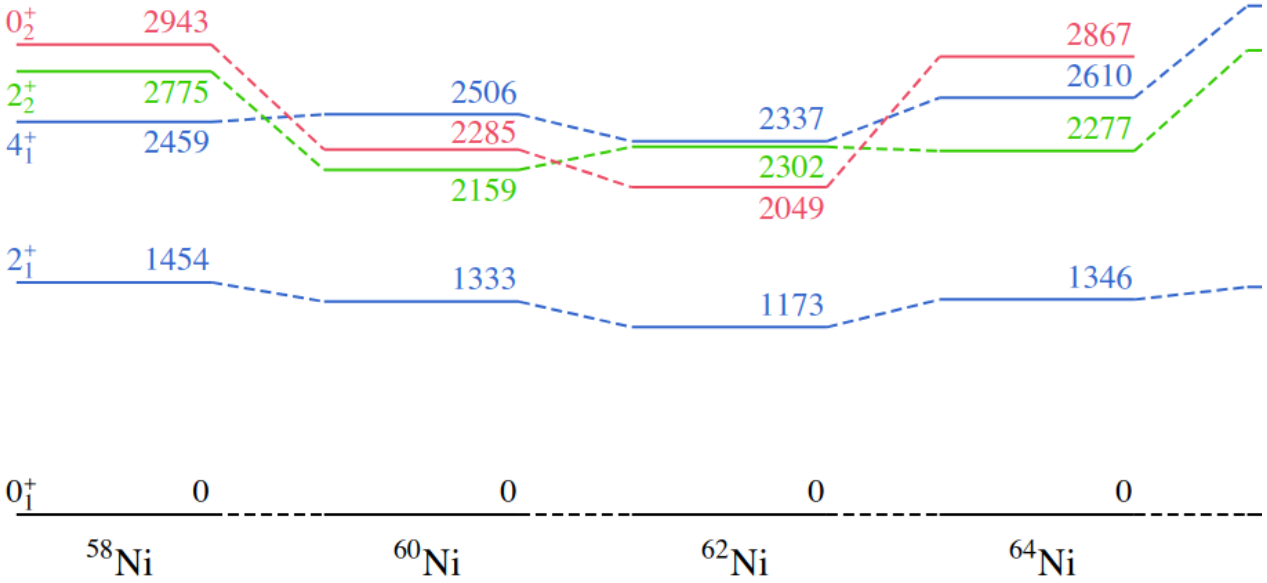
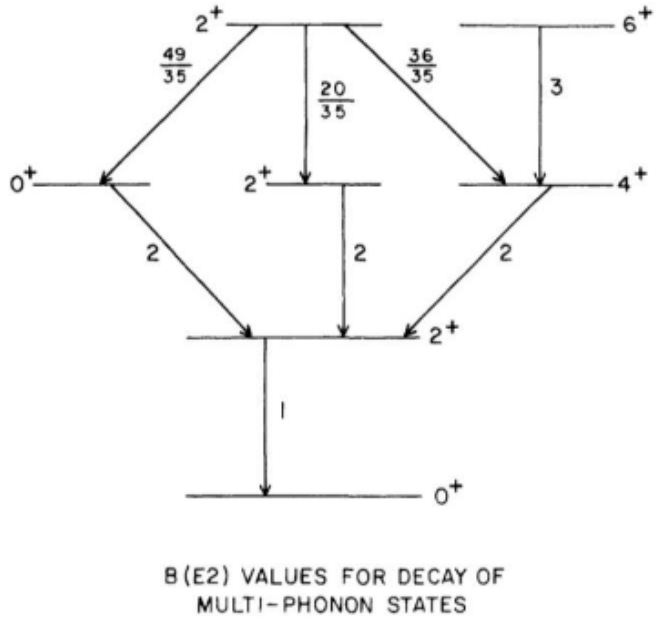
Report on AGATA@LNL experiment 23.08: Coulomb excitation of ^{60}Ni

Agata Krzysiek
Kasia Hadyńska-Klęk

Heavy Ion Laboratory
University of Warsaw

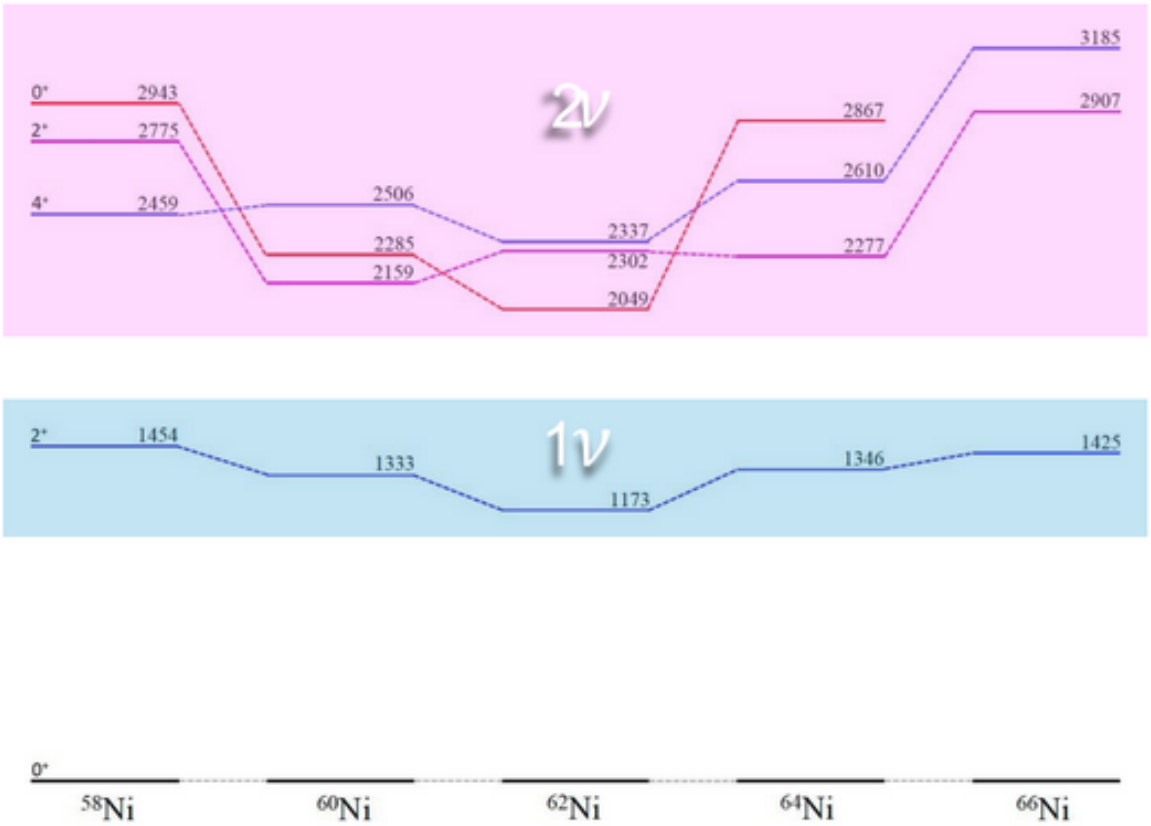
Vibrational limit: predicted transitions

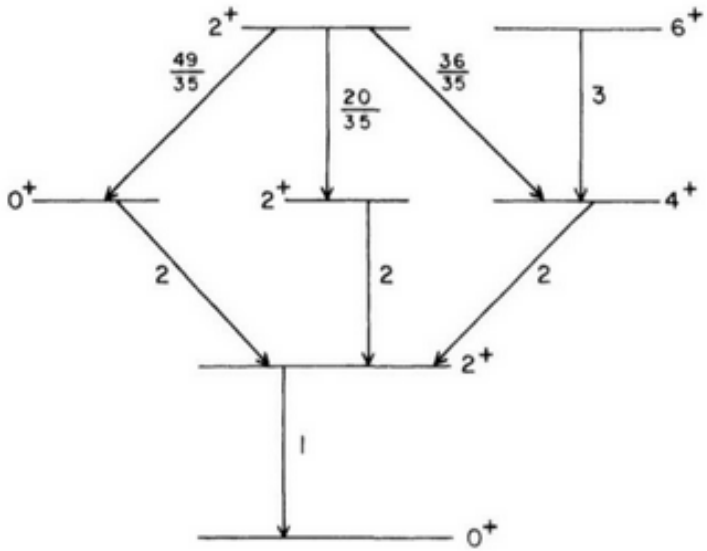




B(E2) VALUES FOR DECAY OF MULTI-PHONON STATES

Vibrational limit: predicted transitions





B(E2) VALUES FOR DECAY OF MULTI-PHONON STATES

B(E2) and Qs values needed
Not only the level scheme but the structure

Large E0 transitions between low-lying states

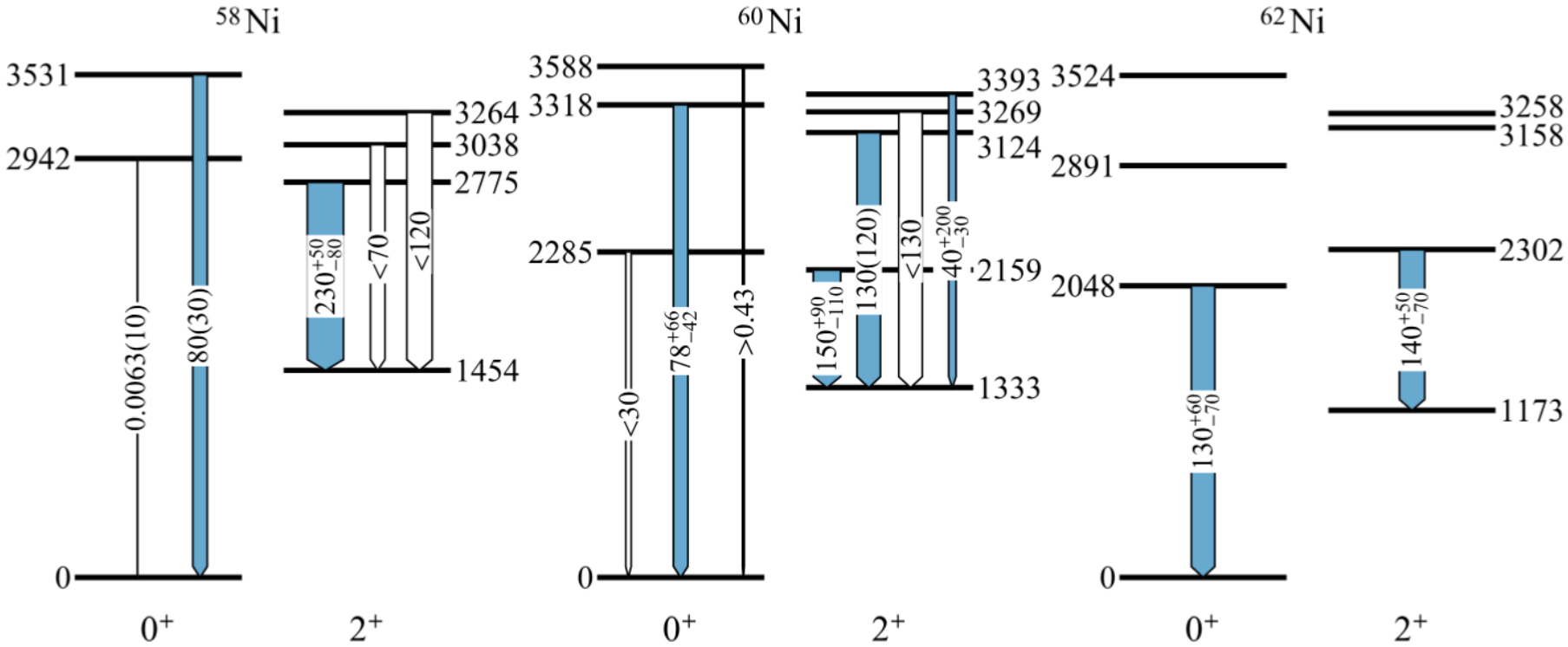
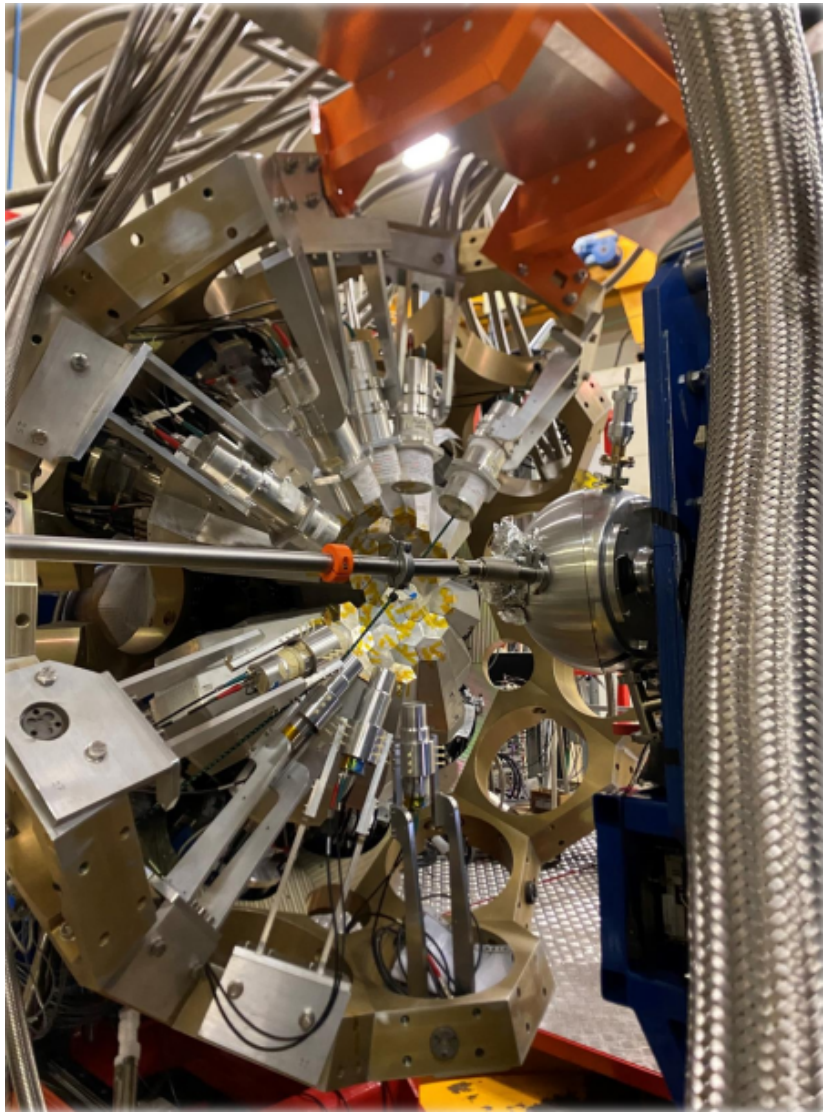


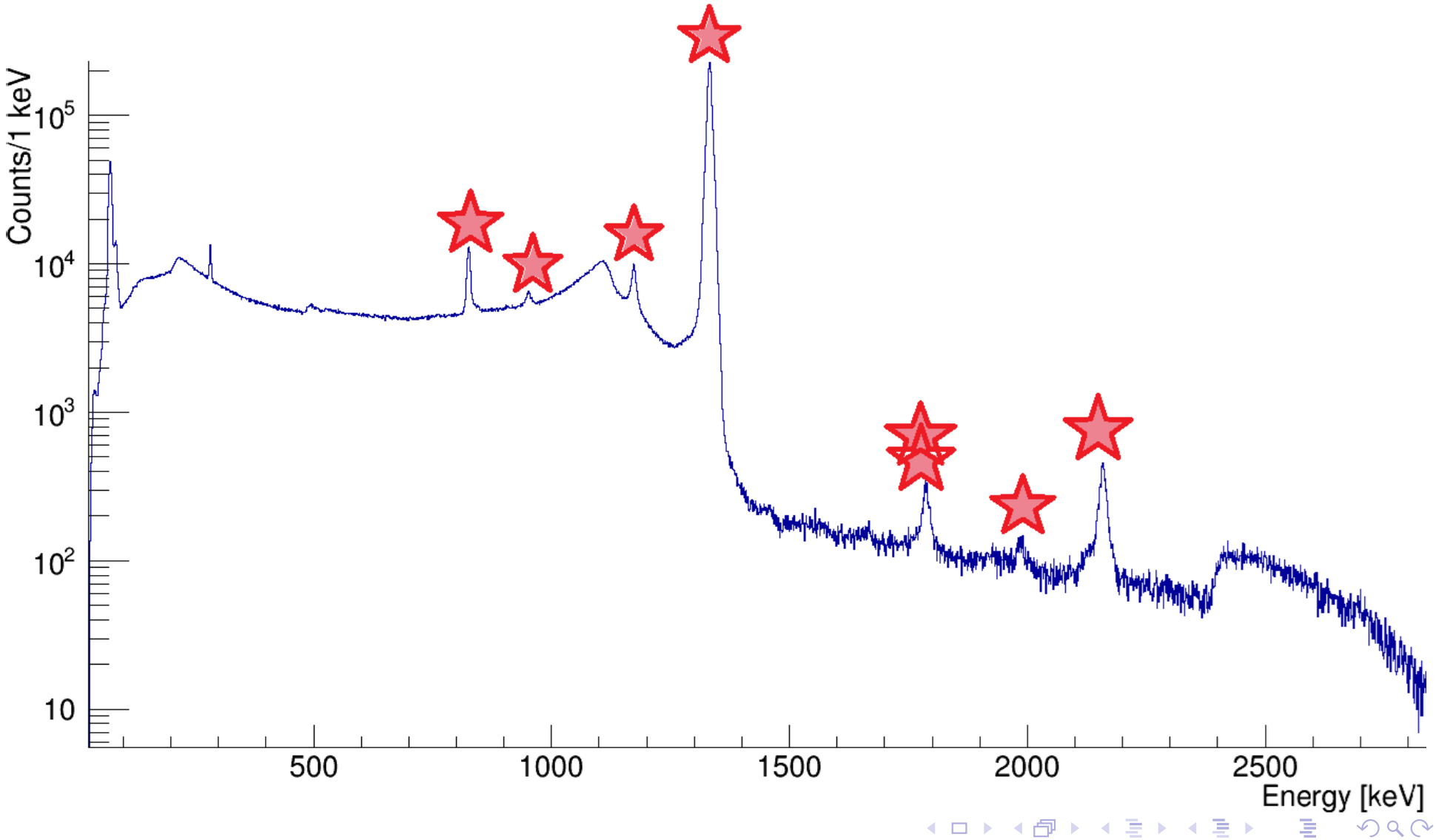
Figure taken from L.J. Evitts et al., Phys. Rev. C 99 (2019) 024306.

Experiment 23.08: Coulomb excitation of ^{60}Ni details:

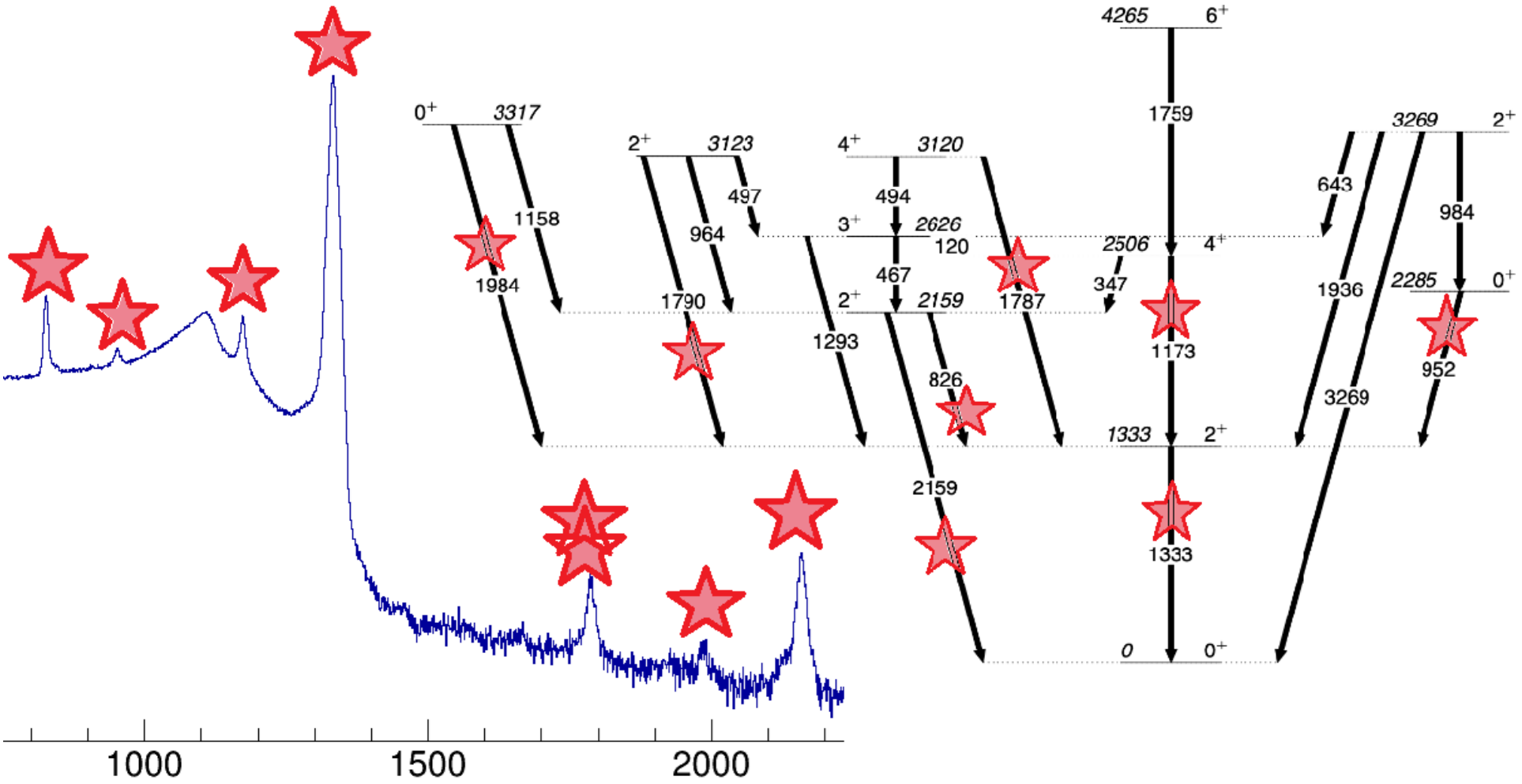
- October 2023 (6 days)
- TANDEM XTU @ INFN LNL
- ^{60}Ni beam, 240 MeV, I≈2 pnA
- ^{208}Pb, 0.8 and 4 mg/cm^2
- AGATA, 34 crystals
- SPIDER, 7 sectors, 8 rings: 128°-160°



^{60}Ni Nearline Doppler-corrected gamma spectrum



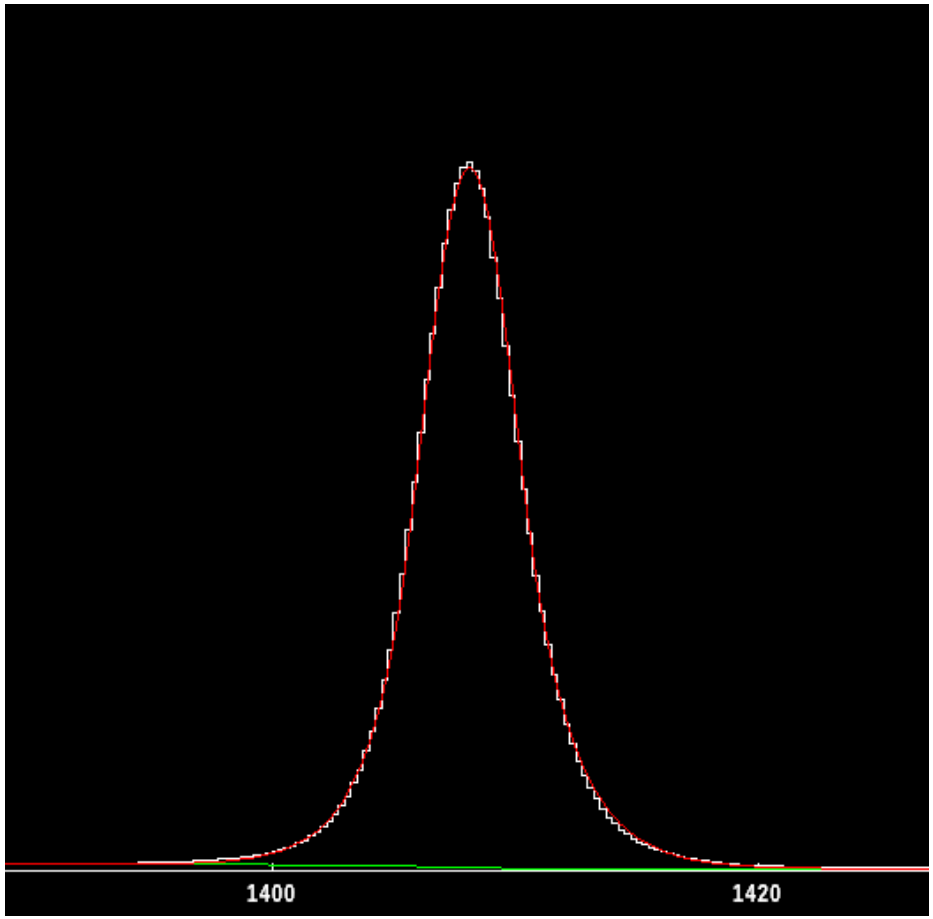
^{60}Ni Nearline Doppler-corrected gamma spectrum



^{152}Eu Total energy spectrum: one year ago

Fit parameters:

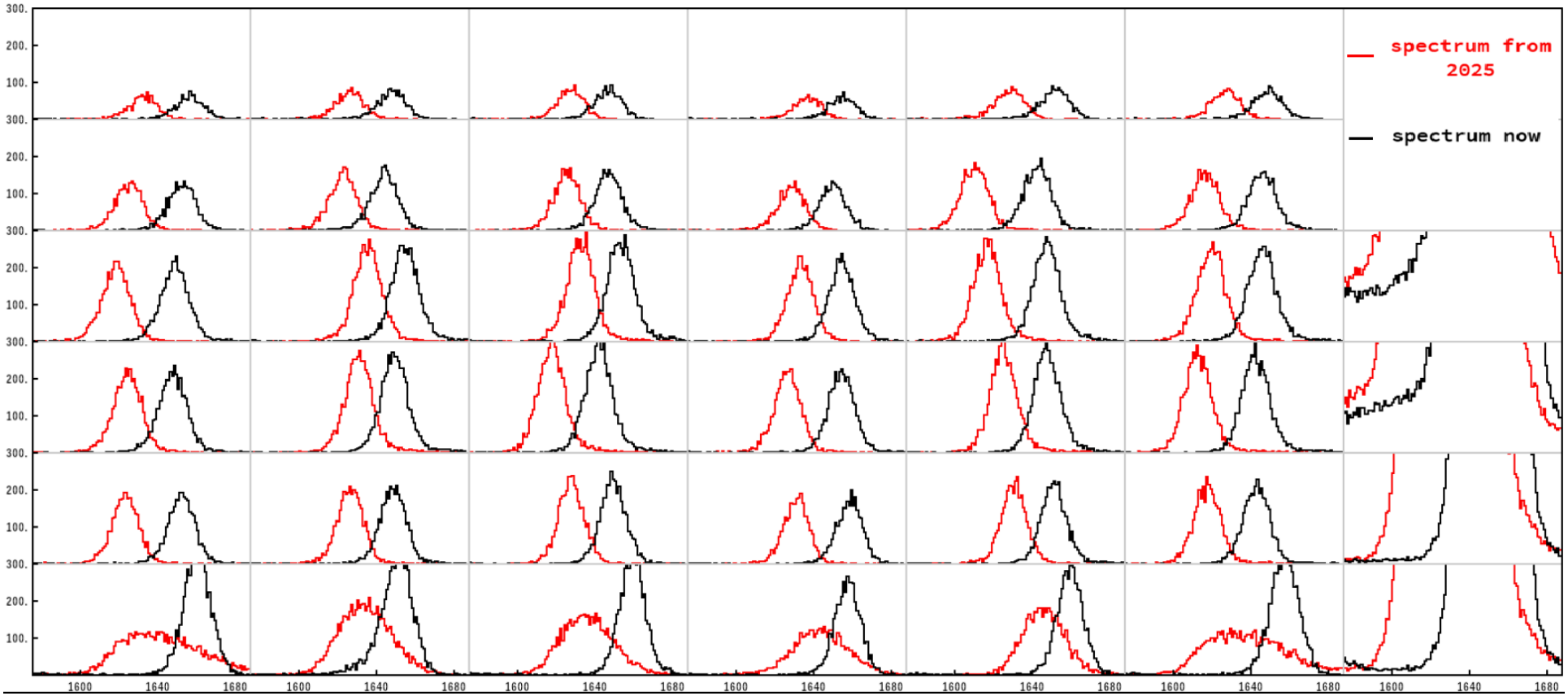
- Centroid:
(1408.101 ± 0.0039) keV
- FWHM:
(4.786 ± 0.0011) keV



Neutron damage correction

^{60}Co energy spectrum (1332 keV) before vs after hole-trapping correction (lambdaH in Trapping.cal file) - comparison for 00A crystal.

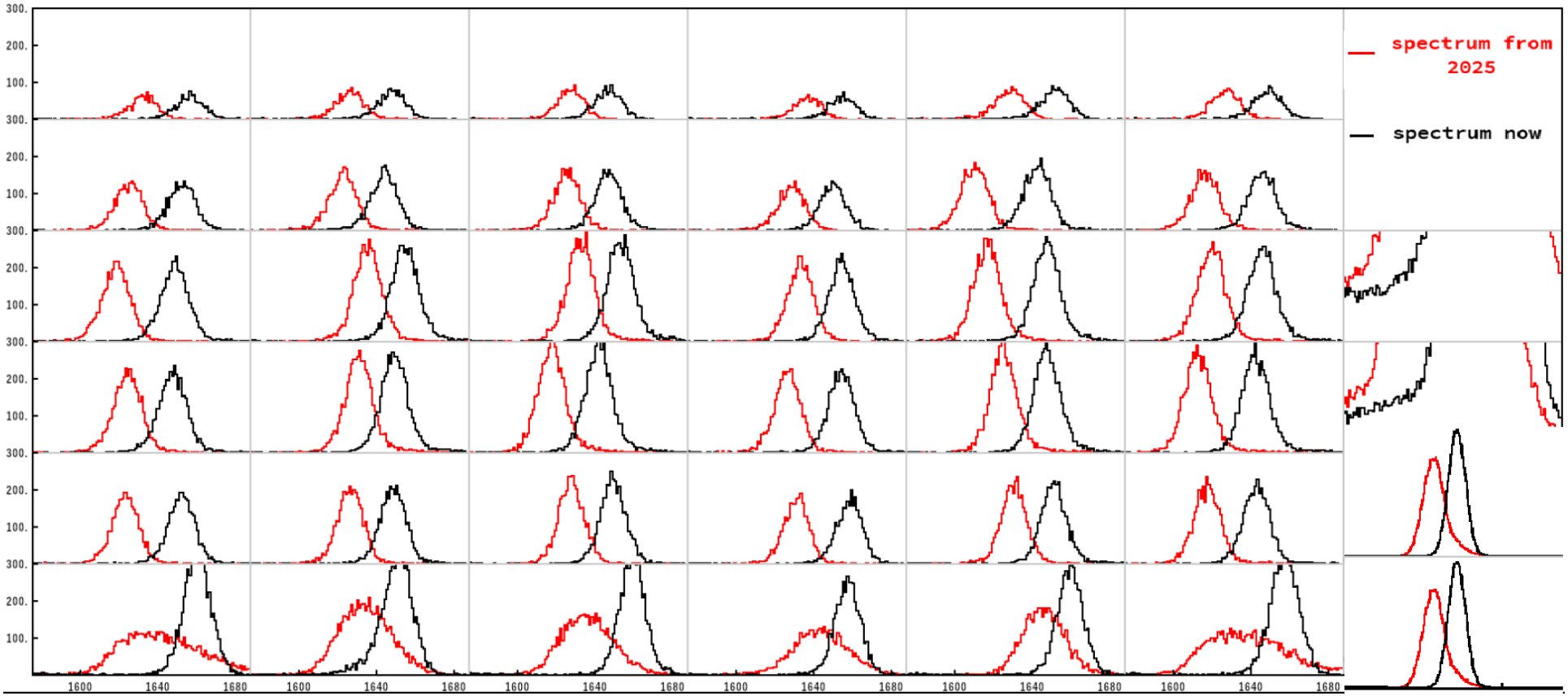
Huge thanks to Marco Siciliano for help!



Neutron damage correction

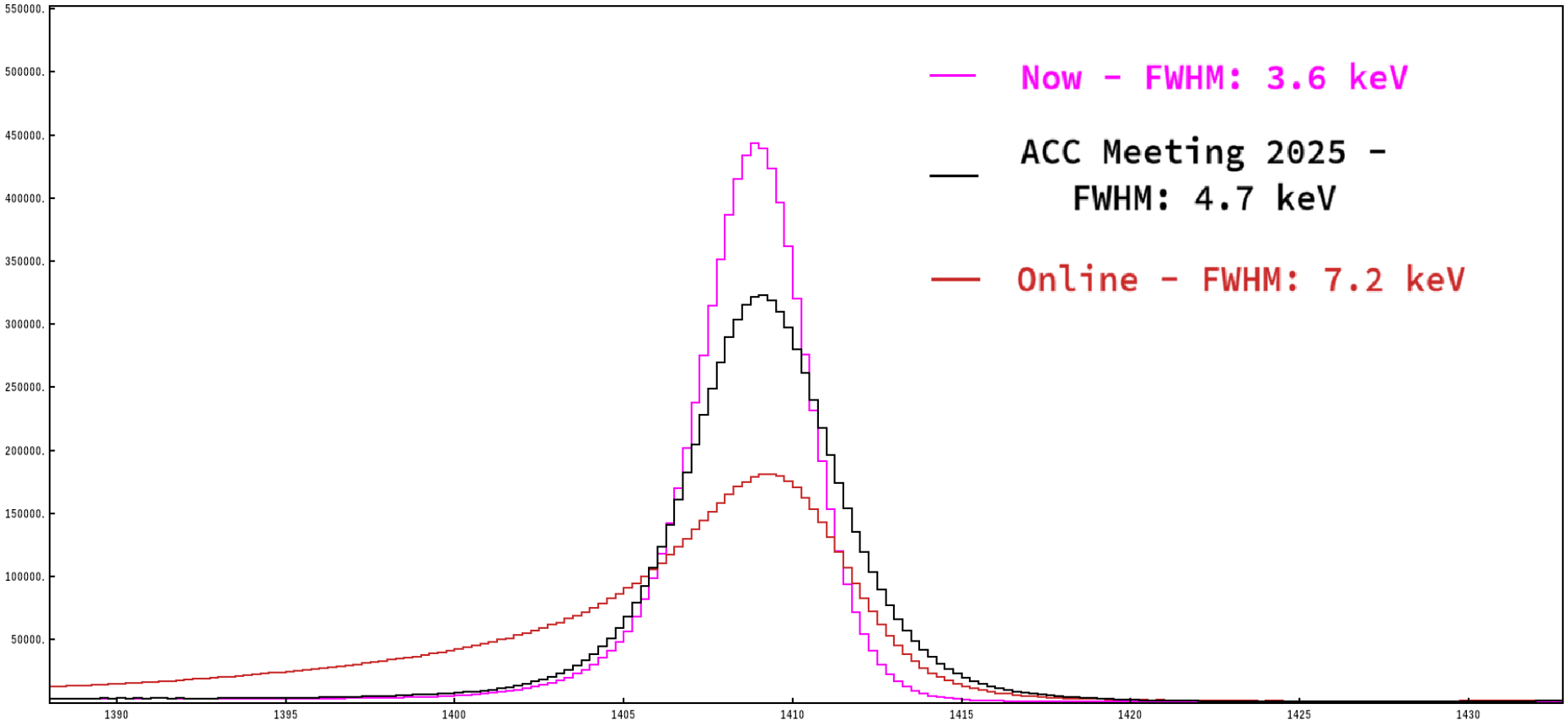
^{60}Co energy spectrum (1332 keV) before vs after hole-trapping correction (lambdaH in Trapping.cal file) - comparison for 00A crystal.

Huge thanks to Marco Siciliano for help!

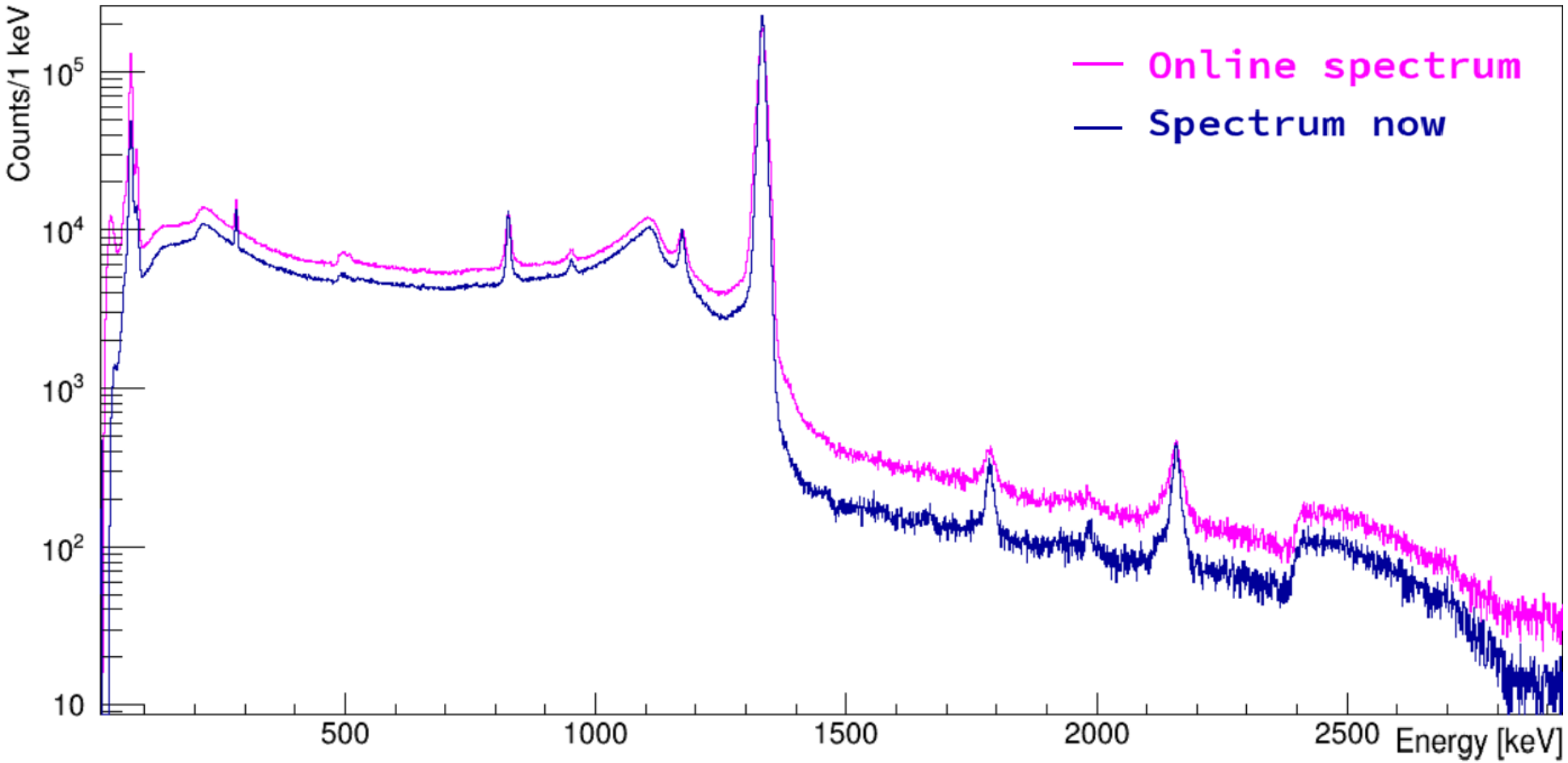


Neutron damage correction & FSTC

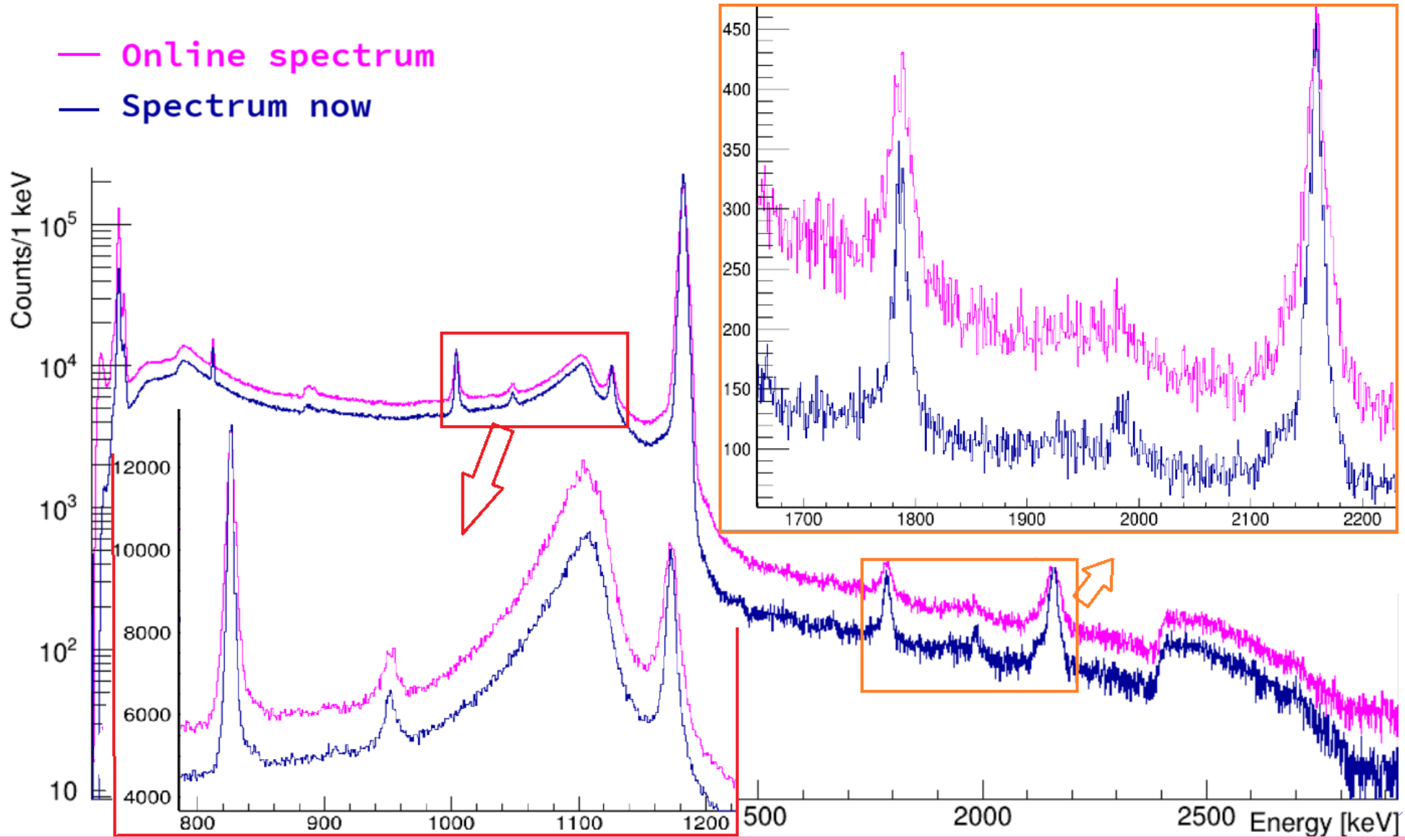
Tracked ^{152}Eu total energy spectrum (1408 keV) with Force Segments to Core applied - comparison



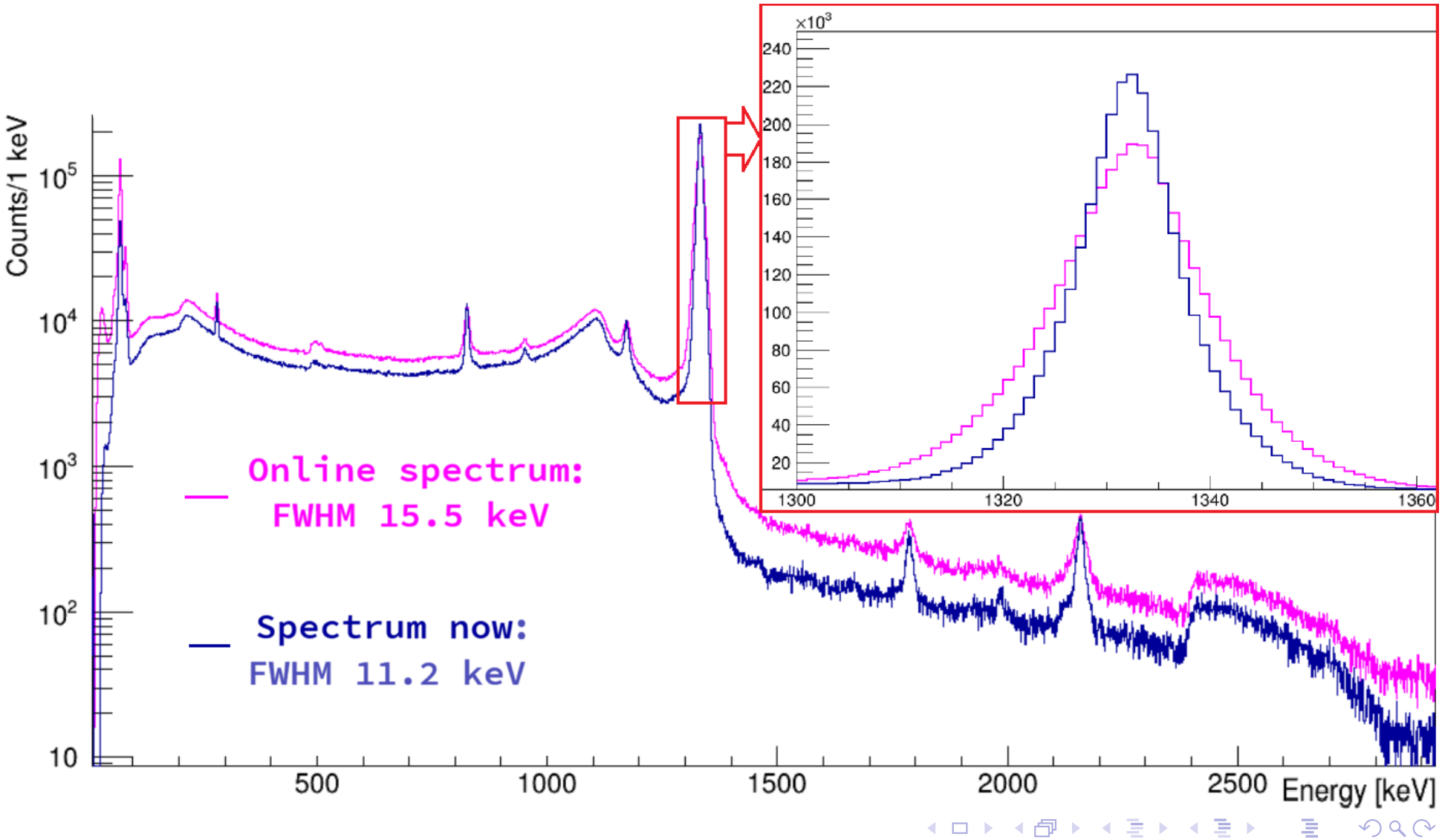
^{60}Ni Doppler-corrected gamma spectrum



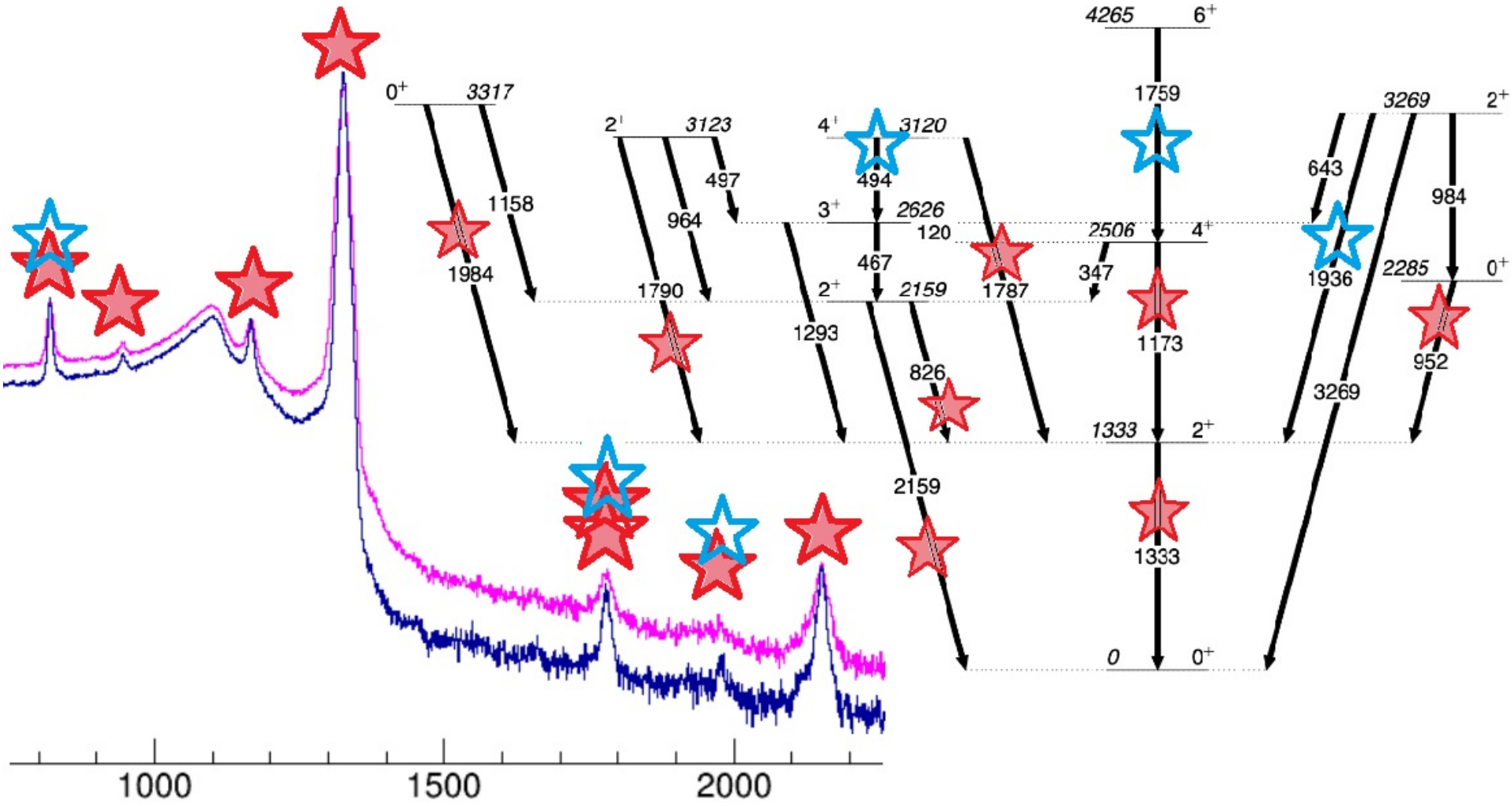
^{60}Ni Doppler-corrected gamma spectrum



^{60}Ni Doppler-corrected gamma spectrum



^{60}Ni Doppler-corrected gamma spectrum



To-do list:

- Postprocessing of AGATA
- Optimisation of the SPIDER array (energy, angles)
- Optimisation of the Doppler correction
- Processing of all runs
- Particle-gamma time coincidence selection
- Coulomb excitation data analysis (GOSIA)

Thank you!

To-do list:

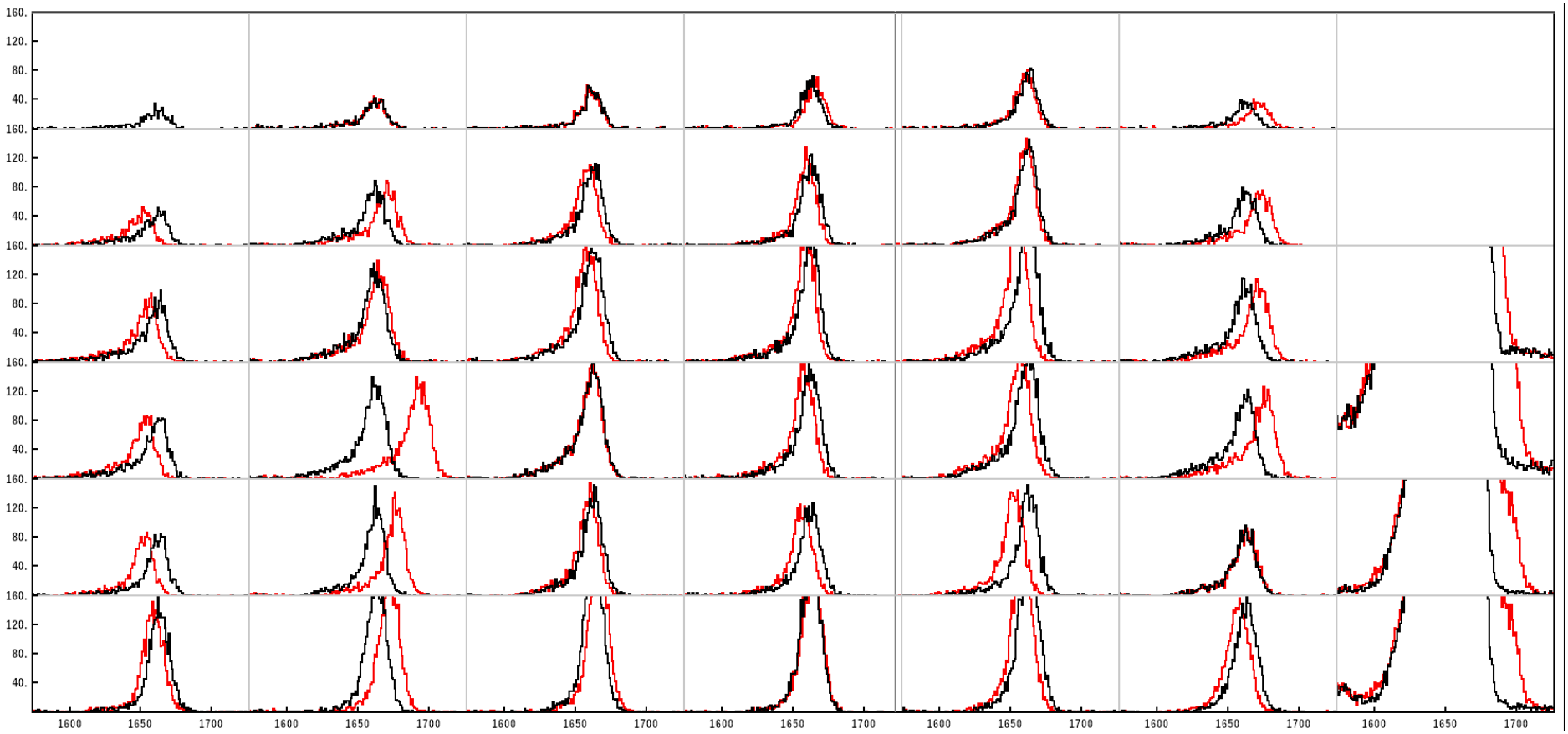
- ~~Postprocessing of AGATA~~
- ~~Optimisation of the SPIDER array (energy, angles)~~
- ~~Optimisation of the Doppler correction~~
- ~~Processing of all runs~~
- Particle-gamma time coincidence selection
- Coulomb excitation data analysis (GOSIA)

Thank you!

Neutron damage correction

^{60}Co energy spectrum (1332 keV) before vs after electron-trapping correction (lambdaE in Trapping.cal file) - comparison for 06C crystal.

Huge thanks to Marco Siciliano for help!



0	0.999211	0.999211	1001.5	80.6	0.998664	1.000153
1	0.998819	0.998819	1001.7	90.2	0.999061	1.000556
2	0.998500	0.998500	4383.4	103.8	0.999281	1.001225
3	0.998746	0.998746	1262.1	118.3	0.998851	1.000600
4	0.998713	0.998713	1185.8	146.2	0.998804	1.000555
5	0.999150	0.999150	1119.7	183.3	0.998732	0.999124
6	0.999142	0.999142	895.7	80.6	0.998389	0.999887
7	0.998665	0.998665	1529.9	107.3	0.999156	1.000735
8	0.998457	0.998457	1239.7	118.3	0.999003	1.000218
9	0.998167	0.998167	2383.4	146.2	0.999229	1.001541
10	0.998621	0.998621	901.5	158.6	0.998869	1.000486
11	0.999024	0.999024	1011.7	188.4	0.998599	1.000039
12	0.998817	0.998817	895.7	77.5	0.998375	1.000311
13	0.998511	0.998511	2934.5	103.8	0.999236	1.001375
14	0.998110	0.998110	3748.6	126.1	0.999178	1.001762
15	0.997904	0.997904	1439.7	142.0	0.998955	1.001702
16	0.998686	0.998686	2292.4	173.4	0.999061	1.001201
17	0.998800	0.998800	1156.8	168.6	0.998330	1.000386
18	0.999047	0.999047	1070.4	83.7	0.998587	1.000399
19	0.998838	0.998838	1069.7	93.5	0.998995	1.000665
20	0.998195	0.998195	1147.0	107.3	0.998974	1.001247
21	0.998528	0.998528	1039.7	122.1	0.998820	1.000811
22	0.998661	0.998661	3521.7	150.5	0.999031	1.001379
23	0.999184	0.999184	945.7	159.4	0.998364	0.999801
24	0.999416	0.999416	870.4	90.2	0.998634	0.999751
25	0.998485	0.998485	1501.5	110.9	0.999167	1.001128
26	0.998482	0.998482	3409.9	142.0	0.999403	1.001360
27	0.998971	0.998971	1482.1	150.5	0.999039	1.000480
28	0.998541	0.998541	3820.4	184.0	0.998994	1.001420
29	0.998894	0.998894	1601.5	199.0	0.998625	1.000442
30	0.999523	0.999523	1001.5	90.2	0.998656	0.999699
31	0.998700	0.998700	8228.2	110.9	0.999228	1.001198
32	0.998485	0.998485	2870.4	125.9	0.999092	1.001187
33	0.998959	0.998959	1585.8	154.9	0.999086	1.000617
34	0.998747	0.998747	2119.7	178.3	0.998987	1.000999
35	0.999194	0.999194	985.5	178.6	0.998312	0.999801

- column 0: segment id
- column 1: extra gain on the segment before correction
- column 2: extra gain on the core before correction
- column 3: electron-trapping correction (lambdaE)
- column 4: hole-trapping correction (lambdaH)
- column 5: extra gain on the segment after correction
- column 6: extra gain on the core after correction

See: https://agata.pages.in2p3.fr/handbook/userguides/LLP$_{P}ostPSA$/