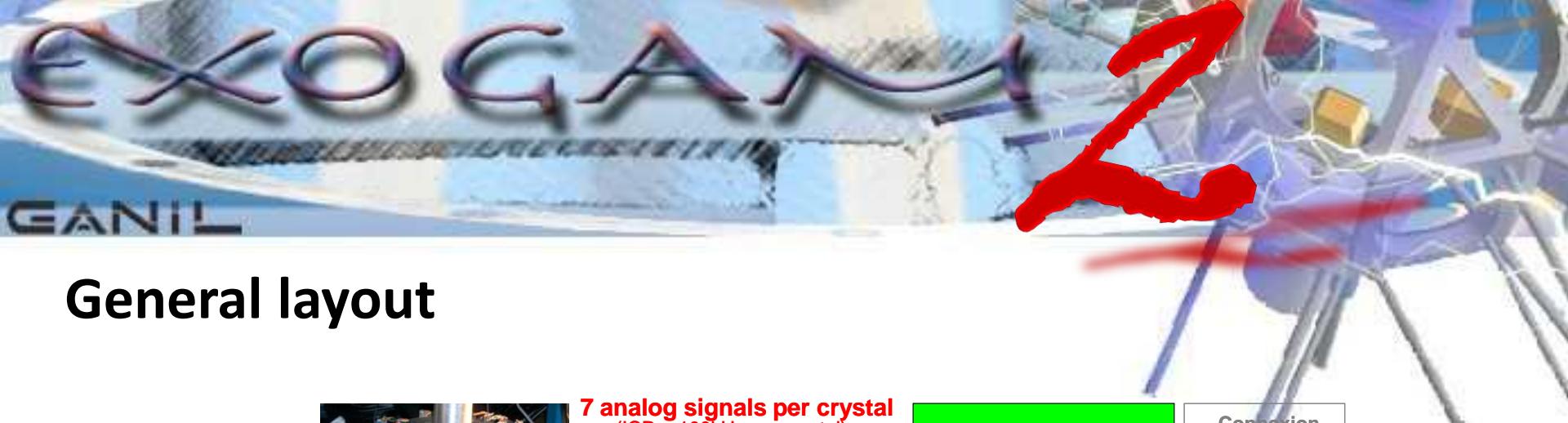


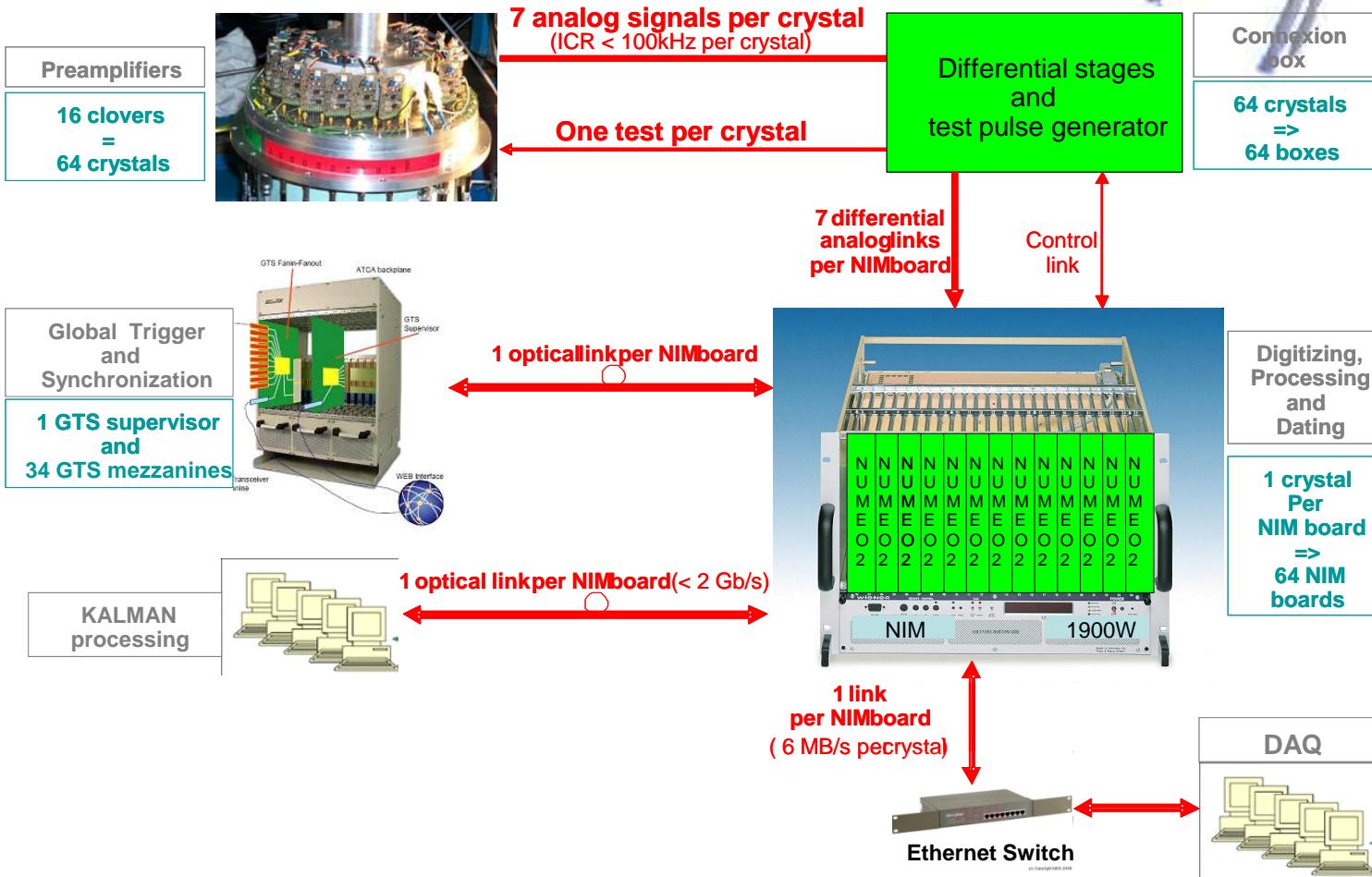
Installation of AGATA and upgrade of the EXOGAM array at GANIL

*W Meczynski, IFJ PAN
G de France, GANIL*

COPIGAL Workshop, Krakow, June 4-6, 2012



General layout





Connection box (GANIL)

Role:

- Common => differential mode for 1 Xtal (7 signals)
- Test generator.

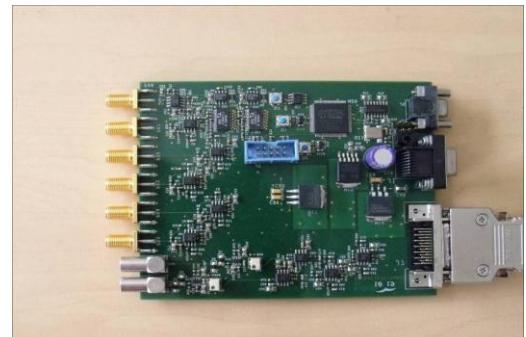
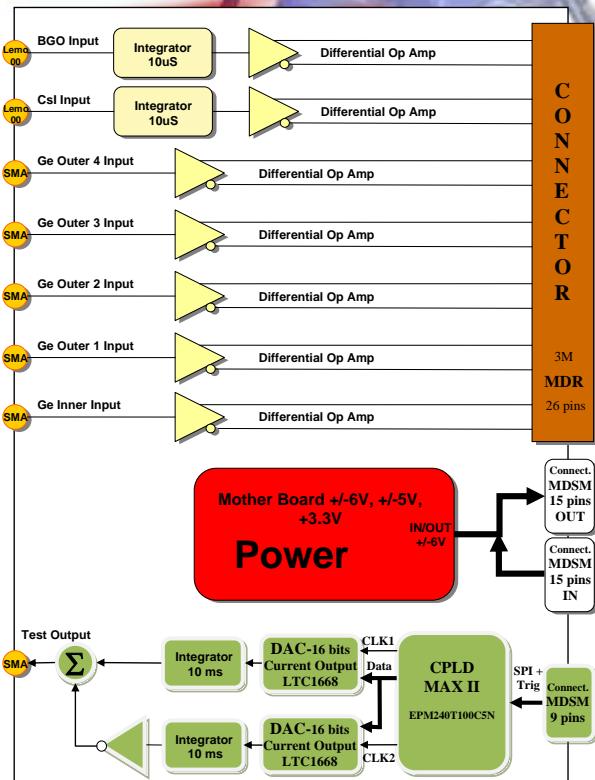
Specs:

16 clovers → 64 connection boxes

- Detector channels:
 - Analog inputs: 1 Ge inner, 4 Ge outer, 1 BGO, 1 CsI
 - Analog outputs: differential 100Ω
 - Gain: G=1 for Ge ; 3<G<15 for BGO and CsI (potentiometer)
- Test generator:
 - Pulse output: 0 to 1V on 50Ω; polarity and amplitude are software controlled
 - Tail pulse: 10ms
- Rate and trigger: software or NIM trigger input controlled

Status:

- Prototype under test

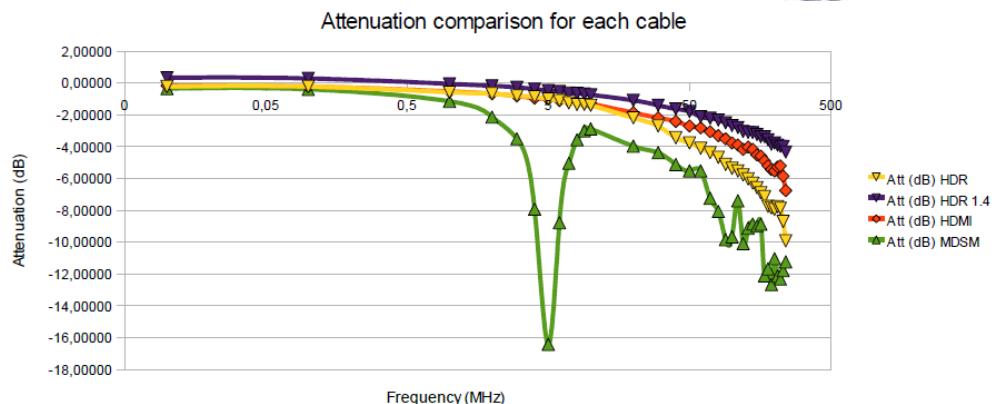




Cables: connection box to digitizer (GANIL, Valencia)

Status:

- Various cables tested
- HDMI cable chosen

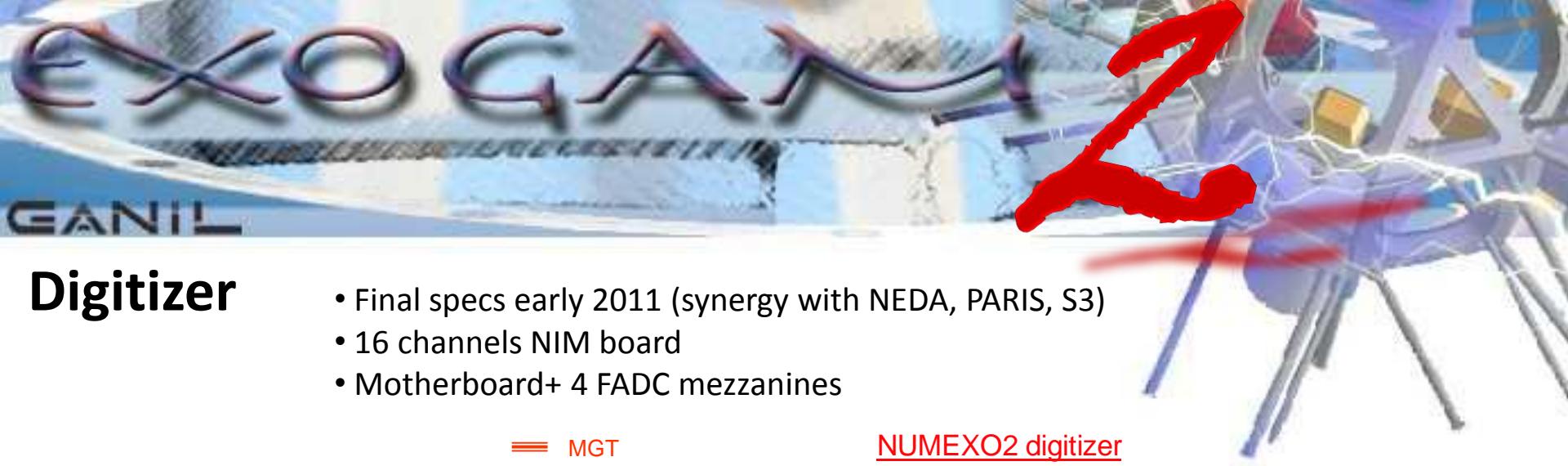


HDMI cable: $t_s=t_f=2.5$ ns



EMC results for HDMI cable



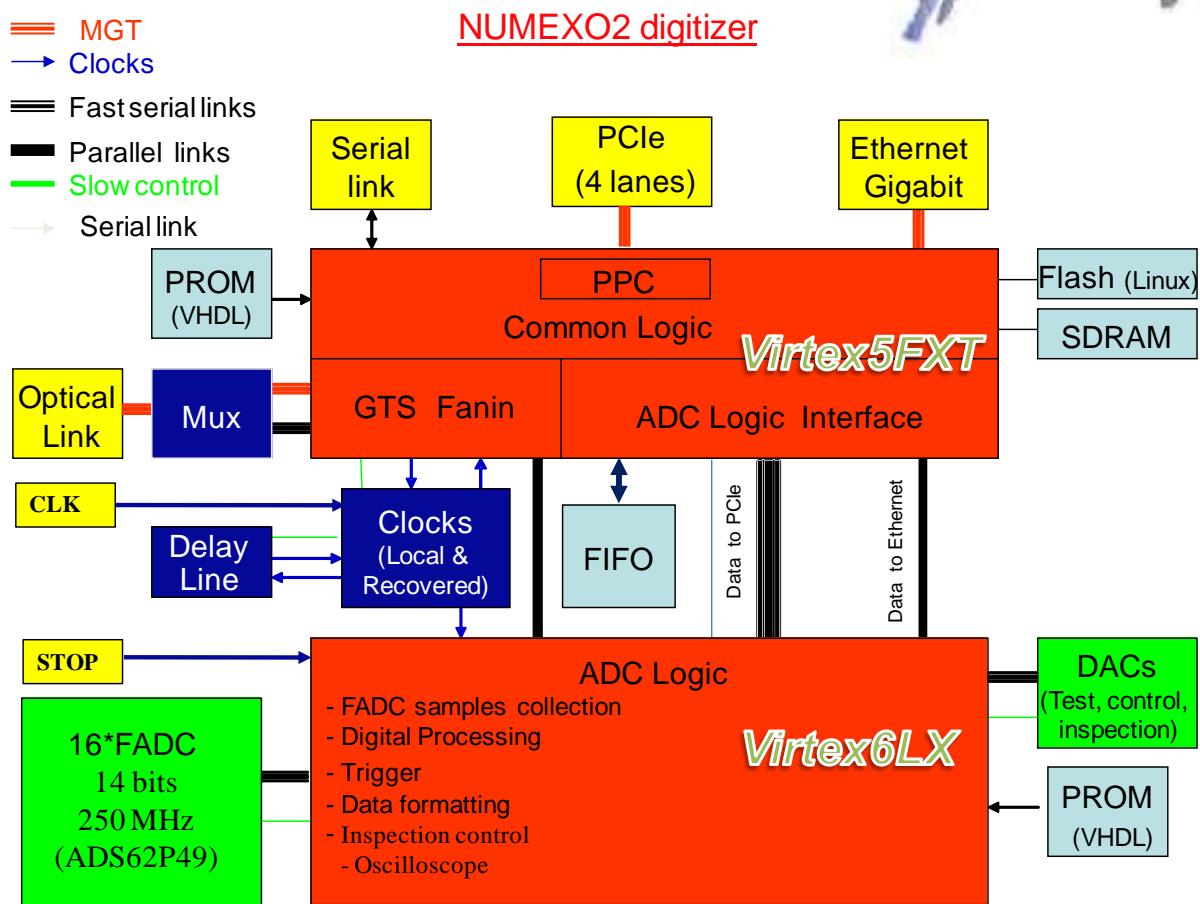


Digitizer

- Final specs early 2011 (synergy with NEDA, PARIS, S3)
- 16 channels NIM board
- Motherboard+ 4 FADC mezzanines

Overall status:

- All IPs identified and implemented in V5
- 45 sheets of schematics in CAD
- Schematics being cross-checked before final approval
- All critical components purchased





Virtex 5 (GANIL, Krakow, Warsaw, IPNO)

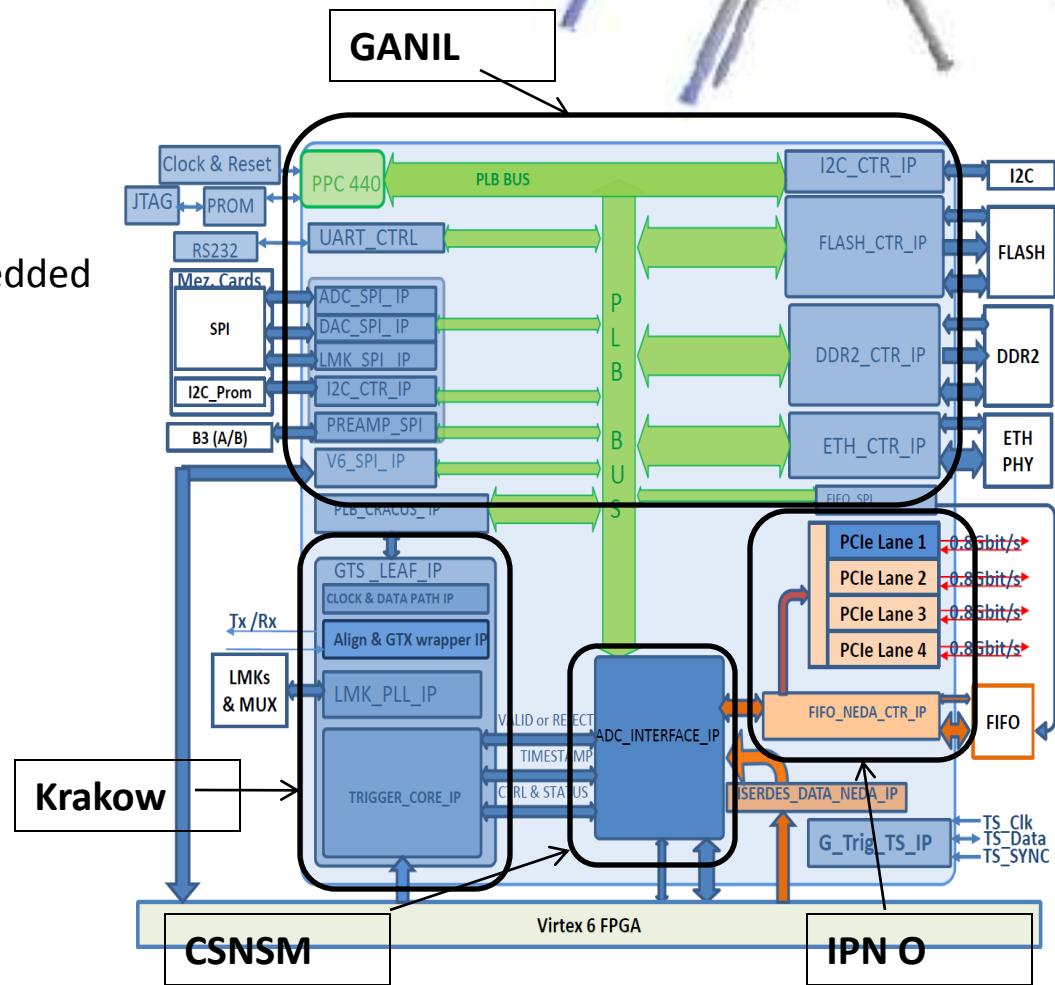
Role:

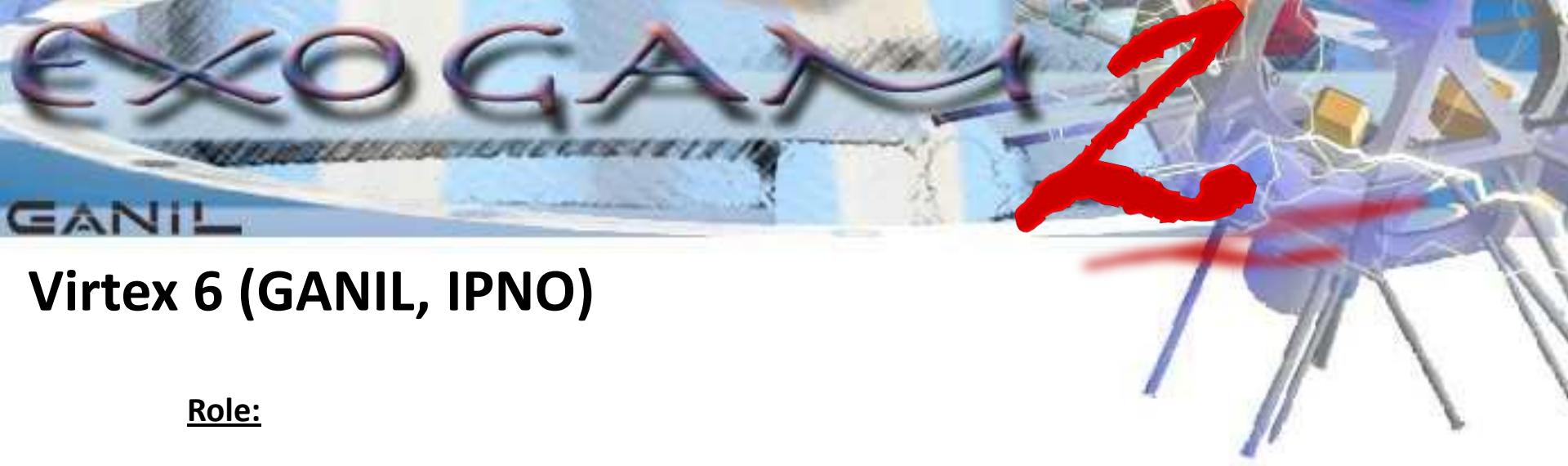
- V5: based on an FPGA integrated PowerPC(PPC405) associated to several Components (DDR2, FLASH...) to ensure Embedded Linux functionalities:

- ✓ Fast data readout (PCIexpress)
- ✓ Global Triggering and time Stamping
- ✓ Slow control

Status:

- All IPs identified and implemented in V5





Role:

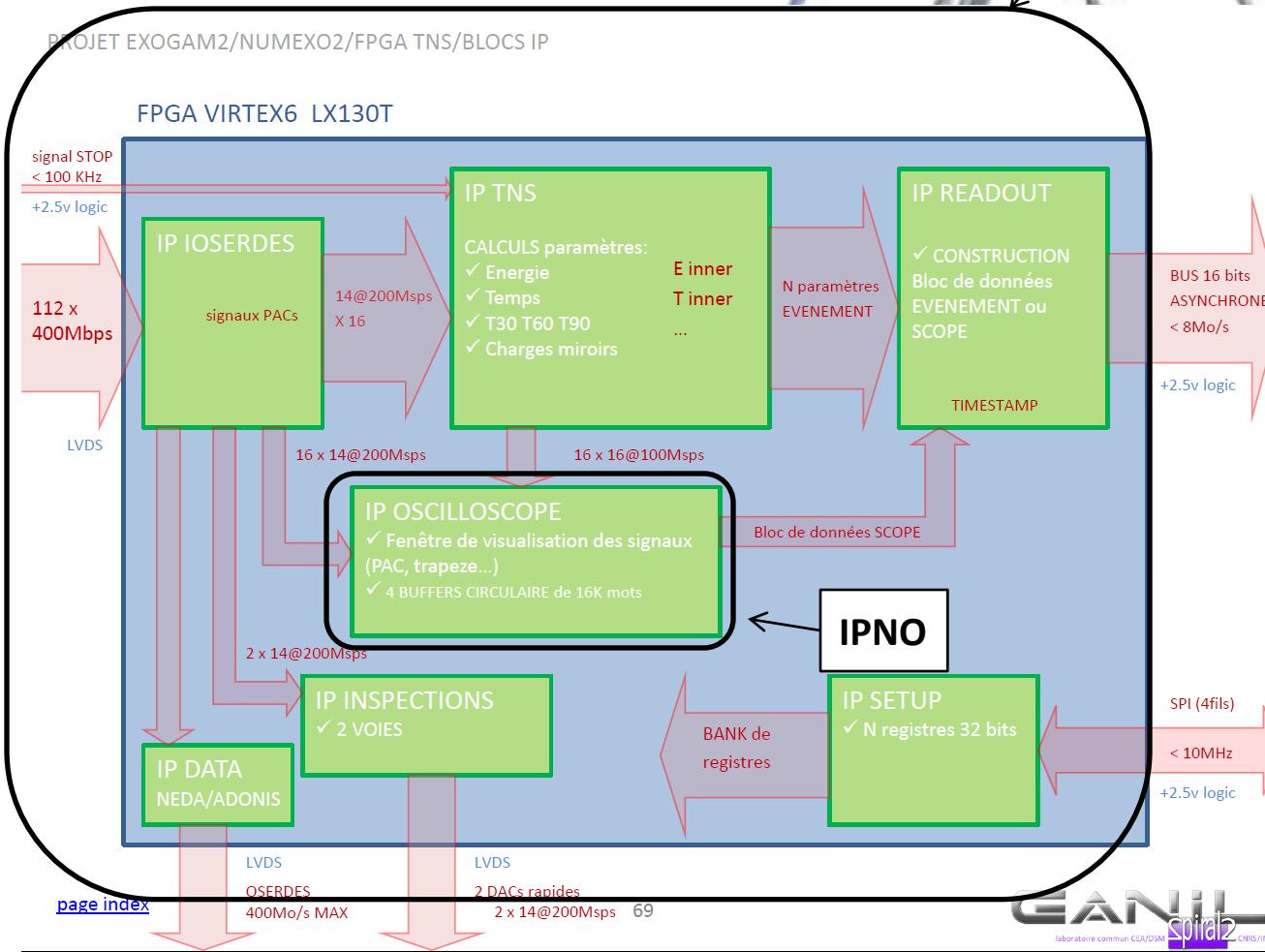
- Collects data from the 16 FADCs
- deals with data flow of 56Gbytes/s
- Measurement of:
 - ✓ Energy
 - ✓ Time
 - ✓ Rise time (T30, T60, T90)
- Produce trigger signals for the two central contacts
- Tools for analysis, inspection, test and debugging
- Transmit deserialized and processed data to the V5 (parallel bus)
- Transmit raw data via a 400 MHz serial bus for NEDA and ADONIS (dedicated deported software to analyze data)

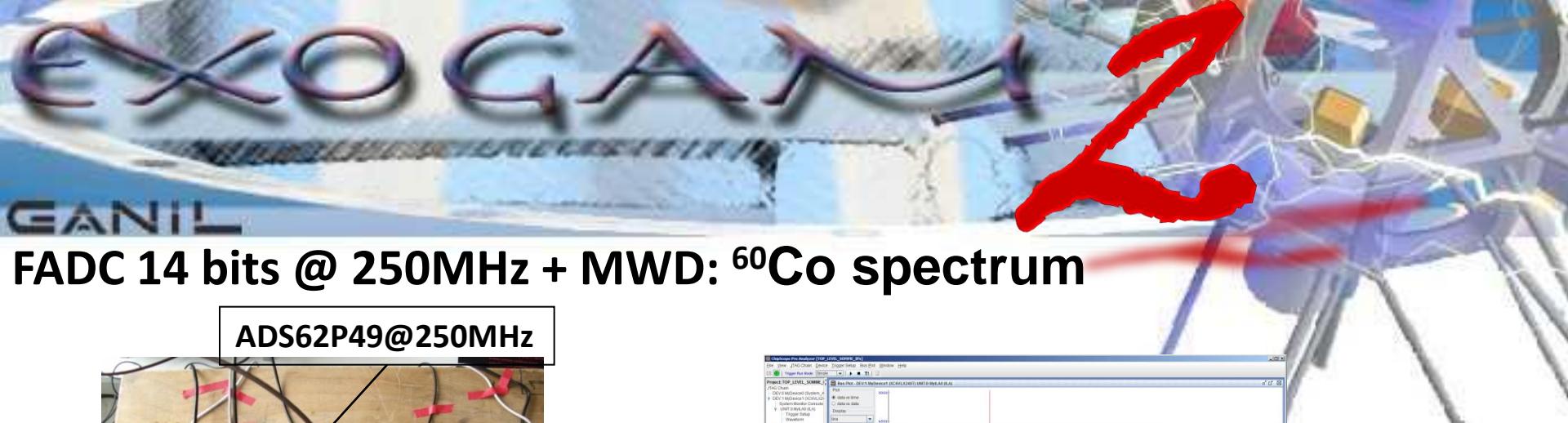


Virtex 6 (GANIL, IPNO)

Status:

- Firmware completed (except oscilloscopy)
- I/O assignment completed
- component chosen : VIRTEX6 LX130T
- Bank assignment underway

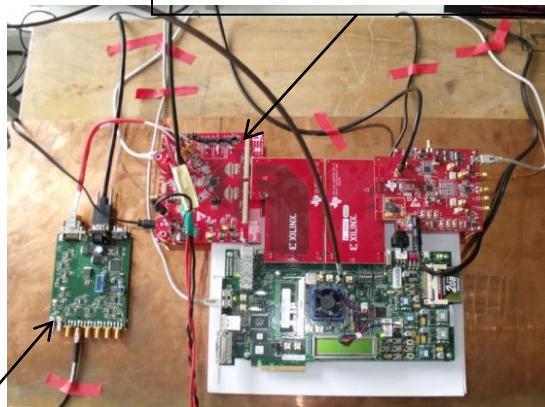




GANIL

FADC 14 bits @ 250MHz + MWD: ^{60}Co spectrum

ADS62P49@250MHz

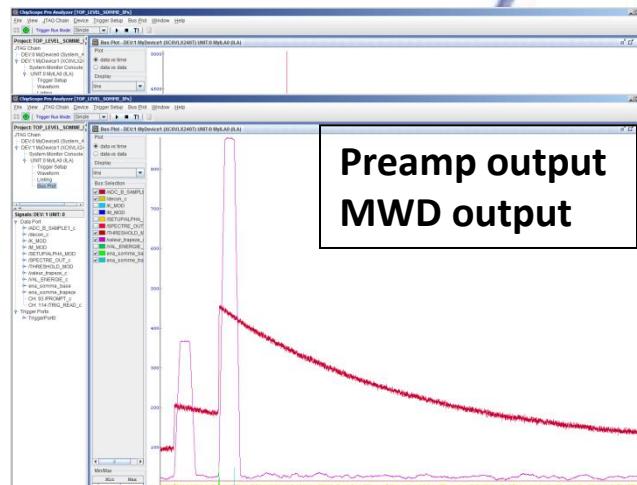


Connexion box

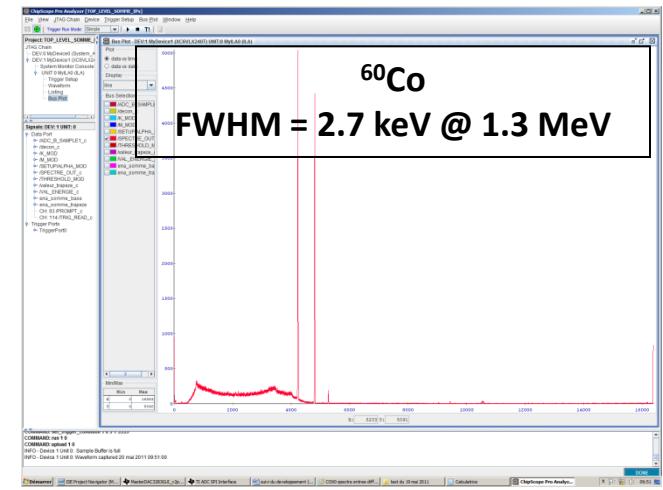
ML605



EXOGAM clover



Preamp output
MWD output





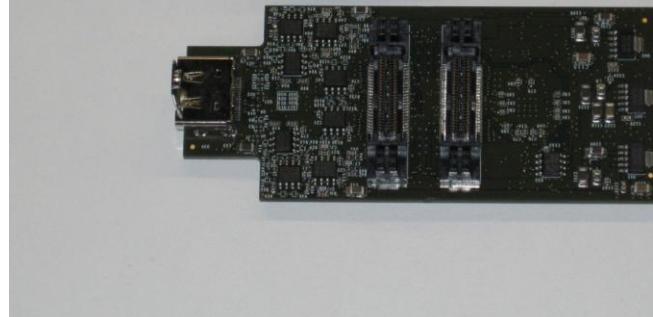
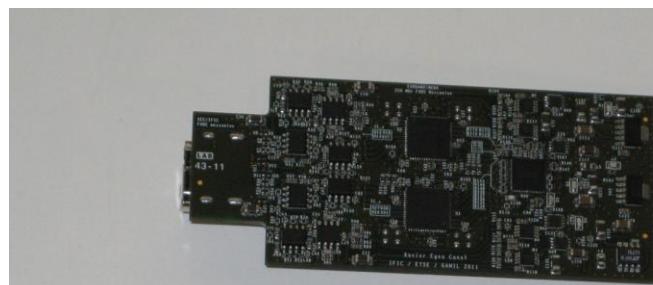
FADC Mezzanine (Valencia, GANIL)

Spec:

- 4 analog differential inputs, 100Ω impedance
- analog bandwidth < 100MHz.
- FADC conversion: from 100MHz to 250MHz, 14 bits.
- sampling frequency controlled by a PLL: 100MHz input reference clock.
- adjustable gain stage for FADC amplitude range matching
- FADC common mode voltage control
- identification registers
- SPI control

Status:

- 10 layers board
- Prototypes manufactured and under tests in Valencia
- Test bench designed and built

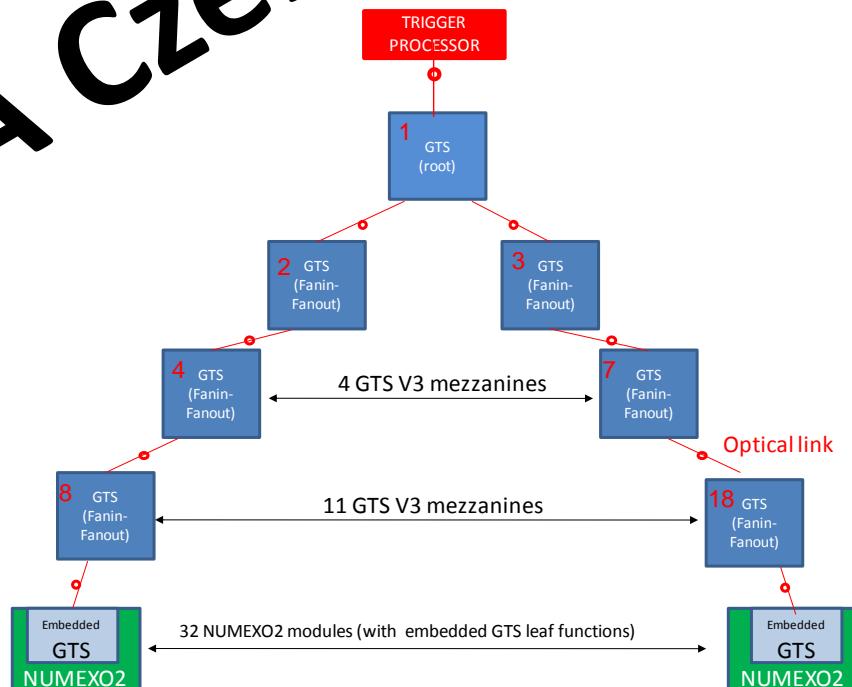


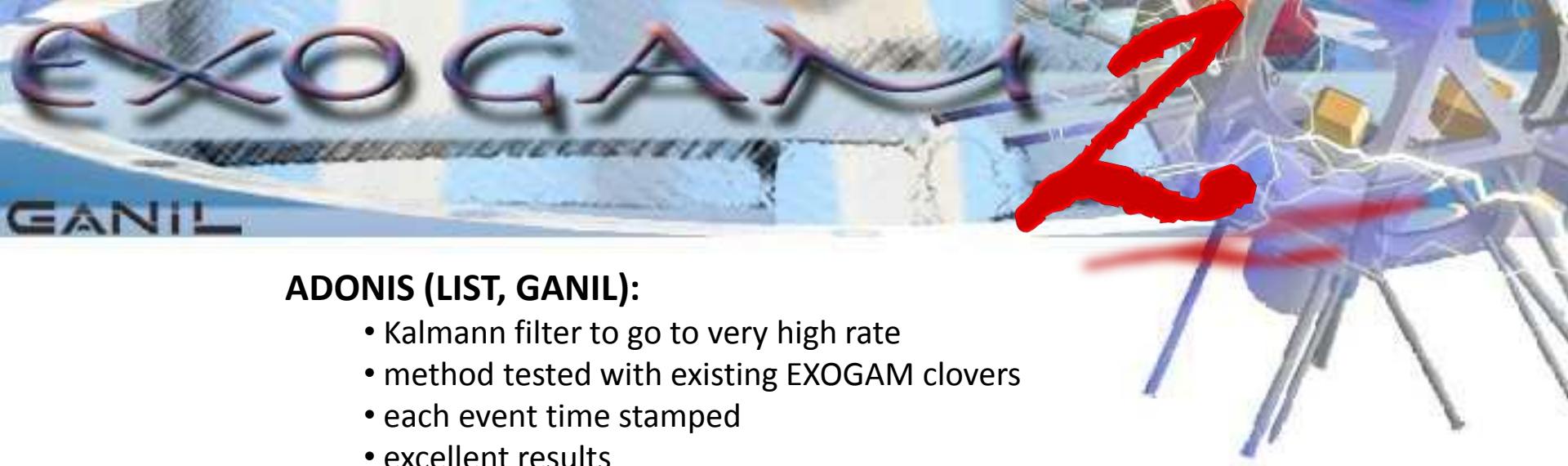


GTS (Krakow, GANIL, IUAC New Delhi)

- Developed for AGATA
 - ✓ Clock distribution
 - ✓ Time stamping
 - ✓ Trigger decision
- Parts to be adapted to EXOGAM2:
 - ✓ GTS leaf integration in the digitizer
 - ✓ GTS carrier
- Need:
 - ✓ 32 GTS leaf functions embedded in digitizer
 - ✓ 18 GTS mezzanines (17 fanin/fanout; 1 root)
 - ✓ 1 trigger processor
- Status:
 - ✓ GTS rear design ready
 - ✓ I/O (firmware) under development
 - ✓ Carrier design completed
 - ✓ Trigger processor: commercial cards bought

GTS task → A Czermak





ADONIS (LIST, GANIL):

- Kalmann filter to go to very high rate
- method tested with existing EXOGAM clovers
- each event time stamped
- excellent results

SOFTWARE (GANIL, Krakow, IPNO):

- embedded software:
 - Linus OS; ported into the V5
 - Register server developped
 - Oscilloscope functionality (to be done)
 - Data readout (to be done)
 - GTS (to be done)
- Control:
 - Setup
 - Vigru (histogram dispay developed for AGATA+FFT)
 - Data flow

DOCUMENTATION:

- Project organization, task/subtask distribution
- Detailed design specs
- Planning, budget and collaboration
- Technical manual



Collaborations/budget/planning

- Collaboration agreement signed
- Collaborators:

GANIL, CNRS/IN2P3/CSNSM, KTH Stockholm*, ATOMKI Debrecen, Nigde Univ. ,
CNRS/IN2P3/IPNO, IFJ PAN Krakow, IUAC New Delhi, TIFR Mumbai.

Table B.2 Capital investment and human resources for EXOGAM2, and planned sharing between the participating collaborating parties. Spent (July 2011): 101 k€.

		Capital investment in k€ (2009-2013)	Personnel in person months (2009-2013)
Party	GANIL (including its contributions via FP7 SPIRAL2-PP and CPER ¹)	372	130
	KTH	30 ²	-
	CSNSM	-	36
	IPNO	30	40
	IFJ PAN	30	40
	IUAC	-	6
	TIFR	100 (inc. Manpower)	6
	Nigde Univ.	61	-
	ATOMKI	45 ³	6
Other contributions	EXOGAM ⁴	66	-
	Total	579	264



Investment plan

Coût estimatif de l'électronique pour 16 clovers						
	Quantité	Prix/unité (k€)	2011	2012	2013	Total (k€)
Interconnection box: Prototype Serie	4 64+6	2 1	8	70		8 70
Cables: MDR 14 pin ou HDMI Optical fibers and transceivers	128+12 32+4	0.1 1	1,2 4		12,8 32	14 36
FADC mezzanines FADC mezzanines prototypes FADC mezzanines (serie)	6 128 + 12	2 1	4	8 140		12 140
Digitizer NIM 16 channels module (prototypes) NIM 16 channels module (serie) NIM crate	4 32+3 3	10 5 10	20	20	135 20	40 135 30
GTS tree: GTS NIM carrier (prototype) GTS NIM carrier (serie) GTS mezzanine NIM crate GTS supervisor	1 5 18+2 1 1+1	2 2 2.5 10 10	2	10		2 10 50 10 20
Switch 48 voies	1	2			2	2
TOTAL (k€)			99,2	278	201,8	579

Planning



Conclusions

- Final specifications approved early 2011: synergy with NEDA (FADC, trigger requests, readout), PARIS?, S3? → flexibility, integration at GANIL, maintenance and support
- Collaboration agreement signed
- Tasks are progressing according planning
- Documentation written (detailed design spec., development roadmap, critical path analysis, collaboration agreement,...)
- Mass production to be clarified(TIFR/BARC?)
- Next major milestone: the full digitizer prototype (order in June and tests from September.