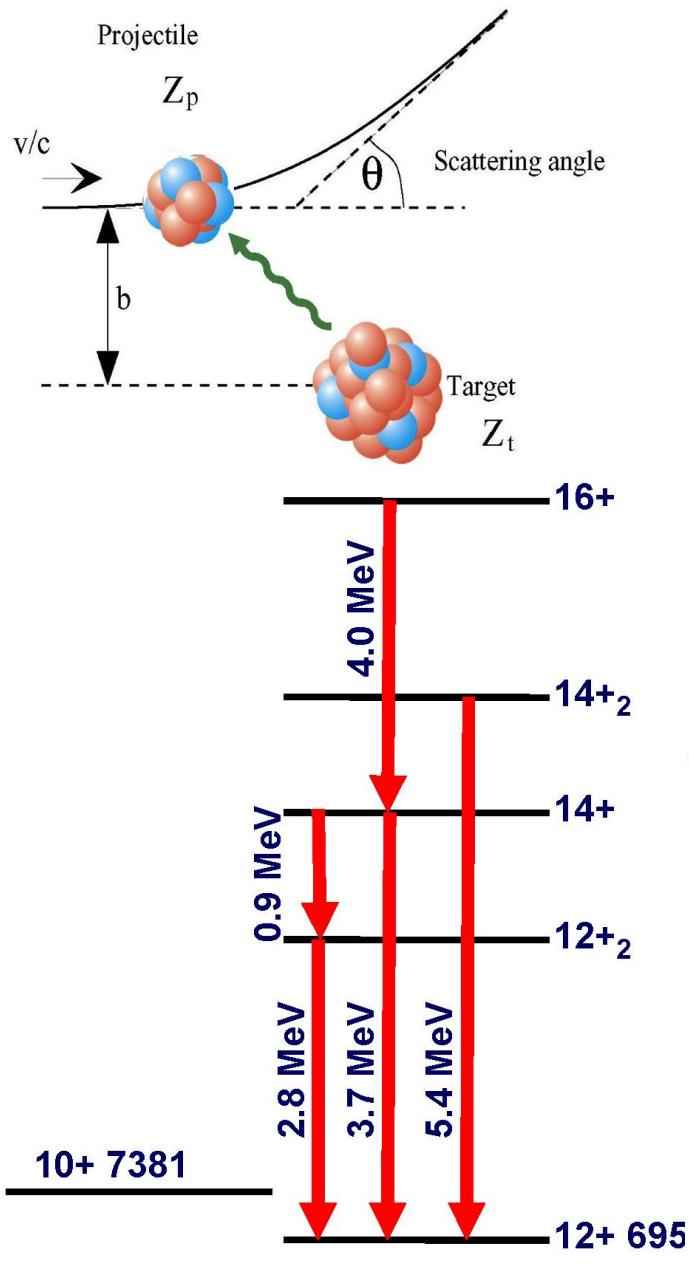


~3.5 ps to cross the target: fast  $\gamma$ -ray transition (~ 0.2ps)  $\rightarrow$  FWHM given by  $\Delta\beta$  in target calculated to be max. 2% for AGATA

H.J. Wollersheim et al., NIM A537

- Relativistic Coulom Excitation for the 12+ isomer calculated with the DWEIKO code (C.A.Bertulani et al.)  $\rightarrow$  5mb for the LSSM B(E2) ( $B(E2, 12_1^+ \rightarrow 14_1^+) = 31 \text{ e}^2\text{fm}^4$   $\rightarrow$  for band terminating)
- Spill 3 + 2 s
- Primary SIS beam  $^{58}\text{Ni}$   $3 \times 10^9$  ions per spill.
- Counting rate at the S2 Scintillator:  $1.5 \times 10^6$  per spill.
- Counting rate at S4 scintillator:  $10^5$  per spill
- Isomeric yield estimated online  $\geq 10\%$
- $\gamma$ -ray energy Emitted by the ion at  $\beta=0.49 \rightarrow 5.5 \text{ MeV}$

# Monte-Carlo Simulations for Lineshape



# Early tasks performed at IFIC on GRID:

- Upgrade of the FEMUL-GRID software to the last available version.
- Installation of the last ADF version in the IFIC GRID
- Check of the Event-Builder, PSA and Tracking

**THE EXISTING GRID RESOURCES FOR AGATA**

**STORAGE SYSTEM**

Recording the line-shape of the output signal...  
TeraBytes of Data...  
Hundreds of Data Files per experiment...

**CPU POWER**

Off-line Pulse Shape Analysis is time consuming...  
Complex  $\gamma$ -ray tracking also...  
Complex algorithms (PSA, tracking)

**OTHER GRID SERVICES**

UI, WMSPROXY, BDII,...



```
-bash-3.25 date
Tue Nov 23 11:50:40 CET 2010

-bash-3.25
-bash-3.25 lcg-infos --vo vo.agata.org all

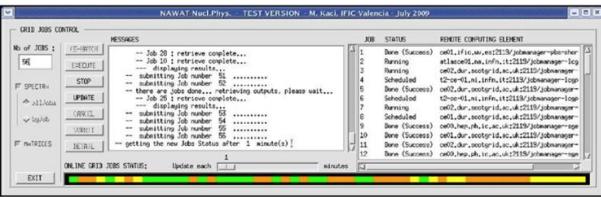
#CPU Free Tot Jobs Run Wait ComputingElement
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656 55 0 0 0 lyogrid07.in2p3.fr:8443/cream-pbs-vo.agata.org
656 55 0 0 0 lyogrid02.in2p3.fr:2119/jobmanager-pbs-vo.agata.org
1216 18 0 0 0 sbgce2.in2p3.fr:8443/cream-pbs-vo.agata.org
536 134 0 0 0 ipngrid04.in2p3.fr:8443/cream-pbs-sdj
426 24 0 0 0 ipngrid04.in2p3.fr:8443/cream-pbs-agata
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Avail Space(Kb) Used Space(Kb) Type SEs
_____
499008918 10796826 n.a lyogrid06.in2p3.fr
10737418240 3262799712 n.a ccarm02.in2p3.fr
3740182493 2617242908 n.a ipnsepm.in2p3.fr
21445619256 72272689927 n.a ipnsedpm.in2p3.fr
1000000000000 500000000000 n.a srm-v2.cern.ch
3611000000000 521996000000 n.a srm-v2.cern.ch
67730137056 380504621652 n.a sbgse1.in2p3.fr
```

**THE END-USER IN THE AGATA GRID COMPUTING MODEL**

The Computing Model would not be complete without a front end interface allowing the end users running transparently their data processing on the Grid...

A light Grid application with user friendly GUI is to be adapted for AGATA Data processing...

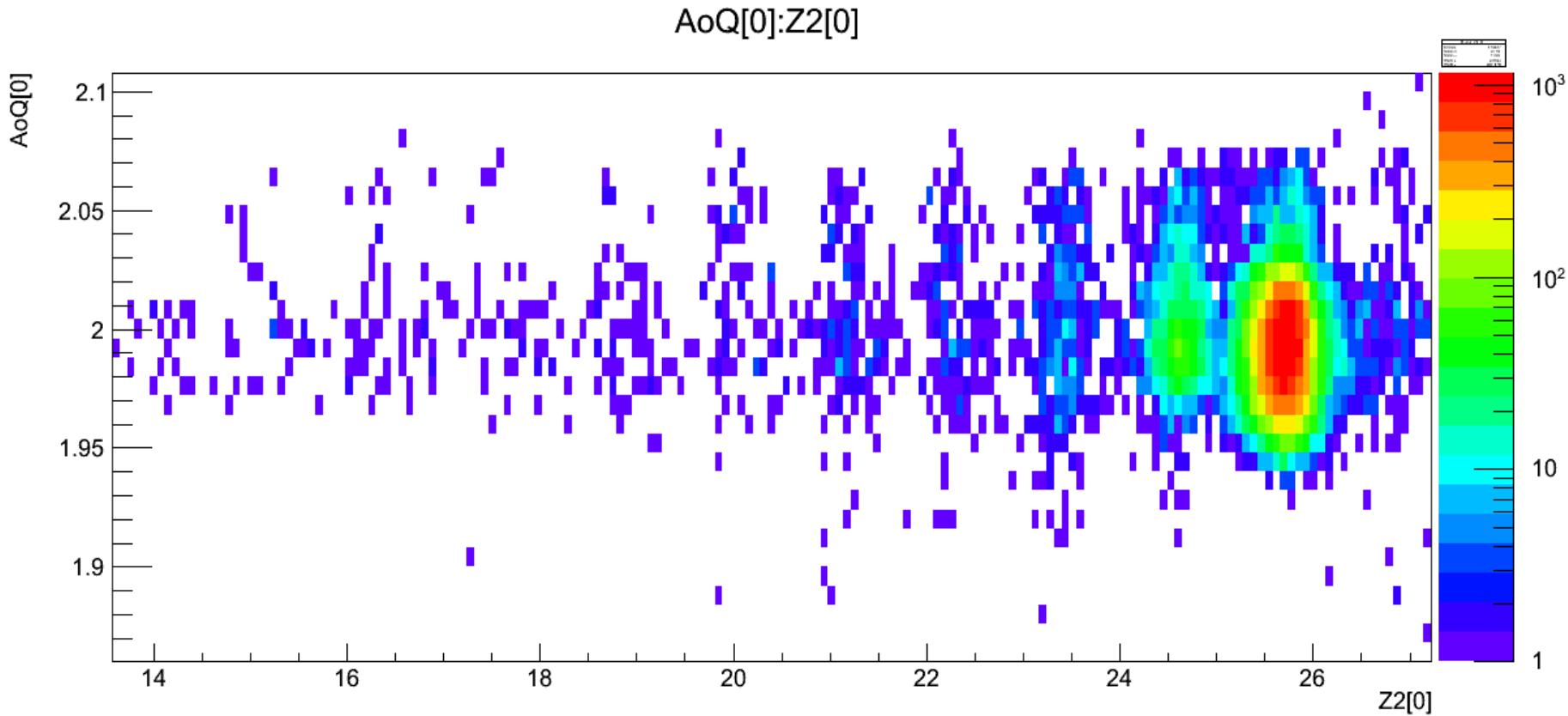


A support to the users for running their Data processing on the Grid is also contemplated in the proposed AGATA Grid Computing Model

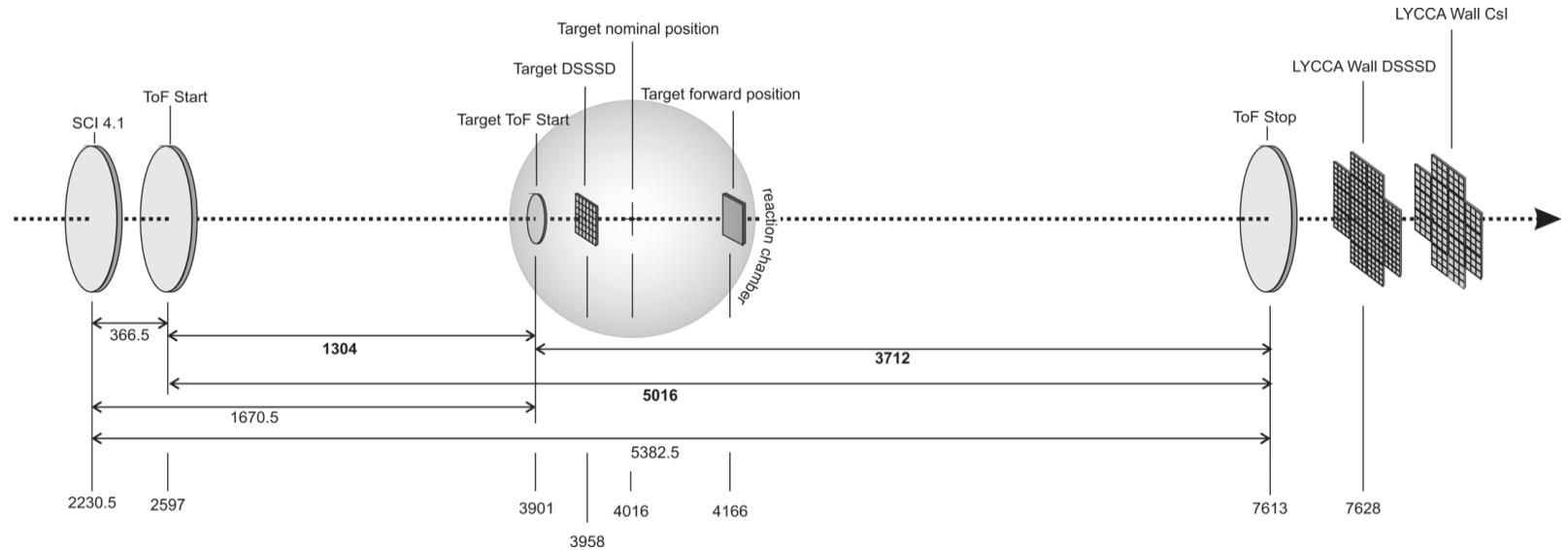


- Sort of Calibration Sources: 60Co, 152Eu, Pu-C
- Calibration of AGATA detector segments with 60Co + Pu-C (for high energy ~5 MeV)

# FRS Identification done but requires improvement and Efficiency reduced for S2 Detectors (improvement ongoing)



# PRESPEC Setup analysis



**Sc 4.1 (FRS trigger)**

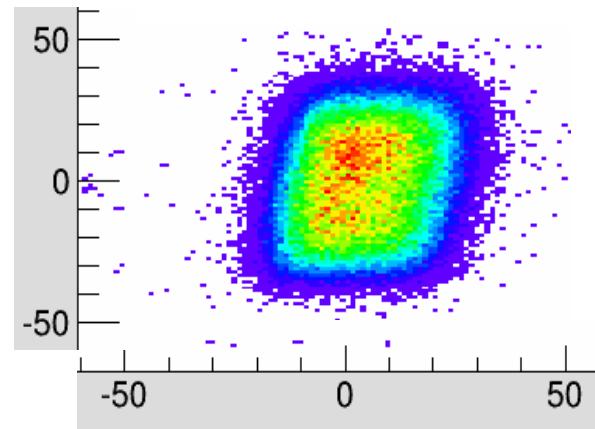
**ToF Start: 96.1 %**

**ToF+DSSD Target: 94.1 %**

**ToF Stop: 96.2 %**

**DSSD Wall: 85.3 %**

**CsI Wall: 97.2 %**

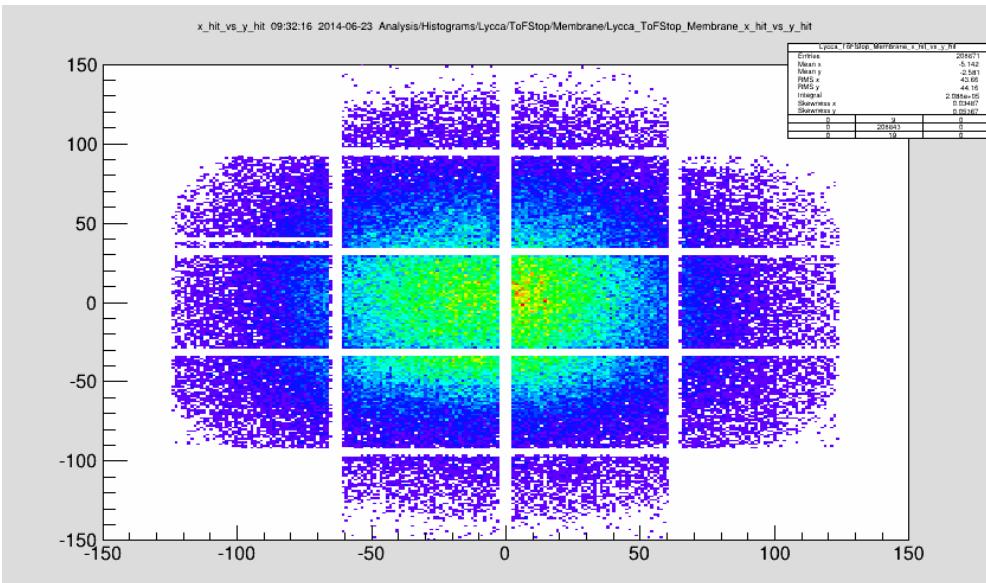
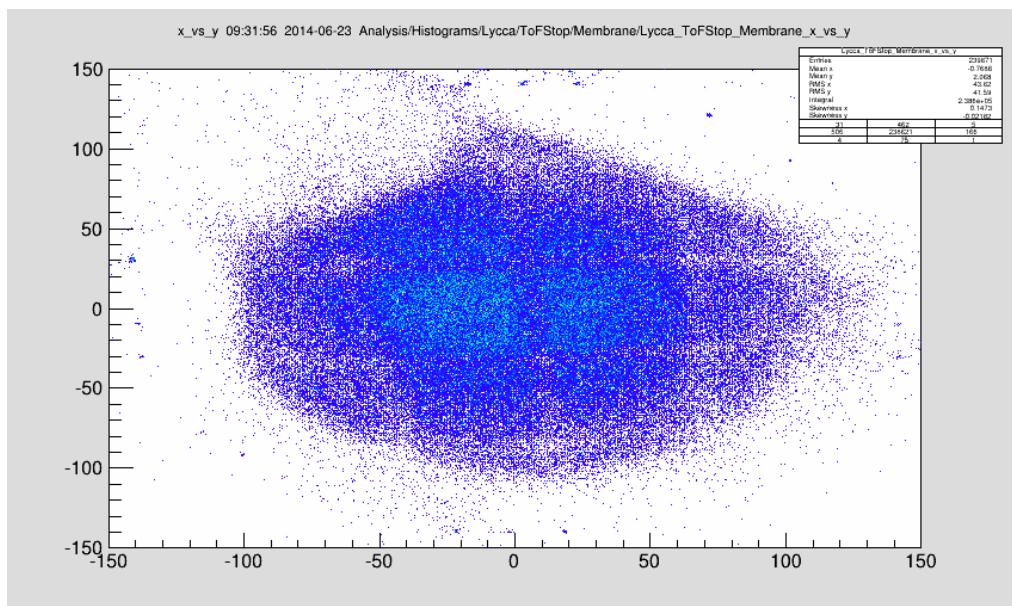
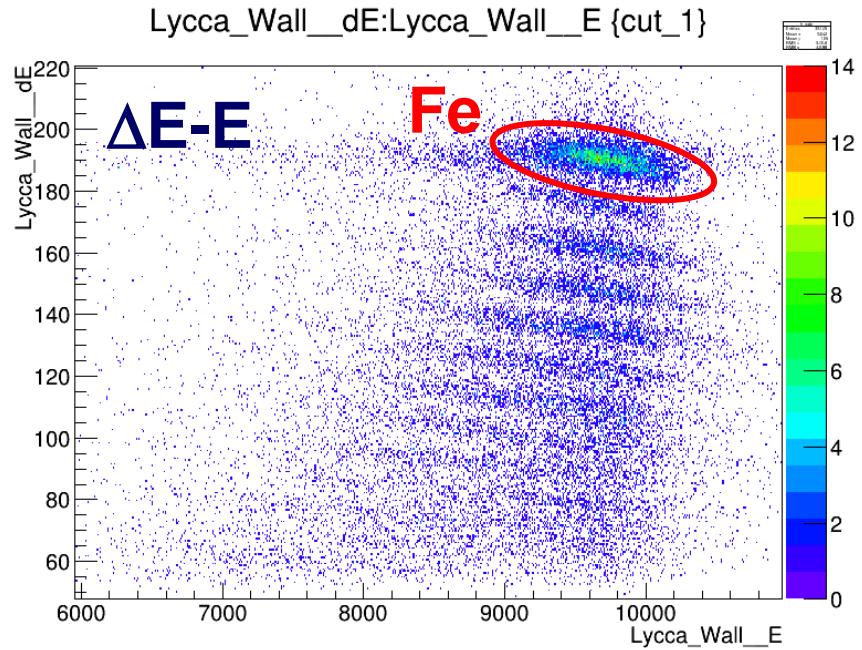


**ToF Start Position**

# LYCCA Analysis

Already working the LYCCA position determination and  $\Delta E$ -E identification. Calibration of DSSD and CsI walls with M.Reese technique.

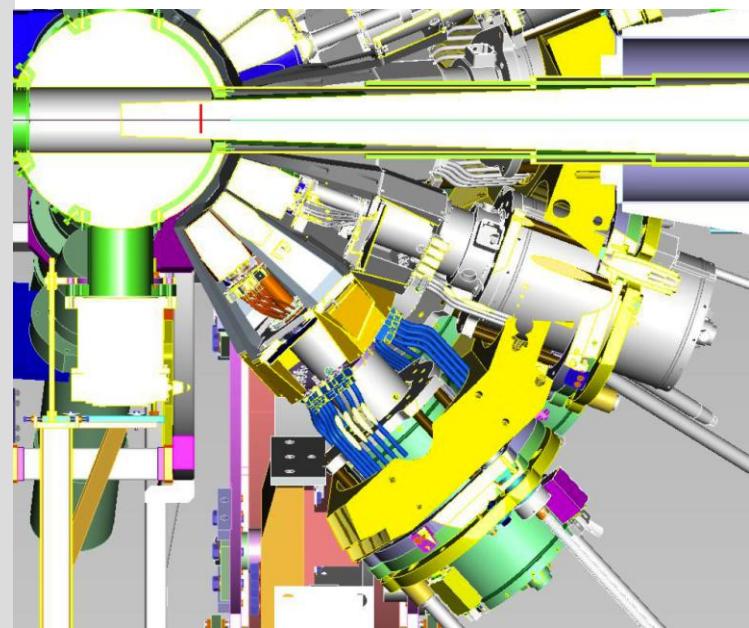
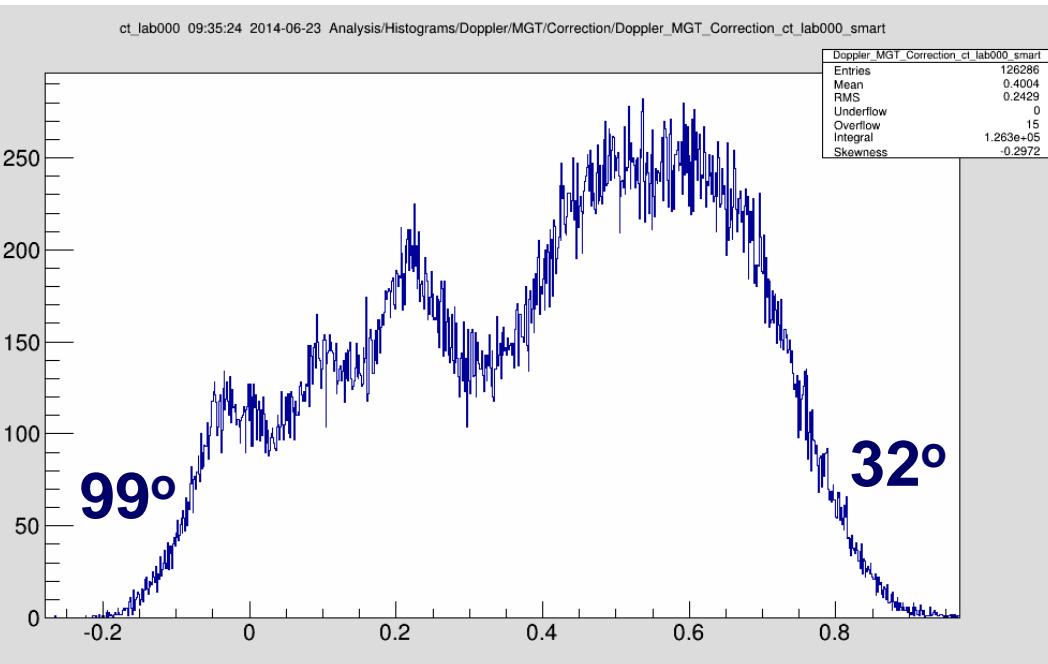
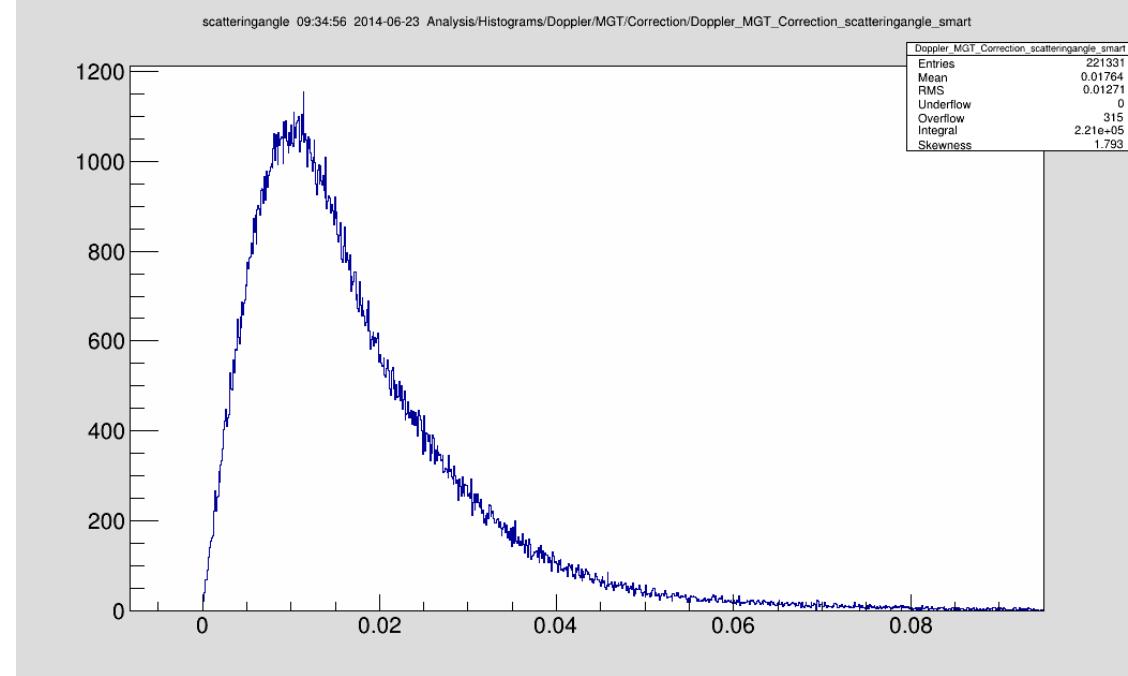
Problems with A &  $\beta$  determination due to ToF calibration



Outgoing Fe ions  
scattering angle



Cos of angle  
between outgoing Fe  
ions and  $\gamma$ -rays  
detected by AGATA



# **Summary:**

- Well advanced the analysis of AGATA. Energy calibration to high energy, PSA and Tracking working on GRID.
- FRS analysis with some problems on the performance of the Finger and TPC's S2 detector.
- PRESPEC-LYCCA analysis mostly completed.
- ToF Target-Stop not ok due to calibration issues.
- Ready to perform sorting with Doppler corrections as soon as we have an acceptable  $\beta$  determination

## **To be done:**

- Identify the issue with the ToF calibration.
- Further check of FRS early detectors performance.
- Include pair production in tracking software.

# **Collaboration:**

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*and the PRESPEC, AGATA, FRS and LYCCA collaborations*