LAPP BI
Read-out electronics

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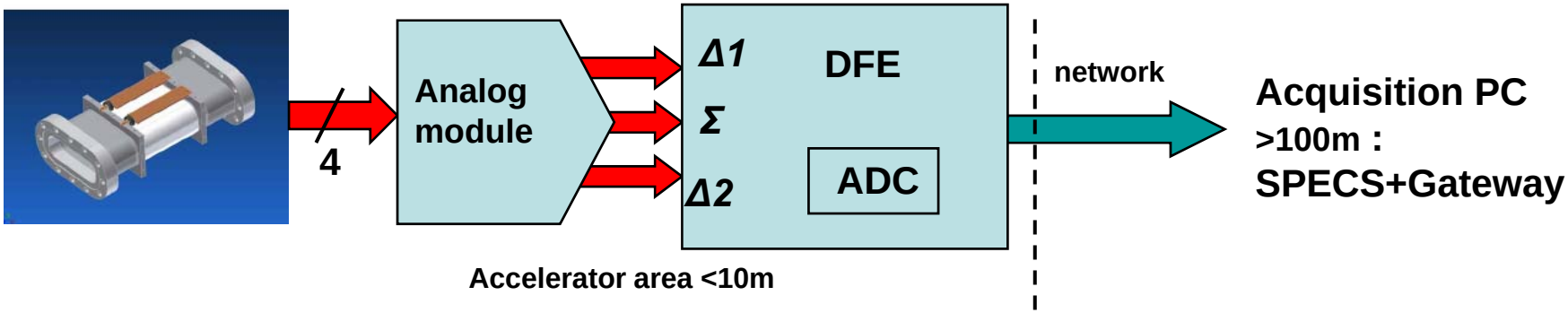
CLIC BI WS 02-03/06/2009

1- CTF3 BPM Acquisition

Aim: *reduction of costs of long analog cables/VME ADC*
→ Rad-hard acquisition electronics close to beam.



Analog module: *Intensity & deviations processing BPI or BPM.*

DFE board: *- sampling **3channels, 12 bits / 500MSps**.*
- Feed-back for analog modules: gains, calibration and attenuations.
*- Daisy chain acquisition: **1 network cable per crate**.*

Acquisition PC : *FESA-OASIS soft and specialist requirements feed-back.*

→ Cost divided by a factor 3 comparing to a « far » acquisition.

1- LAPP in CTF3

***From November 2006 to summer 2009**: production and installation of 47 analog modules and 46 DFE boards in ~12 crates in CR, TL2 and CLEX. Acquisition of BPM, BPI and BPS.*

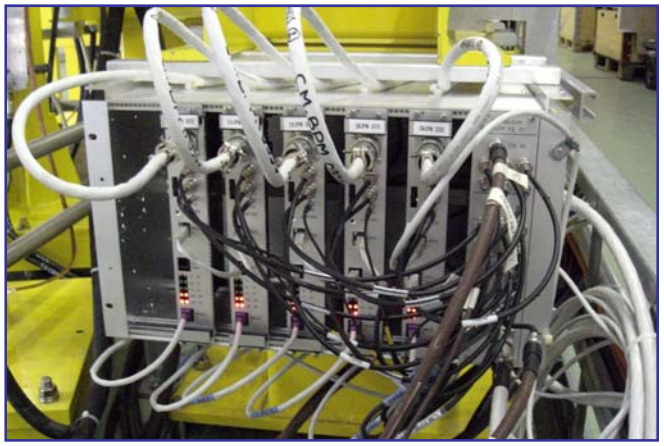
***Man power:** ~2,5men/year full time since September 2005*

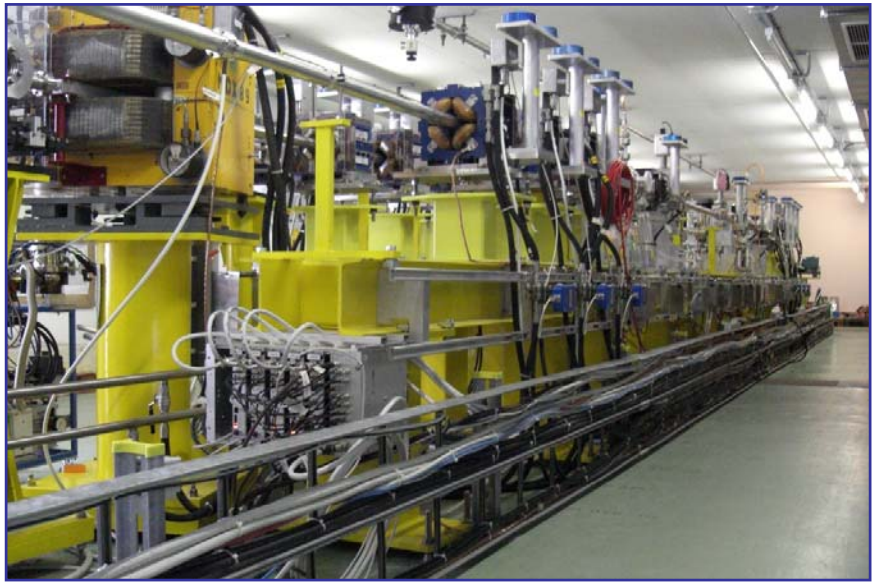
→ *analog, digital electronics and software,*

***IN2P3 funding:** ~100k€ from Sept. 2005 to end 2007.*

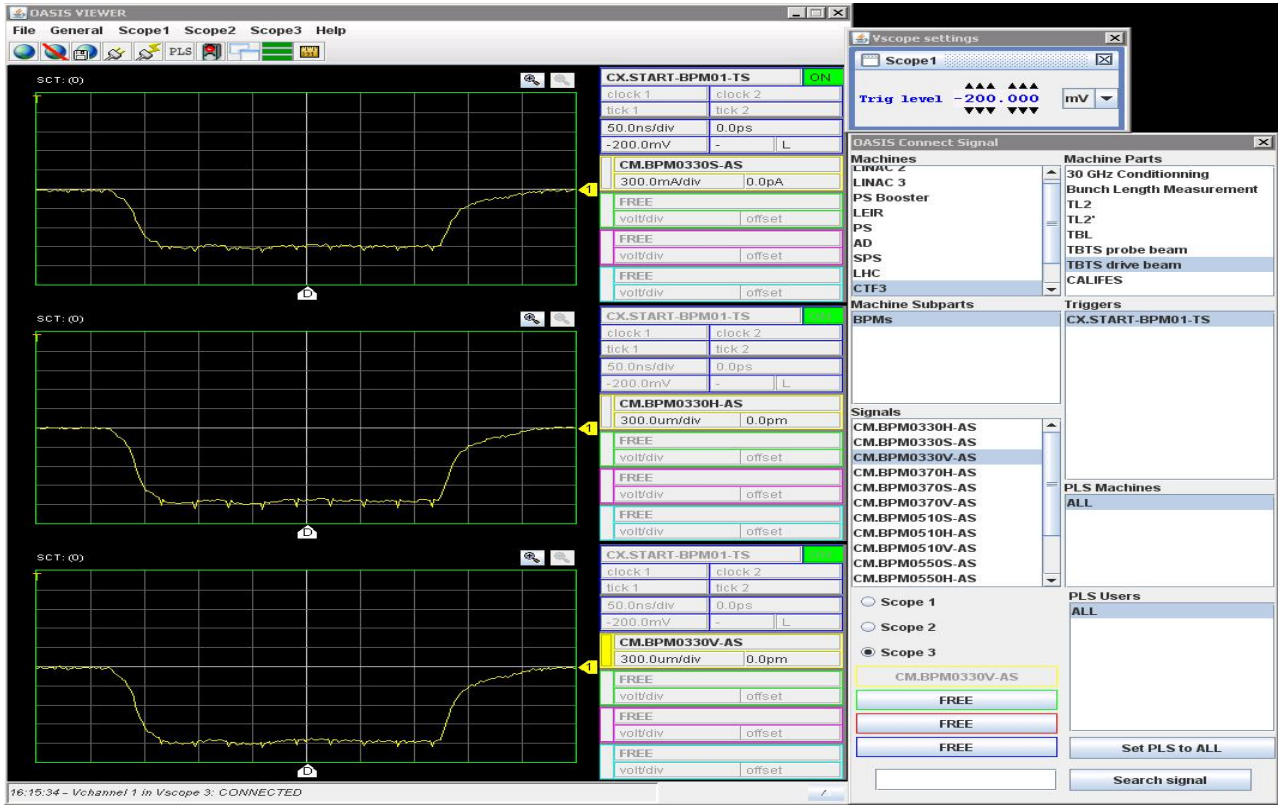
1- crates in TL2-CLEX

Uranus





1- control room



several problems on sampling electronics and transmissions solved by soft.

Thanks to operation team feedback and patience!

2- R&D: new acquisition for CTF3/CLIC

Motivations for a new development:

We met problems with analog memory sampling and network transmissions.

Logical evolution dedicated to a larger accelerator as CLIC:

Rare acces from surface, high number of channels, rad-hard, low-cost, low consumption, all-around accelerator standard acquisition.…

We got experience and like to improve the system…

Most important points to develop:

→ *elimination of last cables: clk, timing, calibration, network, power supplies still remain for a CTF3 crate (~4 BPMs).*

→ *possible elimination of analog preamplifier.*

2- R&D: new acquisition for CTF3/CLIC

Several developments to upgrade the system:

- *New acquisition board.*
- *Simple network regrouping data and timings.*
- *Autonomous crate power supplies (voltage drop).*
- *Autonomous crate calibration generator.*

For CLIC, all these developments should be implemented in a crate for each module:

~6 acquisitions, 1calibration, 1power supplies, 1network switch.

At first, discussions with CTF3 for upgrade but now beginning of collaboration with CLIC:

developments have to fit with the CERN organization and the future chosen tools.

→ Definition of specifications currently for analog inputs

→ Discussion with White Rabbit collaboration foreseen.

2- R&D: new acquisition for CTF3/CLIC

- ***Acquisition board:***

  *Foreseen sampling: **100Msps** (10ns), **16bits.***

  Possible local FPGA processing: raw data, processed data, threshold…

  → currently an evaluation board in production to test architectures:
  ADC LTC2274 100Msps and also ADC Texas Instrument 500Msps, 12bits with FPGA Stratix GX II.

  Delivery and tests next summer.

  *→ Then a prototype **100Msps** will be produced: **end 2009**.*
  still to be defined: crate type.
  Will be compatible with CTF3 crates for tests.

2- R&D: new acquisition for CTF3/CLIC

– ***Network :*** *A first study on elimination of cables concluded to the use of a controlled optical link carrier frequency:*

→ *need to transmit at least a synchronous machine clock.*
→ *allows high data rates.*
→ *important lengths possible, EMC integrity...*
→ *need to be a future solution supported by CERN.*

We foresaw to develop a reception PCI or PCI-express board and a collection/switch board for data collection in the crate : ~6 acquisition boards per crate.

Contacts with CLIC and ***White Rabbit*** *group convinced ourselves that we have to begin our developments trying to use* ***WR*** *system based on synchronous ethernet. Crate type/protocol will be defined depending on the discussions with WR team.*

We could participate to the WR collaboration designing specific electronics…

2- R&D: new acquisition for CTF3/CLIC

Linked developments for local crate:

- ***Power supplies:*** *local and autonomous based on 220V sector to DC converters.*

- ***Local calibration:*** *local and autonomous pulse generator. A first prototype currently under tests. Will be controlled by the distribution/collection board. Depends on the future type of pick-up...*

Crate and prototypes for mid-2010.

- ***Radiations:*** *the choice of rad-hard components is very reduced; specifications on radiation levels are not yet defined.*
  → use of components known for their rad-tolerance (analog).
  → digital with specific design techniques: triple voting, small technos…
  → CTF3 will be a good test area.
  → Qualification based on specifications in the future.
  → Infrastructure possibilities have to be studied.

2- R&D: new acquisition for CTF3/CLIC

CLIC & CTF3 collaborations and LAPP have to organize and formalize these contributions.

All discussions are welcome: other instruments acquisition.

LAPP resources:

for the next two years ~3 men/year and IN2P3 funding ~30k€/year.

A prototype of the full system could be tested end 2010.