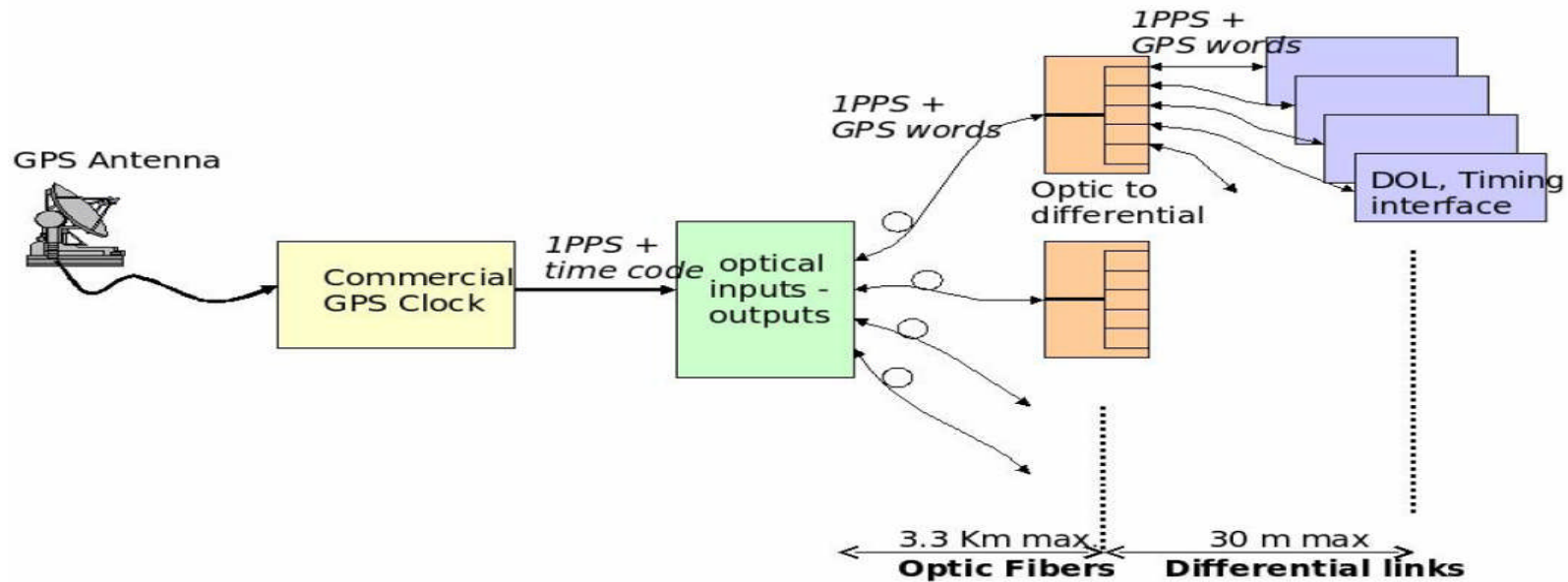


**LAPP R&D – Virgo+ Online architecture**

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Nappa, E. Pacaud, S. Vilalte*

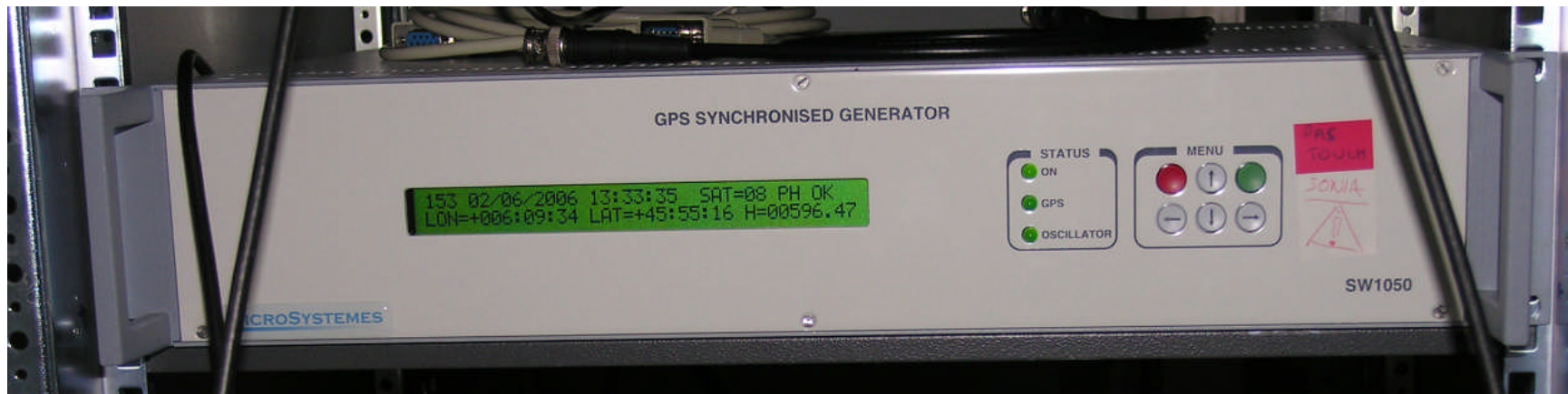
LIGO-G070345-00-Z

## **LAPP R&D – Hardware status**



- 2 signals distributed overall the ITF:
  - ◆ 1PPS(IRIG-B) for the local clock synchronization and the absolute time stamp
  - ◆ A fast clock (10MHz) as centralize fast clock synchronized on the GPS
- Optical fibers and differential cables distribution
- Linear power supply

- Signal generator SW1050-R-10 from MicroSystems
  - ◆ GPS Motorola M12T receiver
  - ◆ Rubidium clock



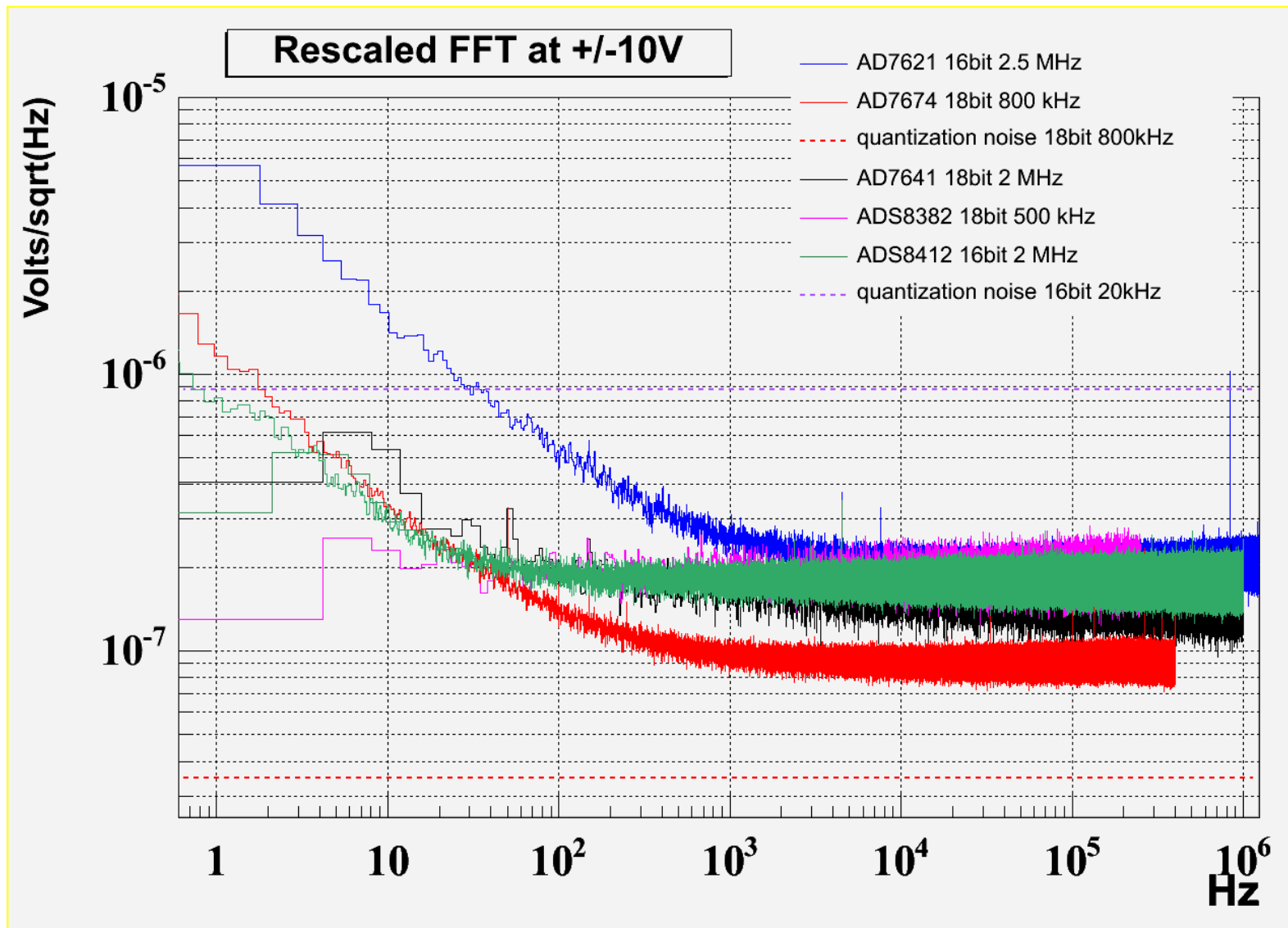
- Fully tested:
  - ◆ IRIGB frame updated with the GPS and ULeaps fields
  - ◆ No more time stamp errors
  - ◆ 1 or 2 jumps of 130ns per week on the 1PPS position in the IRIGB frame
- 2 others signal generator to purchase: 7-8KEuros per generator

- Distribute the timing signals between the buildings and inside a building
- Prototype fully tested:
  - ◆ minor modifications on the PCB

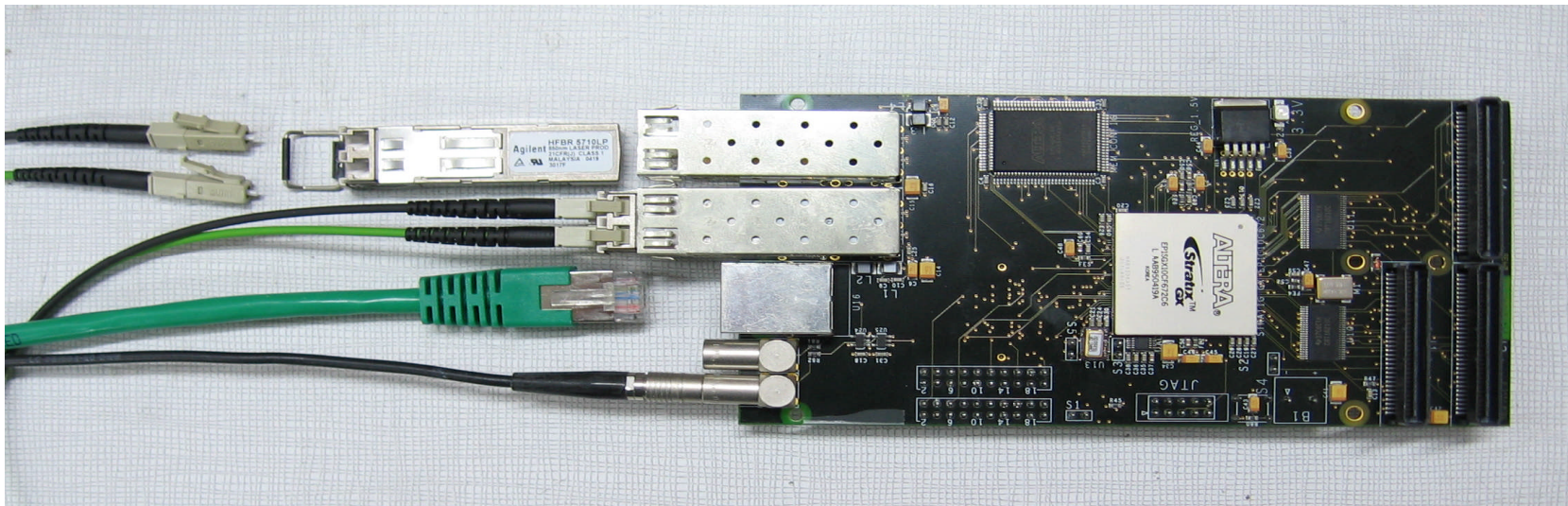


- Performances:
  - ◆ Phase jitter between 2 TDBs over 1m of RJ-45 cable: 18,4ps
  - ◆ phase jitter between 2 TDBs over 3Km of fiber : 58.4ps
- First estimation: 11 TBD A @0.8KEuros – 11 TDB B @1.2KEuros:42.8KEuros

- Higher sampling frequency with embedded shaping/emphasis facilities
- ADC selection done: AD7674 18bit @ 800kHz
- 16 differentials channels with analog anti-alias filter at 400KHz
- Differential or single-ended input
- Digital anti-alias filters in embedded DSPs( 4 channels per DSP ADPS-21262 @150MHz )
- On board Timing system to stamp data with the GPS time
- Communication through optic fiber for data transmission and board configuration
- First estimation: 68 ADC @1.8KEuros : 122.4 KEuros



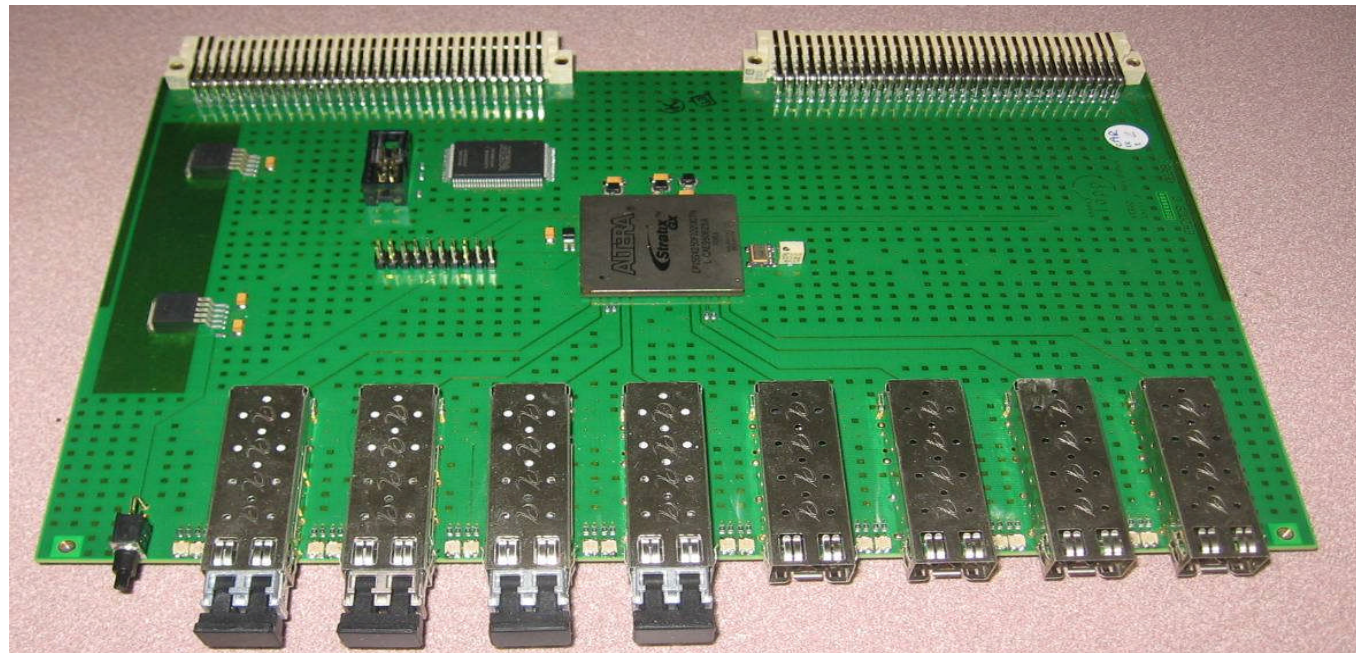
- Prototypes currently used for ADC tests, TOLM /DSP interface tested
- Upgrade with 1.6Gbit/s on the optical link and PCI 64bits@66MHz
- 2 types of TOLM: one as PMC format(v1), one as PC-PCI format(v2)
- TOLM Timing jitter: 15ps at the TOLM output – 30ns between two TOLMs with locked oscillator



First estimation: 41 TOLM-v1 @0.9KEuros – 35 TOLM-v2 @0.9KEuros: 68KEuros

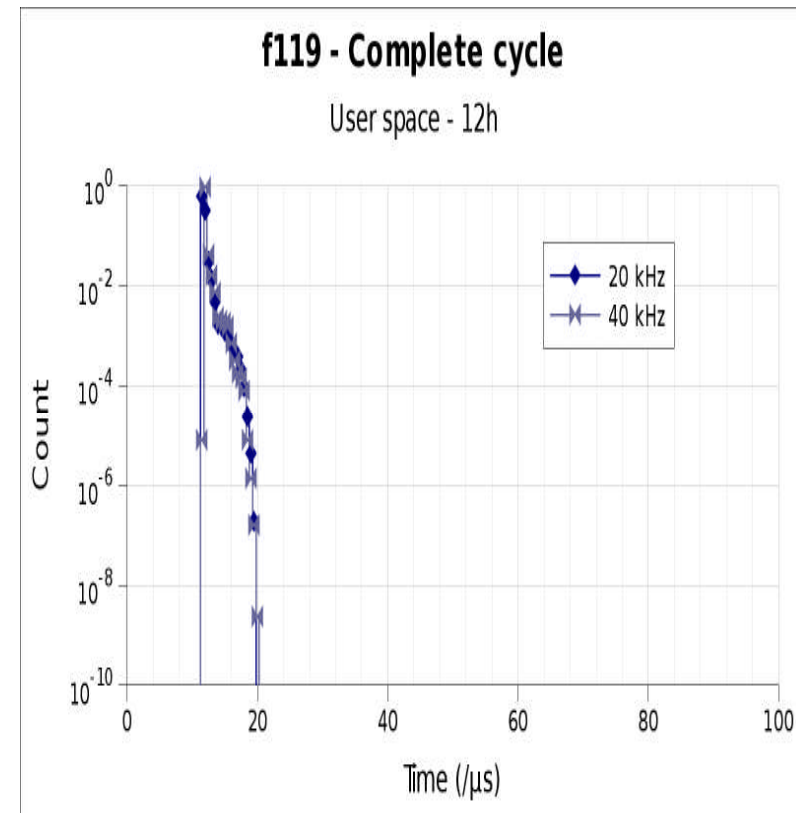


- Improve the data access path: optical links router between TOLM interface
- Electronic tests ok



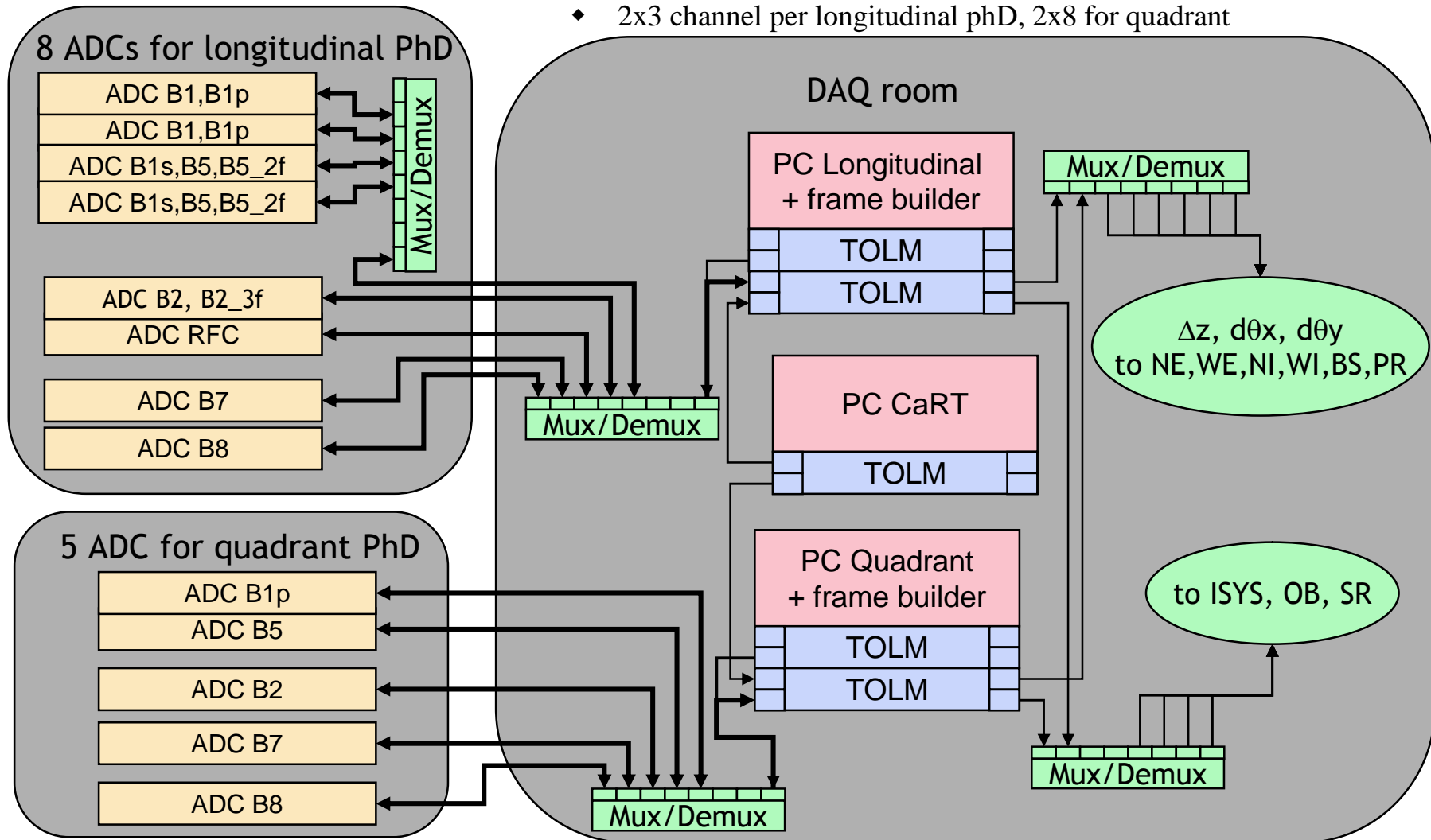
- Full prototype tests: mid-June 07
- First estimation: 32 MUX-DEMUZ @ 1.6KEuros :51.2KEuros

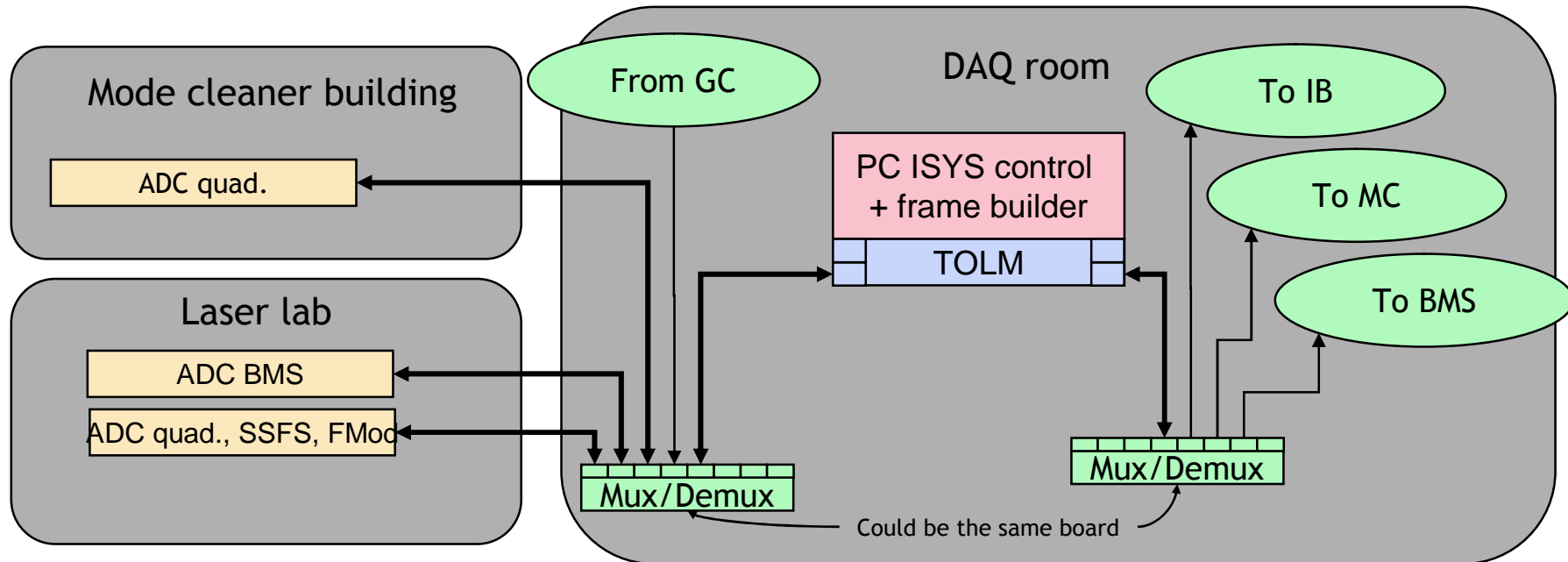
- Transtec: dual core opteron @2GHz
- Kernel tunings: RTAI “vanilla” Linux kernel – Scientific Linux 4
- CPU allocation:
  - ◆ On core involved for real-time operation with the real-time interrupts routed to this CPU only
  - ◆ One core for DAQ and Linux without real-time interrupts routed on it
- Test the full Pr and Gc configurations up to 40KHz : maximum expected time: 22us with 14MBytes/s of compressed data



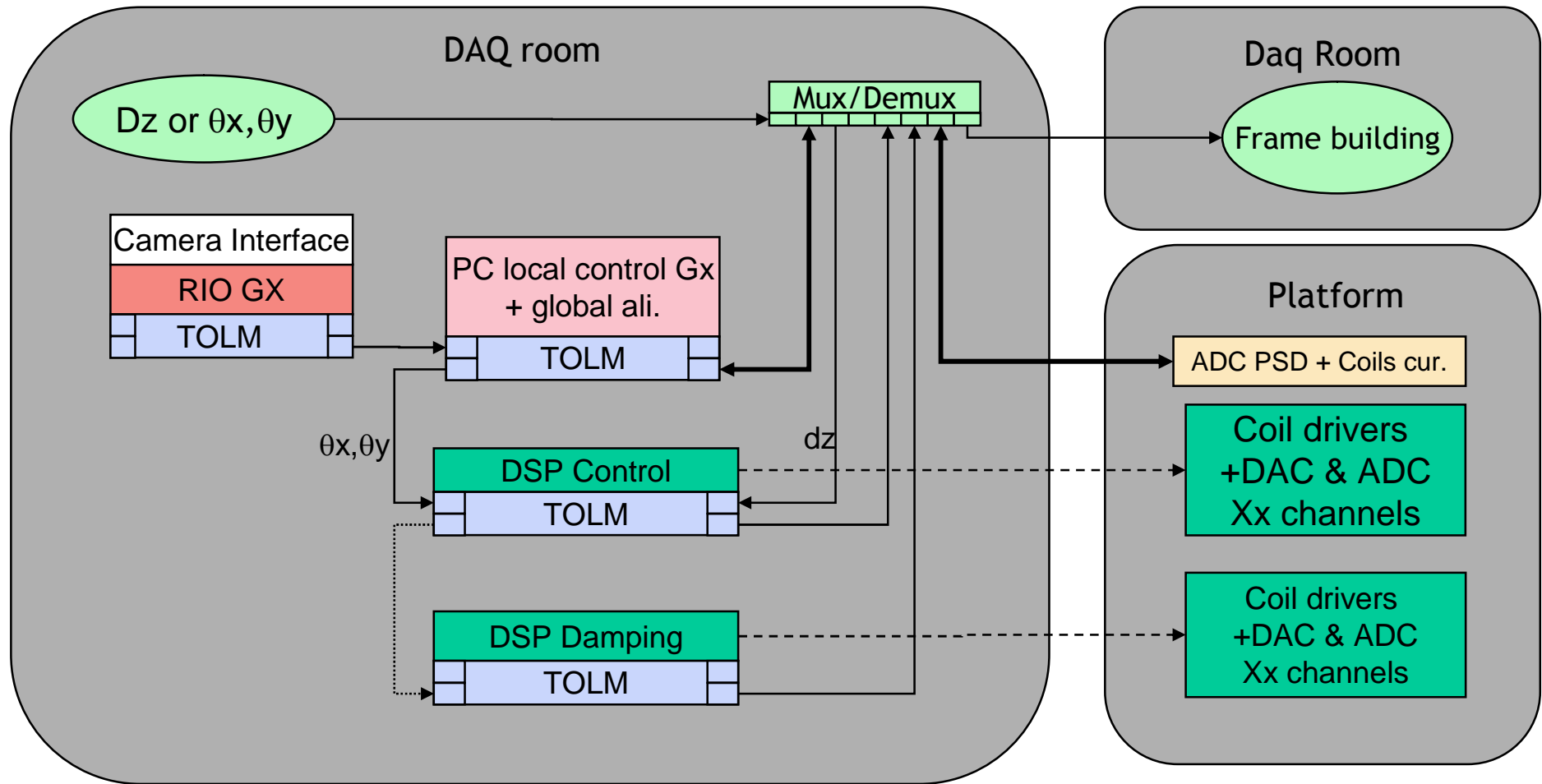
## **Virgo+ Online Architecture**

- ◆ 2x3 channel per longitudinal phD, 2x8 for quadrant





- The PC ISYS runs as ISYS controller



- Locking servers:
  - ◆ Scalable architecture to allow the Pr and Gc servers to run on the same or different PCs
  - ◆ Design almost complete
    - Keep the dictionary for the DAQ collection
    - Use the dictionary for the pipeline exchange
- The *TOLM* board is compatible with the RIO PCI architecture
  - ◆ The GxS server will still run on the RIO
  - ◆ The Detection slow control will be done at the first time on the RIO
    - No DAC with *TOLM* interface
- Timing:
  - ◆ The time stamp is directly available at the *TOLM* level as GPS time stamp
  - ◆ Push on each input packet by the *TOLM* (PCI, DSP link)
  - ◆ Timing library will be developed/upgraded

- TDB production and tests on July-August 2007
- TOLM
  - ◆ v1 production October-November2007
  - ◆ v2 production January-February2008
- MUX-DEMUX production and tests on September-October 2007
- ADC
  - ◆ Design complete – First prototype expected the beginning of July2007
  - ◆ Final production foreseen on December2007-Fevrier2008
- TOLM – DSP and Frame Builder : Integration test in September 2007
  - ◆ TOLM driver and libraries for Linux/Linux-RTAI
  - ◆ Dictionary
  - ◆ TOLM Frame builder
- TOLM Pr-GC servers: November 2007
- On site installation: May 2008