Report on ITS calibration

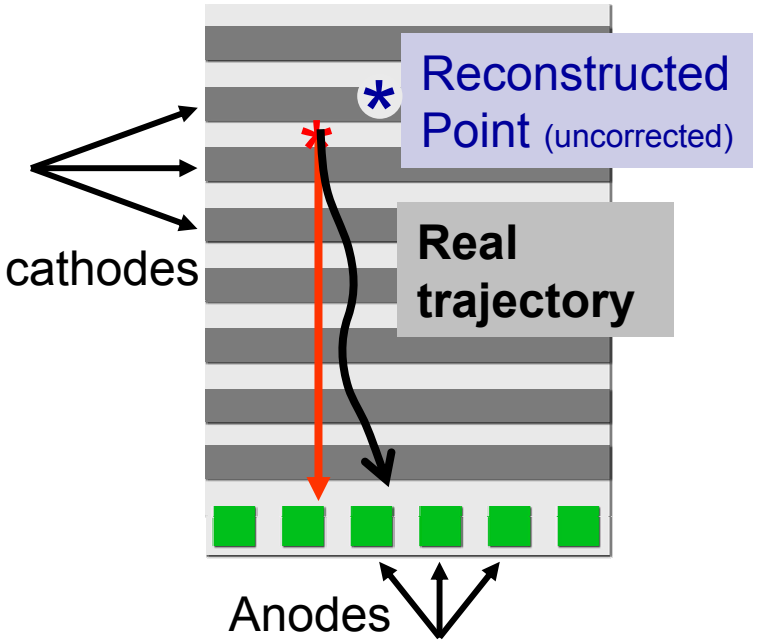
SDD maps

SPD calibration classes

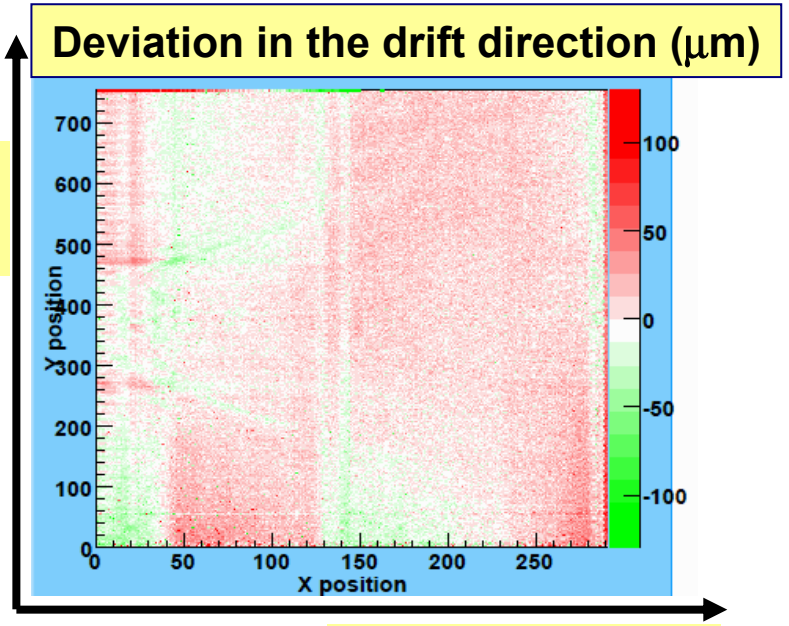
ITS offline access to CDB

Ludovic Gaudichet, INFN Torino

SDD maps ?

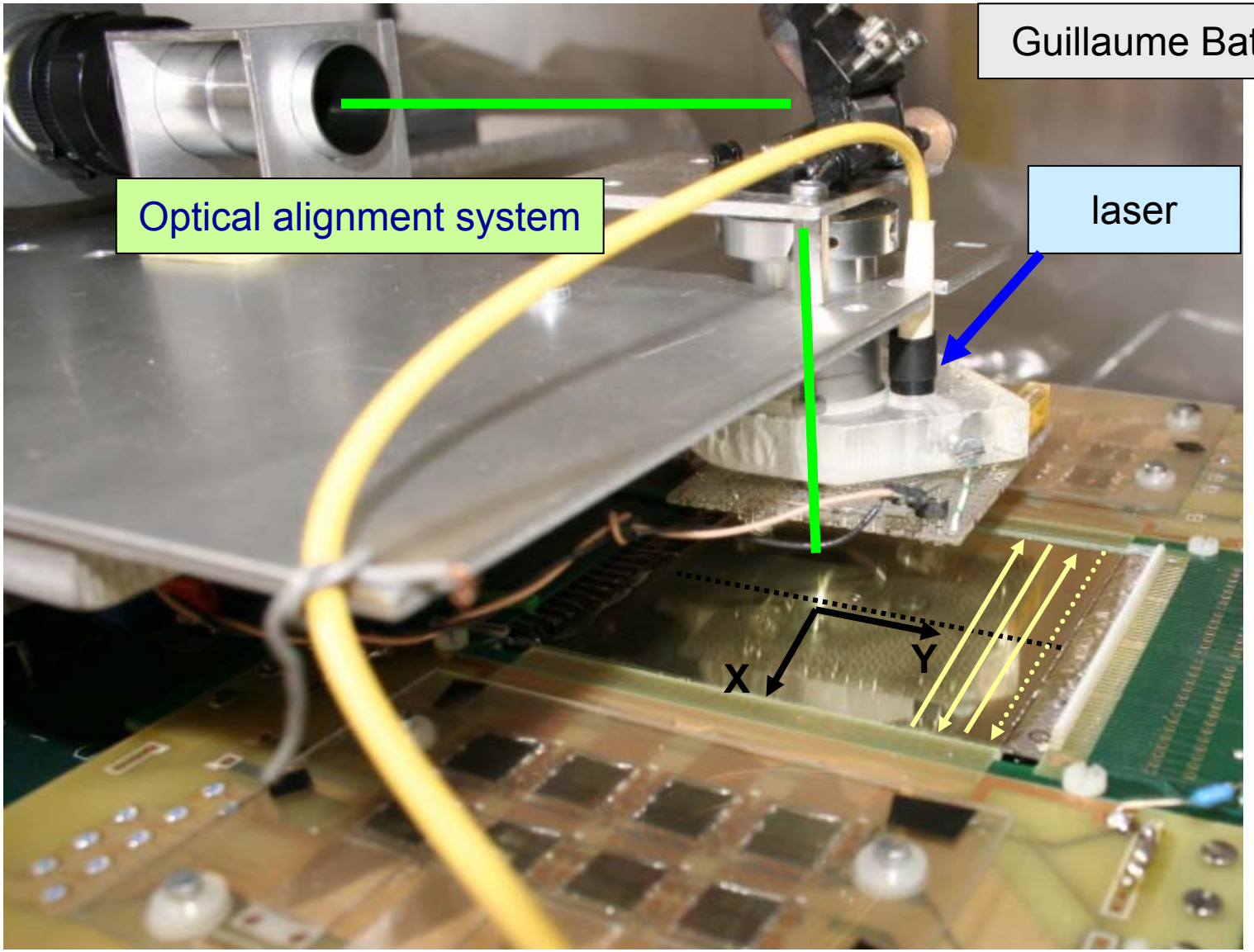


❖ Fluctuations of doping in the SDD wafer create local perturbations of the drift field.
❖ The drift speed is not constant and the trajectory is not straight → error in x and y
❖ Errors are largely greater than SDD resolution, can be more than 100 μm.
❖ Only way is local corrections $(x,y)_{det} \leftrightarrow (x,y)_{real}$



We need :
Local deviations in the drift direction ΔX
Local deviations in the anode direction ΔY

SDD mapping system



Sampling :
120 μm in X
100 μm in Y

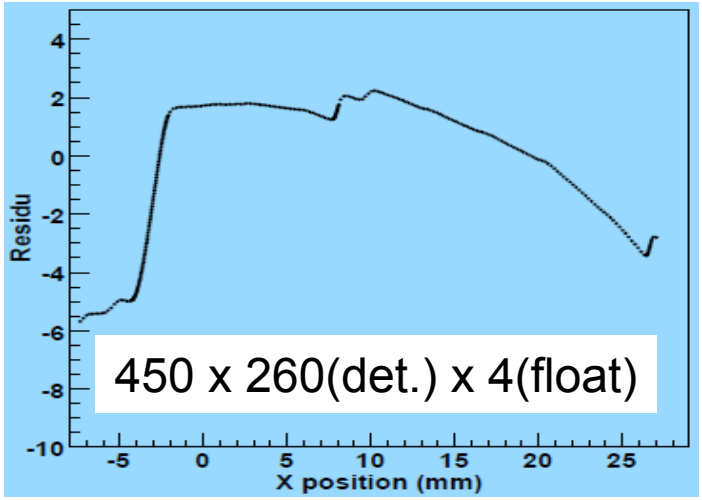
Mapping of one detector in 4-5 hours :
1h : position
1h : warm-up
2h : mapping

Analyze 3h

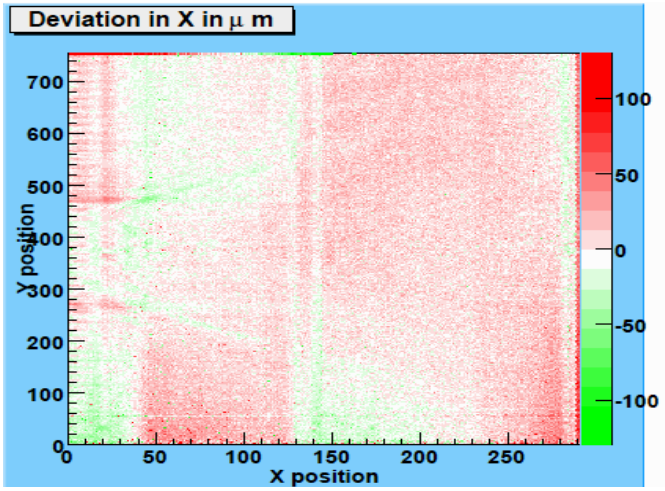
calibration data for SDD mapping

Guillaume Batigne, Torino

1) Residue in drift time

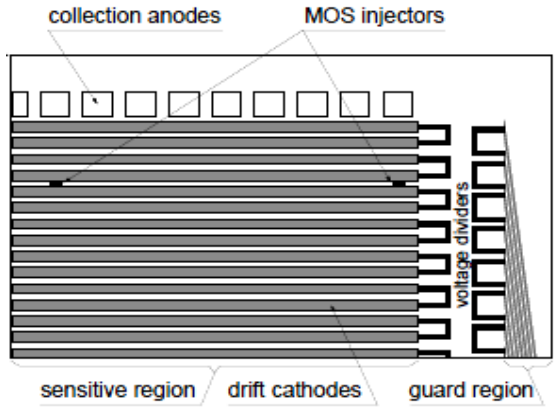


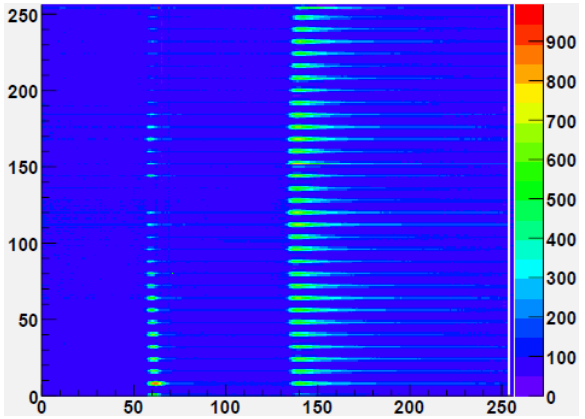
2) (ΔX, ΔY) map



440000 measures
x 2 (ΔX & ΔY)
x 260 (det.)
x 4 (floats)
= 873 MB !!!

3) injector positions
(measurement of drift speed during the run)





SDD maps compression

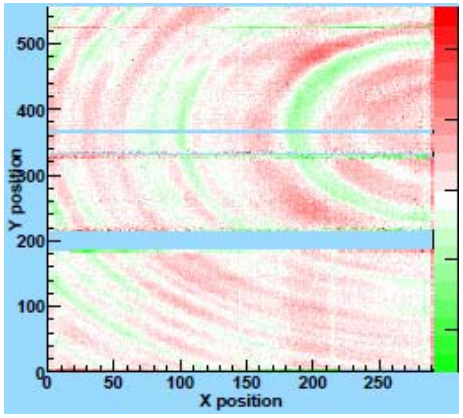
Guillaume Batigne, Torino

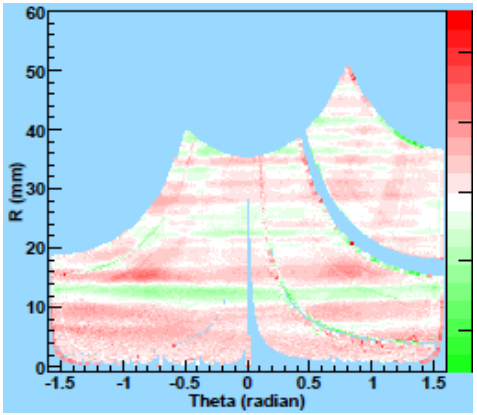
Fourier transform of SDD (ΔX,ΔY) map

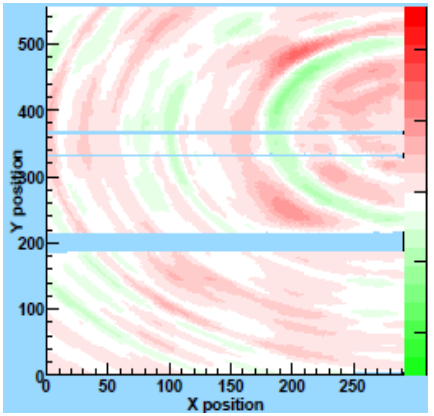
$$F(k)=\sum_i\left\{\Delta X(i)\cos\left(k.X(i)\right)-i\Delta X(i)\sin\left(k.X(i)\right)\right\}=F_R(k)-iF_I(k)$$

Map is approximated by the inverse FT, where only most important coeff. are kept:

$$\Delta X'(i)=\frac{1}{2}\sum_k\left\{F_R\cos\left(k.X(i)\right)+F_I\sin\left(k.X(i)\right)\right\}$$







Ex: 1st detector tested. 1.68 MB → to cylindrical coordinates + FT + coefficient reduction →

25kB

69 times less !

873MB → 13MB

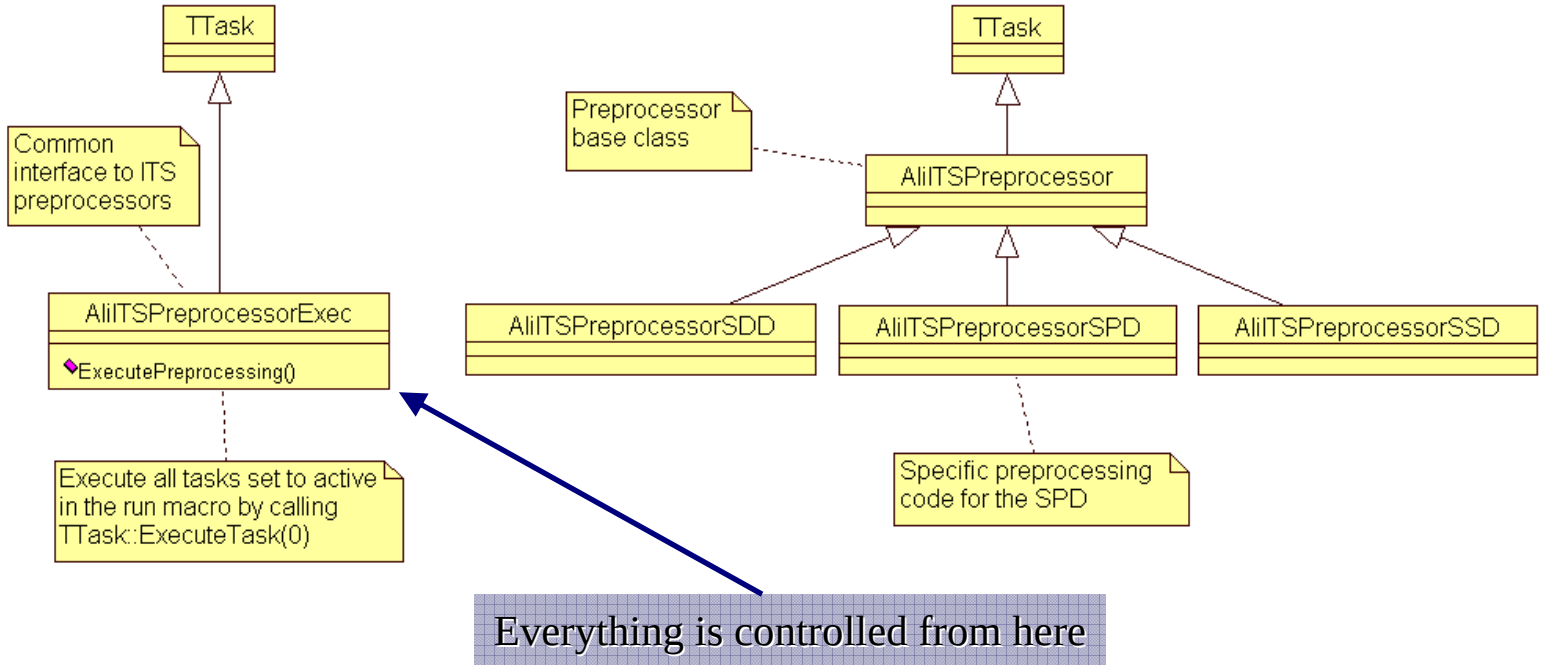
SPD calibration classes

Paul Nilsson

ITS preprocessor : classes for calibration calculation from beam test data

Shown in Offline week, mai 2005
SPD dead pixel calculation :

(Suggested model a la beam test digitizer)



SPD calibration classes and CDB

Paul Nilsson

✓ Working SPD preprocessor classes for identification of noisy channels

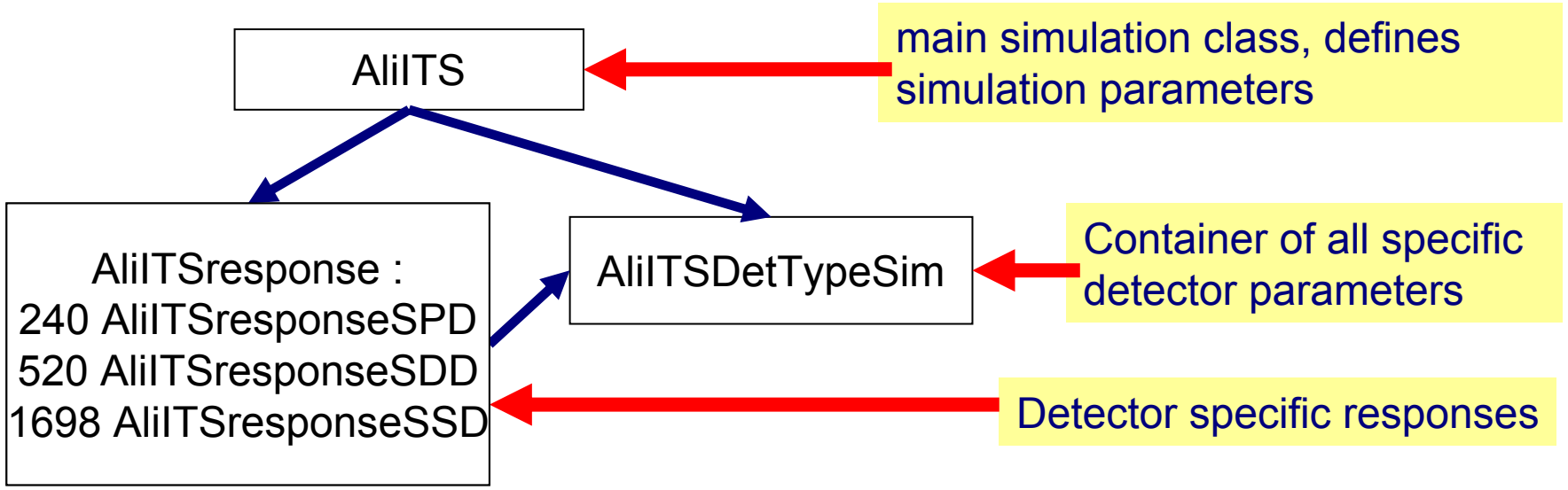
✓ Proposal for ITS preprocessor class structure

✓ SPD has 10M channels, only a few noisy are expected, seems to be confirmed from beam test (6 noisy on 163840 pixels)

✓ Detailed implementation example of usage of calibration database classes (AliITSPreprocessorSPD.cxx + run macro)

✓ How to run SPD preprocessor and store SPD calibration
✓ How to read back stored calibration objects from the database

Calibration in offline simulation



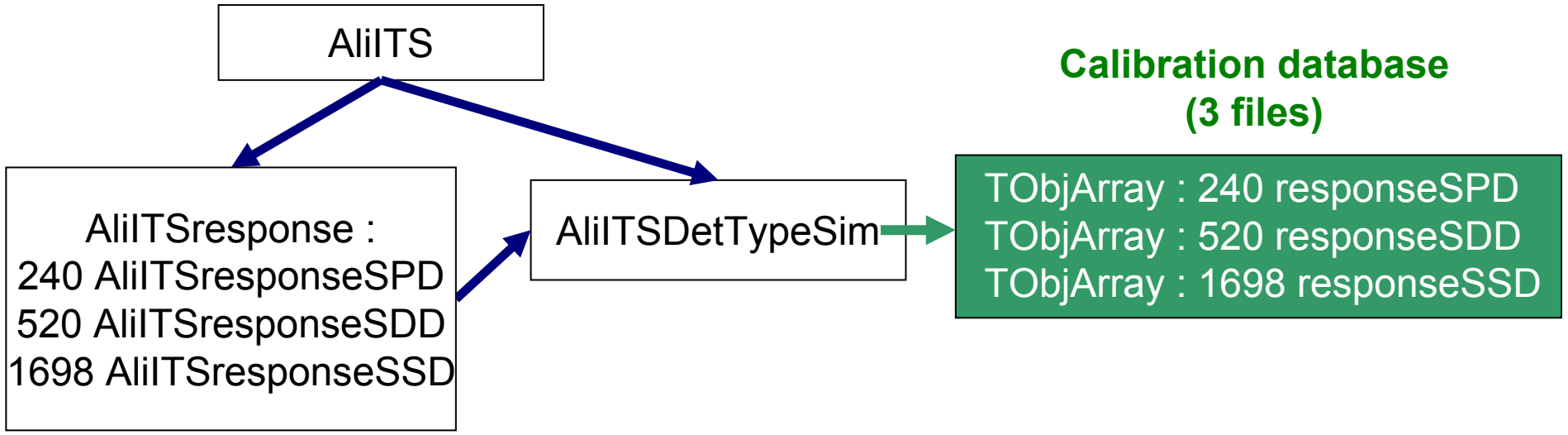
Done :

- ✓ **Split response from one per sub-detector type to one per module,**
- ✓ **AliITSDetTypeSim can fill the calibration database with all the response objects**

To be done :

- ➢ **Include in response classes, or separately, the missing information : SPD dead pixels, SSD dead strips, SDD map, … (non-exhaustive list)**
- ➢ **Make that the simulation uses all available information !**

Calibration in offline simulation



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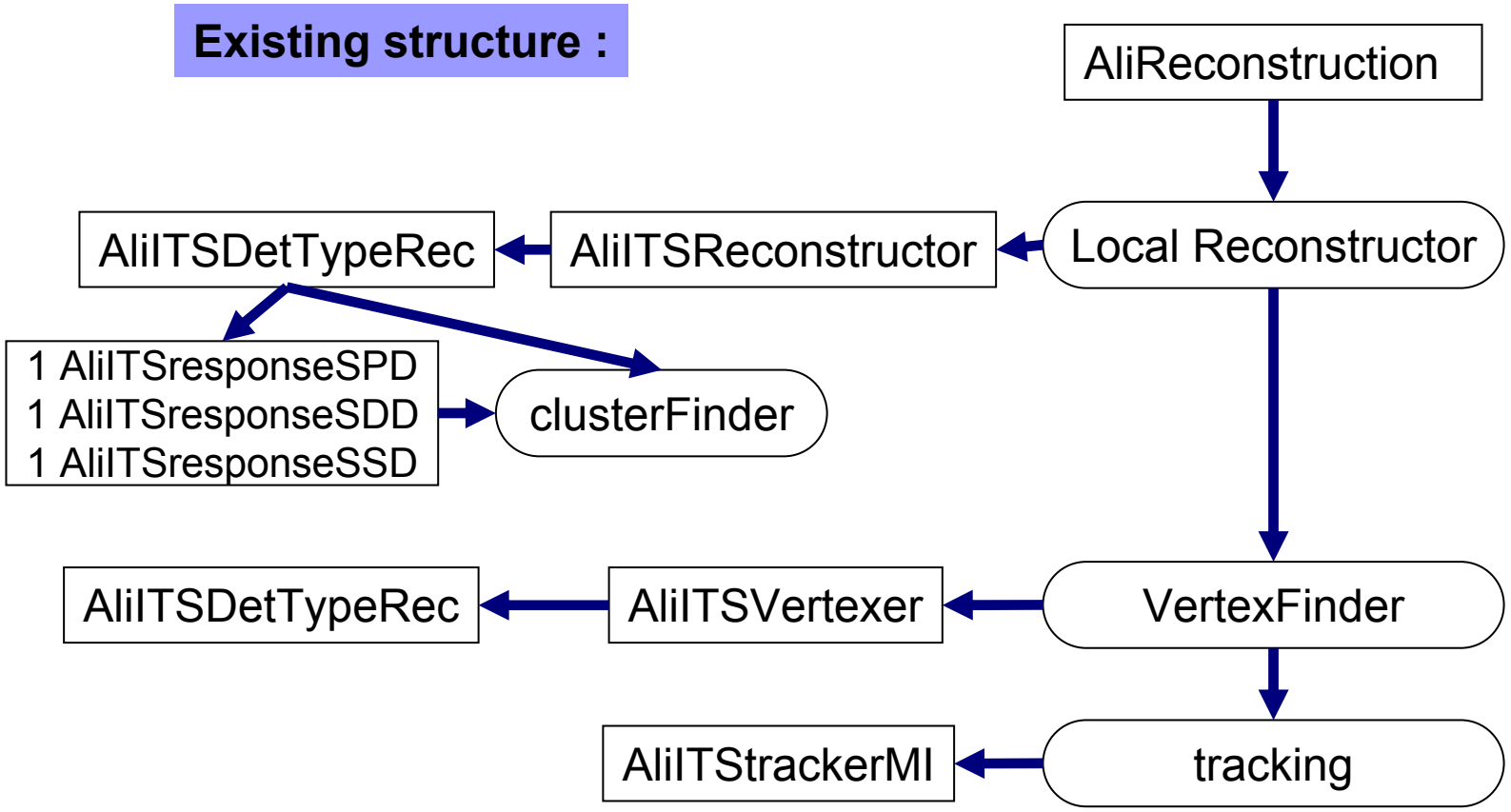
Calibration in offline reconstruction



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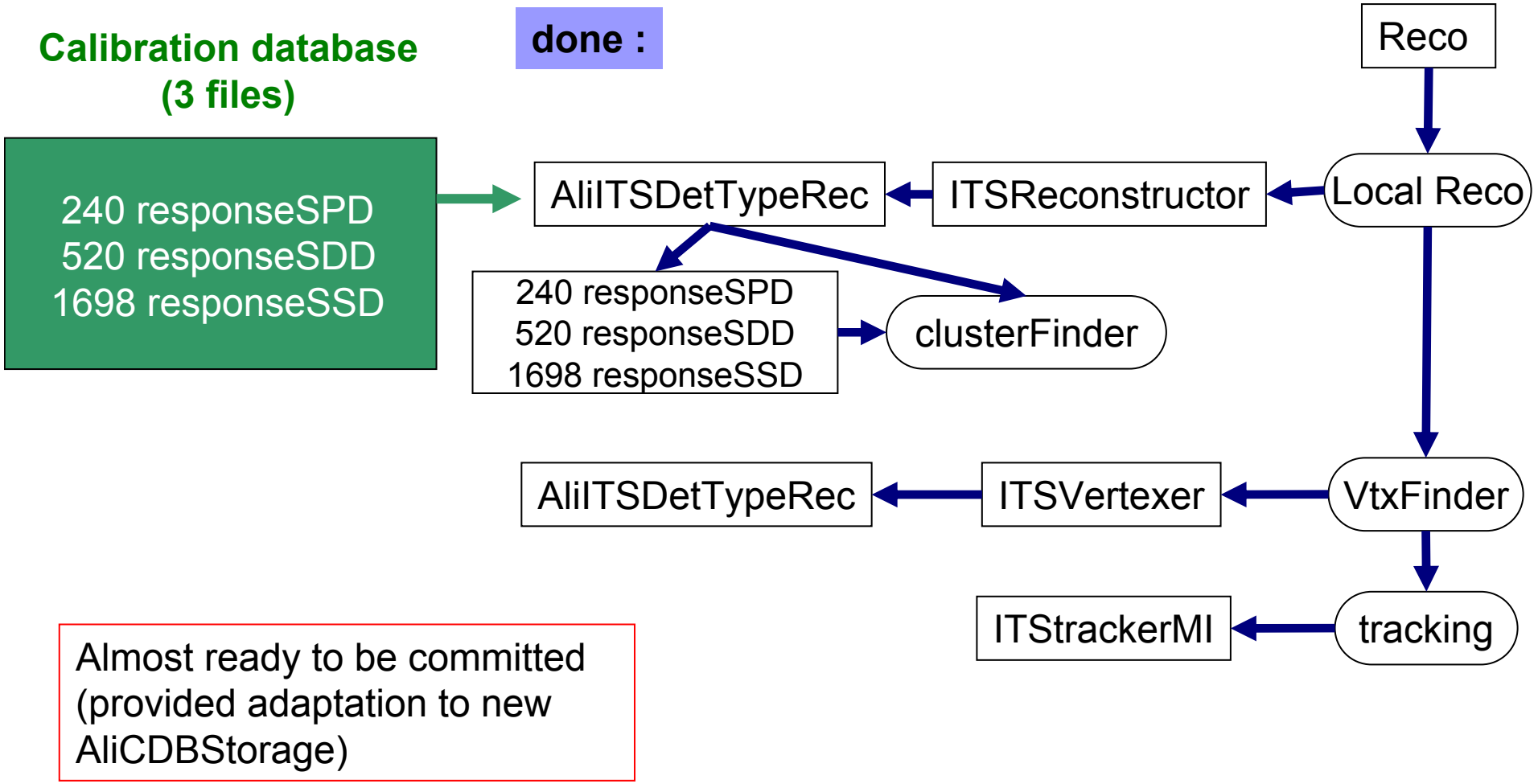
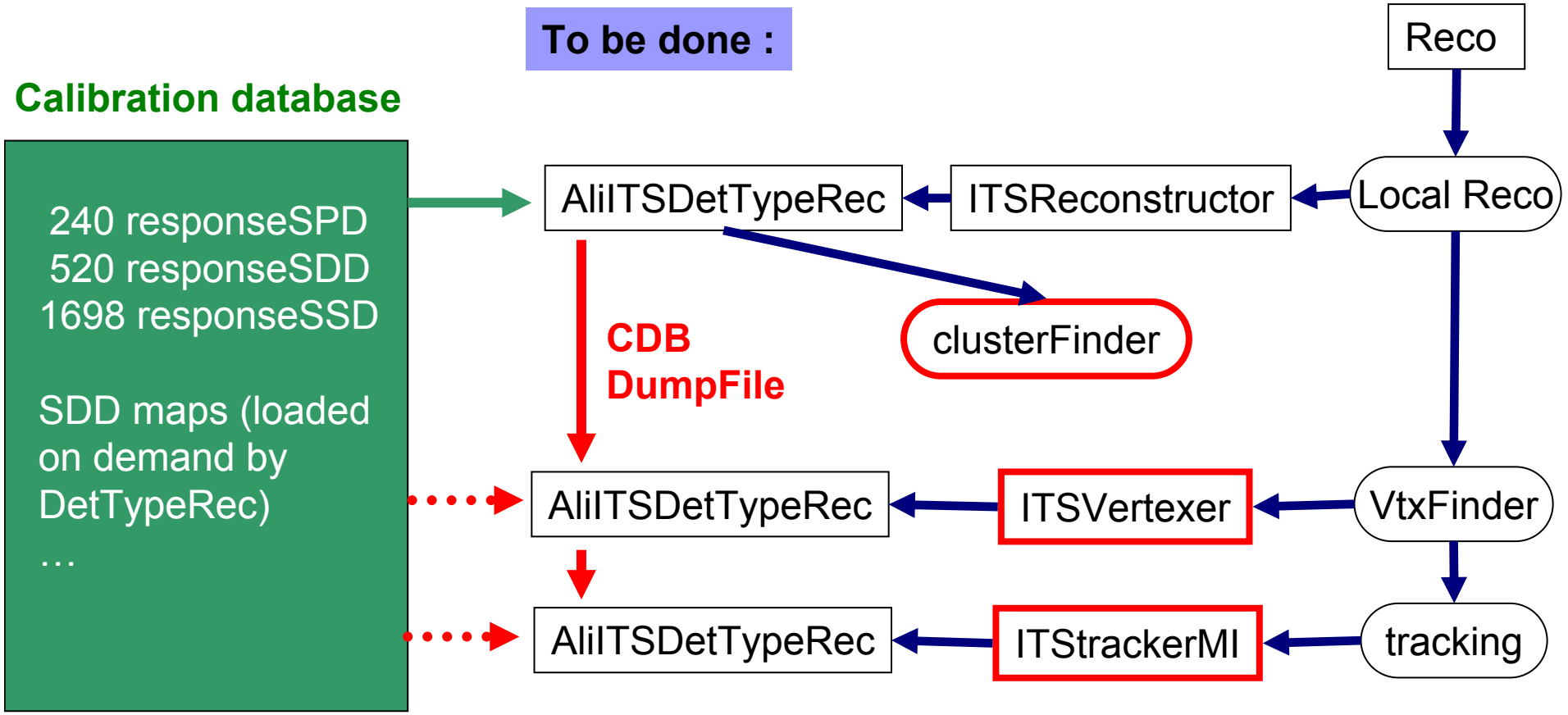


Almost ready to be committed (provided adaptation to new AliCDBStorage)

Calibration in offline reconstruction



Conclusion

- SDD mapping system is ready
- SDD maps are the bigger load for CDB but should be only 14MB

- Preprocessor class for SPD noisy channels calculation ready
- Storage and reading from CDB has been tested and works fine

- Access to CDB is ready in ITS offline code :
  Simulation → CDB → Reconstruction
- Actual estimation of ITS CD size ~ 14MB + 2MB(responses)
  + SPD noisy channels + SSD calibration data

- To be continued :
  - Preprocessor classes for SDD and SSD
  - Use calibration data in offline !

Backup slides

SDD charge with mapping system ?

Not possible to calibrate the energy deposition in SDD with the mapping system