GAMMA RAY SPECTROSCOPY

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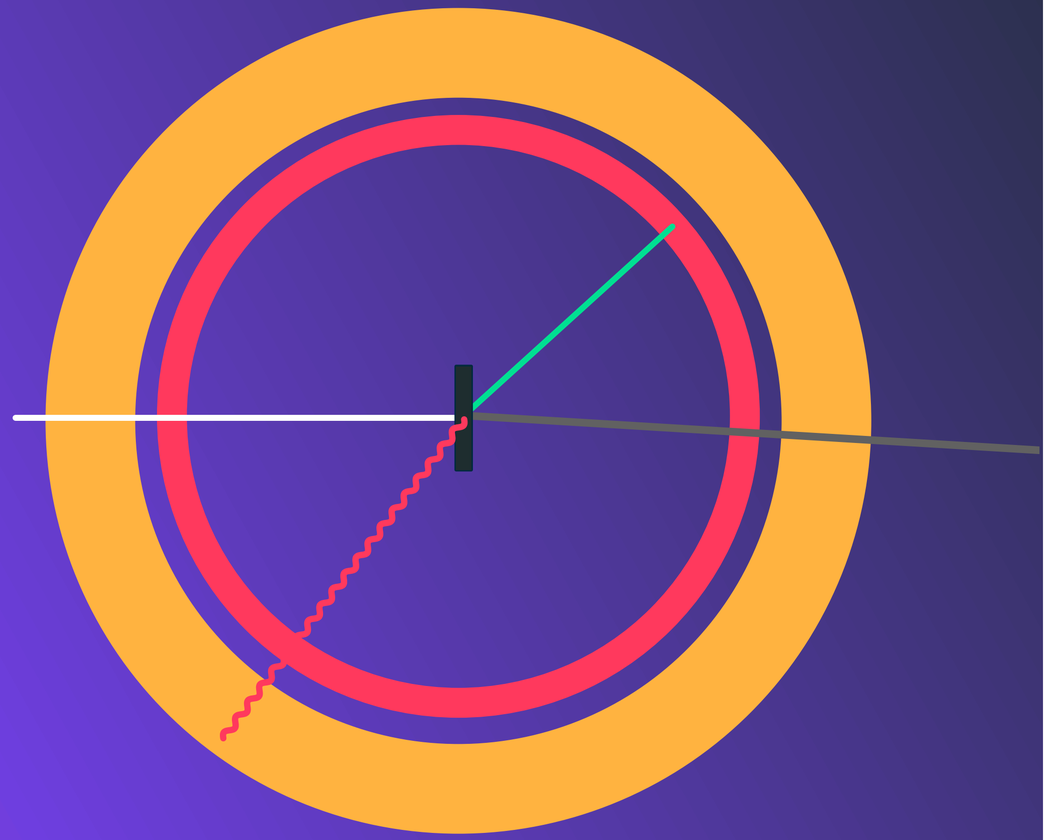
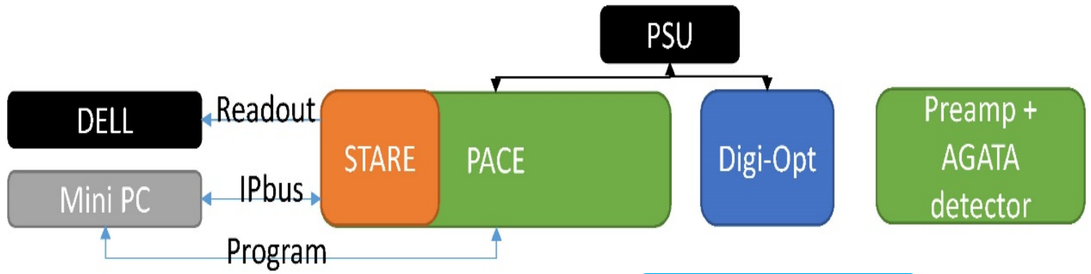
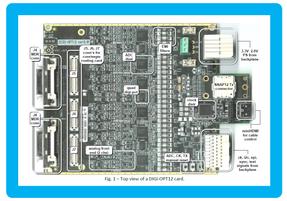


Phase 2 FEBEE: evaluation status





- The most challenging R&D of phase 2
- Mass production has started for all hardware parts in 2024. Procurement delays are > 12 months
- The critical path is the integration at the firmware level in the existing system (GTS, network, flow, RUDP etc…) due to human resource availability

The ASC approved to charge the OC at GANIL for the maintenance of the firmware with the ZeptoNova company contract (52 k€)

Zepto Nova

✉ Signed by GANIL on February 2025

Present schedule

- DIGOPT mass production is on time
- 3 years delay in the mass production of PACE/STARE boards due to difficulties now resolved

- 75 x complete chains are now ordered and to be delivered by summer 2025
- Integration work to coupled with phase 1 (> 100 channels)
- Expected delivery end of 2025
- **2026- 2030 period**, extending the system to cover the full AGATA solid angle

Mid-term future

DALI2

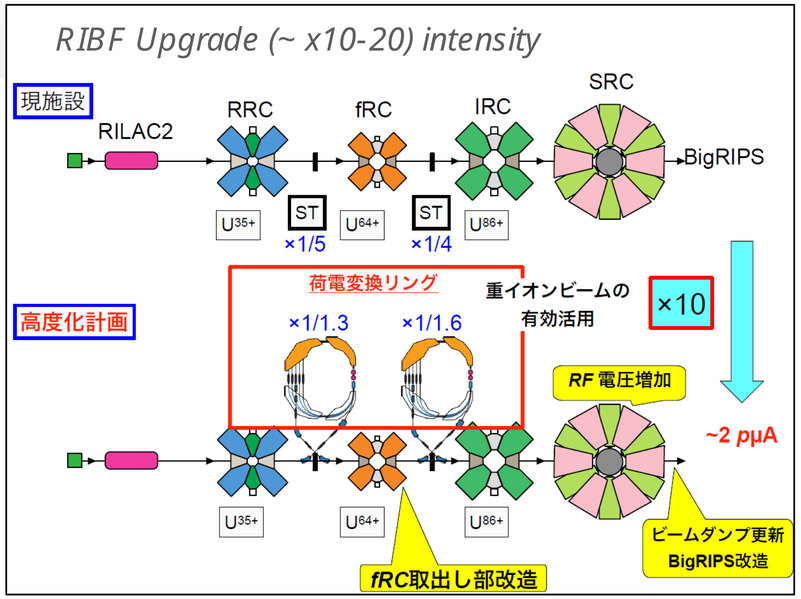
- Today 226 NaI(Tl) crystals
  - [1 MeV, $\beta = 0.6$]: FWHM 10% , $\epsilon = 35\%$
- Undeniable scientif c output:
  - 96 publ. (including 50 PRL, PLB, Nat.)
- But reaching soon a limit:
  - Aging of crystals, electronics, low density
  - few « important » phys. cases remaining

HYPATIA

- 384 GAGG(Ce) forward wall
- 624 CeBr3 - Barrel
- ~1000 crystals for $\epsilon = 53\%$
- Very rough cost estimate~ 7(2) M€
- Modular replacement of DALI2
- [1 MeV, $\beta = 0.6$] E: FWHM~ 5%
- Time : FWHM: ~ 1 ns

Collaboration started.

Long-term future



RIBF upgrade VS FRIB full power (f rst estimates)

	RIBF	FRIB	RIBF	FRIB	RIBF	FRIB
Primary beam	238U	82Se	238U	238U	238U	86Kr
Energy (MeV/	345	237	345	202	345	237
Intensity (kW)	164	400	164	400	164	400
Primary target	Be	C	Be	C	Be	C
Thickness (mm)	4	5.87	4	1.5	4	4
Cross section	BigRIPS	EPAX3*10	BigRIPS	BigRIPS	BigRIPS	EPAX2.15
Isotope	61Sc	61Sc	77Co	77Co	79Cu	79Cu
Rate (pps)	**0.22**	**0.19**	**0.21**	**0.1**	**615**	**389**

Several specif c assumptions, especially for FRIB (take these numbers with caution)

1st spectroscopy of ^{60}Ca, ^{76}Fe + detailed spectroscopy ^{78}Ni could become possible in ~1week exp

- ..but still very challenging for the lowest secondary yields (<1 pps) !!
  - thick LH2 secondary target is essential : advantage to RIBF (i E = i thickness usable)
  - Maximal ϵ_γ required : advantage to scintillator array - if Ge tracking i solid target thick. (degraded resolution)
  - In these conditions: ^{238}U (f ssion/fragmentaion) > ^{82}Se,^{86}Kr projectile fragmentation

At the extremes: RIBF-upgrade + new Scintillators very competitive with FRIB+GRETA