# Commissioning experiments of the AGATA Demonstrator at LNL.

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# The Commissioning runs - 2009

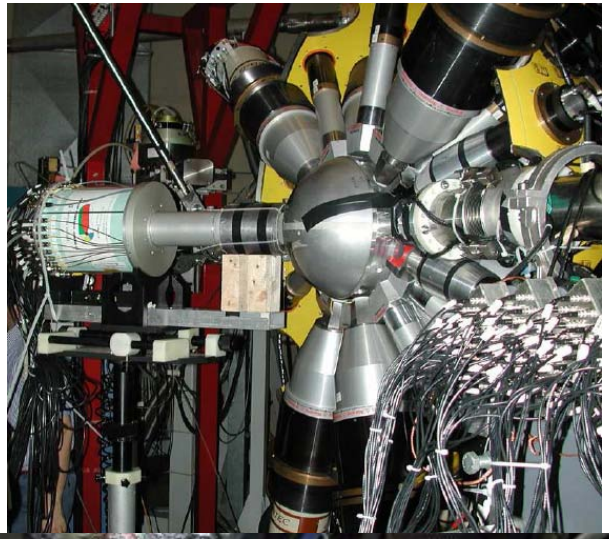
- Week 12: $^{30}Si@70MeV+^{12}C$
  - Fusion - Evaporation
- Week 27: $^{56}Fe@220MeV+^{197}Au$
  - Coulomb excitation (DANTE)
- Week 43: $^{32}S@130MeV+^{110}Pd$
  - Fusion – Evaporation (AGAVA)
- Weeks 46 and 49: $^{58}Ni+^{96}Zr$
  - multi-nucleon transfer (PRISMA)

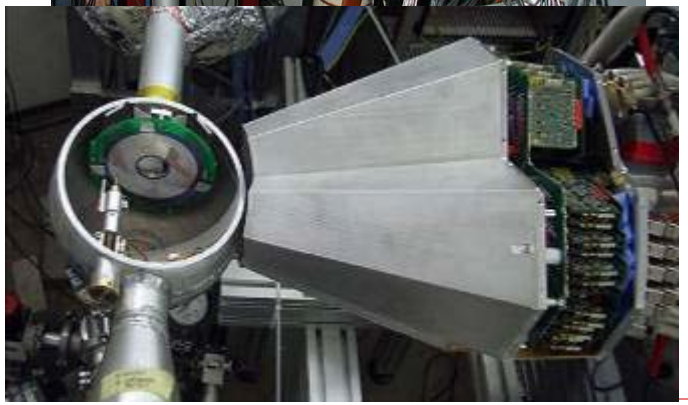
# Week 12 (I): First In-beam test at LNL

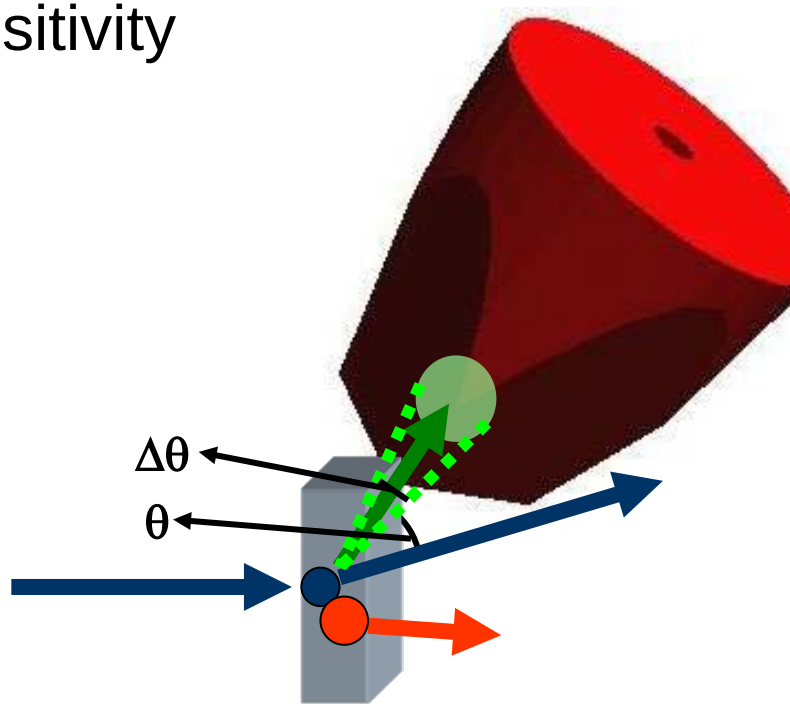
- During week 12 (March 16-22) the full system was tested with an in-beam test using the $^{30}Si(70MeV)+^{12}C$ reaction
- The system included:
  - PSA and tracking performed in real time (online)
  - Trigger-less mode
- GOALS
  - To test the detector in real experiment conditions
  - DAQ
    - Pre-processing electronics
    - On-line analysis
  - Acquire useful data for off-line optimization of the system

# Week 12 (I): The idea

"Standard" experiment: Doppler correction capabilities exploited to measure the position sensitivity

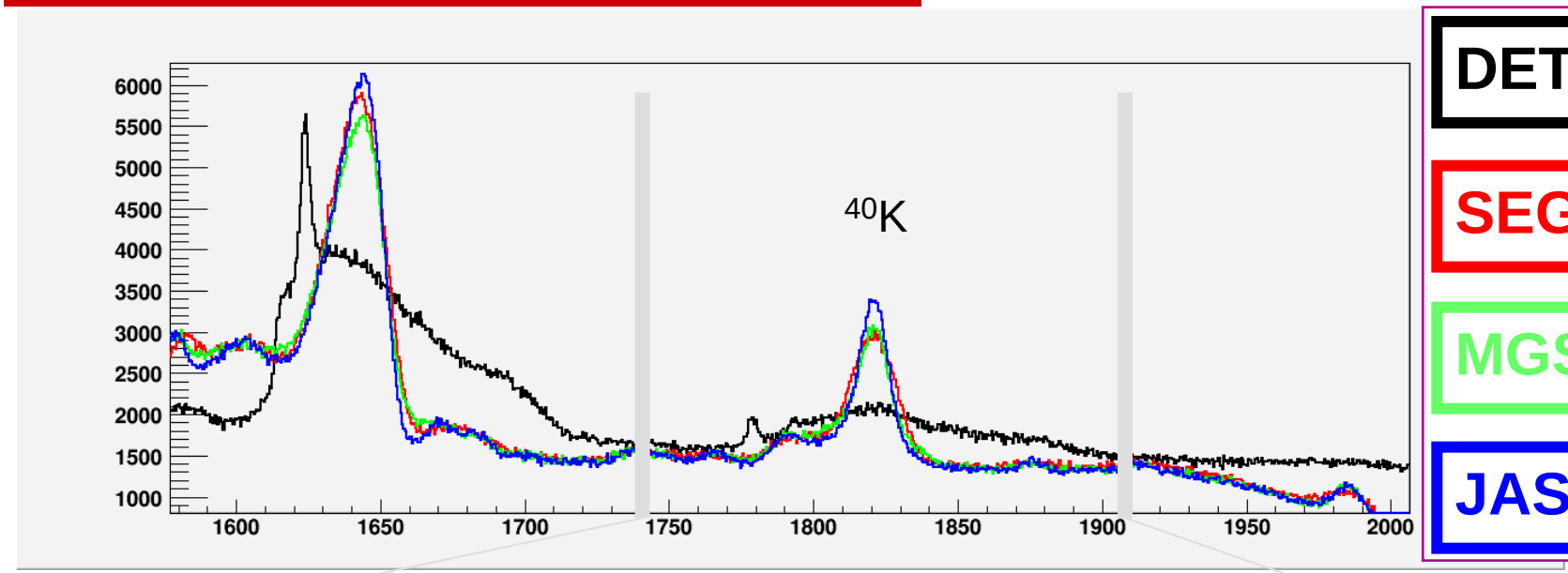


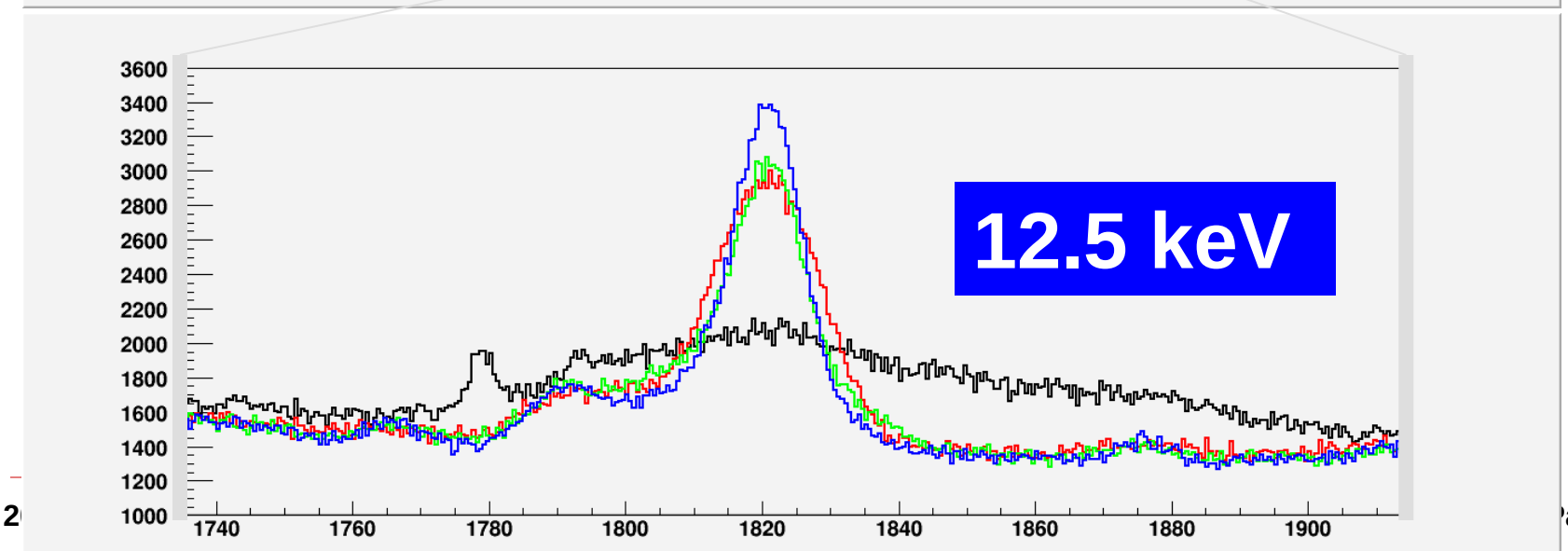




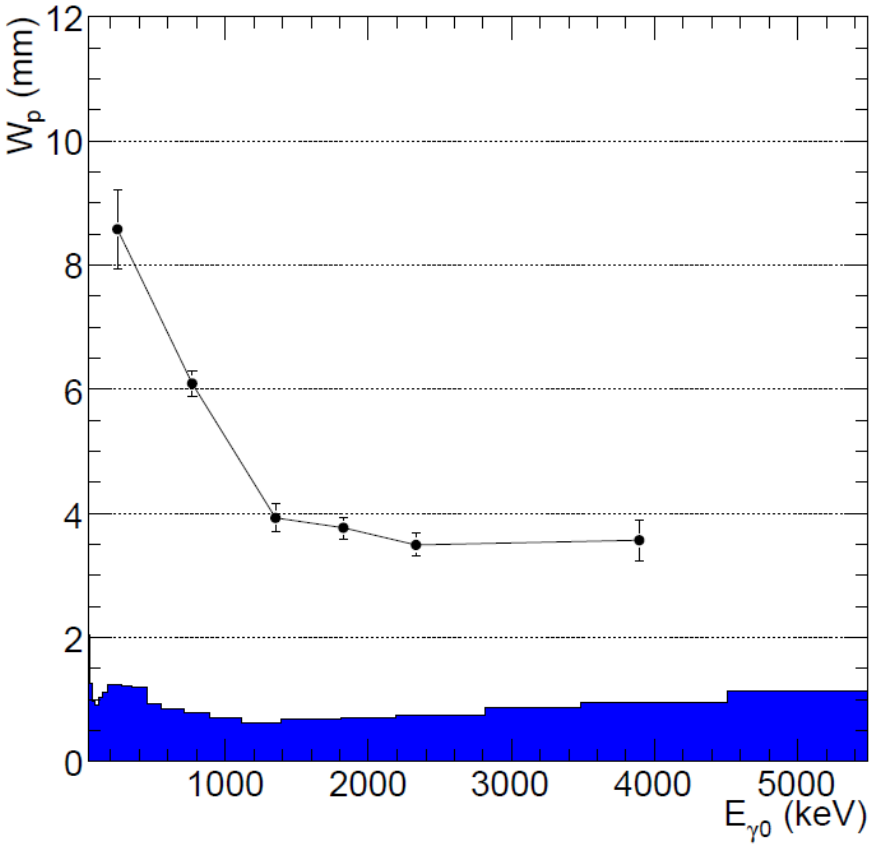

- No ancillaries have been used
- Measurement performed at 2 target-detector distances

# Week 12 (I): Preliminary Results

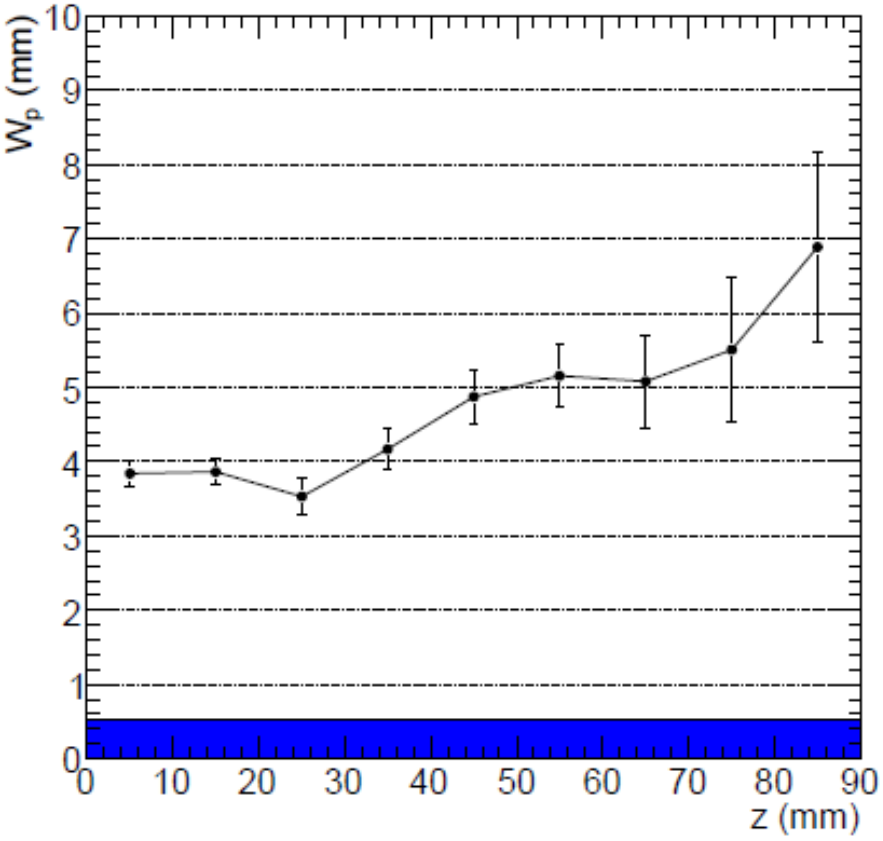


# Week 12 (I): Results




P.-A. Söderström, NIM A630, 96, 2011

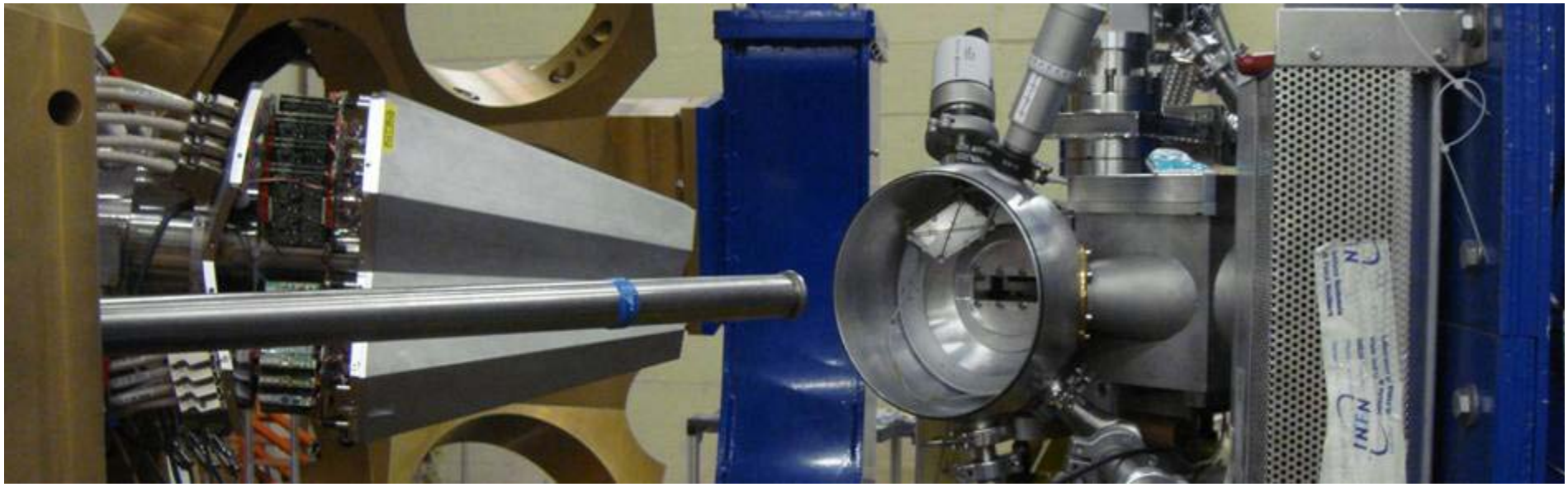


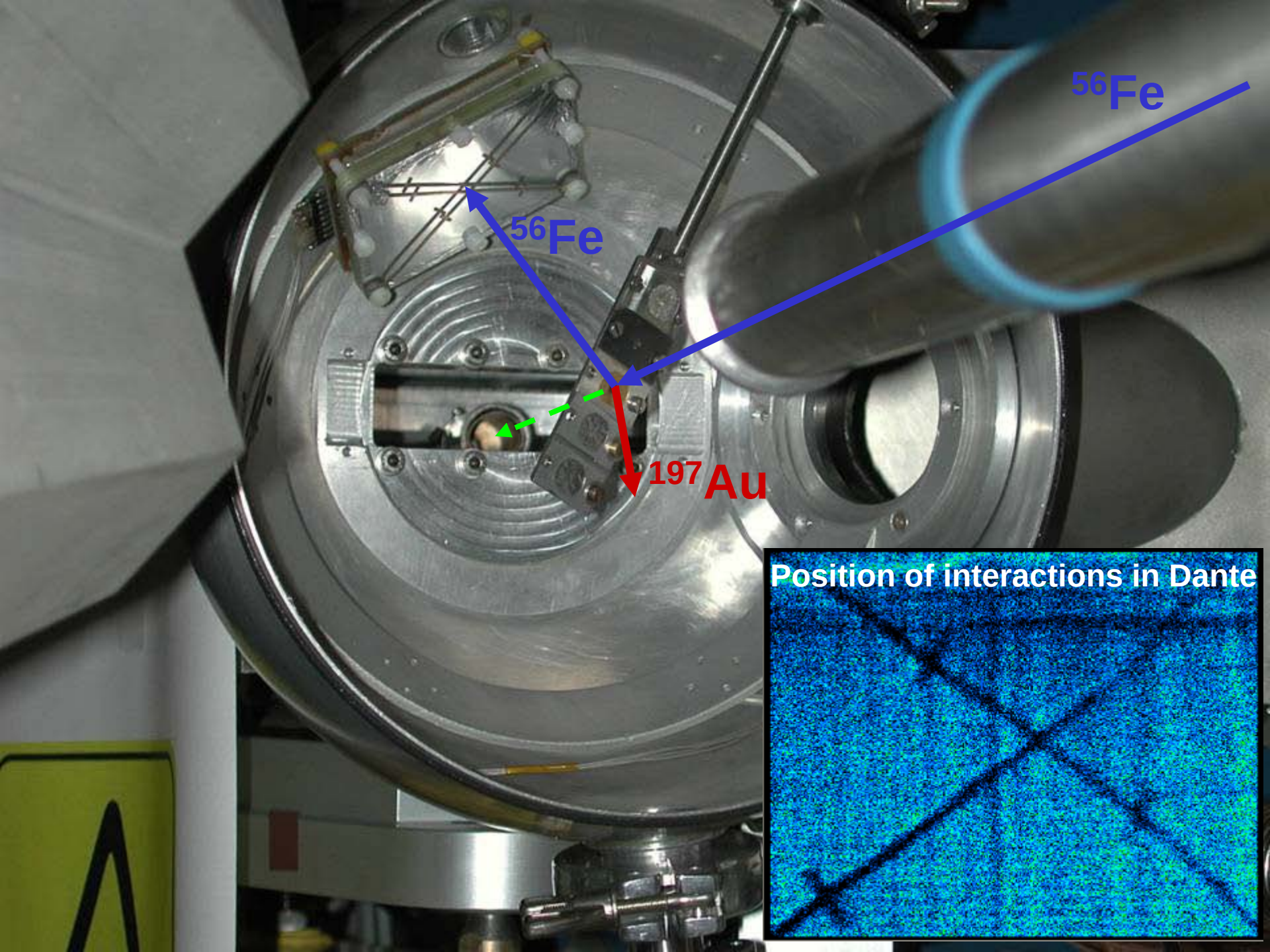

P.-A. Söderström, NIM A630, 96, 2011

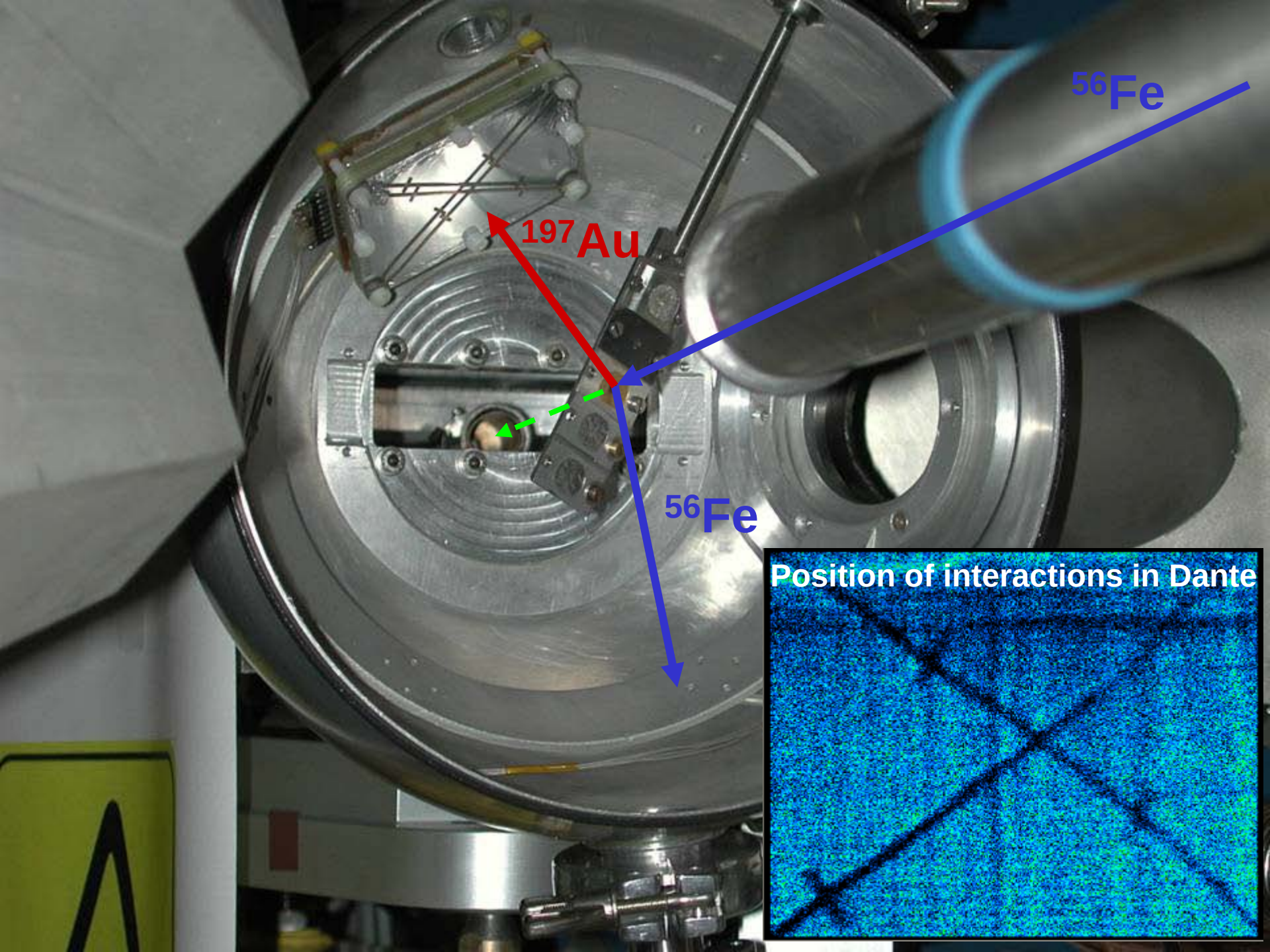
P.-A. Soderstrom – PhD thesis - Uppsala University

# Week 27 (II): The in-beam test

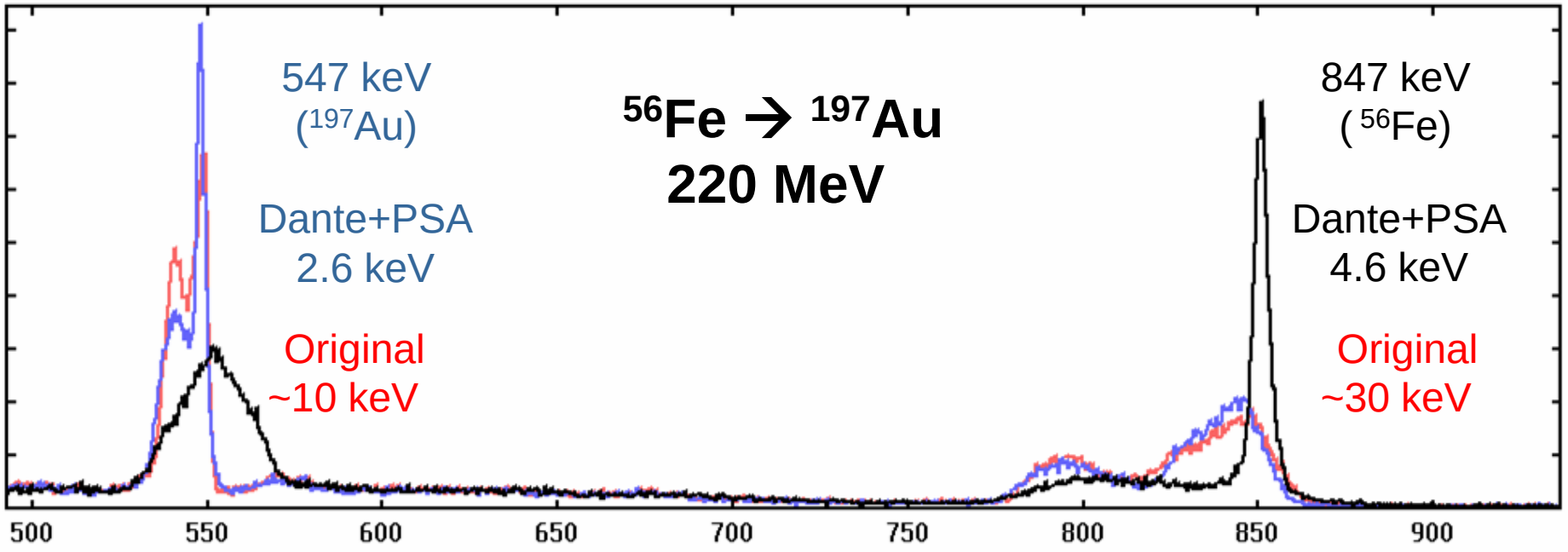
- COULEX reaction
- $^{56}$Fe(220 MeV) → $^{197}$Au target
- recoil detected using DANTE
- no AGAVA available -> DANTE digitized




$^{56}$Fe
$^{56}$Fe
$^{197}$Au
Position of interactions in Dante


$^{56}$Fe
$^{197}$Au
$^{56}$Fe
Position of interactions in Dante

# Week 27 (II): Results

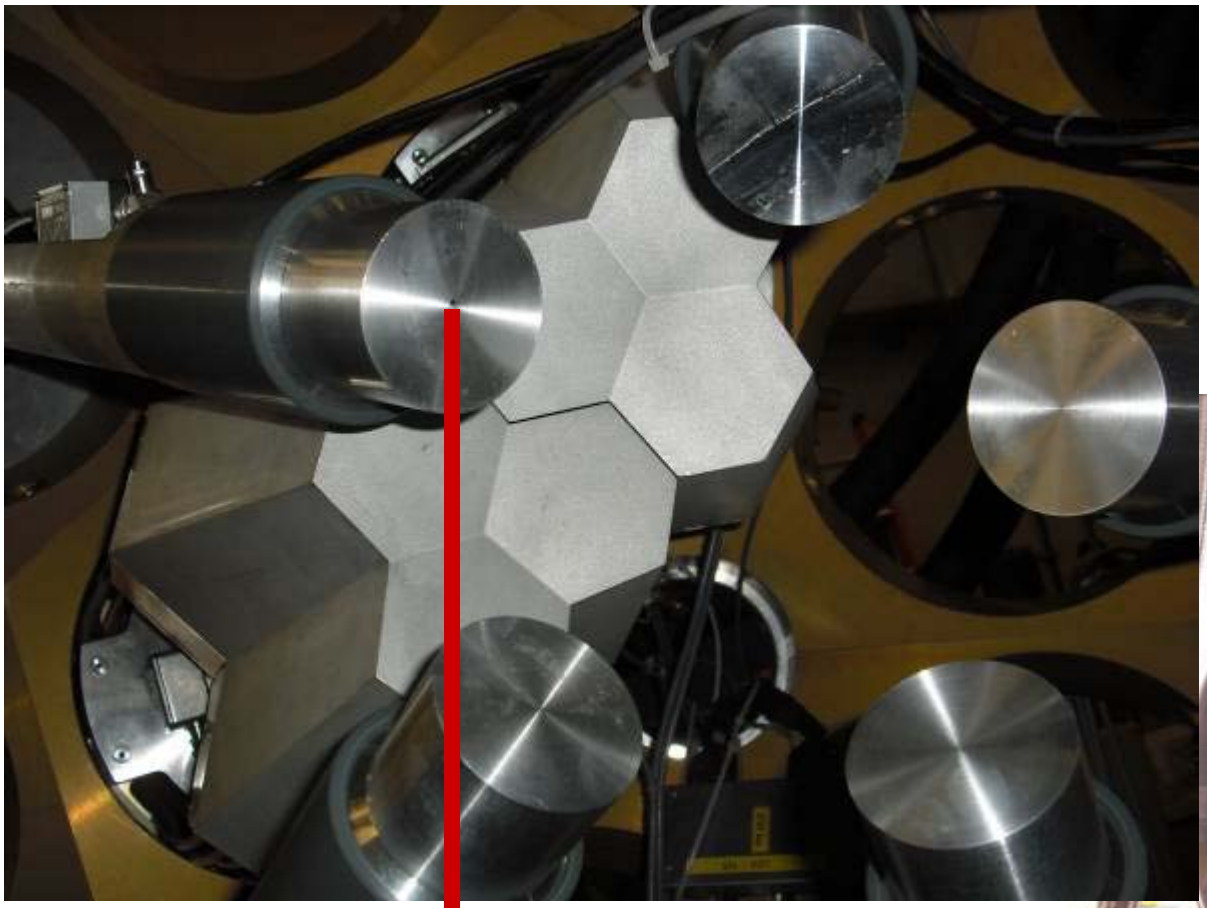



- 10 keV → 7 keV → 4 keV
- Signal basis and electronic response
  - Pre-amp risetime
  - Differential crosstalk

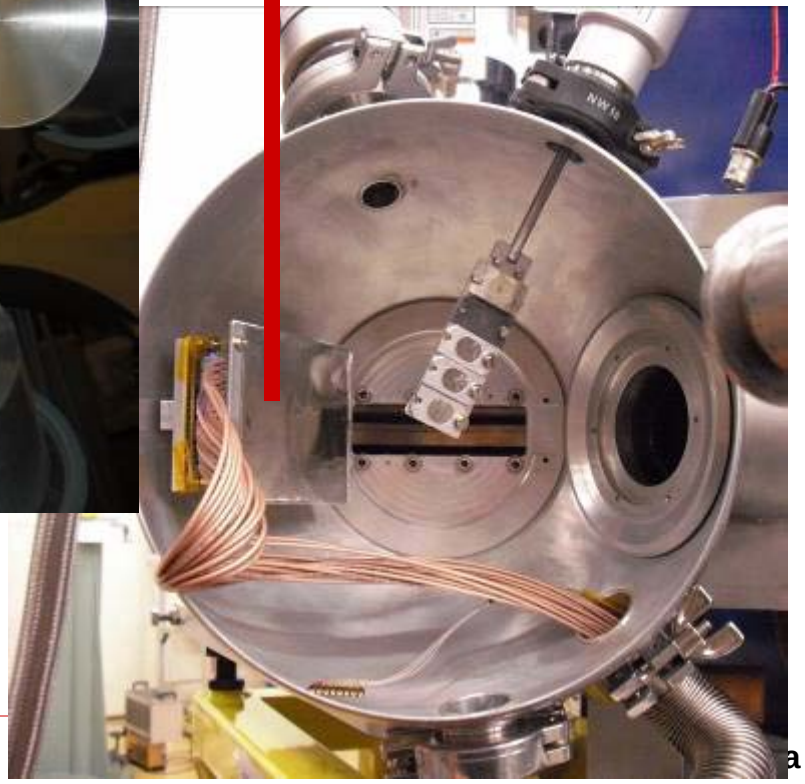
# Week 43 (III): The in-beam test

- $^{32}S + ^{110}Pd$ @ 135 MeV
- Data: Singles, Doubles, Triples
- Thin target (500 µg/cm$^2$)
- Thick Target (670 µg/cm$^2$ + 8 mg Au)
- Fusion Evaporation with CN $^{142}Sm$
  - $^{138}Sm$ (4n)
  - $^{138}Pm$ (p,3n)

# Week 43 (III): The setup

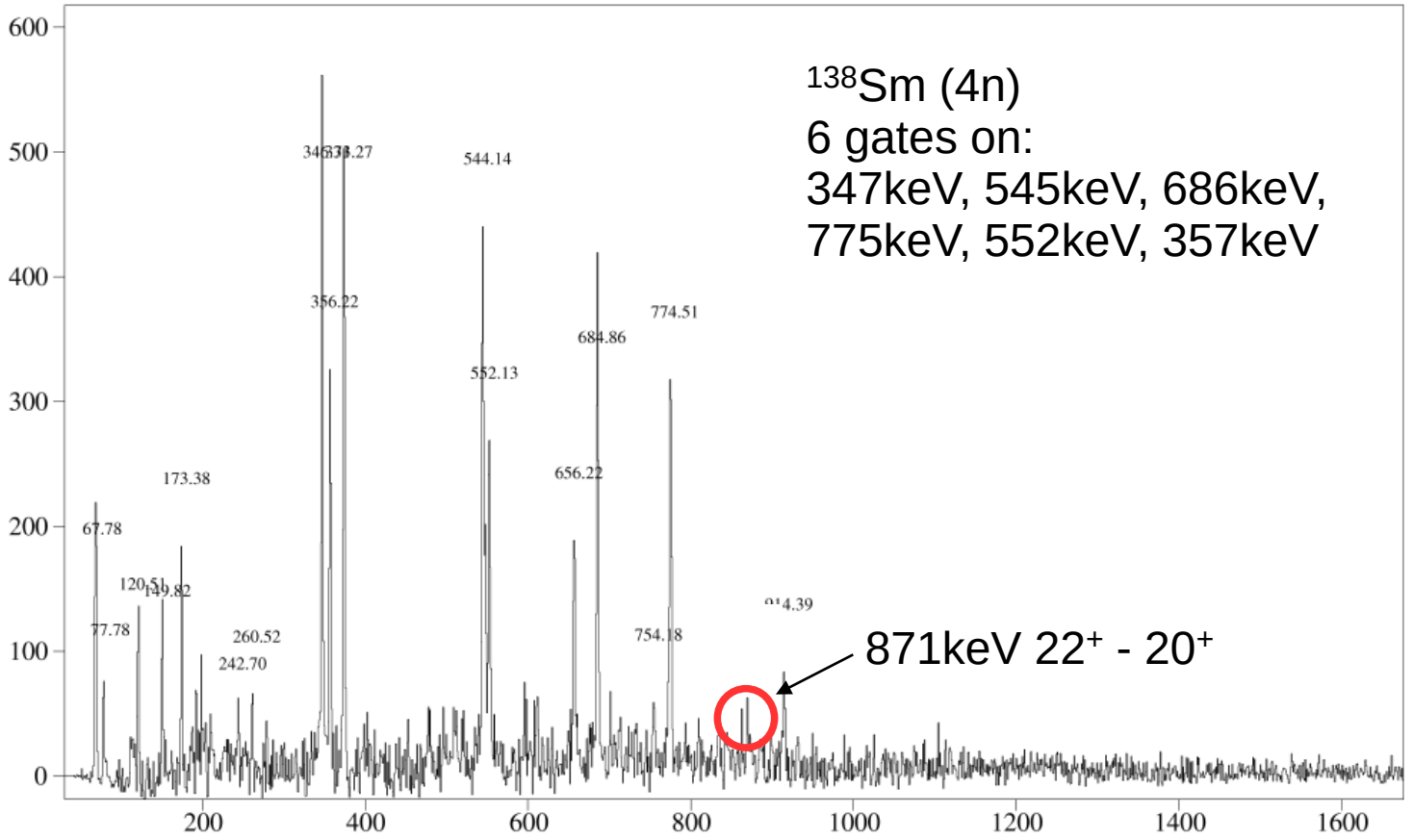


Si detector



LaBr scintillator

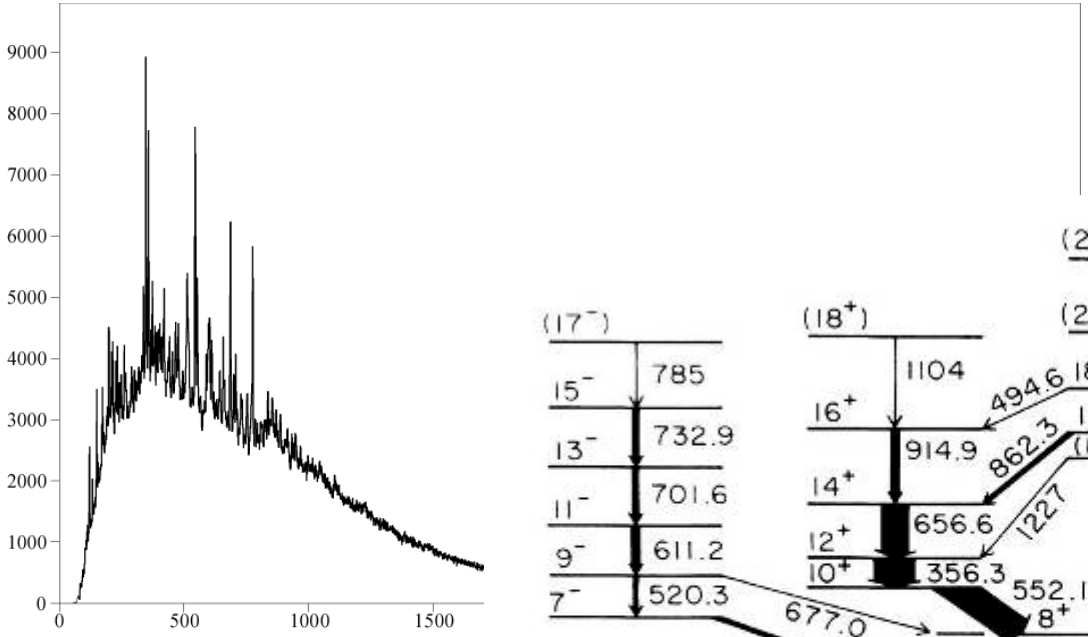
# Week 43 (III): Results




$^{138}$Sm (4n)
6 gates on:
347keV, 545keV, 686keV,
775keV, 552keV, 357keV

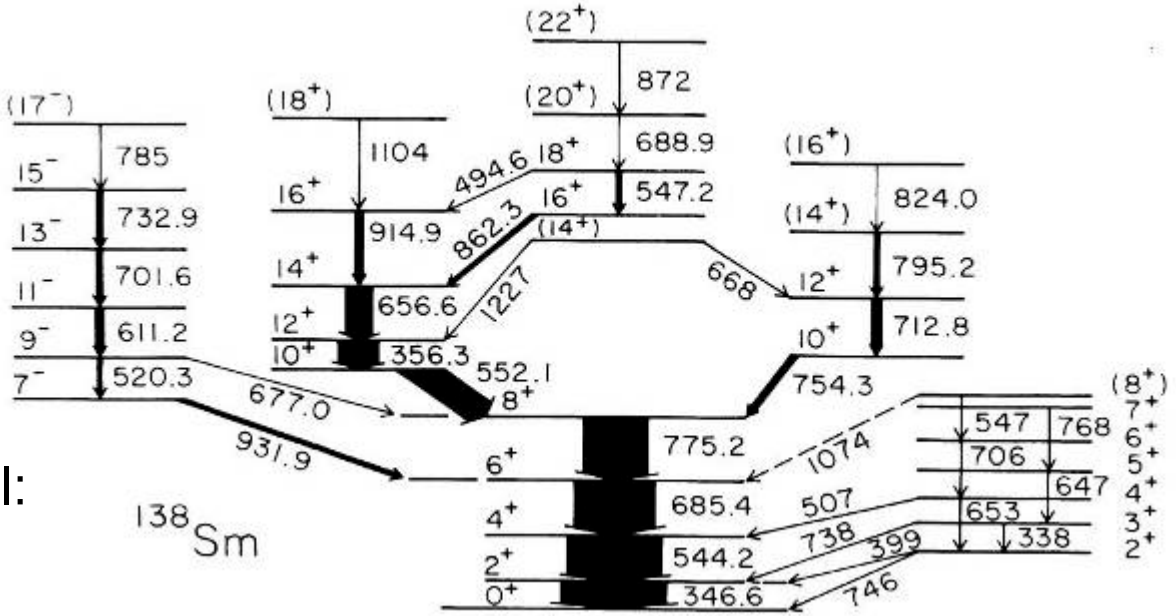
Most intense channel: $^{138}$Sm

# Week 43 (III): High multiplicity events



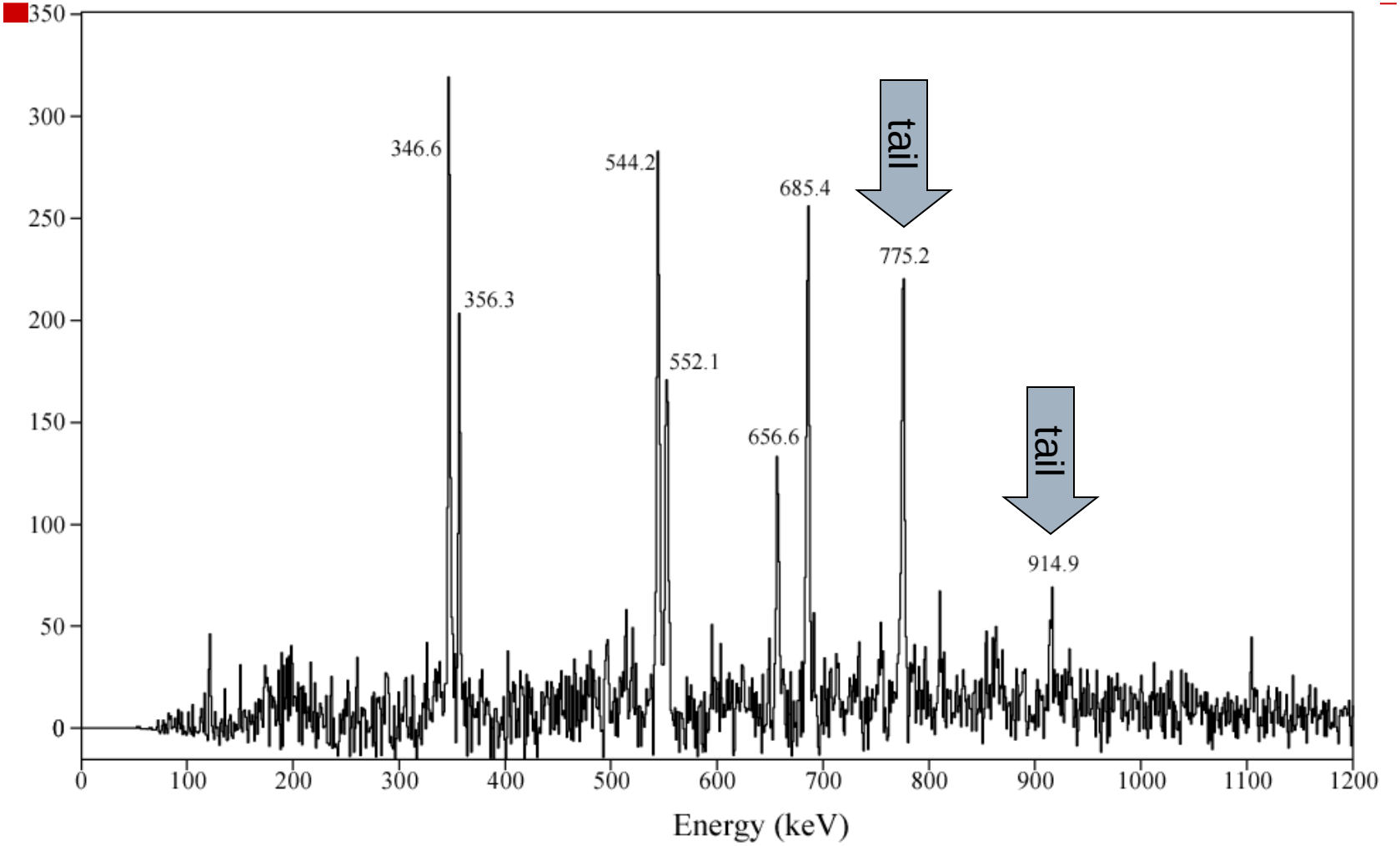

Projection of $\gamma\gamma$ matrix

Most intense channel:
$^{138}$Sm



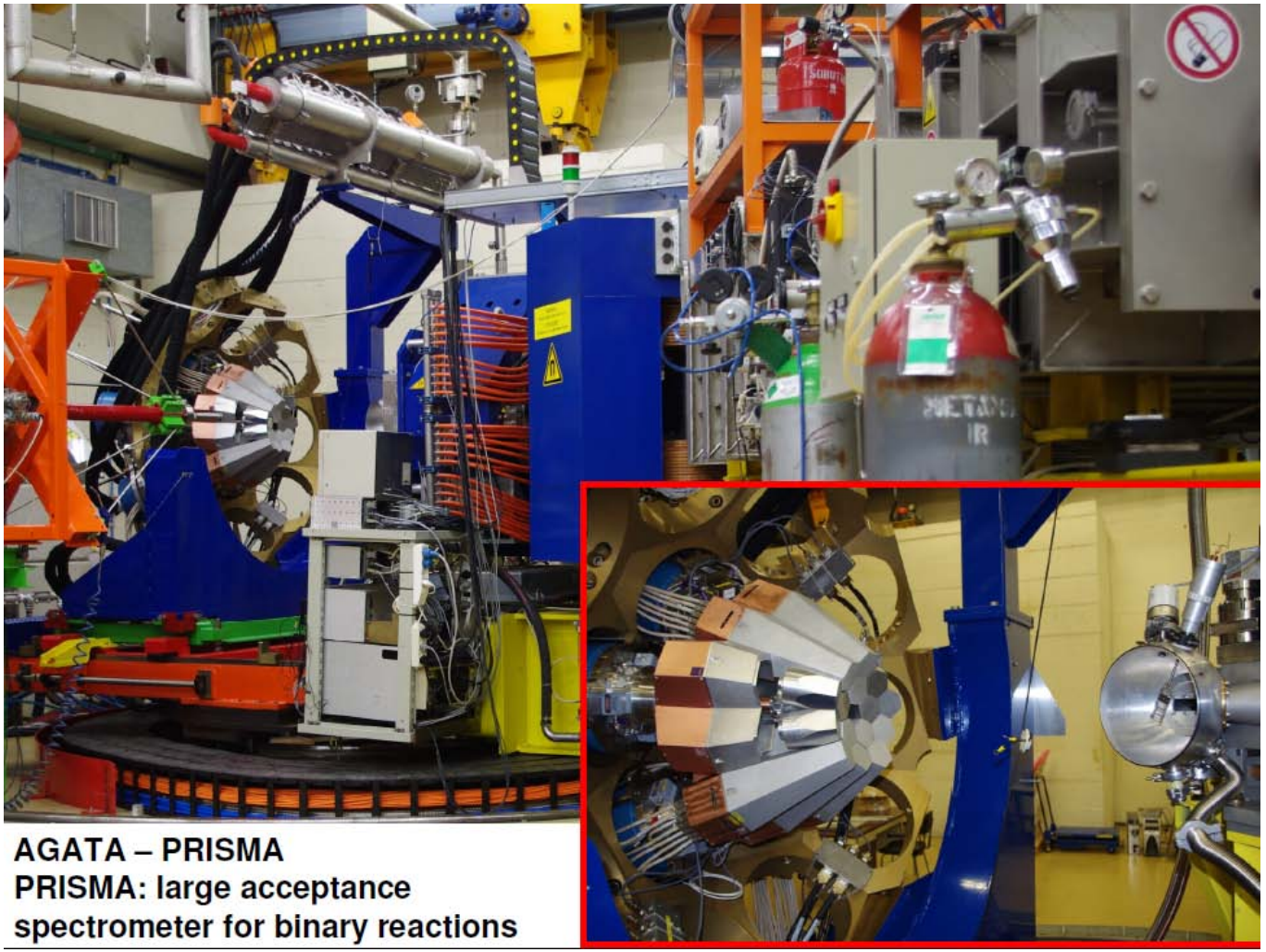

With only 2 ATC (6 HPGe crystals) and γ-ray tracking, high-spin states in $^{138}$Sm are clearly visible. The performance is actually comparable to conventional arrays with a much larger number of crystals

# Week 43 (III): High multiplicity events



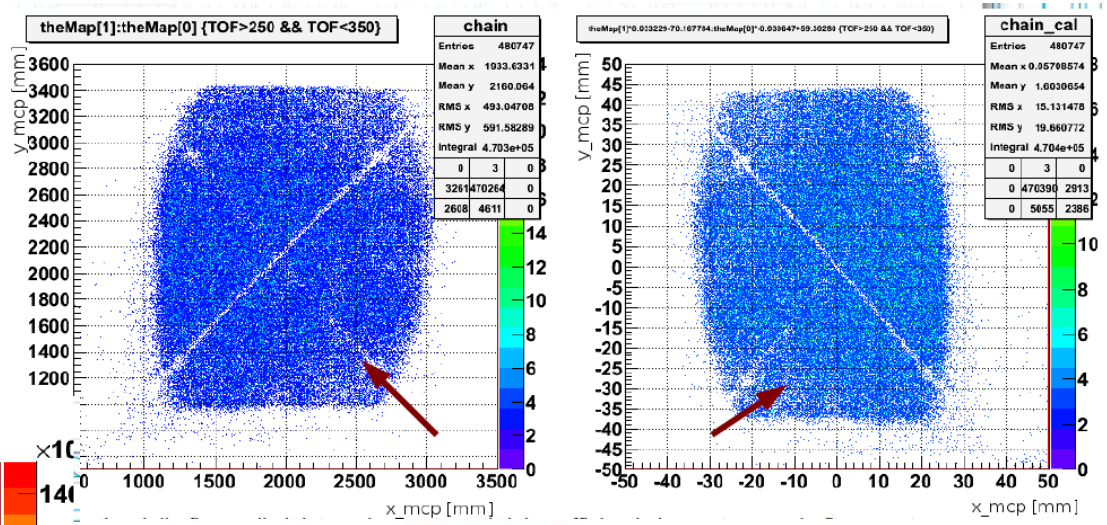

Ryan Kempley – PhD thesis – University of Surrey

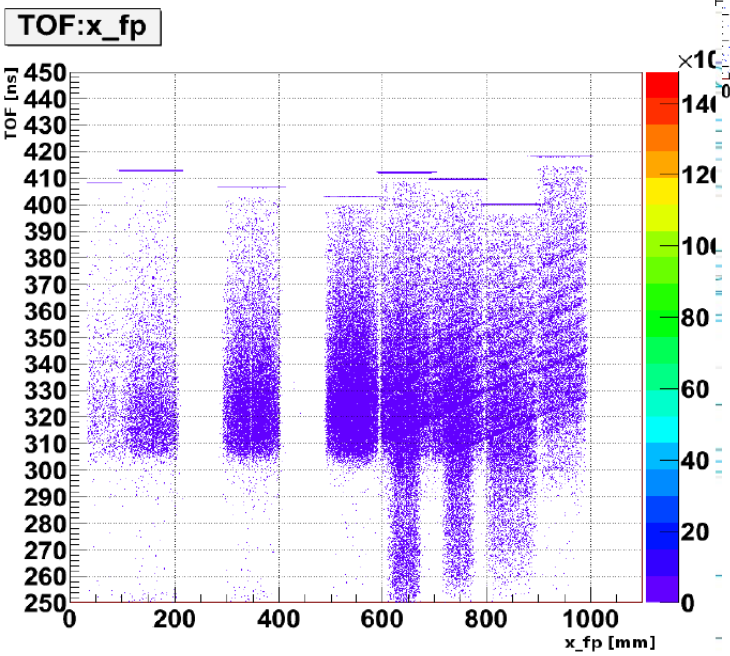
# Weeks 46 and 49: $^{58}$Ni@$^{96}$Zr multinucleon transfer, AGATA+PRISMA

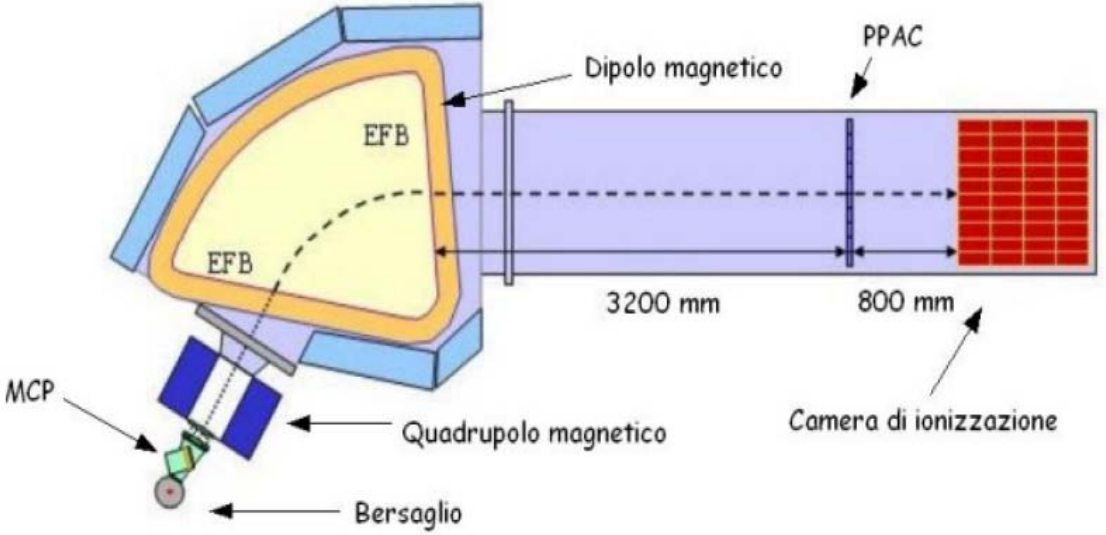


AGATA – PRISMA
PRISMA: large acceptance spectrometer for binary reactions

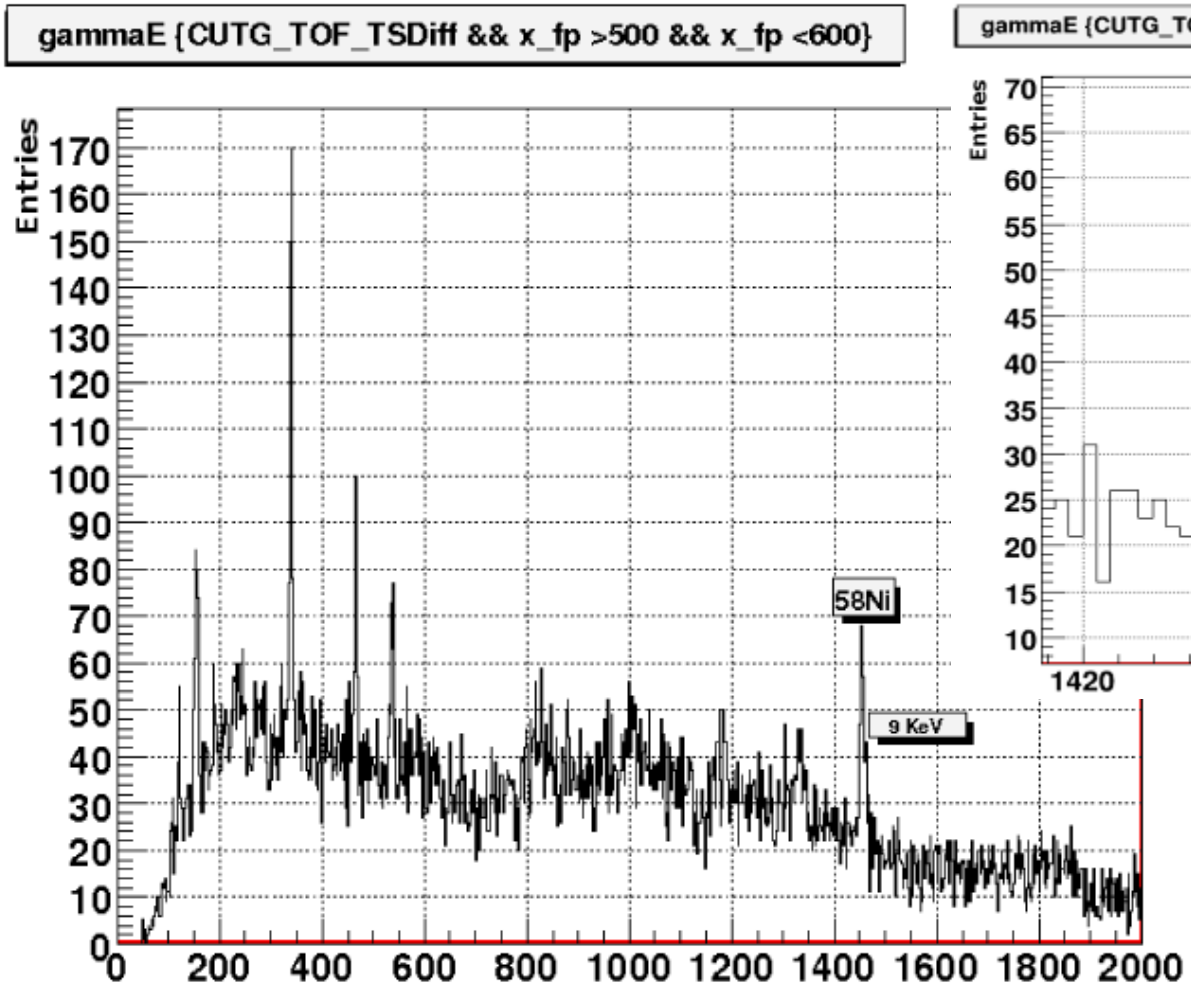
# Weeks 46 and 49: PRISMA analysis

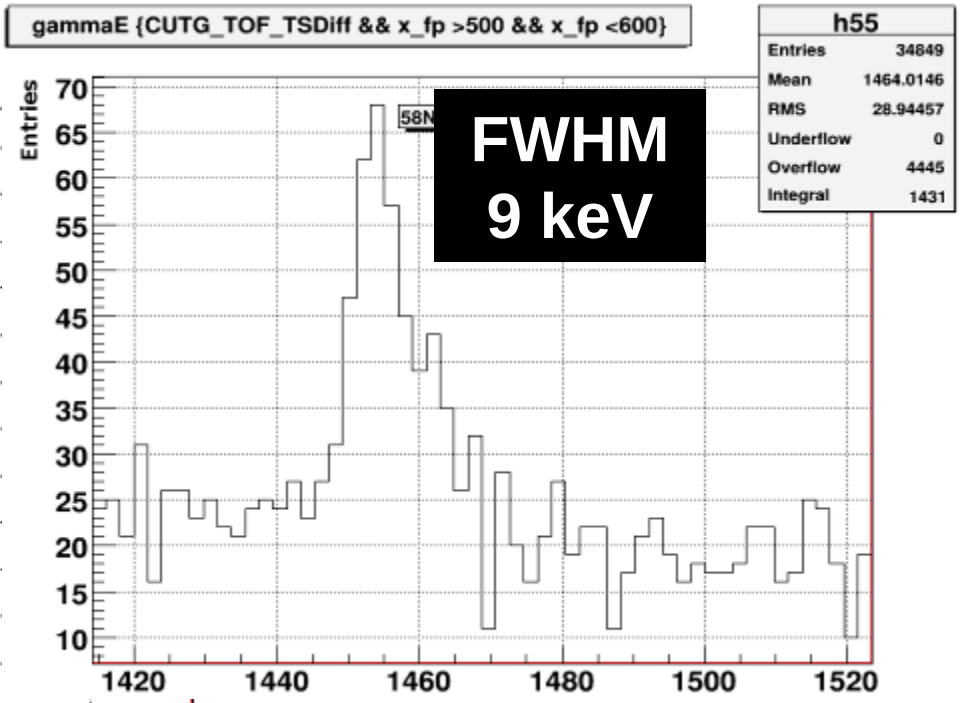


# Weeks 46 and 49: $^{58}$Ni+$^{96}$Zr multinucleon transfer, AGATA+PRISMA



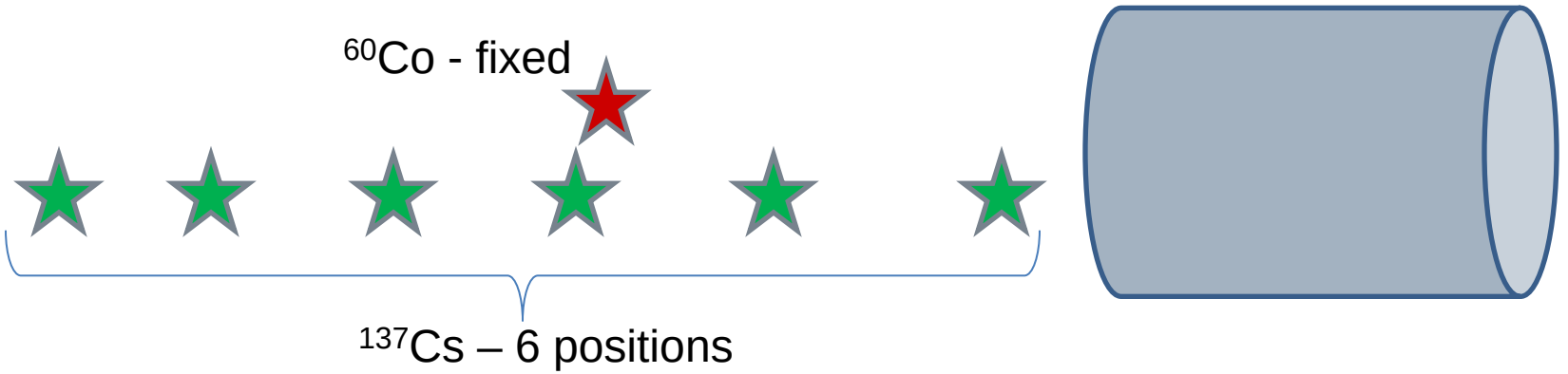




Leonardo Pigatto, Daniele Mengoni – Università di Padova

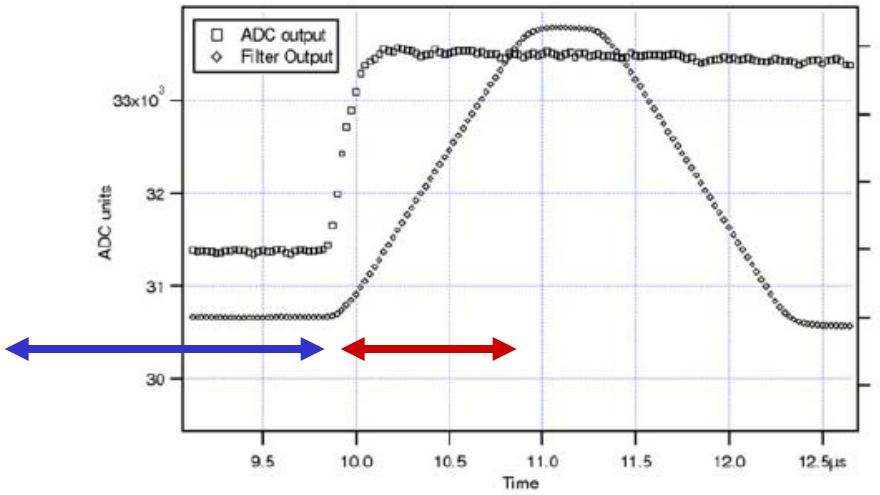
# Conclusions

- Week 12: AGATA only
  - Solved issues with software and detector positioning
  - Energy dependence of position resolution
- Week 27: AGATA+DANTE
  - Optimisation of the signal basis
- Week 43: AGATA+Si+LaBr
  - First in-beam test with AGAVA
  - High-multiplicity events ++
- Weeks 46 and 49: AGATA+PRISMA
  - Optimisation of the software and DAQ setup for Physics campaign

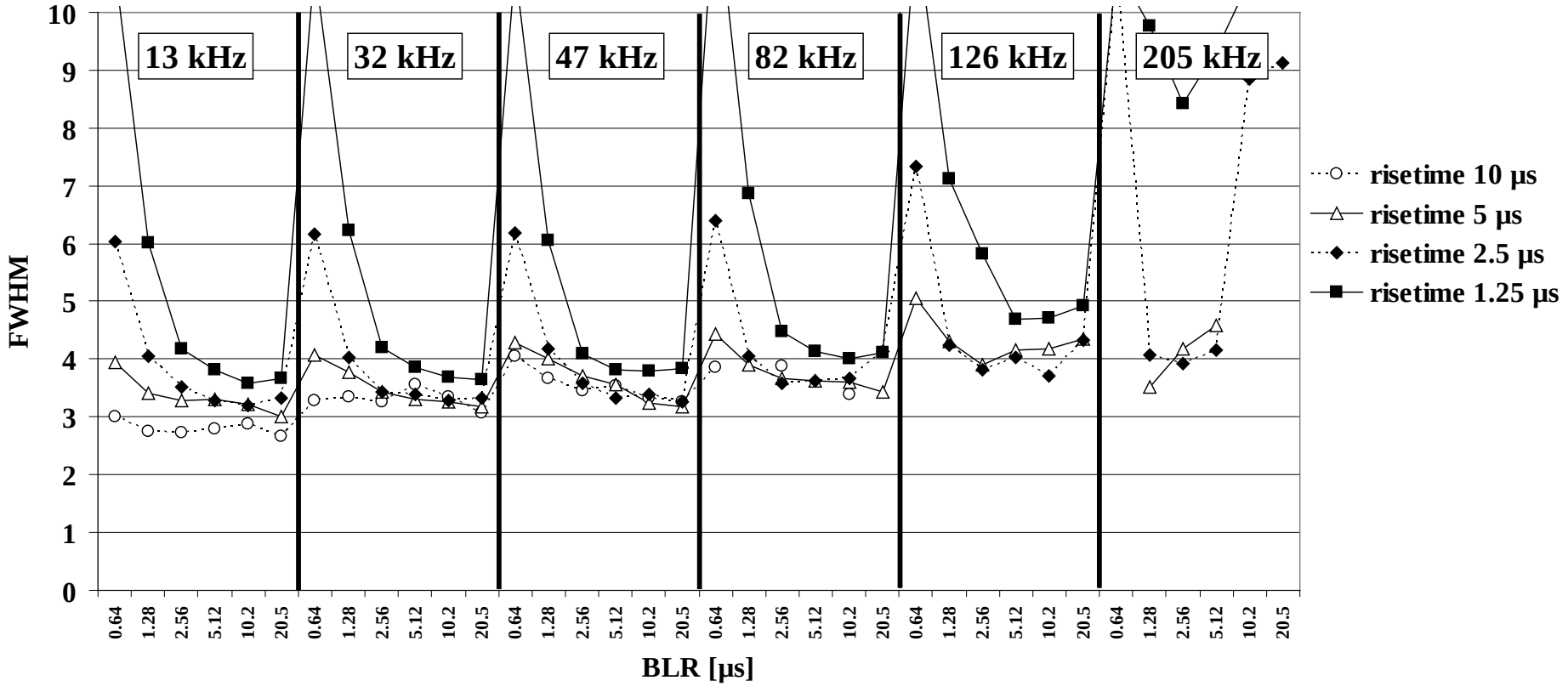
# Measurement setup




6 different rates x 4 trapezoid risetime x 6 blr length

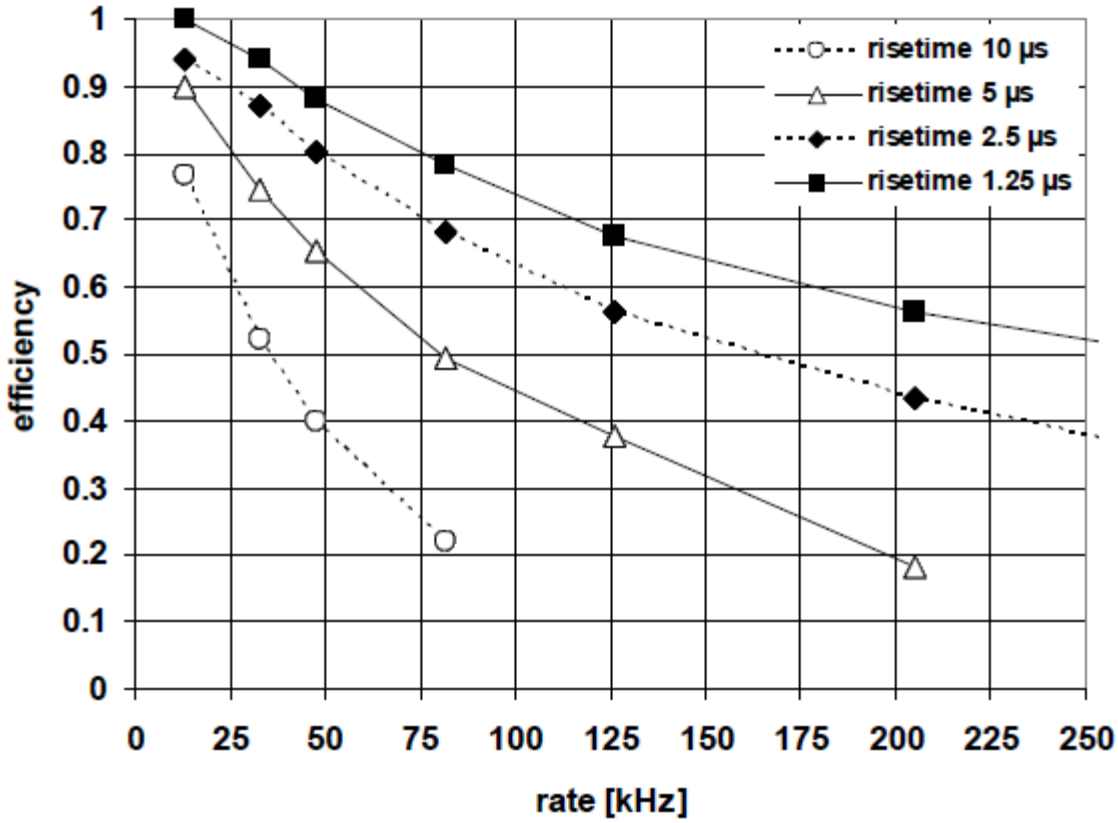


# Resolution of CC vs rate



# Thank you!

# Relative efficiency vs Rate




- Dead-time from Pile-up rejector and GTS deadtime

# Modelization of deadtime