Status report of the ongoing analysis of the pygmy AGATA experiment at GSI

Riccardo Avigo[1,2]

1 Università degli Studi di Milano
2 Istituto Nazionale di Fisica Nucleare

UNIVERSITÀ
DEGLI STUDI
DI MILANO

26th June 2014- EGAN workshop in GSI, annual AGATA collaboration meeting

Outlines

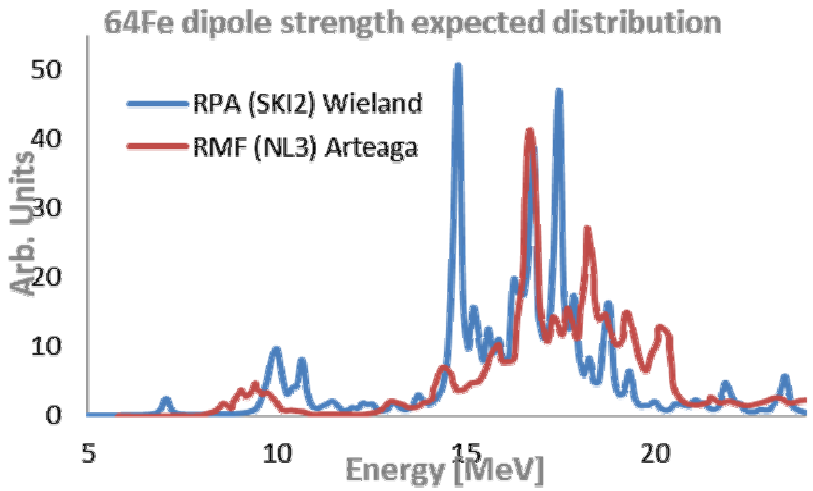
- ✓ Pygmy Dipole Resonance in iron isotopes
- ✓Ion identification
- ✓HECTOR+ gamma spectrum
- ✓AGATA gamma spectra
- ✓Physical perspectives

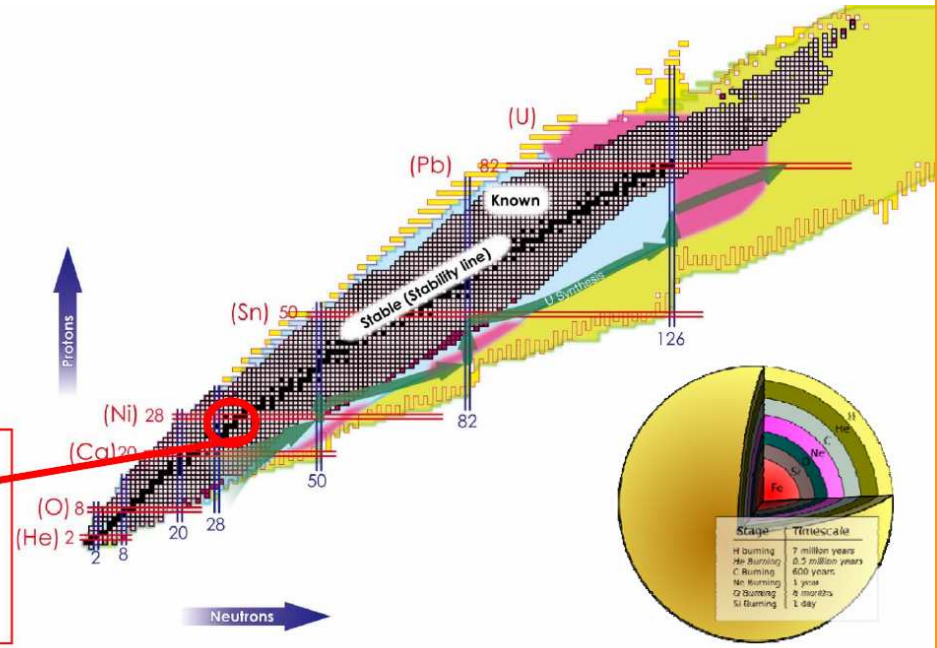
Pygmy Dipole Resonance in Fe isotopes

E1 strength distribution in exotic nuclei is a part of a study over decades of Collective excitations

Neutron rich iron isotopes show an expected E1 strength accumulation around one particle separation energy (Pygmy Dipole Resonance)

Measuring E1 strength above and below one particle separation energy is the key point





Supernova-Explosion
Starting in Ni and Fe region
going towards exotic
r-process starting points

Experiment S430 - PDR in ^{64,62}Fe

2012

prymary beam : ^{86}Kr @ 730 MeV/nucleon

relativistic coulomb excitation: ^{64}Fe @ 400 MeV/u on ^{208}Pb target

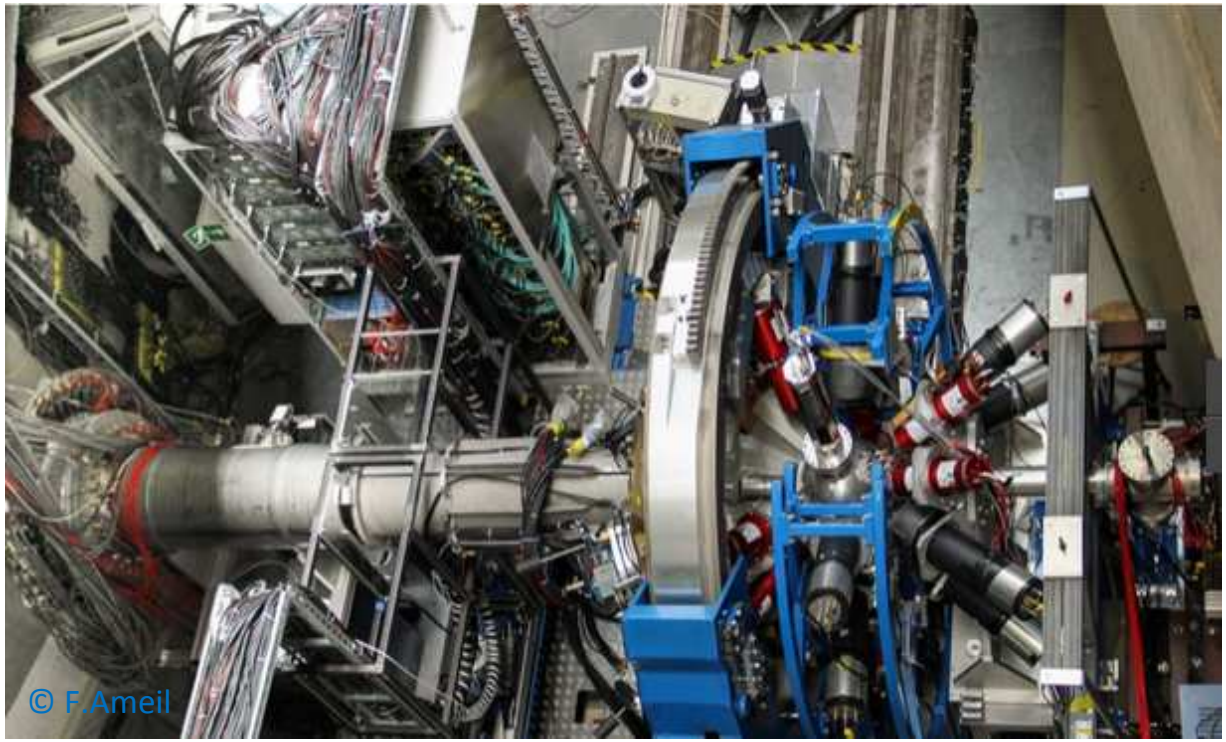
2014

prymary beam : ^{86}Kr @ 700 MeV/nucleon

relativistic coulomb excitation: ^{62,64}Fe @ 400 - 440 MeV/u on ^{192}Au target

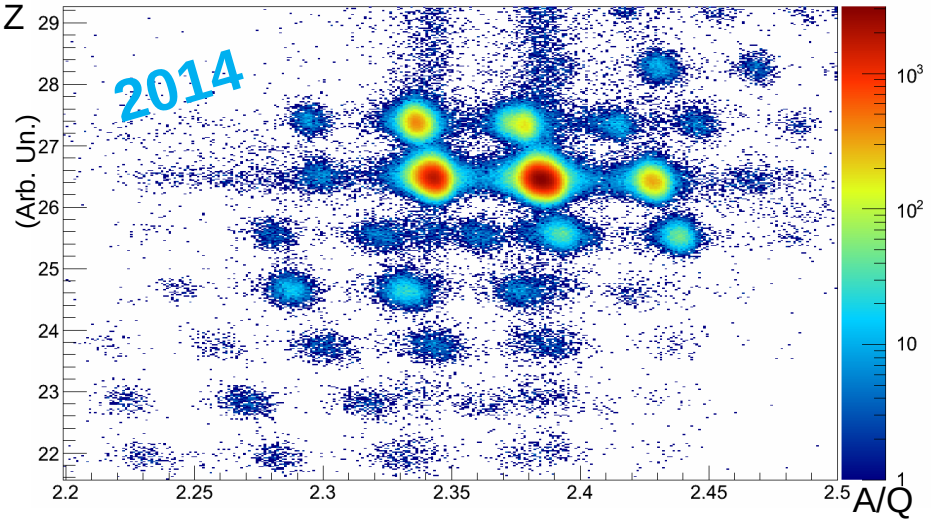
PDR gamma decay : expected gammas energy range 9-10 MeV in CM frame (low multiplicity). Expected Energies in Lab frame ~15-20 MeV

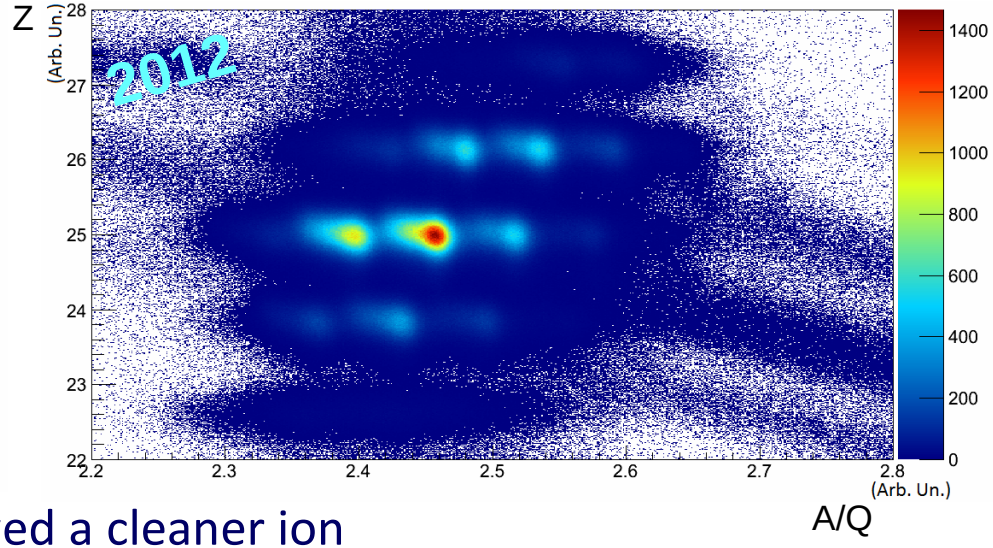
Gamma detector arrays:
AGATA [forward angles]
HECTOR+ [$LaBr_3$:Ce + BaF_2
at different angles]



Ion Identification

FRS identification

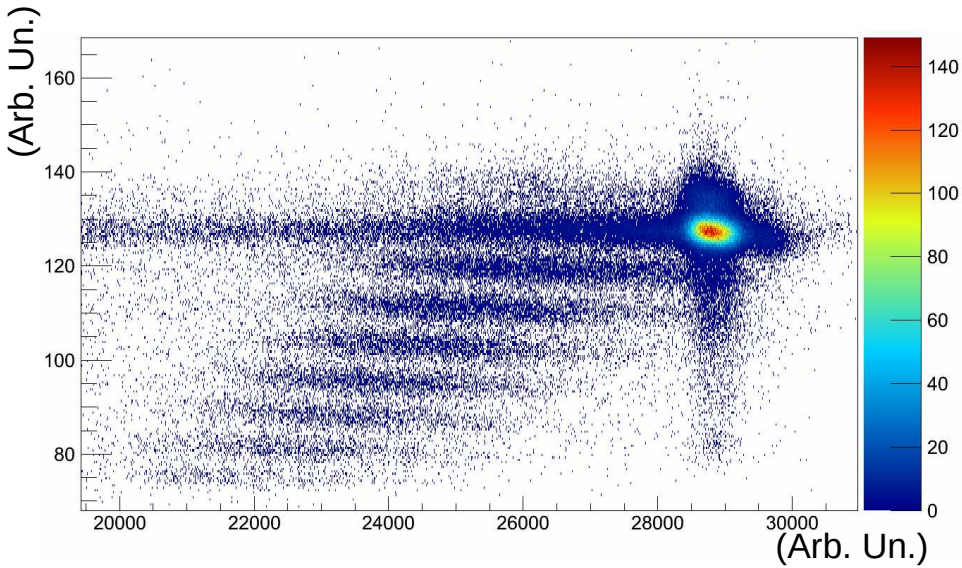




2014 run - Lower rate at S2 stage allowed a cleaner ion identification. Higher identification efficiency with TPCs → 75% .

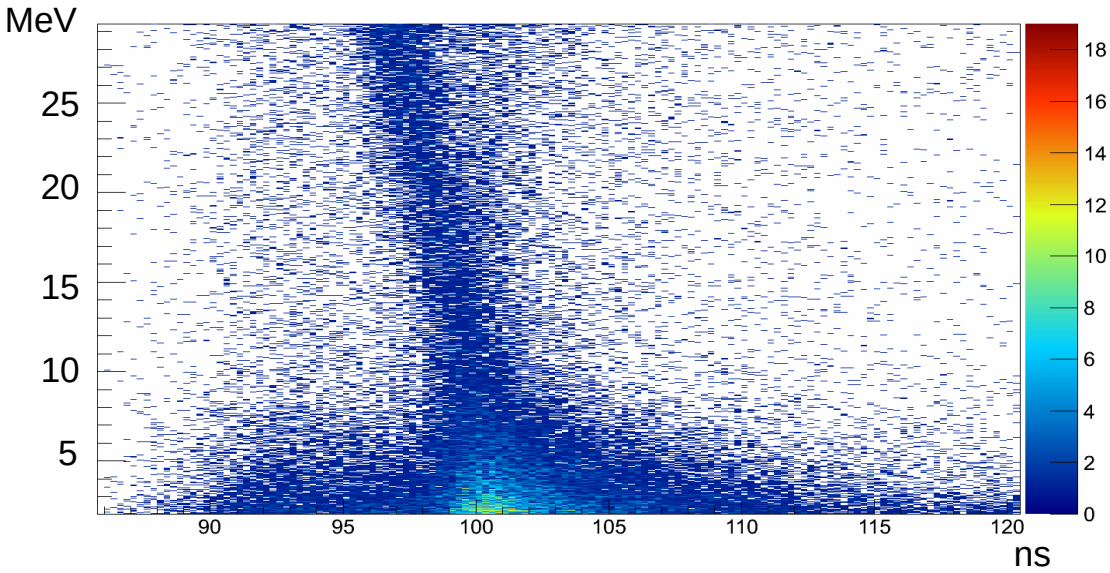
LYCCA identification

Nice identification in LYCCA E-ΔE plot

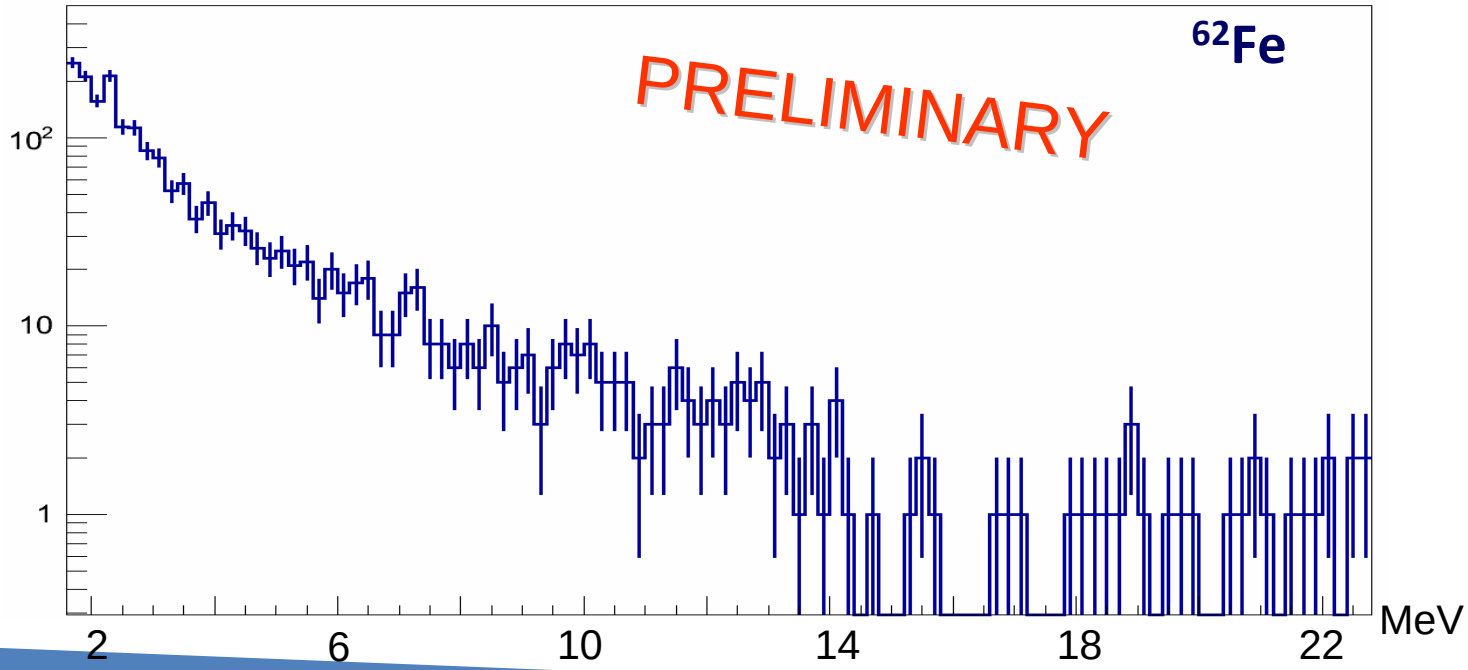


HECTOR+ spectra

$LaBr_3$:Ce Energy-Time matrix show tipical pattern with a drift in time at high energies

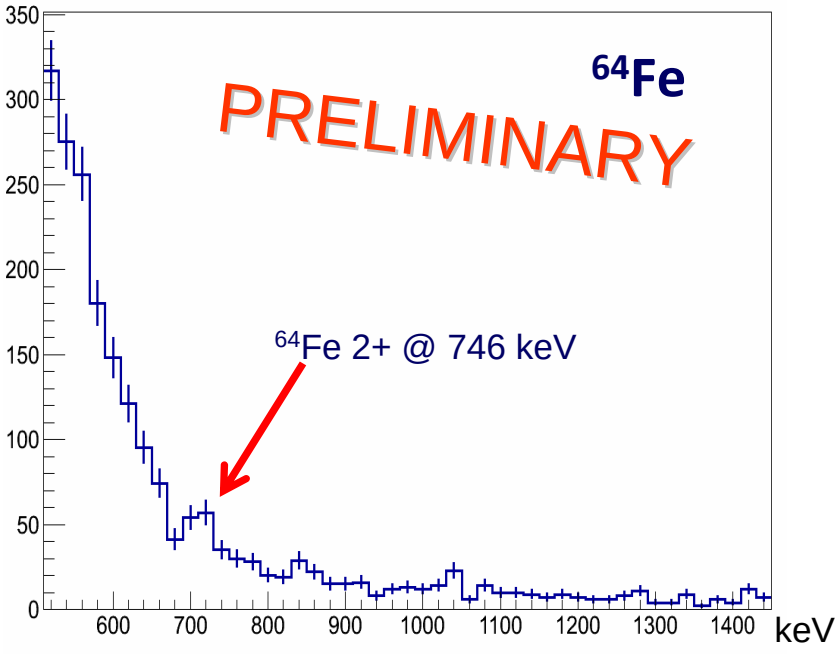


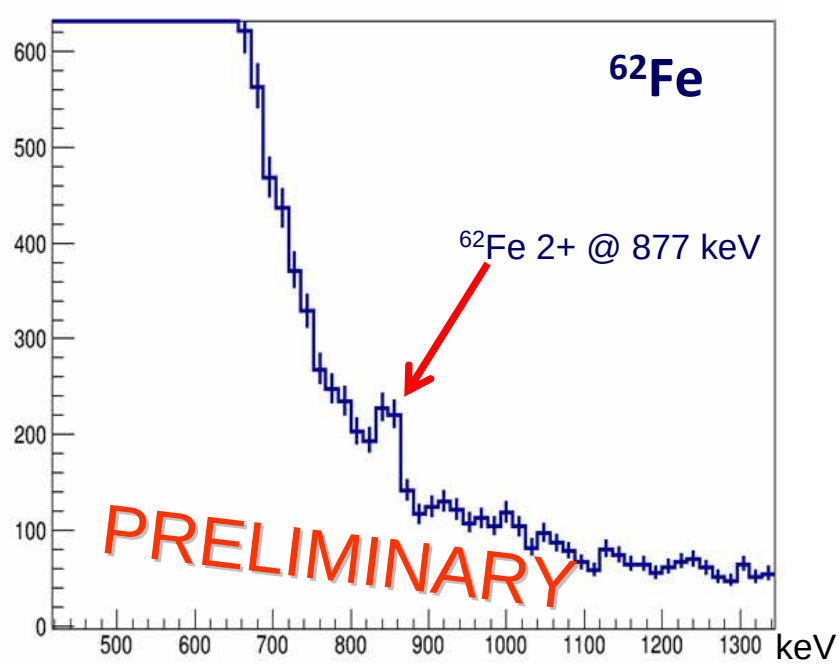
Preliminary $LaBr_3$:Ce energy spectrum shows some accumulations at high energies



AGATA spectra at low energy

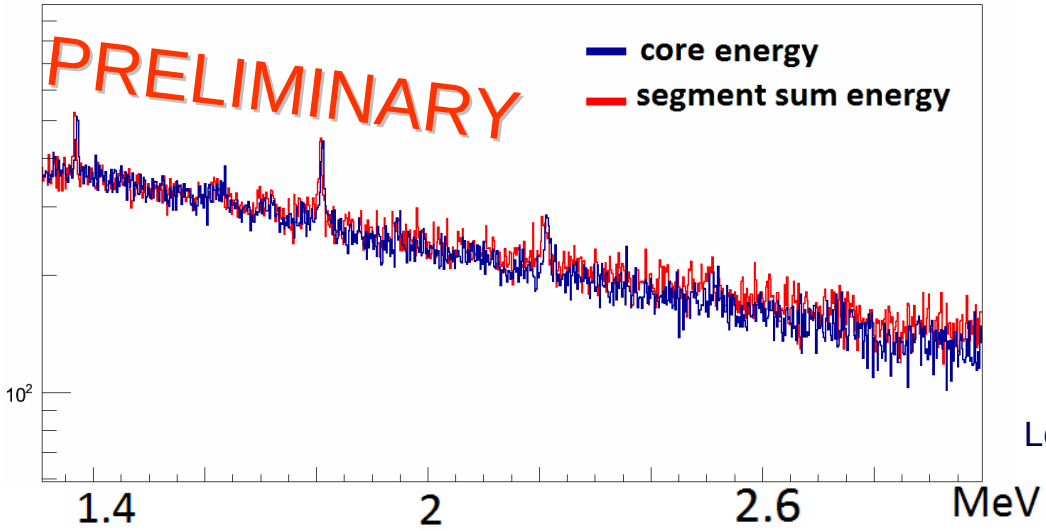
Doppler corrected AGATA spectra requiring coulomb excitation condition on ion tracking



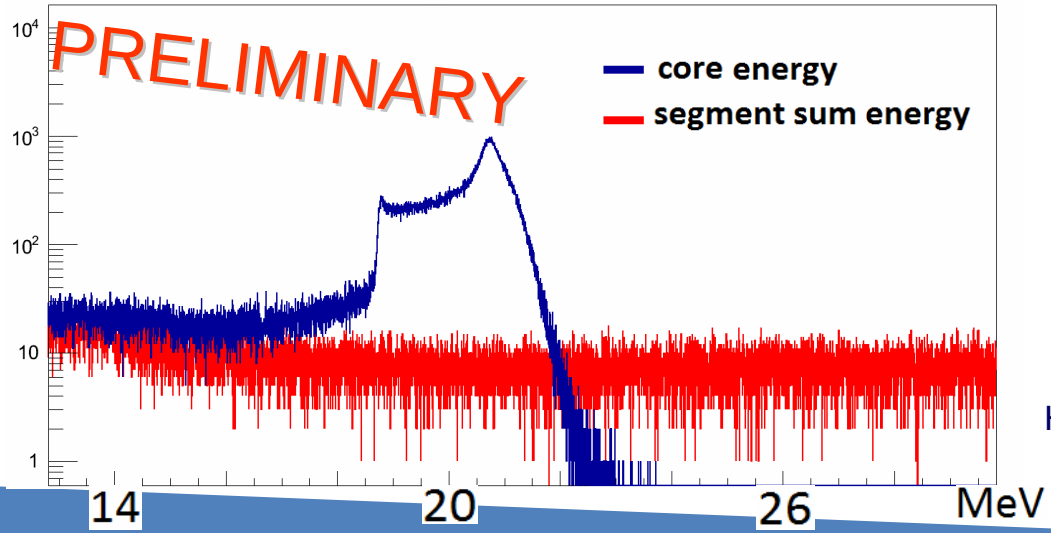


2012 High Energy AGATA data (replay)

2012 runs with long range segments (16 MeV) show that summing energy segments allows to overcome the core saturation energy. Events at so high energies are a good test for MGT libraries and for other possible algorithm used for tracking gammas

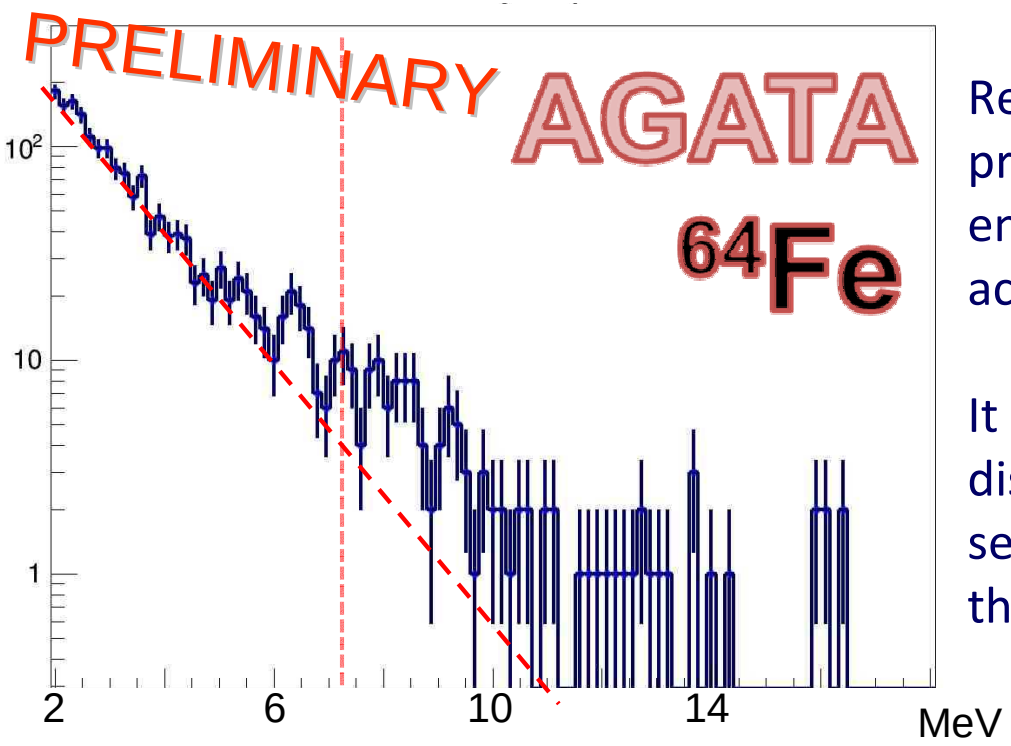


Low Energy spectrum comparison



High Energy spectrum comparison

Physic interpretation of gamma spectra



Requiring coulomb excitation condition, preliminary gamma spectra at high energy from 2012 data show accumulation at high energies

It is possible investigating E1 strength distribution below one neutron separation energies (at energies lower than PDR)

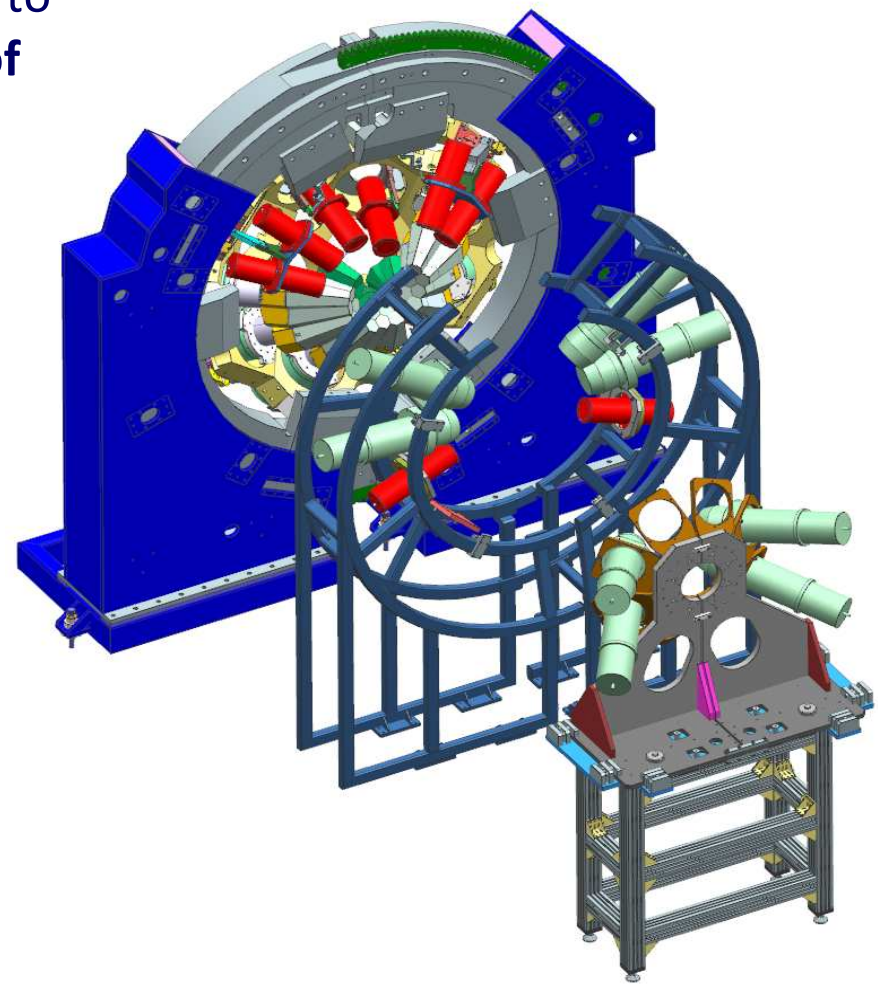
A comparison with theory and simulation is needed

Multipolar character of strength

Dweiko calculations can be exploited to obtain E1 and E2 angular distribution

HECTOR+ array coupled with **AGATA** allow to have angular distribution in a **wide range of angles**

	2012 setup		2014 setup	
	$LaBr_3$	BaF	$LaBr_3$	BaF
22.5 °	--	--	2	--
68°	4	--	4	--
95°	4	4	2	4
142°	2	4	--	4



Conclusion and perspectives

- 2+ peak identification in AGATA spectra allows to have a fine correction of β value and reference for strength at high energy

- AGATA data replayed without condition on segment energy sum allows to recover statistics at high energy

- Angular distribution for E1 strength is possible thanks to HECTOR detectors angular position

Thanks to: PRESPEC et al : A Great Collaboration

Collaboration:

- *O. Wieland, R. Avigo, A. Bracco, F. Camera, S. Ceruti, G. Benzoni, N. Blasi, S. Brambilla, F.C.L. Crespi, S. Leoni, B. Million, A. Morales, L. Pellegri, A. Giaz et al., Dip. di Fisica and INFN, Sezione di Milano, Italy*
- *A. Maj, M. Kmiecik, P. Bednarczyk, et al., The Niewodniczanski Institute of Nuclear Physics, PAN, Krakow, Poland*
- *G. de Angelis, D.R. Napoli, et al., INFN, Laboratori Nazionali di Legnaro, Italy*
- *D. Bazzacco, E. Farnea, S.M. Lenzi, S. Lunardi, et al., Dip. di Fisica and INFN, Sezione di Padova, Italy*
- *J. Gerl, M. Gorska, H.J. Wollersheim, T. Aumann, P. Boutachkov, S. Pietri, M. Reese, D. Ralet, Ch. Stahl et al., GSI, Darmstadt, Germany*
- *et al. …*
- *and the AGATA - PRESPEC and FRS collaboration.*

Thank you for your attention!