

MUGAST

- physics cases & Lol
- detectors (prototypes)
- testbench
- electronics
- budget

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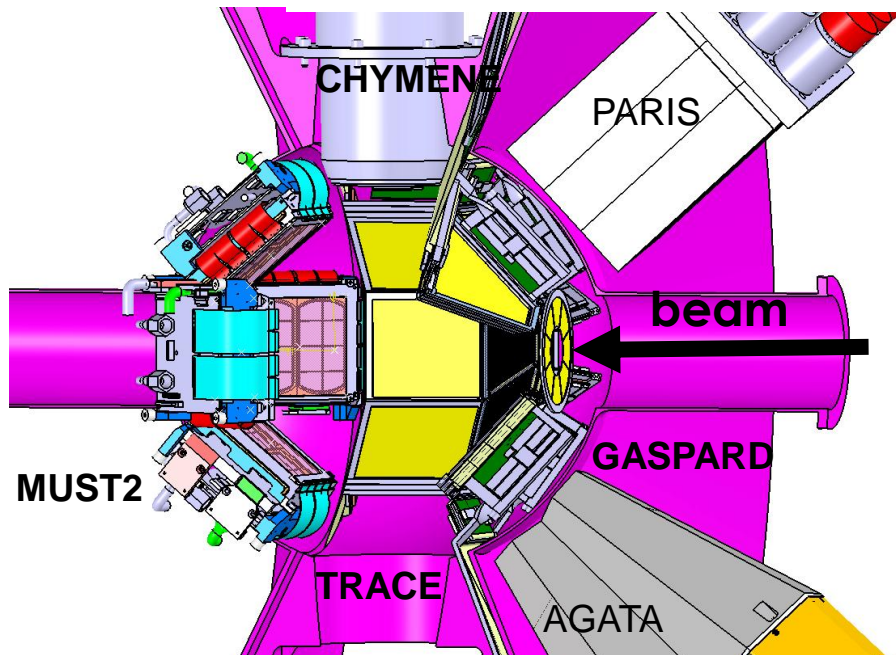
MUGAST concept (~end 2017)

AGATA campaign on VAMOS @ GANIL until end of 2017- 2018 (?)

→ Lol for AGATA+MUGAST for the PAC @ GANIL

- . very **high energy resolution** (5keV)
- . good efficiency (about 5% depending on number of clusters)
- . MUGAST **one-layer of Silicon** in the **backward** direction (AGATA side) (TIARA spirit) + MUST2 (forward)
- well-suited for **stripping** measurements

. **existing** electronics



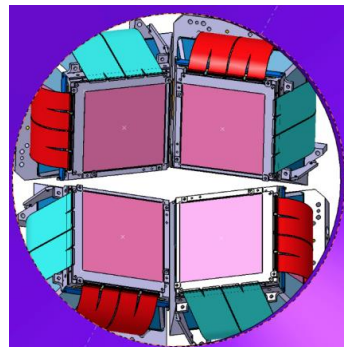
- MUST2 + GASPARD-TRACE prototypes
- One-layer philosophy (VAMOS)
- CHYMENE
- MUST2 electronics with new connectics

MUGAST configuration ~ end 2017

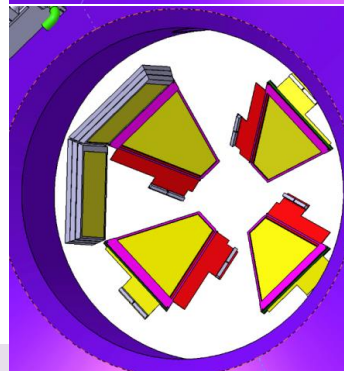
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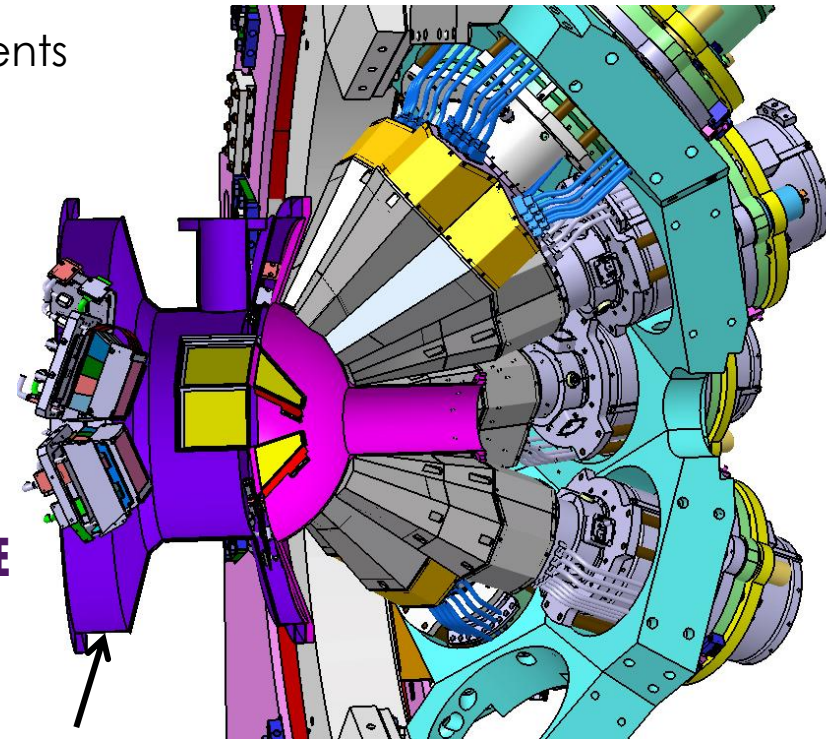
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MUST2



**TRAPEZ.
+SQUARE**



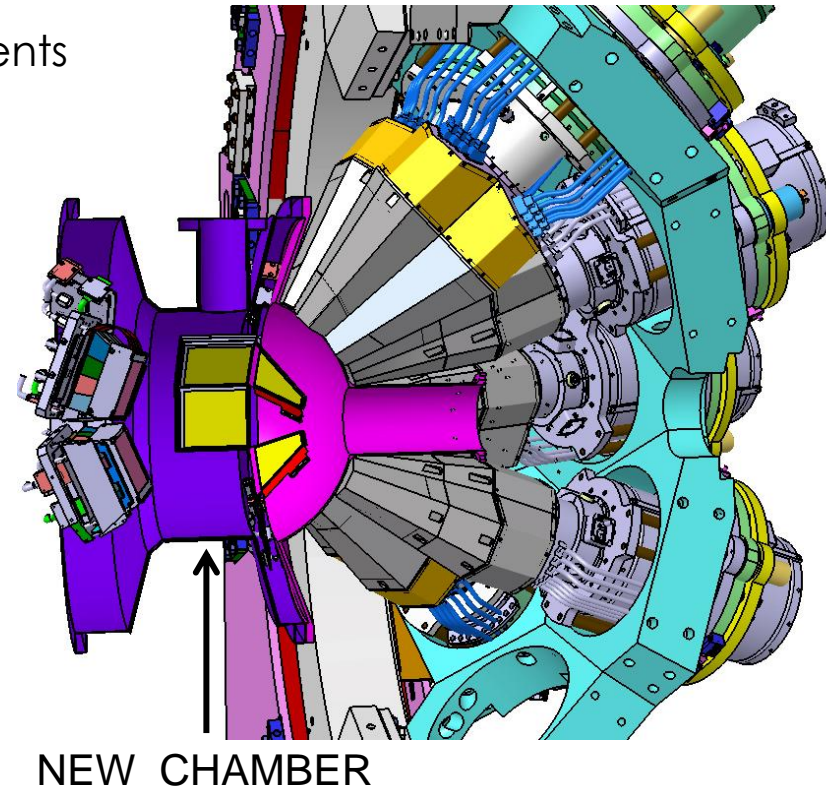
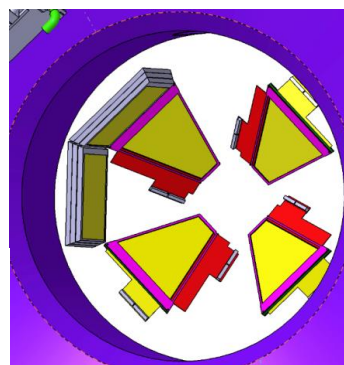
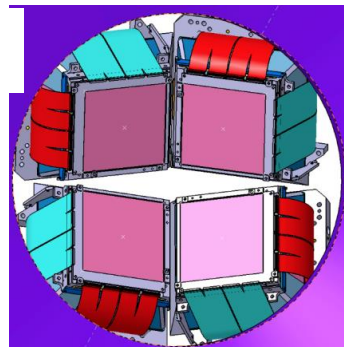
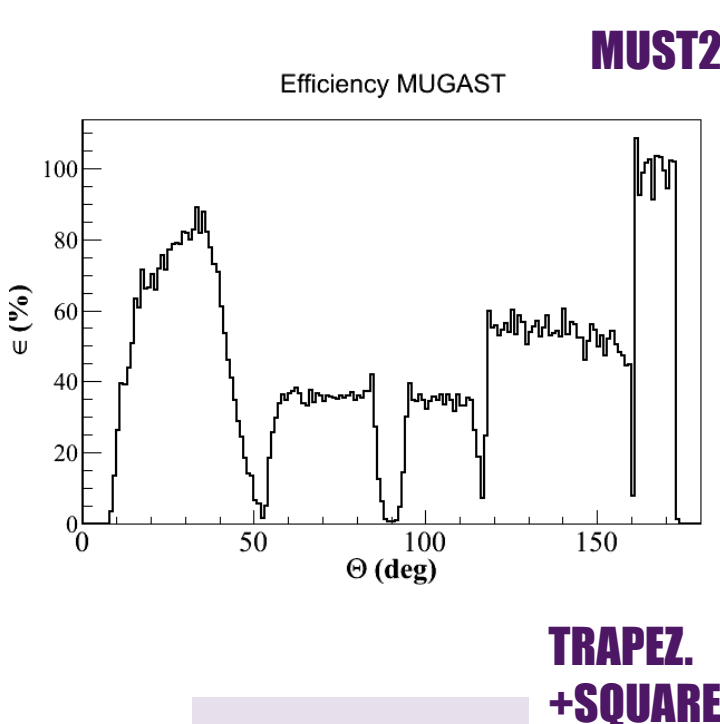
NEW CHAMBER

MUGAST configuration ~ end 2017

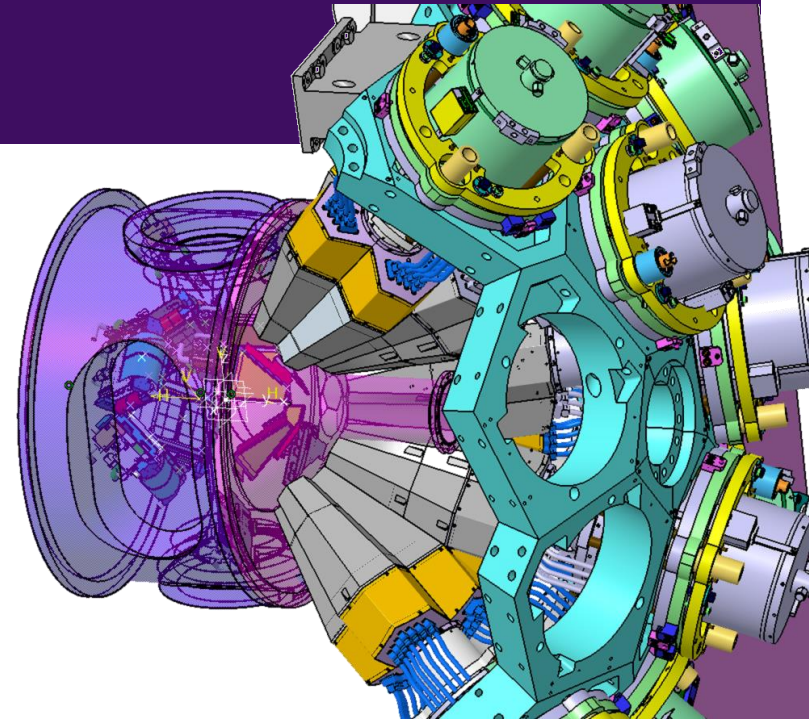
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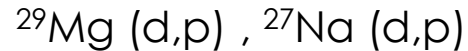
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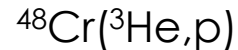
MUGAST@ AGATA+VAMOS

Physics Cases for MUGAST + AGATA+VAMOS
with Spiral1 beams

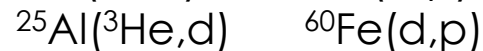
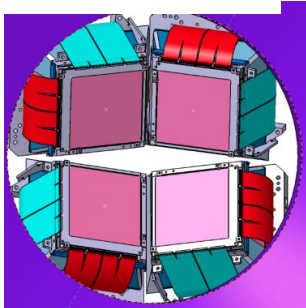
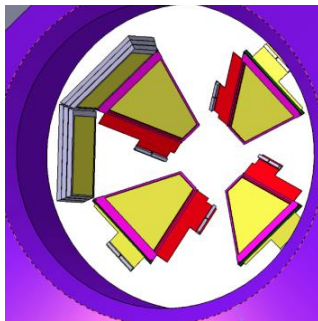
→ Shell Evolution



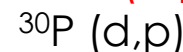
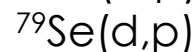
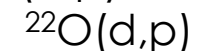
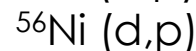
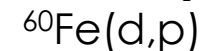
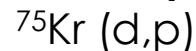
→ Pairing



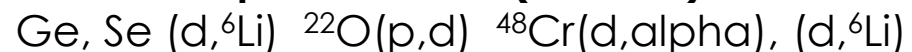
→ nuclear astrophysics

MUST2
(close config.)TRAPEZES (GASPARD)
+CARRES (Trace)

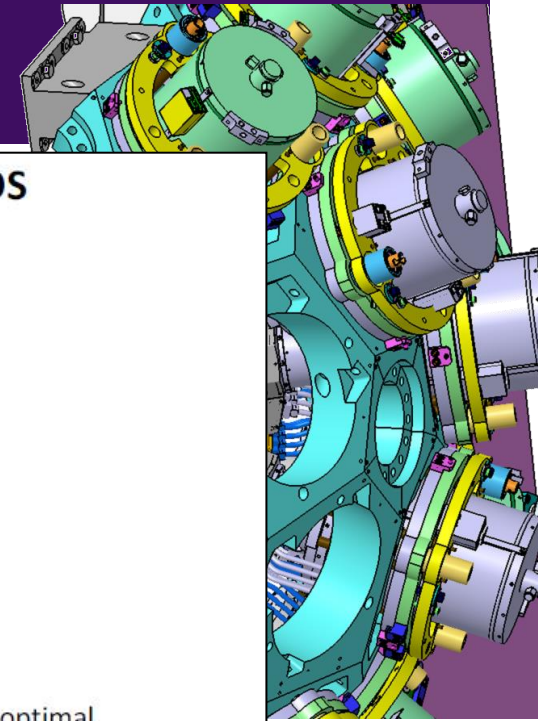
• « Stripping » reactions (backward)



• « Pick-up » reactions (forward)

• Incomplete fusion $^{45}\text{K} + ^7\text{Li}$ • Nuclear dynamics : correlations in $^{16}\text{O} + ^{27}\text{Al}$ • Coulex : $^{18}\text{Ne}, ^{18}\text{O}, ^{32-34}\text{Ar}$ (energy too low)

MUGAST@ AGATA+VAMOS



Physic
with Sp

Reaction studies using the MUGAST+AGATA setup at VAMOS

Letter of Intent to the AGATA collaboration

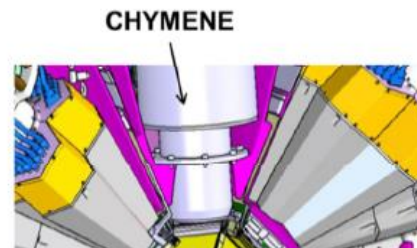
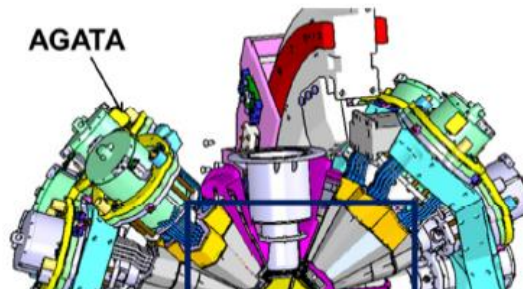
D.Beumel, IPN Orsay

D.Mengoni, University and INFN Padova

MUST2
(close co

1. Introduction

The GASPARD and TRACE high granularity Silicon arrays have been natively designed for optimal integration in new generation gamma detectors such as AGATA with the aim of performing high-resolution reaction studies. Indeed, the coupling to AGATA allows a very large gain in excitation energy resolution, in comparison with the case where the excitation energy is deduced from the recoil charged-particle measurement. The GASPARD and TRACE collaboration are now converging to build such new-generation Si ensemble in common, with a timeline of 2019-20 for completion of the final 4π array, ready for the emerging ISOL facilities, like SPES and SPIRAL1. A view of such ultimate GASPARD-TRACE setup sitting inside AGATA is shown in Fig.1.



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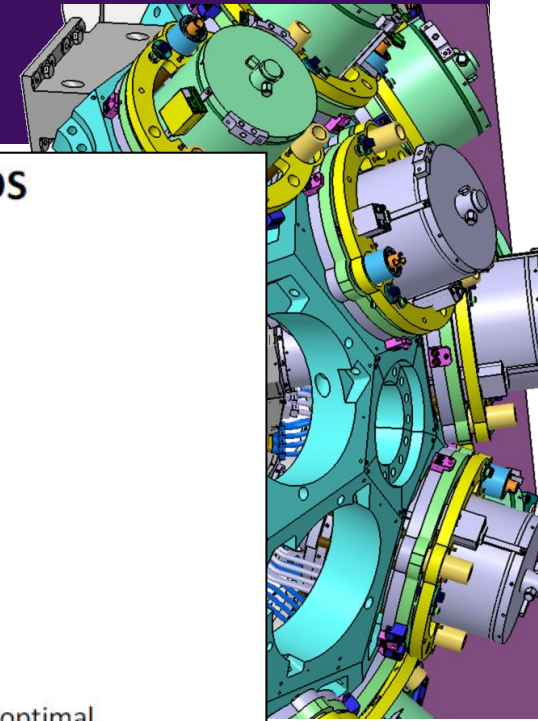
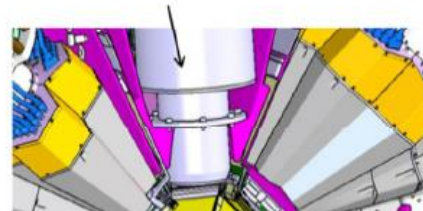
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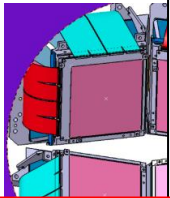
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The PAC found the proposition of combining MUGAST+AGATA with VAMOS compelling, and it was clear that much progress had already been made in realising this ambition, with significant development of the instrumentation. The aim to deliver a campaign around transfer reactions (including stripping) was well received as it was believed that this should be a core component of the future scientific programme of GANIL, building on the rich heritage of the programme that the present collaboration has led. The PAC is therefore supportive of this development and it would seem that the best course of action is to present this proposition to the GANIL Scientific Council as directed by the GANIL Director.



MUST2
(close co



Prototypes for GASPARD-TRACE

Ordered to Micron

- **2 trapez.** prototypes nTD DSSSD ordered by IPN in Nov. 2013 *delivery expected* **end of june 2015**
- **2 square** prototypes nTD DSSSD ordered by INFN end of 2014 + **1 thick square DSSSD**

Prototypes for GASPARD-TRACE

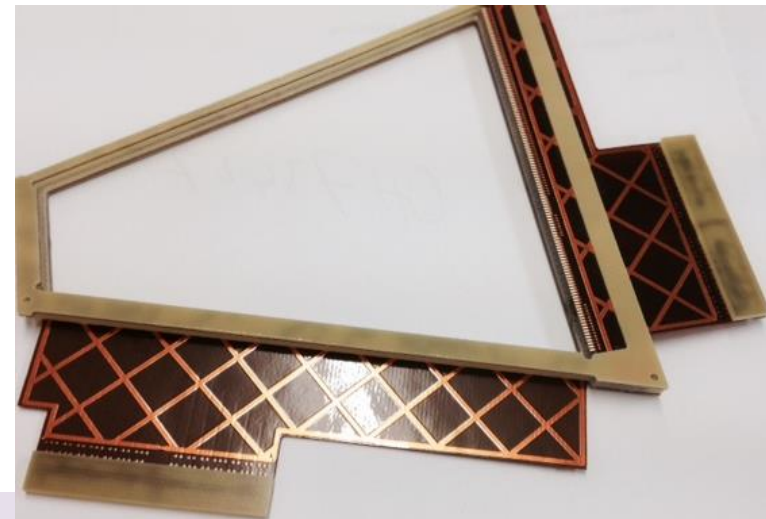
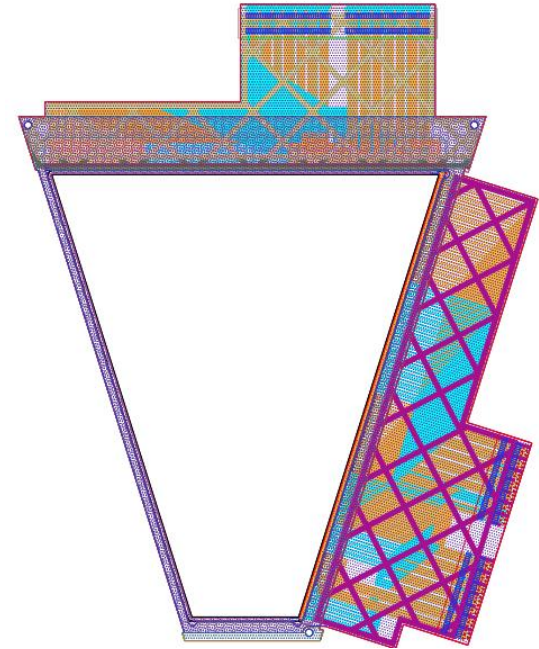
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Trapezoid detectors characteristics

>> **Junction side** (rear in our case)
standard type 2M DC strip
implant dead layer of typically 0.3 μm
metallisation of 0.5 μm all over the strip.

>> **Ohmic side** (front in our case)
type 9 TT
- 30 μm wide deep (0.3 μm) implant periphery
- majority of the strip metallisation of **0.1 μm** coverage



Prototypes for GASPARD-TRACE

Ordered to Micron

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Next steps:

after validation of prototypes :

- 1 trapez.** detector to be ordered by Univ. of **Surrey**
- 1 trapez.** detectors to be ordered by **Univ. of Santiago de Compostela**
- 1 trapez.** detector to be ordered by **IPN-Orsay**

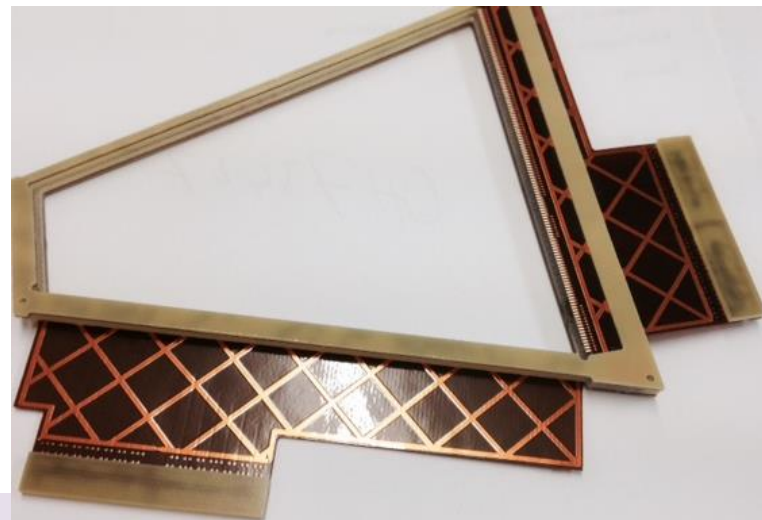
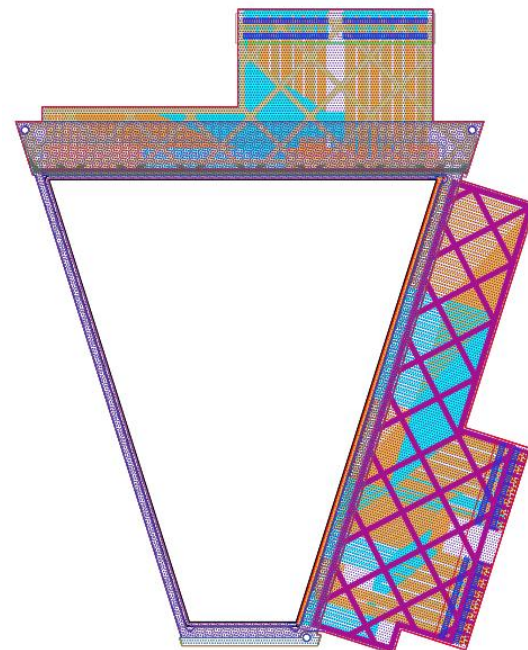
Total nb of detectors:

First layer (500um)

- 5 trapez. detectors (1 spare)
- 2 square detectors

2nd layer

- 1 thick (1.5mm) square detector



Test-bench

- **Digital test bench:**

4X+4Y -- PACI -- WaveCatcher

9X+9Y -- iPACI -- WaveCatcher

→with alpha source

- **Analog test bench :**

2 options under study :

1) MUFEE (MUST2)+ MUVI + GANIL DAQ

2) COFEE (MUSSET) + MUVI + GANIL DAQ

→ 128X+128Y channels with alpha source

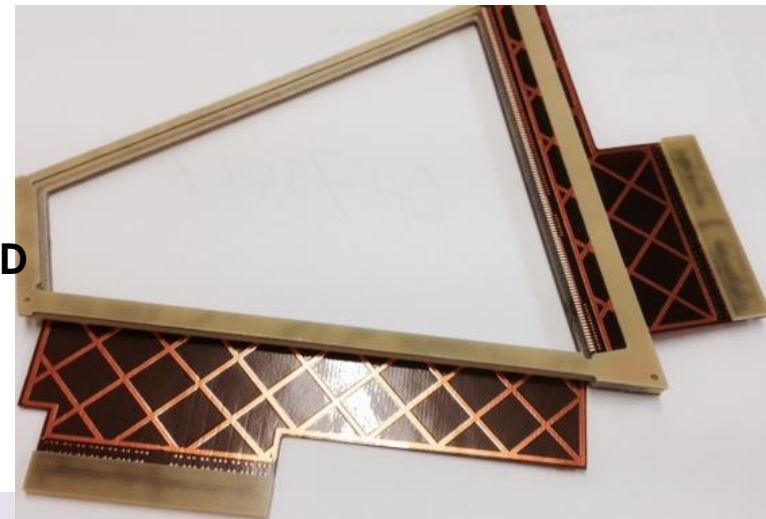
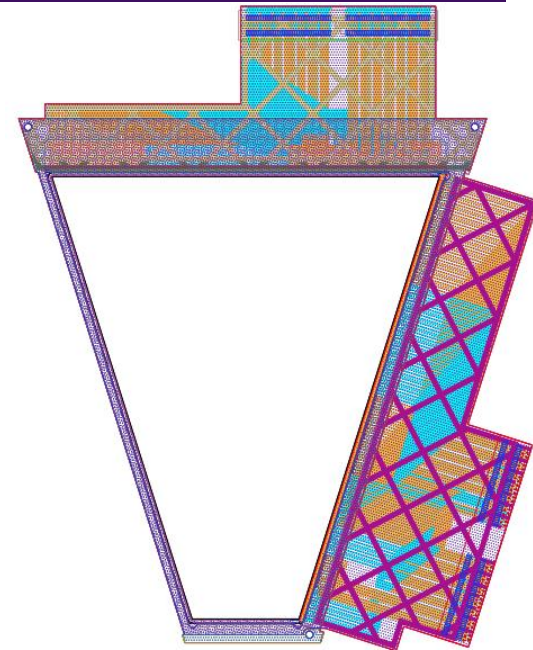
- **Captinnov'** (A. Torrento)

→ **Testbench for point probe measurement for DSSSD**

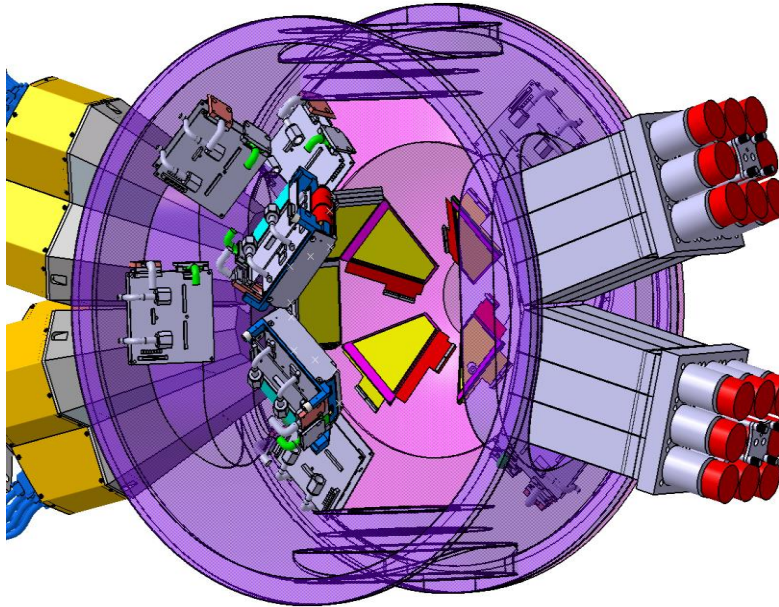
- leakage current per strip

- capacitance per strip

- resistance of the interstrip



MUGAST configuration



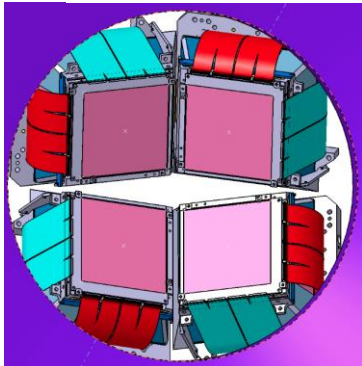
Electronics

- 4 MUST2 = **MUFEE(2x4) + MUVI(1)**
- + 4 trapezoid DSSSD 500um (backward)
- + 2 square DSSSD 500um (90 deg.)
- + annular ?

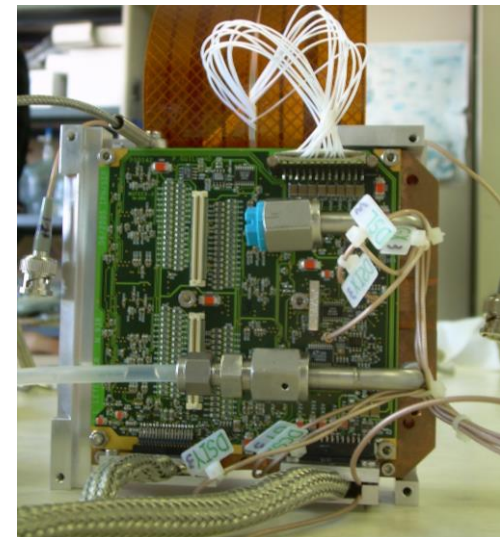
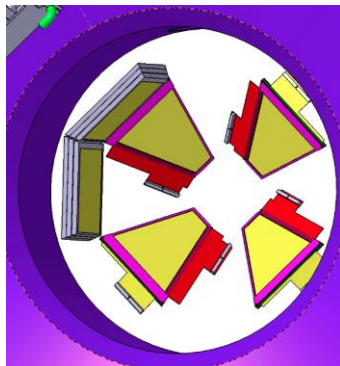
Option 1:

- MUFEE (7x2) + 2 MUVI

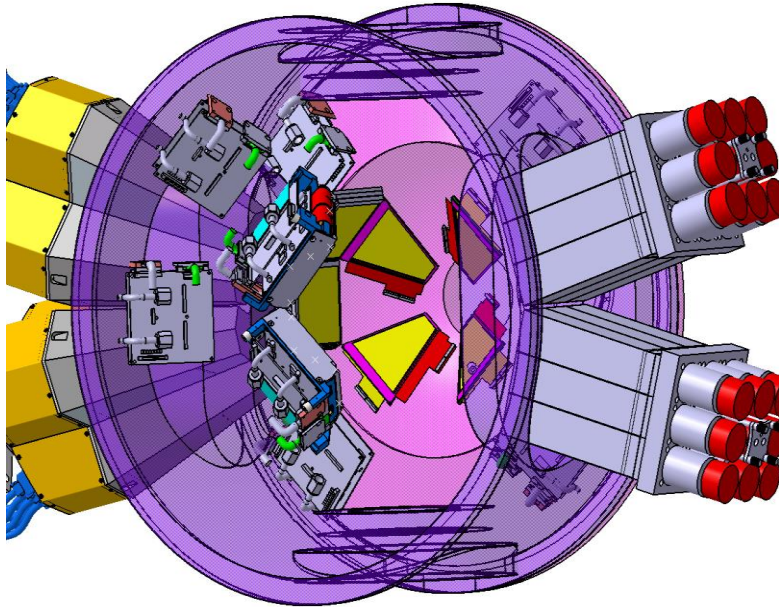
MUST2
(close config.)



TRAPEZES (GASPARD)
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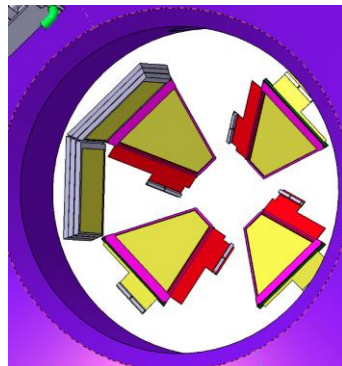
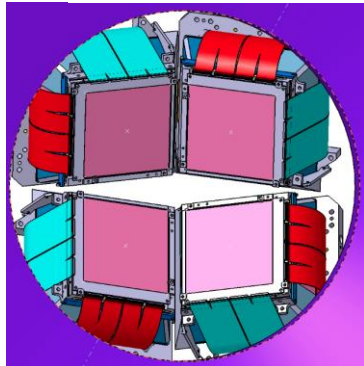


MUGAST configuration



MUST2
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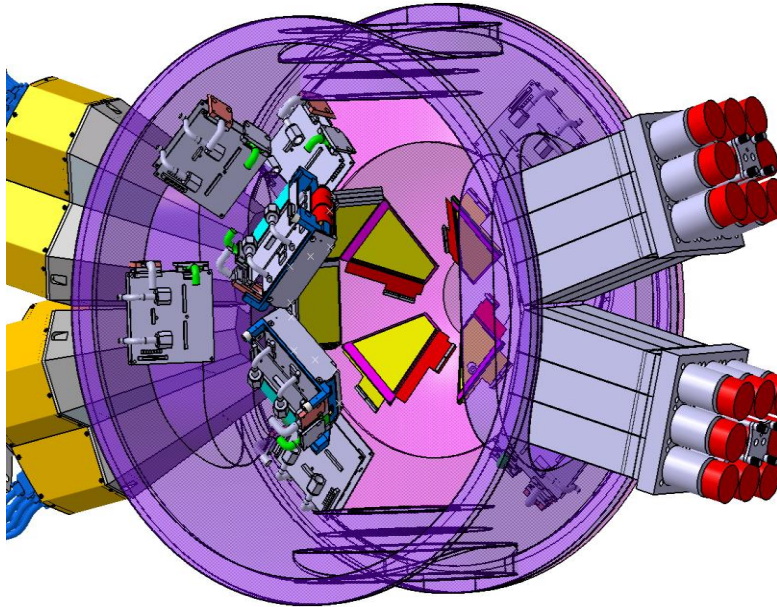
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Option 2:

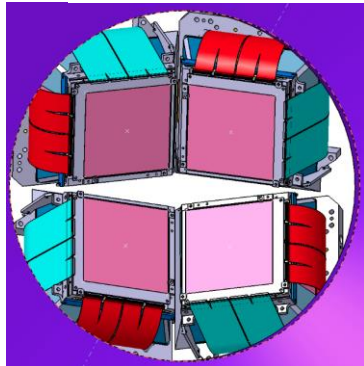
- COFEE (7x2) *MUSSET* electronics
- + 4 MUVI
- + polarisation circuits (*to be done*)



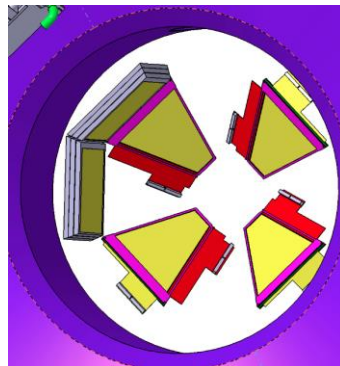
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- + 4 MUVI
+ polarisation circuits (*to be done*)

To do :

- new kaptons (IPN)
- new cooling blocs (IPN)
- reaction chamber (Surrey ?)

items for MUGAST

ITEM	STATUS	COST	Purchase
DETECTORS		(k€)	
Trapezoids proto (x2)	To be commissioned	50	
Trapezoids pre-serie (x3) IPN, Surrey, Santiago		24	End of 2015
Squared proto (x2) (2 thin+ 1 thick)	Ordered	50	
Annular (x1)	Available	-	
MUST2 (x4)	Available	-	
ELECTRONICS			
MUST2 FEE boards (x12)	Available	-	
MUST2 Digital boards (x3)	Available	-	
Kaptons (x48)		10	End of 2015
Cables & feedthroughs		20	2016
MECHANICS			
Chamber and supports	Matching grant (W. Catford)	30	2016
Cooling blocks		6	2016
CHYMENE support		20	2016
	TOTAL	102	