SITRA Test beams Simulations

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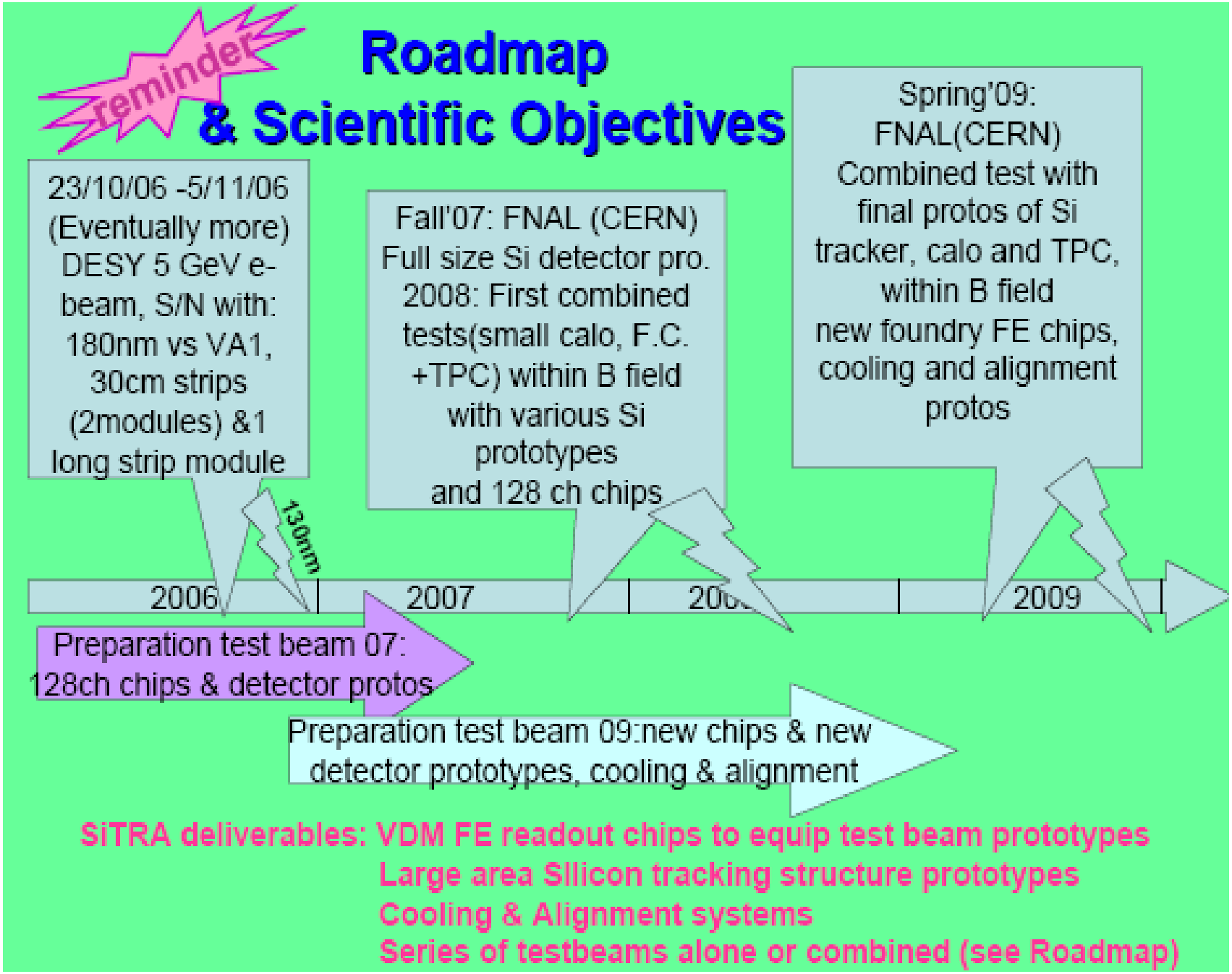
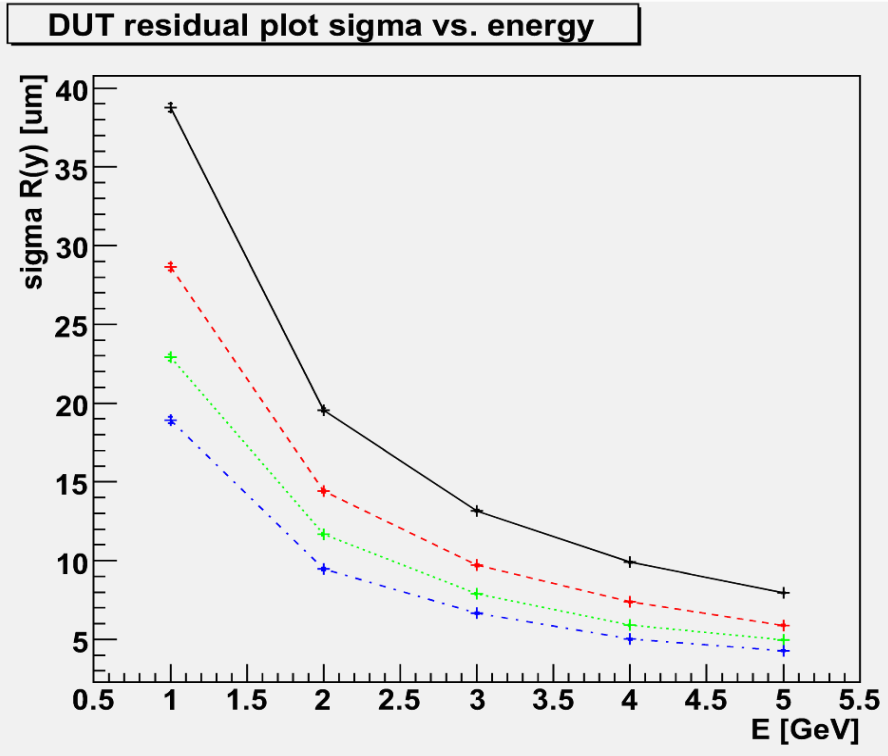
Annual EUDET meeting Munich 18-20 October 2006


reminder
Roadmap
& Scientific Objectives
23/10/06 -5/11/06
(Eventually more)
DESY 5 GeV e-
beam, S/N with:
180nm vs VA1,
30cm strips
(2modules) &1
long strip module
130nm
Fall'07: FNAL (CERN)
Full size Si detector pro.
2008: First combined
tests(small calo, F.C.
+TPC) within B field
with various Si
prototypes
and 128 ch chips
Spring'09:
FNAL(CERN)
Combined test with
final protos of Si
tracker, calo and TPC,
within B field
new foundry FE chips,
cooling and alignment
protos
2006
2007
2009
Preparation test beam 07:
128ch chips & detector protos
Preparation test beam 09:new chips & new
detector prototypes, cooling & alignment
SiTRA deliverables: VDM FE readout chips to equip test beam prototypes
Large area Silicon tracking structure prototypes
Cooling & Alignment systems
Series of testbeams alone or combined (see Roadmap)

Beams used

- DESY, 1-6 GeV e
  - Good access via EUDET
  - Problem of multiple scattering (track precision >10 μm)
  - G4 simulation (Prague)
  - Oct 23-Nov 5



Beams available

- CERN, 20-200 GeV π,μ,e
  - High quality beam
  - Planned for use in 2007+

Ingredients

- Trigger + DAQ + Telescopes
- Prototype modules + DAQ HW
- DAQ software
- Chamber, XY stage
- Manpower (experts, shifters)
- Data analysis

Trigger + DAQ+Telescopes

ZEUS DESY group kindly provides us with the telescopes:

trigger photomuliplier

- 3 defining an area of 9x9 mm2 triggering the readout of the 3 telescope units

telescope

- 3 modules with crossed sensors about 3x3 cm2; diode pitch 25 micron, readout pitch 50 micron ("Cern type", Coledani et al., NIM372(1996)379)

readout

- CAEN module 550 and 551 in VME Power PC in the VME crate coincidence, deadtime control,... in a NIM crate in the hut. The VME crate is close to the telescope. Software and data format under investigations

SiLC Prototype Modules

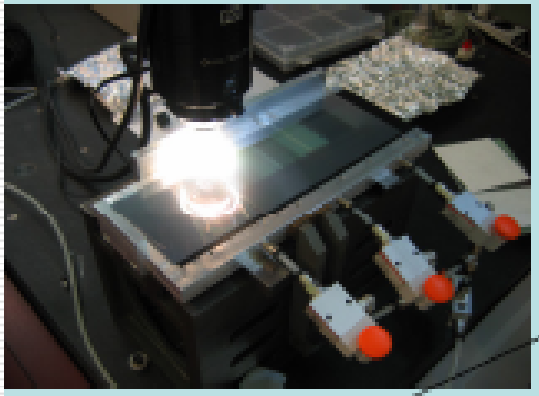
30 cm ladders

- 2 new ladders with 3 9-cm CMS sensors each, i.e. 28 cm strip length one equipped with VA1 chips (for a comparison) and the other with SiLC UMC 180 nm chip
  - This module was built in Paris

Long ladder

- a new prototype with 10 GLAST sensors, i.e. 90 cm strip length equipped with VA1 and SiLC UMC 180 nm chip
- This module was built in in collaboration of Karlsruhe and Paris (with help from CERN)

Detector prototypes: CERN (A. Honma et al.), IEKP-Karlsruhe, LPNHE-Paris, IEHP-Vienna, Hamamatsu



Assembly

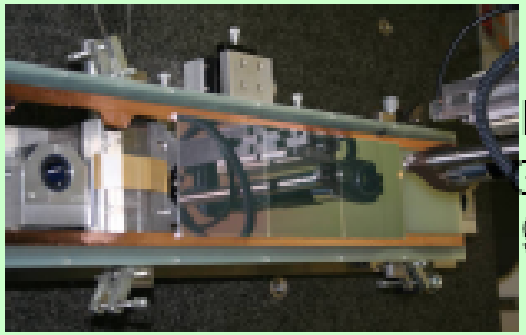
3 CMS sensors 28 cm strip long

Read out:

VA1+180UMC r.o and all VA1 r.o.

2 modules fabricated in Paris, bonding CERN on automated CMS system (Collab CERN-LPNHE)

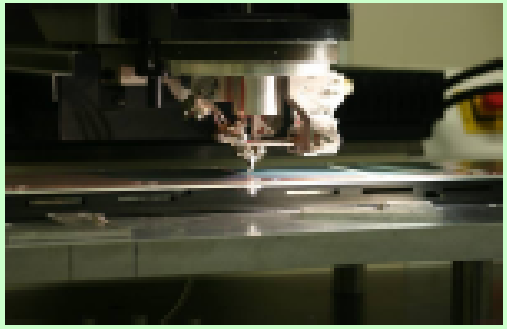
Ready by September 25th

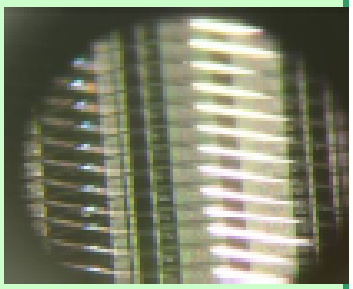


Assembly:

Module = 10 GLAST sensors 90 cm strip long

Bonding

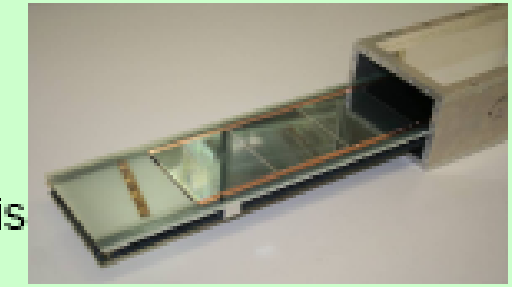




The full construction done at IEKP

R.O.

Pitch adapter + VA1 + 180UMC provided by Paris



Ready by September 25th

DAQ HW+SW

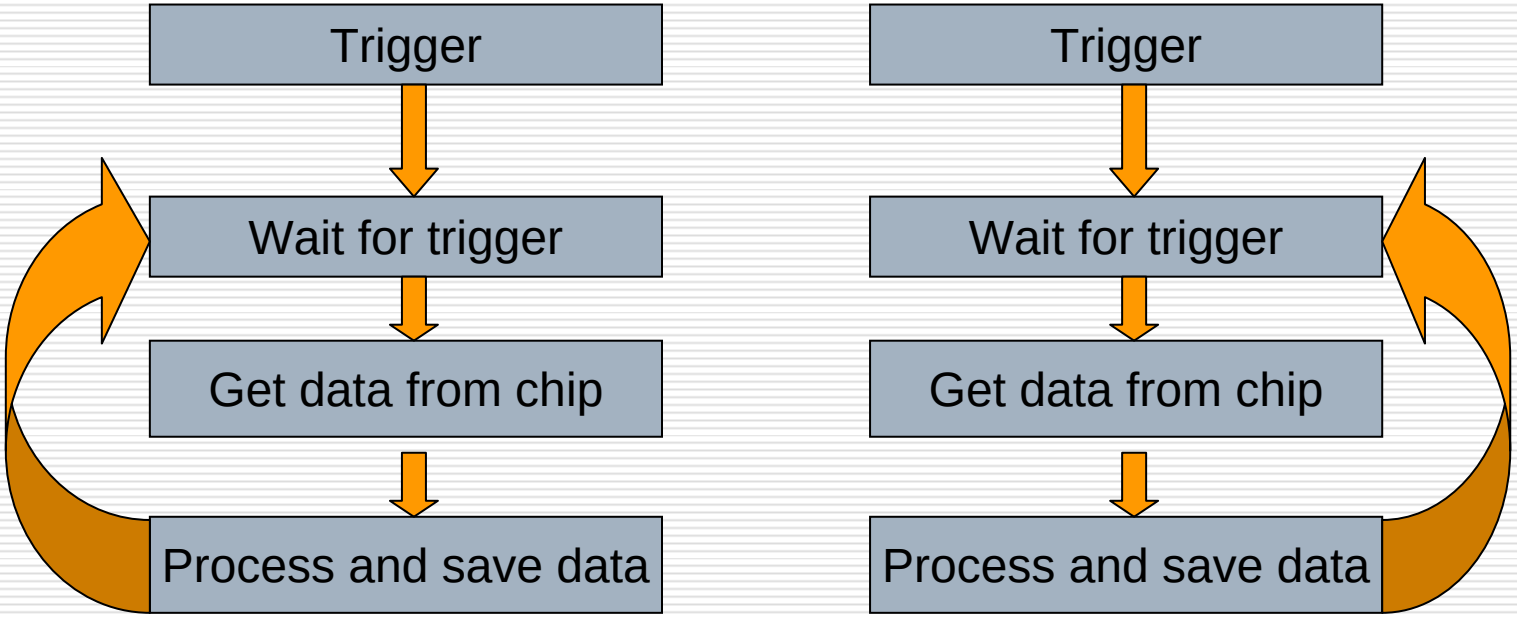
Telescopes:

- CAEN VME V550+551 ADC+sequencer
- PowerPC in VME Crate, Lynx OS
- DESY Support promised

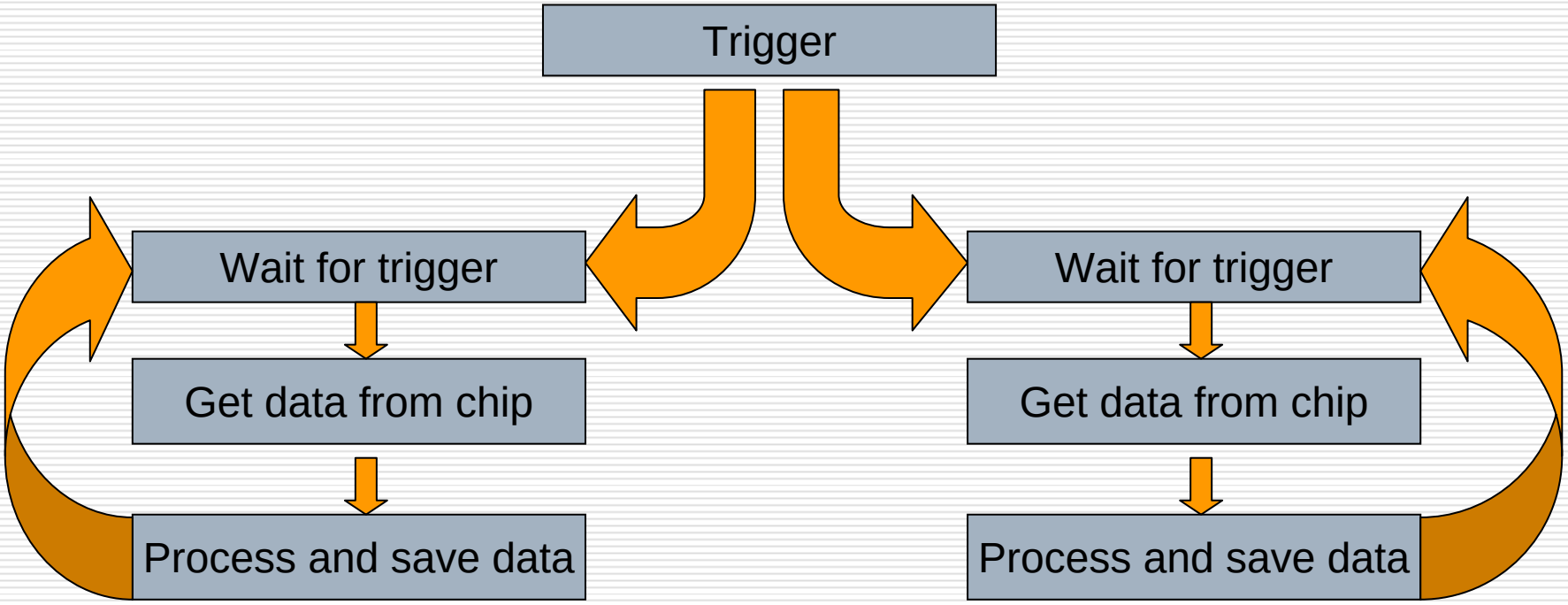
SiLC modules:

- Interface card between UMC/VA chips and ADC
- NI AD card, 100 MHz, 14 bit (PCI or PXI)
- LabView DAQ SW tested in lab in Paris
- Readout speed limitations

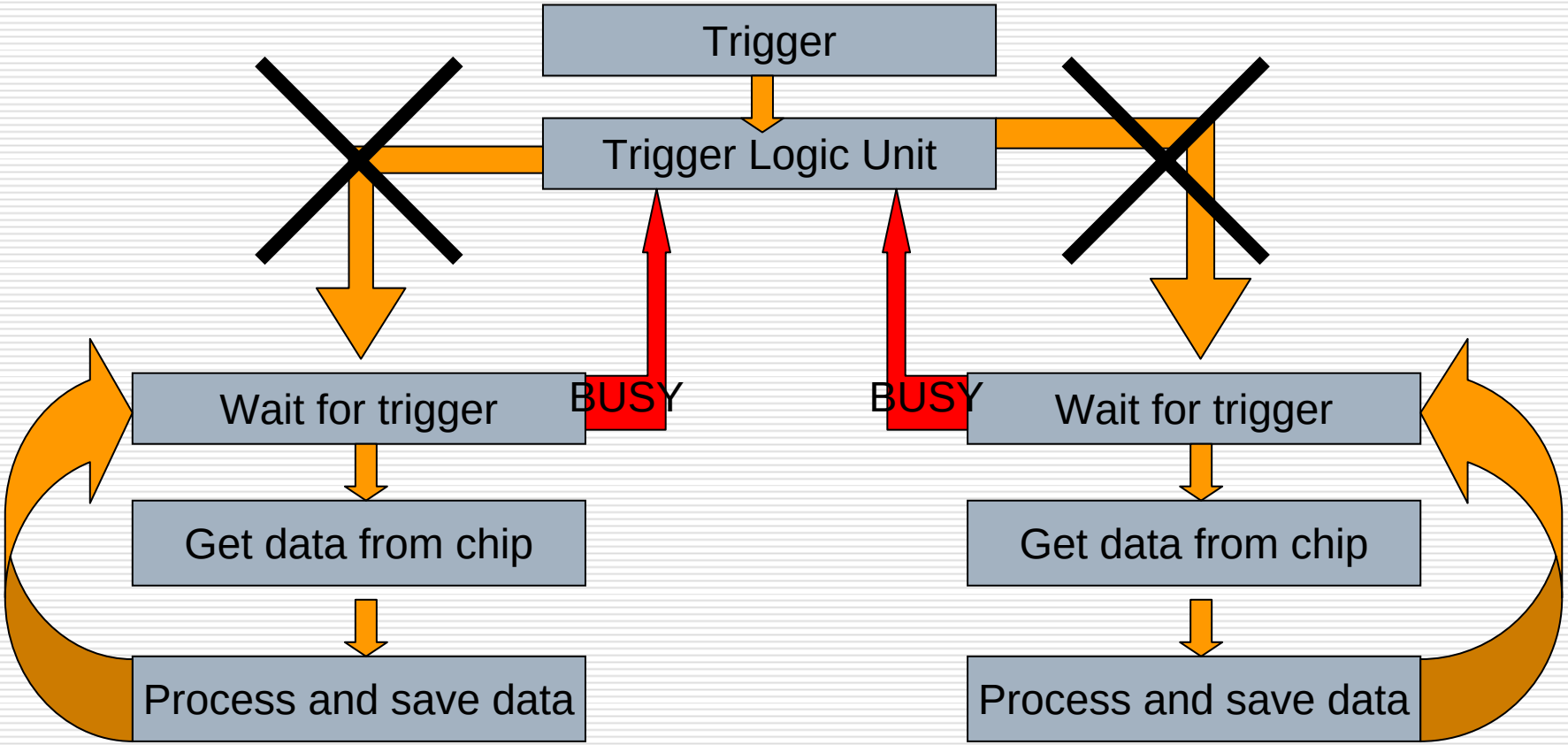
Standalone Telescope+Proto DAQ



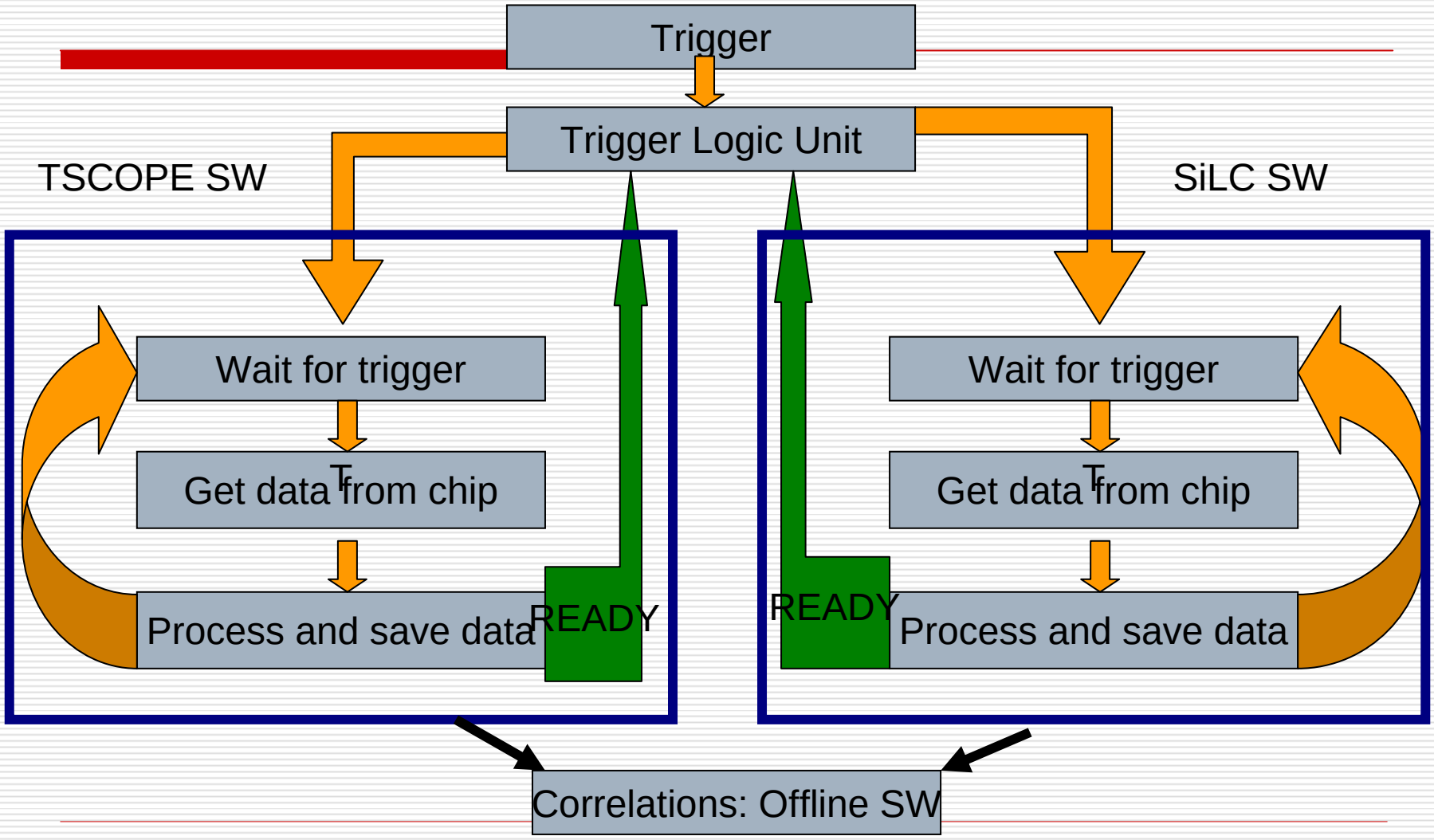
Synchronised Telescope+Proto DAQ



Synchronised Telescope+Proto DAQ



Synchronised Telescope+Proto DAQ



Not prompt!

Synchronised Telescope+Proto DAQ

Telescopes VME PowerPC readout, Lynx

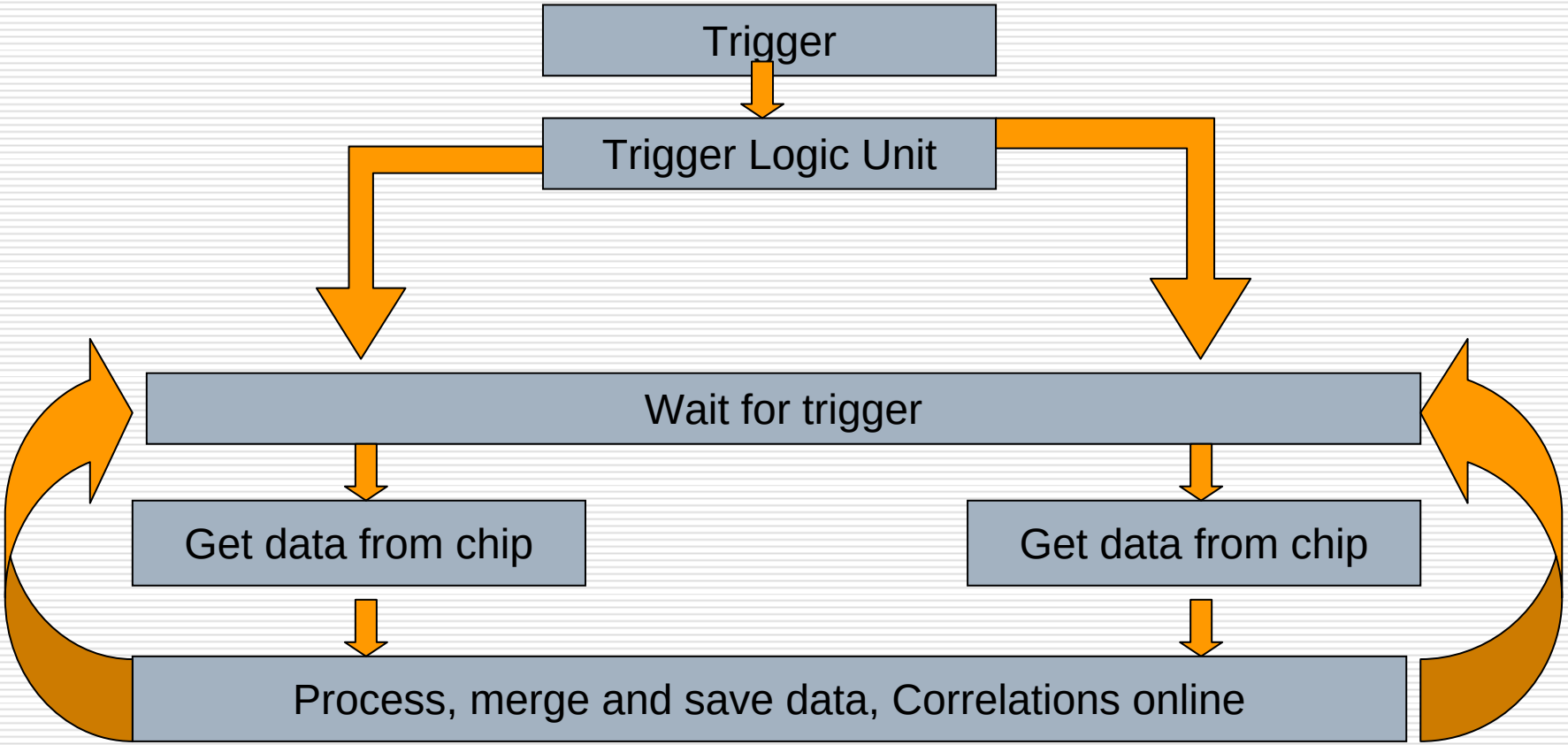
SiLC NI AD card (PCI or PXI), LabView DAQ SW

Synchronisation might be time consuming!

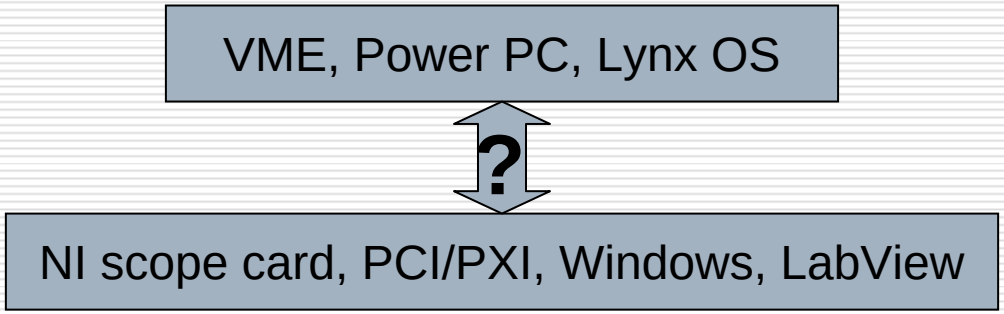
Hard to test in advance, but need to be prepared:

- data formats
- readout logic
- source codes

Common Telescope+Proto DAQ



Common Telescope+Proto DAQ



- Hardware?
- Operating system?
- SW Platform?
- Perspective?

Common Telescope+Proto DAQ

Operating system?

- Telescopes: VME can be read with a different communication board (NI PCI-VME) under Win or Linux
- SiLC
  - No need to leave Windows

Common Telescope+Proto DAQ

Operating system?

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Common Telescope+Proto DAQ

SW platform?

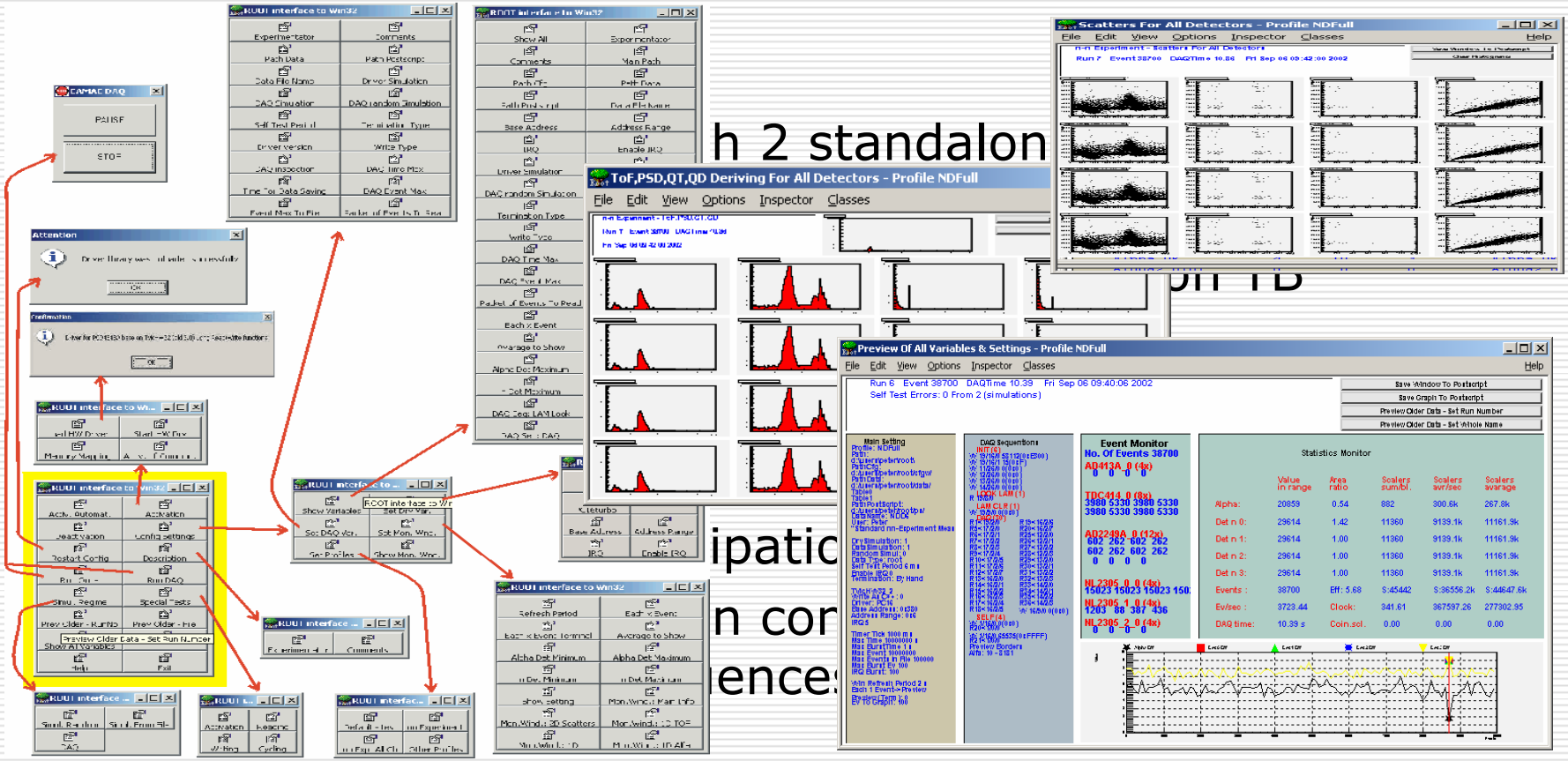
- LabView: ‘easy’, but slow
- Windows MSVC++: fast, can use dll from vendors for PCI/PXI,VME + ROOT GUI + plots

Common Telescope+Proto DAQ

Perspective?

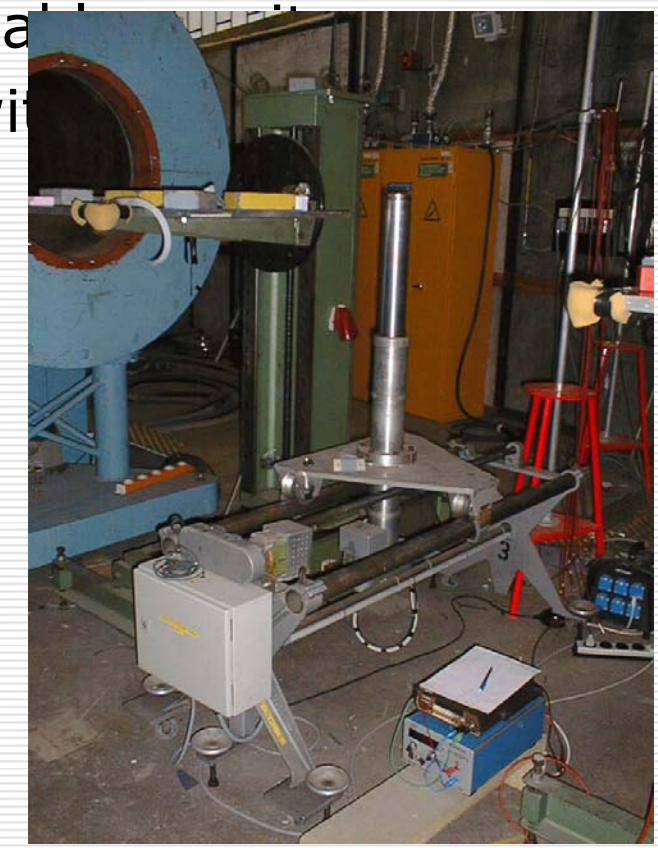
- Telescopes:
  - The same for DESY beams
  - Hopefully similar or identical for CERN/FNAL beams
  - New EUDET for 2008+ with common DAQ?
- SiLC
  - R/O mode change with 130 nm (end of 2006): digital readout
  - Simpler DAQ HW will be needed
  - Keeping SW/HW functionality for 180 nm/VA desirable for crosscheck

Common Telescope+Proto DAQ



Chamber, supports, XY stage

- ripod availa
- Y stages wi
- oked
- e checked



Responsibilities

Telescopes, trigger…
- Prague
- Obninsk
- DESY

Prototypes+ test setup
- Paris
- Karlsruhe
- Vienna

Mechanics, chambers
- DESY
- Paris
- Karlsruhe
- Valencia

Readout
- Prague
- Paris
- DESY

Offline analysis
- Prague

Shifts
- All

Data analysis
- Prague
- Everyone interested

Analysis framework

- Tools for quick data visualisation to find correlations etc. exist
- Root DST will be created from raw data
- Set of macros to analyze basic detector performance (CMN, S/N) exists
- Further detailed analysis will be done on the DSTs

Simulations

- Spatial resolution is not expected to be the most urgent parameter to find at DESY beam test
- Existing Prague G4 simulation framework is used to simulate the geometry
- Further simulations in G4/MOKKA system are planned at Paris, DESY and Prague
- For future beam tests simulation based geometry optimisation is necessary