

GAMMA

2014

Padova, 1.07.2013

Roberto Menegazzo

GAMMA

- Commissione Scientifica Nazionale III

- Linea 3: Nuclear Structure and Reaction Dynamics

- Fission and fusion reaction mechanisms
 - Production and study of very exotic nuclei far from the stability region
 - Structure of nuclei from gamma spectroscopy
 - Radioactive ion beams

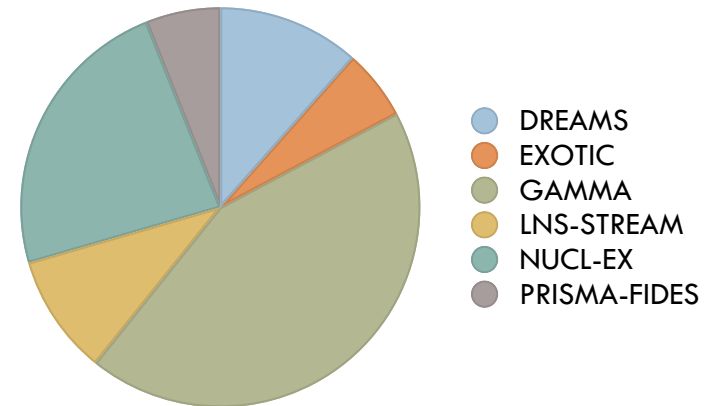
- GAMMA

- Sezione di Padova, Sezione di Milano, Sezione di Firenze, Sezione di Perugia, Laboratori Nazionali di Legnaro
 - Circa 50 FTE

- GAMMA-PD – 2013

- 12 Ricercatori (7.9 FTE) 2 Tecnologi (1.2 FTE) 2 Tecnici
 - Richieste finanziarie 420 k€ → Assegnazioni 300 k€

*Distribuzione FTE 2013
Linea 3 CSN III*



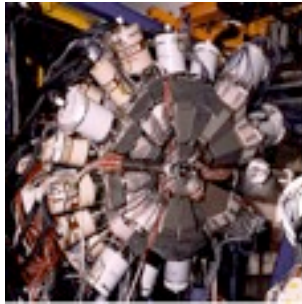
GAMMA-PD

- Spettroscopia gamma di alta risoluzione e alta efficienza
 - Rivelatori HPGe per raggi gamma

GASP – 1992



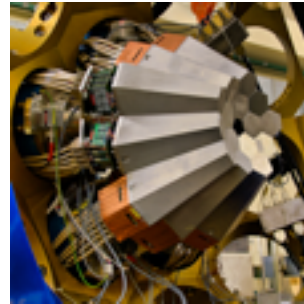
EUROBALL – 1998



CLARA – 2004



AGATA-D – 2010



GALILEO – 2013



- Rivelatori ancillari per particelle (protoni, alpha, neutroni): TRACE, EUCLIDES, n-Ring
- Utilizzo dei fasci disponibili ai Laboratori Nazionali di Legnaro
 - Fasci stabili: Tandem – ALPI – PIAVE
 - Fasci esotici (in prospettiva): SPES
- Esperimenti in laboratori esteri (GSI, GANIL, MSU, RIKEN)
 - Fasci radioattivi

GAMMA-PD

- Struttura nucleare in condizioni estreme di momento angolare, energia di eccitazione, isospin
 - High spin states: highly and superdeformed nuclei, wobbling motion
 - Deformed nuclei: pear shaped– and tetrahedral shaped–nuclei
 - Collectivity and shell model
 - Isospin symmetry breaking effects: mirror nuclei
 - Isospin mixing: $N=Z$ nuclei
 - Spectroscopy at the drip–line
 - Shells stability and evolution in neutron–rich nuclei
 - Symmetries at the critical point
 - Nucleosynthesis

GAMMA-PD 2013

- Dimostratore di AGATA → GSI
 - Commissioning e sperimentazione → Meno coinvolti nella gestione
- Realizzazione GALILEO
 - Realizzazione della struttura di supporto → *completata*
 - Allestimento del punto misura → *in ritardo*
 - Produzione 10 criostati tripli → *in ritardo*
 - Preamplificatori GASP e produzione per i cluster tripli → *completati*
 - Elettronica di processamento per 60 canali Ge + 60 canali AC → *prodotta*
 - Allestimento DAQ → *in ritardo*
 - Schermo AntiCompton (Milano) → *da ripensare*
 - Produzione dell'elettronica di campionamento 60+60 canali (Milano) → *fatto*
- Produzione elettronica per 10 rivelatori AGATA (400 canali)
- Sviluppo rivelatore per particelle cariche TRACE
- Esperimenti al GSI, GANIL, MSU, RIKEN, ...



AGATA

AGATA Demonstrator \rightarrow 1π Program

2010-2011 \rightarrow LNL
5 TC

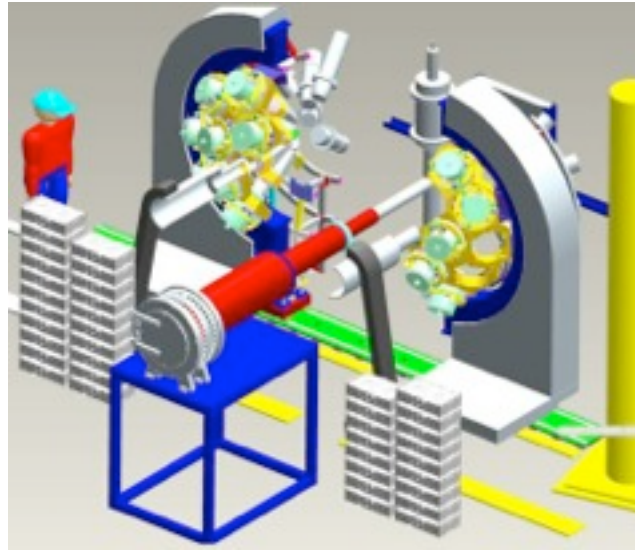


AGATA D.+PRISMA

Total Eff. \sim 6%



2012 \rightarrow GSI/FRS
 \geq 5 DC + 5 TC

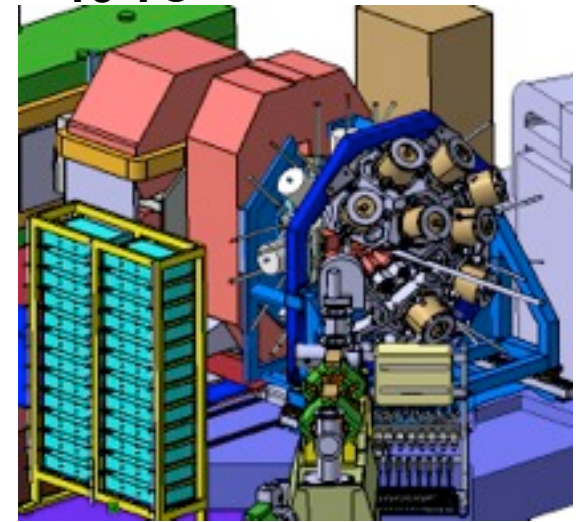


AGATA @ FRS

Total Eff. $>$ 10%



2014 \rightarrow GANIL/
SPIRAL2
 \sim 15 TC



**AGATA + VAMOS
+ EXOGAM**

Total Eff. $>$ 20%

The 2012 set-up in reality

LYCCA

**AGATA Cluster
array**

**HECTOR
BaF₂ array**

PreSPEC

The 2012 set-up in reality

LYCCA

**Au, Be
target**

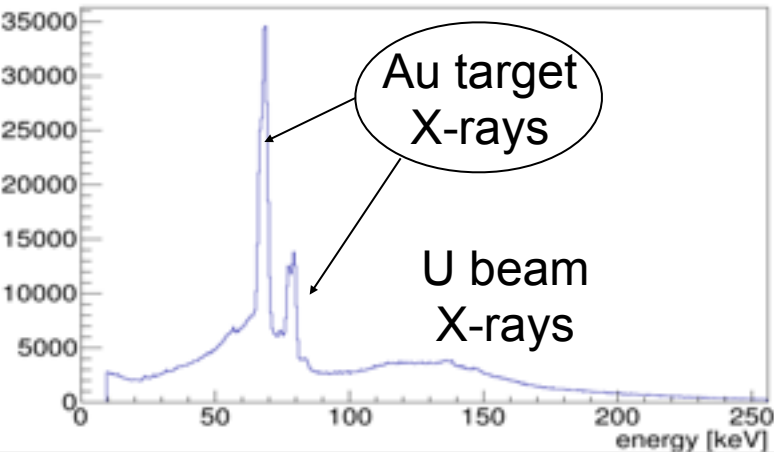
**AGATA Cluster
array**

**HECTOR
BaF₂ array**

PreSPEc

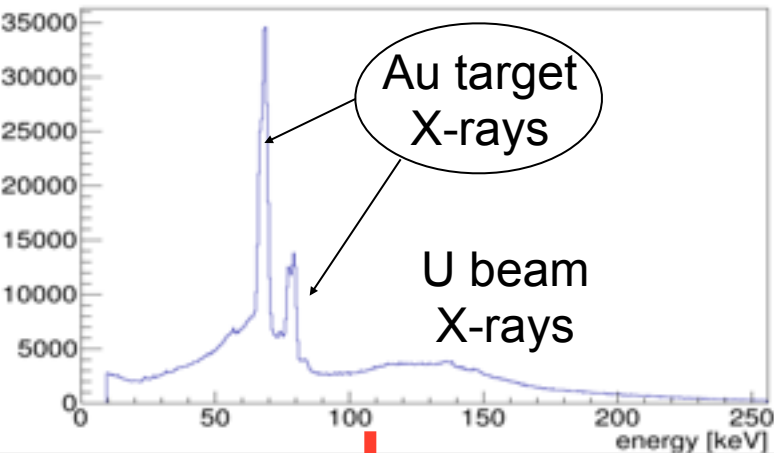
Doppler-Correction of Uranium X-Rays

Technical Commissioning

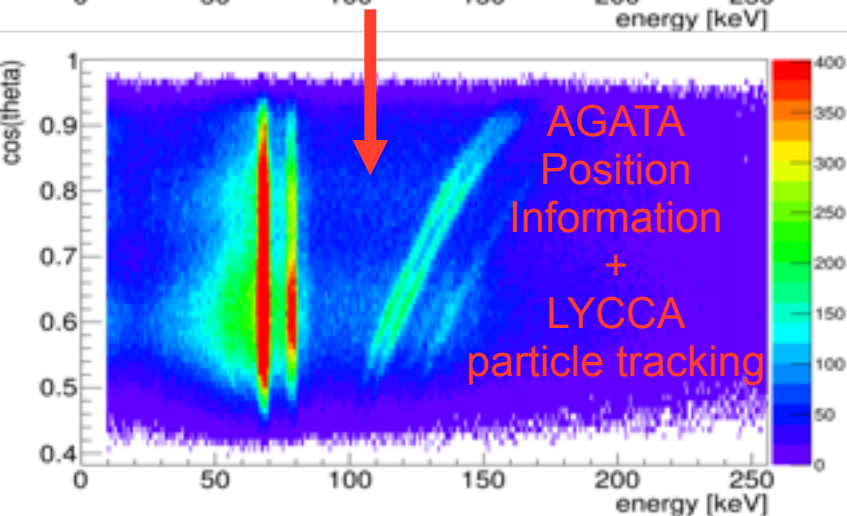


- U beam on Gold Target: thickness 400 mg/cm²
- U velocity at Target position: $v/c \approx 0.5$
- U-atoms have x-rays around 100 keV
- Doppler shift to 100 – 150 keV

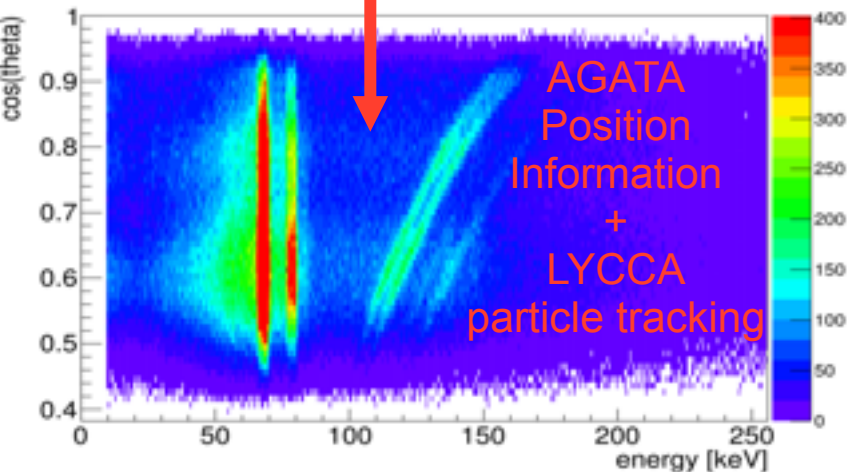
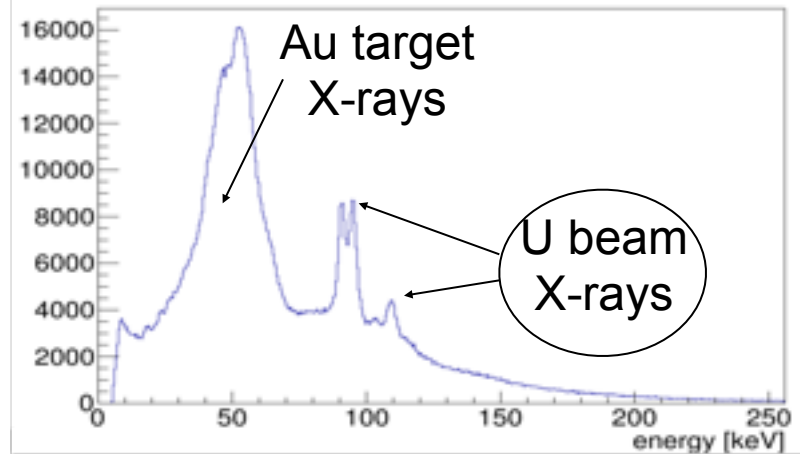
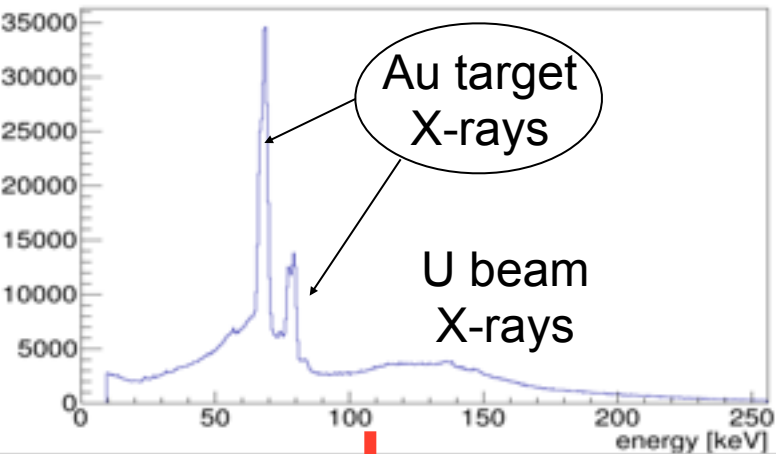
Doppler-Correction of Uranium X-Rays Technical Commissioning



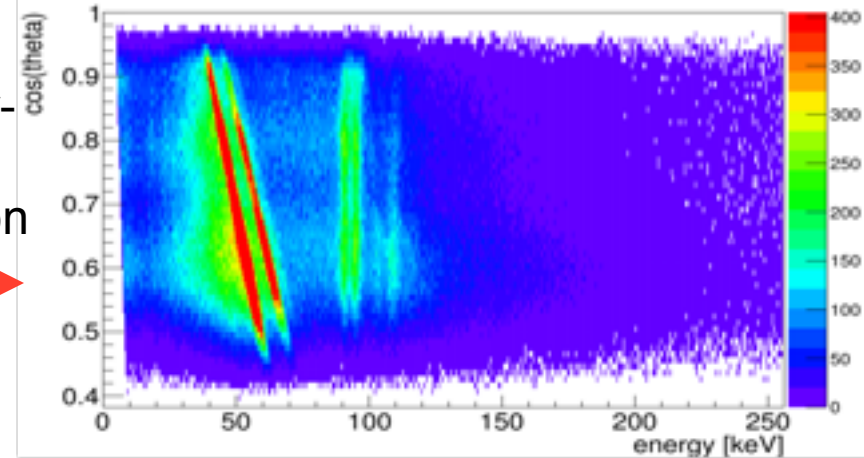
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Doppler-Correction of Uranium X-Rays Technical Commissioning



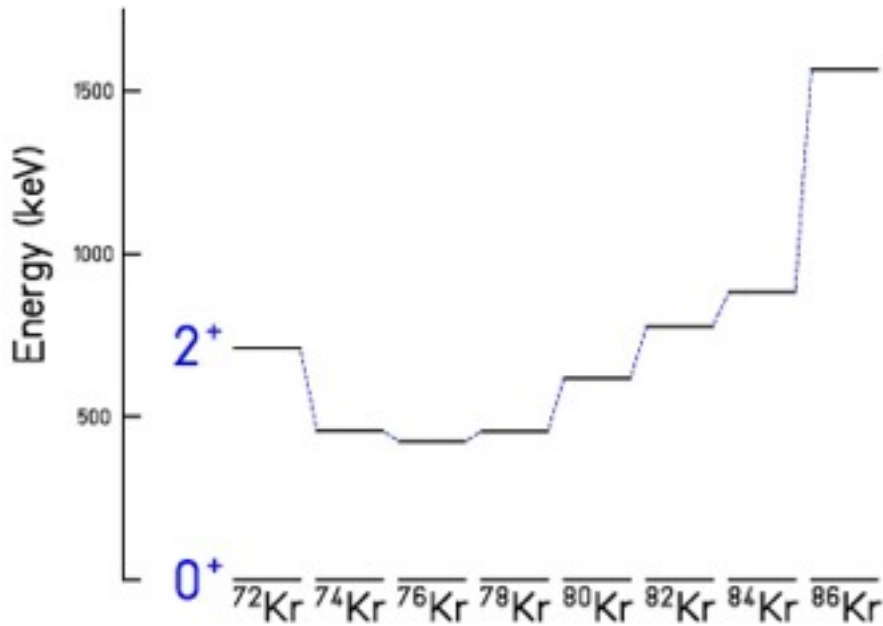
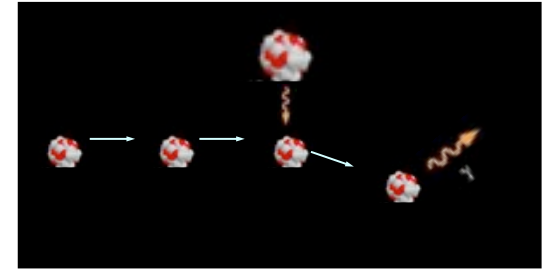
Doppler-
shift
correction



performance commissioning: ^{80}Kr beam on Be/ Au

Kr78	Kr79 35.04 h 1/2-	Kr80	Kr81 2.29E+5 y 7/2+	Kr82	Kr83	Kr84	Kr85 10.756 y 9/2+	Kr86
0+	EC	0+	EC	0+	9/2+	0+	0-	0+
0.35		2.25		11.6	11.5	57.0	0	17.3

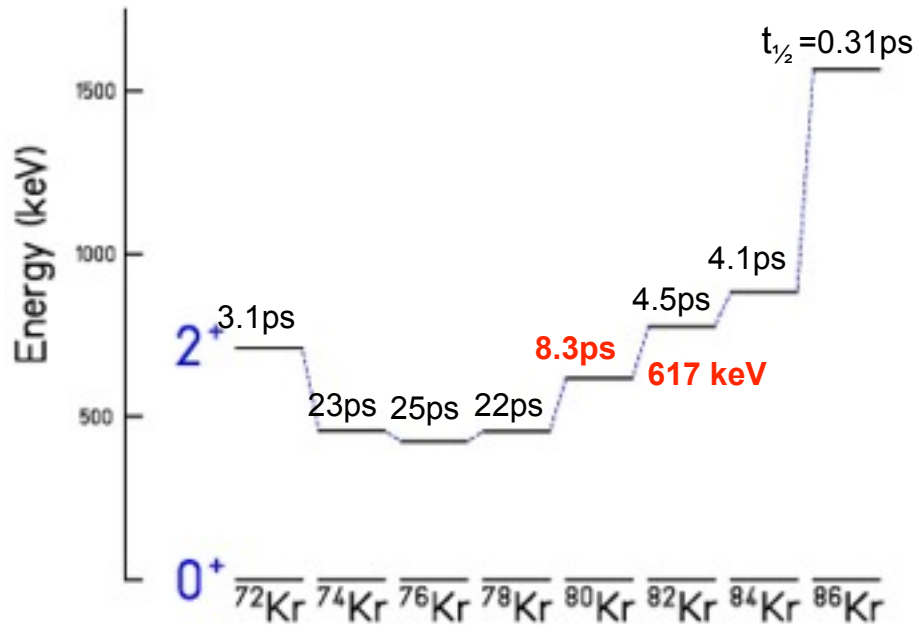
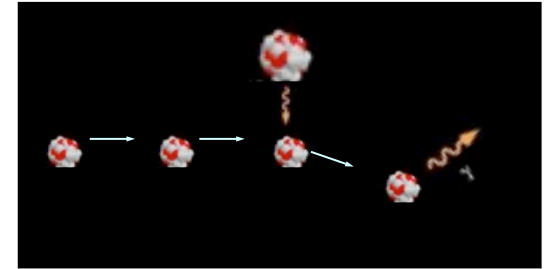
50



2 / 2012										September 2012											
Week	Week 36									Week 37					Week						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
S424, Korlos/Gerl, 80Kr, EZR 400 MeV/u, 1E6/spill, FRS																					

performance commissioning: ^{80}Kr beam on Be/ Au

Kr78	Kr79	Kr80	Kr81	Kr82	Kr83	Kr84	Kr85	Kr86
0+	35.041 1/2-	0+	29E+5 y 7/2+	0+	9/2+	0+	16.756 y 9/2+	0+
0.35	EC	2.25		11.6	11.5	57.0	0	17.3
								50



2 / 2012										September 2012										
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
S424, Korlen/Gerl, 80Kr, EZR 400 MeV/u, 1EG/sp8, FRS																				

Approved 2012 Proposals



S424: Korten/Gerl

(4 days, 9/2012)



Performance commissioning (PreSPEC-AGATA- LYCCA)



S429: Rudolph / Podolyák / Gerl

(6 days, 10/2012)



Quadrantic evolution of collectivity around ^{208}Pb



S430: Wieland / Gorská

(5/7 days, 10/2012)



Pygmy Dipole Resonance in ^{64}Fe and the properties of neutron skin



S426: Pietralla / Rainovski / Gerl

(1/8 days, 2013)

Relativistic $M1$ -Coulomb excitation of ^{85}Br



S433: Gadea / Gorská

(5 days, 10/2012)



Coulomb excitation of the band-terminating 12^+ yrast trap in ^{52}Fe



S431: Boutachkov / Korten

(4 days, 11/2012)



Proton hole states in ^{132}Sn and $N=82$ shell structure



S428: Pietri

(4 days, 11/2012)



Shape evolution in neutron-rich Zr



S427: Sahin / de Angelis

(5 days, 2013)

Study of the $T_z=-1$ nucleus ^{70}Kr (isospin symmetry $A=70$)



S434: Recchia / Bentley

(5 days, 2013)

Transition rates and mirror energy differences in isobaric multiplets

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S426: Pietralla / Rainovski / Gerl

(1/8 days, 2013)



S433:

days, 10/2012)



Backlog: about 3 weeks



S431:

p in ^{52}Fe

days, 11/2012)



S428: Pietri

(4 days, 11/2012)



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(5 days, 2013)

Transition rates and mirror energy differences in isobaric multiplets



PreSPEC-AGATA proposals 2013

T. Grahn	Univ. Jyvaeskylae	Relativistic Coulomb excitation of neutron mid-shell Pb nuclei at AGATA and FRS	184Pb - 188Pb (CLX)
P. Reiter, A. Wendt	Univ. Koeln	Isospin symmetry in the sd shell	25Si, 29S (CLX)
Z.Podolyak, D. Rudolph, J. Gerl	Univ. Surrey, Lund Univ., GSI	Quadrantic Evolution of Collectivity Around 208Pb	208Po - 214Po, 210Pb (CLX)
S. Tashenov	Univ. Heidelberg	Production and diagnostics of polarized highly charged ions towards the Complete Photoionization Experiment in the regime of hard x-rays	Polarisation of Pb K x-rays
A. Gottardo	LNL	(p,p') reactions in n-rich tin isotopes: how is nuclear matter deformation evolving?	106,108Sn (p,p')
T. Back	RIT Stockholm	Spectroscopy and B(E2) measurements in neutron rich Mo nuclei:	108Mo - 112Mo (DSAM)
B. Cederwall	RIT Stockholm	Measurement of B(E2) values for the first excited 2+ states in 92,94,96Pd	94,96Pd (CLX)
C. Louchart, A. Corsi	TU Darmstadt, CEA	Structure of Zn isotopes from inelastic scattering and knockout	72- 76Zn (p,p')
C. Stahl	TU Darmstadt	Precise determination of the B(E2, 0+ → 2+) in 106, 108Sn	106Sn (CLX)
A. Obertelli, F. Flavigny	CEA, KU Leuven	H-induced reactions from Ni isotopes	52 -56Ni (p,p')
Z. Dombradi, Dora Sohler	Atomki Debreczen	Search for a new type of neutron decoupling in heavy Sn and Te nuclei	136Te (p,p')
M. Doncel, V. Modamio	RIT Stockholm, LNL	Evolution of the collectivity of neutron-rich Co isotopes around N=40	67-69Co (CLX)
C. Domingo-Pardo	IFIC Valencia	Multiple shape coexistence in 80Zr	80Zr (DSAM)
J. Valiente-Dobon, G. de Angelis, A. Gadea	INFN Legnaro	Coherent Proton–Neutron Contribution to Octupole Correlations in 114Xe studied by inelastic proton and deuteron scattering	114Xe (p,p'/d,d')

PreSPEC-AGATA timeline

- 2010:** **Contract between AGATA & GSI: ≥ 12 weeks beamtime!**
Discussion of 36 Letters of Intent (LoI) (Istanbul meeting)
In-beam PreSPEC experiments with EB Cluster + LYCCA-0
- 2011:** In-beam PreSPEC experiments with EB Cluster + LYCCA-0
Plunger and LH₂ commissioning experiments
Internal LoI revision, pre-selection of first 12 physics cases
GSI G-PAC meeting, 8 expts. plus comm. approved (~ 7 weeks)
- 2012:** PreSPEC-AGATA + LYCCA-1 commissioning
September: performance commissioning
October-November: 5 out of 8 experiments, **3 weeks backlog**
December: Discussion (revised and new) LOIs for the 2nd round
- 2013:** **Spring: Internal pre-selection and evaluation 2nd round**
Fall: Backlog and new experiments, about 7 remaining weeks

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In-beam PreSPEC experiments with EB Cluster + LYCCA-0
- 2011:** In-beam PreSPEC experiments with EB Cluster + LYCCA-0
Plung
Inter
GSI offers (can offer, cf. BMBF) only some 4 weeks in 2013 (~ 7 weeks)
- 2012:** PreSPEC-AGATA + LYCCA-1 commissioning
September: performance commissioning
October-November: 5 out of 8 experiments, **3 weeks backlog**
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Beam Time at GSI

□ **Beam Time 2013**

Due to technical and organizational constraints there will be no beam time at the GSI accelerators in 2013. We will announce any plans for 2014 as soon as they are available.

AGATA references

Technical

AGATA- Advanced Gamma Tracking Array

S, Akkoyun et al., Nucl. Instr. and Meth. in Phys. Res. A668 (2012) 26

Improved energy resolution of highly segmented HPGe detectors by noise reduction

A. Wiens et al., Eur. Phys. J. A 49, 47 (2013)

Correction for neutron damage in AGATA detectors using Pulse Shape Analysis

B. Bruyneel et al., Eur. Phys. J. A 49, 61 (2013)

Physics

High-Spin Structure in 40K

P.-A. Söderström et al. Physical Review C 86, 054320 (2012)

Study of the Order-to-Chaos transition in W-174 with the AGATA-Demonstrator

V. Vandone et al., XIX INTERNATIONAL SCHOOL ON NUCLEAR PHYSICS, NEUTRON PHYSICS AND APPLICATIONS (VARNA 2011) IOP

Journal of Physics Conference Series Volume: 366 Article Number: 012045

Towards the determination of superdeformation in 42Ca

K. Hadyńska-Klęk et al., Acta Phys. Pol. B44, 617 (2013)

Collective nature of low-lying excitations in 70,72,74Zn from lifetime measurements using the AGATA spectrometer demonstrator

C. Louchart et al, Phys. Rev. C 87, 054302 (2013)

Lifetime Measurements in Neutron-rich Cu Isotopes

M. Doncel et al., Acta Phys. Pol. B44, 505 (2013)

Global properties of K-hindrance probed by the β -decay of the warm rotating 174W nucleus

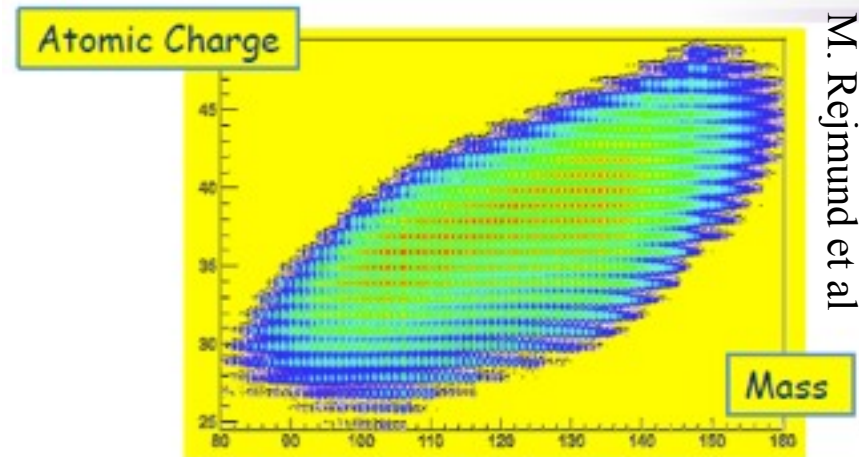
V. Vandone et al., Physics Letters B in press

F. Recchia et al., PRC in press

V. Modamio et al., PRC to be submitted

AGATA Configurations at GANIL

It has been decided that the first campaign will be AGATA + VAMOS std. + EXOGAM2 (+ Plunger)



Proposals using these setups will be submitted to the next PAC meeting (**foreseen in January 2014**).

By the end of October / beginning of November 2013, ~ two months before the PAC meeting, we will organize a collaboration meeting to discuss together the proposals based on the LoI of this call, eventual new proposals, check the feasibility and eventual overlaps.

All proposals have to be discussed at this meeting before being submitted to the PAC.

Altre misure

ILL – Grenoble

Collaborazione scientifica ILL-GANIL-LNL per campagna di misure al reattore. Siamo nel core team di gestione dell'apparato, dell'analisi dati e pubblicazione dei risultati. Referente per l'Italia: Calin. A. Ur.

Contribuiamo con 6 rivelatori di GASP completi di schermi AC e con il sistema HV.

Spokesperson italiani di alcune misure: S. Leoni, D. Mengoni e C.A. Ur.

EURICA - RIKEN

La campagna di misure presso il laboratorio RIKEN in Giappone utilizza l'apparato EURICA, array di rivelatori al Ge di tipo Cluster (ex-EUROBALL) accoppiato con un array di Si. Lo scopo principale della campagna è quello di studiare il decadimento beta e il decadimento isomerico di nuclei esotici prodotti dalla fissione relativistica del fascio di ^{238}U accelerato a 345 MeV/u. Misura congiunta con un esperimento di eccitazione Coulombiana per lo studio dei nuclei $^{73,75}\text{Ni}$. **Spokespersons italiani**: G. Benzoni e G. de Angelis.

NSCL – MSU

Misura del grado di collettività degli isotopi $^{70,72}\text{Ni}$ mediante scattering inelastico di protoni. Reazione in cinematica inversa con bersaglio H_2 criogenico. Identificazione del fascio prima e dopo la reazione in coincidenza con i fotoni rivelati dall'apparato GRETINA. **Spokesperson italiano**: G. de Angelis.

GAMIPE - LNL

The EXILL Campaign @ ILL

On Going Analysis:

(n, γ) DATA



Cold n + $^{46,48}\text{Ca}$ (Reactor ILL, Grenoble)

Exogam/GASP Ge Array + LaBr_3

Search for low-spin members of the Particle-phonon multiplets with 3- of ^{48}Ca



Cold n + ^{209}Bi (Reactor ILL, Grenoble)

Exogam/GASP Ge Array + LaBr_3

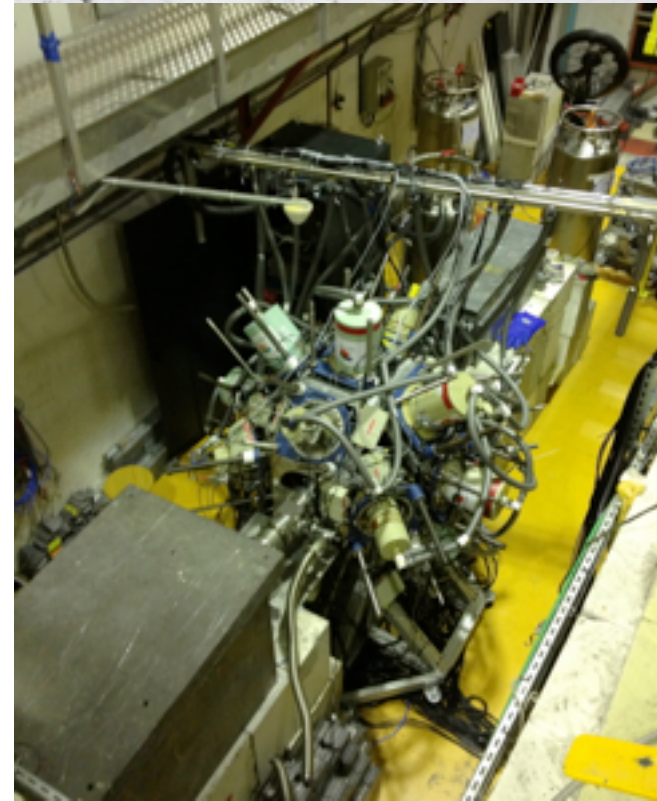
Search for proton-neutron multiplet with 3- in ^{208}Pb (34 Wu !!!)

FISSION DATA

1 and 2 nucleons around ^{132}Sn

Cold n + ^{235}U and ^{241}Pu (Reactor ILL, Grenoble)

Exogam/GASP Ge Array + LaBr_3



γ spectroscopy and Lifetimes (Fast Timing)

NP1112-RIBF80: Structural changes between N=40 and N=50 next to Ni isotopes: a joint proposal



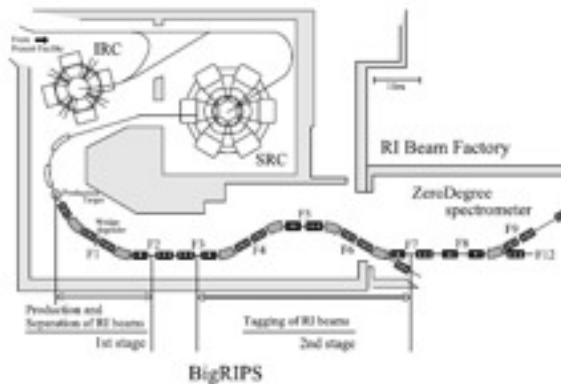
Spokeperson: G. Benzoni (INFN Italy)

May 22-27

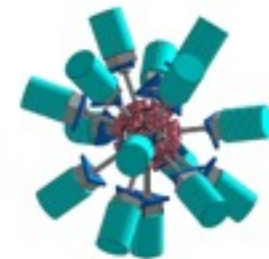
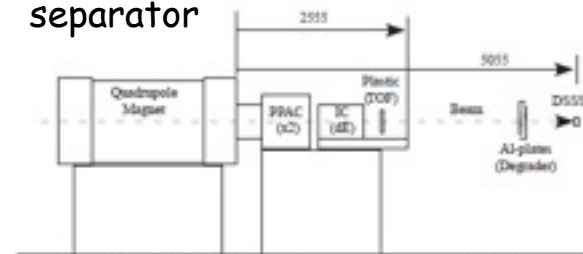
Main topics of investigation:

- (a) Z=28 shell gap towards ^{78}Ni : Beta-decay studies of neutron-rich $^{75,77}\text{Cu}$
- (b) Decay spectroscopy of ^{74}Co
- (c) Spectroscopic and isomeric study of very neutron-rich Iron isotopes
- (d) Isomeric states in neutron-rich $^{73,75}\text{Ni}$

Experimental setup @RIKEN: EURICA



@ final focal plane of BigRips separator



(b) View from 120 degrees



Beam details

- Relativistic fission of ^{238}U @ 345 AMeV
- BigRIPS setting centred around ^{72}Fe , with a high momentum cut
- $I_{\text{beam}} \sim 9 \text{ pA}$
- 3 effective days of measurements @ $<10 \text{ pA}$:
Rich dataset in many isotopic chains

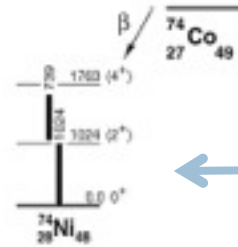
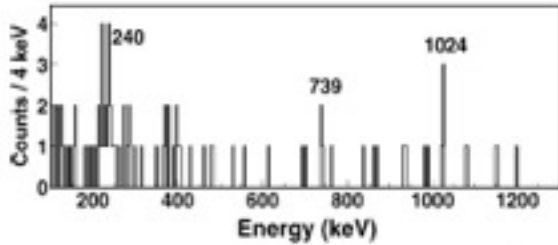
Detectors setup

- Standard BigRIPS detectors
- EURICA setup comprising 5 DSSSD of WAS3ABi
- 12 Cluster detectors (80 capsules working)
- LaBr_3 detectors will help increasing efficiency

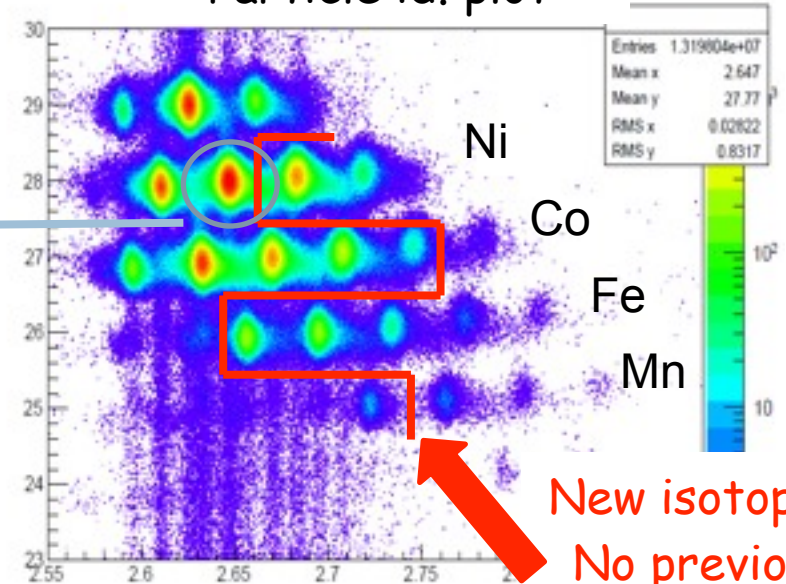
Beamtime shared with NP1112-RIBF49

On-line spectra

Egs. Previous info on β decay of $^{74}\text{Co} \rightarrow ^{74}\text{Ni}$



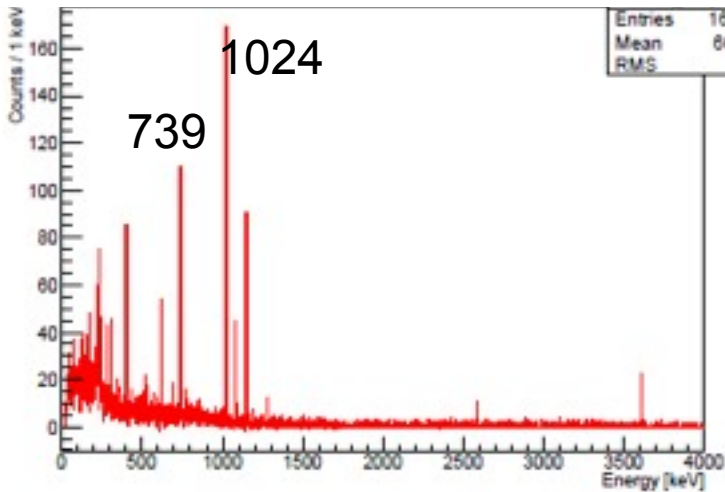
Particle id. plot



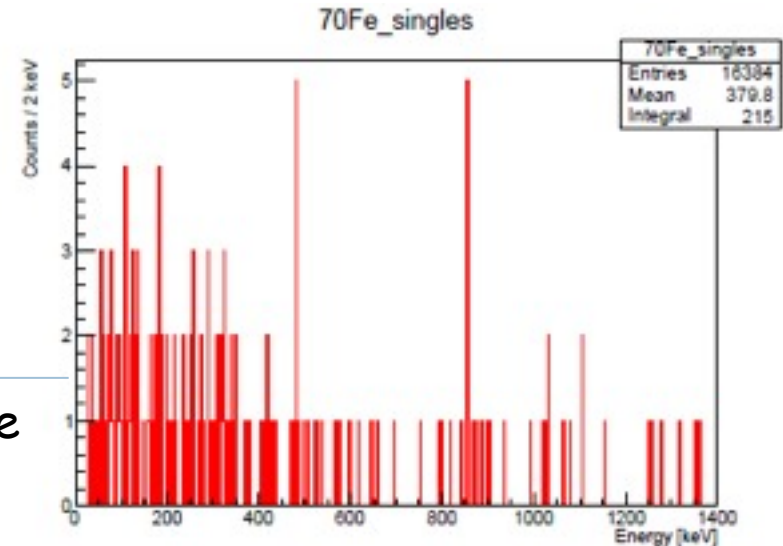
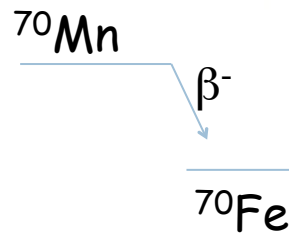
New isotopes:
No previous info available

C.Mazzocchi et al. PLB622

On-line spectrum:
additional lines seen in coincidence!



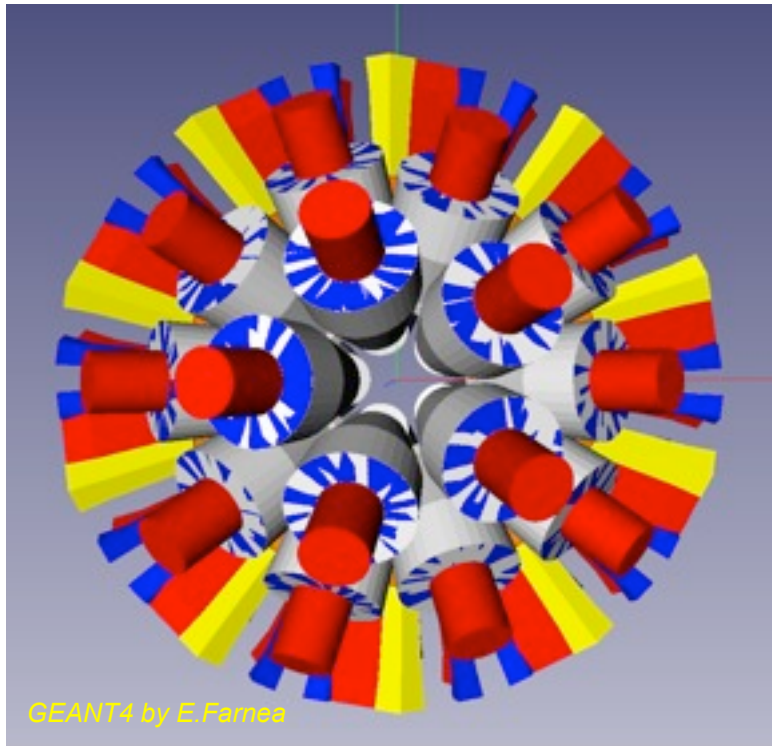
First info.
on decay





GALILEO

The GALILEO Project



30 GASP detectors @ 22.5cm

5 5 5 5 5 5
29° 51° 59° 121° 129° 151°

10 triple cluster (EB clusters) @ 24cm

90°

take advantage of the recent technical developments for AGATA
preamplifiers, digital sampling, preprocessing, DAQ
→ **high count rates (30–50 kHz/det)**

use of existing detectors
EB cluster detectors capsules
GASP detectors
→ **high photopeak efficiency**

use beam facilities at LNL
Tandem, ALPI, PIAVE – stable
SPES – RIB
→ **production of new nuclei**

$\epsilon_{ph} \sim 8\%$ P/T $\sim 50\%$

Start physics campaign in summer 2013 - delayed

GALILEO – Mechanics

Triple cluster cryostat

- end-cap, cold finger, dewar
- use of the EB cluster capsules

Anti-Compton shield for the TC detector

- recover the crystals from the original EB cluster shields

Holding structure

- highly flexible, space for ancillary detectors

Pb collimator

- divided in 4 parts

Reaction chamber

- accommodate different ancillary detectors

Beam line

- the structure opens along the beam line

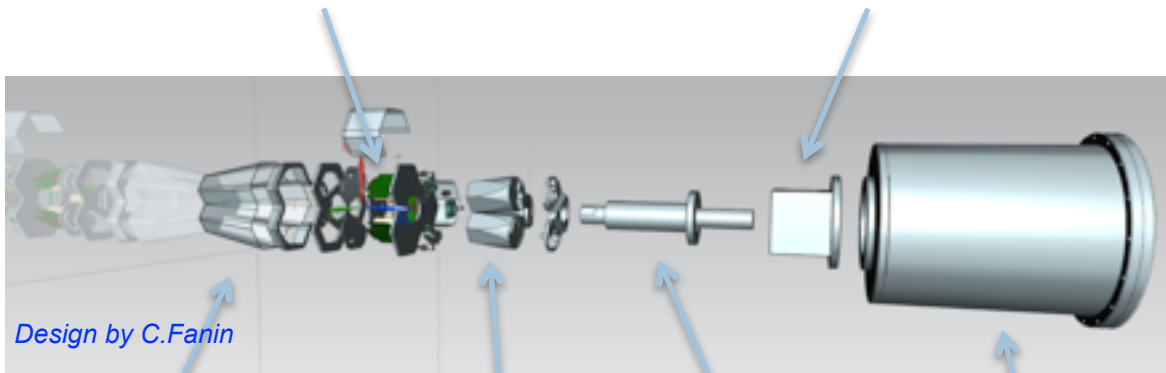
Ancillary detectors

- integration with the holding structure

Triple Cluster Detector – First Prototype

front–end electronics
(warm part)

Zeolites container



end–cap in
Carbon fiber

capsules

cold finger

dewar



Testing

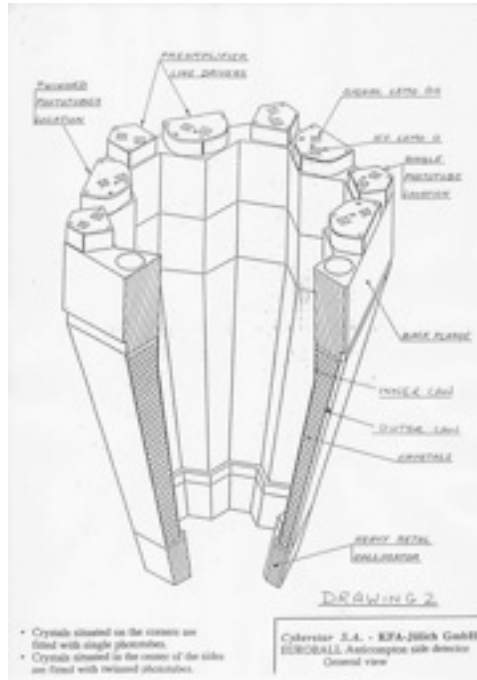
2012 – prototypes

2013 – production 10 cryostats

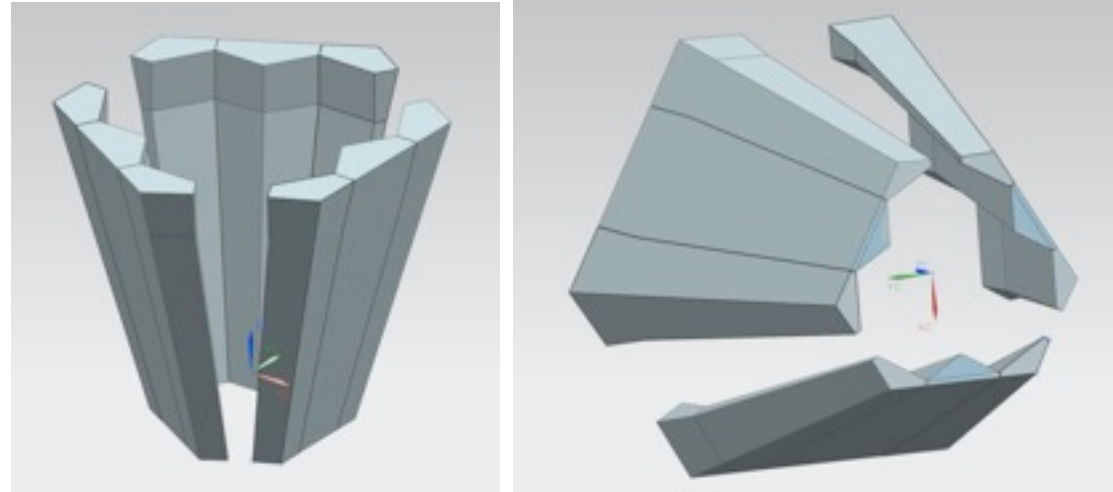
Mechanical workshop in Padova and Legnaro

Triple Cluster Detector – AC Shield

EB cluster AC shield



Refurbished AC shield for TC detectors



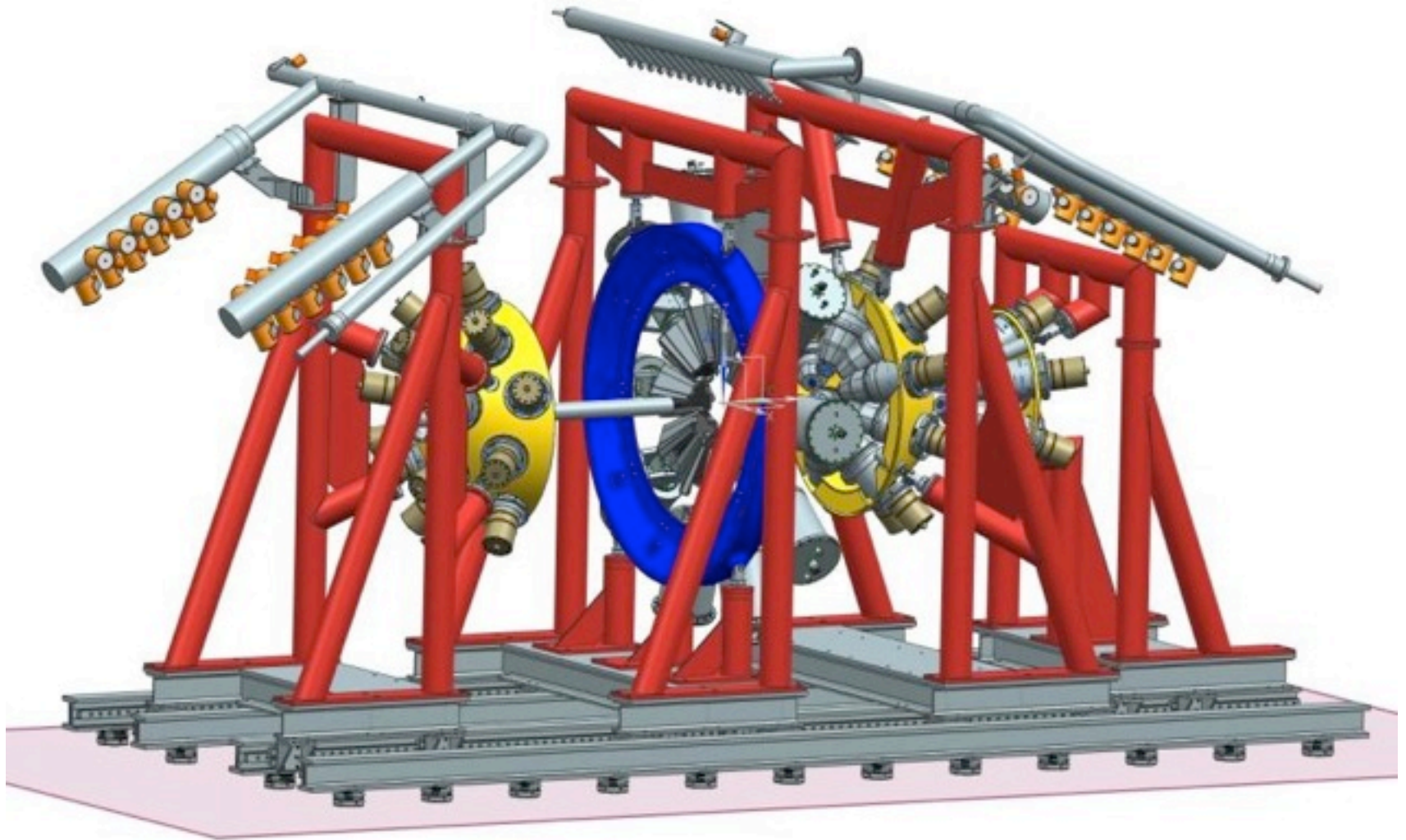
construction of the triple cluster AC shield out of the individual crystals of the original EB cluster shield

→ **received from the GAMMAPOOL and taken apart one EB AC shield**

2012 – design (possibility of using carbon fiber enclosure)

2013 – production 10 AC shields

GALILEO – Mechanics



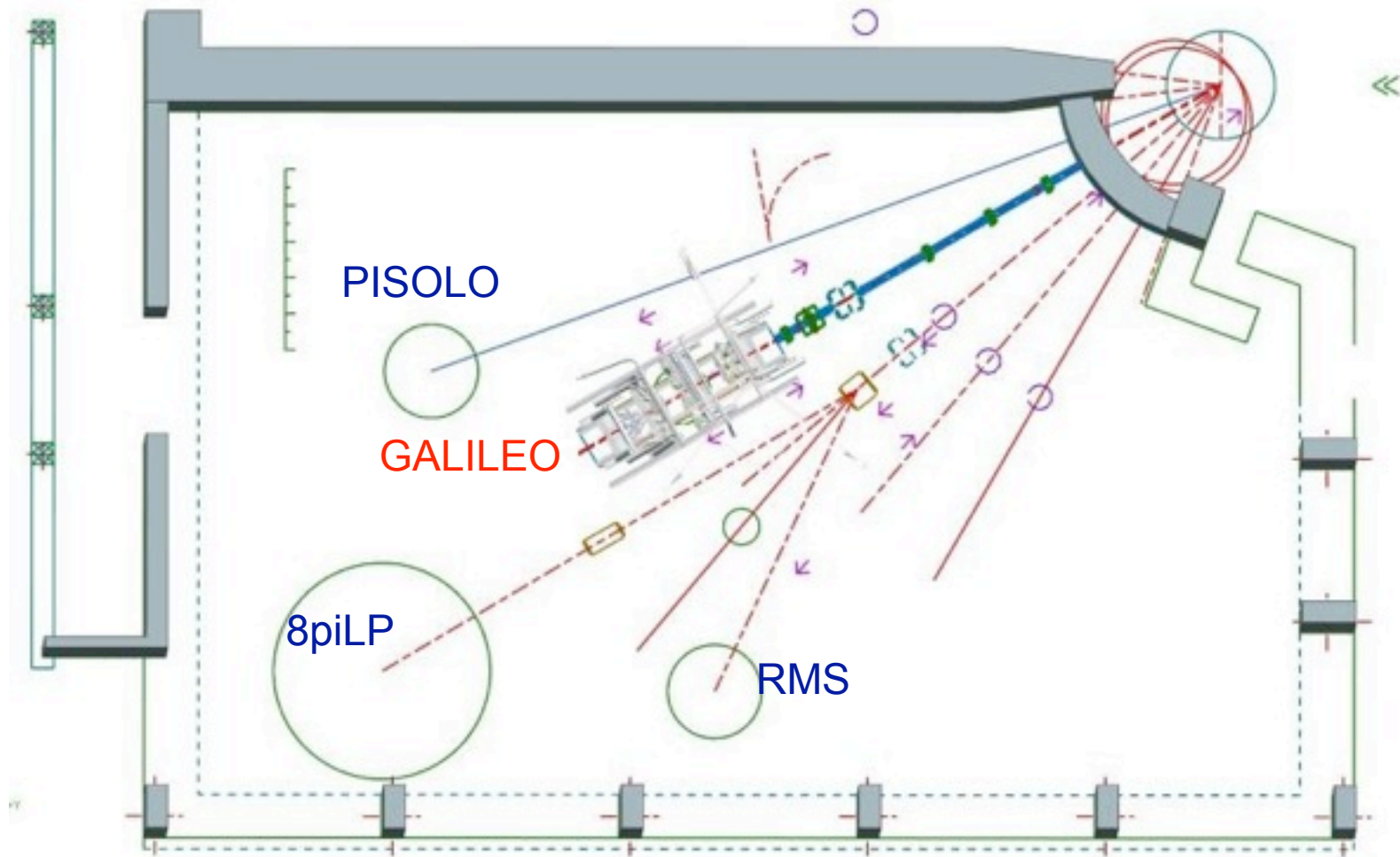
Technical Office of Padova: [C.Fanin](#), [M.Turcato](#), [M.Rampazzo](#), [M.Romanato](#)

GALILEO – Mechanics



SCM
Modena

GALILEO – Location



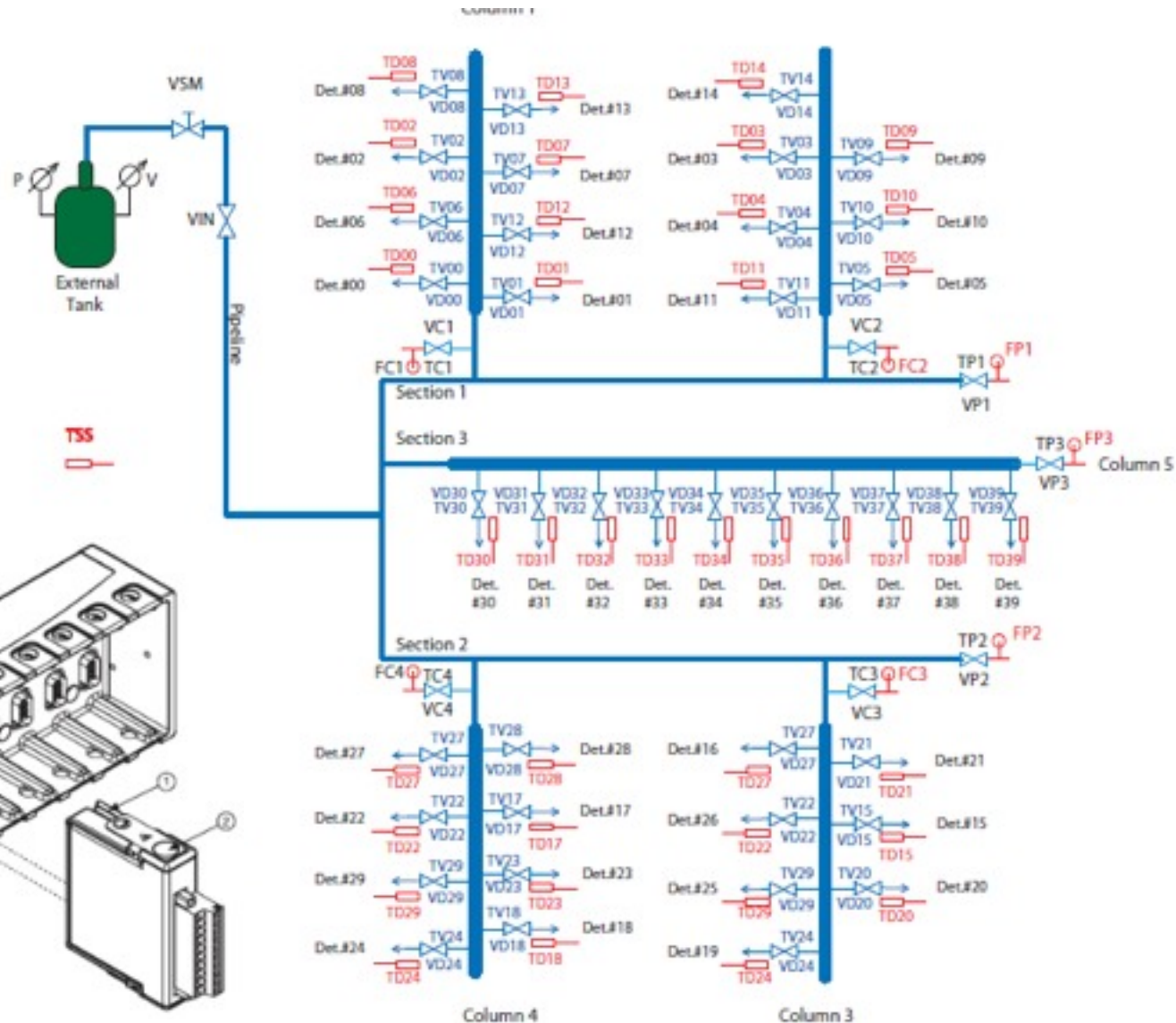
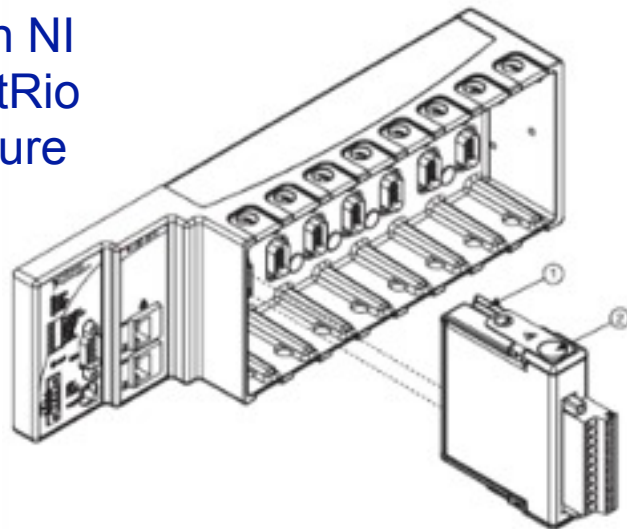
Experimental Hall II – replacing GASP

July 2012 – beam time used for to align the beam line
and start installing the bins

GALILEO – LN₂ Filling System

same logic flow as
in GASP and
EUROBALL

based on NI
CompactRio
architecture



Designed and built by the electronics lab. of INFN Padova (M. Bettini)

GALILEO – Electronics & DAQ

New electronics built in close synergy with AGATA

* low-noise, fast, low-power consumption *

- new cold part
- use solutions already developed for AGATA
 - core type preamplifiers - done
 - GTS - done
 - AGAVA interface with the VME electronics (collab. with Kracow)
- new developments for AGATA and GALILEO
 - low power digitizers – produced 144 channels
 - readout and preprocessing on PCI express boards - production started
- anti-Compton shields signal readout
 - digital (similar to the Ge detectors) - successful test

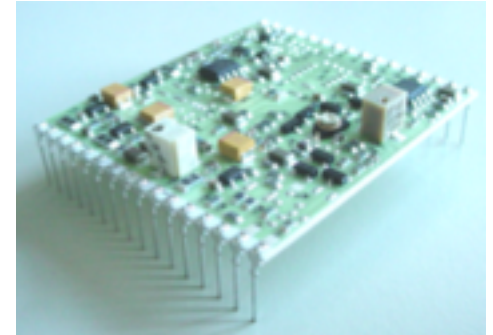
New DAQ

- based on XDAQ developed at LNL – in progress

GALILEO – Electronics

Sviluppi in sinergia con AGATA permettono un ottimizzazione del costo, del lavoro e del personale

Nuovi preamplificatori per rivelatori a Ge sviluppati a Milano; in produzione



Nuovi campionatori digitali a 14 bit e 100 MHz progettati a Milano e Padova; prodotti 144 canali



Nuovo sistema di readout e processamento dei segnali sviluppato a Padova e Legnaro; in produzione



**Sviluppo di un nuovo sistema di presa dati basato su XDAQ
– Servizio Calcolo dei LNL**

GAMMA-PD 2014

- Campagna di misura con AGATA al GSI e GANIL
 - Sperimentazione e supporto all'installazione → Meno coinvolti nella gestione
- Realizzazione GALILEO
 - Commissioning sotto fascio e inizio campagna di misura
- Sviluppo e integrazione rivelatori ancillari (EUCLIDES, TRACE, ...)
- Sviluppo scheda processore del trigger per AGATA
- Esperimenti al GSI, GANIL, MSU, RIKEN

- Importante ristrutturazione del gruppo
- Aumento richieste di supporto in sezione

Richieste GAMMA 2014 – Stima

Attività	Stato	Apparati	Inventario	Consumo
GALILEO	Installazione		33	19
EUCLIDES	R & D	100	5	5
TRACE	R & D			(30)
Altre spese ricerca	Consumo e manutenzioni			34 (+10)
AGATA	Installazione	120		
TOTALE [k€]		220	38	58 (+40 s.j.)
Missioni	100			

Richieste ai Servizi della Sezione 2014

- **UT** **6 MU**
 - ▣ Completamento progetto e disegni tecnici GALILEO
 - ▣ Progettazione supporto meccanico rivelatori ancillari per GALILEO – TRACE/DANTE/NEDA/EUCLIDES

- **OM** **6 MU**
 - ▣ Modifiche/completamento criostati GALILEO
 - ▣ Realizzazione pannelli e box per elettronica di GALILEO
 - ▣ Costruzione supporto meccanico rivelatori ancillari per GALILEO – TRACE/DANTE/NEDA/EUCLIDES

- **LOE** **5 MU**
 - ▣ Produzione e test elettronica rivelatori ancillari per GALILEO
 - ▣ Modifiche/aggiustamenti sistema controllo LN2

- **CALC** **1 MU**
 - ▣ Supporto farm di gruppo

Programmazione lavori LOE 2013

□ **Priorità alta – prima metà 2013**

- Completamento montaggio di due moduli OR per lo shutdown dei rivelatori a Ge di GALILEO
- Progettazione e montaggio di 4 contenitori alimentati per i campionatori digitali di GALILEO
- Completamento e test del sistema di controllo basato su architettura CompactRio per il riempimento con azoto liquido dei rivelatori a Ge di GALILEO
- Realizzazione di patch panel per i segnali di GALILEO

□ **Priorità media – seconda metà 2013**

- Realizzazione di preamplificatori per i cristalli scintillatori degli schermi anticompton per GALILEO; circa 350 canali raggruppati in 40 scatole
- Alimentatori di bassa tensione per i preamplificatori degli schermi anticompton di GALILEO
- Montaggio di connettori ad alta densità e con tenuta da vuoto sul canale di fascio per GALILEO

□ **Priorità bassa**

- Seguire la produzione PCB per i rivelatori di TRACE
- Supporto per l'acquisto di materiale elettronico legato ai progetti in corso nel laboratorio
- Interventi di montaggio componenti e realizzazione di PCB durante l'anno da concordare di volta in volta
- Sviluppo di un sistema di controllo per riempimento con LN_2 per 4 rivelatori (da concordare)

GAMMA-PD

Nome	Tipo	Qualifica	%
Diego Barrientos Turrion		Orpite	0
Dino Bazzacco	Dipendente	Dirigente di Ricerca	100
Marco A. Bellato	Dipendente	Primo Tecnoogo	40
Claudio Fanin	Dipendente	Primo Tecnologo	80
Roberto Isocrate	Dipendente	Collaboratore Tecnico E.R.	70
Silvia M. Lenzi	Associata	Prof. Associato	40
Santo Lunardi	Associato	Prof. Ordinario	100
Daniele Mengoni	Associato	Ass. Ric. FIRB	100
Roberto Menegazzo	Dipendente	Ricercatore	60
Caterina Michelagnoli	Associata	Assegnista	100
Gabriele Rampazzo	Dipendente	Collaboratore Tecnico E.R.	70
Francesco Recchia		Assegnista Uni.	0
Colin A. Ur	Dipendente	Ricercatore	0
Roberto Venturelli	Associato	Docente	100

GAMMA-PD – 2014: 7 Ricercatori (6 FTE) 2 Tecnologi (1.2 FTE) 2 Tecnici