AGATA Project

1 π Phase Back end Electronics

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Outline

- Futur perspectives for the AGATA Project Instrument
- Summary of the overall system after the demonstrator integration.
- New Specifications for back end electronics.
- EXOGAM II electronics and the Possible Architecture of the AGATA Back End Electronics
- Mechanical preliminary overview
- Block diagram of the BEE for one Ge crystal
- Conclusion

Futur Perspectives for AGATA

- List AGATA Constraints after the Demonstrator installation
- What did we learn from the Actual design for electronics.
- What options in the earlier designs are no more needed after the qualification of the Demonstrator phase.
- New Specifications for back end electronics to help resolving these constraints.

Summary of the overall system after the demonstrat integration.

- Actual AGATA Infrastructure and Back End Electronics :

  - AGATA is NOT fixed Instrument. It MUST move TO different accelerators. (LNL, GSI, GANIL, etc…)
  - Needs Fast mounting dismounting time
  - Actual connections cannot support several mount and unmount cycles.
  - Preamplifier Signal is sensitive to Noise due to the MDR cable length
  - Too many Preamplifier signal transmission Cables per TC (21 MDR cables for signals only 10 mm diam each ~20kg weight) not including PS cables

Summary of the overall system after the demonstrat integration.

- Actual AGATA Infrastructure and Back End Electronics :

  - Too many Fiber optics cables per TC (21 cables with 6 fiber per cable) to transfer ADC data
  - Actual Digitiser size is 3 x (19” crates of 3 u) per TC (600x540x400 mm) 90 kg approx.. 600 W
  - Each TC preprocessing electronics is housed in 6 ATCA carrier cards (half a crate) volume size 180 x 200 x 250 mm 600 W.
  - All electronics were designed 8 years ago. It was the best solution to respect the instrument sensitivity and specification.

New Specifications for AGATA electronics

- AGATA Back End Electronics Specification:
  - Must keep actual system interface as it is. This means that a modified ATC can be connected to either BEE (demonstrator or embedded)
  - Must be as close as possible to the TC Cryostat to keep the preamplifier signal integrity.
  - Mounting and dismounting time (MTTR) is few hours hours instead of days
  - Use 1 connector and 1 cable preamplifier per crystal instead of 7
  - Removes constraints for mechanics cabling and infrastructure
  - Integrate preprocessing within digitisers remove ALL synchronisation procedures and ALL Fiber Optics.
  - AGATA BEE can be tramsported with the ATC as the preamplifiers today.
  - Compatibility with the actual BEE (digitisers + Preprocessing cards) by using Cable adapters to MDR connectors box. This is extremely important while testing new electronics to compare the detector resolution very quickly by simple connector change.

New Specifications for AGATA electronics

- AGATA Back End Electronics Specification:
  - Today New technology electronics gives the chance to use the exact minimum electronics needed to fullfill the AGATA specifications.
  - Virtex 6 FPGA can house up to 10 Virtex 4 FPGAs
  - The actual digitisers contain enormous options to be used for diagnostics only. The Virtex 2 FPGAs are not needed.
  - 33 % of the mezzanine cards is used for diagnostics.
  - Lot of components and FPGA designs inside the carrier cards are used to synchronise the master and slave functionalities. Using 1 preprocessing card will eliminated all these components.
  - 20 % of the carrier card is used for the ATCA data transfer buffers and fast switches which are not used.

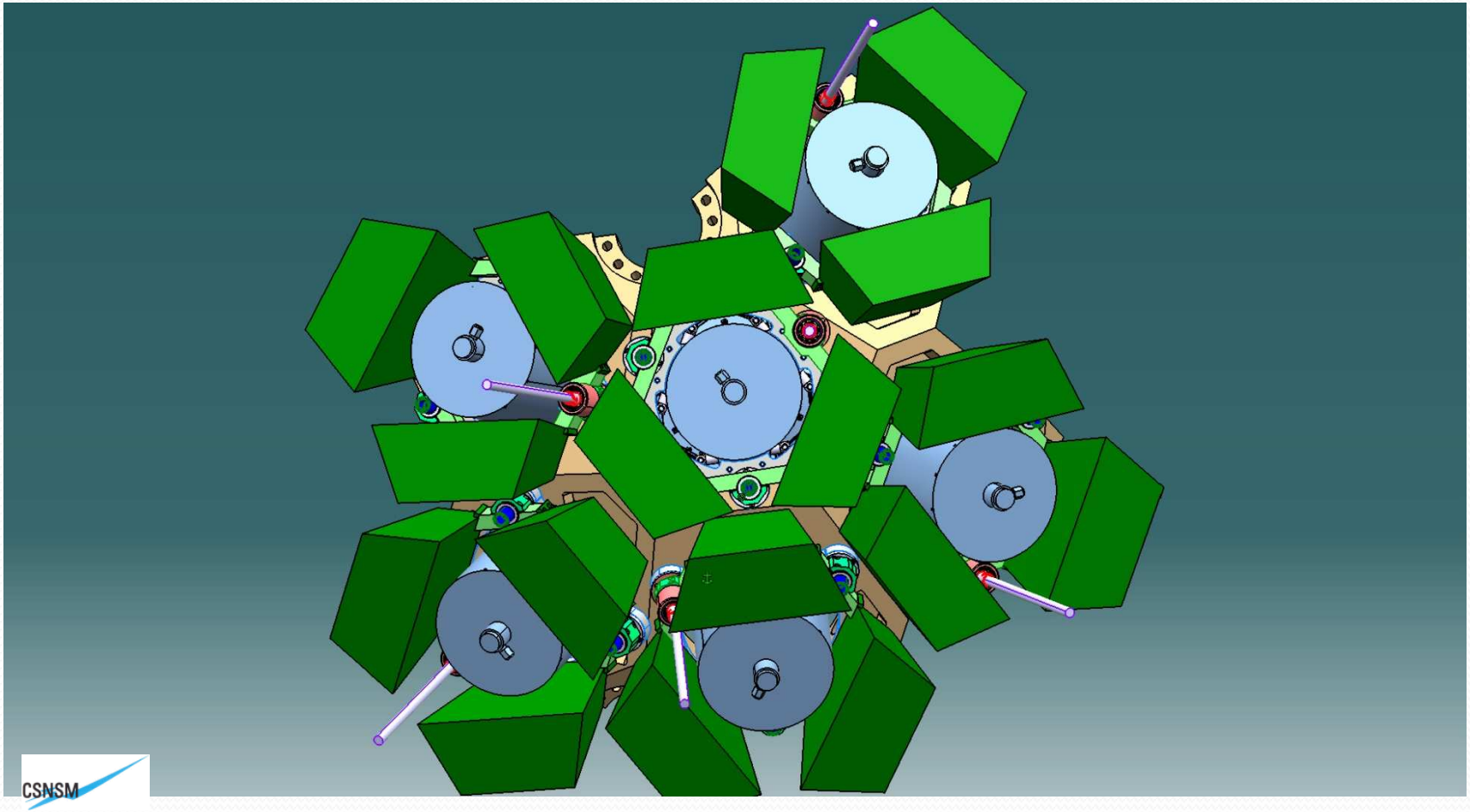
New Specifications for AGATA electronics

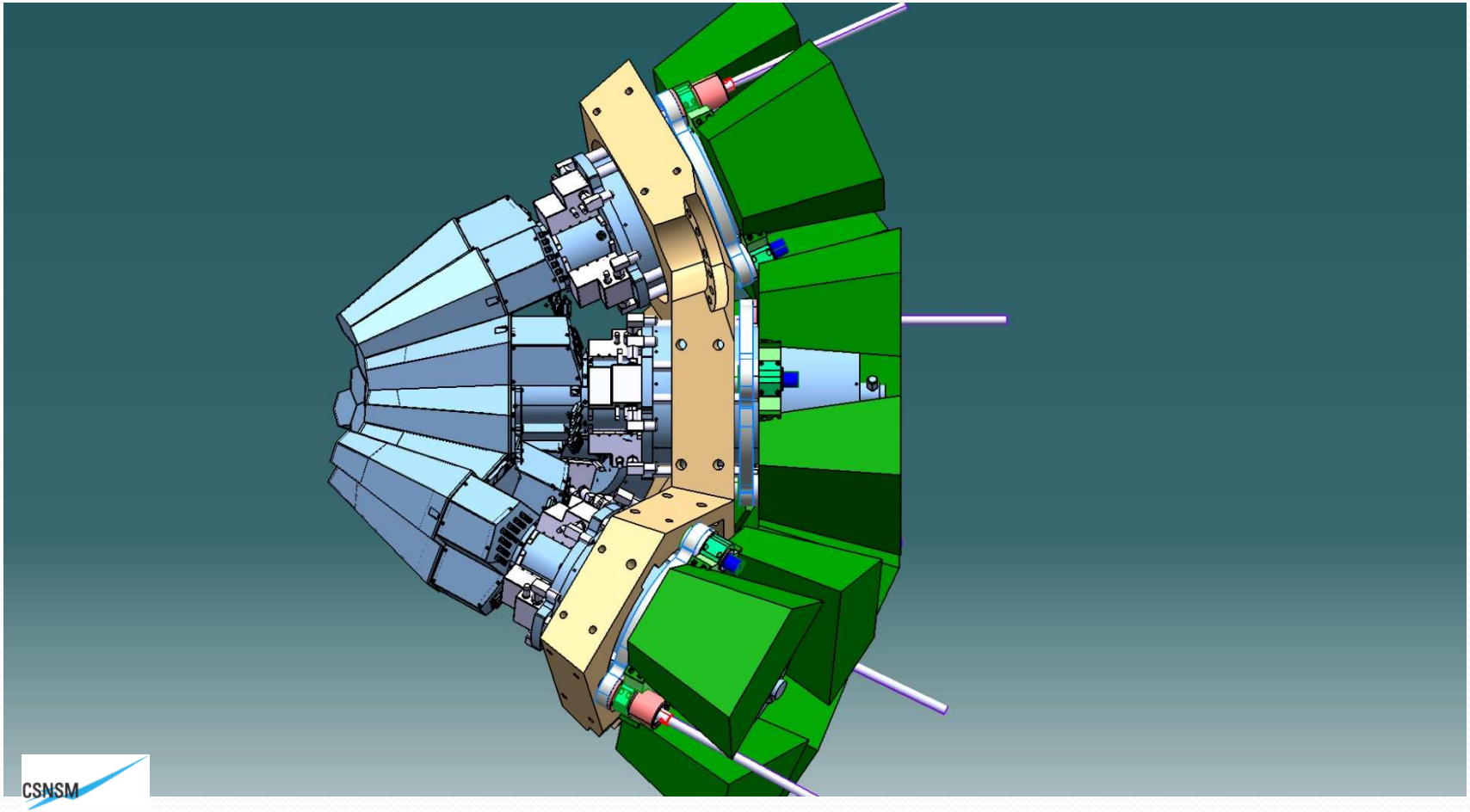
- AGATA Back End Electronics Specification:
  - The AGATA BEE will house in Metallic boxes with heat sinks and thermal pcb drains (try not to use fans for noise generation maybe internal).
  - The boxes are mounted behind the LN2 dewars
  - No heat transfer from the Boxes to the internal dewars.
  - The preamplifier interface is made out of 56 DSTP cable length 1 m
  - The output data is only online preprocessing data will be sent to Pizza box through PCIe as it does today using linko boards.
  - GTS leaf is inside the Virtex 5
  - PPC integrated in the Virtex 5 will be used for ENX webserver
  - 1 clock signal will trigger the ADCs and the preprocessing stage
  - TOT processing will be integrated

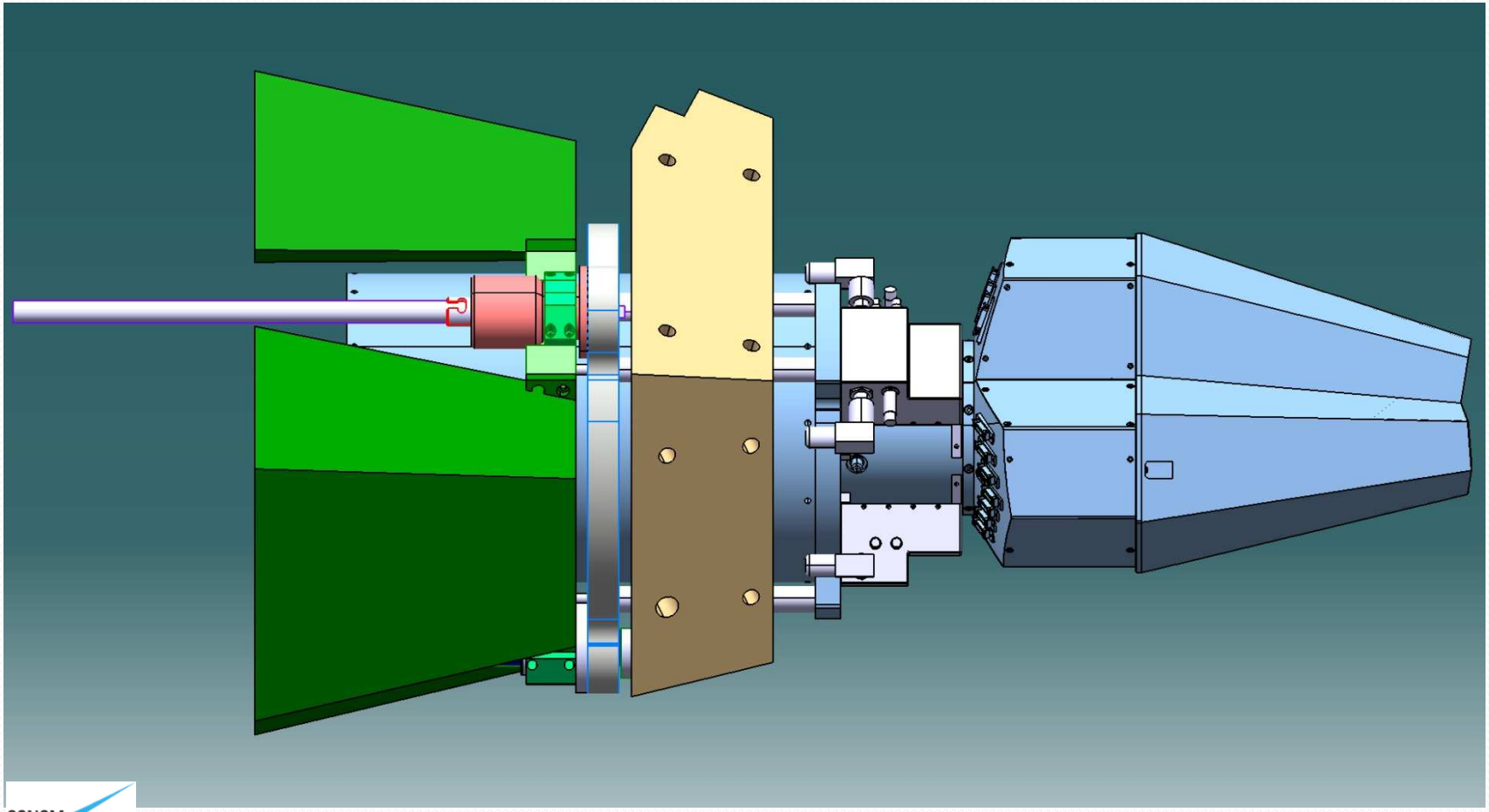
Characteristics of the Proposed BEE for AGATA

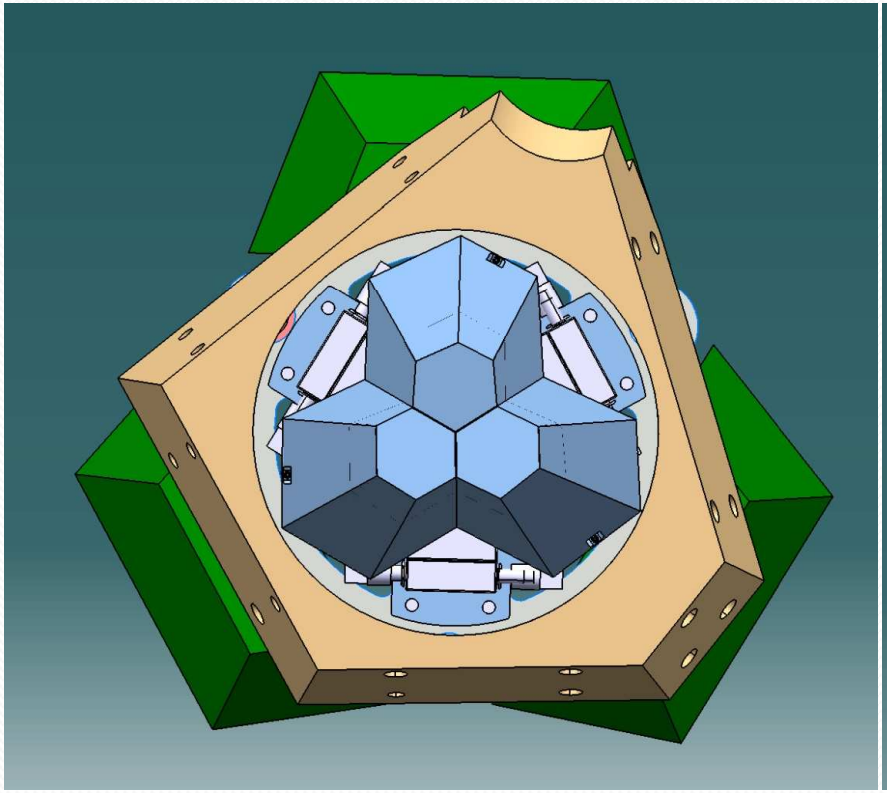
- For 1 Ge Crystal is composed of the following:
- 1 metallic boxes of volume of 250 x 250x 70 mm each
- 7 kg weight per box
- 40 FADC channels daughter board 220 x 220 mm
- 20 x 40 mm per channel
- Preprocessing Mother board based on Exogam II 220 x 220 mm
- Power consumption 60 to 80 W
- Price 15 keuros + 20% -0% TBC per box
- Prototype ready in 24 months (if manpower is available).

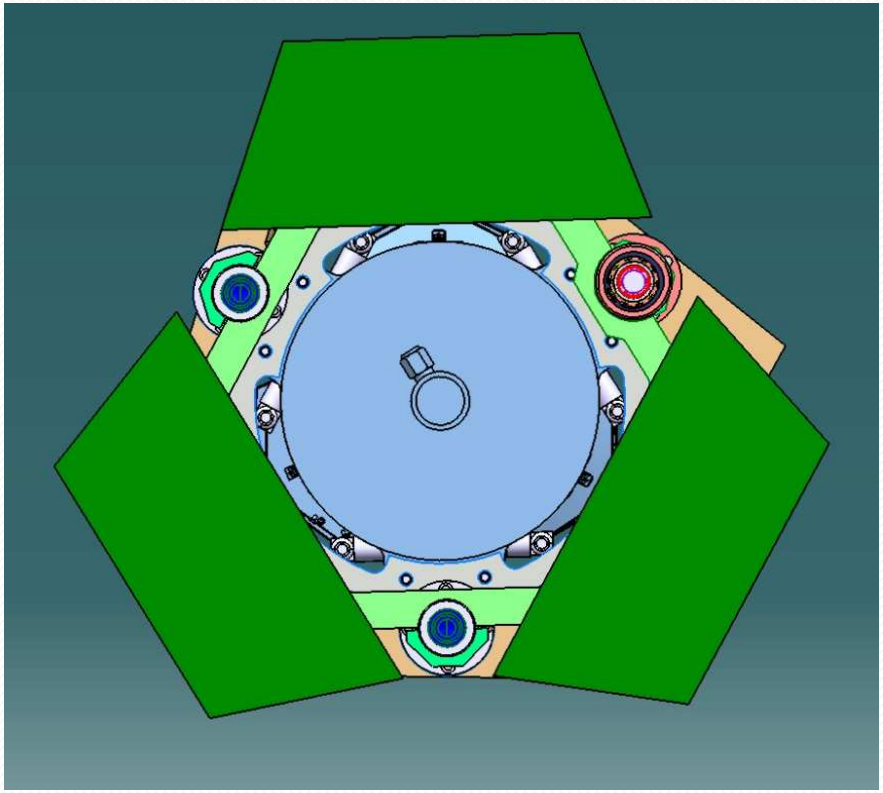
Where to put the embedded electronics

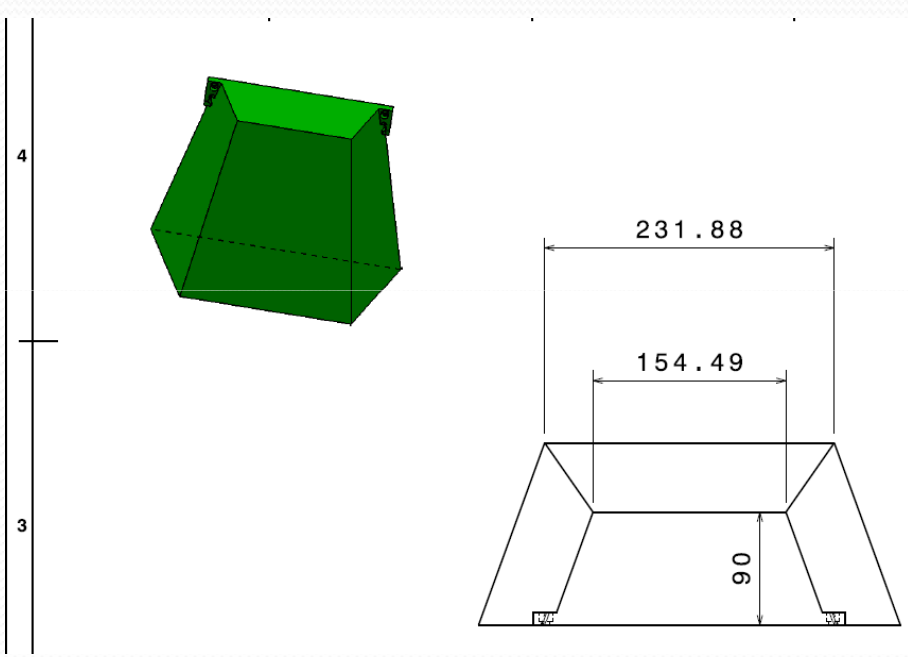








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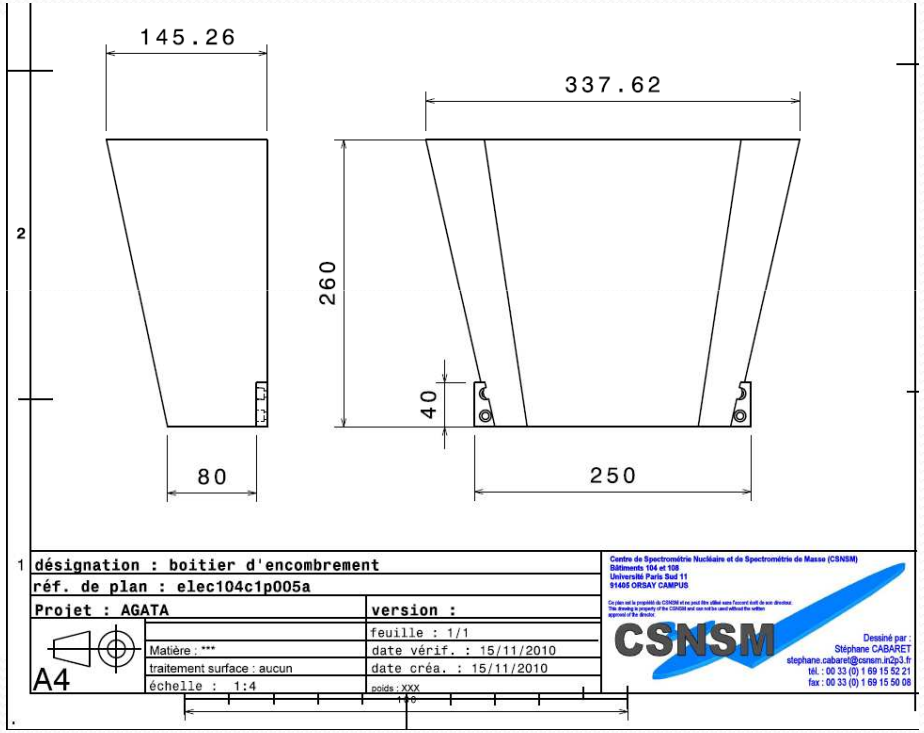
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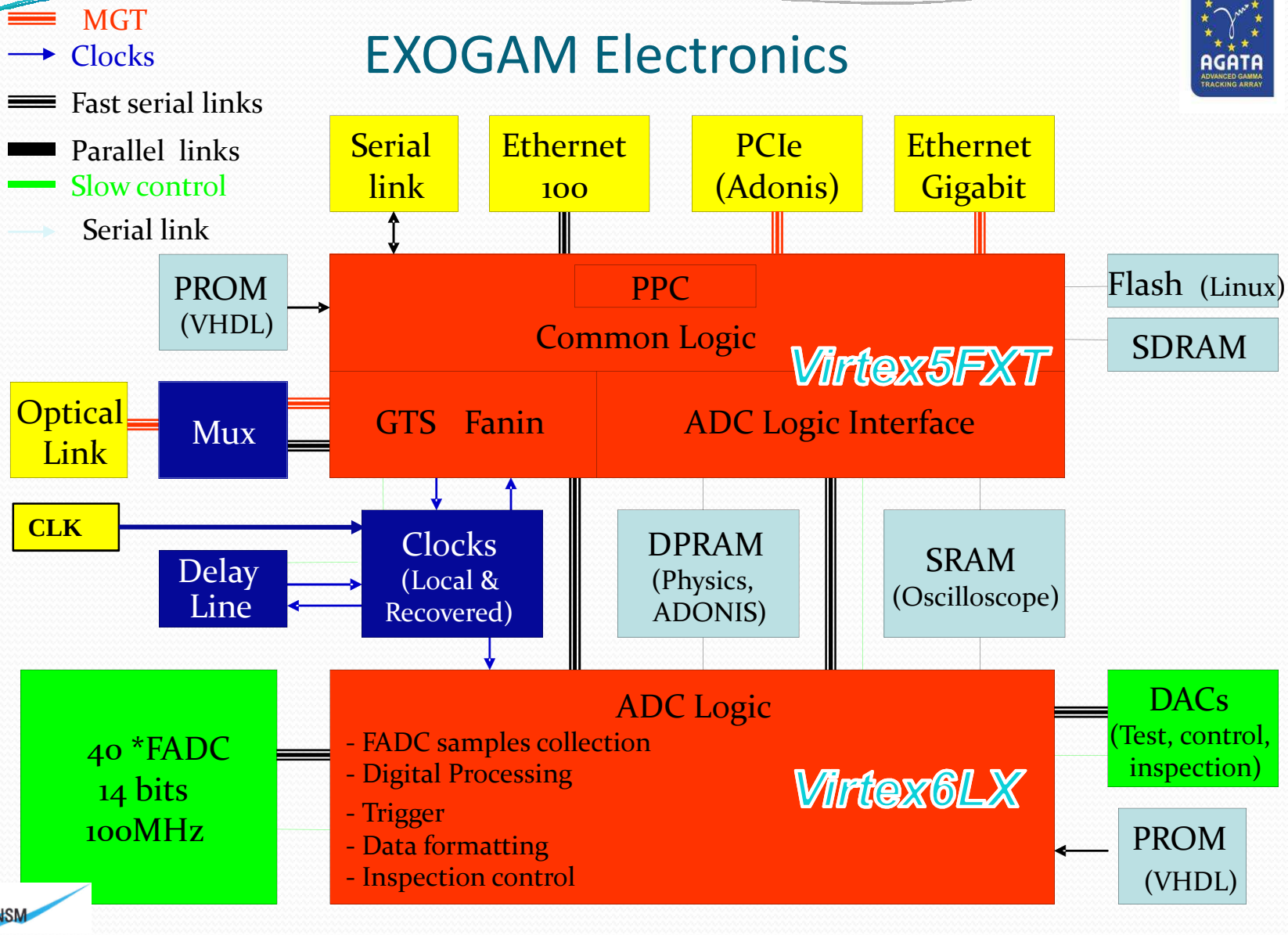
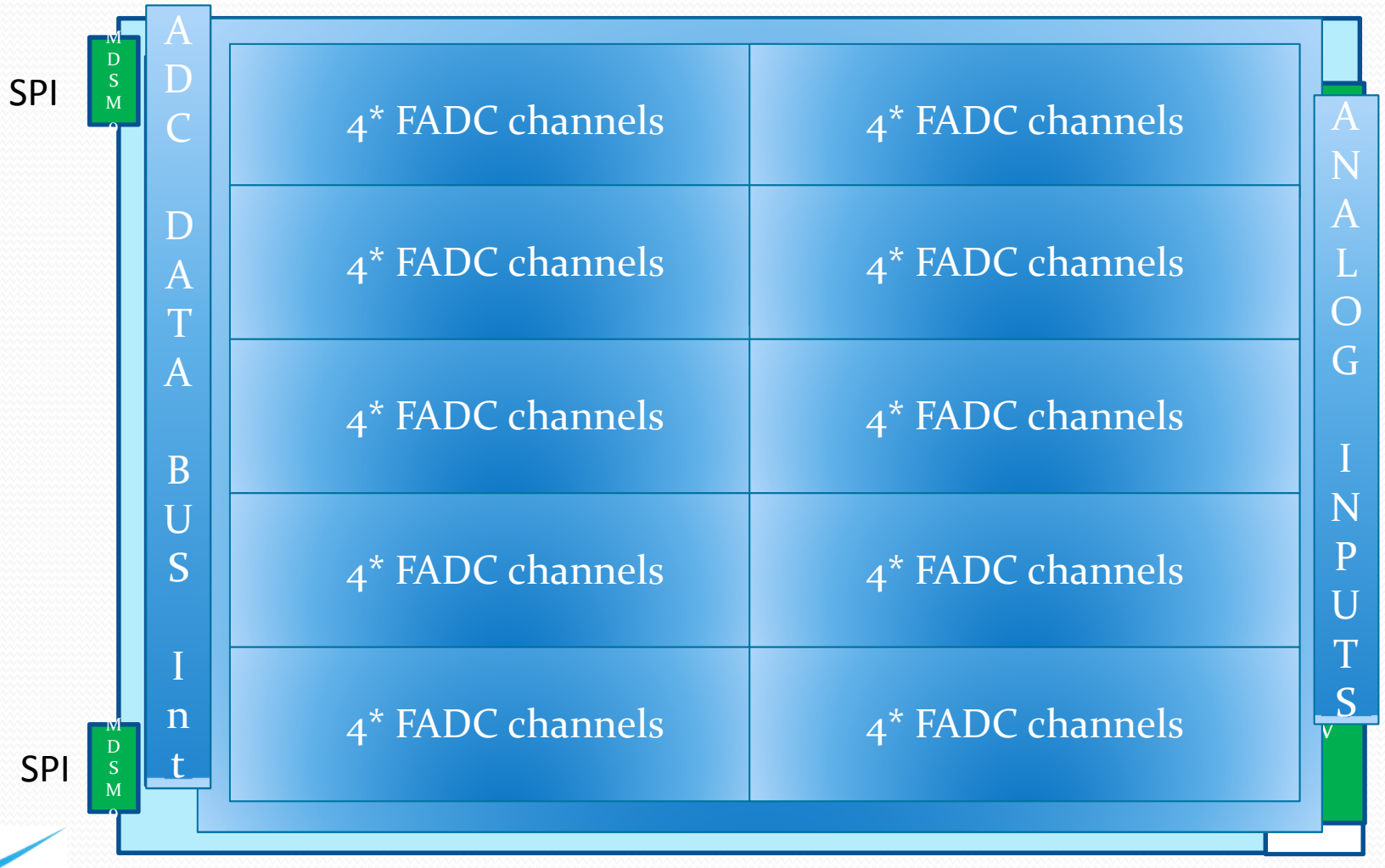
CSNSM
Dessiné par :
Stéphane CABARET

EXOGAM Electronics



Architecture of the AGATA Back End Electronics



Proposed BEE for AGATA

- Planning starting from To:
  - T1 = To + 3 month design definition and architecture plus interface connection definition
  - T2 =T1+6 months CAD design schematics is ready for the 2 cards. Manufacturing files ready for the flash ADC card
  - T3=T2+4 months Manufacturing files ready for the Carrier card
  - T3 + 6 months prototype industrial files generation, pcb manufacturing and assembly plus preliminary power and jtag tests
  - To+12 months VHDL Code translation to Virtex 6and GTS leave integration
  - T4=To+12 months embedded linux integration inside the PPC
  - T5= T4 +6 months slow control and run control interface development
  - To+18 months mechanical design and prototype including dummy prototypes for tests

ManPower in MM for the AGATA BEE

- Manpower needed :
  - 6 MM design and specification
  - 15 MM HardWare CAD system (schematics to manufacturing files)
  - 18 MM VHDL
  - 12MM mechanics
  - 12 MM embedded Software
  - 3 MM GEC integration
  - 3 MM industrial documentations
  - 12 MM test and qualification
  - 3 MM Project Managing and coordination
  - 12 MM Test bench facility
  - Total of 96 MM -> 8 FTE

- ManPower Available :
  - Hardware Engineers (3 FTE) (XL, DL, BT, SP, NK) + 1 FTE IN2P3 CDD
  - Software Engineers (1 FTE) (ND and EL)
  - Plus engineers from GANIL are foreseen to collaborate
  - Plus people from the collaboration are welcome