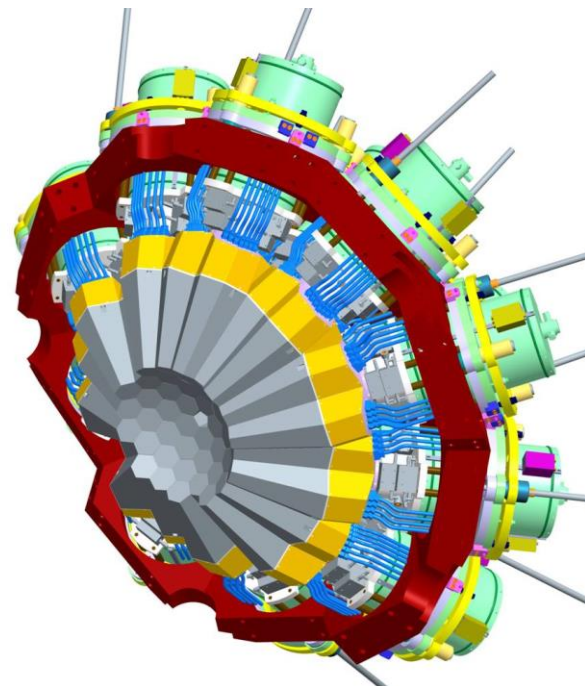# AGATA Electronics: Trigger and Synchronization for AGATA 4π

Andres Gadea (IFIC-CSIC, Spain)
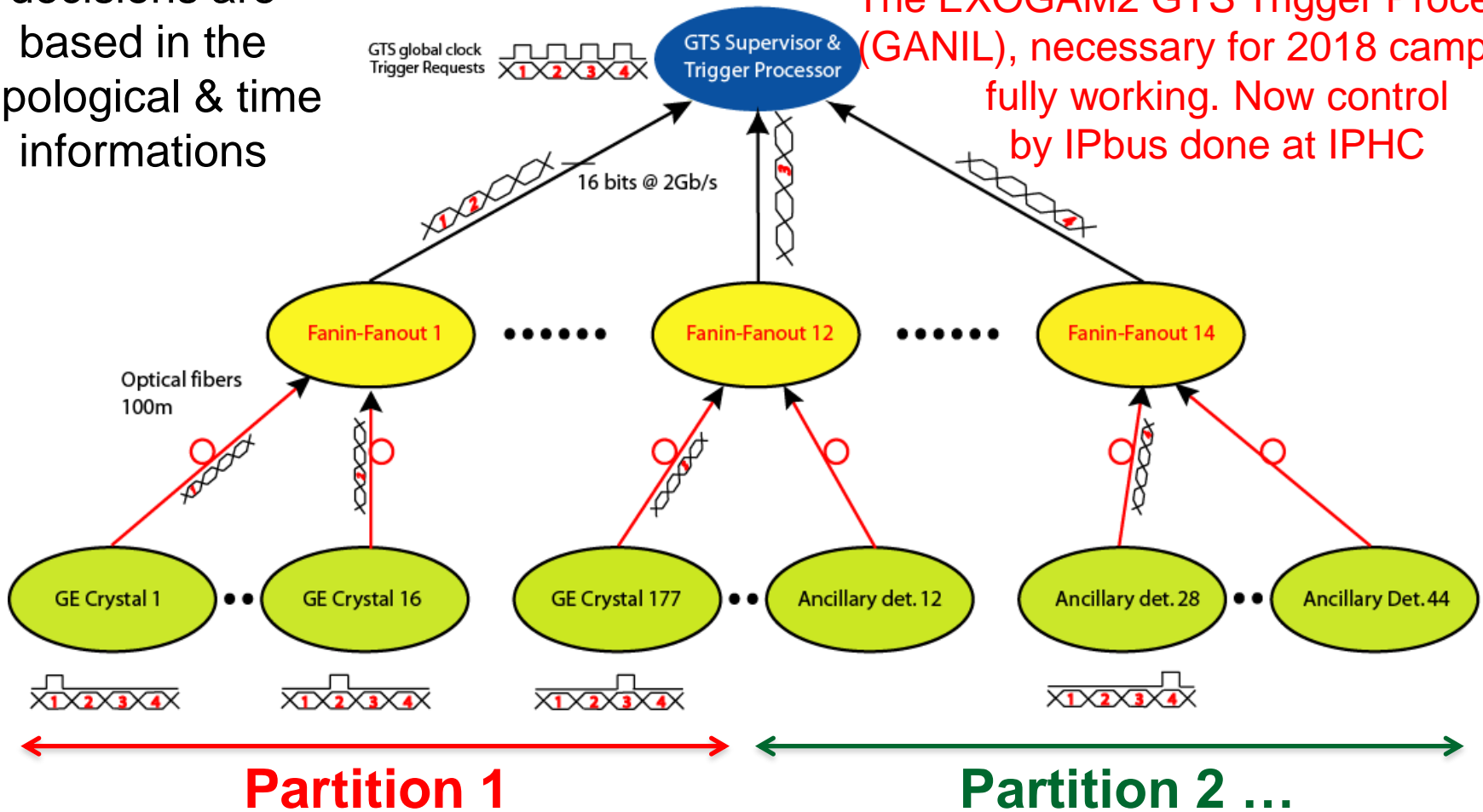**on behalf the AMB and AGATA Collaboration**

19th AGATA Week 10th – 14th September 2018, IPHC, Strasbourg
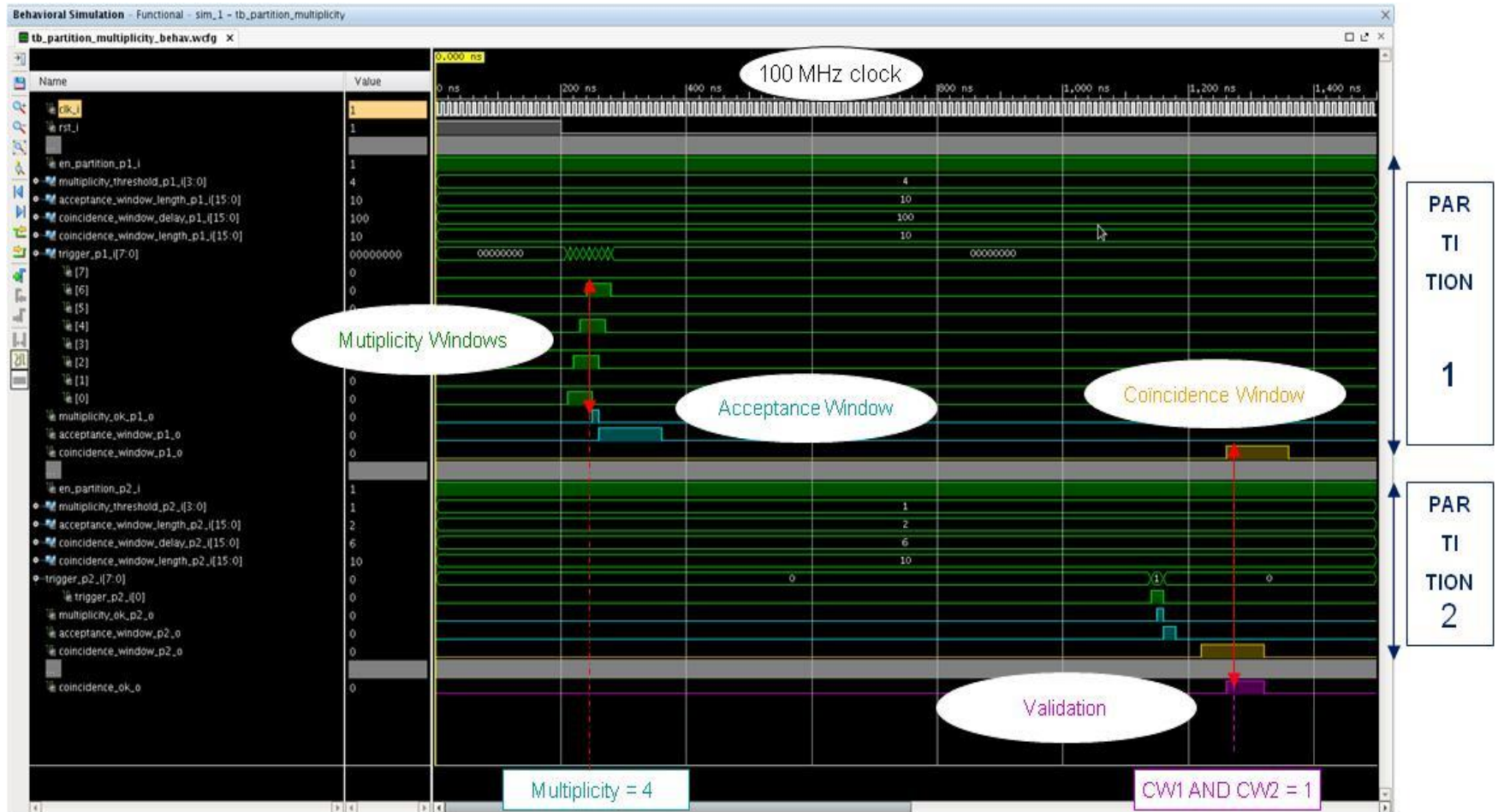
GTS Trigger & Synchronization Structure

GTS Trigger decisions are based in the topological & time informations

Early AGATA GTS Trigger Processor limited to 40 TR (channels). The EXOGAM2 GTS Trigger Processor, (GANIL), necessary for 2018 campaign, fully working. Now control by IPbus done at IPHC

GTS global clock Trigger Requests
X 1 2 3 4 X

GTS Supervisor & Trigger Processor

16 bits @ 2Gb/s

Fanin-Fanout 1 ...... Fanin-Fanout 12 ...... Fanin-Fanout 14

Optical fibers 100m

GE Crystal 1 .. GE Crystal 16   GE Crystal 177 .. Ancillary det. 12   Ancillary det. 28 .. Ancillary Det. 44

Partition 1   Partition 2 …

INFN-Padova, GANIL-Caen, IPHC-Strasbourg

NUMEXO2 / GANIL GTS Trigger Processor

Looking forward to have a Hardware and a Software Trigger Levels

Courtesy of M.Tripon and the GANIL collaborators

GANIL-Caen, IPHC-Strasbourg, CSNSM

GTS Limitations and Issues

We think nowadays that the GTS system is presenting some problems and/or limitations:
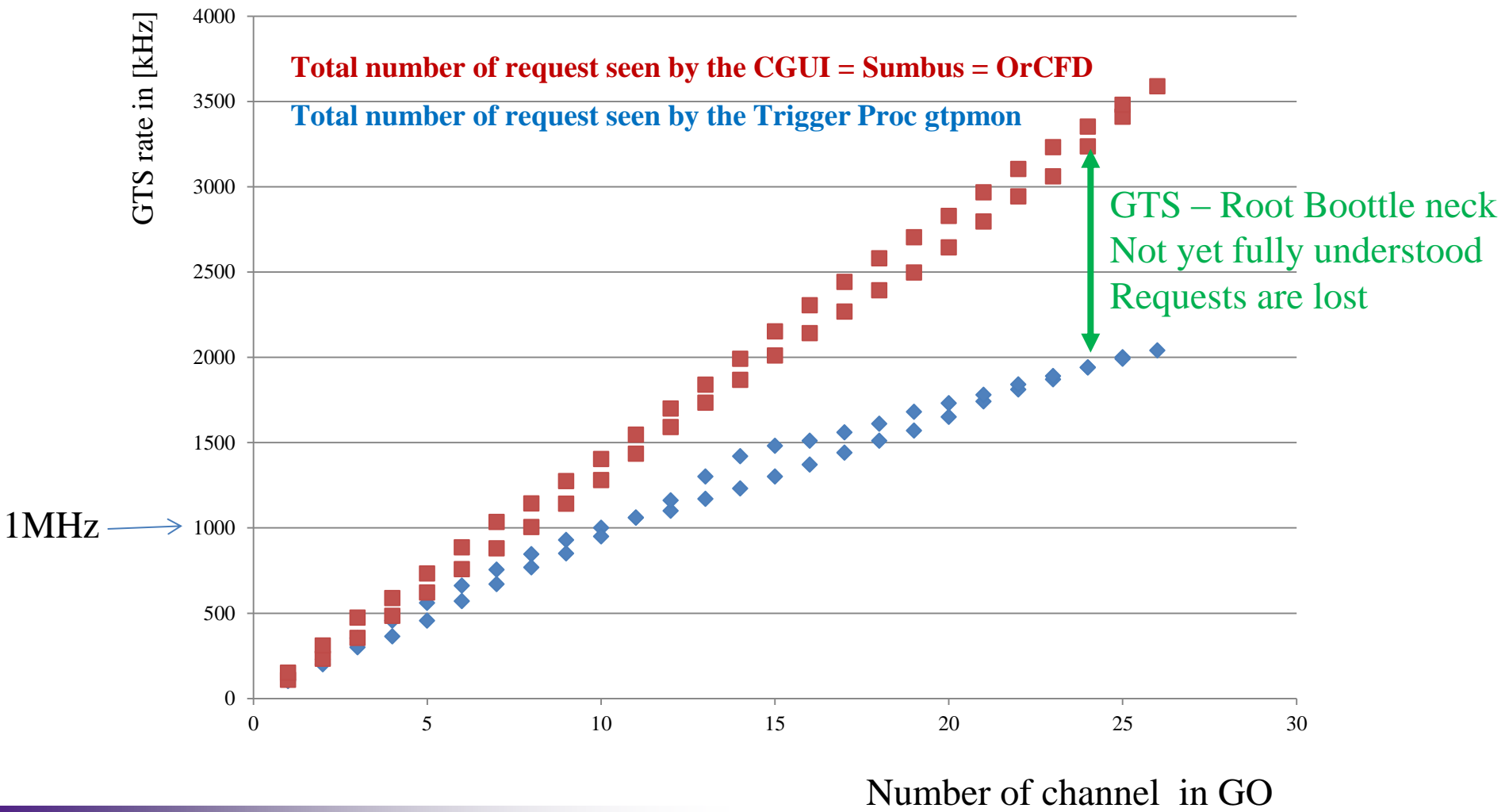
- Presently the number of available independent channels is limited to 255 due to the specifications. Strong limitations when coupling with other detector arrays based on GTS.
- Difficulties to produce the present tree hardware. Obsolete components for the mezzanines, the last trigger processor produced by EXOGAM2. Large number of FIFOS needed
- In strong disagreement with the specifications, found loses in the GTS transfer when approaching 1MHz of trigger request. With 1MHz request from AGATA + NEDA we have from 10% to 15% loses. It is unclear if they are coming from the protocol itself or the performance of the FIFOS or else.
- Slightly different behavior between the ATCA (full GTS protocol) and the GGP and NUMEXO2 (simplified protocol with no identifier), on the Validation success.
- Need broader compatibility on clock and synchronization for complementary instrumentation

UPGRADE OR NEW SYNCHRONIZATION/TRIGGER SYSTEM

No Readout ! Just request to the trigger system

Total number of request seen by the CGUI = Sumbus = OrCFD

Total number of request seen by the Trigger Proc gtpmon

GTS − Root Boottle neck
Not yet fully understood
Requests are lost

1MHz

GTS rate in [kHz]

Number of channel in GO

E.Clément

High rate effect

2017 GANIL MBq ^{60}Co source (32 crystals) ATCA + GGP
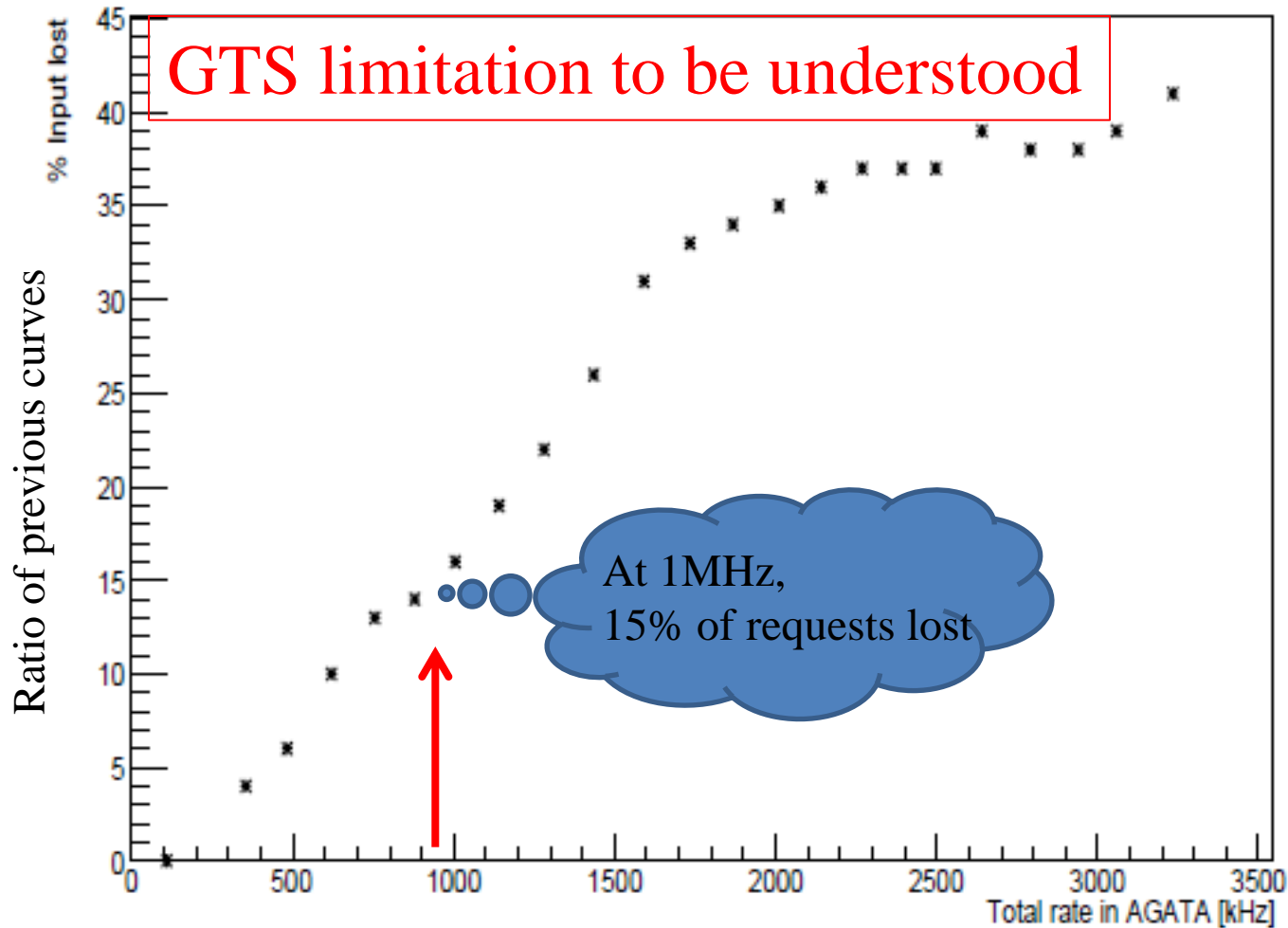
Conclusion: Two alternatives

1. **Upgrade of the present protocol, to be done by INFN-Padova because there are no other experts on the development. Easy back-compatibility.**

2. **To pass to other Global Trigger and Synchronization. Drawback is the difficulty to make the system compatible with previous versions of the AGATA electronics.**

Actions taken:

- **GTS responsible both in AGATA and INFN-Padova contacted, in order to explore the possibility of an upgrade .**

- **Early contacts with GANIL Engineers that will start a project to develop a new Trigger and Synchronization protocol/system, hardware compatible with GTS.**