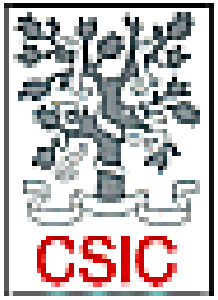
RDDS lifetime measurement in the region of the neutron-rich doubly magic ^{132}Sn: the 6^+ state in ^{136}Te.



PIAVE-ALPI / AGATA Demonstrator – PRISMA

Tayfun Hüyük

Spokesperson of the experiment: A.Gadea

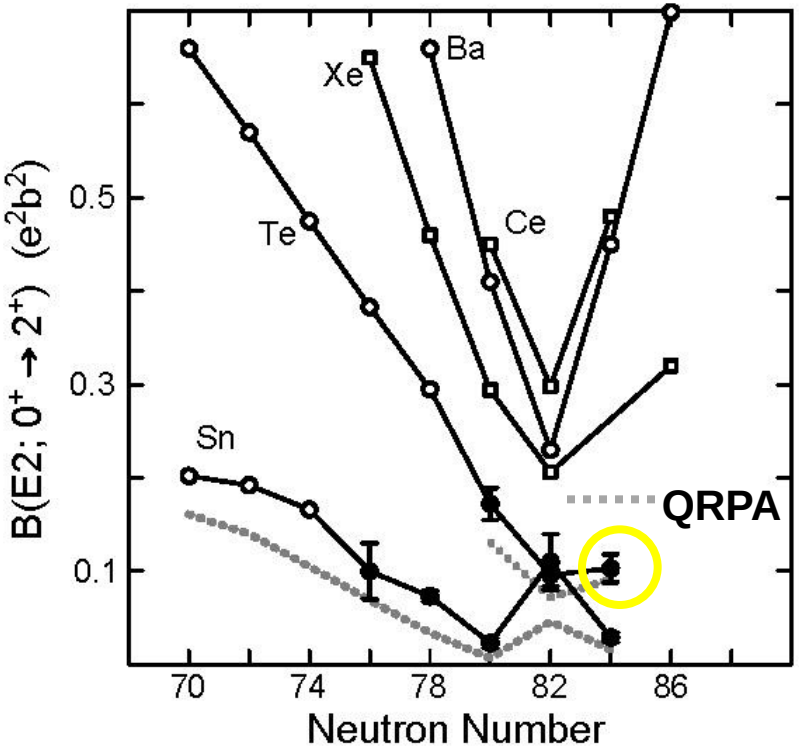
CSIC-IFIC, Valencia, Spain, IKP University of Cologne, Germany
INFN - Laboratori Nazionali di Legnaro, Italy , University of Manchester, U.K.,
University of Surrey, U.K., IKP TU Darmstadt,
INFN and Università di Padova, Italy, CSIC-IEM, Madrid, Spain
Universidad Autonoma de Madrid, Spain, Universidad de Salamanca, Spain,
INFN and Università di Torino, Italy, INFN and Università di Firenze, Italy
INFN and Università di Napoli, Italy, GSI Darmstadt, Germany
INFN and Università di Milano, Italy, Ruder Boskovic Institute, Zagreb, Croatia
Physik-Department E12, TU München, Germany, Paisley University, U.K.
and the AGATA and PRISMA COLLABORATIONS

RDDS lifetime measurement in the region of the neutron-rich doubly magic ^{132}Sn: the 6^+ state in ^{136}Te.

Contents

- The ^{136}Te Physics case
- The AGATA data analysis in **GRID**
- Status of the analysis

Physics case: Lifetimes in 136Te



Experimental B(E2;$0^+ \rightarrow 2^+$) for even-even Sn, Te, Xe, Ba and Ce isotopes D. Radford et al., NPA752 (2005) 264c

B(E2 0+ →2+) = 0.103(15) e^2b^2
Coulomb excitation measurement
D.C. Radford et al., NPA 752 (2005) 264c

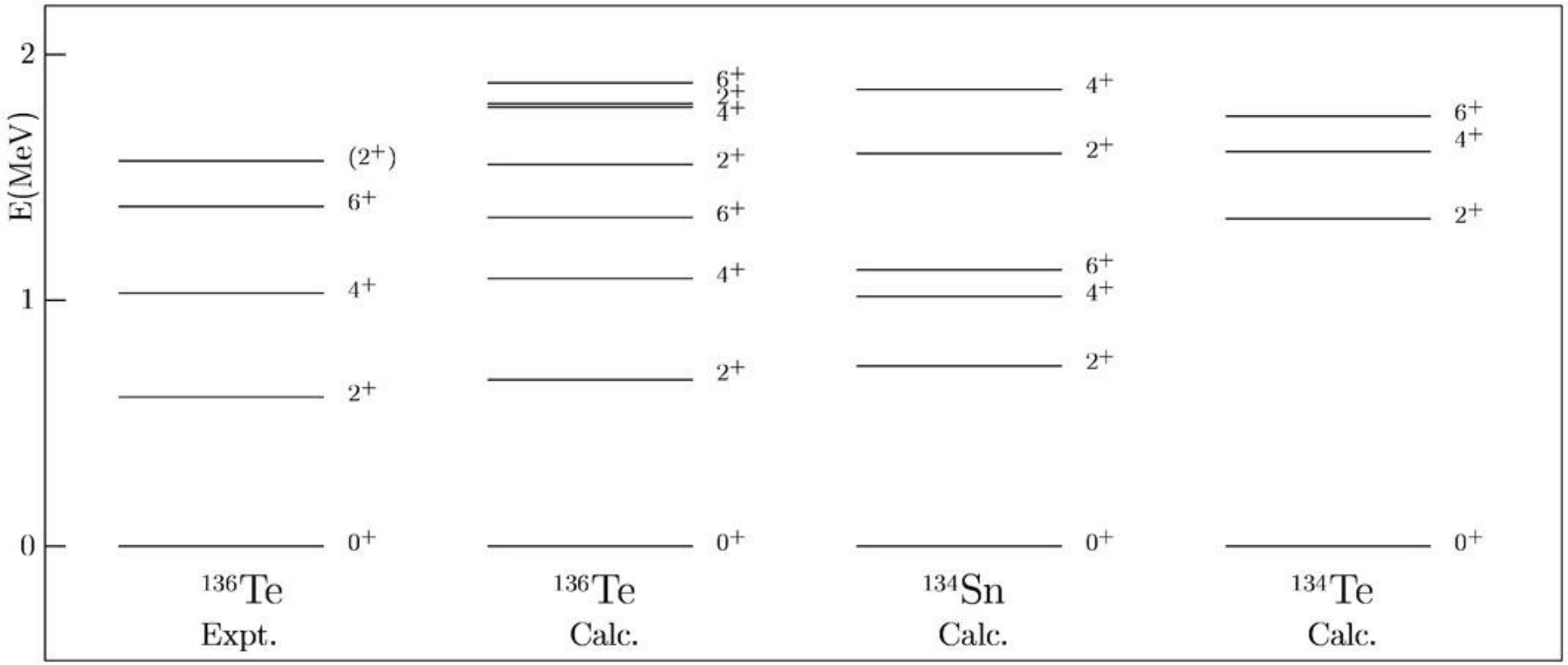
B(E2 0+ →2+) = 0.122(24) e^2b^2
fast timing lifetime measurement
L.M. Fraile et al., NPA 805 (2008) 218c

modified Grodzins rule B(E2) = 0.44(8) e^2b^2

CD-Bonn shell model B(E2) = 0.18 e^2b^2
A.Covello et al., PPNP 59 (2007) 401

QRPA B(E2) = 0.09 e^2b^2
J. Terasaki et al., PRC 66 (2002) 054313
(Modify Neutron pairing gap)

Schematic shell model B(E2) = 0.15 e^2b^2
N. Shimizu, et al., PRC 70 (2004) 054313



CD-Bonn potential, OXBASH calculation

A. Covello et al. Progress in Particle and Nuclear Physics 59 (2007) 401

Table 1
Experimental and calculated $B(E2)$ values (in W.u.) for ^{136}Te, ^{134}Sn, and ^{134}Te

$J_i^\pi \to J_f^\pi$	^{136}Te		^{134}Sn		^{134}Te	
	Expt.	Calc.	Expt.	Calc.	Expt.	Calc.
$0^+ \to 2^+$	25 ± 4	44	7 ± 1	8	24 ± 3	20
$4^+ \to 2^+$		11		1.6	4.3 ± 0.40	4.3
$6^+ \to 4^+$		7.5	0.89 ± 0.17	0.81	2.05 ± 0.04	1.9

$$|^{136}\text{Te; g.s}\rangle = 0.85|^{134}\text{Sn; g.s.}\rangle|^{134}\text{Te; g.s.}\rangle + \cdots,$$

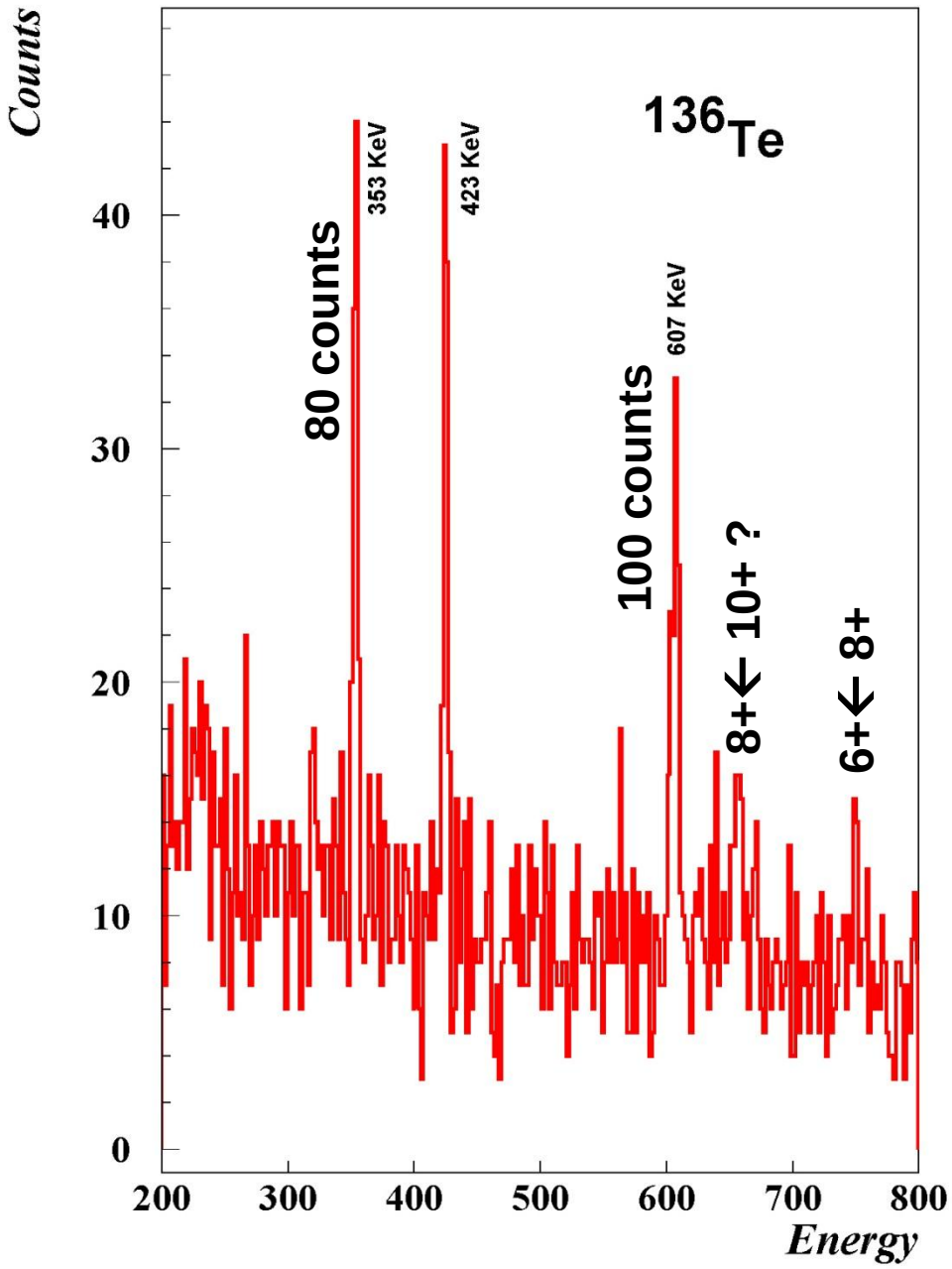
$$|^{136}\text{Te}; 2_1^+\rangle = 0.73|^{134}\text{Te; g.s.}\rangle|^{134}\text{Sn}; 2_1^+\rangle + 0.36|^{134}\text{Sn; g.s.}\rangle|^{134}\text{Te}; 2_1^+\rangle + \cdots,$$

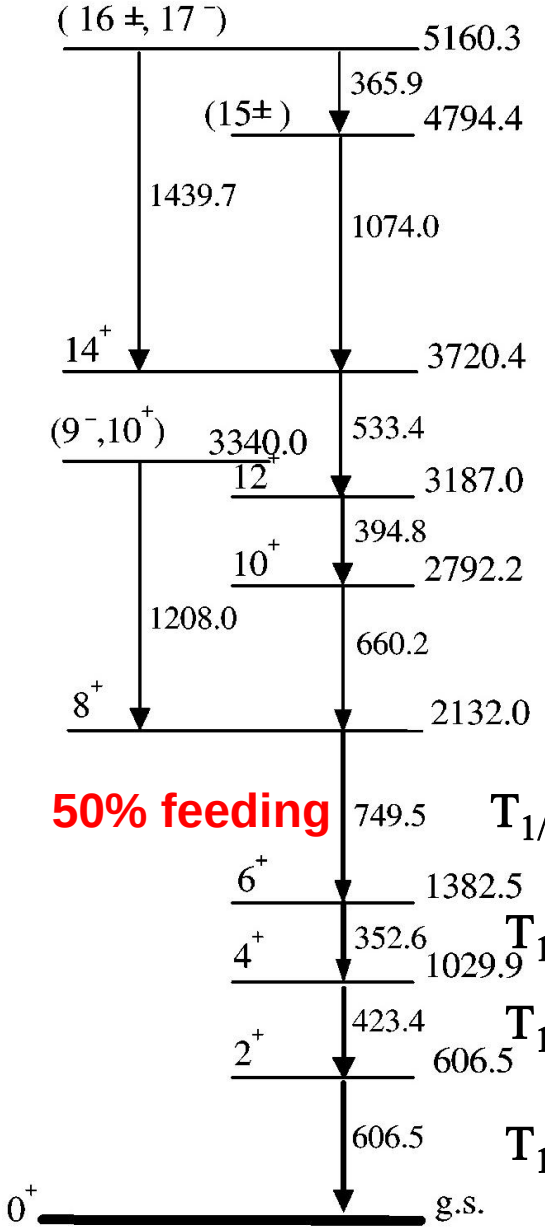
$$|^{136}\text{Te}; 4_1^+\rangle = 0.71|^{134}\text{Te; g.s.}\rangle|^{134}\text{Sn}; 4_1^+\rangle + 0.28|^{134}\text{Sn; g.s.}\rangle|^{134}\text{Te}; |4_1^+\rangle + \cdots,$$

$$|^{136}\text{Te}; 6_1^+\rangle = 0.78|^{134}\text{Te; g.s.}\rangle|^{134}\text{Sn}; 6_1^+\rangle - 0.21|^{134}\text{Sn; g.s.}\rangle|^{134}\text{Te}; 6_1^+\rangle + \cdots,$$

CD-Bonn potential, OXBASH calculation, e_π=1.55e and e_ν=0.70e

From the previous CLARA-PRISMA experiment*





50% feeding

$T_{1/2}$ ≈10 ps

$T_{1/2}$ ~ 150 ps

$T_{1/2}$ ~ 40 ps

$T_{1/2}$ ~ 30 ps

Calculated lifetime

A.Korgul et al., E.P.J. A 7 (2000) 167

*

Differential RDDS measurements at LNL

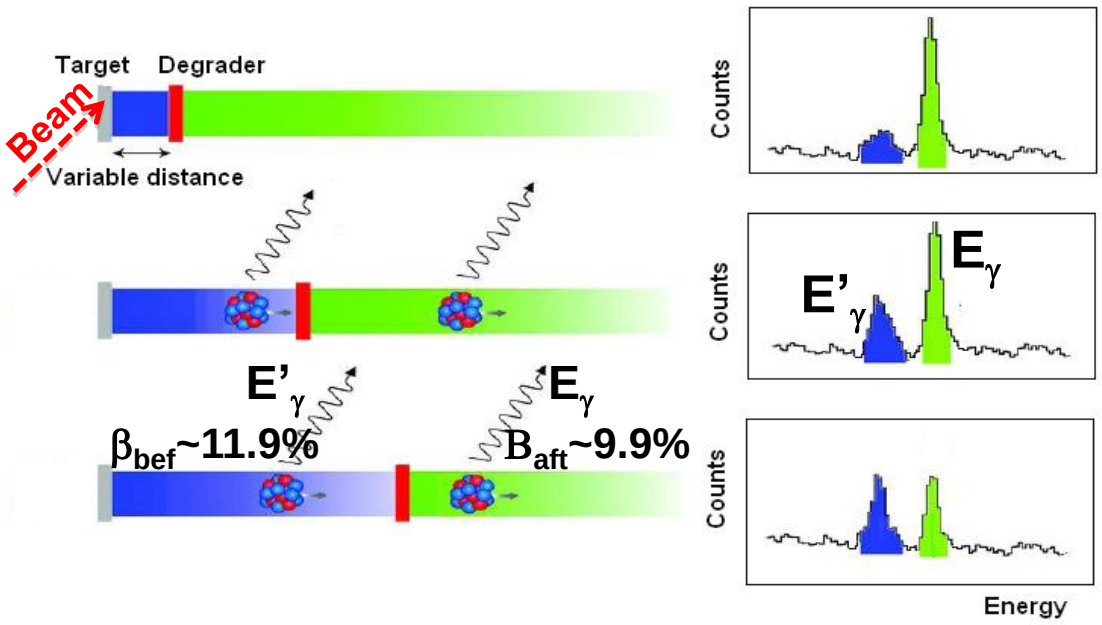


Table 1: Specifications of the Cologne differential plunger for the use in grazing reactions.

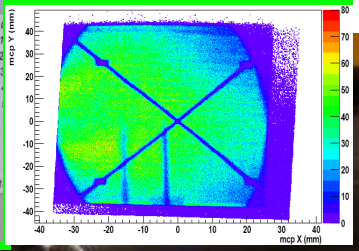
Target-degrader separations:	0–10 mm
Precision of the target-degrader separation setting (motor):	0.1 μm
Inductive transducer resolution:	0.01 μm (0–40 μm range), 0.1 μm (0–200 μm range), 1 μm (0–5 mm range)
Maximum rotation against the beam axis:	45 degrees[a]

[a] The maximum angle can be increased to 70 degrees by using different degrader cones and holding structures.

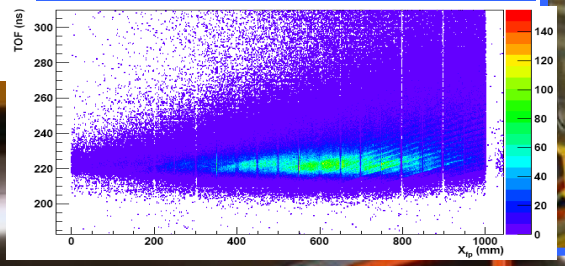
RDDS measurement θ_G=43º

A.Dewald, Th. Pissulla, J.Jolie, O. Möller (IKP, Köln and IKP TU Darmstadt)

MCP Start Det.
X,Y & T_I

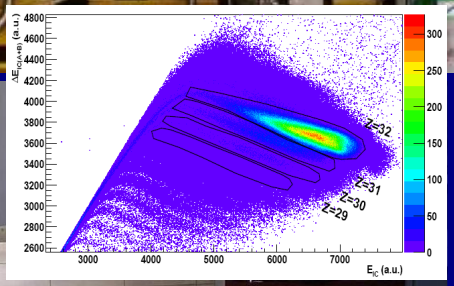


MWPPAC X,Y & T_F



10 sect.

6m TOF



10x4 sect.

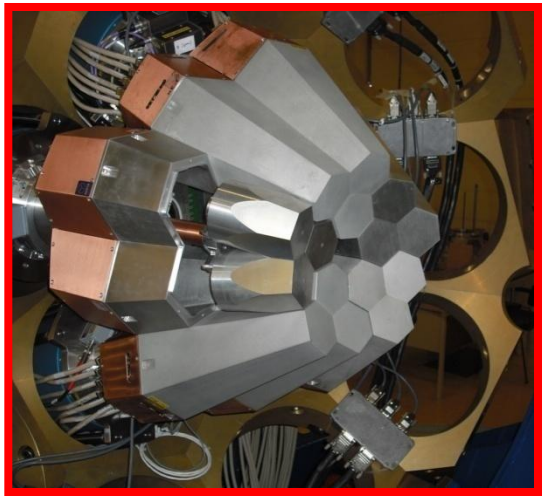
PRISMA: Tracking Magnetic Spectrometer
Large acceptance Ω = 80 msr
ΔZ/Z ≈ 1/60 (Measured) IC
ΔA/A ≈ 1/190 (Measured) TOF
Energy acceptance ±20%
Max. Bρ = 1.2 T.m.

Ionisation Chamber ΔE - E

Experimental Conditions

- Beam: ^{136}Xe 1115 MeV ~ 1pnA (very unstable) / 1080 MeV ~ 1pnA
- Target: 0.9 mg/cm^2 ^{93}Nb + 1,4 mg/cm^2 ^{238}U /
  0.8 mg/cm^2 ^{93}Nb + 2 mg/cm^2 ^{238}U
- AGATA-Target shift: -65.6 mm in z-axis
- Plunger Degrader 4.6 mg/cm^2 ^{93}Nb
- Grazing angle 43^o,
- Reaction products at 43^o after target TKE~890 MeV β~11.9%
- Reaction products at 36^o after degrader TKE~630 MeV β=9.9%
- The Reaction product arrives to the PRISMA IC with ~570 MeV
- Only two Target-Degrader distances: 2.5 mm (~70 ps), 5 mm (~140 ps)
- 1pnA ^{136}Xe reaction on ^{238}U produces 40kHz
  counting rate per AGATA crystal
- PRISMA magnetic fields; Dipole: 0.915202 T
  Quadrupole: 0.880938 T

TOTAL Effective Beam Time used:
4 days of the 8 approved by the LNL PAC

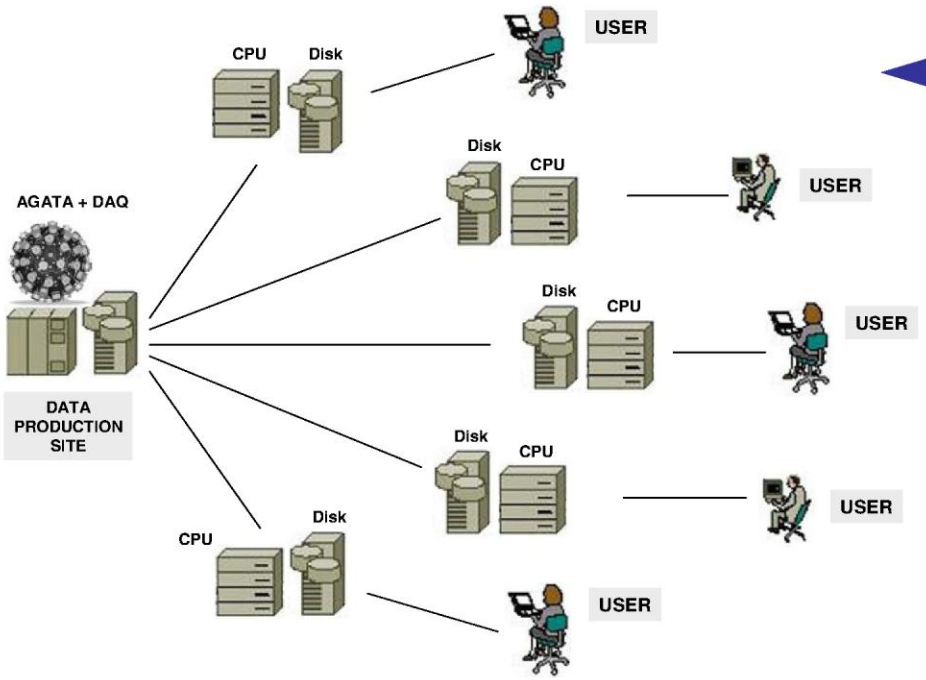


A GRID COMPUTING MODEL FOR AGATA DATA MANAGEMENT AND DATA PROCESSING

Based on the document of "**The AGATA Grid Computing Model for Data Management and Data Processing**"

by **M. KACI (CSIC – IFIC, Valencia, Spain)**

COORDINATED RESOURCE SHARING…

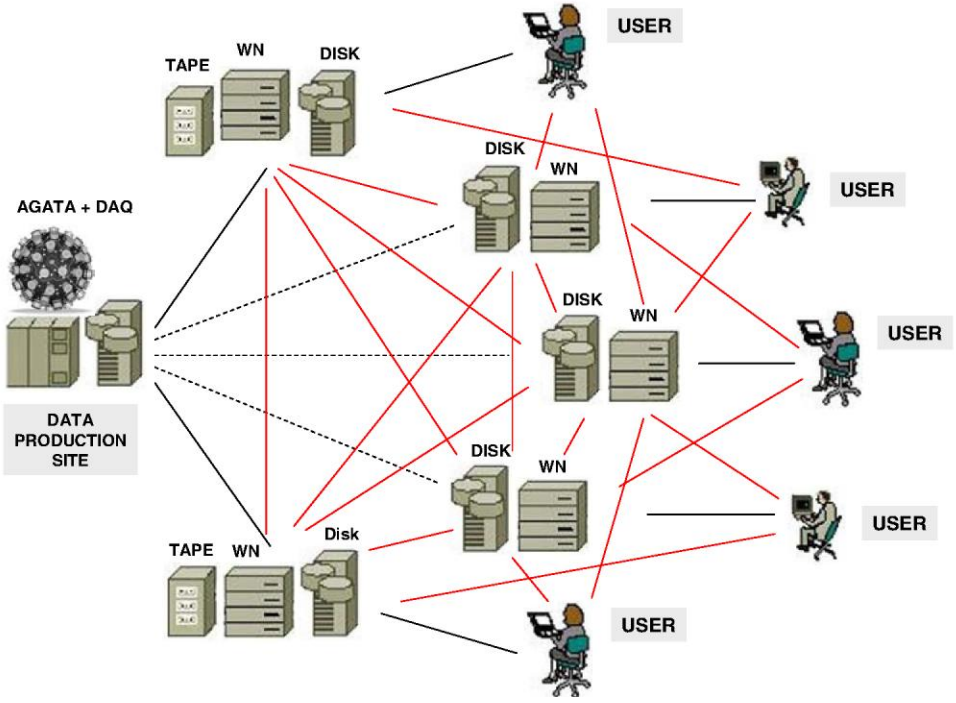


MIGRATE FROM…

The classical situation where each user / institution uses his / its own computing resources and takes a copy of the experimental data at the local institution…

TOWARDS…

A new situation where the users share computing resources and data in a coordinated way (policy) within a Virtual Organization…



THE EXISTING GRID RESOURCES FOR AGATA

STORAGE SYSTEM

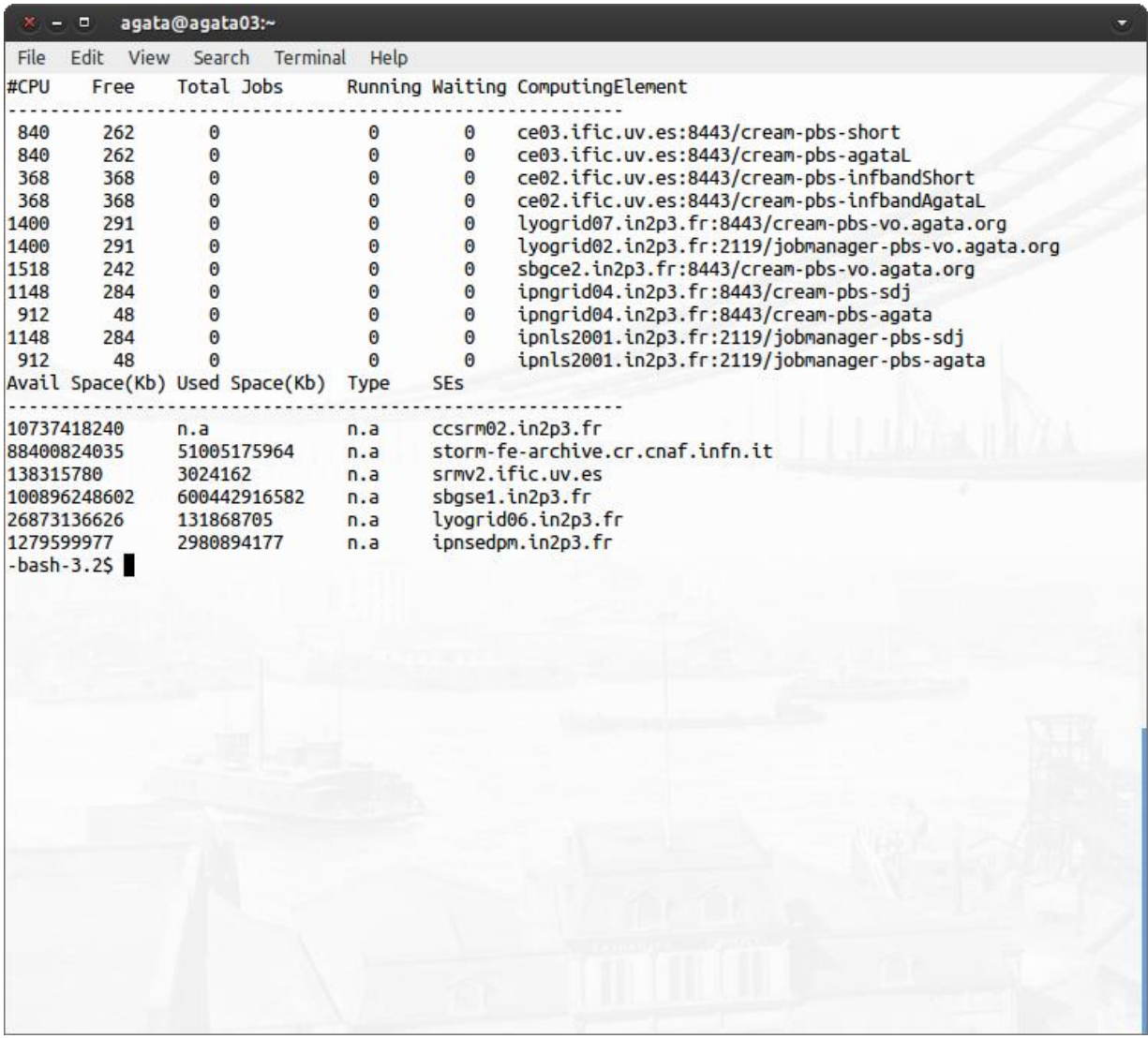
Recording the line-shape of the output signal…
TeraBytes of Data…
Hundreds of Data Files per experiment…

CPU POWER

Off-line Pulse Shape Analysis is time consuming…
Complex γ-ray tracking also…
Complex algorithms (PSA, tracking)

OTHER GRID SERVICES

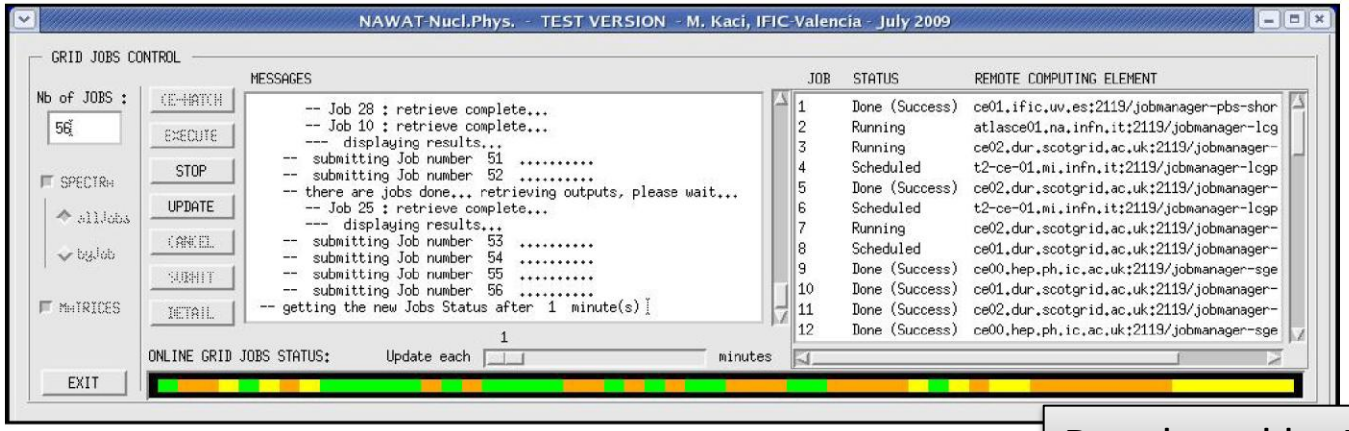
UI, WMSPROXY, BDII,…



THE END-USER IN THE AGATA GRID COMPUTING MODEL

The Computing Model would not be complete without a front end interface allowing the end users running transparently their data processing on the Grid…

A light Grid application with user friendly GUI is to be adapted for AGATA Data processing…



Developed by M. KACI

A support to the users for running their Data processing on the Grid is also contemplated in the proposed AGATA Grid Computing Model

FEW NUMBERS

Nawat-agata has been run in all AGATA Grid sites:

Using run_0047 of 2011_week29 experiment:

Number of data files processed: 30 (2 to 4 GB per file, total size around 93 GB)
ProcessType: PSA
DataAccess: NONE
Sites:

IPNL :	01:02:21	success	25/30
IPHC :	01:06:25	success	30/30
IPNO :	01:13:41	success	30/30
IFIC :	01:03:17	success	30/30
	00:52:15	success	30/30 with DataAccess = Lustre

Using the whole data of 2011_week29 experiment:

For the following Tasks, around 200 cores was available

PSA data processing of the whole experiment:
373 data files (near 0.5 TB); 01:21:36

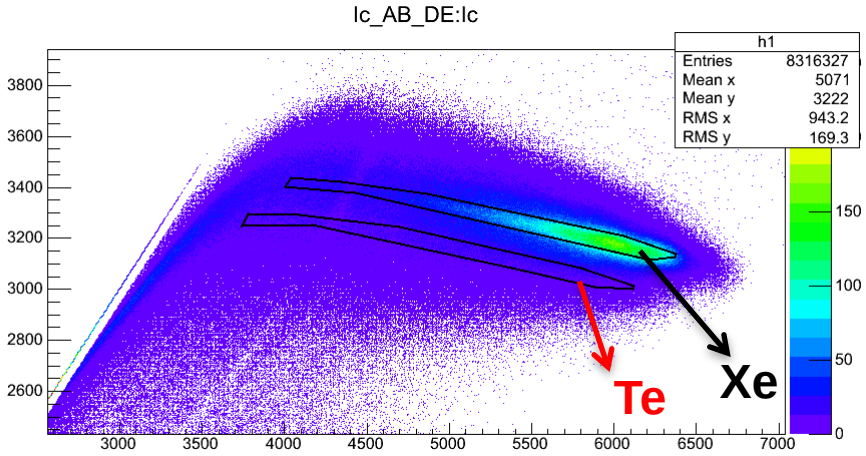
MERGING+TRACKING processing:
25 runs; 00:37:43

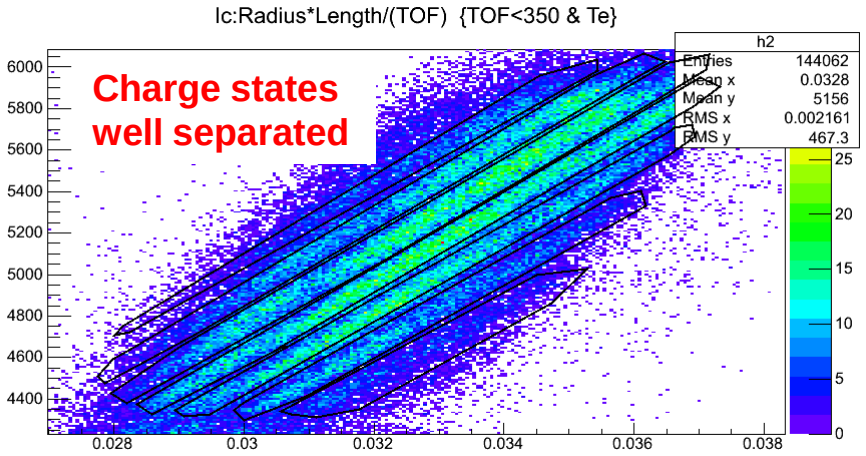
PSA data processing for calibration files:

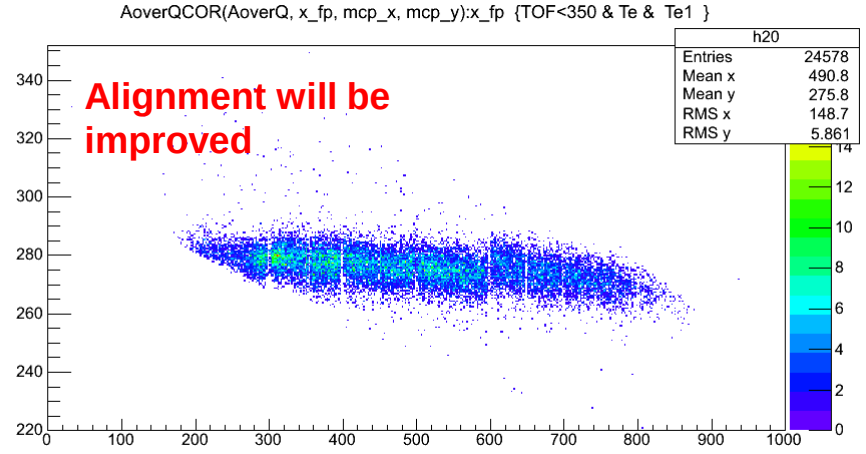
600	data files (2.3 TB);	02:55:40;	DataAccess = Lustre
947	data files (3.6 TB);	03:57:45;	43 jobs failed.

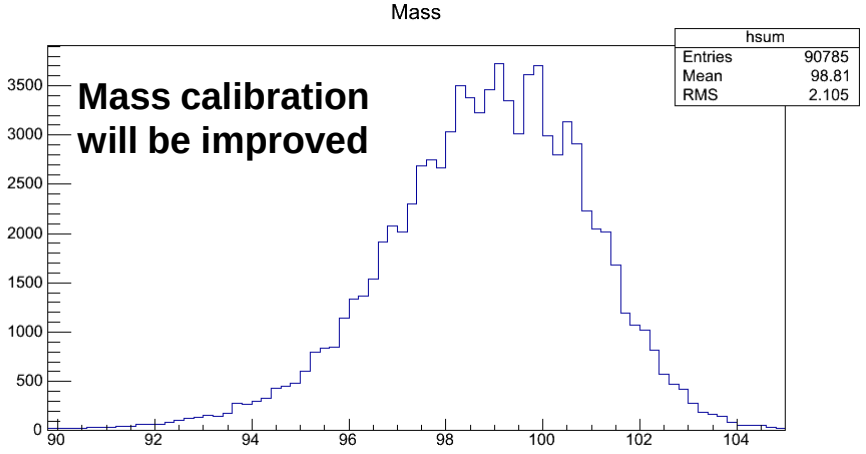
Status of the Analysis

It was necessary to perform PSA and tracking offline and we have now all performed in GRID.









A.Gadea[1], F.Recchia[3] , S.Lunardi[3] , T. Hüyük[1], A.Algora[1], G.de Angelis[2], L.Corradi[2], E.Fioretto[2], A.Gottardo[2], D.R.Napoli[2], , E.Sahin[2], A.M.Stefanini[2], J.J.Valiente Dobon[2], S.J.Freeman[4], A.Deacon[4], D.Steppenbeck[4], C.Fitzpatrick[4], E.Farnea[3], D.Bazzacco[3], S.Lenzi[3], , R.Menegazzo[3], D.Mengoni[3], D.Montanari[3], C.Michelagnoli[3], G.Montagnoli[3], F.Scarlassara[3], C.A.Ur[3], G.Pollarolo[5], A.M.Bizzeti-Sona[6], P.G.Bizzeti[6], A. Giannatiempo[6], B.Melon[6], A.Nannini[6], A.Covello[7], A.Gargano[7], L.Coraggio[7], N.Itaco[7], A.Jungclaus[9], R.Orlandi[9], A.Bracco[10], G.Benzoni[10], F.Camera[10], B.Million[10], S.Leoni[10], N.Blasi[10], O.Wieland[10], F.Crespi[10], S.Szilner[11], Th. Kröll[12], O. Möller[12], N. Pietralla[12], J.Wrzesiński[14], A.Dewald[15], P.Reiter[15], K. Geibel[15], D. Lersch[15], B. Birkenbach[15], B. Bruyneel[15], W.Rother[15], B .Quintana[16], M.Doncel[16], A. Hernandez[16], D.Barrientos[16].

and the AGATA and PRISMA collaborations.

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5 INFN and Università di Torino, Italy, 6 INFN and Università di Firenze, Italy
7 INFN and Università di Napoli, Italy 8 GSI Darmstadt, Germany
9 IEM-CSIC, Madrid, Spain,10 INFN and Università di Milano, Italy
11 Ruder Boskovic Institute, Zagreb, Croatia 12 IKP TU Darmstadt, Germany
14 IFJ-PAN, Krakow, Poland 15 IKP, Universtaet zu Koeln, Germany
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