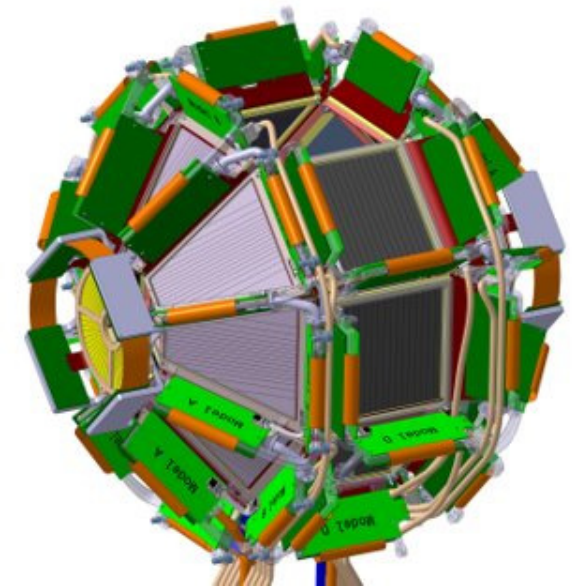
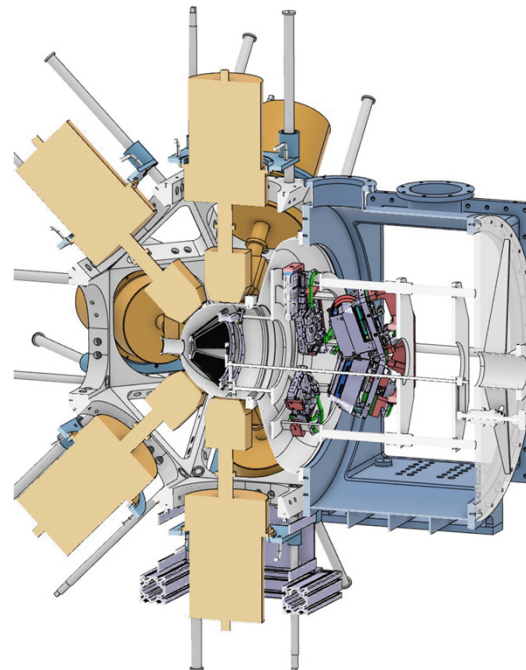
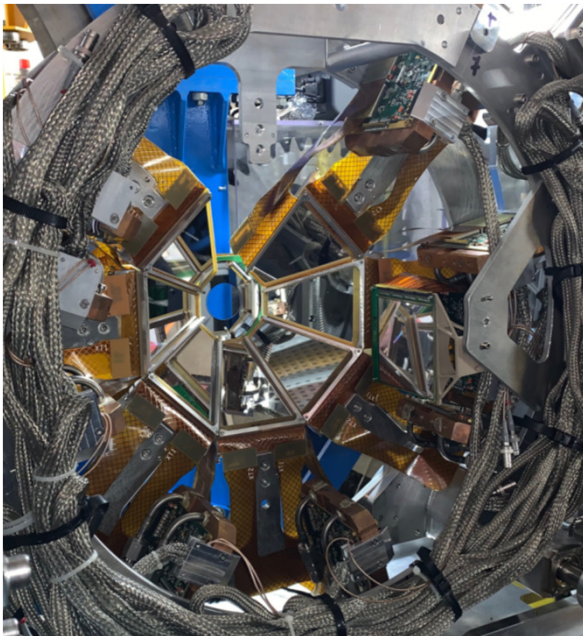
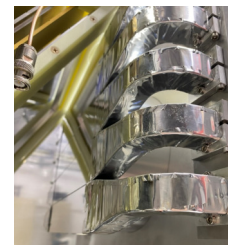
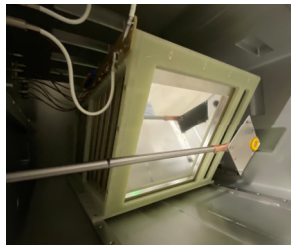
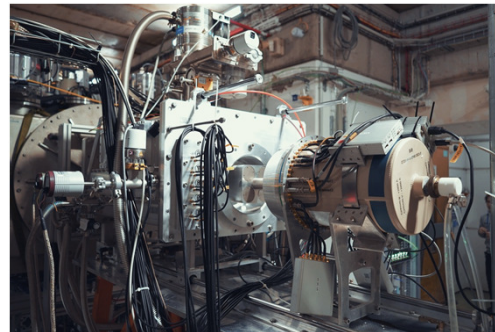
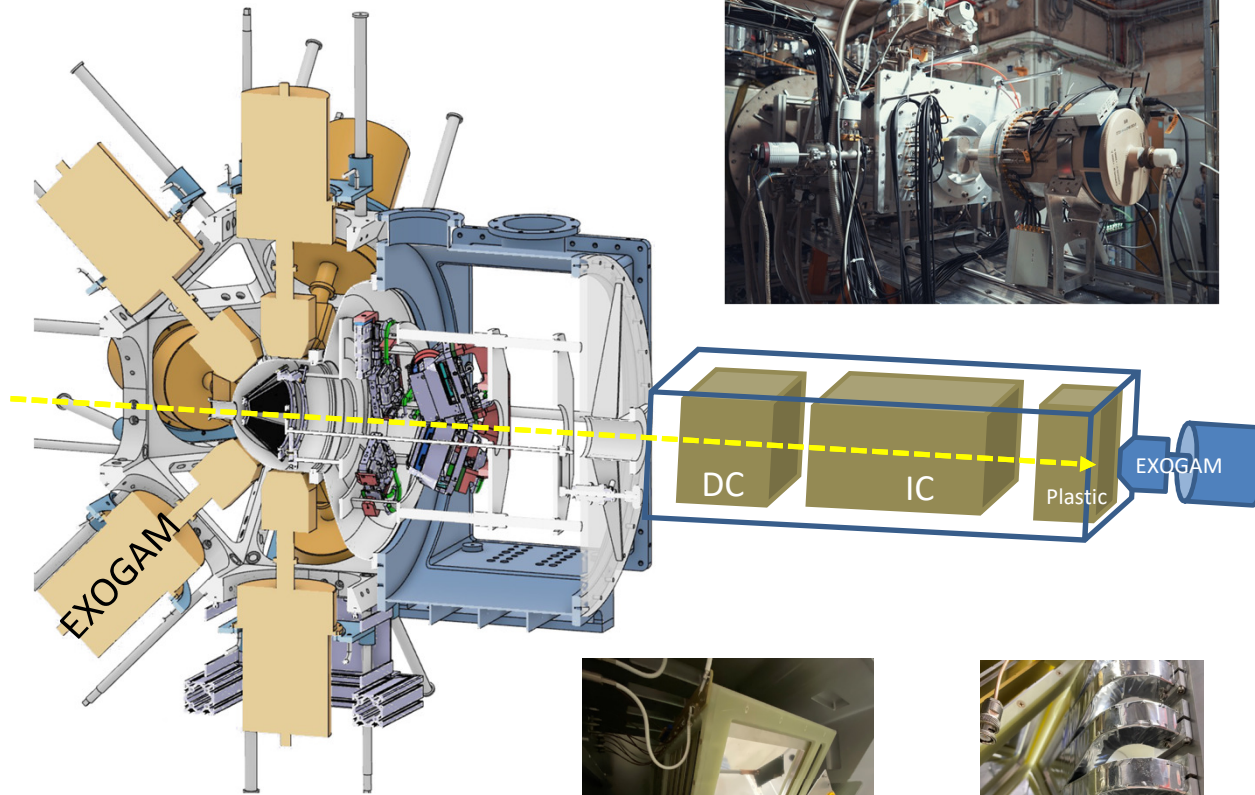
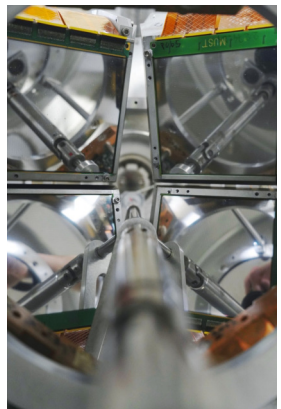


demandes AP 2024 MUGAST&GRIT



Physiciens IJCLab: M.Assié, D.Beaumel, Y.Blumenfeld, N.de Séreville, S.Franchoo, V. Girard-Alcindor, F.Hammache, I.Stefan
Doctorants: H.Jacob, T. Zanatta Martinez

2023: start of MUGAST-EXOGRAM@LISE

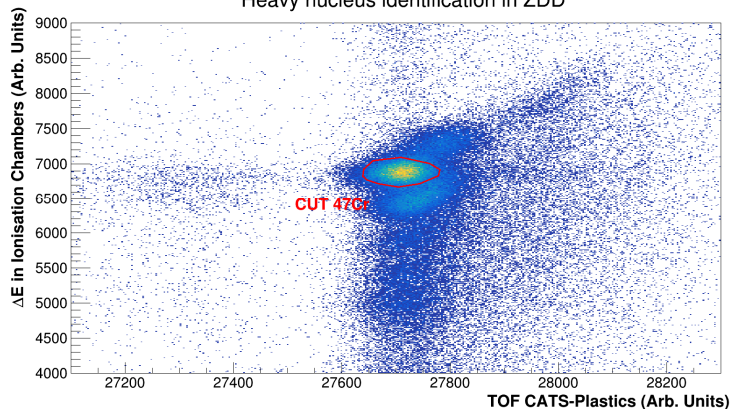


- 5 trapezoidal DSSD (backward)
- 4 MUST2 telescopes (forward)
- 12 EXOGAM Ge det. @14cm
8% effic. after add-back
- 0° Detection: ZDD from LISE
- Solid Target

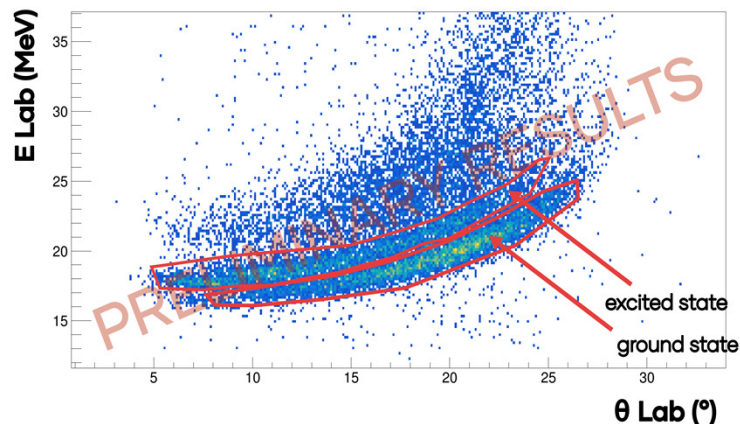
Campaign coordinator: Valerian Girard-Alcindor

MUGAST@LISE in 2023 : Online spectra

Heavy nucleus identification in ZDD



$^{48}\text{Cr}(p,d)^{47}\text{Cr}$ kinematic lines



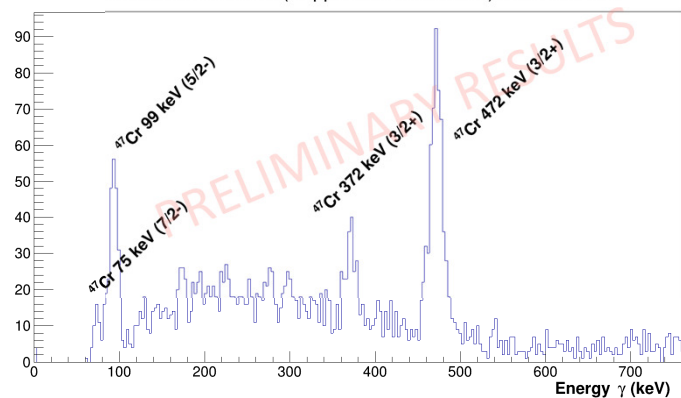
Two expts performed in 2023

➤ np pairing
(M.Assié)
 $^{48}\text{Cr}(p,^3\text{He})^{46}\text{V}$

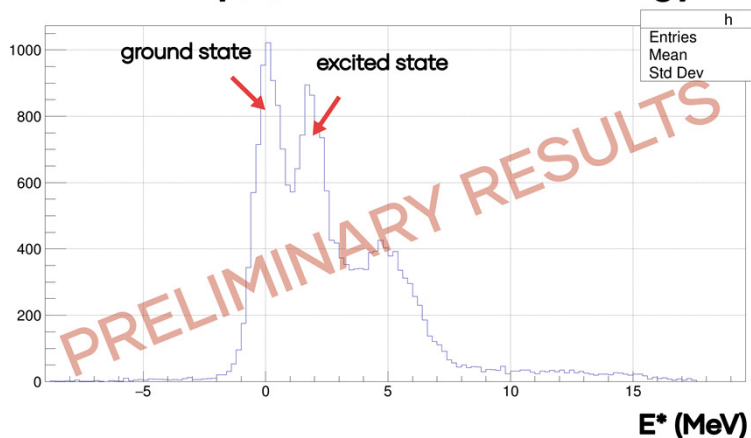
➤ Fermi surface at N=40
(S.Koyama, O.Sorlin)
 $^{68}\text{Ni}(d,p)(d,t)(p,d)$

Successfully !

Gamma in EXOGAM (Doppler corrected + AB) with ZDD CUT



$^{48}\text{Cr}(p,d)^{47}\text{Cr}$ excitation energy



MUGAST : physics program (as for now...)

2023	<p>Commissioning of the campaign</p> <p>^{58}Ni (p,d) ^{57}Ni @30 MeV/u</p> <p>M.A. V. G-A (IJCLab)</p>	<p>PAIRING : How does deformation influence neutron-proton pairing?</p> <p>Study of $^{48}\text{Cr}(p,^3\text{He})^{46}\text{V}$</p> <p>M. Assié (IJCLab)</p> <p>^{48}Cr beam at $2.5 \cdot 10^5$ pps</p> <p><i>PhD : H. Jacob</i></p>	<p>SHELL MODEL</p> <p>Study of ^{68}Ni by neutron adding and removing reactions</p> <p>S. Koyama, O. Sorlin (GANIL)</p> <p>$^{68}\text{Ni}(d,p\gamma)$ and $^{68}\text{Ni}(p,d\gamma)$</p>	
2024	<p>COMMISSIONING ZDD</p>	<p>SHELL MODEL</p> <p>Evolution of the neutron $1d_{3/2}$-$1d_{5/2}$ spin-orbit splitting at N = 19 and Fermi surface in ^{34}Si</p> <p>F. Galtarossa (INFN-LNL) O. Sorlin (GANIL)</p>	<p>CLUSTERING off stability</p> <p>Cluster structure of the g.s. of light exotic nuclei beyond alpha-clustering</p> <p>V. Girard-Alcindor, D. Beaumel (IJCLAB)</p> <p><i>PhD : T. Zanatta Martinez</i></p>	<p>TETRANEUTRON</p> <p>The tetra-neutron Isobaric Analog State in ^4H : The case for the $^6\text{He}(p,^3\text{He})$ reaction</p> <p>A.O. Macchiavelli (ORNL), M. Assié (IJCLab)</p>
2025	<p>NUCLEAR ASTROPHYSICS</p> <p>Determining the thermonuclear $^{18}\text{Ne}(\alpha,p)^{21}\text{Na}$ reaction rate by measuring $^7\text{Li}(^{18}\text{Ne},t)^{22}\text{Mg}(p)^{21}\text{Na}$</p> <p>C. Diget (U. York), N. de Séreville (IJCLab), L. Lalanne (CERN)</p>		<p>2025 ← ?</p> <p>Two new proposals (at least) to be submitted at GANIL PAC (dec 2023):</p> <ul style="list-style-type: none"> - Study of aligned np pairing through $^{52}\text{Fe}(d,\alpha)$, M. Assié & G. de France - Neutron capture at the ^{85}Kr s-process branching (surrogate method), F. Recchia, & G. de Angelis (INFN-LNL) 	

Publications & Demande d'AP TGIR GANIL

Sunday 28-Apr	6h00	E869_22 F. Galtarossa
	10h00	
	14h00	
	18h00	
	22h00	
Monday 29-Apr	2h00	20 UT D6 MUGAST EXOGAM CATS MUST2 ZDD
	6h00	
	10h00	
	14h00	
	18h00	
Tuesday 30-Apr	22h00	MUGAST EXOGAM CATS MUST2 ZDD
	2h00	
	6h00	
	10h00	
	14h00	
Wednesday 12-Jun	18h00	E870_22 V. Alcindor
	22h00	
	2h00	
	6h00	
	10h00	
Thursday 13-Jun	14h00	26 UT D6 MUGAST EXOGAM
	18h00	
	22h00	
	2h00	
	6h00	

Thèses/Post-docs en cours

T.Zanatta Matinez (IJCLab) -> thèse débute Nov. 2023

H. Jacob (IJCLab) --> thèse débutée sept 2022

S. Koyama (GANIL) post-doc

J. Sanchez-Rojo (U. of York) defended 2022

D. Brugnara (INFN) defended 2022

I. Zanon (INFN) defended 2022

Publications

MUGAST (depuis 2022):

I. Zanon et al, submitted to PRL (avril 2023)

L. Lalanne et al, submitted to PRL (mars 2023)

L. Lalanne et al, PRL (2022)

V. Girard-Alcindor, PRC Lett. (2022) --> 15F

B. Le Crom, M. Assié et al, PLB (2022)

MUGAST

Demande AP 2023 (TGIR GANIL)

- Expériences MUGAST en 2024 :
27 k€ de missions
- Divers petits équipements(câbles, réparation de cartes MUFEE): **11 k€** équipement
- Modifications méca : **4 k€**

TOTAL = **27 (missions) + 15 k€ (équipement)**



Accueil

Appel à contribution

Ordre du jour

Liste des contributions

Ma conférence

↳ Mes contributions

Recueil des résumés

Inscription

Liste des participants

Comité d'organisation

Le but de ce workshop est de rassembler la communauté IN2P3 et IRFU de spectroscopie in-beam utilisant des faisceaux d'ions lourds stables et radioactifs pour débattre des programmes scientifiques à l'horizon de 2025-2030 autour des instruments comme AGATA et GRIT.

Dans un contexte remplis d'incertitudes sur les accélérateurs européens de faisceaux radioactifs, le nouveau LRP de NUPPEC apparaît comme une opportunité pour discuter en 2023 d'une stratégie scientifique à appliquer à moyen terme autour de SPES, GANIL, HIE-ISOLDE, JYFL ou FAIR.

Le cœur des discussions initiées par ce workshop portera sur les directions, les moyens, et le programme scientifique des équipes françaises souhaitant se projeter d'ici la fin de la prochaine décennie.

Le workshop sera construit autour de contributions spontanées déposées par les participants dressant un panorama des intentions de la communauté à l'échelle de la décennie. Les contributions peuvent être

- **Shell structure and Shape-coexistence**
 - Spectroscopy with AGATA and GRIT at SPES using the ^{131}mSn beam (E.Clément)
 - Detailed spectroscopic studies at Legnaro (O.Sorlin)
 - Mapping of valence orbitals around the $N=50$ shell closure using $^{84}\text{Se}, ^{82}\text{Ge}(d,p)$ (F.Flavigny)
 - Shape coexistence at $A \sim 100$ (E.Clément)
 - Shell structure evolution through high-spin orbitals (D.Beaumel)
- **PDR**
 - Microscopic structure of PDR in n-rich nuclei using transfer reactions (D.Beaumel, A.Maj)
- **Pairing**
 - Probing pairing effects at LNL (M. Assié, S.Bottoni, J.Dudouet, F.Galtarossa)
- **Astrophysics**
 - Reaction studies for the i-process (F.Hammache, N.de Séréville)
- **Clustering**
 - Beyond alpha clustering in medium-mass nuclei using transfer reactions (V.Girard-Alcindor, DB)

The GRIT array

4π Silicon array fully integrable in AGATA & PARIS

- High efficiency for particles
- High granularity (strip pitch < 0.8 mm)

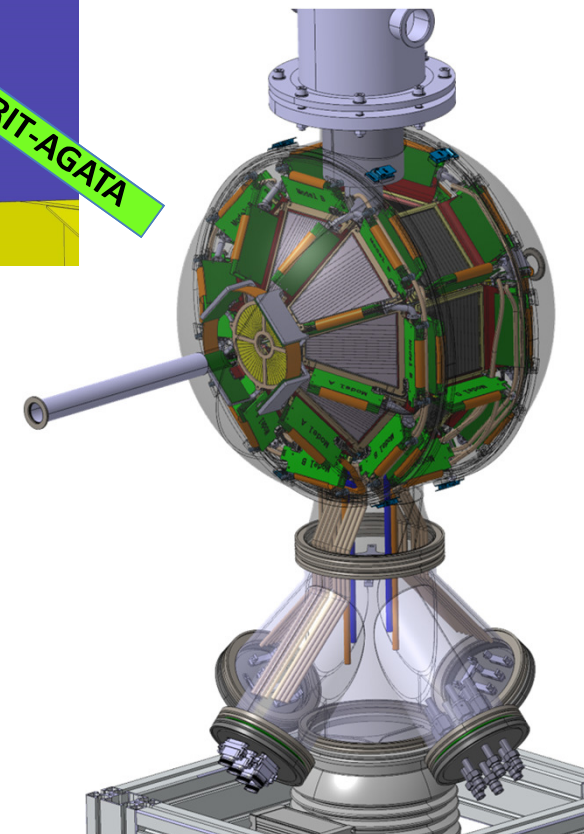
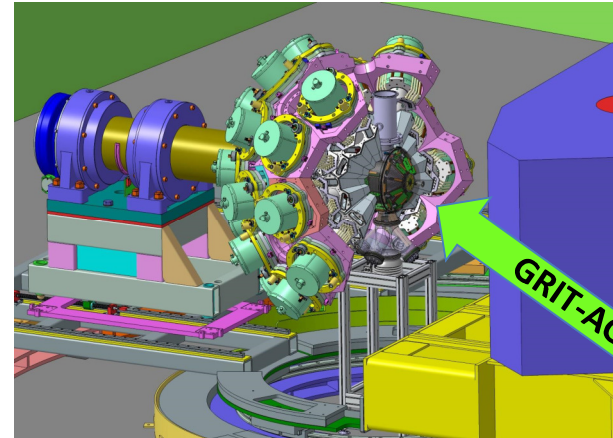
Layers of Silicon

- 500 μm DSSD pitch < 0.8 mm
- 1.5 mm DSSD pitch $\sim 10\text{mm}$

- Large dynamical range
- PID using Pulse Shape Analysis techniques

New Integrated Digital electronics designed by IJCLab, LPC Caen, INFN

- Integration into **AGATA (radius=23 cm)**
- transparency to gamma-rays
- high compacity
- Special targets : cryogenic, tritium, windowless



DETECTORS STATUS



TRAPEZOIDS

1st layer (500 μ m, 128 N + 128 P strips): (micron designation: FF2)

14 serial pieces purchased but 3 pieces are still pending orders (for Orsay, INFN Milano and Valencia)

From the 11 pieces available:

- 8 pieces tested and validated (7 by Orsay + 1 by Huelva)
- 3 pieces to be tested (@ Orsay)

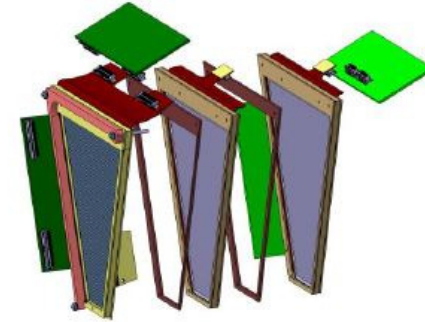
2nd layer (1.5 mm, 16+16 strips): (micron designation: MMM4)

- 12 serial pieces purchased and received (LPC Caen) with packaging design modifications
- First test results encouraging, planned to be completed by end of June 2023



3rd layer (1.5 mm, 16+16 strips): (micron designation: MMM4)

- Same detector type as 2nd layer detector but nothing done so far for the packaging design - no purchase



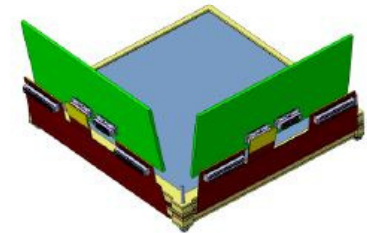
SQUARES

1st layer (500 μ m, 128 N + 128 P strips): (micron designation: TTT1)

- 4 pieces (1 prototype + 3 serial) purchased and received recently (INFN Padova) with packaging design modifications
- Tests planned in the June / July 2023

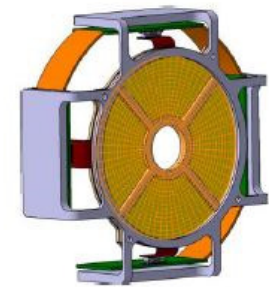
2nd layer (1.5mm, 16 N + 16 P strips): (micron designation: TTT16)

- Prototype ordering with packaging design modifications postponed due to administrative issues (INFN Padova)
- The packaging would be ready for shipment according to last news from Micron
- Tests start unclear (depending on the delivery date)



ANNULARS

- First physics simulations results presented at the last collaboration technical status meeting (4th May 2023)
- Following meeting planned on 8th June 2023 with physicists, mechanics and electronics
- Goal: Finalize 1st layer annular specifications by end of June



From C.Soulet

Annular detectors for GRIT

Report on physics simulations completed (May 2023)
(C.Paxman, A.Matta, V.Girard-Alcindor)

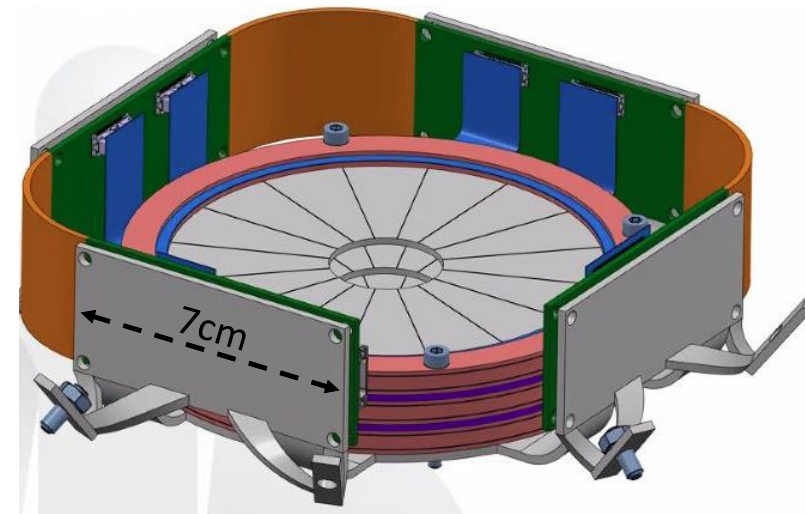
1 Si detector layer at backward angles
3 Si detector layers at forward angles

- 1st stage : 64 rings / 16 sectors
- 2nd stage : 16 rings / 16 sectors
- 3rd stage : 16 rings / 16 sectors

Discussions with the manufacturer (MSL) to start soon



Preliminary design & integration



Y.Peinaud, P.Rosier IJCLab

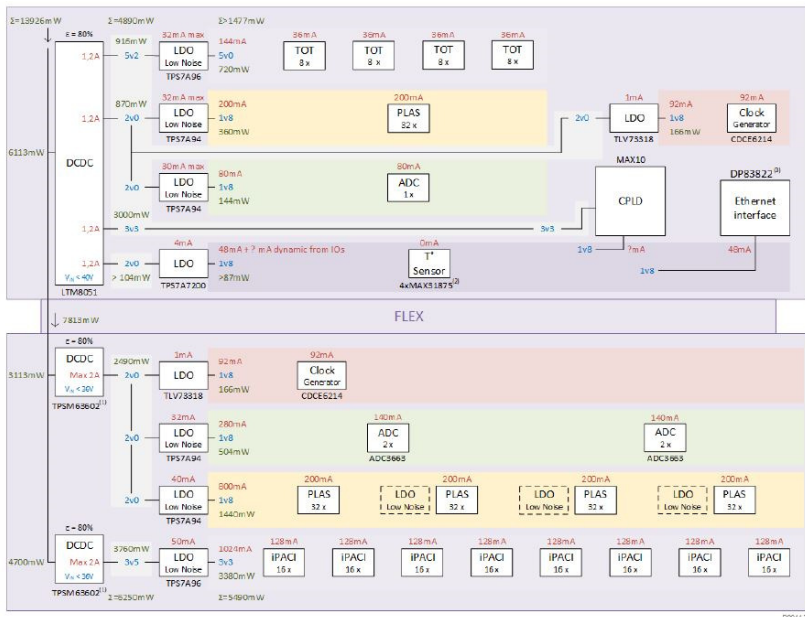
4 PCB (70x30mm²) and 3 flex
13W to dissipate

GRIT electronics

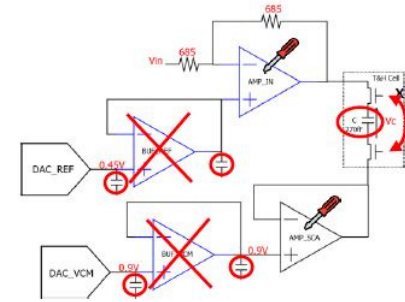
2023

- New FEE working group coordinator Ludovic Alvado, LPC Caen (repl. J.-J. Dormard)
 - ❑ iPACI → L.Leterrier (LPC)
 - ❑ FEE Boards → E.Raully (+L.Alvado)
 - ❑ Routing: F.Dorangeville

FEE BOARD



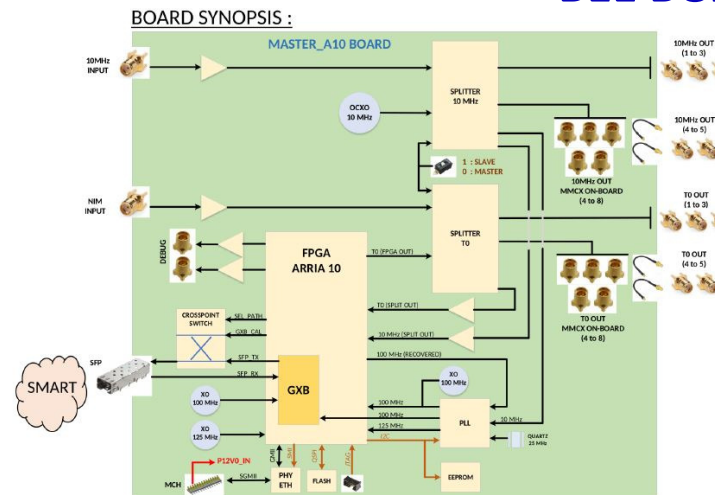
PLAS Asic simulations



Sampling stage

	Noise [892,857 kHz; 1 GHz]	SNR	DC ENOB	BW
PLASv2 schematics	672 μV_{RMS}	55,3 dB	8,9 bits	165 MHz
Modified schematics	178 μV_{RMS}	67,2 dB	10,9 bits	90 MHz

BEE BOARD

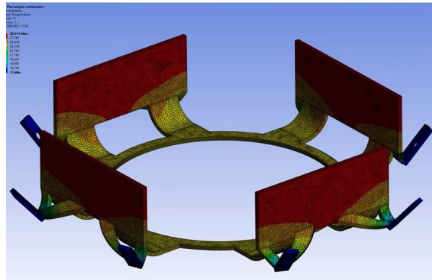


- ✓ Designed and Manufactured
- ✓ Assembly on-hold
- ✓ Test start after summer 2023

GRIT Budget request 2024

MECHANICS 7k€

- Mockup of
 - ✓ 4 trapezoid cooling blocks
 - ✓ 1 Annular



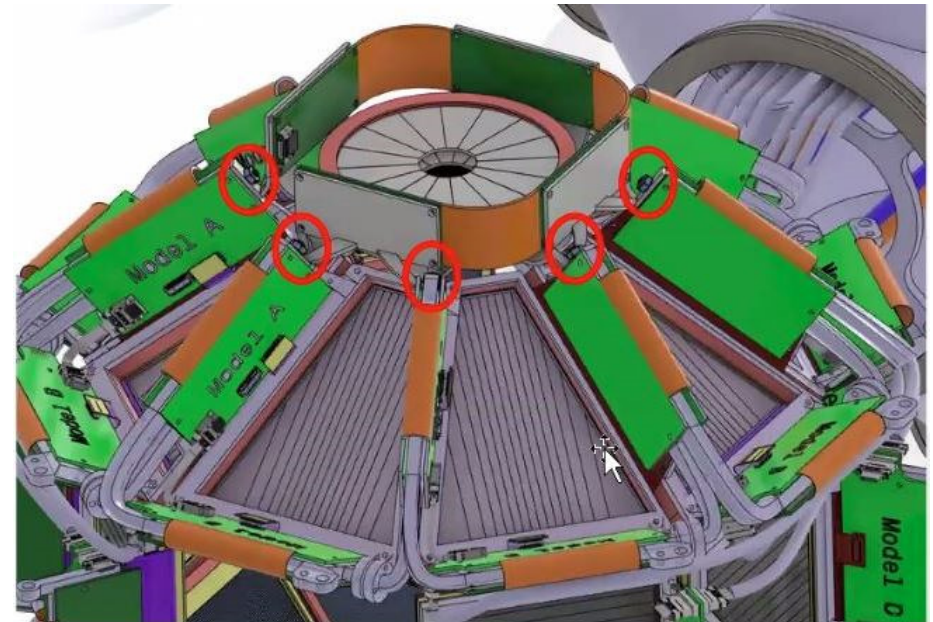
ELECTRONICS 3k€

- Test board

DETECTORS 13k€

- 2 Serial thin trapez. (6.5k€)

TOTAL EQUIPEMENT : 23k€



Y.Peinaud, P.Rosier IJCLab

Missions (meetings LPC-IJCLab, Sejour a LNL, tests a Bordeaux, conference) : 6k€



Advances in nuclear structure via charged particle reactions with AGATA

D. Mengoni^{1,2,a}, D. Beaumel³, W. N. Catford⁴, M. Assié³, D. Brugnara^{1,5}, F. Galtarossa², A. Gottardo⁵, I. Zanon^{5,6}, M. Zielińska⁷

¹ Dipartimento di Fisica e Astronomia, Università di Padova, via F. Marzolo, 8-35131 Padova, Italy

² INFN Sezione di Padova, via F. Marzolo, 8-35131 Padova, Italy

³ Université Paris-Saclay, CNRS/IN2P3, IJCLab, 91405 Orsay, France

⁴ Department of Physics, University of Surrey, Guildford GU2 7XH, UK

⁵ INFN Laboratori Nazionali di Legnaro, Legnaro, Italy

⁶ Dipartimento di Fisica e Scienze della Terra, Università di Ferrara, via G. Saragat, 1-44122 Ferrara, Italy

⁷ Irfu, CEA, Université Paris-Saclay, 91191 Gif-sur-Yvette, France

Received: 19 March 2023 / Accepted: 6 May 2023

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Communicated by Nicolas Alamanos

Collaboration

IJCLab Orsay: M. Assié, D. Beaumel, Y. Blumenfeld, N. de Séréville, F. Flavigny, F. Galtarossa, J. Guillot, F. Hammache, A.Korichi, L. Lalanne, I. Stefan

INFN-Padova, LNL : D. Brugnara, J.Casal, D. Mengoni, A Goasduff, A. Gottardo, D. Testov,

INFN-Legnaro: A. Raggio, A. Montanera Piza, I. Zanon

INFN-Milano: S.Leoni, B.Million

GANIL.: E. Clément, A. Lemasson, D. Ramos, V.Girard-Alcindor, M. Rejmund, O. Sorlin, F. de Oliveira, C.Fougères, G. De France, B. Bastin, S. Leblond

LPC Caen : F. Delaunay, J.Dudouet, C.Lenain, A.Matta, F.Noury, N.Orr

IRFU-CEA-Saclay: M.Siciliano

IPHC Strasbourg : K. Rezynkina, G. Duchêne, F. Didierjean

University of York C. Diget, A. Laird, J.S. Rojo

University of Surrey : W. Catford, G. Lotay

HHNIPNE Magurele: R.Borcea, M.Stanoiu

University of Santiago : B. Fernandez-Dominguez

University of Valencia : A. Gadea

GRIT Collaboration structure

Collaboration:

IJCLab, LPC Caen, INFN (Padova, Milano, Firenze), Surrey U., Valencia U.,
Santiago de Comp^{la} U., Huelva U., GANIL

Steering committee

Y. Blumenfeld (IJCLab)
W. Catford (U. of Surrey)
G. De Angelis (LNL)
G. De France (Ganil)
A. Gadea (IFIC/Valencia)
S. Leoni (INFN-Milano) CHAIR
N. Le Neindre (LPC)
A. Pullia (INFN-Milano)

Spokesperson : D. Beaumel (IJCLab)
co-Spokesperson: D. Mengoni (INFN/Padova)
Technical coordinator : C. Soulet (IJCLab)

Management Board

SP , co-SP, TC
+ Working Group Leaders

Working Groups

- 1. Mechanics**
Ph. Rosier (IJCLab)
- 2. Detectors**
F. Galtarossa (Padova)
- 3. FE Electronics**
L. Alvado (LPC Caen)
- 4. DAQ/backend**
A. Matta (LPC Caen)
- 5. Simulations**
S. Bottoni (Milano)
- 6. Special targets**
A. Gottardo (Legnaro)
- 7. MUGAST**
M. Assié (IJCLab)

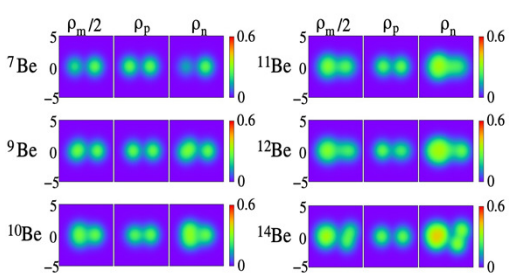
Campaign coordinator (MUGAST) : V. Alcindor (IJCLab)
Scientific coordinator at GANIL : M. Assié (IJCLab)



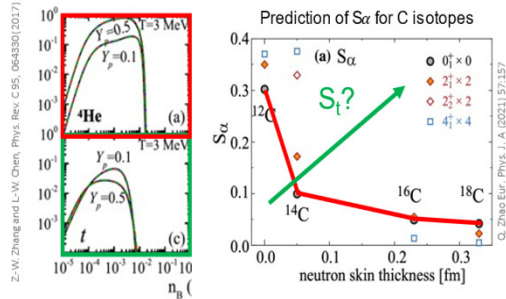
MUGAST@LISE in 2024-2025

V. Girard-Alcindor, D. Beaumel:

Cluster structure of the ground state of light exotic nuclei beyond alpha-clustering



Clustering in Be isotopes



Expected triton clustering in neutron rich isotopes

C. Diget, N. De Séville:

Determining the thermonuclear $^{18}\text{Ne}(\alpha,p)^{21}\text{Na}$ reaction rate by measurement of the $^7\text{Li}(^{18}\text{Ne},t)^{22}\text{Mg}(p)^{21}\text{Na}$ reaction

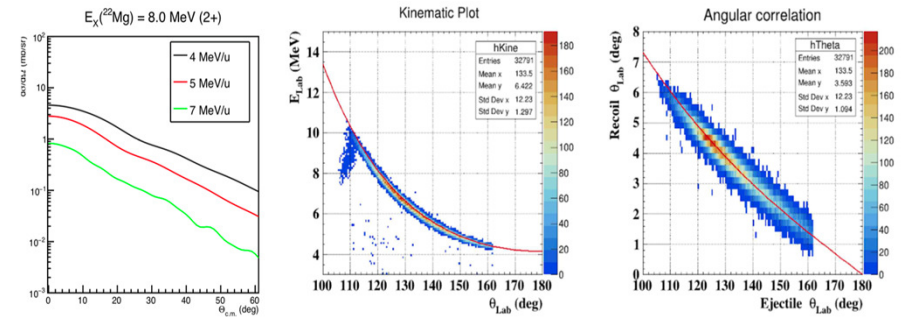


Figure 1: Differential cross section for 2+ state with $C^2S = 1$ (left); triton kinematics for ^{22}Mg resonance (middle); and heavy-ion (^{22}Mg) angle against triton angle (right).

F. Galtarossa:

Evolution of the neutron $1d_{3/2}-1d_{5/2}$ spin-orbit splitting in $N = 19$ isotones and Fermi surface in ^{34}Si

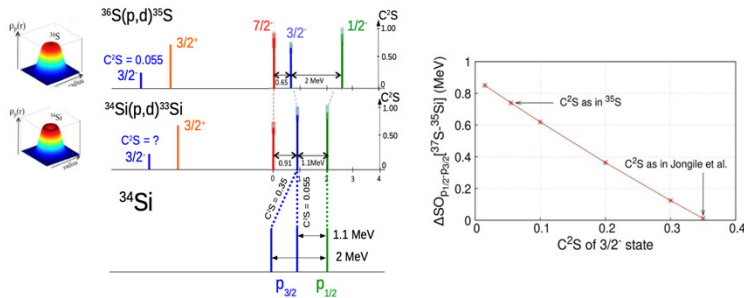
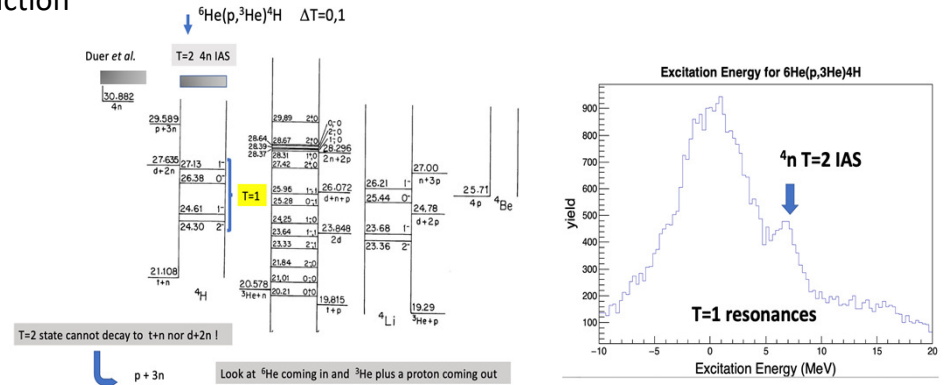


FIG. 3: Pictorial representation (left) and graphic (right) of the predicted variation of the difference between the $\nu p_{1/2}-\nu p_{3/2}$ SO splitting in ^{37}S and in ^{35}Si as a function of the C^2S of the $3/2^-$ state at 1.981 MeV in ^{33}Si .

A. Machiavelli, M. Assié:

The tetra-neutron Isobaric Analog State in ^4H : The case for the $^6\text{He}(p,^3\text{He})^4\text{H}$ reaction



MUGAST-EXOGRAM@LISE in the current GANIL Call for proposals