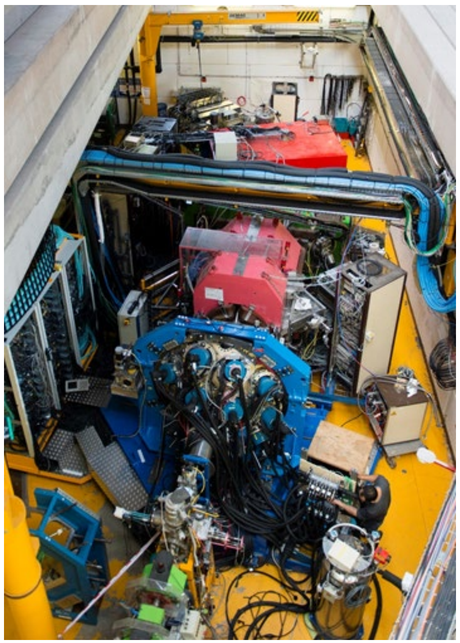
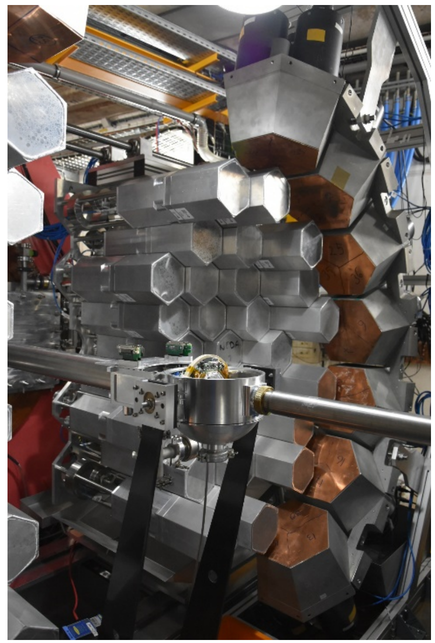
AGATA@GANIL
Status report

AGATA week 2019

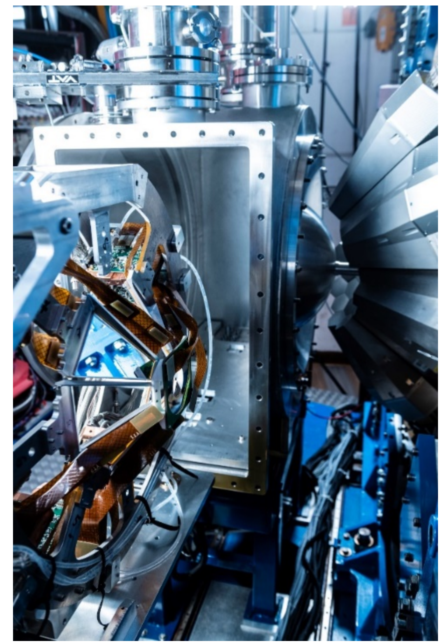
AGATA campaigns@GANIL



2015-2017
VAMOS Campaign
24-35 capsules



2018
NEDA/DIAMANT Campaign
35 capsules



2019-2020
MUGAST Campaign
41-44 capsules

2021
?? Campaign
~ 44 capsules

The GANIL Campaign organization

The AGATA campaign at GANIL has been extend to ~~2017~~, ~~2018~~, ~~2020~~, <u>2021</u>.

- 5th PAC in November 2018: call for MUGAST-AGATA-VAMOS experiments only
  - 5 MUGAST-AGATA-VAMOS experiments proposed
  - 2 experiments approved (E. Clément/A. Goasduff & A. Gottardo/M. Assié)

- 6th PAC 17-18 October 2019: call for MUGAST-AGATA-VAMOS experiments only
  - 3 MUGAST-AGATA-VAMOS experiments only proposed due to Spiral1 beam test canceled: ^{24}Ne(^{6}Li,d), ^{26}Al(d,p) and ^{47}K(d,p)

899 UT have been already approved spanned on 33 experiments
709 UT have been spanned on 25 experiments

Backlog is
3 NEDA (+ DIAMANT, PARIS, FATIMA) 66 UT
4 VAMOS 92 UT
1 MUGAST 32 UT

- 2020 beam time should be ~3 months; starting first week of February

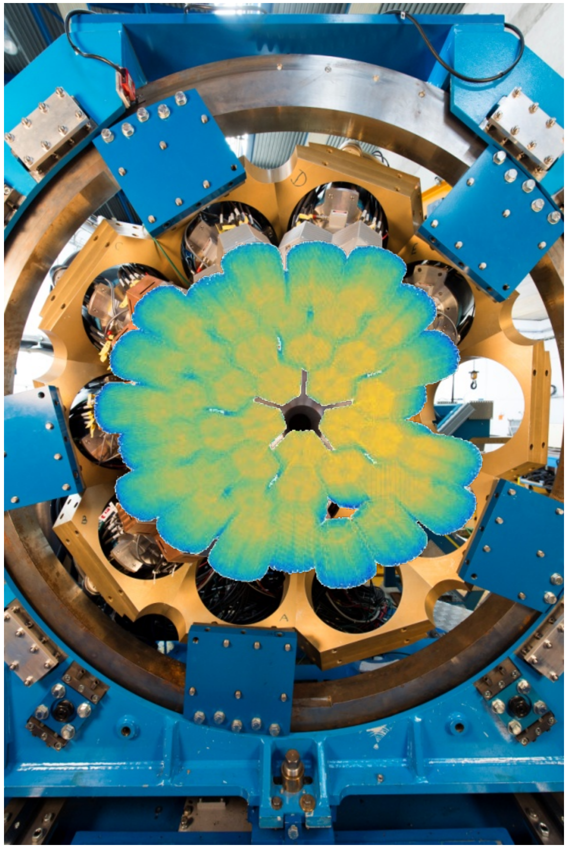
- The 7th and LAST PAC in 2020 for the 2021 beam time is to be defined

2019 Technical achievements

- Operation
  - *We ran 25 experiments since 2015
  - *In-beam data since 2014, the campaign is approved until 2021 (8 years operation)
  - *Detectors maintained cold since October 2014
  - *41 Detectors took data in 2019 in unstable conditions**
- Upgrades
  - * DCOD upgrade with trigger soft, on-line event builder and AGASPY watchers
  - * 7 new GGP channels were installed and put in operation from the 2[nd] production batch, 5 more are installed in the last workstation delivery batch. 24 ATCA** channels + 23 GGP channels are delivered at GANIL
  - * Delivery of the last batch of workstation for the next GGP production
  - *Several maintenance and re-ordering in the DAQ-box
  - *Migration of the Muscade client to Java OpenJDK for the Autofill
  - *Continus upgrades of the data-analysis tool (femul upgrade, Cubix, AGATASPY, GRID …)

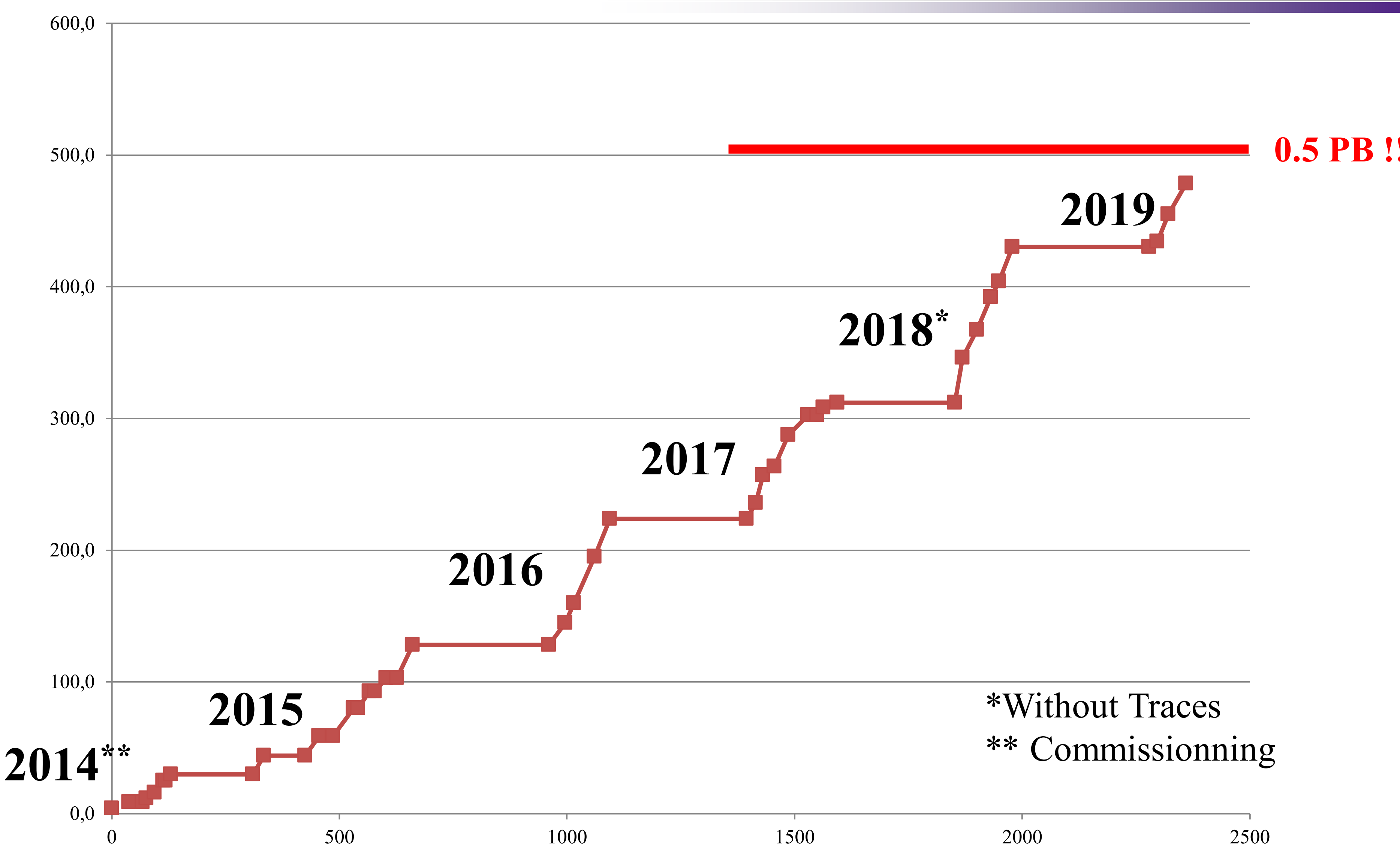
  *All the hardware is delivered at GANIL for the 1π

41 detectors on-line in 2019



AGATA@GANIL

Cumulative [TB]



2019 Technical Problems Summary

- Relatively easy GTS and DAQ coupling between AGATA-VAMOS-MUGAST

- EXOGAM2 TP is not 100% reliable at > 25kHz/core due to non-ordered request from GGP's.
- The 2019 run was performed in TriggerLess

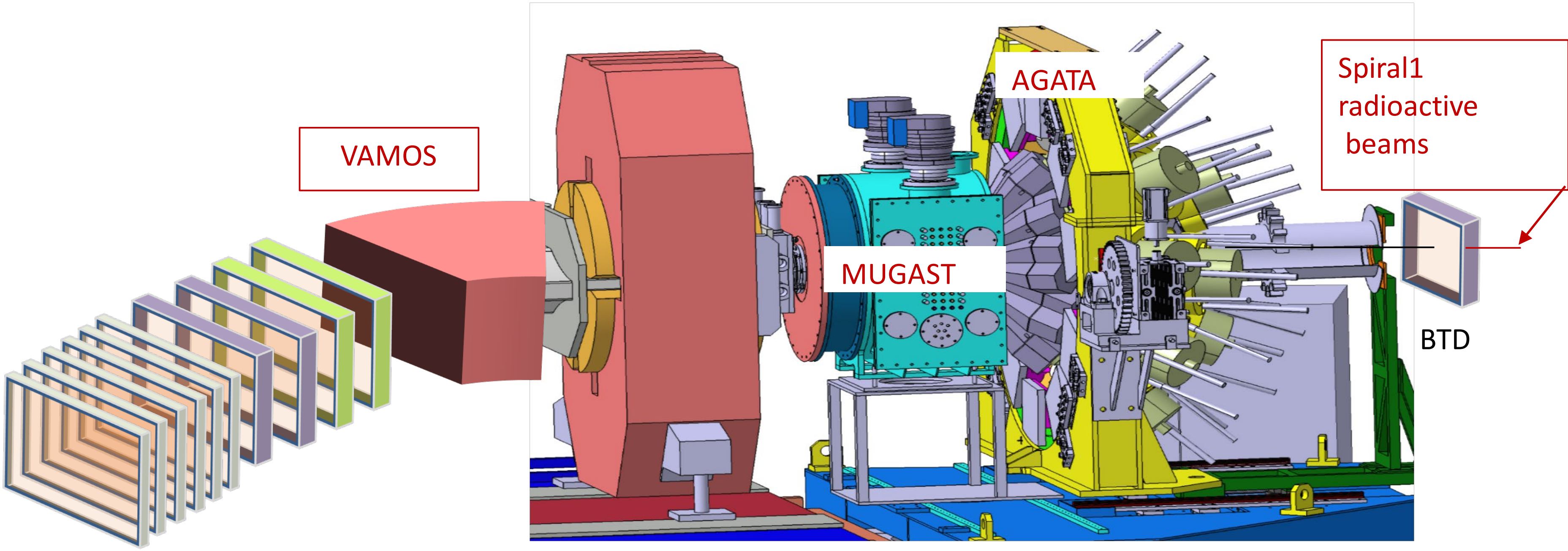
- Aging of the V0 electronic (several digitizers with sever problems and first ATCA carrier off)

- 2/3 of the experiments performed with the CEPH spear

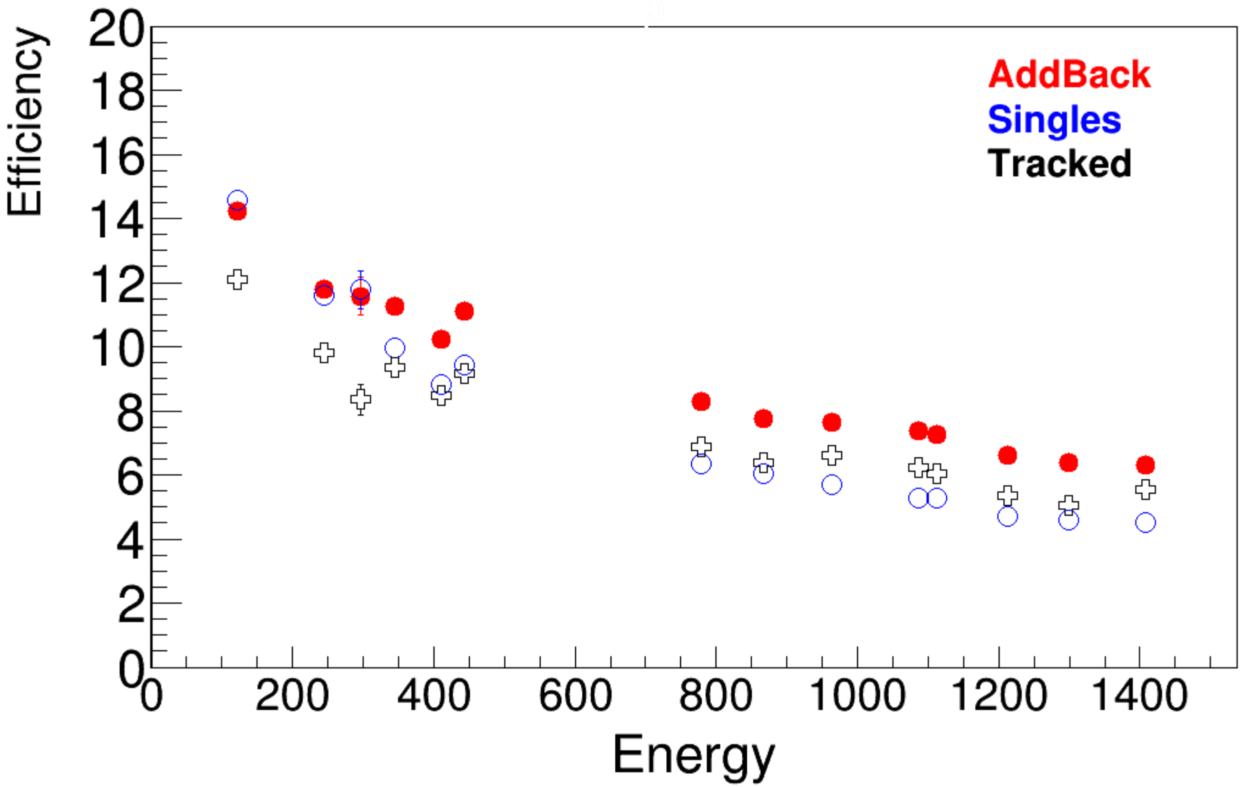
- GTS instabilities during the 2^{nd} experiment (12h lifetime) solved after a complete disassembly of the GTS Tree

- More and more detectors are requesting a refill before the 6h period

The MUGAST–AGATA-VAMOS setup



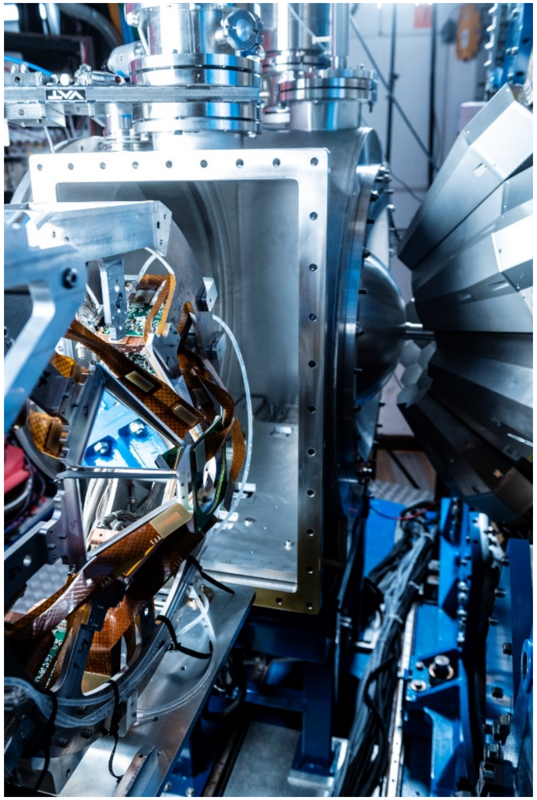
Commissioning / E744 efficiencies : 37 capsules
AGATA is approached by 51 mm for the MUGAST campaign



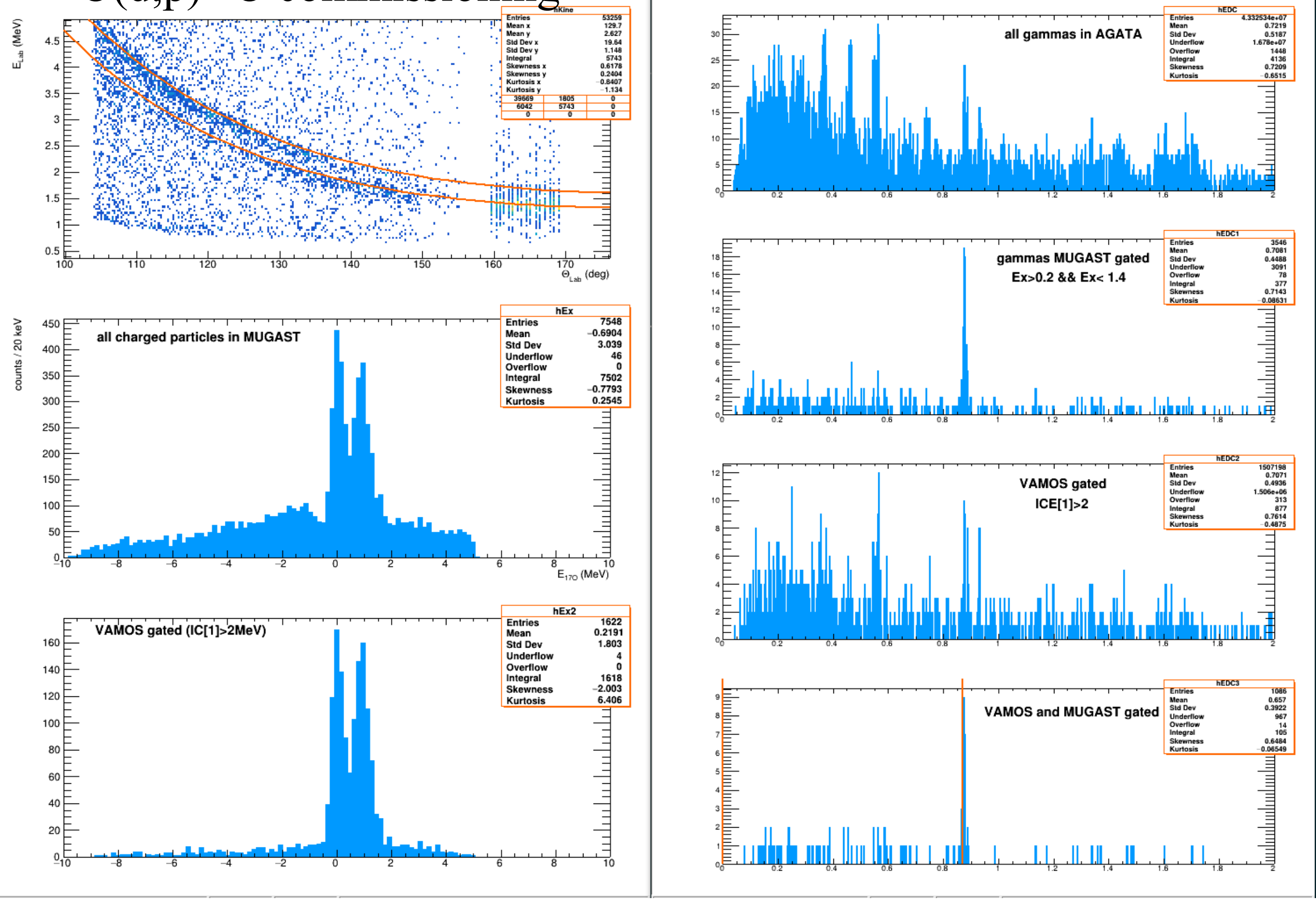
Efficiencies @ 1.4 MeV
AddBack 6.3(1)%
Tracked 5.5(1)%
According to G4 with adjusted crystal relative efficiencies

No loss at low energy was measured due to MUGAST

MUGAST commissioning



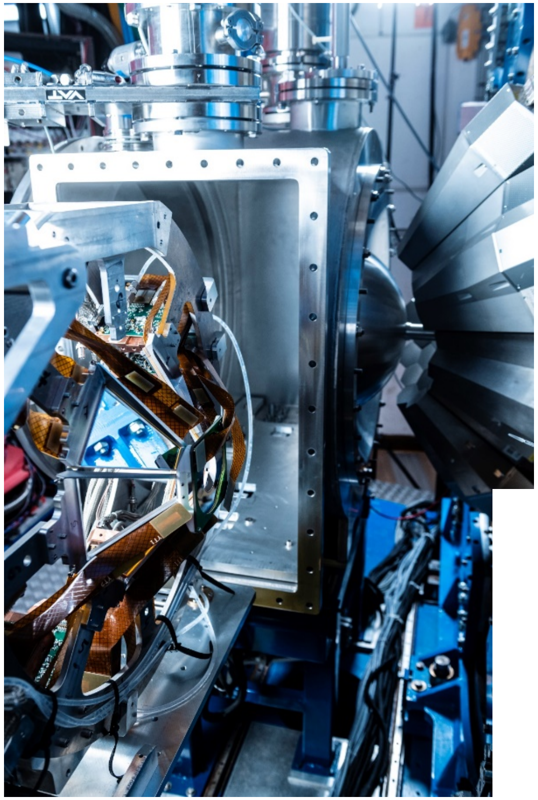
$^{16}O(d,p)^{17}O$ commissioning



AGATA in full trigger less
→ In-beam efficiencies

AddBack efficiencies
867 keV:: 152Eu= 7.7(2)%.
870 keV ^{17}O = 7.8%.
Geant4 = 7.5%

MUGAST campaign 2019



UNBOUND STATES

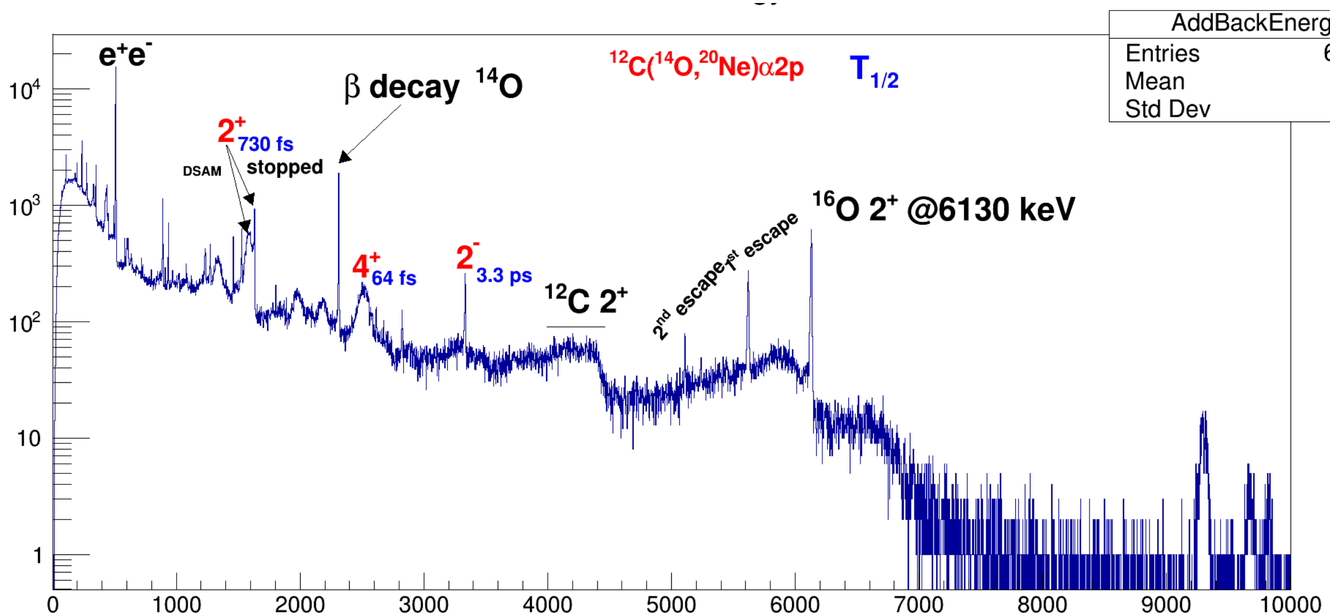
Above barrier narrow resonances in ^{15}F

$^{14}O(p,p')$ inelastic scattering

- Search for new negative parity states
- Type of two-proton decay
- Gamma transition within unbound nucleus (extremely rare)

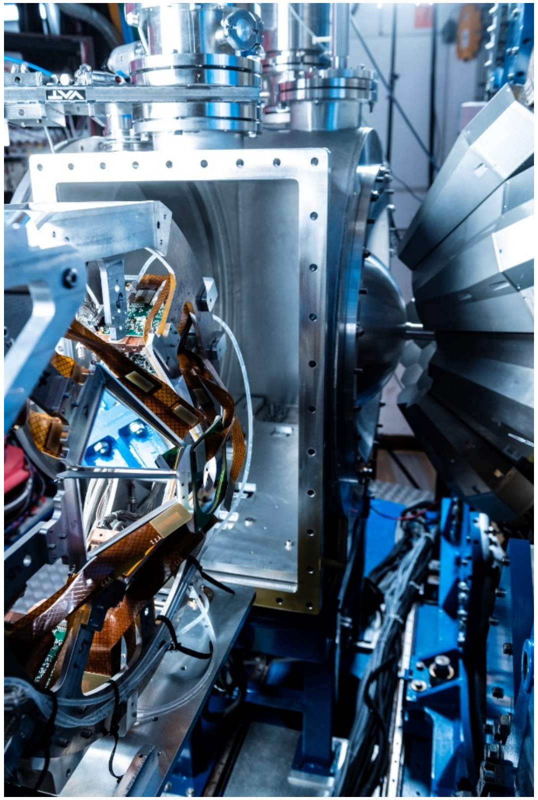
I. Stefan (IPN), F. de Oliveira (GANIL)

→ Expected γ-rays not seen (would have been a real discovery)



fs scale sensitivity
Eu energies calibration
calibrate well the 6.1 MeV line of ^{16}O

MUGAST campaign 2019



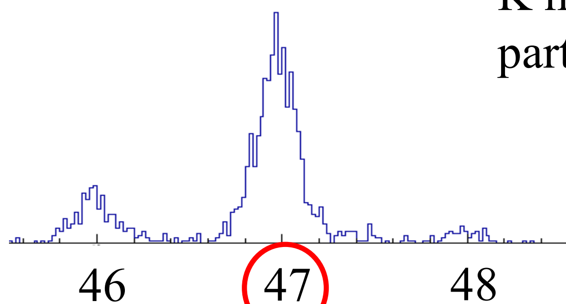
SHELL MODEL

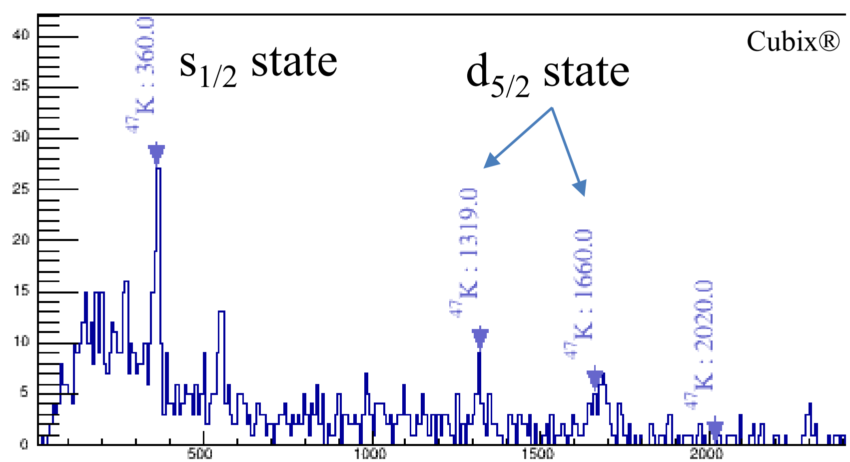
Is there a problem with protons in N=28 nucleus ^{46}Ar ?

^{46}Ar(^{3}He,d)^{47}K to probe proton WF and study vacancies in $s_{1/2}$ and $d_{3/2}$ shells.
^{3}He cryogenic target !

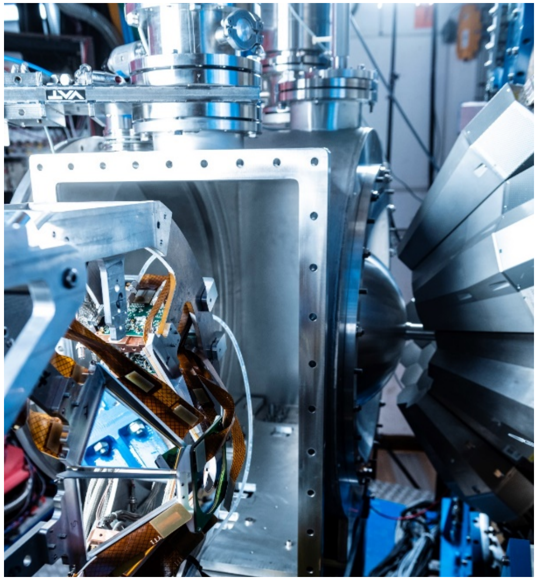
A. Gottardo INFN, M. Assié IPN

K masses isotopes in coincidence with particle at backward angle





MUGAST campaign 2019



NUCLEAR ASTROPHY.

Determining the α+^{15}O radiative capture rate

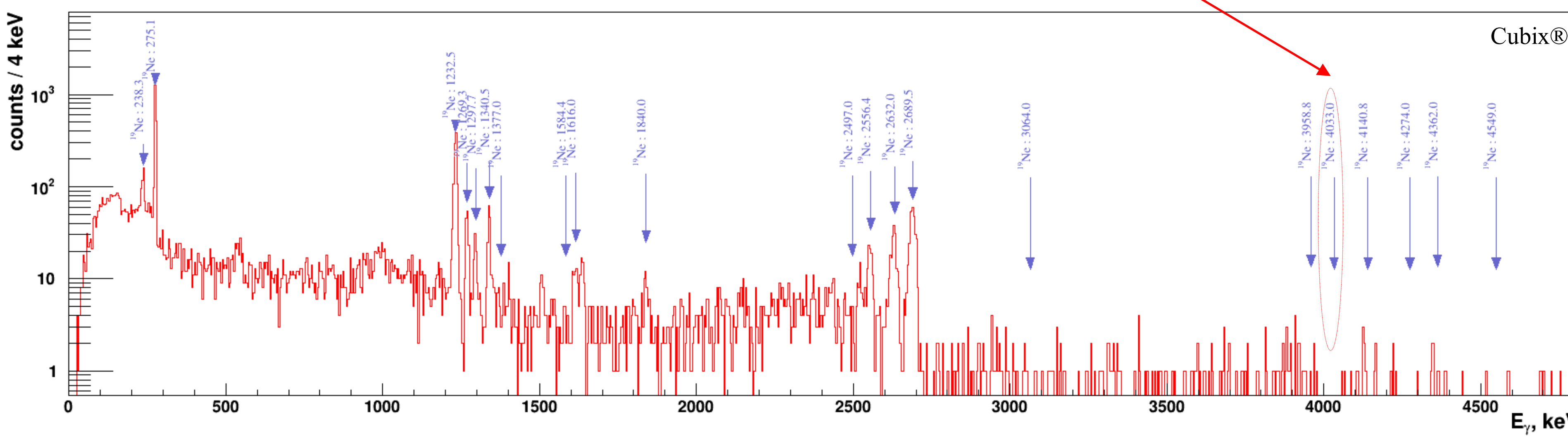
^{15}O(^{7}Li,t)^{19}Ne indirect measure

Important reaction for breakout from Hot-CNO cycle to rp-process in Type I X-ray bursts

C. Diget (York), N De Séréville (IPN)

→ Expected transition not seen

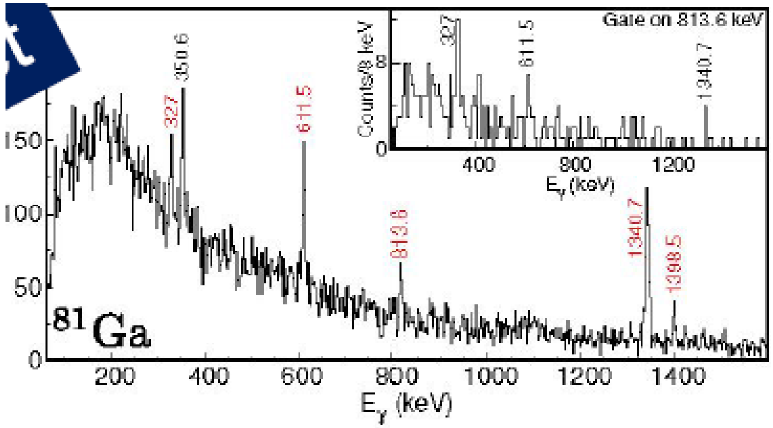
It is a result, ie that the $C_s\alpha$ is small

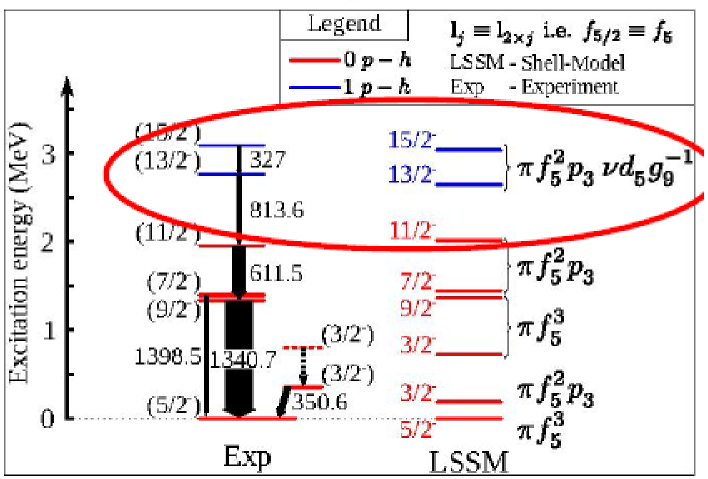


AGATA spectrum in triple coincidence with MUGAST and ^{19}Ne

Recent Publication from past campaigns

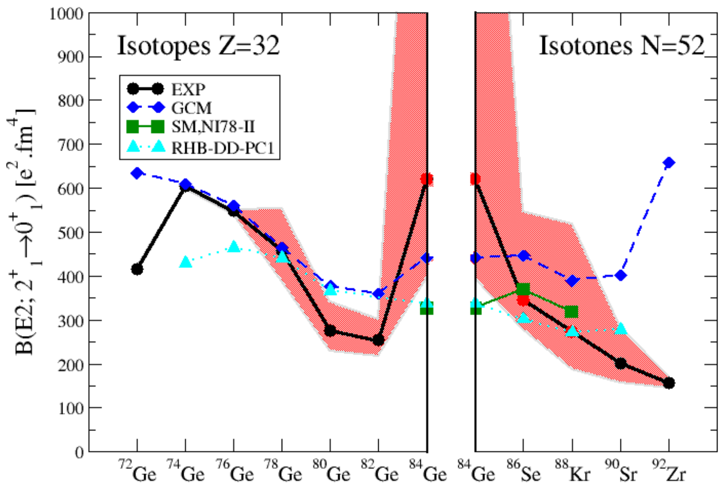
The quenching of the N=50 gap towards ^{78}Ni can be investigated looking at the Spectroscopy of excited states involving particle-hole excitations across the N=50 gap





- ^{81}Ga spectroscopy

J. Dudouet et al, Phys.Rev. C 100, 011301 (2019)



- First lifetime of excited states measured in ^{88}Kr
- Lifetime measured with better accuracy in ^{86}Se
- First lifetime measured in the very exotic ^{84}Ge
- Unexpected enhancement of collectivity in ^{84}Ge

Sudden rise of collectivity after the N=50 shell closure

… in contradiction with shell model calculation

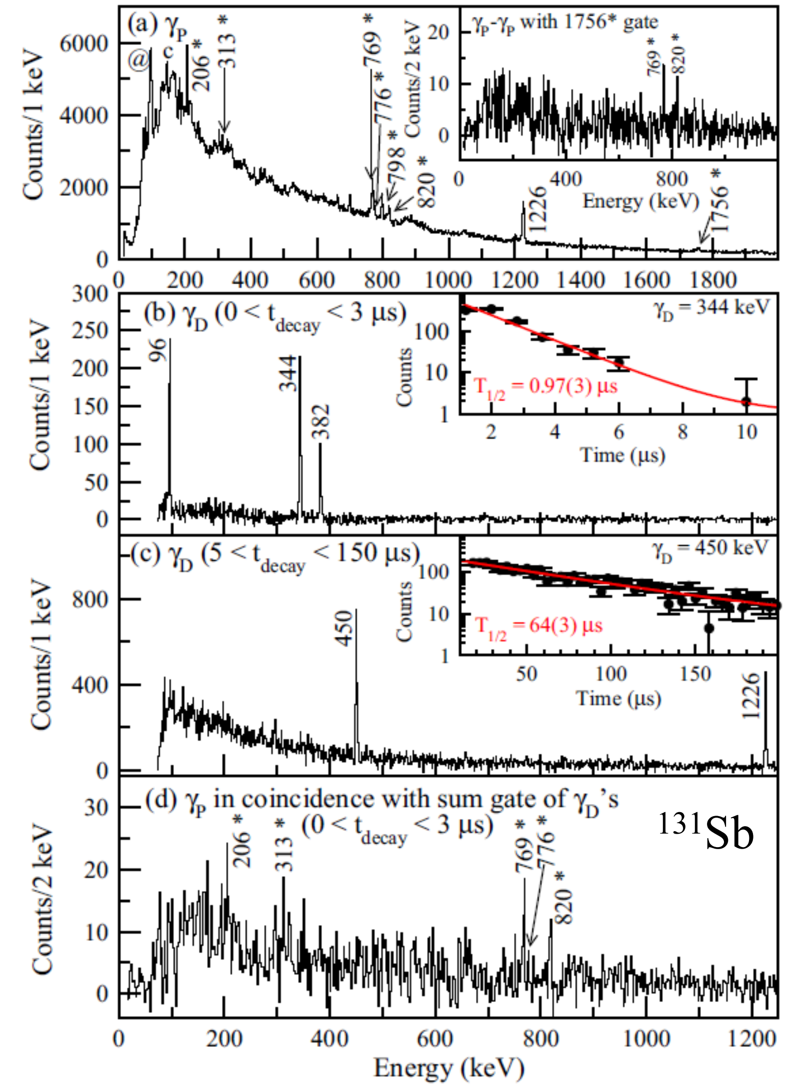
C. Delafosse et al., Phys.Rev.Lett. 121, 192502 (2018)

Effects of one valence proton on seniority and angular momentum of neutrons in neutron-rich $^{122-131}$Sb isotopes

laboratoire commun CEA/DSM CNRS/IN2P3

LSSM calculations in the ^{132}Sn vicinity constrained by combined prompt-spectroscopy, isomer spectroscopy and related B(E2) in Sb isotopes

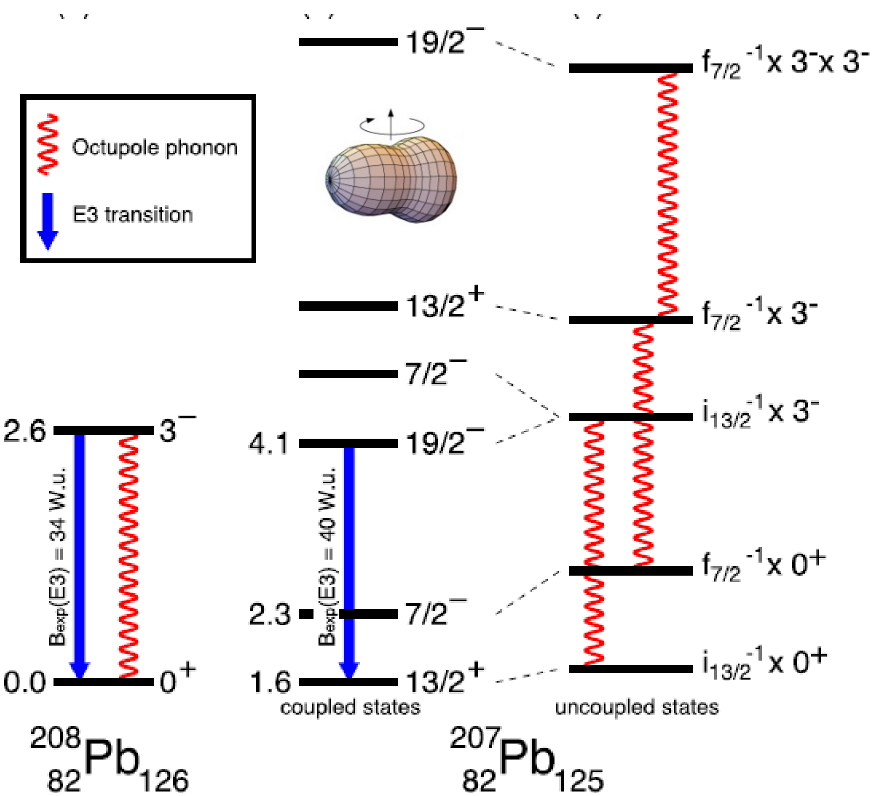
Modifications of several components of the shell-model interaction were introduced to obtain a consistent agreement in neutron-rich Sn and Sb isotopes

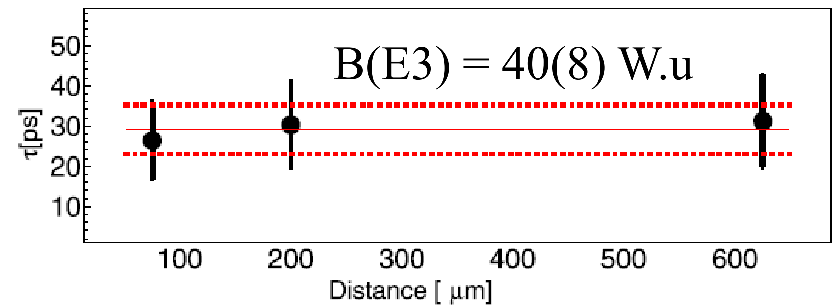


S. Biswas et al. Phys. Rev. C 99, 064302 (2019)

Shell evolution around ^{208}Pb

Study of the two-phonon vibrational states in the ^{208}Pb region
Case of the ^{207}Pb $\nu(i_{13/2})^{-1}$ state band structure





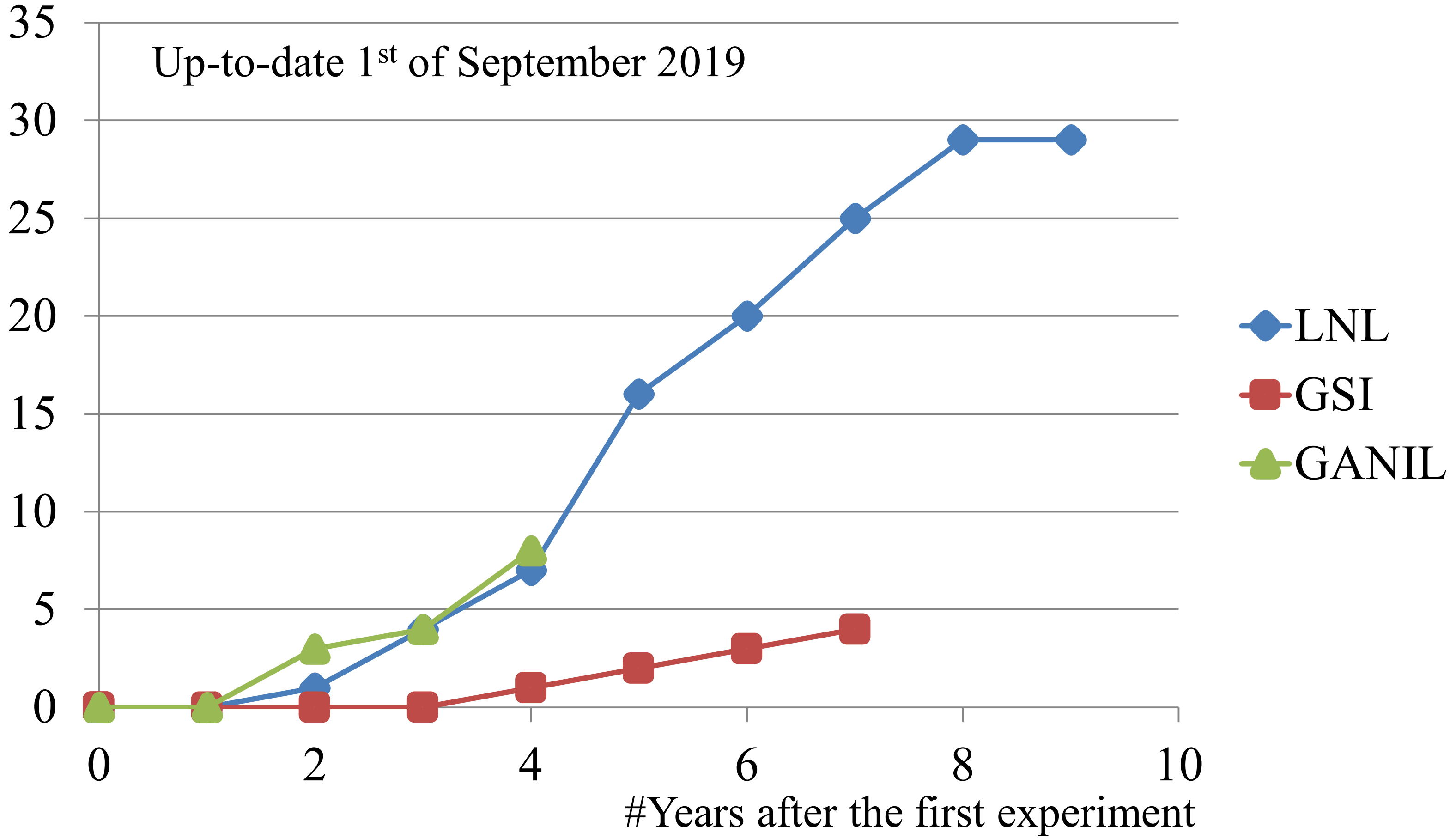
Evidence of octupole-phonons at high spin in ^{207}Pb

The measured reduced transition probability is compatible with a contribution from the two-to-one-octupole-phonon *E*3 transition.

Further information on the double-octupole-phonon state can be obtained by a more precise lifetime measurement of the 19/2⁻state in ^{207}Pb

D. Ralet et al Physics Letters B 797 (2019) 134797

Cumulative number of publications (Technical excluded)



→ On good track

Conclusion

•AGATA is operated since 2014 at GANIL and 25 experiments have been performed

•The number of detectors is approaching the 1π

•In 2019, we observed a clear aging of the electronic and detectors

• Successful start of the MUGAST-VAMOS-AGATA campaign in 2019 to be continued in 2020

• Many results are coming all along the nuclear chart for many different physics topics

• Publications are important for GANIL and AGATA

• Many thanks to all AGATA collaborators !