CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE

IN2P3

UPMC PARIS UNIVERSITAS

LPNHE Laboratoire de physique nucléaire et des hautes énergies

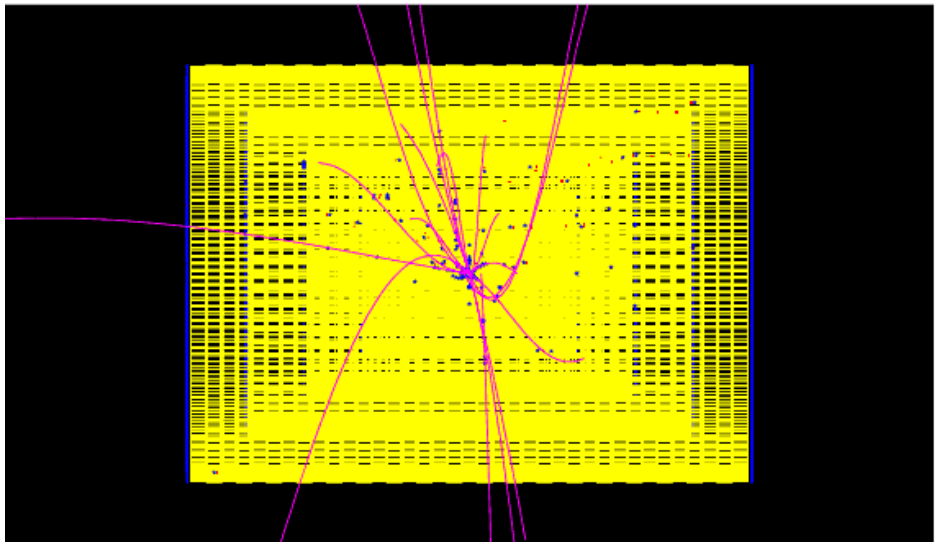
Present status of ILCRoot simulations

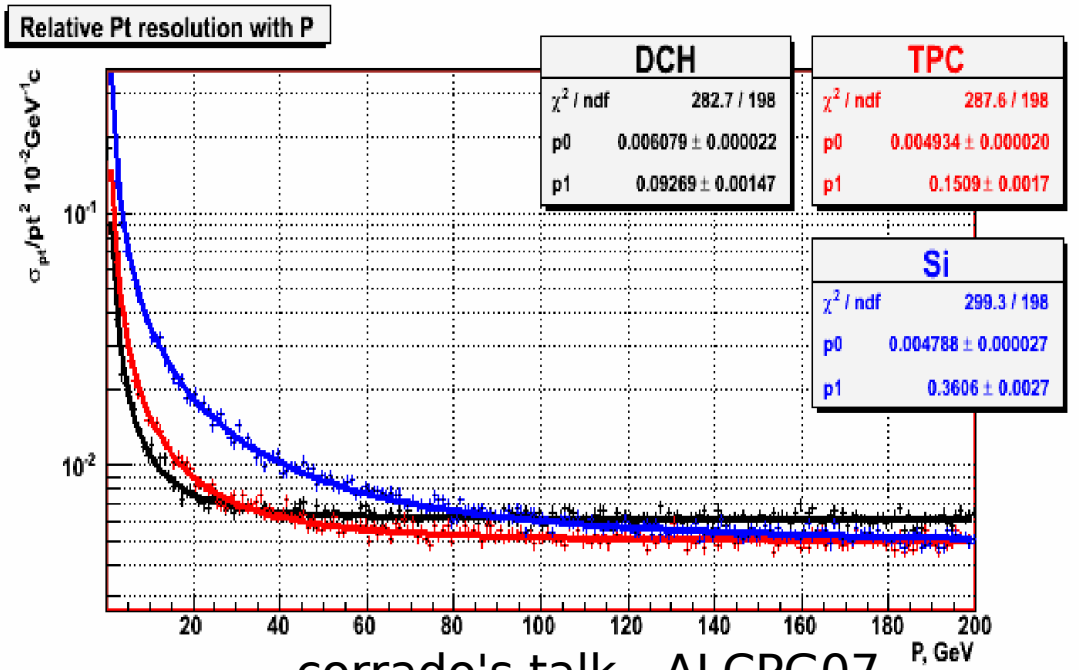
(DAQ system)

Alexandre CHARPY (LPNHE)

Full simulations frameworks

- MOKKA / IlcRoot
- ILD / 4th Concept
- Same tools for comparison: IlcROOT.
- Starting point: existing full silicon concept and use it for ILD





corrado's talk - ALCPG07

Simulation and reconstruction with IlcROOT framework

- *Introduction of ILD concept in IlcRoot (in collaboration with Corrado Gatto's team - 4th concept – INFN Lecce)*
- *IlcRoot: based on ALICE framework*

  GEANT3/4, FLUKA support

  Simulation -> Hits -> Digitization -> Reconstruction (Fedor Ignatov)

  CERN support
- *Idea: introduce the MOKKA data base parameters (Collaboration Valeri Saveliev)*

Database sit02 - table sit

Showing records 0 - 2 (2 total)

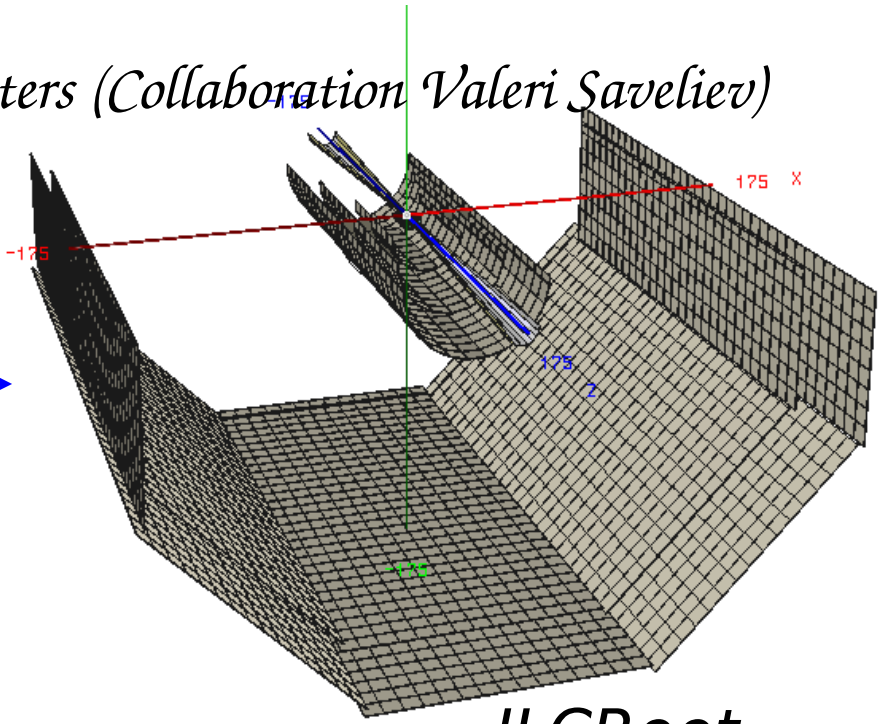
Show : 30 rows starting from 0 Full Texts

layer_id	inner_radious	half_z	sensitive_thickness	support_thickness
1	160	380	0.275	1
2	270	660	0.275	1

Show : 30 rows starting from 0 Full Texts

Insert new row

MOKKA DB

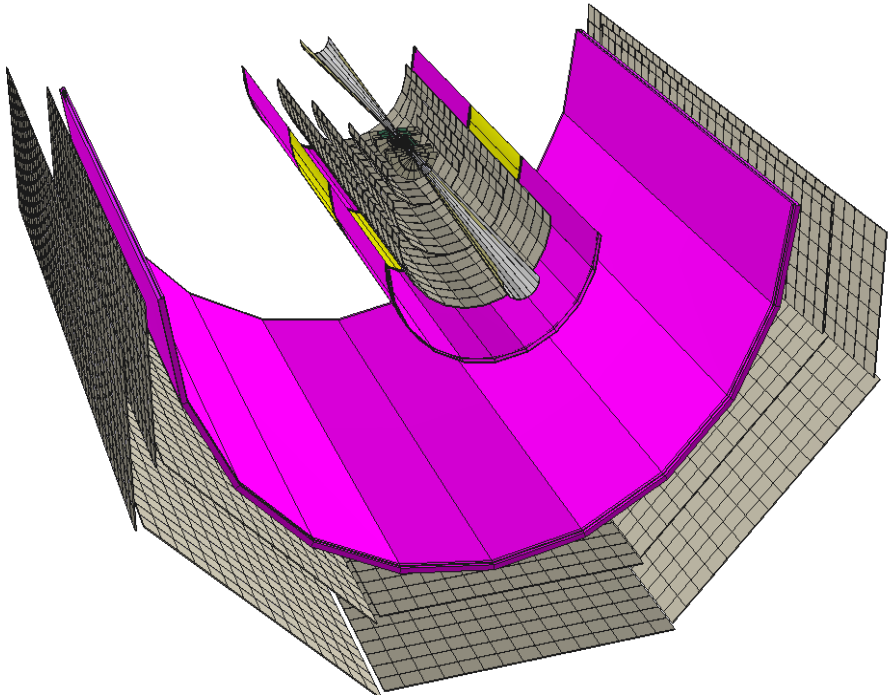


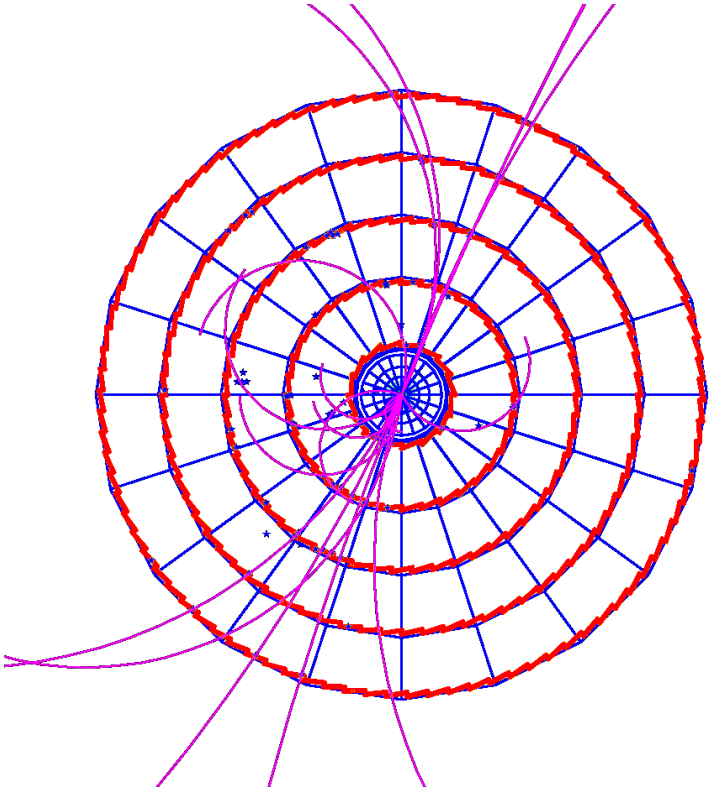
ILCRoot

Simulation and reconstruction with IlcROOT framework

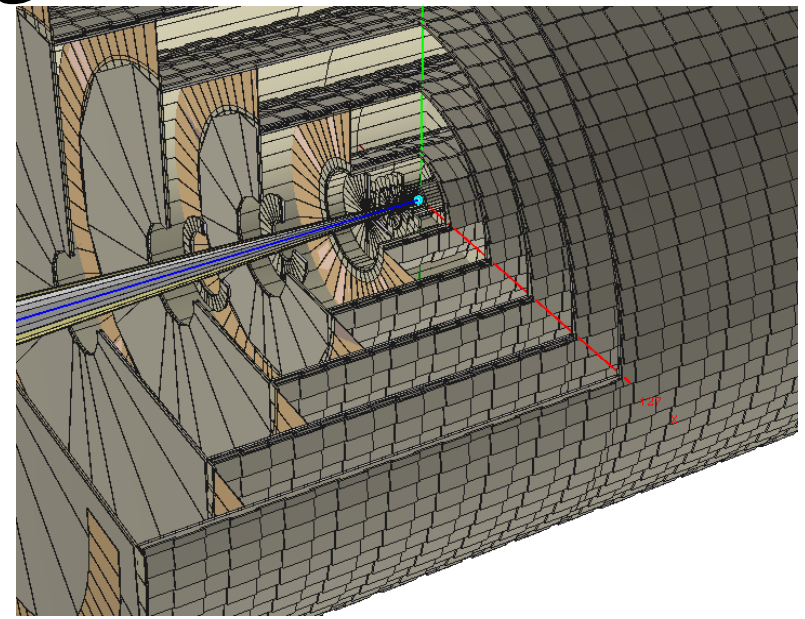
Comparison between different configurations:

- Full silicon detectors / Silicon tackers (SIT+SET) + TPC
- Overlapping/adjacent sensors in central barrel
- Projective/tile at forward rapidity
- Sensors technologies (pixels, single strips, double strips)





IlCRoot: preparing the LOI

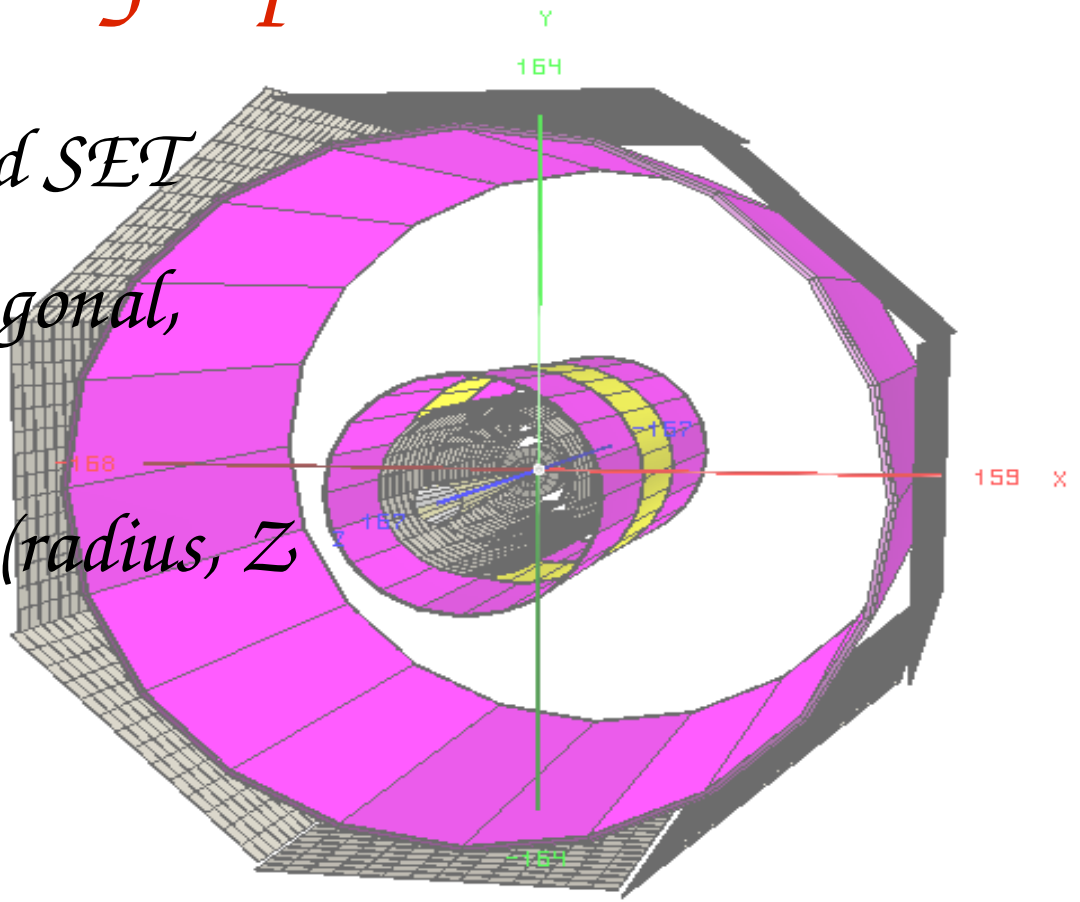


- *Status:*
  - *using the VXD + TPC configuration*
  - *using a full silicon detectors*
- *Goal:*
  - *more flexible source code for VXD to introduce SIT and SET (first step) with respect of convention for reconstruction algorithm*
  - *link with Mokka data base via XML file for main parameters*
  - *disposition of the modules – edge less, overlapping, angle*
  - *thinking about the mechanical integration – module size …*

Code development
Geometry aspect

<u>Main parameters</u>:

- number of layers for SIT and SET
- Shape of sub-detectors (octogonal, cylinder ...)
- Dimension of sub-detectors (radius, Z length ...)



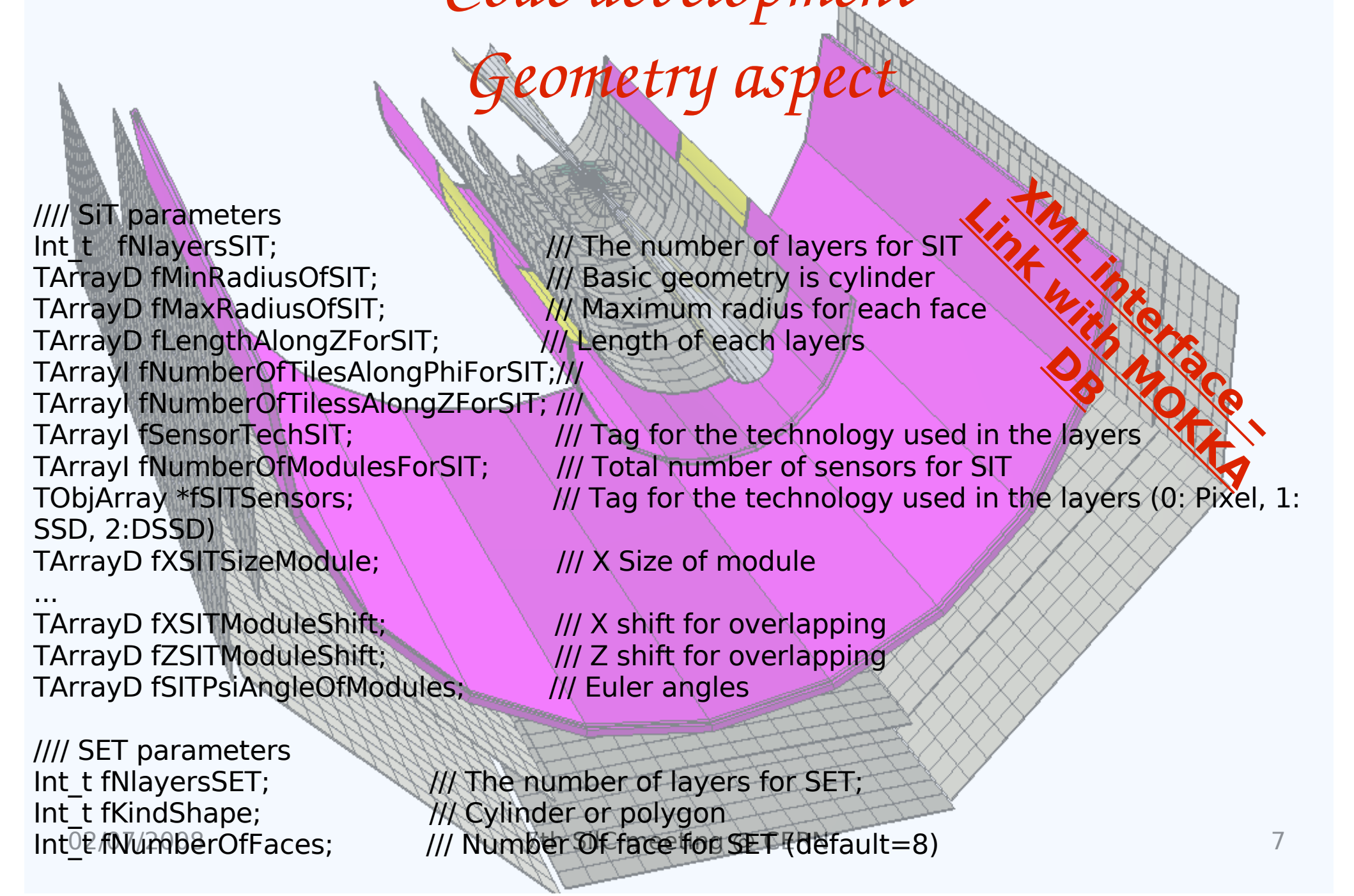
<u>Optional</u>:

- Euler Angle / Edge less
- Coordination with mechanic department
- TPC (Alice version rescaled)

VerteX Detectors
(corresponding with M.Rucco and Anna)
Lecce

Code development

Geometry aspect

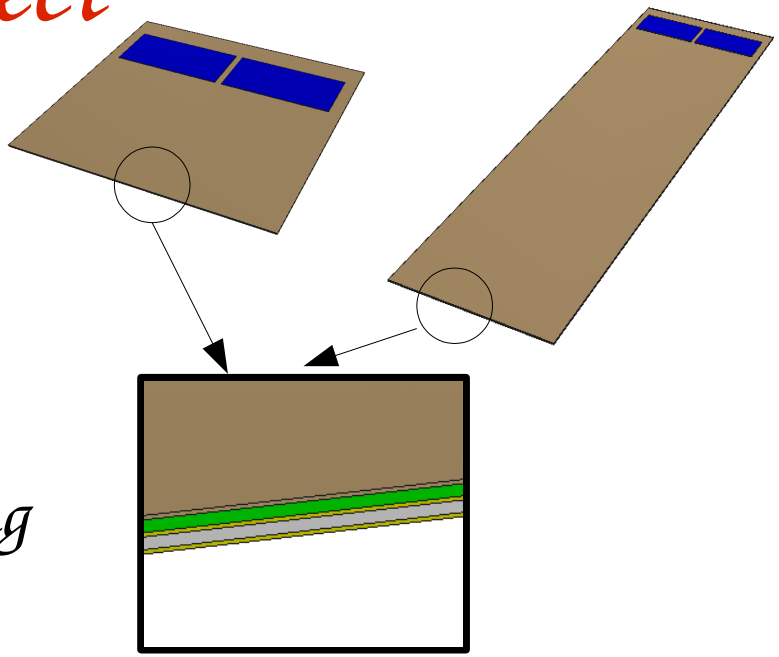


XML interface - Link with MOKKA DB

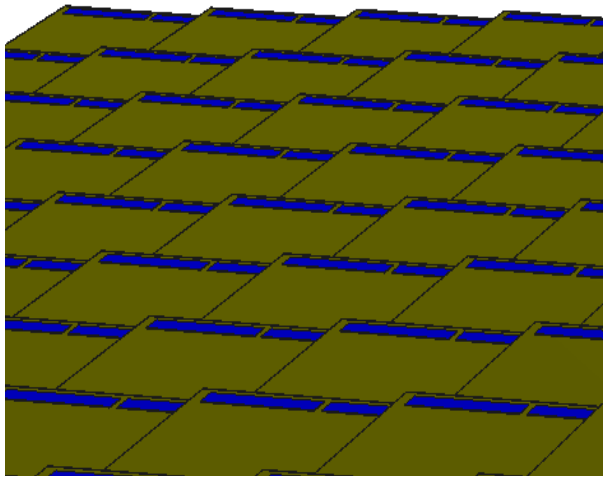
```
//// SiT parameters
Int_t   fNlayersSIT;                    /// The number of layers for SIT
TArrayD fMinRadiusOfSIT;                /// Basic geometry is cylinder
TArrayD fMaxRadiusOfSIT;                /// Maximum radius for each face
TArrayD fLengthAlongZForSIT;            /// Length of each layers
TArrayI fNumberOfTilesAlongPhiForSIT;///
TArrayI fNumberOfTilessAlongZForSIT; ///
TArrayI fSensorTechSIT;                 /// Tag for the technology used in the layers
TArrayI fNumberOfModulesForSIT;         /// Total number of sensors for SIT
TObjArray *fSITSensors;                 /// Tag for the technology used in the layers (0: Pixel, 1:
SSD, 2:DSSD)
TArrayD fXSITSizeModule;                /// X Size of module
...
TArrayD fXSITModuleShift;               /// X shift for overlapping
TArrayD fZSITModuleShift;               /// Z shift for overlapping
TArrayD fSITPsiAngleOfModules;          /// Euler angles

//// SET parameters
Int_t fNlayersSET;              /// The number of layers for SET;
Int_t fKindShape;               /// Cylinder or polygon
Int_t fNumberOfFaces;           /// Number Of face for SET (default=8)
```

Code development
Geometry aspect

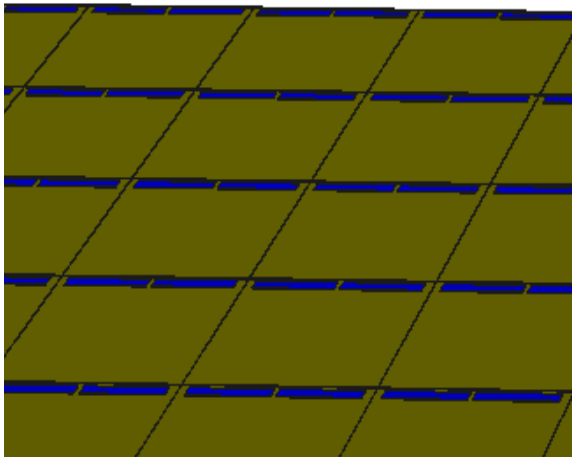
- *Example of SET:*
  - *modules sensors geometry and technology (SPD/SSD/DSSD)*
  - *definition of detection elements -> building layers*

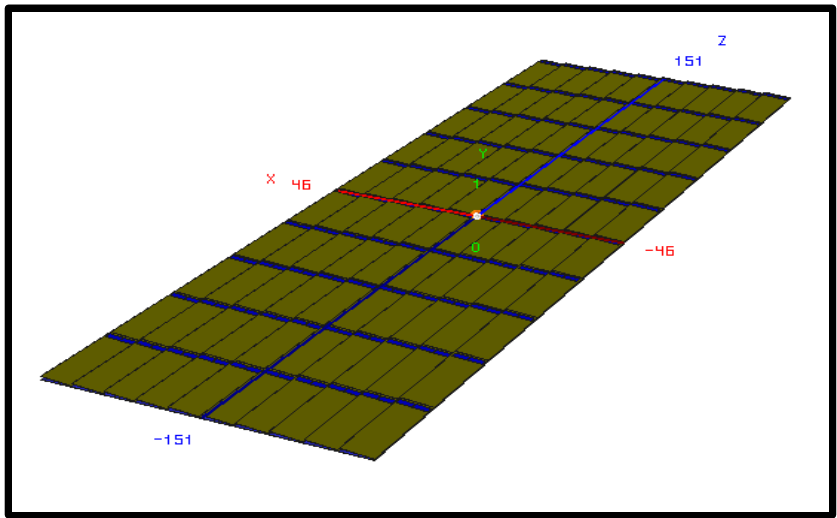


Overlapping along X and Z



Edge less





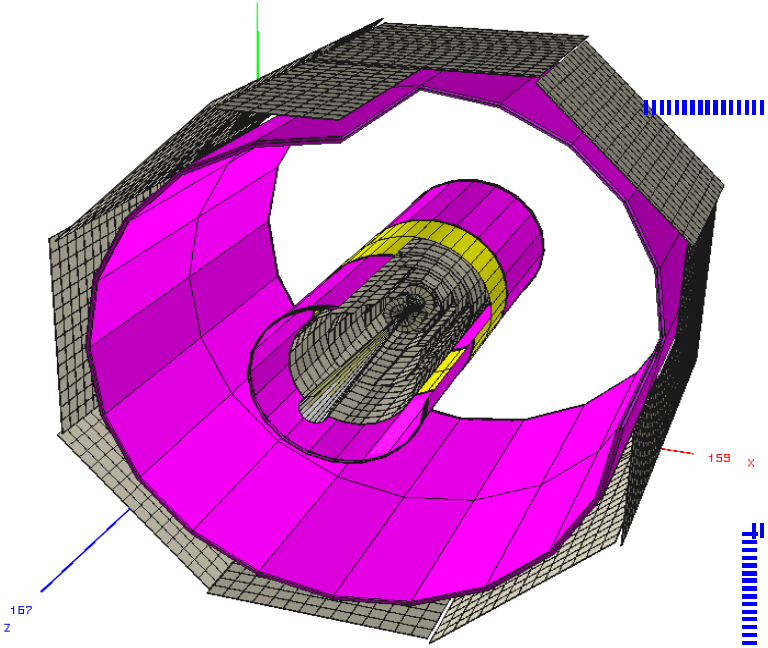
Code development

Digitization

- Choice the technology (pixel/strip/strixel) – need modulation of the code for technology mixing
- Flexible parameters: pitch, strip width, thickness ...
- possibility to import MOKKA digitization (Z. Drasal) into IlcRoot framework:
  - exchange between simulation with beam/bench test results
    - see Catalin's Talk
    - next tests: @CERN: VA1' and @DESY: SiTr130-88
    - test bench @ LPNHE (see Jacques' talk)
  - import the SiTr130-88 chip parameters for signal response (H. PHAM)

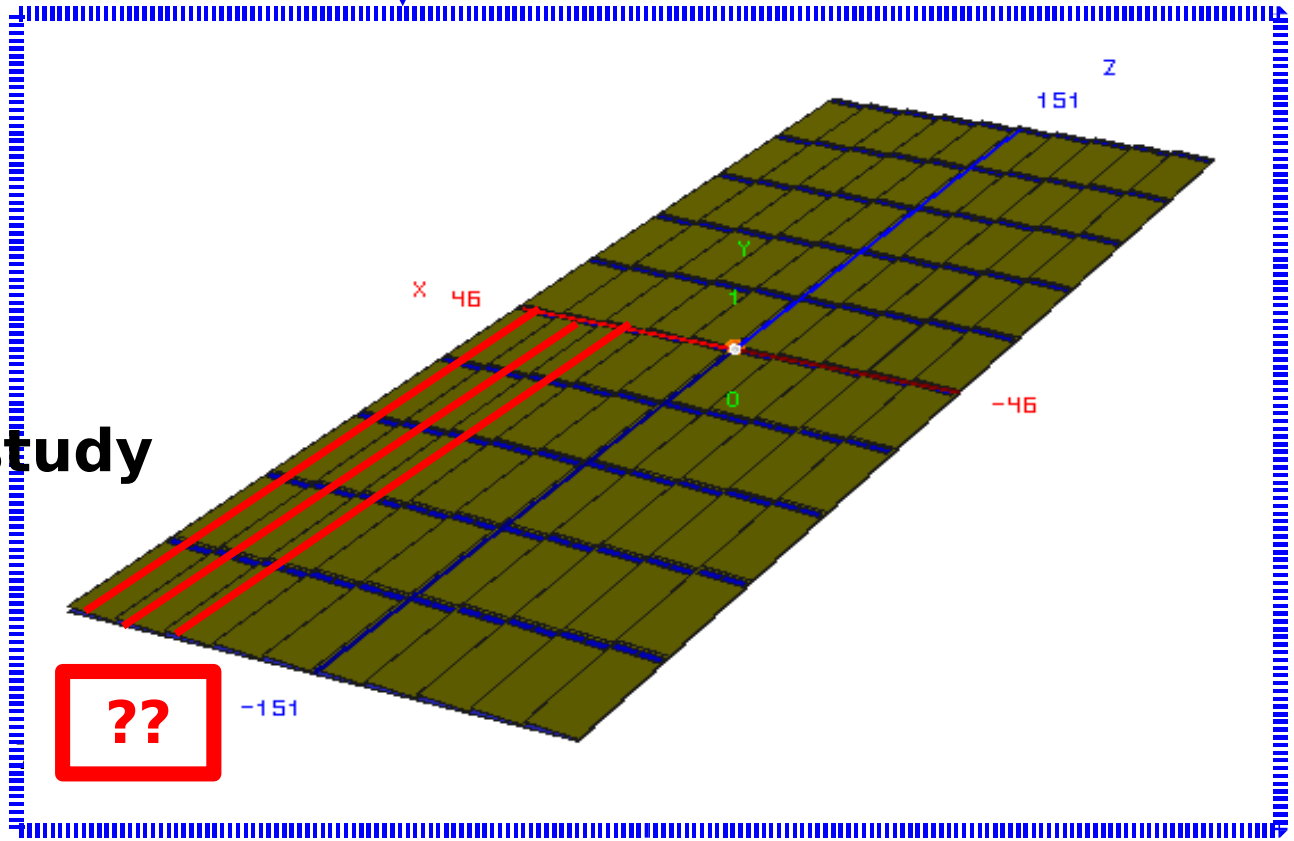
Forecast: development of ECT

DAQ



Reflexion about the acquisition chain

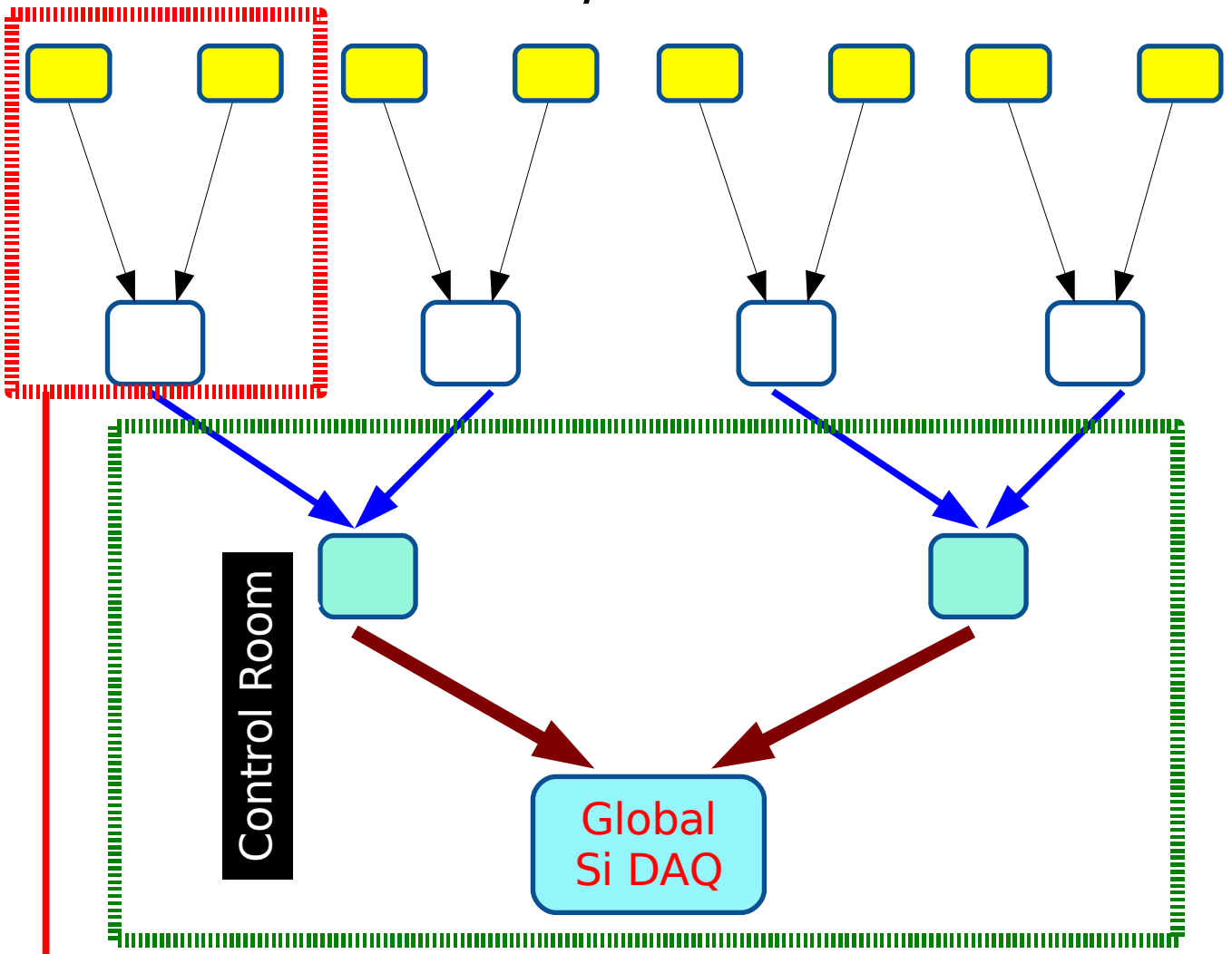
cables:
-through the module support
-mechanics/electronic study



DAQ

(Aurore's talk)

VA1/SiTr130



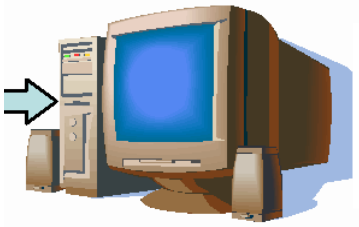
Include our system
in beam test @ DESY/FermiLab

Test bench under development

F1: chip on sensor, Full read out chain in a single chip (A/D, zero suppress, multiplex

F2: on detector sides, Daisy chaining chips information from chips, buffering, pre-process, interface/outside world

F3: in control room, processing /azimuthal sector, track reconstruction

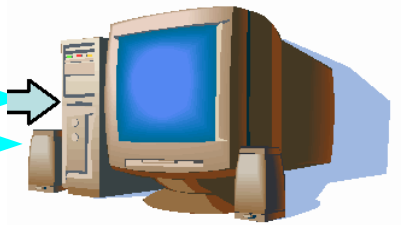


PC linux (Labview) for slow control

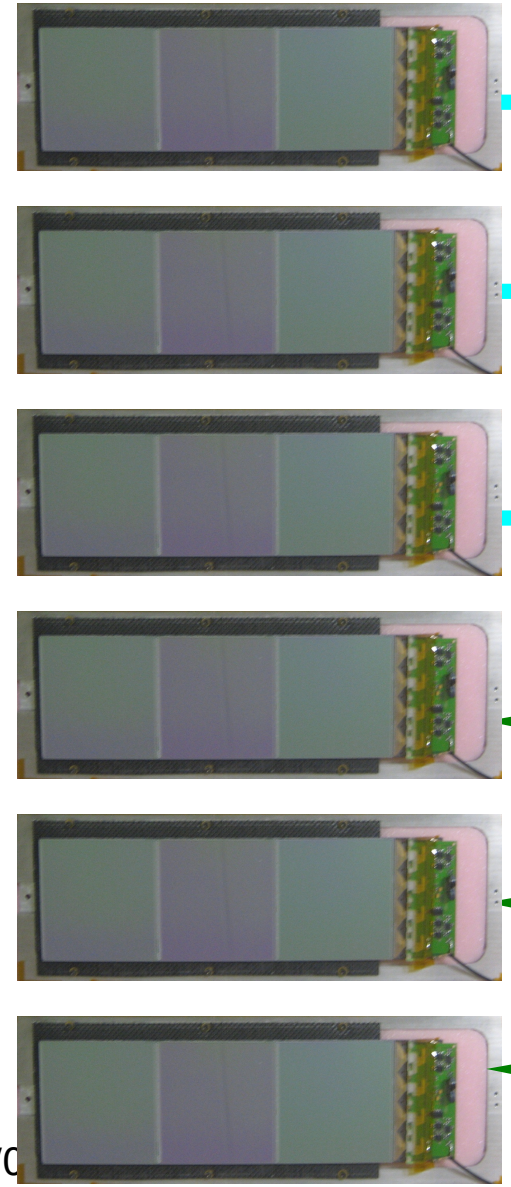
DAQ

Usb Connexion
Next step: Ethernet connexion
Vertex solution

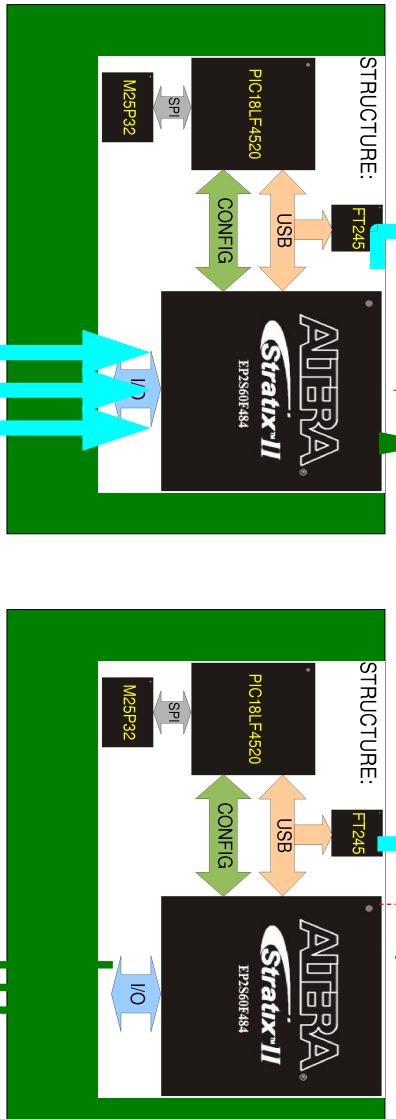
PC linux for acquisition (C++)



VA1 / SiTr130-88



Mother board FPGA/USB



trigger

VETO

Trigger dispatching

DAQ

- Hardware parts:
  - SiTr130-88: R.Sefi, H.Pham, A. Comerma,
  - front end electronics: J.David (LPNHE)
  - USB/FPGA board: A.Comerma (Barcelona)

- Software parts:
  - FPGA development: M. Dhellot (LPHNE)
  - DAQ development: A.Charpy
    - C++ code on SL4
    - new management of data event
    - new raw data format file
    - option: on-line event preview
    - analysis (Catalin Ciobanu)

Deadline: CERN beam test – VA1' for reference tracking system
DESY beam test – dedicated for SiTr130-88

Include our system in the DESY acquisition beam test

Thanks

Backup slides

Status on Simulation Tools

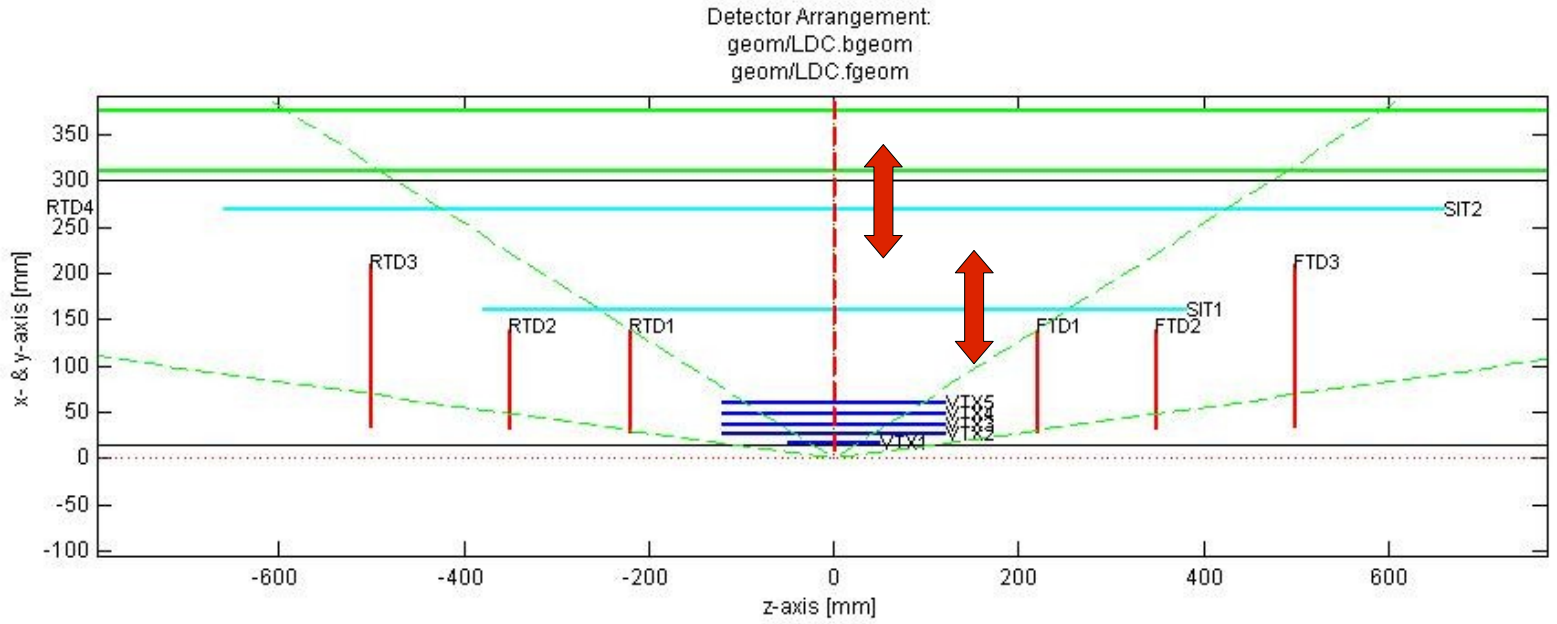
- Fast simulations (LicToy)

The SIT links the VTX and TPC subdetectors:

- momentum measurement in TPC
- position measurement in VTX

Goal: improvment with the SIT optimization ?

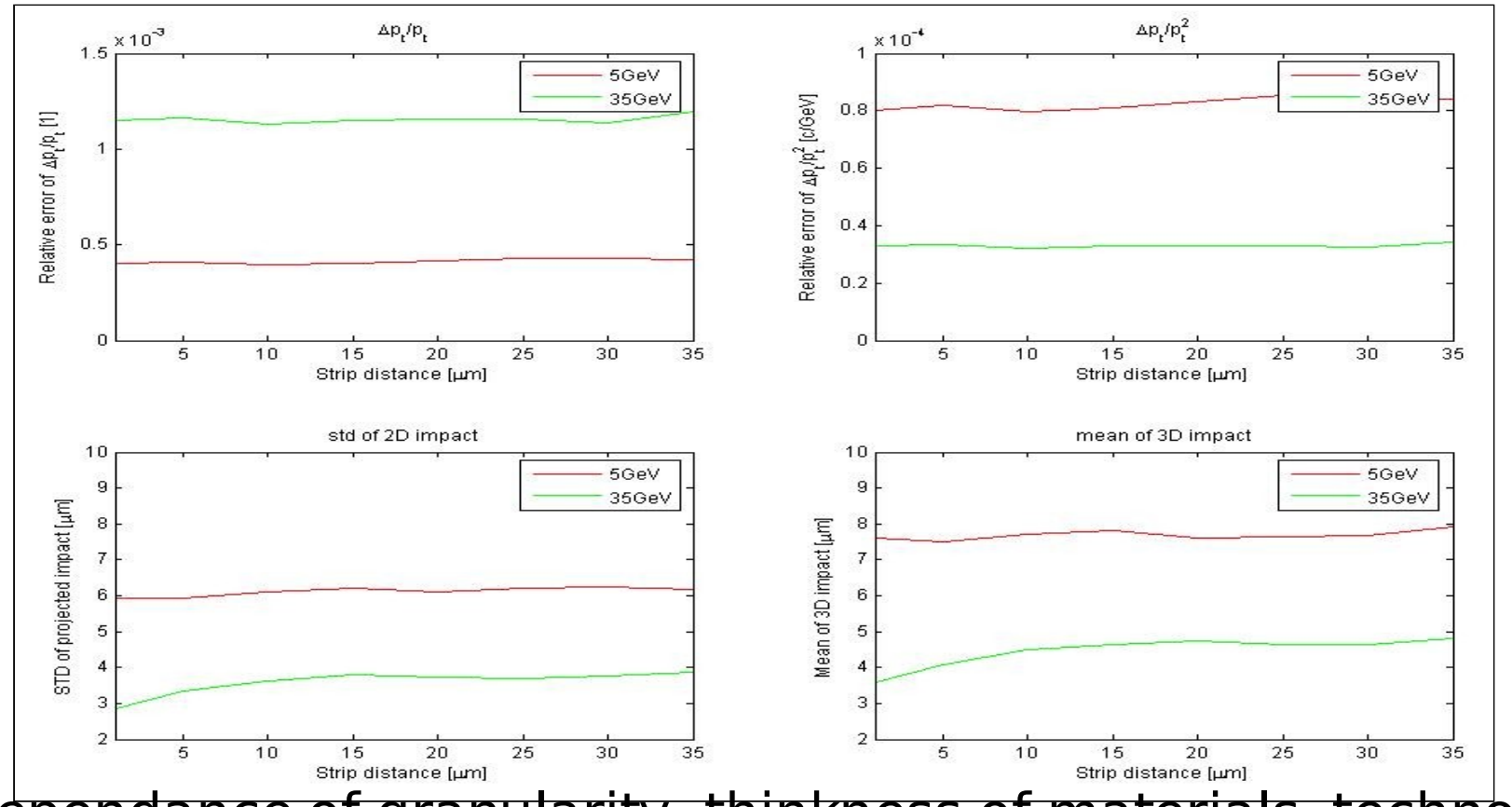
- comparison of four setups with different positions of the SIT's layers
- Plot $\Delta p_t/p_t^2$ and the 3D impact in dependence of p_t for four θ ranges



Results of LicToy

entum and position resolution seems unaffected by modifications of the SIT pos

n properties does the SIT have to have to contribute to the detector resolution?



Dependance of granularity, thinkness of materials, technology (SSD or pixel), overlapping ?

Need Full simulations