The AGATA CAMPAIGN at LNL

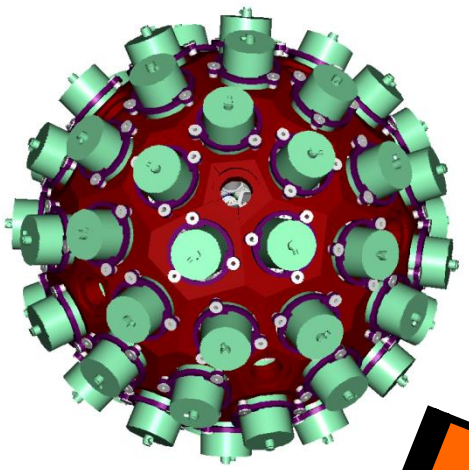
Daniele Mengoni

Università and INFN Padova – ITALY

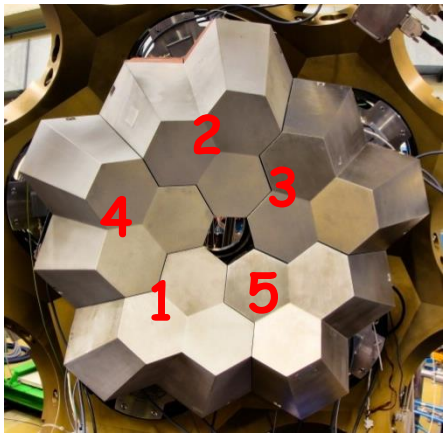
for the AGATA collaboration

ARIS – Advances in Radioactive Isotope Science 2014
1th- 6th June 2014, Tokyo - Japan

Advanced Gamma-ray Tracking Array

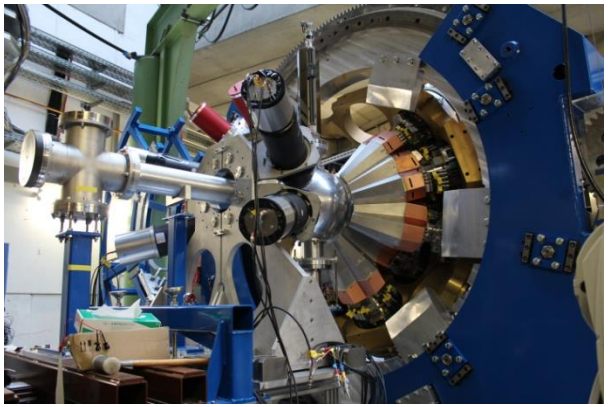


2009 LNL



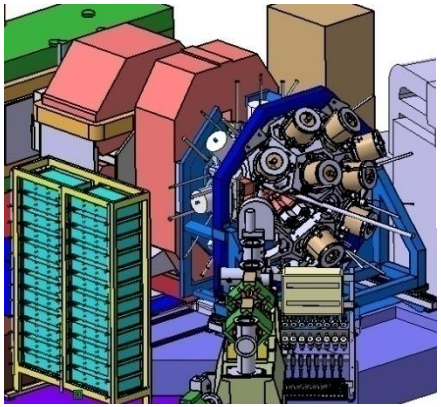
- 5TC
- PRISMA
- EFF~6%

2012 GSI



- 8TC
- FRS
- EFF>10%

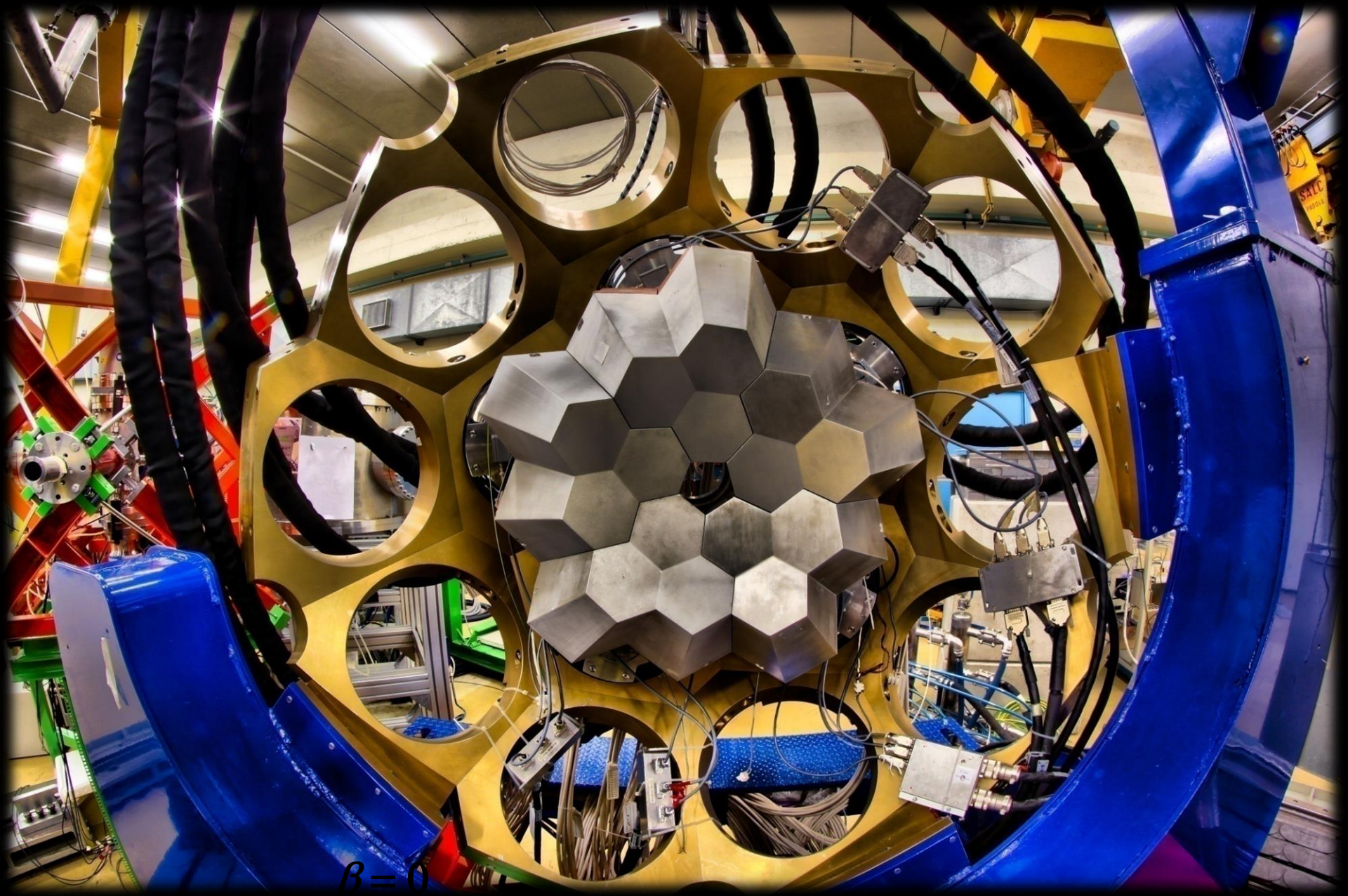
~2014 GANIL



- 15 TC
- VAMOS
- EXOGAM
- EFF~20%

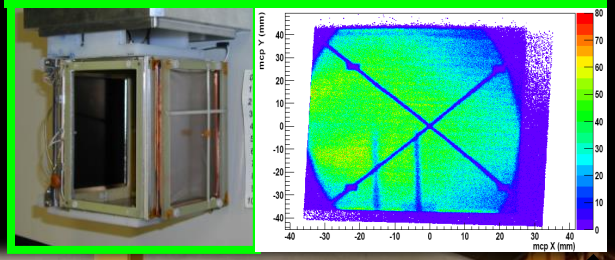
SPES
exotic beams for science

The first implementation of AGATA installed at LNL

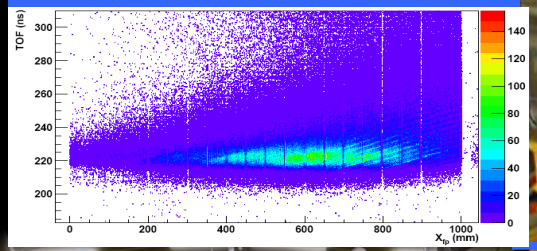


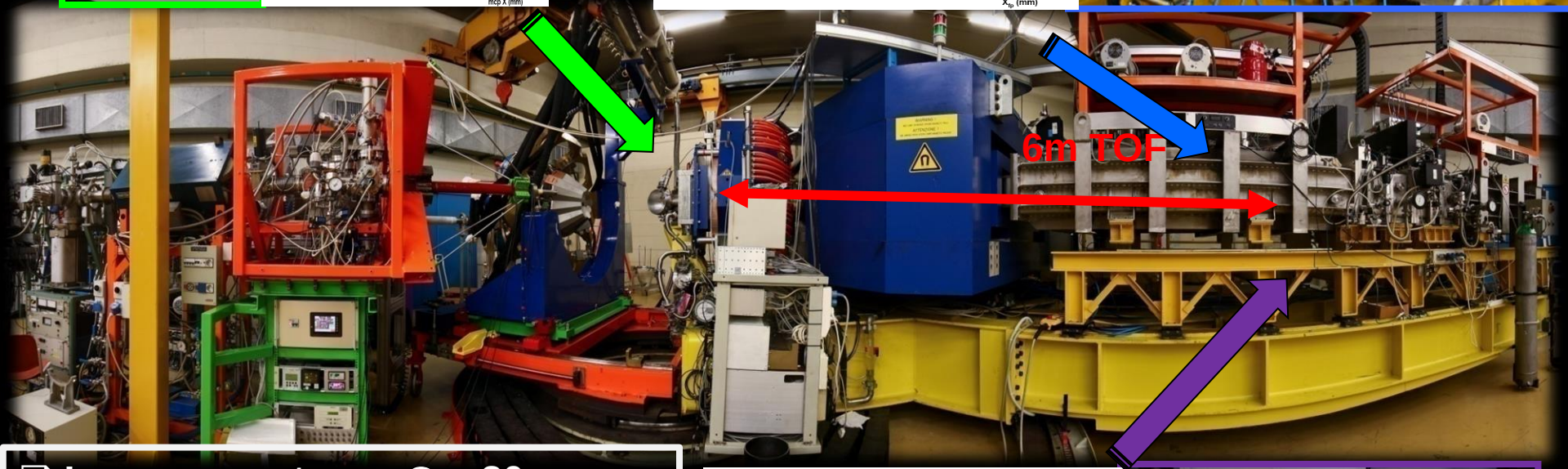
PRISMA: Tracking Magnetic Spectrometer

MCP Start Det.: X,Y & T_I

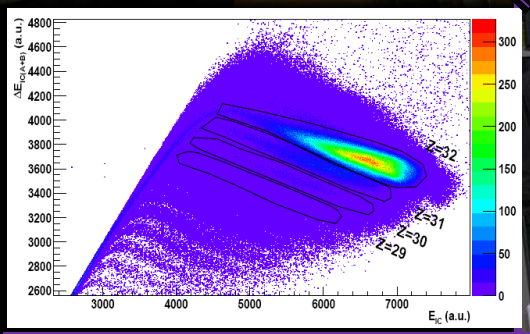


MWPPAC X,Y & T_F



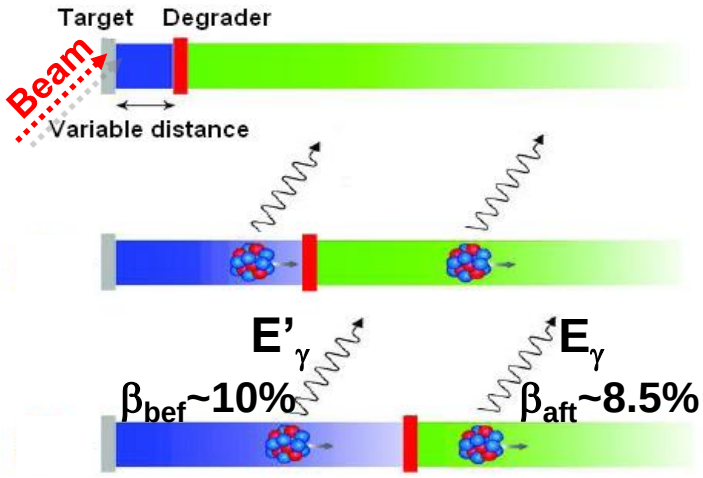


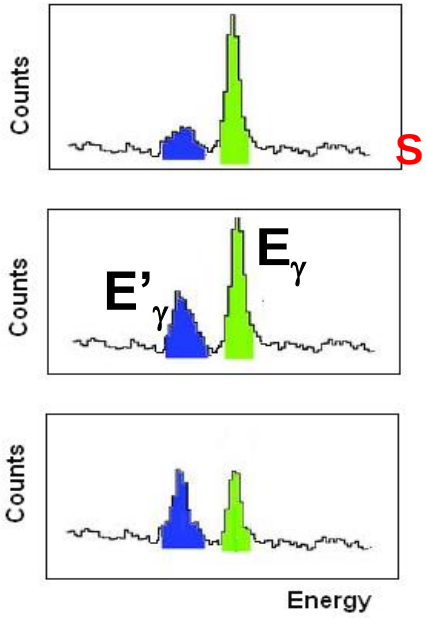
- ❑ Large acceptance Ω = 80 msr
- ❑ ΔZ/Z ≈ 1/60 (Measured) IC
- ❑ Energy ΔA/A ≈ 1/190 (Measured)
- ❑ Acceptance ±20%
- ❑ Max. Bρ = 1.2 T.m.



Ionisation Chamber ΔE - E

DIFFERENTIAL RDDS MEASUREMENTS AT LNL



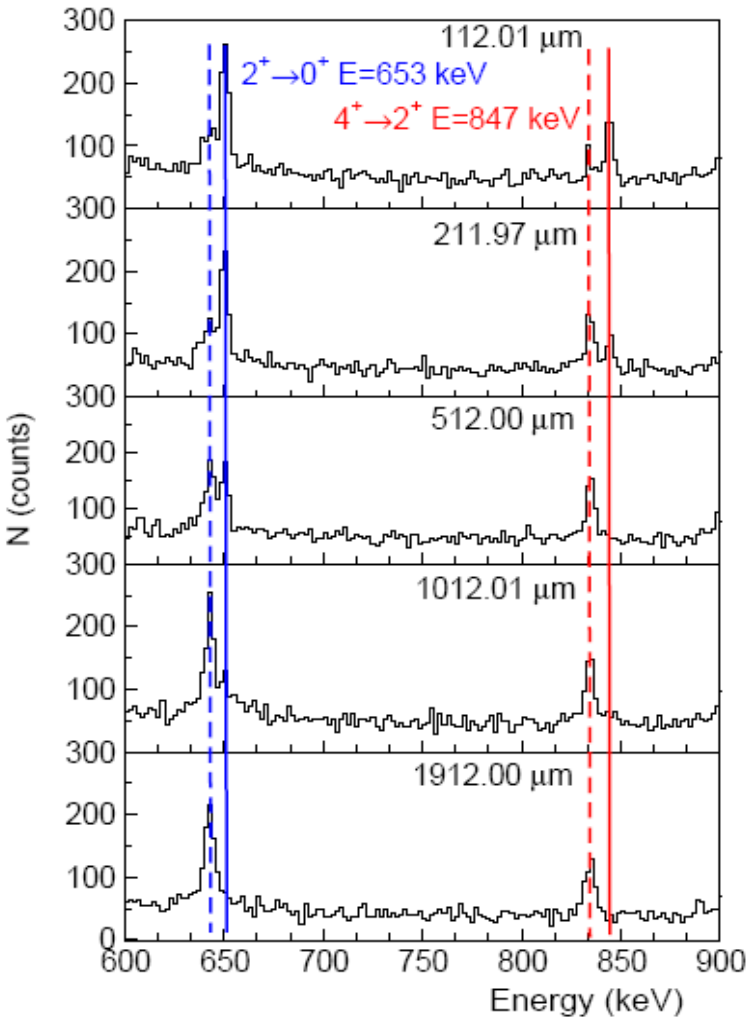


RDDS measurement
θ_G=55°

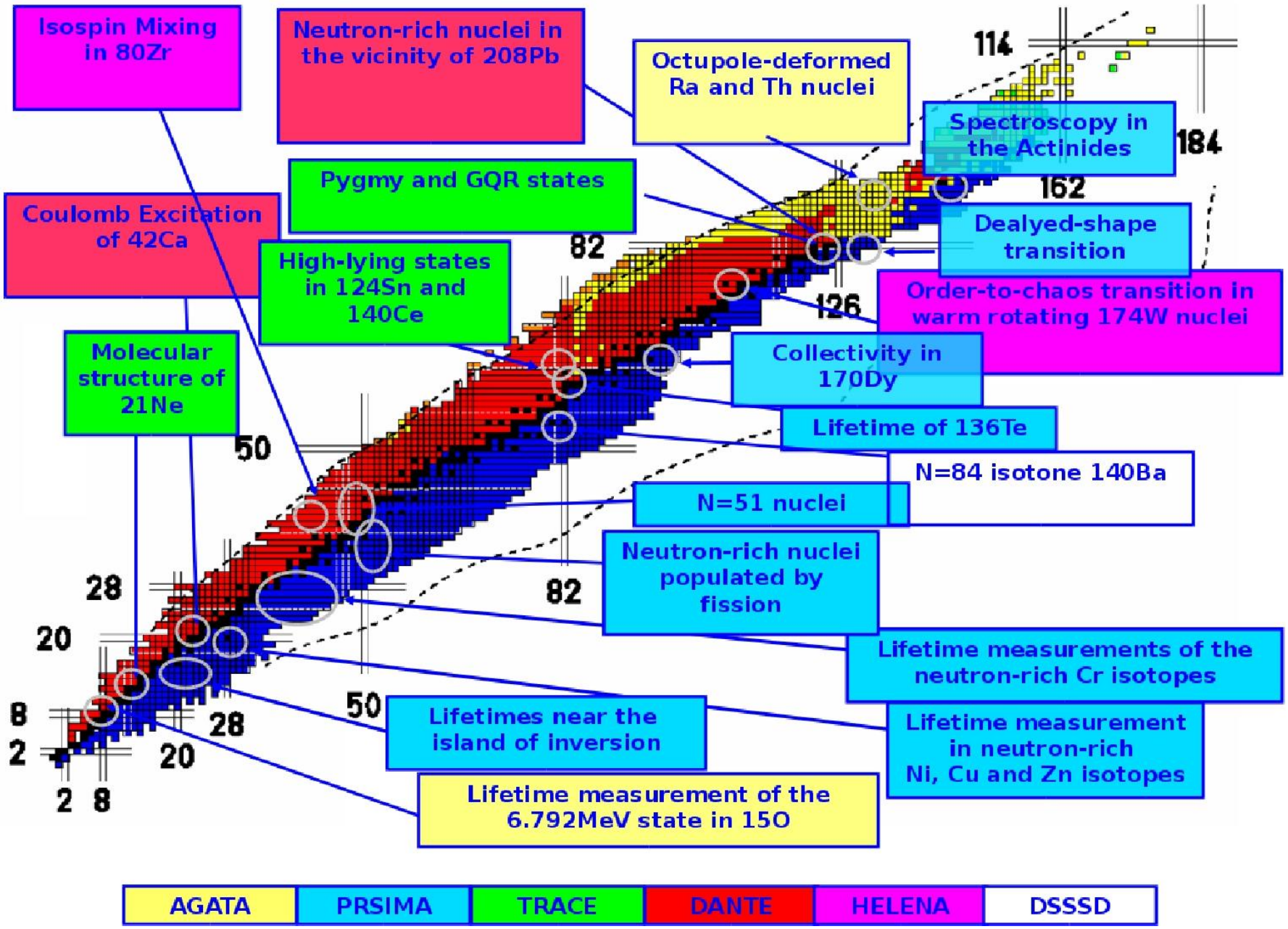
^{76}Ge + ^{238}U 577 MeV

^{72}Zn (-2p-2n)

Spectra at 50 kHz/capsule counting rate



LNL EXPERIMENTS: 20 exps, 148 days, 3500 hs



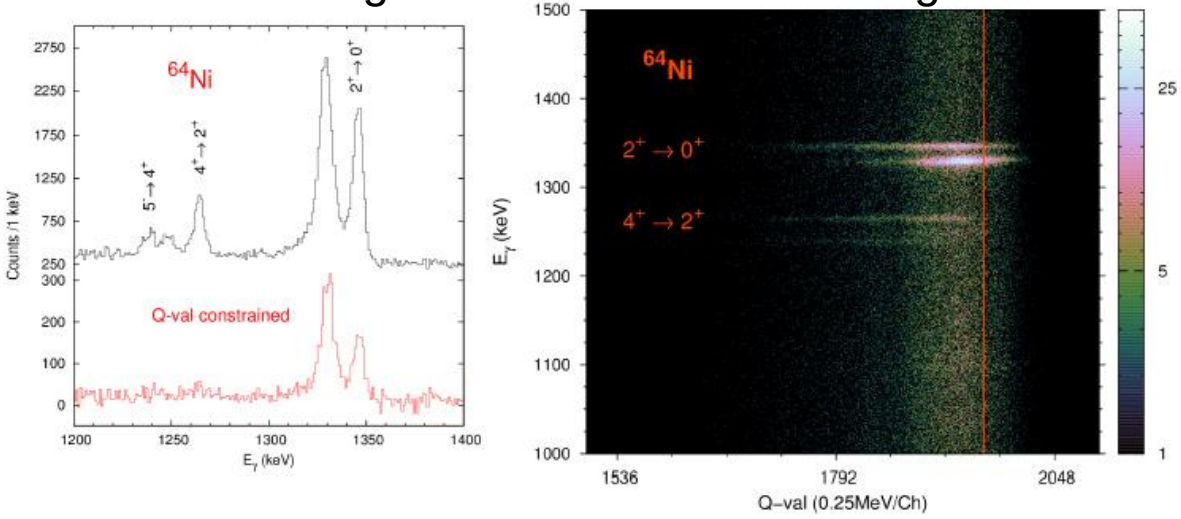

LIFETIMES

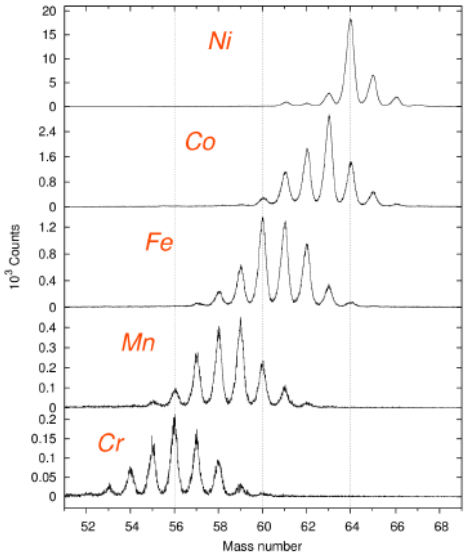
III ISLAND OF INVERSION AT N=40

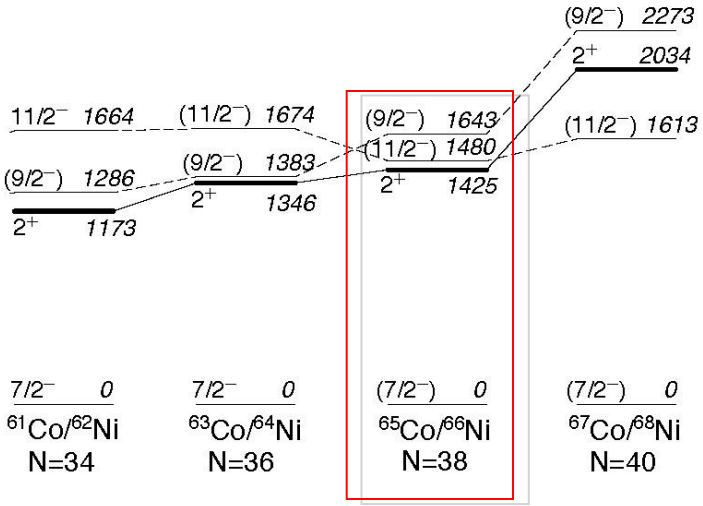
LIFETIME

^{64}Ni @ 460 MeV (TANDEM+ALPI)
^{238}U target of 1.35 mg.cm^{-2} + 4 mg.cm^{-2} Nb Degrader

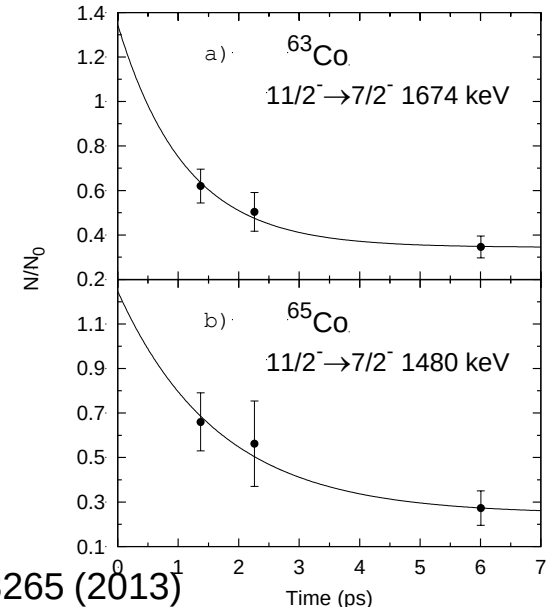
TKEL gate to reduce side feeding







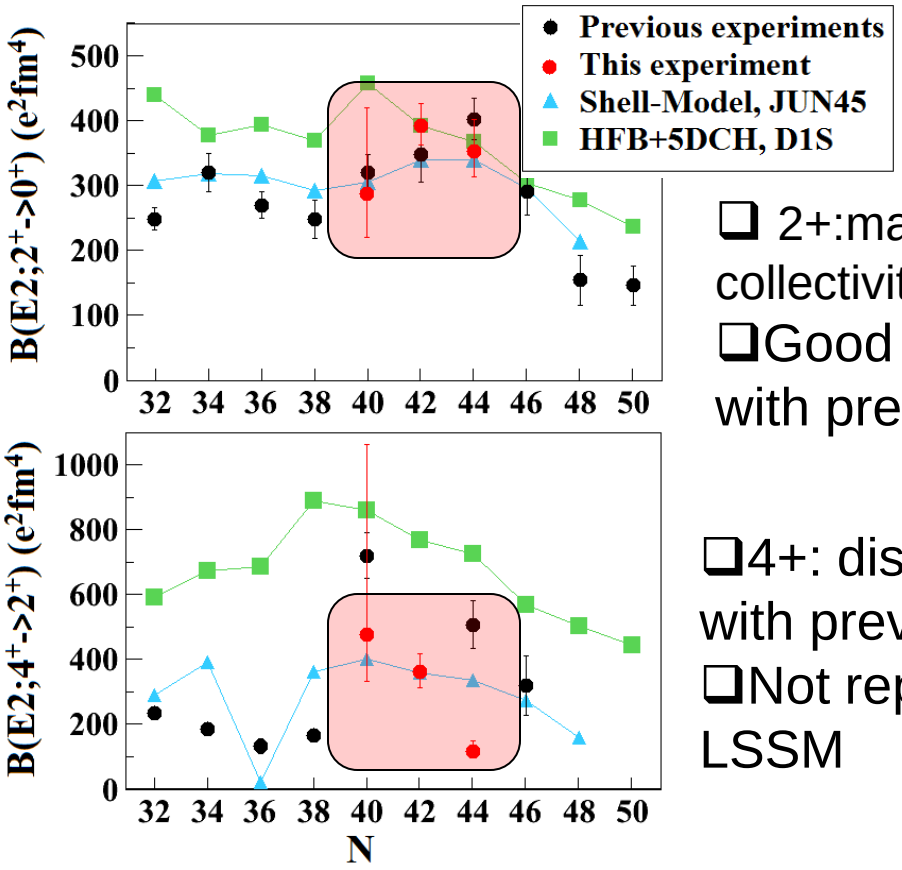
Inversion of 9/2- and 11/2- in ^{65}Co agrees with the LSSM LNPS interaction results. Due to the ^{66}Ni Quadrupole - f7/2 weak coupling



F. Recchia et al., PRC 85, 064305 (2012), V. Modamio et al., PRC 88, 0443265 (2013)

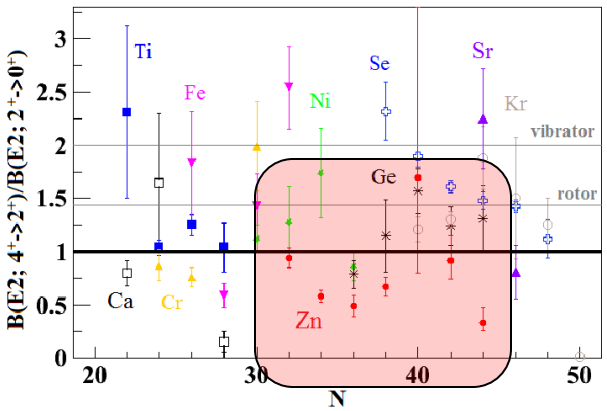
RESULTS ON ^{70,72,74}Zn

LIFETIME



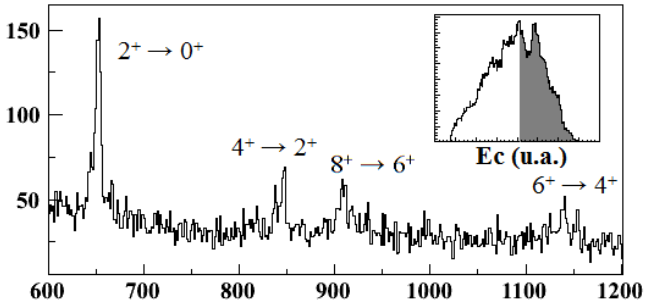
- 2+:maximum collectivity at N=42
- Good agreement with previous results

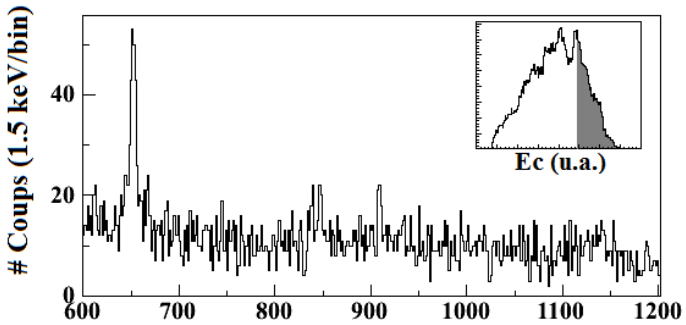
- 4+: disagreement with previous results
- Not reproduced by LSSM

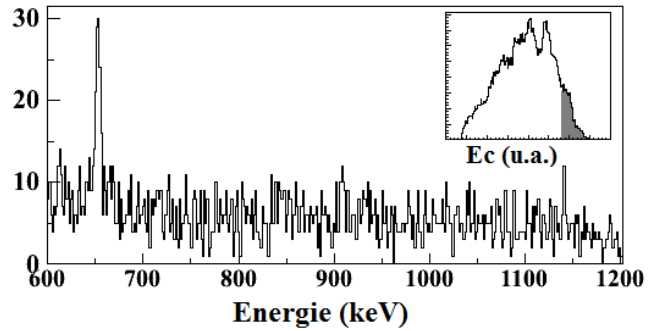


- Lowest B(4/2)<1
- B(4/2) ~ seniority:

- ^{72}Zn $\longrightarrow$ Q_{val} gate



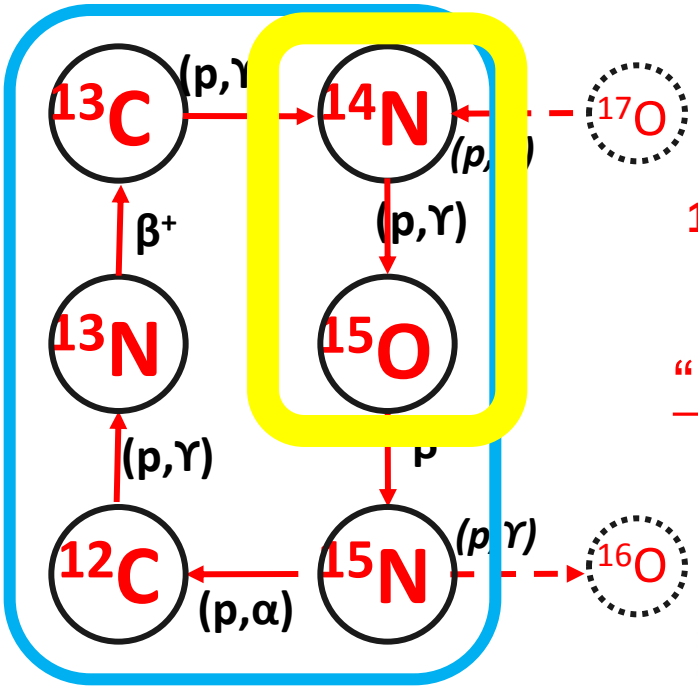




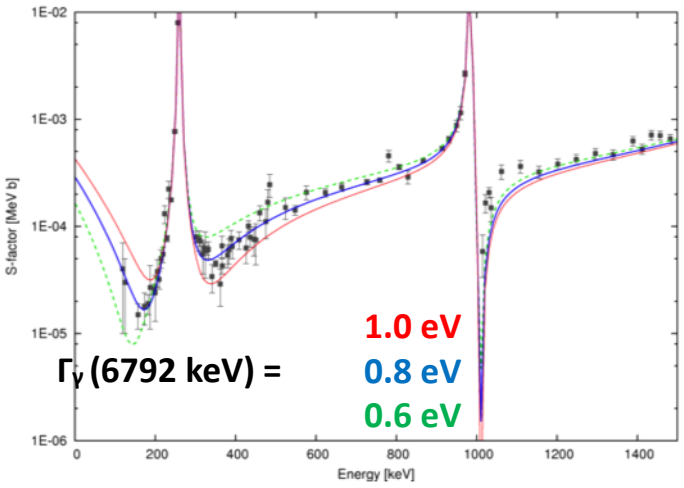
C.Louchart et al., PRC 87, 054302 (2013)

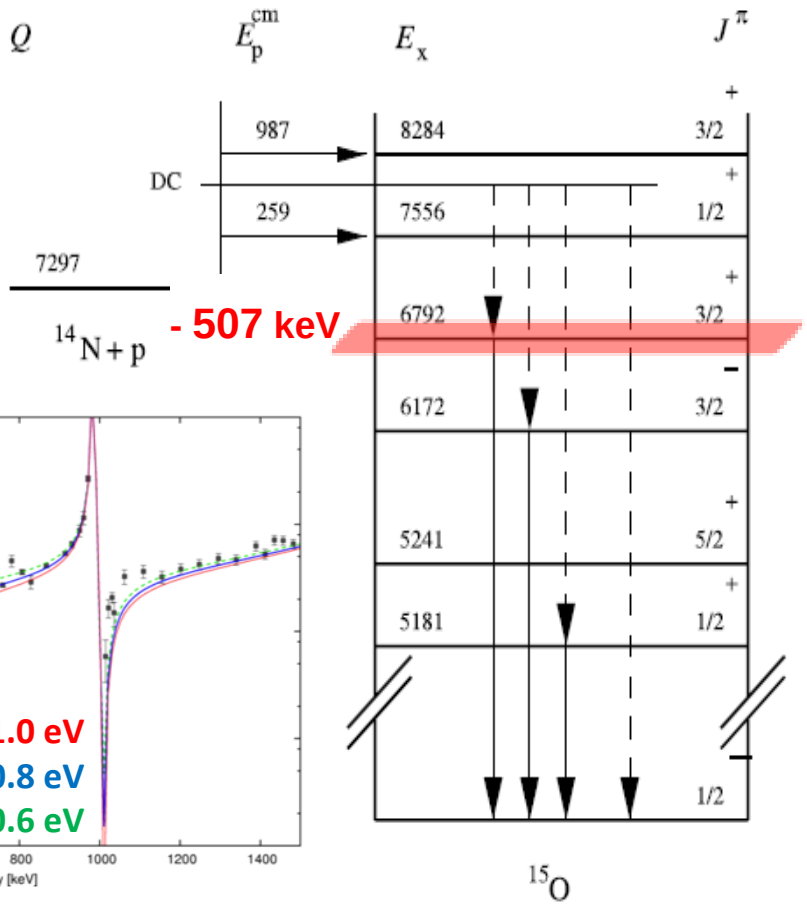
$^{14}N(p,\gamma)^{15}O$ REACTION CROSS SECTION

LIFETIME



$^{14}N(p,\gamma)^{15}O$ is the **"bottle neck"**





Captures to different excited states in ^{15}O contribute to the cross-section.

The one to the gs in ^{15}O is dominated by the tail of the sub-threshold resonance at -507 keV (**6.79 MeV state in ^{15}O**)

C.Angulo et al., NP A690 (2001) 755,
M.Marta et al., PR C78 (2008) 022802(R)

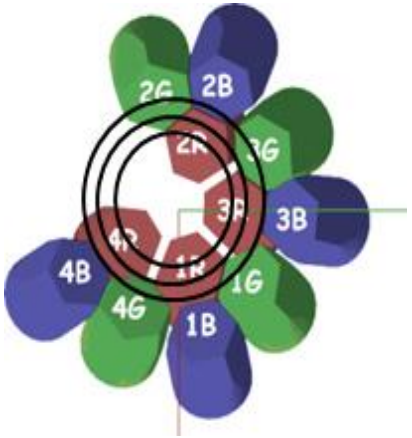
possible solution for the "solar composition problem"

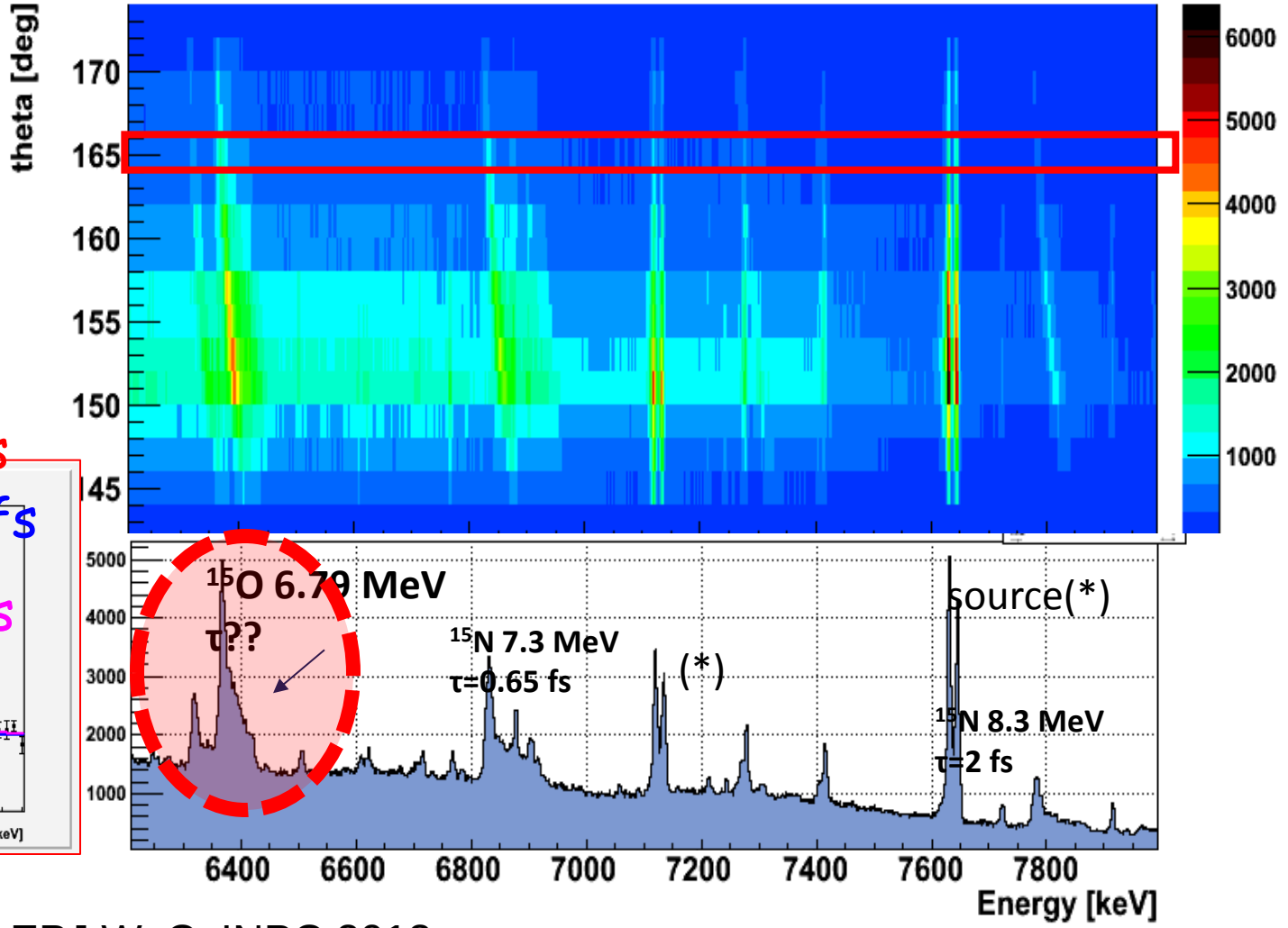
A.M.Serenelli et al., As.J.Lett. 705 (2009)

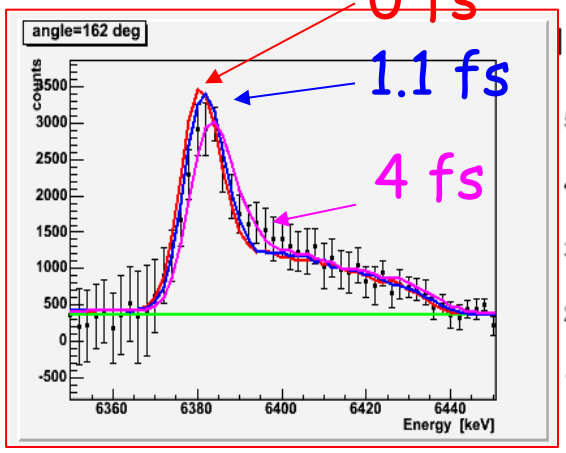
LIFETIME MEASUREMENT of 6.79 MeV in ^{15}O

^{14}N(^{2}H,n)^{15}**O** and ^{14}N(^{2}H,p)^{15}N reactions @ 32 MeV (XTU LNL Tandem)

Direct lifetime measurement with 4 ATCs at backward angles (close to the beam-line)





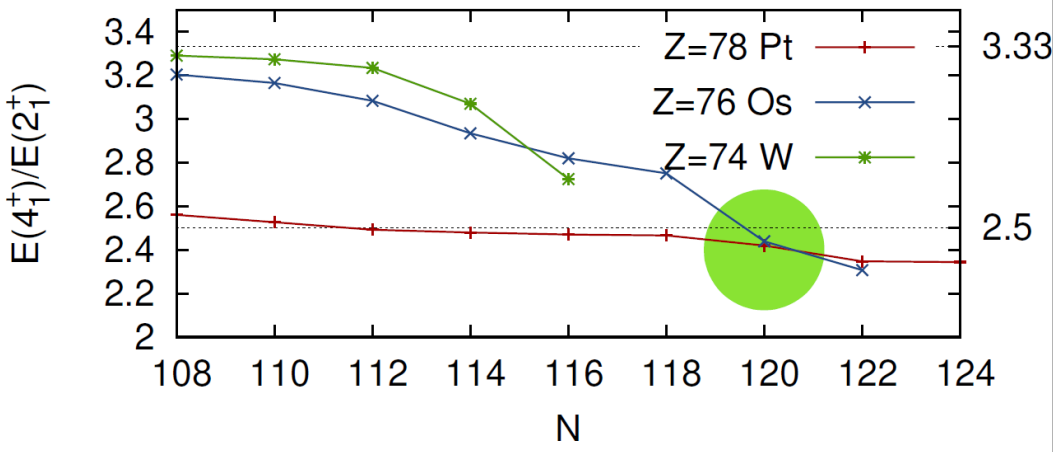


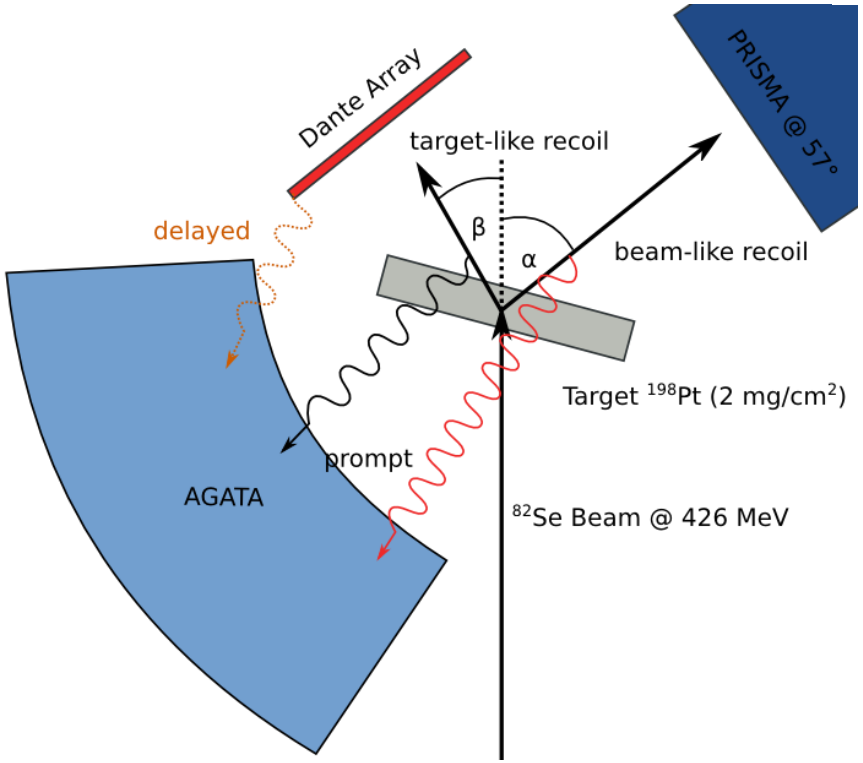
C. Michelagnoli et al., EPJ WoC, INPC 2013

BINARY PARTNER

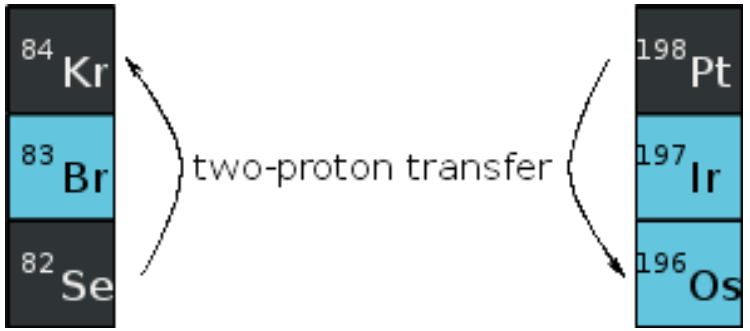
SHAPE TRANSITION IN THE OS ISOTOPES

- Shape transition from prolate to oblate deformed nuclei in the Os isotopes
- ^{194}Os suggested to be prolate
- ^{198}Os shows oblate character

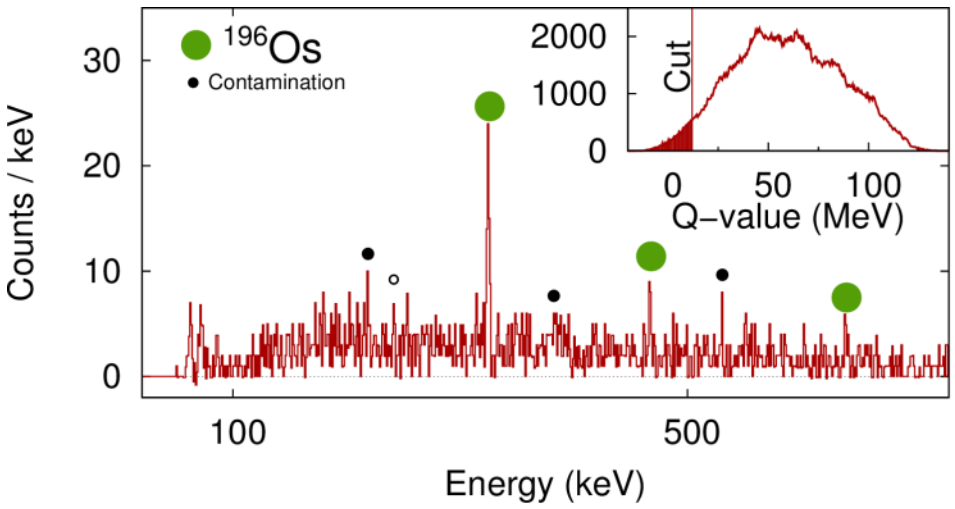




- Binary Partner Method
- ^{82}Se(^{198}Pt, ^{196}Os)^{84}Kr @ 426 MeV
- Detect lighter beam-like recoil in PRISMA
- Reconstruct Spectrum for ^{196}Os



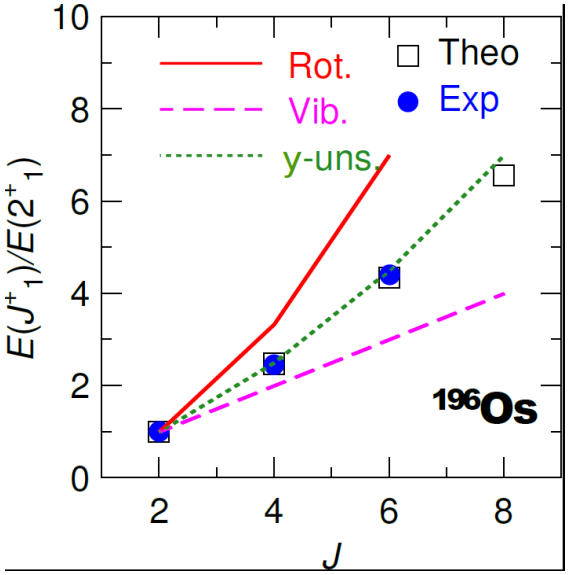
SHAPE TRANSITION IN THE OS ISOTOPES

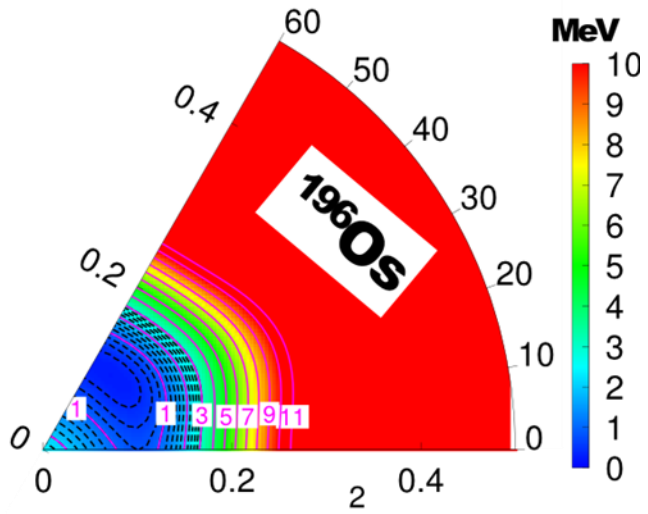


- Yrast band measured for the first time
- $E(4^+)/E(2^+)$ close to 2.5 (γ-soft nucleus)

P.R.John et al., submitted to PLB

- State of the art symmetry conserving configuration mixing (SCCM) calculations performed (T.R. Rodriguez)
- ^{196}Os is a transitional nucleus

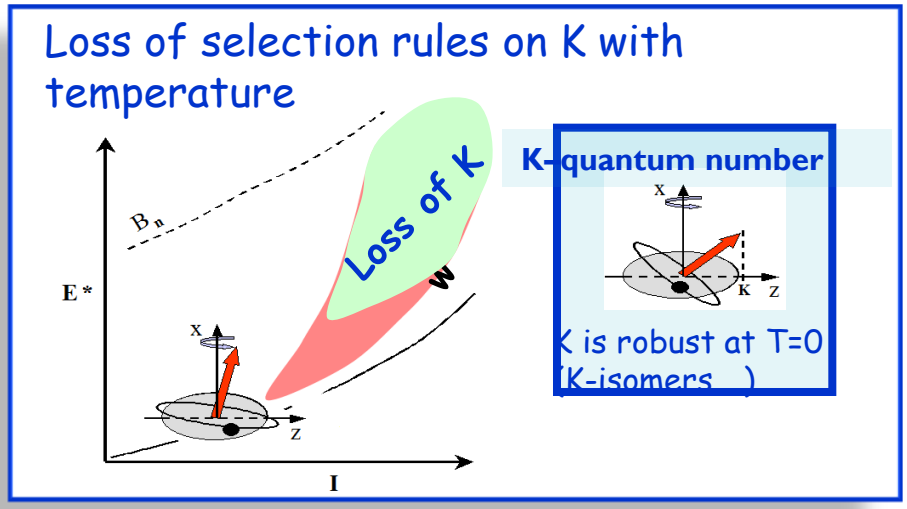




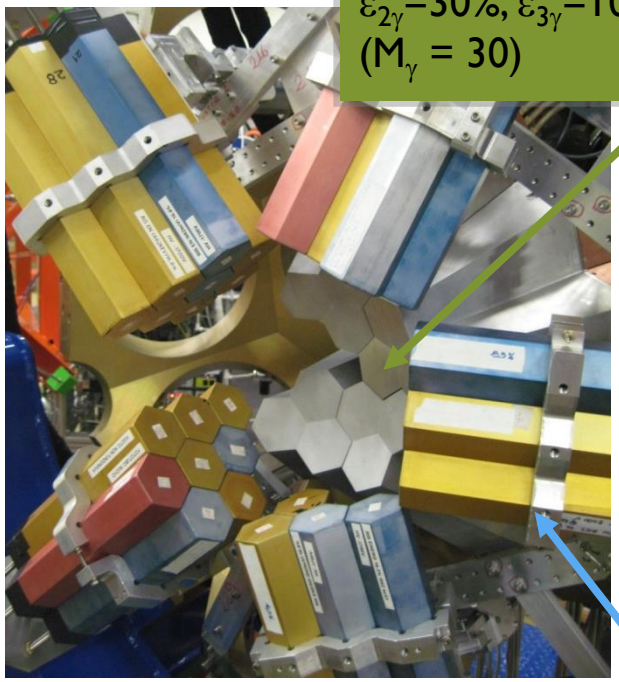
❑ HE REGIME

^{174}W: ORDER-TO-CHAOS TRANSITION

High-Spin Fusion Evaporation
^{50}Ti on ^{128}Te @ 217 MeV, $I \geq 60\hbar$



4 Triple Clusters
2 and 3 folds:
$\varepsilon_{2\gamma}$=30%, $\varepsilon_{3\gamma}$=10%
(M_γ = 30)



27 detectors: 5 clusters of BaF_2
(3" × 3", exagonal)
Total solid angle: 25% of 4π
Total efficiency: 16% @ 500keV

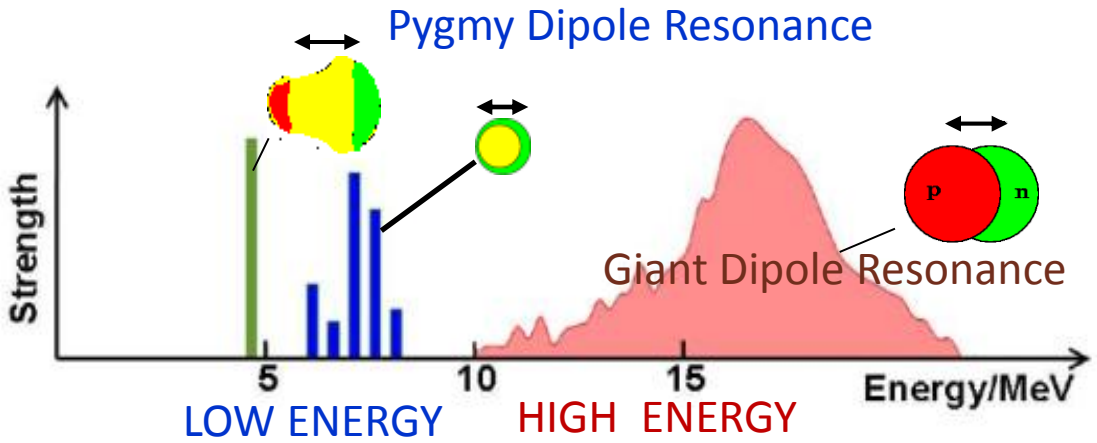
Goal: populate ^{174}W at the **highest possible spins** (≥60ħ), in order to make the **statistical fluctuation analysis of the ridge-valley structures in the γ-γ matrices**, to estimate the number of low-*K* and high-*K* bands and their correlation

V.Vandone et al., PRC 88, 034312 (2013)

PHYSICS CASE

Nuclear Structure information from the Low Energy part of the Electric Dipole response

The relevant energy window for (γ,n) reactions in the stellar photon bath is located in the vicinity of the PDR.



Inelastic scattering of ^{17}O @ 20 MeV/u on different targets + γ-rays in coincidence

TWO EXPERIMENTS PERFORMED:

- Studied Nuclei: **208Pb 90Zr**

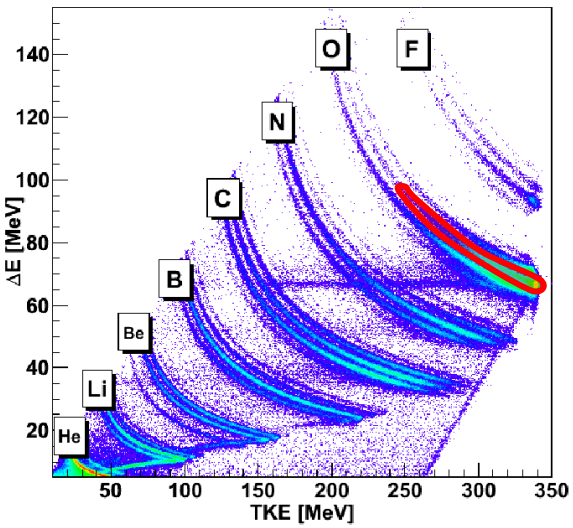
R. Nicolini (Università di Milano /INFN)
D.Mengoni (Università di Padova/INFN)

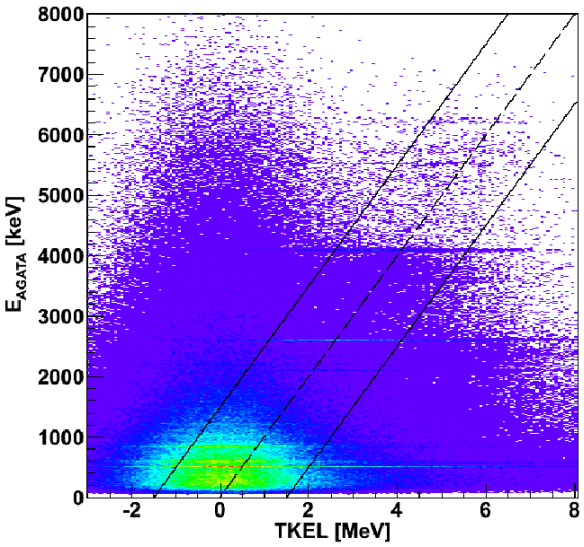
- Studied nuclei: **208Pb, 124Sn,140Ce**

M. Kmiecik (IFJ PAN Kraków) ,
F. Crespi (Univ. di Milano/INFN)

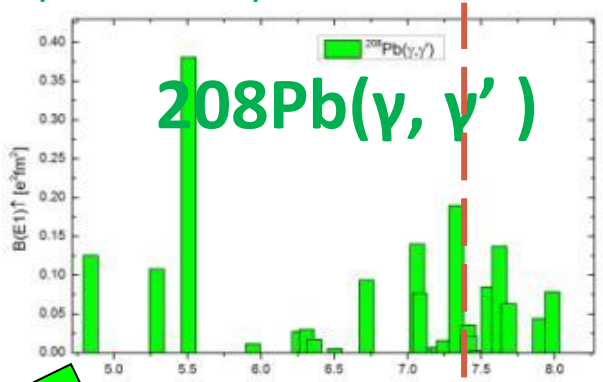
F.C.L. Crespi et al., PRL accepted

PYGMY in ^{208}Pb

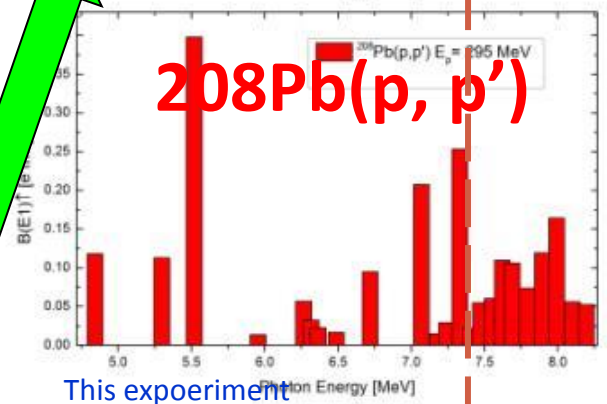




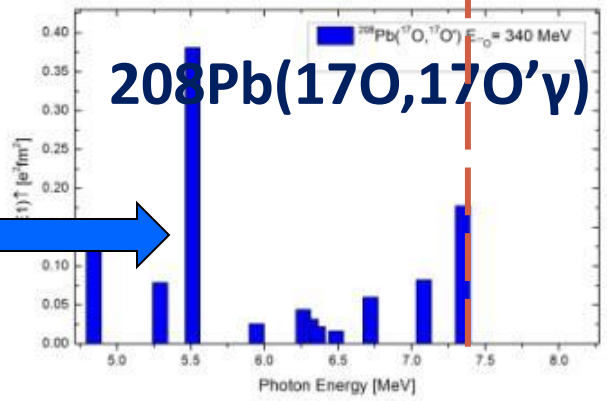
N. Ryezayeva et al., PRL 89, 27 (2002) – previous NRF Experiment



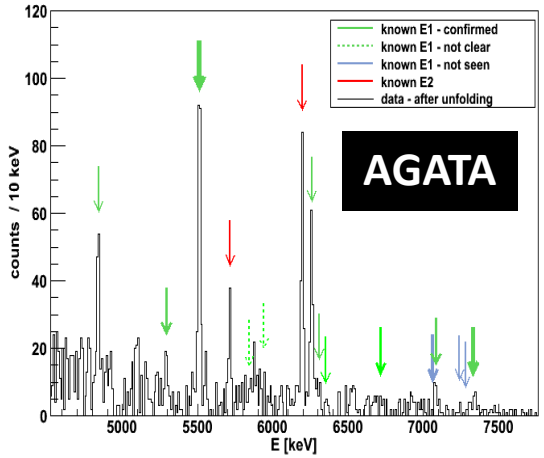
A. T[illegible] et al., PRL 107, 062502 (2011)

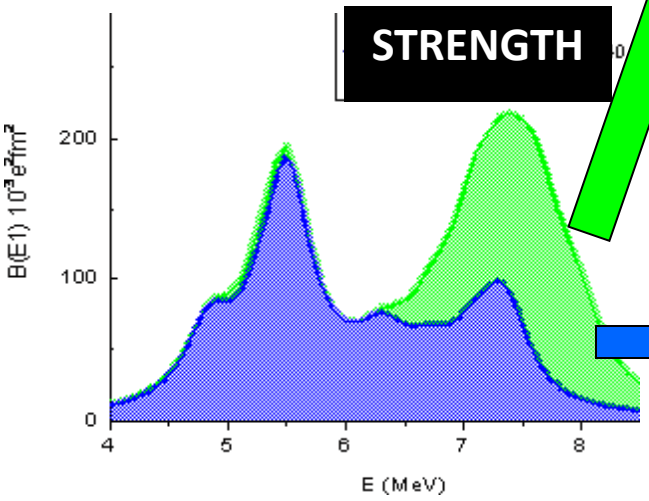


This expoeriment



❑ One group of states with **isoscalar** character, the other with an **isovector** nature.





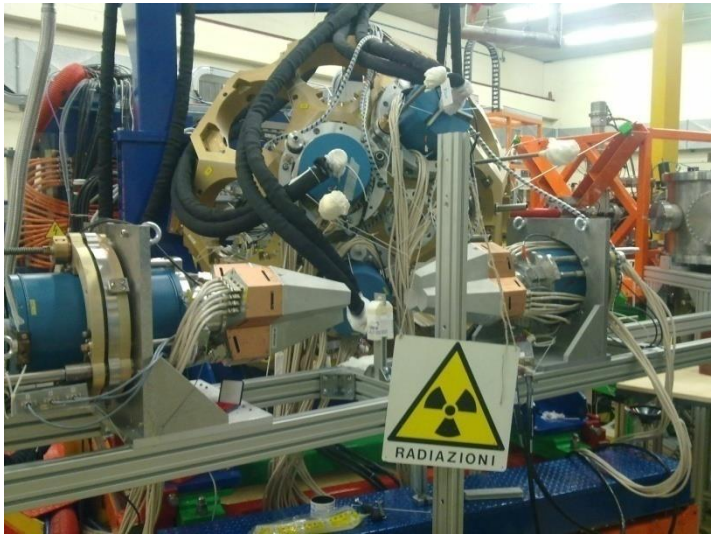
❑ POLARITAZION

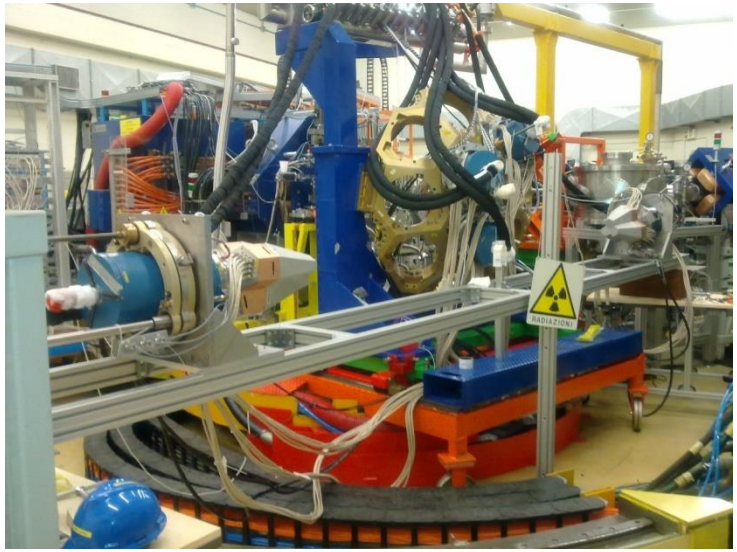
POLARIZATION

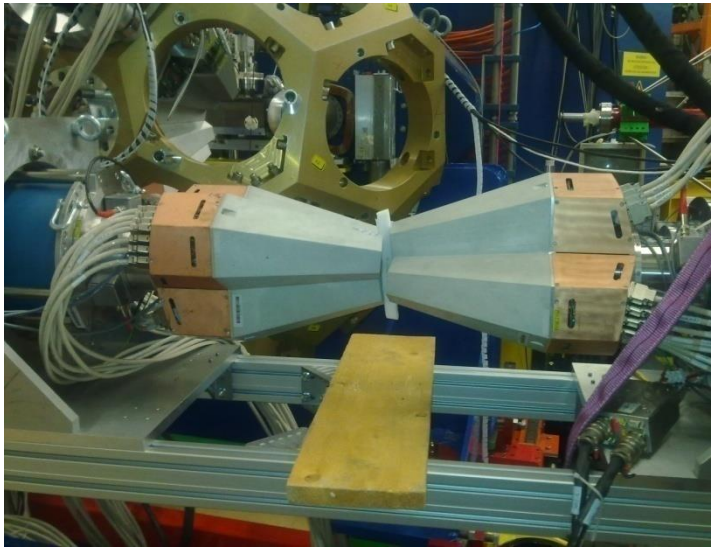
I. COULEX TEST ^{104,108}**Pd**

II. NON-YRAST OCTUPOLE BAND
^{220}Ra, ^{222}Th (J.F.Smith , D.Mengoni)

III. POSITRONIUM ENTANGLEMENT
β^+ source ^{22}Na (P.G. Bizzeti)

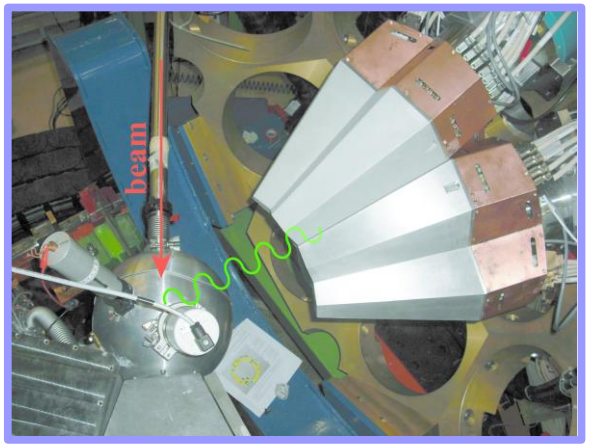


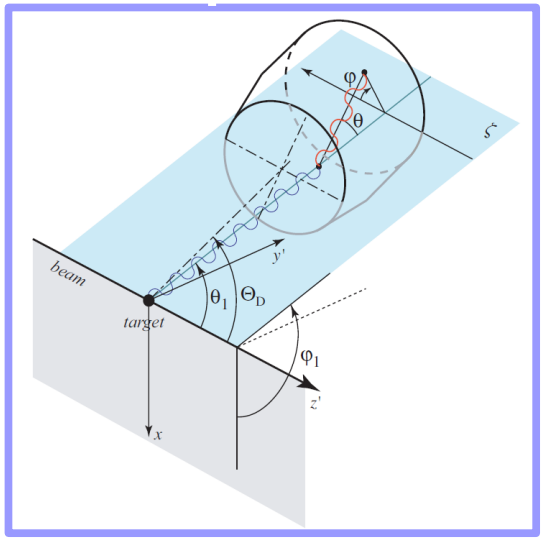




PRELIMINARY RESULTS, COULEX

Partially-polarized 555.8-keV and 433.9-keV lines in ^{104}Pd and ^{108}Pd [+unpolarized ^{137}Cs source].

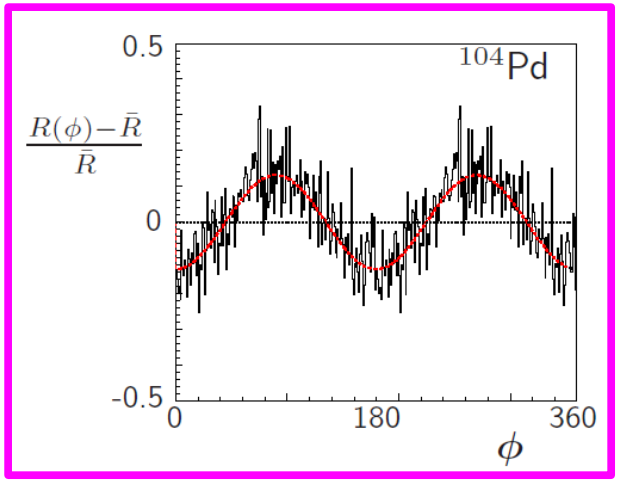




$$\bar{\sigma}_C(\theta,\varphi) = \frac{r_0^2}{4}\left(\frac{E'_\gamma}{E_\gamma}\right)^2\left[\frac{E_\gamma}{E'_\gamma}+\frac{E'_\gamma}{E_\gamma}-\sin^2\theta\ (1+P\cos 2\varphi)\right]$$

GOSIA

$$\frac{\mathrm{d}N}{\mathrm{d}\varphi} = a_0 + a_2\cos(2\varphi)\ .$$



Analyzing power: 0.48

P.G. Bizzeti et al., EPJ WoC, INPC 2013

SUMMARY AND CONCLUSIONS

- SUCCESSFUL TWO-YEAR LONG PHYSICS CAMPAIGN: LIGHT/HEAVY MASSES, HIGH SPINS AND LOW-LYING PROPERTIES, ETC.

- **PERFORMANCE OF THE AGATA DEMONSTRATOR IS PROMISING, MOSTLY IN COMBINATION WITH SEVERAL ANCILLARY DETECTORS**

ACKNOWLEDGMENTS

Nuclear Instruments and Methods in Physics Research A 668 (2012) 26–58

S. Akkoyun [a], A. Algora [b], B. Alikhani [c], F. Ameil [d], G. de Angelis [e], L. Arnold [f,s], A. Astier [h], A. Ataç [a,ij], Y. Aubert [k], C. Aufranc [l], A. Austin [m], S. Aydin [n], F. Azaiez [k], S. Badoer [e], D.L. Balabanski [o], D. Barrientos [b], G. Baulieu [l], R. Baumann [f,s], D. Bazzacco [n], F.A. Beck [f,s], T. Beck [d], P. Bednarczyk [p], M. Bellato [n], M.A. Bentley [q], G. Benzoni [r], R. Berthier [s], L. Berti [e], R. Beunard [t], G. Lo Bianco [r], B. Birkenbach [u], P.G. Bizzeti [v,w], A.M. Bizzeti-Sona [v,w], F. Le Blanc [k], J.M. Blasco [x], N. Blasi [r], D. Bloor [q], C. Boiano [r], M. Borsato [y], D. Bortolato [n,y], A.J. Boston [z,*], H.C. Boston [z], P. Bourgault [t], P. Boutachkov [d,c], A. Bouty [s], A. Bracco [r,aa], S. Brambilla [r], I.P. Brawn [ab], A. Brondi [ac], S. Broussard [s], B. Bruyneel [u], D. Bucurescu [ad], I. Burrows [m], A. Bürger [z,ae,af], S. Cabaret [h], B. Cahan [t], E. Calore [y], F. Camera [r,aa], A. Capsoni [r], F. Carrió [x], G. Casati [r,ag], M. Castoldi [ah], B. Cederwall [i], J.-L. Cercus [k], V. Chambert [k], M. El Chambit [f,s], R. Chapman [ai], L. Charles [f,s], J. Chavas [h], E. Clément [t], P. Cocconi [e], S. Coelli [r], P.J. Coleman-Smith [m], A. Colombo [n], S. Colosimo [z], C. Commeaux [k], D. Conventi [n], R.J. Cooper [z], A. Corsi [r,aa], A. Cortesi [r], L. Costa [e], F.C.L. Crespi [r,aa], J.R. Cresswell [z], D.M. Cullen [ai], D. Curien [f,s], A. Czermak [p], D. Delbourg [k], R. Depalo [ak], T. Descombes [al], P. Désesquelles [h], P. Detistov [o], C. Diarra [k], F. Didierjean [f,s], M.R. Dimmock [z], Q.T. Doan [l], C. Domingo-Pardo [b,d], M. Doncel [am], F. Dorangeville [k], N. Dosme [h], Y. Drouen [s], G. Duchêne [f,s,*], B. Dulny [p], J. Eberth [u], P. Edelbruck [k], J. Egea [b,x], T. Engert [d], M.N. Erduran [an], S. Ertürk [ao], C. Fanin [n], S. Fantinel [e], E. Farnea [n,*], T. Faul [f,s], M. Filliger [f,s], F. Filmer [z], Ch. Finck [f,s], G. de France [t], A. Gadea [c,b,*], W. Gast [ap], A. Geraci [r,ag], J. Gerl [d], R. Gernhäuser [aq], A. Giannatiempo [r,w], A. Giaz [r,aa], L. Gibelin [h], A. Givechev [c], N. Goel [d,c], V. González [x], A. Gottardo [e], X. Grave [k], J. Grębosz [p], R. Griffiths [m], A.N. Grint [z], P. Gros [a], L. Guevara [k], M. Gulmini [e], A. Görgen [a], H.T.M. Ha [h], T. Habermann [d], L.J. Harkness [z], H. Harroch [k], K. Hauschild [h], C. He [e], A. Hernández-Prieto [am], B. Hervieu [s], H. Hess [u], T. Hüyük [b], E. Ince [an,r], R. Isocrate [n], G. Jaworski [ar,as], A. Johnson [i], J. Jolie [u], P. Jones [at], B. Jonson [au], P. Joshi [q], D.S. Judson [z], A. Jungclaus [av], M. Kaci [b], N. Karkour [h], M. Karolak [s], A. Kaşkaş [a], M. Kebbiri [s], R.S. Kempley [aw], A. Khaplanov [i], S. Klupp [aq], M. Kogimtzis [m], I. Kojouharov [d], A. Korichi [h,*], W. Korten [s], Th. Kröll [n,r], R. Krücken [aq], N. Kurz [d], B.Y. Ky [k], M. Labiche [m], X. Lafay [h], L. Lavergne [k], I.H. Lazarus [m], S. Leboutelier [h], F. Lefebvre [k], E. 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Özben [ay], M. Ozille [t], C. Oziol [k], E. Pachoud [f,s], M. Palacz [as], J. Palin [m], J. Pancin [t], C. Parisel [f,s], P. Pariset [h], G. Pascovici [ba], R. Peghin [n], L. Pellegri [r,aa], A. Perego [v,w], S. Perrier [h], M. Petcu [ad], P. Petkov [o], C. Petrache [k], E. Pierre [h], N. Pietralla [c], S. Pietri [d], M. Pignanelli [r,aa], I. Piqueras [f,s], Z. Podolyak [ax], P. Le Pouhalec [s], J. Pouthas [k], D. Pugnère [t], V.F.E. Pucknell [m], A. Pullia [r,aa], B. Quintana [am], R. Raine [t], G. Rainovski [ax], L. Ramina [n], G. Rampazzo [n], G. La Rana [ac], M. Rebeschini [n], F. Recchia [n,y], N. Redon [l], M. Reese [c], P. Reiter [u,*], P.H. Regan [ax], S. Riboldi [r,aa], M. Richer [f,s], M. Rigato [e], S. Rigby [z], G. Ripamonti [r,ag], A.P. Robinson [aj], J. Robin [f,s], J. Roccaz [h], J.-A. Ropert [t], B. Rossé [t], C. Rossi Alvarez [n], D. Rosso [e], B. Rubio [b], D. Rudolph [az], F. Saillant [t], E. Şahin [e], F. Salomon [k], M.-D. Salsac [s], J. Salt [b], G. Salvato [n,y], J. Sampson [z], E. Sanchis [x], C. Santos [f,s], H. Schaffner [d], M. Schlarb [aq], D.P. Scraggs [z], D. Seddon [z], M. Şenyiğit [a], M.-H. Sigward [f,s],

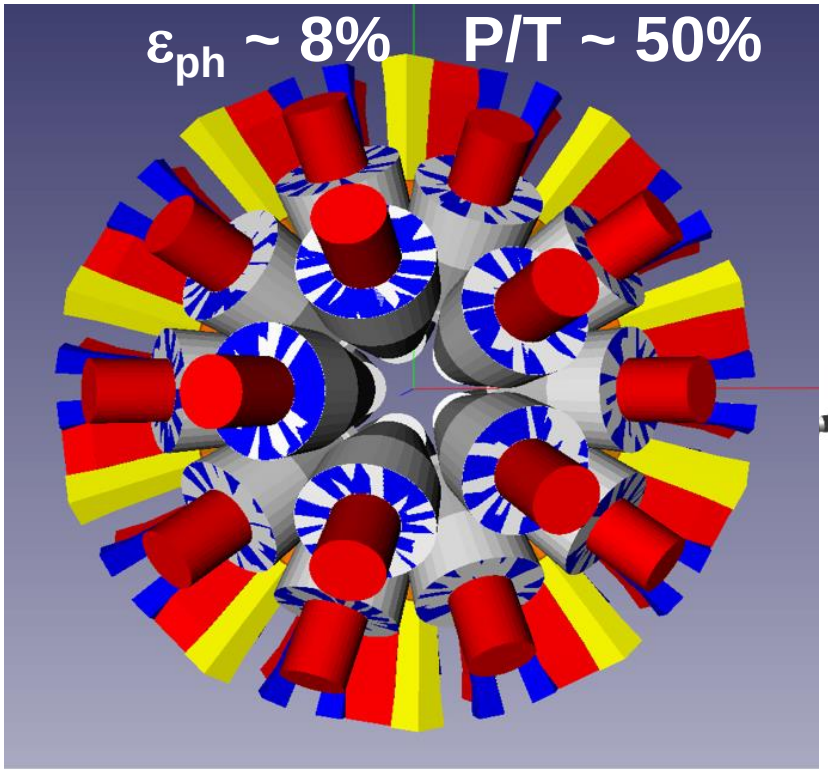
and counting ….

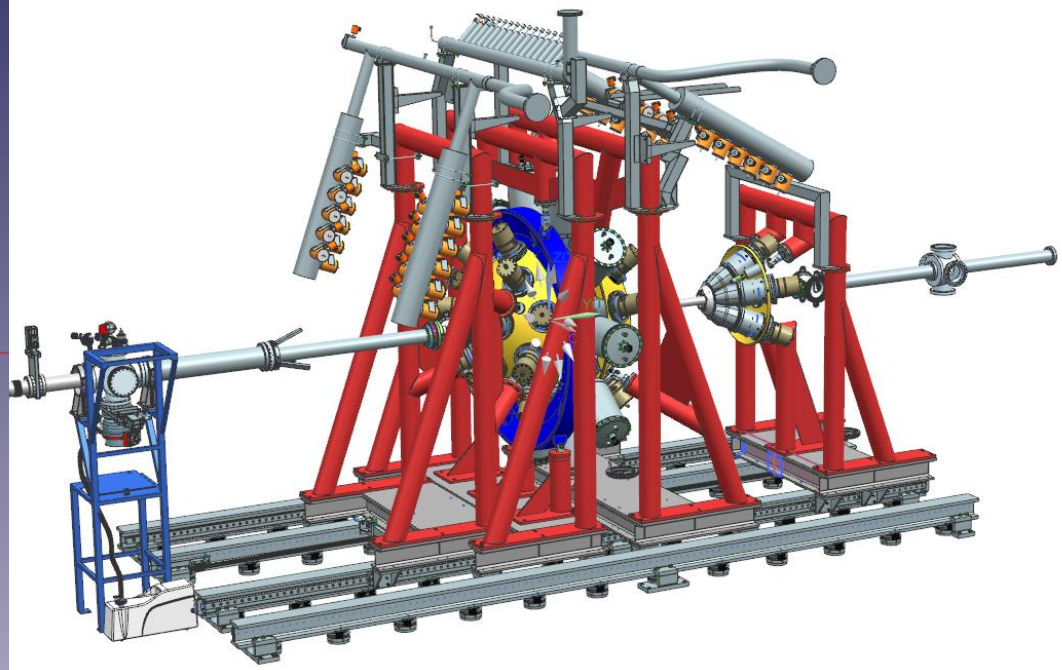
GALILEO

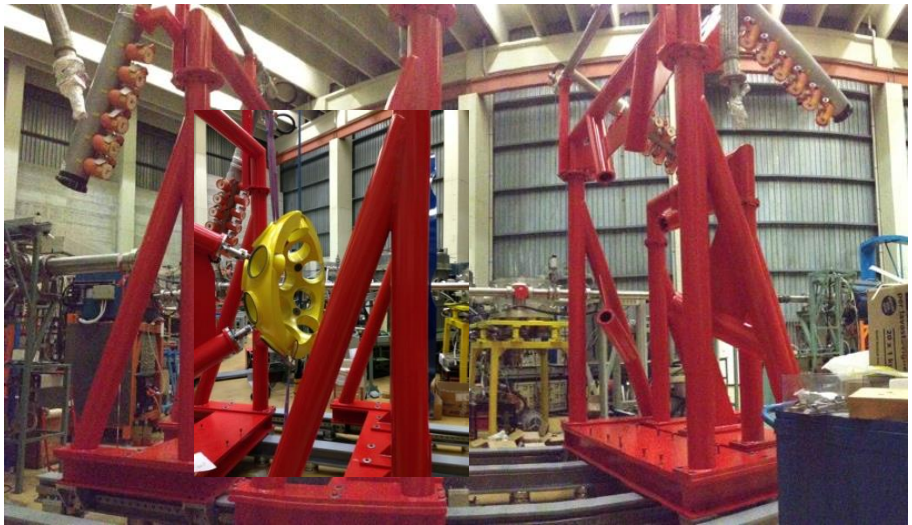
Jose Javier Valiente Dobon
Francesco Recchia
Daniele Mengoni

for the GALILEO Collaboration

GALILEO: THE NEW INSTALLATION





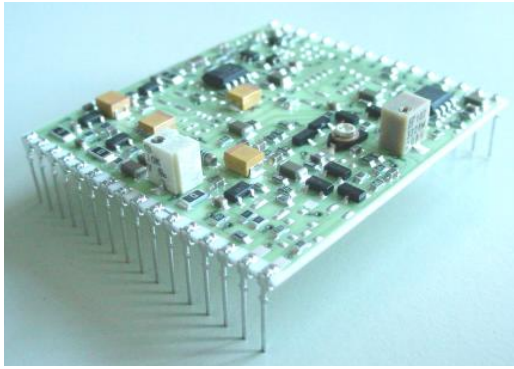


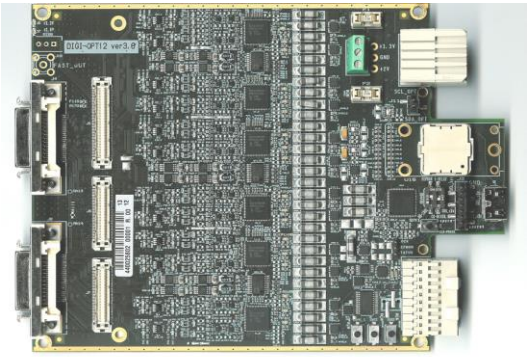
- High efficiency and P/T
- High sustainable counting rate

- Holding structure
- LN_2 filling system
- Beam line and beam dump
- Detectors tapered and triple

THE GALILEO (NEW AGATA) ELECTRONICS

- A fast low–noise charge sensitive preamplifier based on the core–type AGATA preamplifier
- used for both tapered and triple cluster detectors
- 80 preamplifiers already available



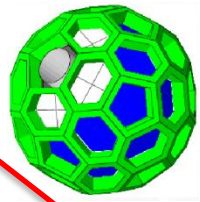


- Digi-opt12: 12-channel **14**/16-bit **100**/125-MS/s digitizer with optical output for GALILEO/AGATA power consumption < 10 W / board
- Prototypes under test

- New low–power and low–cost readout and preprocessing PCI–express boards developed for GALILEO and AGATA
- Prototypes under test

ANCILLARY DETECTORS

EUCLIDES
LuSiA
TRACE



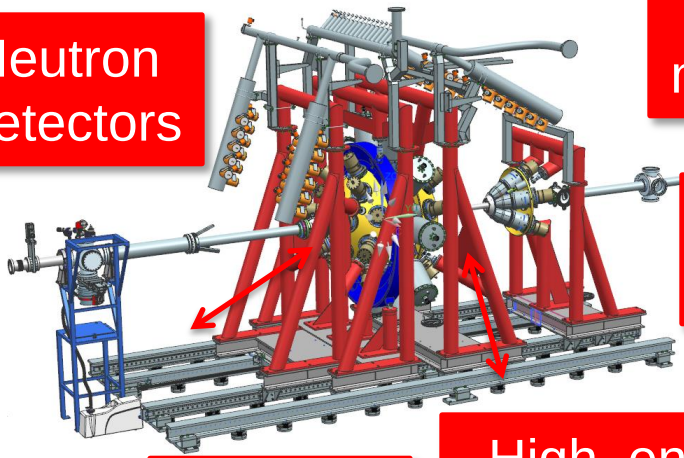
Light charged particles detectors

Binary reactions fragment detectors

DANTE
MW–
PPAC

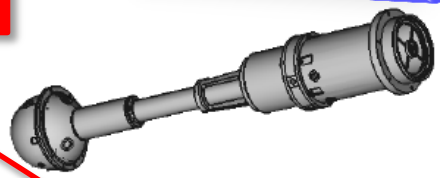
n–Ring
N–Wall
NEDA

Neutron detectors



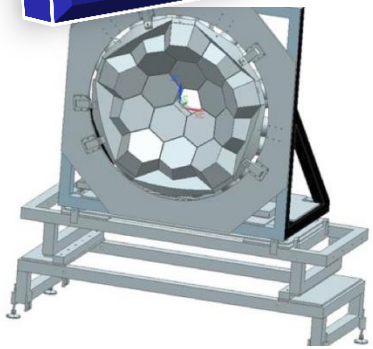
Lifetime measurement

Cologne Plunger



Fast timing detectors

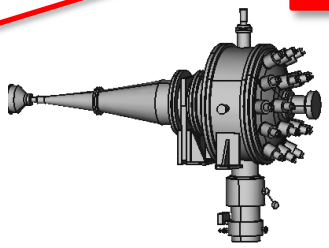
$LaBr_3$

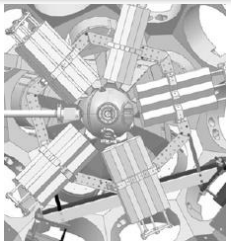


Recoil detectors

High–energy g–ray detectors

RFD
SPIDER





HECTOR
HECTOR+
PARIS

ABOUT PHYSICS: CALL FOR LoIs …

- STRUCTURE OF N~Z NUCLEI
- ISOSPIN SYMMETRY
- STUDY OF NEUTRON–RICH NUCLEI
- EXOTIC DECAY OF HIGH–SPIN STATES
- NUCLEAR STRUCTURE CLOSE TO 100SN
- CLUSTER AND HIGHLY DEFORMED STATES IN SD–SHELL NUCLEI
- GIANT RESONANCES AND WARM ROTATIONS
- SYMMETRIES AND SHAPE–PHASE TRANSITIONS IN NUCLEI
- SHAPE COEXISTENCE IN NEUTRON–DEFICIENT NUCLEI
- g – FACTOR MEASUREMENTS
- MEASUREMENT OF ASTROPHYSICAL INTEREST CROSS SECTIONS – SURROGATE NR METHOD

- **GALILEO 0.0: GASP-TYPE DETs, DIGITAL ELECTRONICS**
- **TANDEM XTU – PIAVE – ALPI**

SPES exotic beams for science

2nd workshop @ LNL
26-28 May 2014

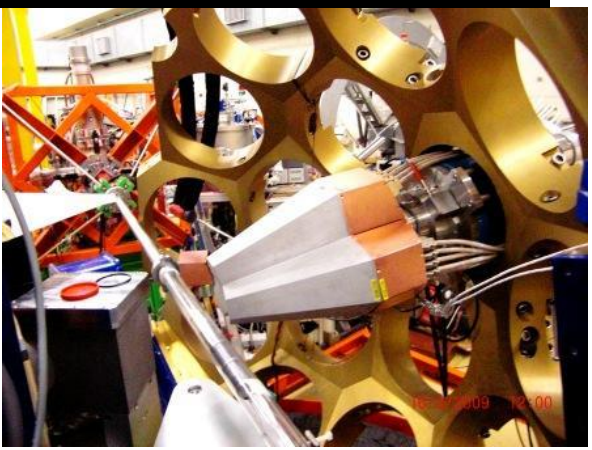
(ALMOST) COMPLETE LIST OF EXPERIMENTS

/agatadisks/data/	size (MB) (07.12.2011)	size(MB) (06.01.2012)	Spokesperson(s)	copied to GRID	raw data deleted	Experiment	Goal
2009_w eek49	426,180	81,927	test	xx	x	AGATA+DANTE+PRISMA	
2010_w eek06	1,868	1,869	test	xx	x	AGATA+DANTE+PRISMA	
2010_w eek07	1,233,943	26,285	A.Maj,F.Azaiez, P. Napiorkow ski	xx	x	AGATA+DANTE	Coulomb excitation of the presumably deformed band in 42Ca
2010_w eek09	109,475	14,014	J.Leske	xx	x	AGATA+SSD	
2010_w eek19	885,033	471,344	Zs. Podolyac	xx	x	AGATA+DANTE+PRISMA	Neutron--rich nuclei in the vicinity of 208Pb
2010_w eek21	311,444	180,501	R. Nicolini,D. Mengoni	xx	x	AGATA+TRACE+HELENA	Inelastic scattering as a tool to search for highly excited states up to the region of the Giant Quadrupole Resonance
2010_w eek24	710,484	710,484	M. Doncel,A. Goergen,E. Sahin	xx	x	AGATA+PRISMA+plunger	Lifetime measurement in neutron--rich Ni, Cu, and Zn isotopes
2010_w eek25	668,207	149,082	J-J. Valiente	xx	x	AGATA+PRISMA+plunger	Lifetime measurements of the neutron-rich Cr isotopes.
2010_w eek28	376,044	35,539	V. Vandone	xx	x	AGATA+HELENA	Order--to--chaos transition in warm rotating 174W nuclei
2010_w eek29	196,429	67,247	R. Menegazzo,C.A. Ur	xx	x	AGATA	Lifetime measurement of the 6.792 MeV state in ^{15}O
2010_w eek48	13,249	13,249	F. Crespi	xx	x	AGATA	Measurement of 15 MeV gamma rays with the AGATA cluster detectors
2010_w eek49	2,115,231	466,036	P.G. Bizzeti	xx	x	AGATA	Measurement of the analyzing power of an Agata module (coulex 104,106Pd)
2011_w eek10	440,931	60,570	test	xx	x	plunger backings	
2011_w eek11	4,333,809	4,307,174	**J. Smith, D. Mengoni**	xx	x	AGATA	Characterization of new structures in octupole-deformed radium and thorium nuclei
2011_w eek12	1,066,357	869,720	**C. Wheldon**	xx	x	AGATA+TRACE	Confirmation of the molecular structure in ^{21}Ne
2011_w eek14	3,878,798	729,811	D. Montanari	xx	x	PRISMA+AGATA	Near and sub-barrier transfer reactions in ^{60}Ni+^{118}Sn
2011_w eek18	310,762	310,759	test	xx		AGATA	background with traces
2011_w eek19	552,036	141,658	A. Giaz	xx	x	AGATA+LaBr3	Isospin mixing in the N=Z nucleus ^{80}Zr at medium temperature
2011_w eek23	432,398	261,433	**R. Chapman,F. Haas**	xx	x	AGATA+PRISMA+plunger	Lifetimes of intruder states in N = 20 sd-pf-shell neutron-rich nuclei
2011_w eek25	24,906	24,906	E. Fioretto	x		PRISMA	
2011_w eek26	132,841	132,481	M. Evers	x		PRISMA	
2011_w eek28	867,239	244,976	C.A. Ur,E. Merchan,N. Marginean	xx	x	AGATA+LaBr3	iment of the nuclear structure of neutron-rich isotopes in the Z~38 region populated by heavy--ion induced fission
2011_w eek29	6,797,341	270,096	A. Gadea	xx	x	AGATA+PRISMA+plunger	RDDS lifetime measurement in the region of the neutron-rich doubly magic 132Sn: Lifetime of the 6+ state in 136Te
2011_w eek39	597,514	402,214	J. Leske***	x	x	AGATA+SSD	DSAM measurement in ^{140}Ba--test of mixed--symmetry character
2011_w eek40	5,342,744	808,477	J. Nyberg	x	x	AGATA+PRISMA+DANTE	tivity at maximum nucleon valency: Investigation of ground-state rotation in the neutron-rich Dy Er and Yb nucle
2011_w eek41	6,648,720	1,005,145	P. Reiter	x	x	AGATA+PRISMA+DANTE	Spectroscopy of neutron rich Th and U nuclei after multi-nucleon reactions
2011_w eek42	3,567,394	3,511,166	C.A. Ur,E. Merchan,N. Marginean***	x	AGATA+PRISMA(+DANTE)		
2011_w eek43	3,602,562	303975	A.Gadea***	x	x	GATA+PRISMA(+DANTE)	
2011_w eek44	12,495,414	1,678,435	V.Modamio	x	x	AGATA+PRISMA(+DANTE)	Delayed shape transition in ^{196}Os
2011_w eek45	5,884,339	996,270	D.Verney,G.Duchêne,G.de Angelis	x	x	AGATA+PRISMA+plunger	Structure beyond the N=50 shell closure in neutron rich nuclei in the vicinity of 78Ni: the case of N=51 nuclei
2011_w eek49	2,093,213	1,008,686	test	x	part	AGATA	background with traces, 60Co at various shaping times
2011_w eek50	16,211,369		M. Kmiecik, F.Crespi	x		AGATA+TRACE+HELENA	Study of high-lying bound and unbound states in 124Sn and 140Ce via inelastic scattering of 17O ions
2011_w eek51	2,437,934		test	x		AGATA	Final characterization of AGATA detectors
2011_w eek52_P1	11,148,187	2,909,889	P.G.Bizzeti	x	part	ATC1+ATC2	Entanglement of 511 keV photons from 22Na Distance = 025 cm
2011_w eek52_P2	3892540			x			Entanglement of 511 keV photons from 22Na Distance = 250 cm
2011_w eek52_P3	12000000						Entanglement of 511 keV photons from 22Na Distance = 002 cm
total	111,806,935	9,571,161					

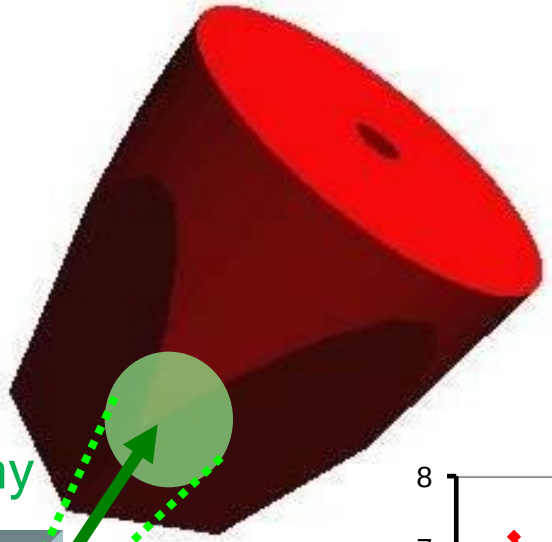
****recovery*

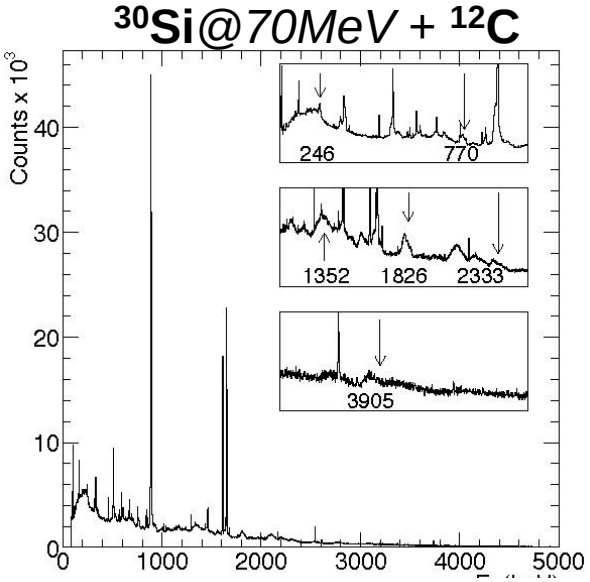
Position Resolution from in-beam tests

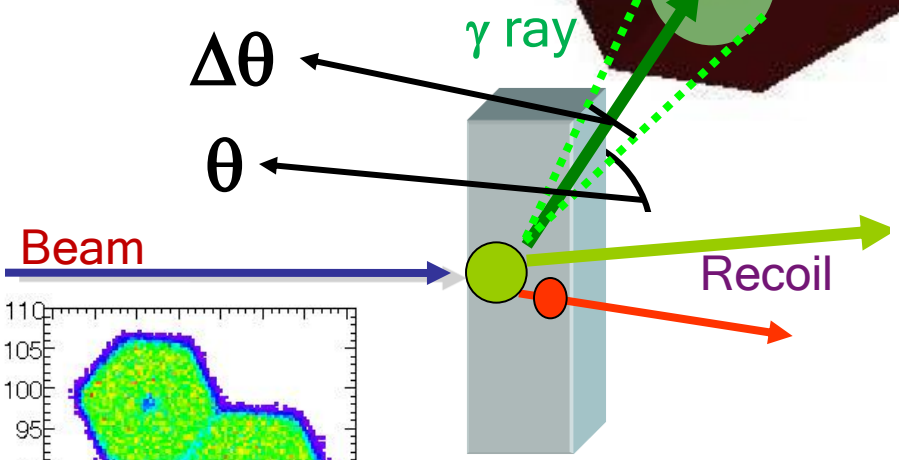
- ^{30}Si@*70MeV* + ^{12}C

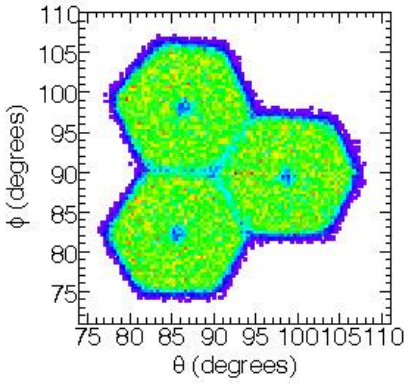


Position of first interactions at AGATA nominal distance

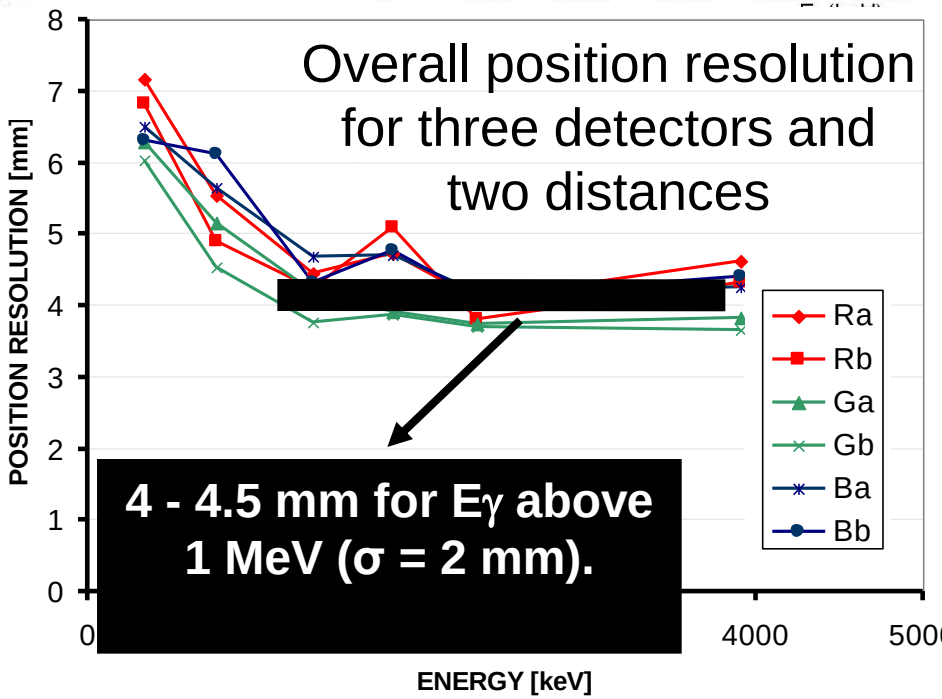






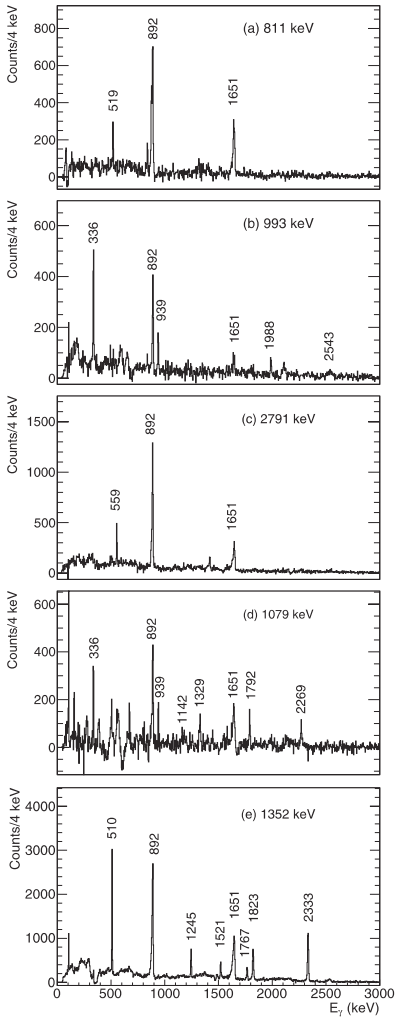


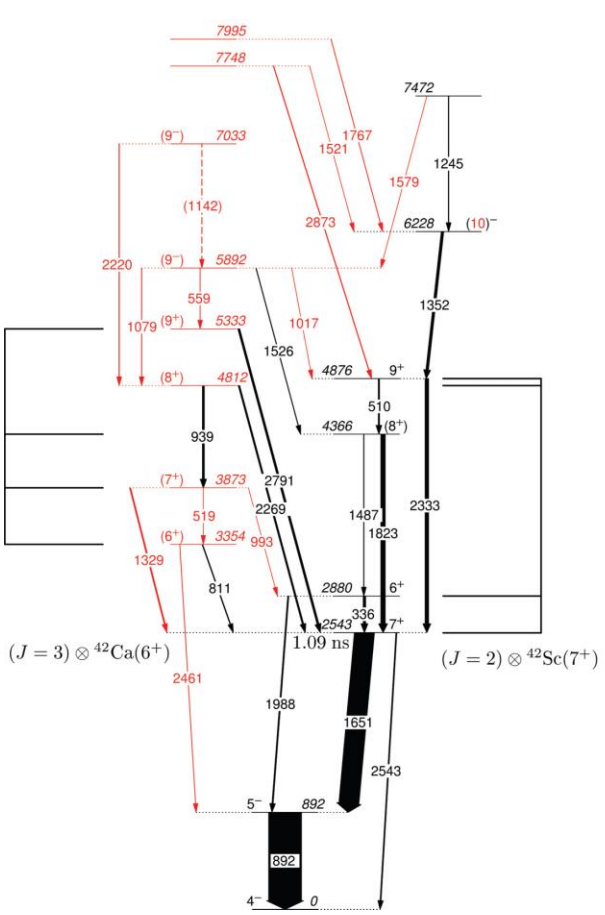
P-A Söderström (Uppsala)
F. Recchia (INFN-PD)
NIM A 638 (2011) 96

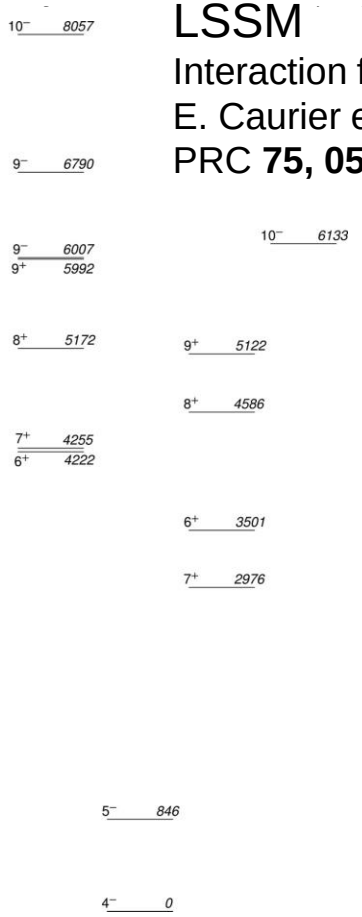


1ATC PERFORMANCE FROM COMMISSIONING RUN

P.-A. Söderström,[1,2] F. Recchia,[3,4] J. Nyberg,[1] A. Gadea,[5] S. M. Lenzi,[3,4] A. Poves,[6] A. Ataç,[7] S. Aydin,[3,4,8] D. Bazzacco,[3] P. Bednarczyk,[9] M. Bellato,[3] B. Birkenbach,[10] D. Bortolato,[11] A. J. Boston,[12] H. C. Boston,[12] B. Bruyneel,[10] D. Bucurescu,[13] E. Calore,[11] B. Cederwall,[14] L. Charles,[15] J. Chavas,[16] S. Colosimo,[12] F. C. L. Crespi,[17,18] D. M. Cullen,[19] G. de Angelis,[11] P. Désesquelles,[20] N. Dosme,[20] G. Duchêne,[15] J. Eberth,[10] E. Farnea,[3] F. Filmer,[12] A. Görgen,[16,21] A. Gottardo,[11] J. Grębosz,[9] M. Gulmini,[11] H. Hess,[10] T. A. Hughes,[12] G. Jaworski,[22,23] J. Jolie,[10] P. Joshi,[24] D. S. Judson,[12] A. Jungclaus,[25] N. Karkour,[20] M. Karolak,[16] R. S. Kempley,[26] A. Khaplanov,[14] W. Korten,[16] J. Ljungvall,[16,20] S. Lunardi,[3,4] A. Maj,[9] G. Maron,[11] W. Męczyński,[9] R. Menegazzo,[3] D. Mengoni,[3,4,27] C. Michelagnoli,[3,4] P. Molini,[3,4] D. R. Napoli,[11] P. J. Nolan,[12] M. Norman,[12] A. Obertelli,[16] Zs. Podolyak,[26] A. Pullia,[17,18] B. Quintana,[28] N. Redon,[29] P. H. Regan,[26] P. Reiter,[10] A. P. Robinson,[19] E. Şahin,[11] J. Simpson,[30] M. D. Salsac,[16] J. F. Smith,[27] O. Stézowski,[29] Ch. Theisen,[16] D. Tonev,[31] C. Unsworth,[12] C. A. Ur,[3] J. J. Valiente-Dobón,[11] and A. Wiens[10]
(AGATA Collaboration)





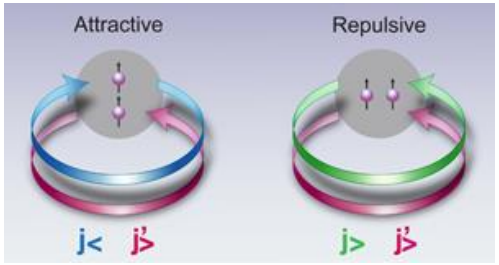


LSSM
Interaction from
E. Caurier et al.
PRC **75, 054317**

SHELL EVOLUTION IN Cu AND Zn ISOTOPES

❑Systematic variation of effective single-particle energies due to the tensor interaction

T. Otsuka et al. PRL 95, 232502 (2005)



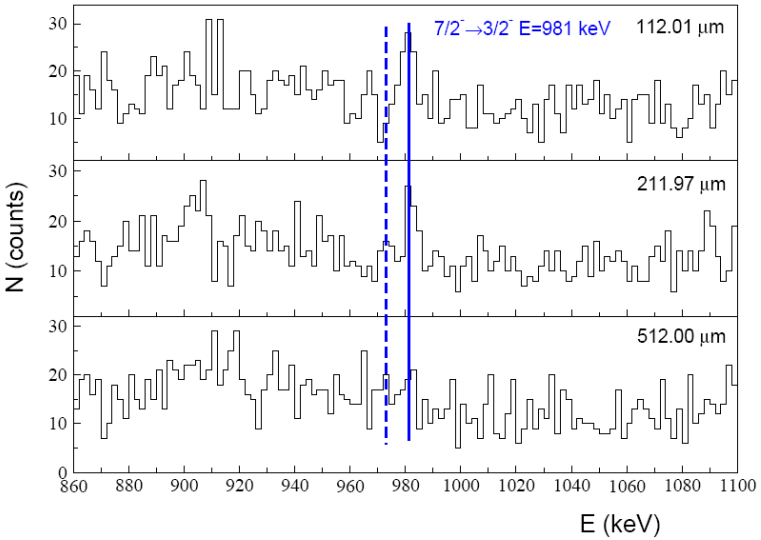
❑presence of both single-particle and collective states at low energy

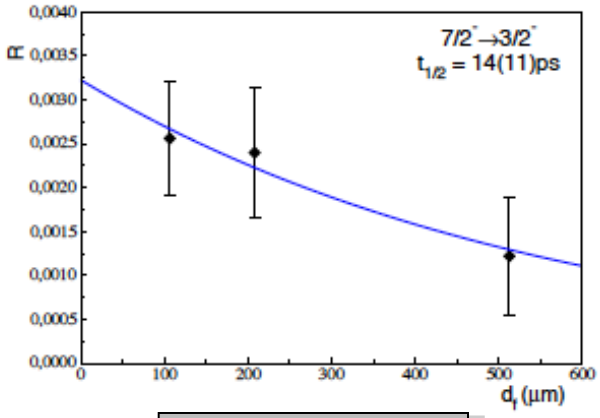
S. Franchoo et al., PRL 81, 3100(1998),
I. Stefanescu *et al.,* PRL 100, 112502 (2008) ,
K. Flanagan PRL, 103, 142501 (2009),
J. M. Daugas PRC 81, 034304 (2010)

Spokepersons: E. Sahin, M. Doncel, A. Goergen

CHARACTER OF THE $7/2^-$ STATE IN ^{71}Cu

- RDDS measurement: ^{76}Ge (577 MeV) + ^{238}U (1.5 mg/cm^2), Degrader Nb 4.17 mg/cm^2





τ=20+/-16ps

$\pi p_{3/2} \times 2^+$ (Ni) $7/2^-$ 1190 keV

$(\pi f_{7/2})^{-1}$ $7/2^-$ 981 keV

$\pi p_{3/2}$ $3/2^-$

$^{71}Cu_{42}$

- New approach for lifetime: normalization done with the number of ions (PRISMA)
- ***LNPS interaction*:** shell-model calculations using an enlarged valence space: pf-shell orbitals for protons and $f_{5/2}$, $p_{1/2}$, $p_{3/2}$, $g_{9/2}$ and $d_{5/2}$ orbitals for neutrons.

transition	$B(E2\downarrow)\,exp\,(e^2fm^4)$	$B(E2\downarrow)\,th_2\,(e^2fm^4)$	
$7/2_1^- \rightarrow 3/2^-$	45(36)	40.0 (3)	LNL
$7/2_2^- \rightarrow 3/2^-$	187(21)	157.1	ISOLDE

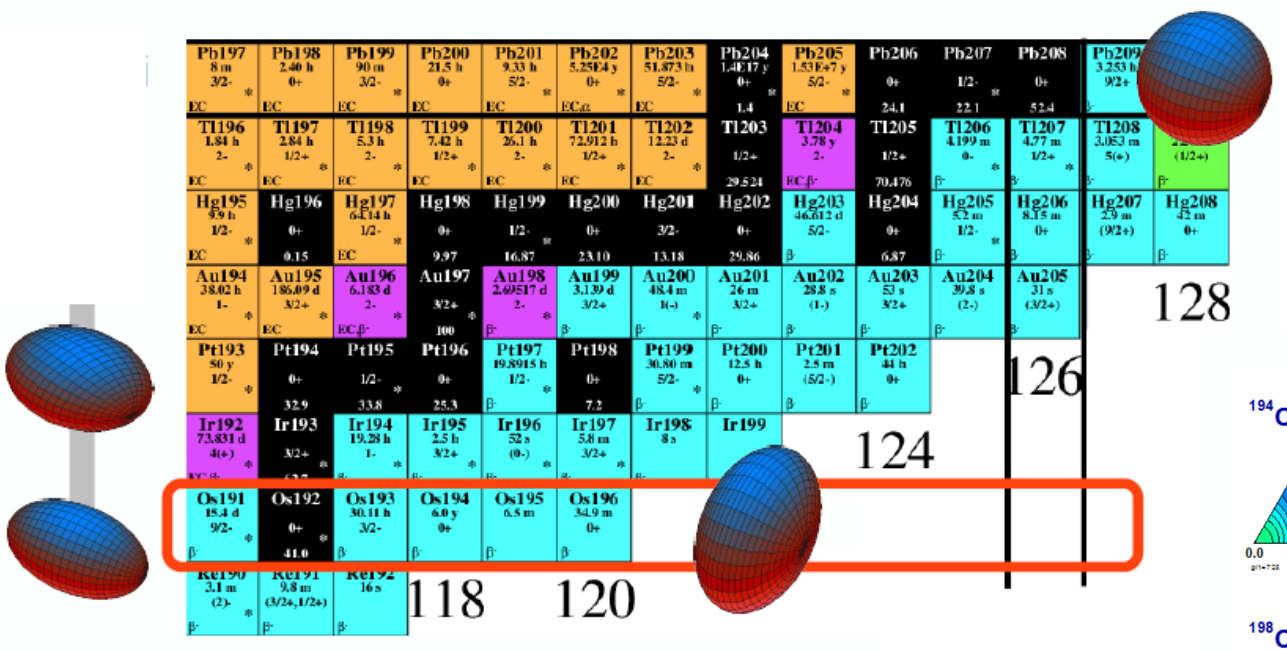
Complex wavefunctions small changes in πp3/2 & p1/2 occupancies

Analysis by M. Doncel, E. Sahin, C.Louchart

LSSM by K. Sieja *et al.*

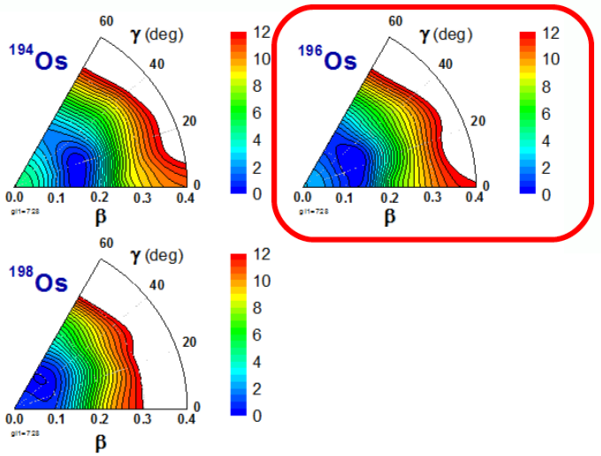
SHAPE TRANSITIONS IN Os ISOTOPES

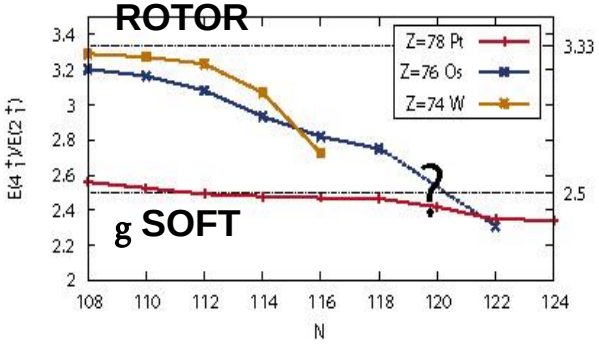
Ph.R. John, V. Modamio, Zs. Podolyak, C. Wheldon, W. Korten

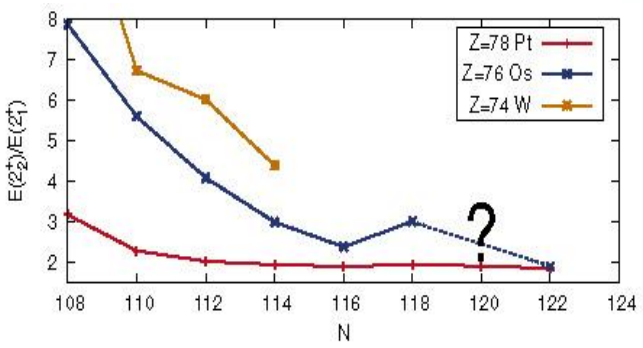


Energy Density Functionals – D. Vretenar (Priv. Comm.)

Binding energy map βγ plane







P.D. Bond Phys. Lett. 130B, 167

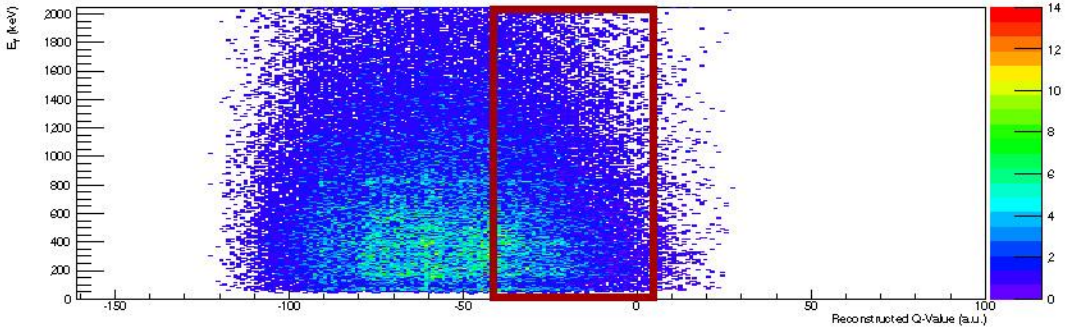
Zs. Podolyàk et al. PRC79, 31305(R)

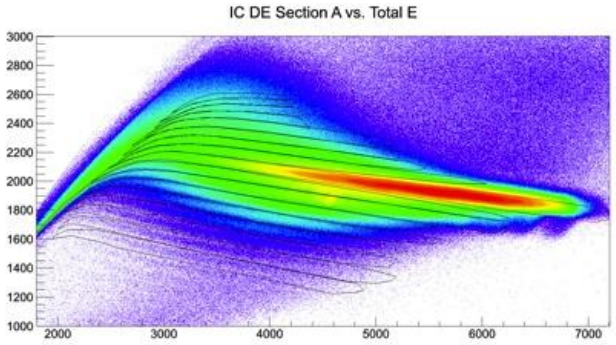
C. Wheldon et al. PRC63, 11304

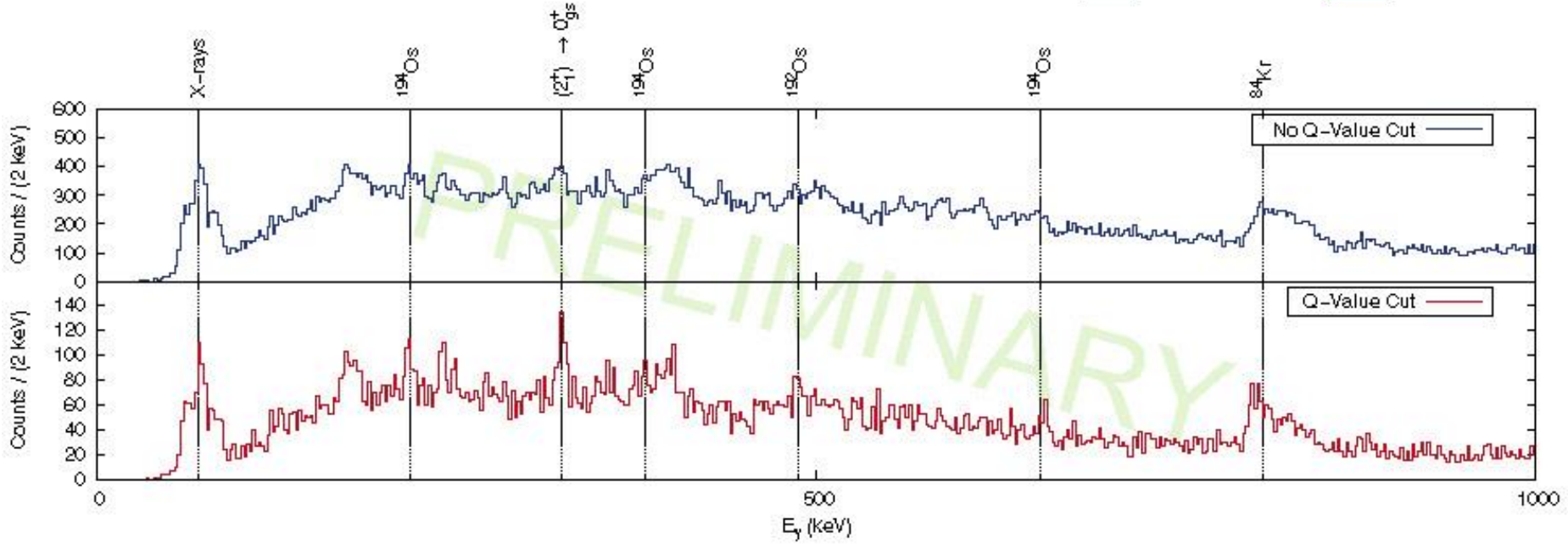
FIRST EVIDENCE OF ^{196}Os

^{82}Se + ^{198}Pt (2mg/cm^2) at 426 MeV

BLF: β~10% FWHM: 0.5%
TLF: β~3% FWHM: 1.8%

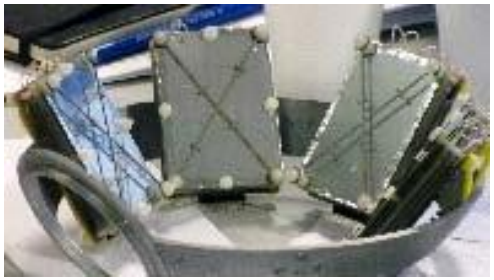






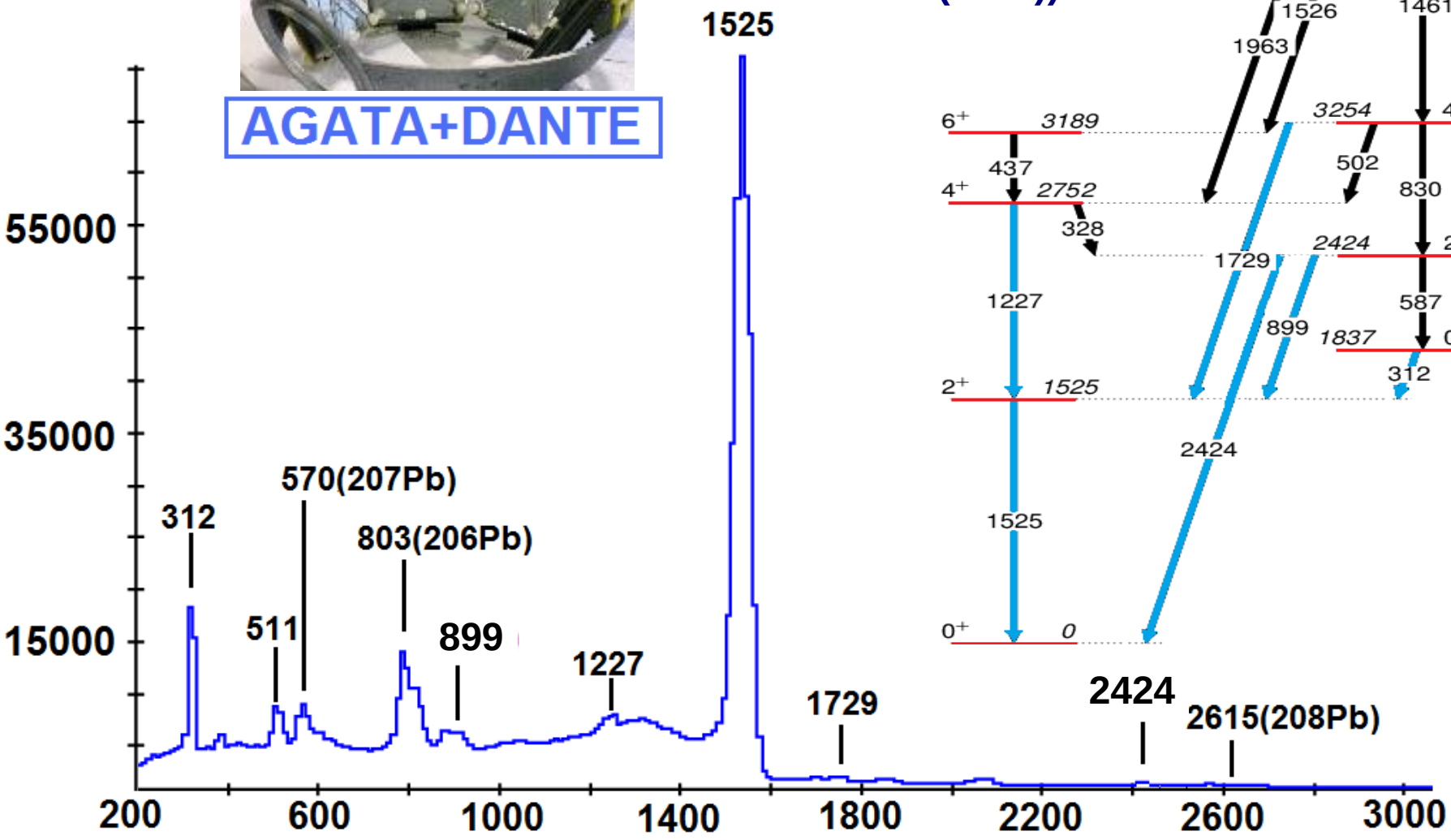
Analysis by P.R. John

COULEX ^{42}Ca (γ SPECTRUM ^{42}Ca+^{208}Pb)



AGATA+DANTE

K. Hadyńska-Klęk *et al.*, (Acta Phys. Pol B 42, 817 (2011))



COULEX ^{42}Ca: SUPER DEFORMATION?

K. Hadyńska-Klęk *et al.*, (accepted in Acta Phys. Pol B)
Zakopane Conference on Nuclear Physics 2012

Q^2 nuclear shape invariants determined by using the Quadrupole Sum Rules method

$$\langle Q^2 \rangle = \left[\frac{3}{4\pi} Z (r_0 \sqrt[3]{A})^2 \right]^2 \langle \beta^2 \rangle$$