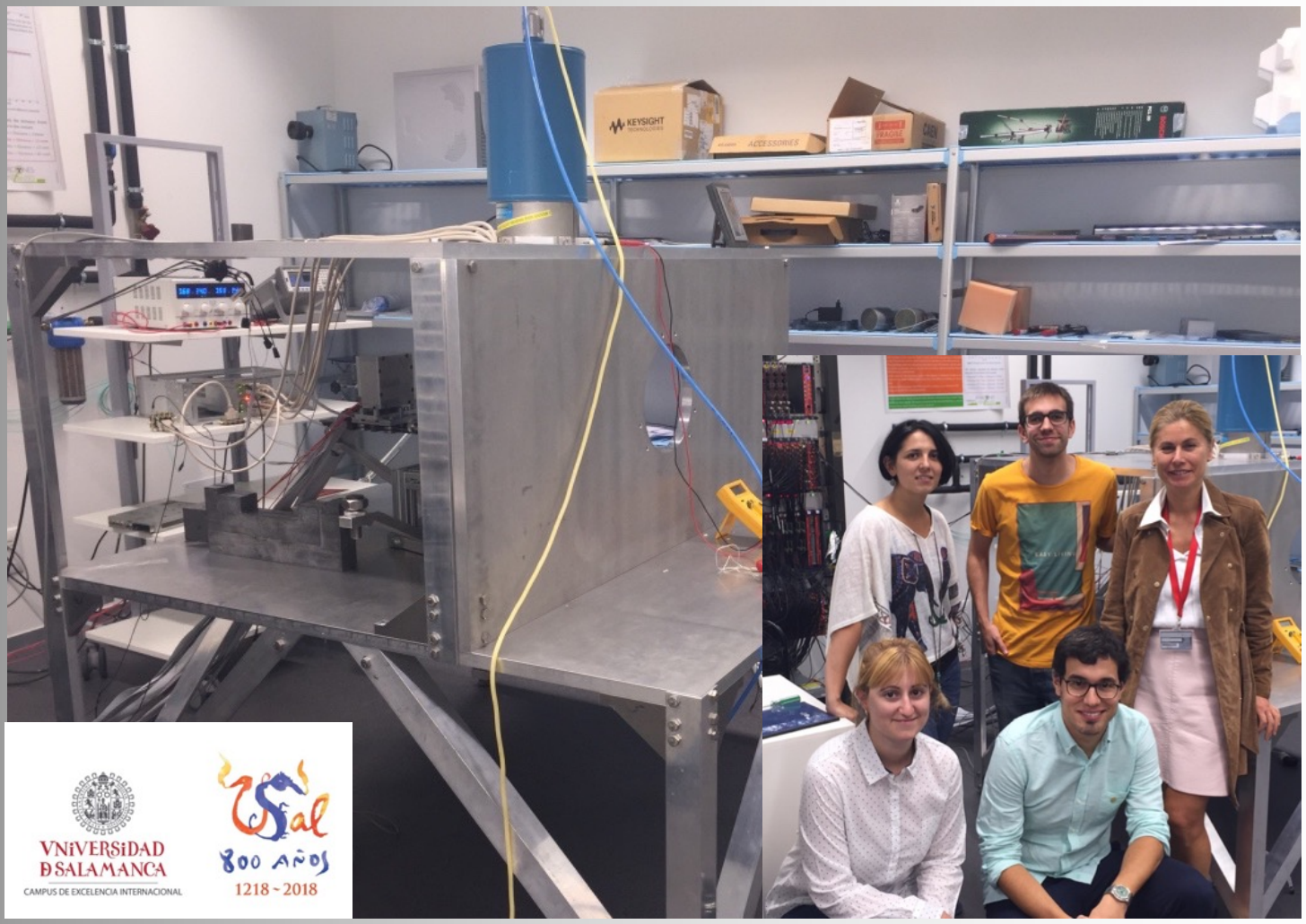
Status and preliminary results of the B014 characterization with SALSA



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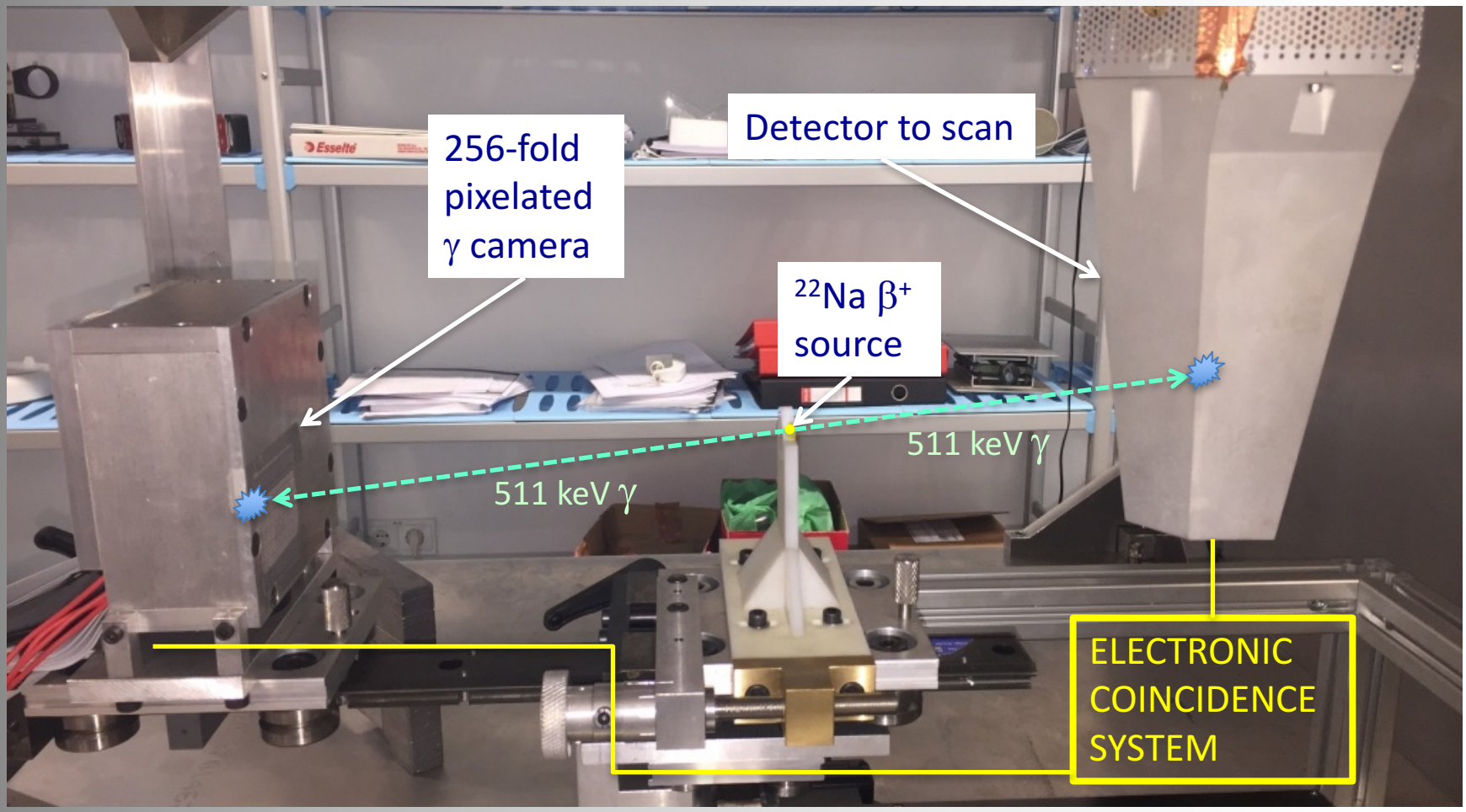
The Salamanca Lyso based Array, SALSA



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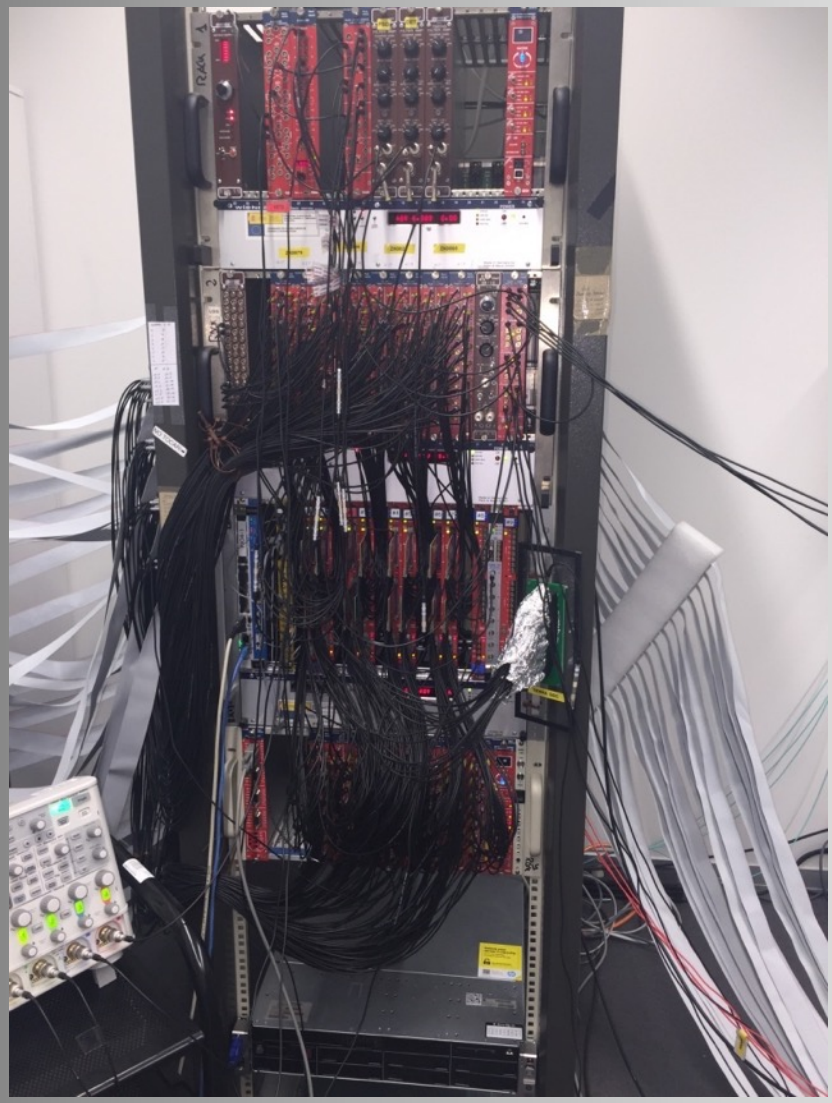
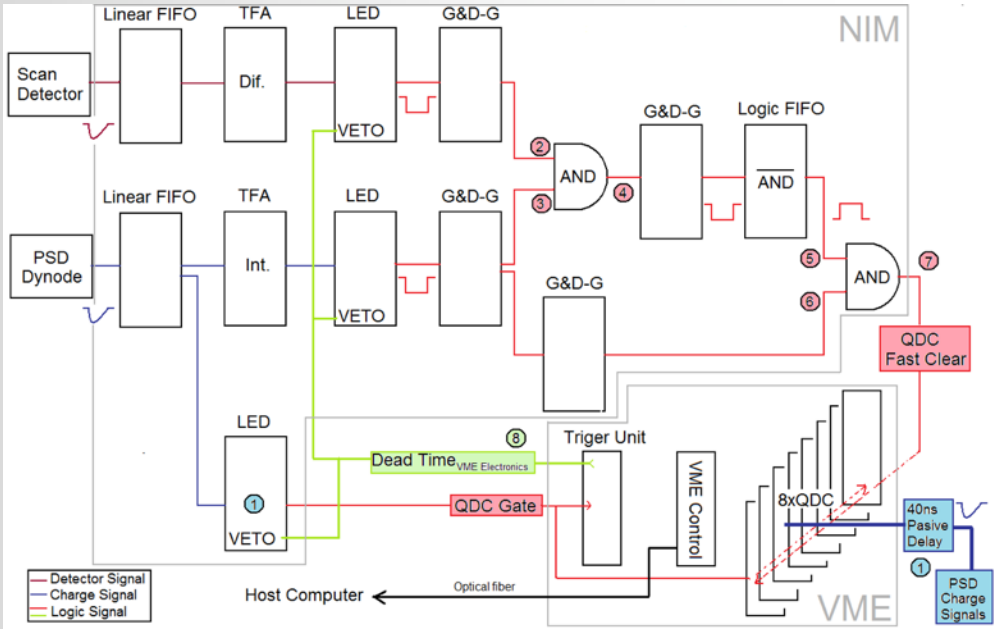
SALSA electronics



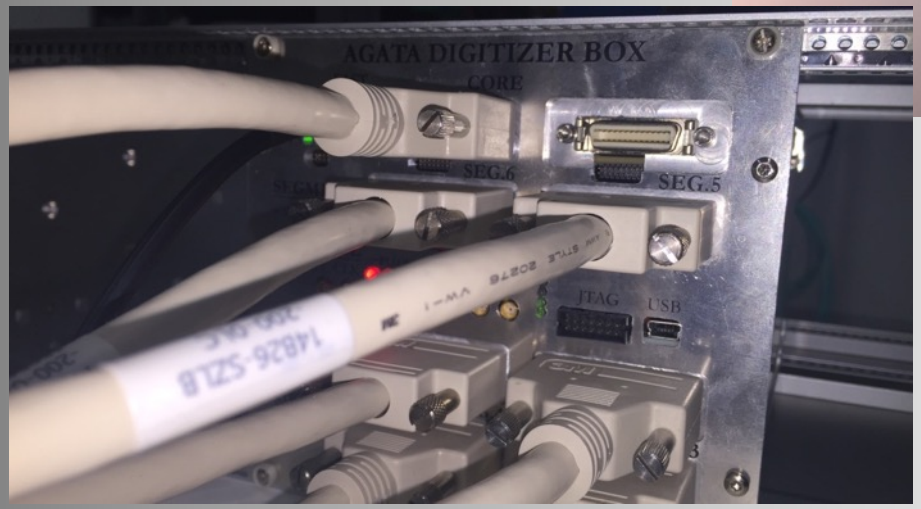
-8 V792 QDCs (CAEN)
-Readout via MBS in a RIO4-8072RE
-Fast N840 LED (CAEN)
-TFA-474 (ORTEC)
Gate an delay generators GG8020 (ORTEC)



AGATA electronics

Second generation AGATA digital electronics:

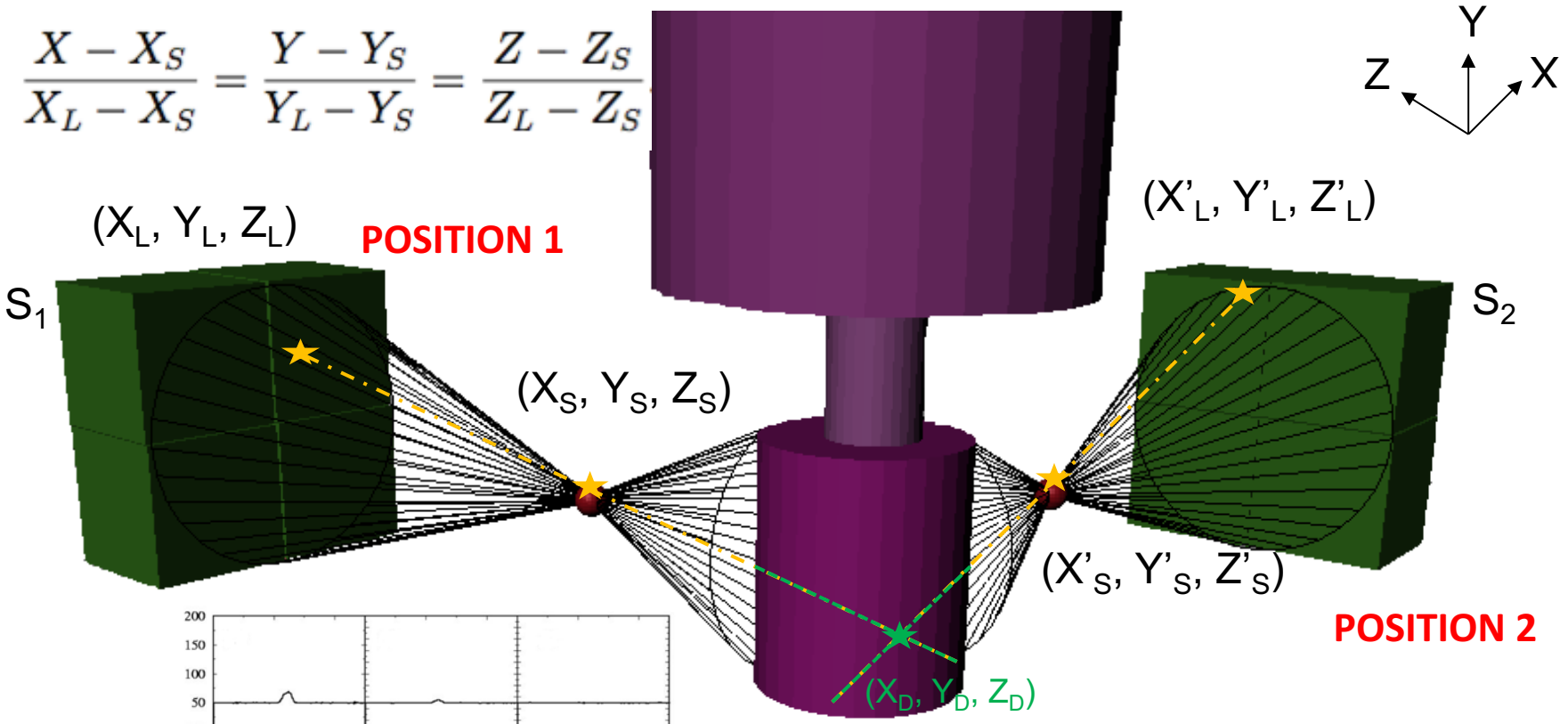
- 4 DIGI OPT12 (ASCOM)
- GGP (bus PCI-Express, Padova) in HP DL360pGen8 server

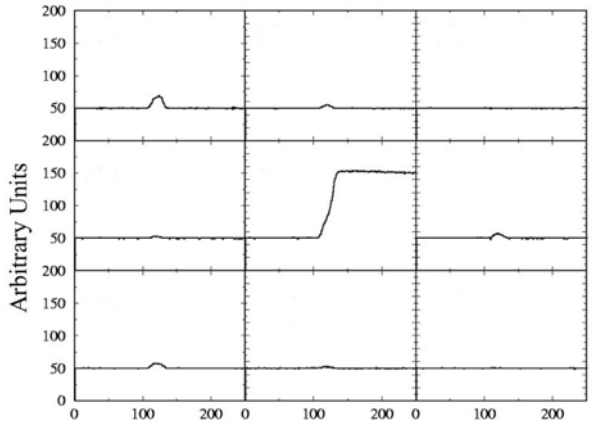


AGATA-SALSA COINCIDENCES DISENTANGLED THROUGH SOFTWARE BY USING A RAMP GENERATOR

SALSA: Two-position scan

$$\frac{X - X_S}{X_L - X_S} = \frac{Y - Y_S}{Y_L - Y_S} = \frac{Z - Z_S}{Z_L - Z_S}$$





$$\frac{(X - X'_S)}{(X'_L - X'_S)} = \frac{(Y - Y'_S)}{(Y'_L - Y'_S)} = \frac{(Z - Z'_S)}{(Z'_L - Z'_S)}$$

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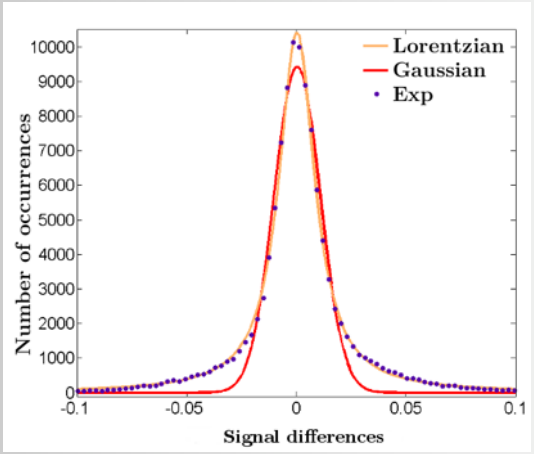
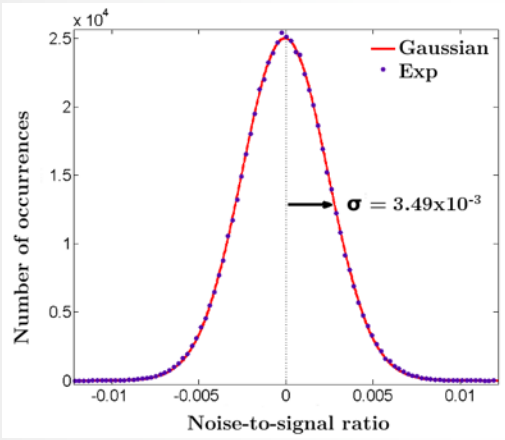
PULSE SHAPE COMPARISON

Development of a new method which takes into account the electronic signal noise: Wilcoxon signed-rank-based technique for the pulse shape analysis of HPGe detectors. S. Martín *et al*. NIMA 823 (2016), 32-40.

1. Requires electronic noise characterization
2. Performs the alignment of the signals to compare based in T10 and T90 signal positions. This step spoils the Gaussian distribution
3. Applies the Wilcoxon test to estimate whether differences are statistically significant or not.
4. Not statistically differing pulses are grouped and used to calculate "superpulses", which are representative of each group





The Wilcoxon-based algorithm is tuned according to the real signal noise. No other constrain applies.

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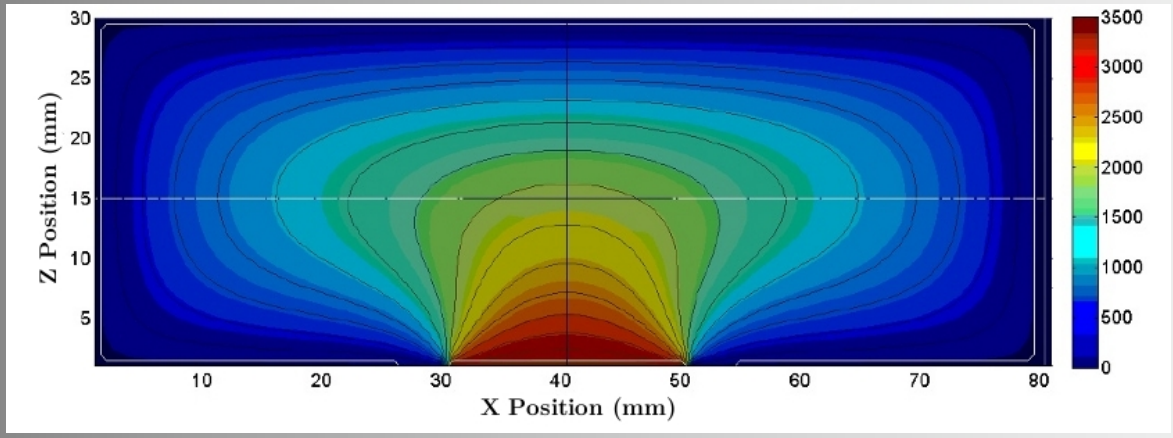
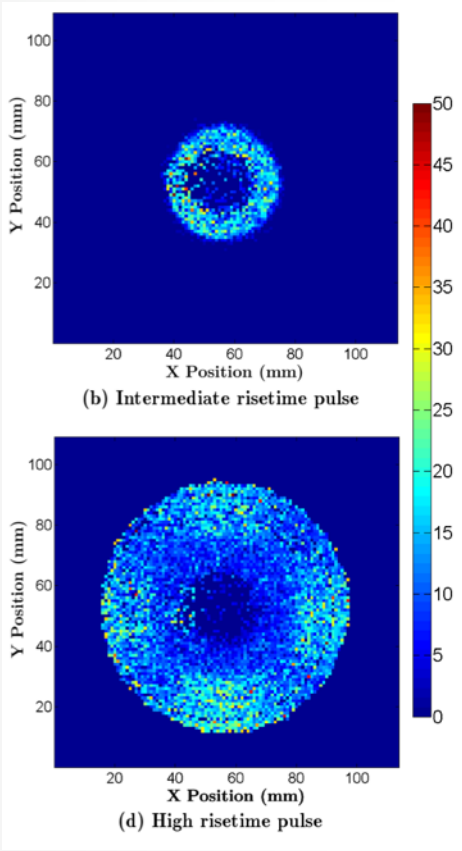
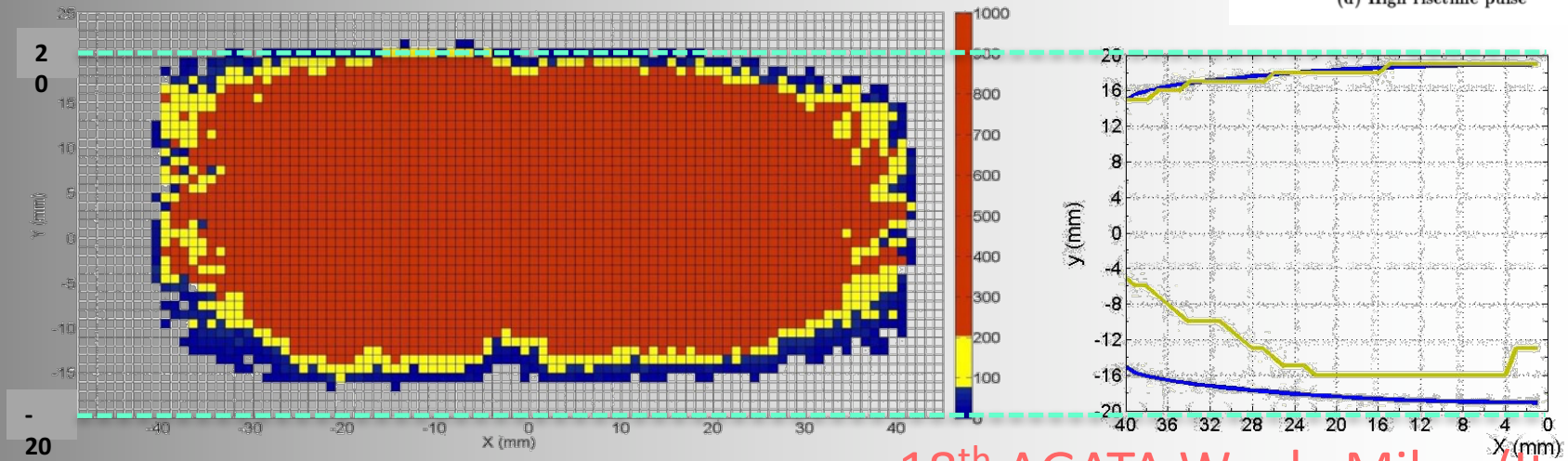
Previous results: characterization of a BEGe detector

Simulated potential mapping using MGS code







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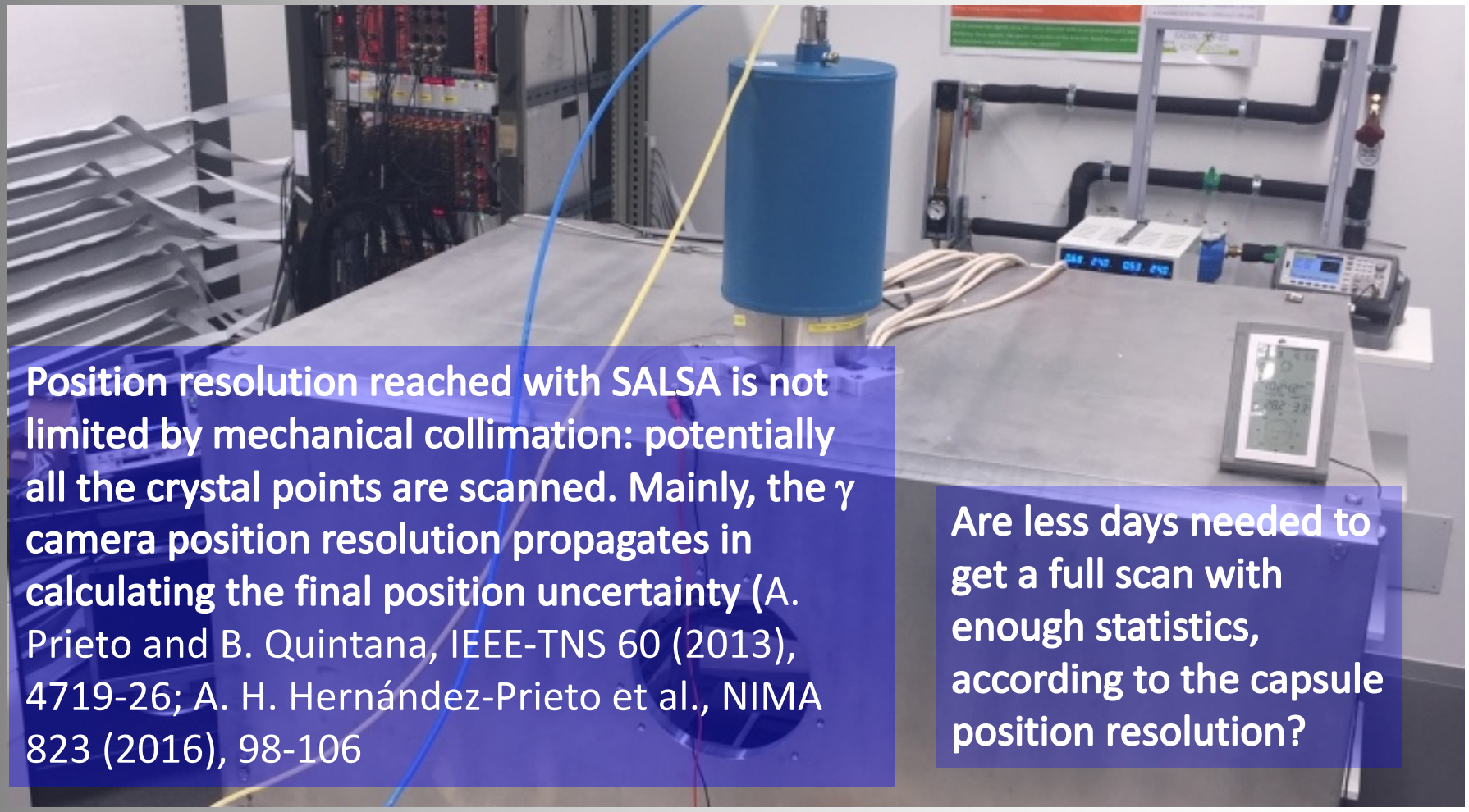
B014 capsule characterization with SALSA



Position resolution reached with SALSA is not limited by mechanical collimation: potentially all the crystal points are scanned. Mainly, the γ camera position resolution propagates in calculating the final position uncertainty (A. Prieto and B. Quintana, IEEE-TNS 60 (2013), 4719-26; A. H. Hernández-Prieto et al., NIMA 823 (2016), 98-106

Are less days needed to get a full scan with enough statistics, according to the capsule position resolution?

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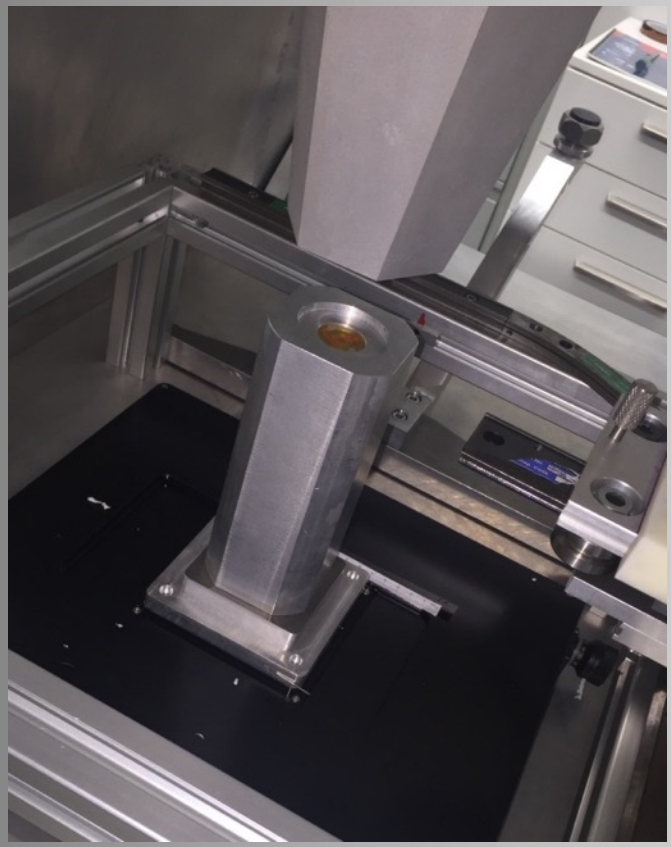
B014 capsule measurements



- ✓ B014 capsule arrival at the middle of June
- ✓ FWHM tests carried out to check cryostat
- ✓ Mechanically collimated measurements done to determine edges between segments in slice 1
- ✓ Method to select coincident signals set up
- ✓ One of the γ camera flat pannels replaced
- ✓ Scanning measurements during three months

B014 data processing

STEPS:

1. Noise characterization for PSC (σ=0.0048)
2. Time alignment of SALSA and AGATA signals to determine coincidence events and data merging.
3. Selection of data corresponding to one-event net signals
4. PSC between net signals to determine main groups in the data set for P1 and P2 scanning positions
5. PSC between transient signals into a given group: subgroups are created for each segment at P1 and P2

Not-differing pulse data grouped for each segment according to the crystal sensitivity

6. Calculation of crossing lines and determination of interaction points

B014 data processing status

- ✓ Data processing completed for ten-day measurement in POSITION 1 and eight-day one in POSITION 2
- ✓ Statistics: P1

Single-interaction event number per day

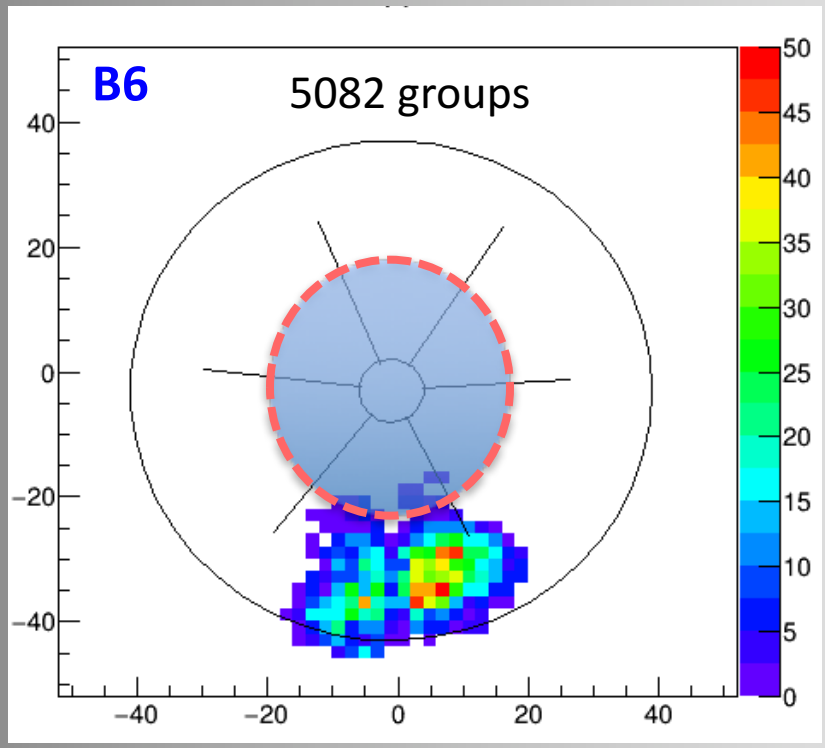
A1	B1	C1	D1	E1	F1
5552	9756	6256	1416	656	1032

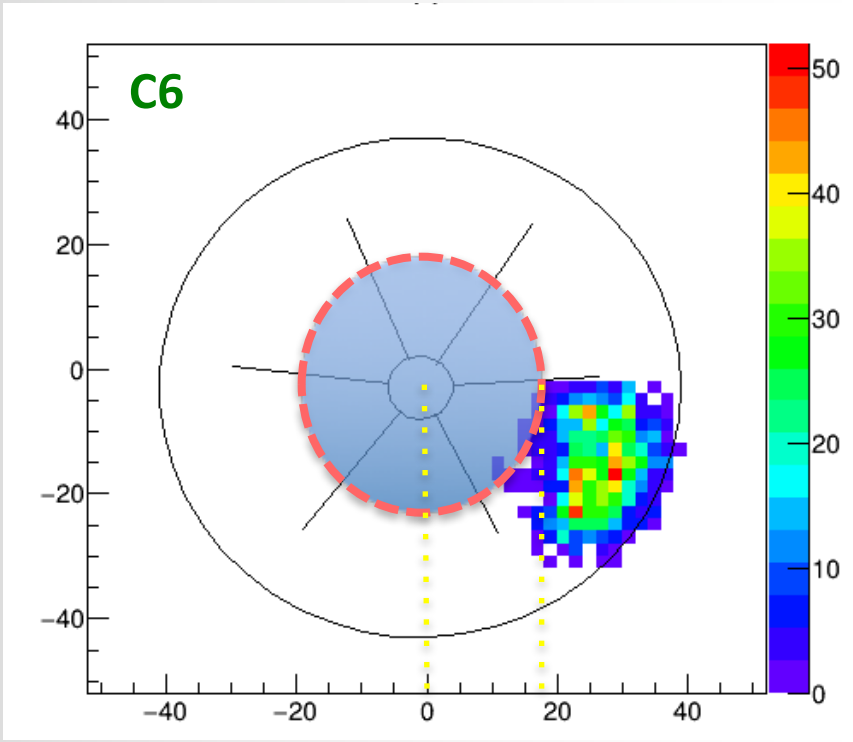
P2

A1	B1	C1	D1	E1	F1
745	3584	8304	8056	2484	490

- ✓ Number of groups made up with the net signals measured in the whole detector: 2052
- ✓ After full processing, event number per day in B1 reduces to 620, likely due to the fact that just eight effective days are processed.
- ✓ Position resolution calculated from position fluctuation into subgroups: σ_X= 2.82, σ_Y= 2.18 σ_Z= 3.88 (mm)

Some figures…





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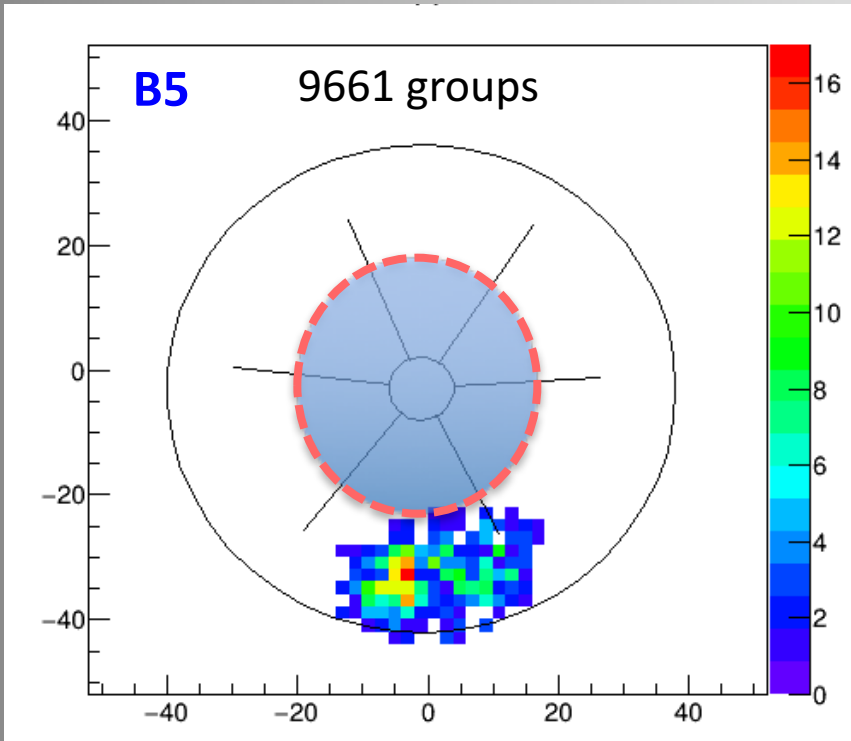
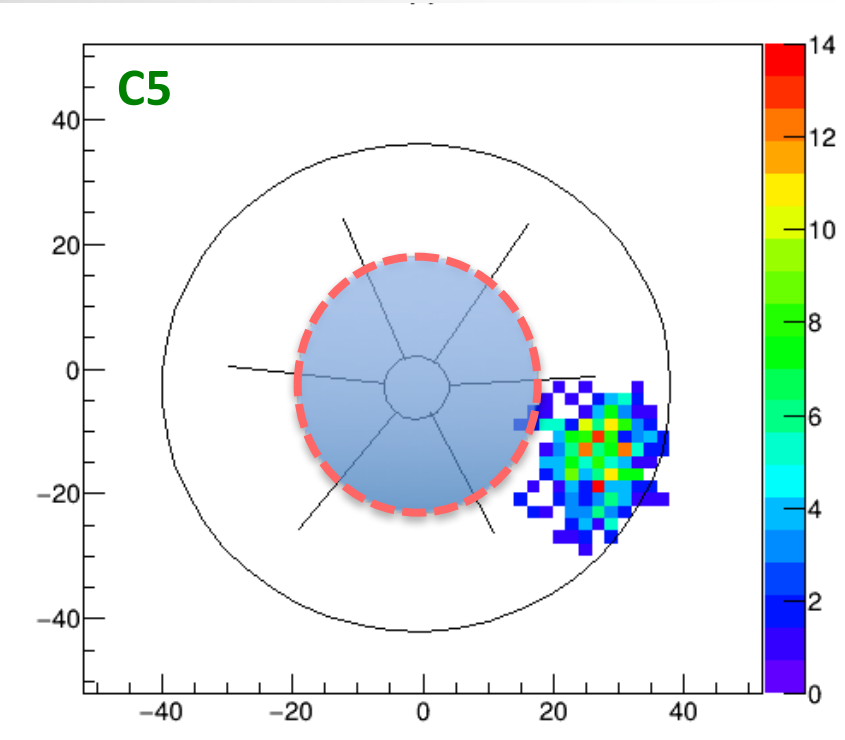
Some figures…





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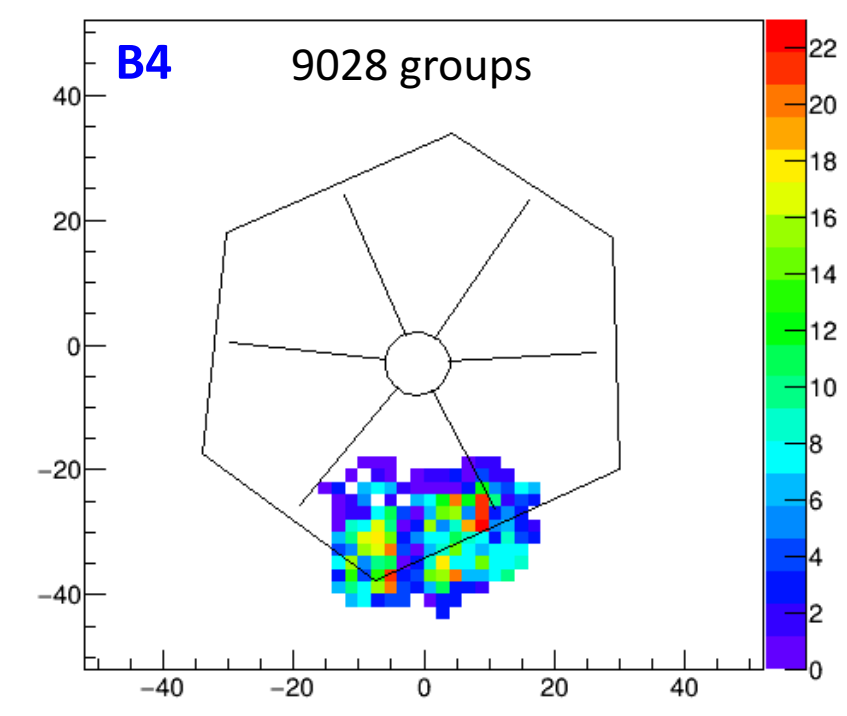

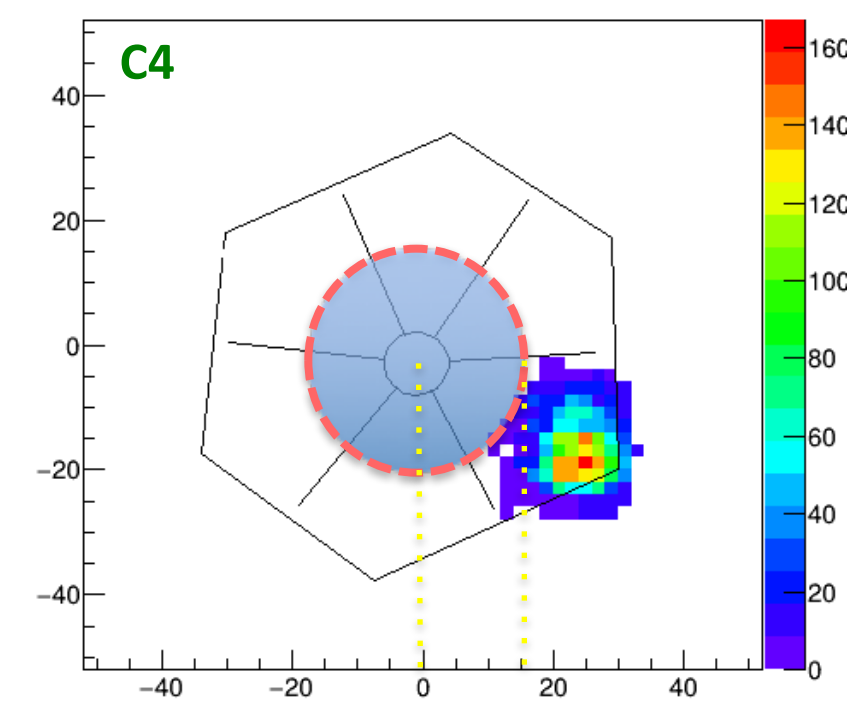

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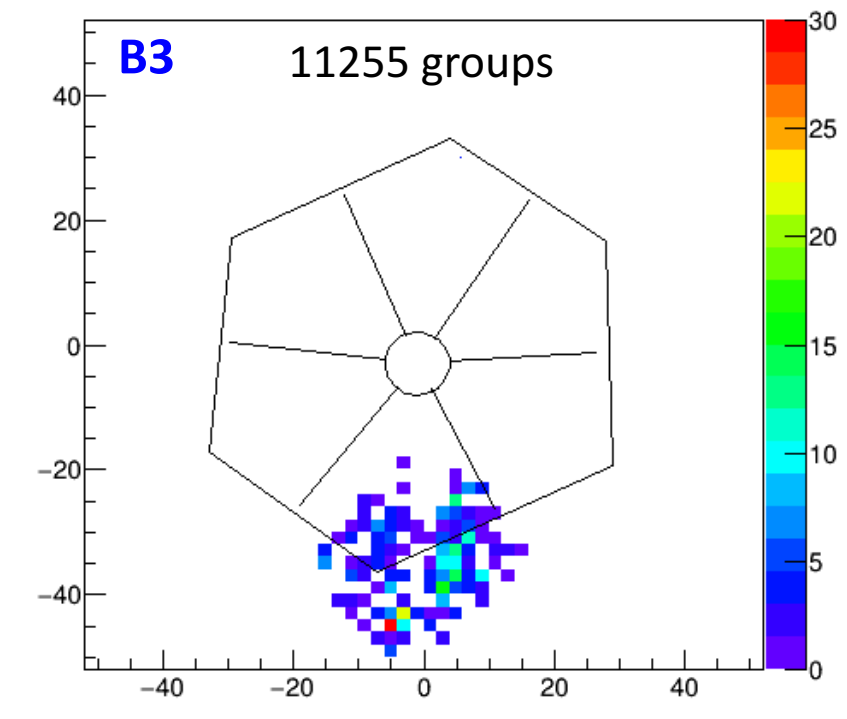

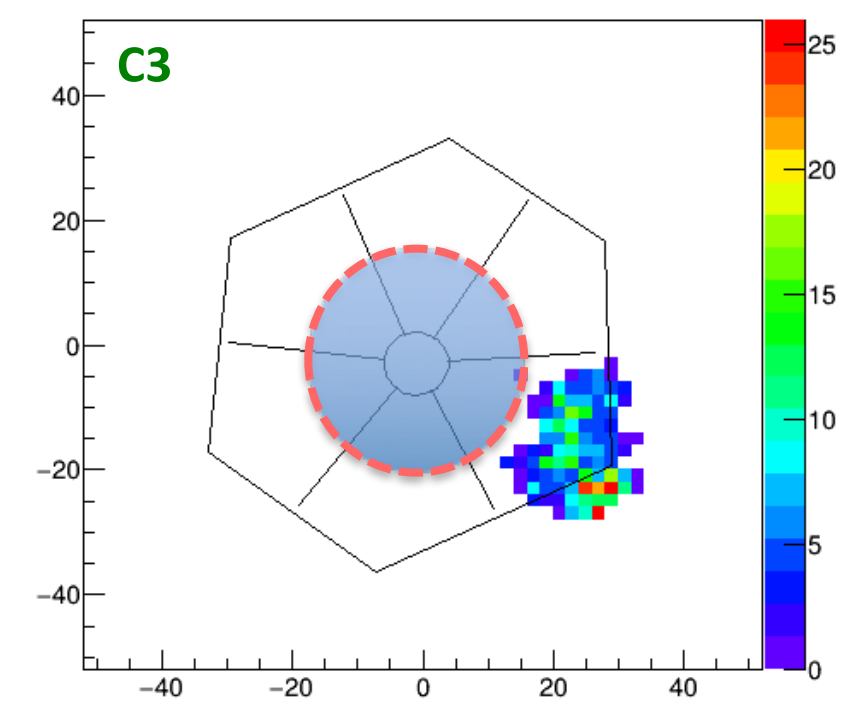

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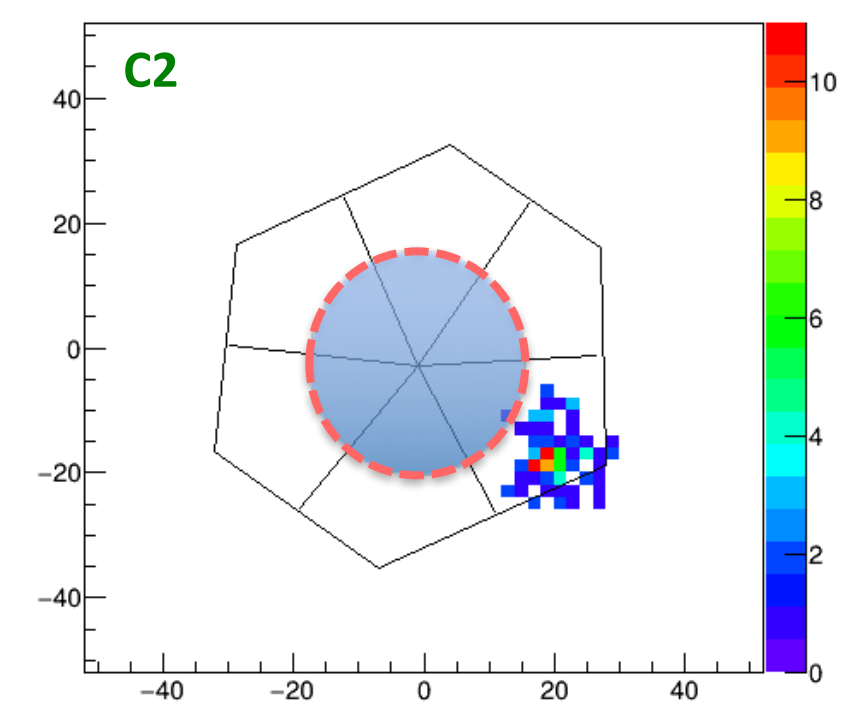

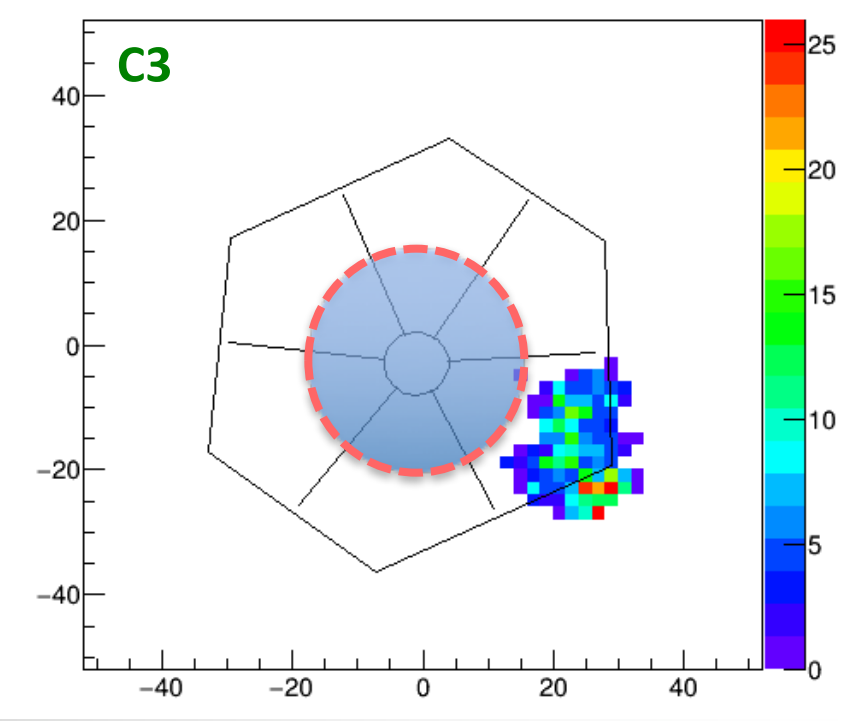

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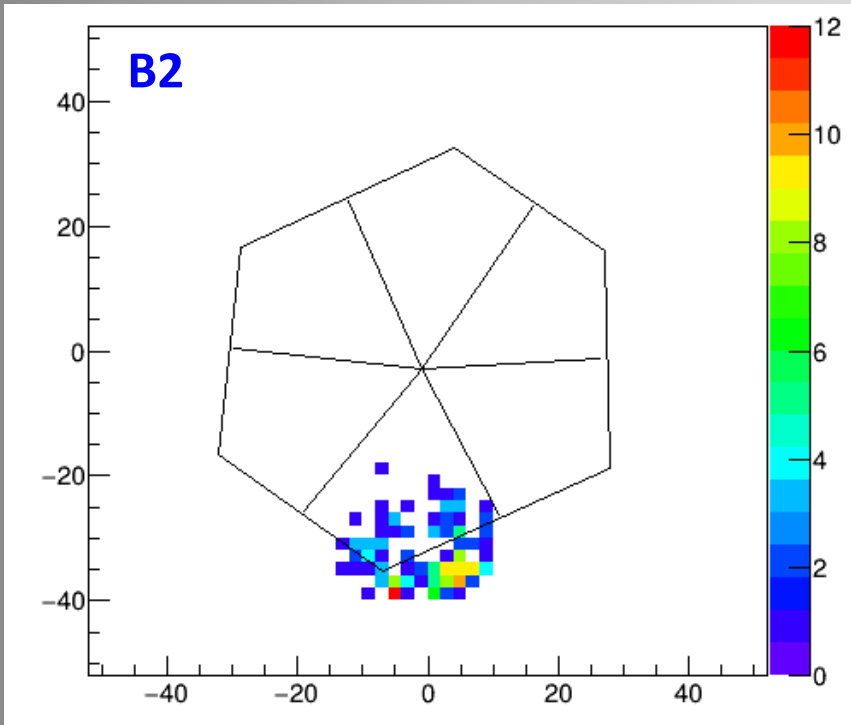
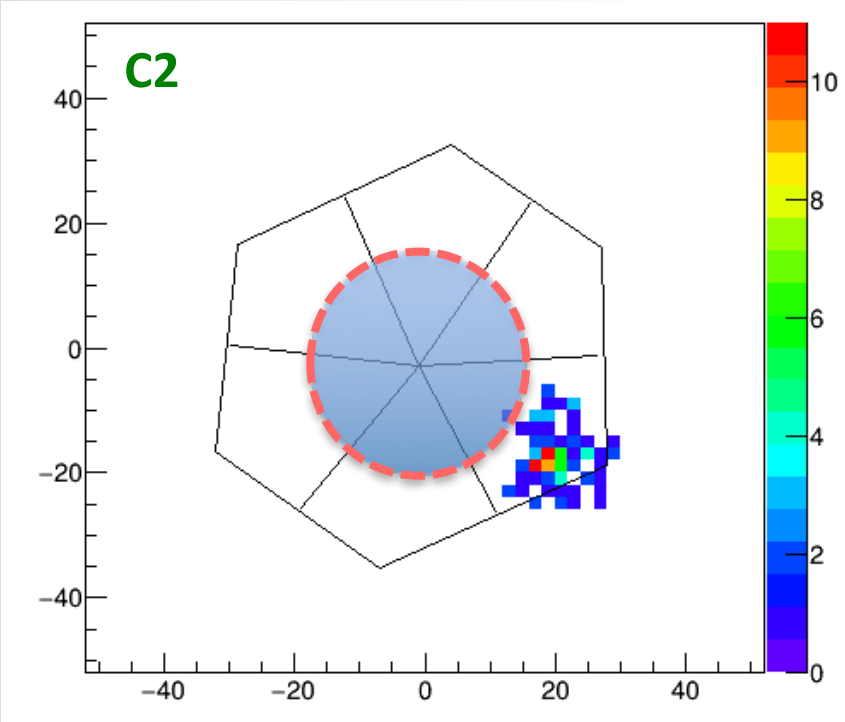
Some figures…

10103 groups/1555 events/day





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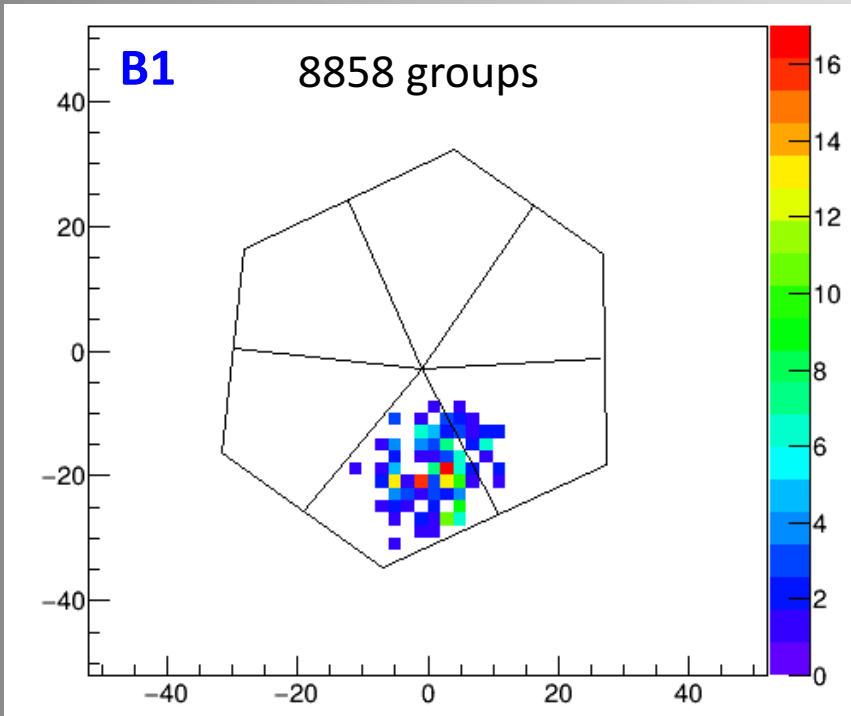

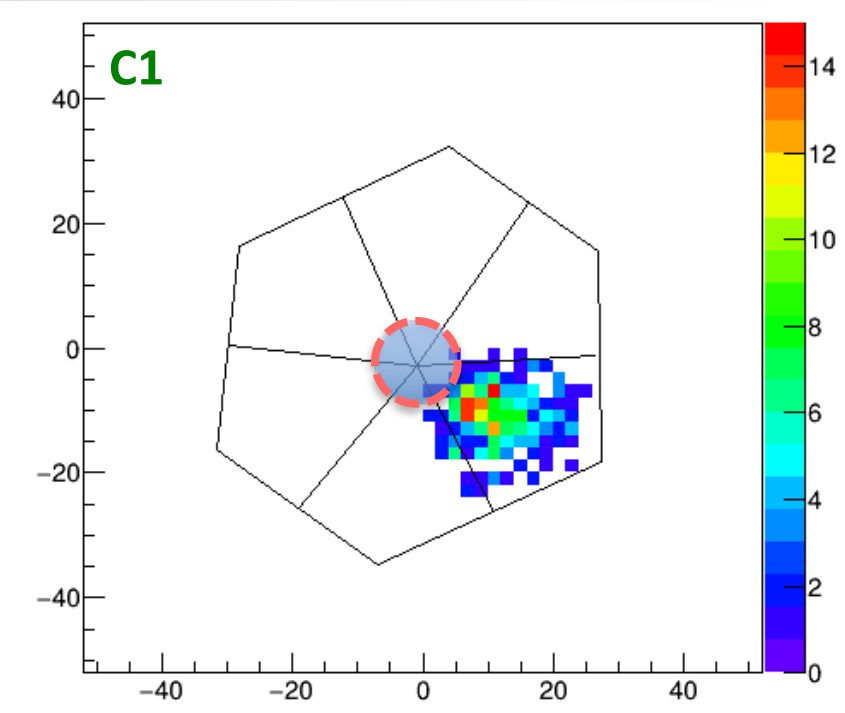

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Summary

1. Up to now three-month measurement is available
2. Still just eight effective days processed, too long processing time…
3. In spite of this, some issues start to come out: FWHM in position by 5 mm and large dead volume into the crystal, mainly in the upper segments
4. It would be interesting to go on with the measurements in order to confirm the ultimate position resolution

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