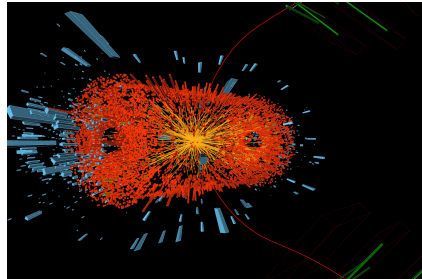


ATLAS Inner Tracker Project : ITk



Collider physics

⇒ Experimentalists :



10^{-9} > interest for discovery

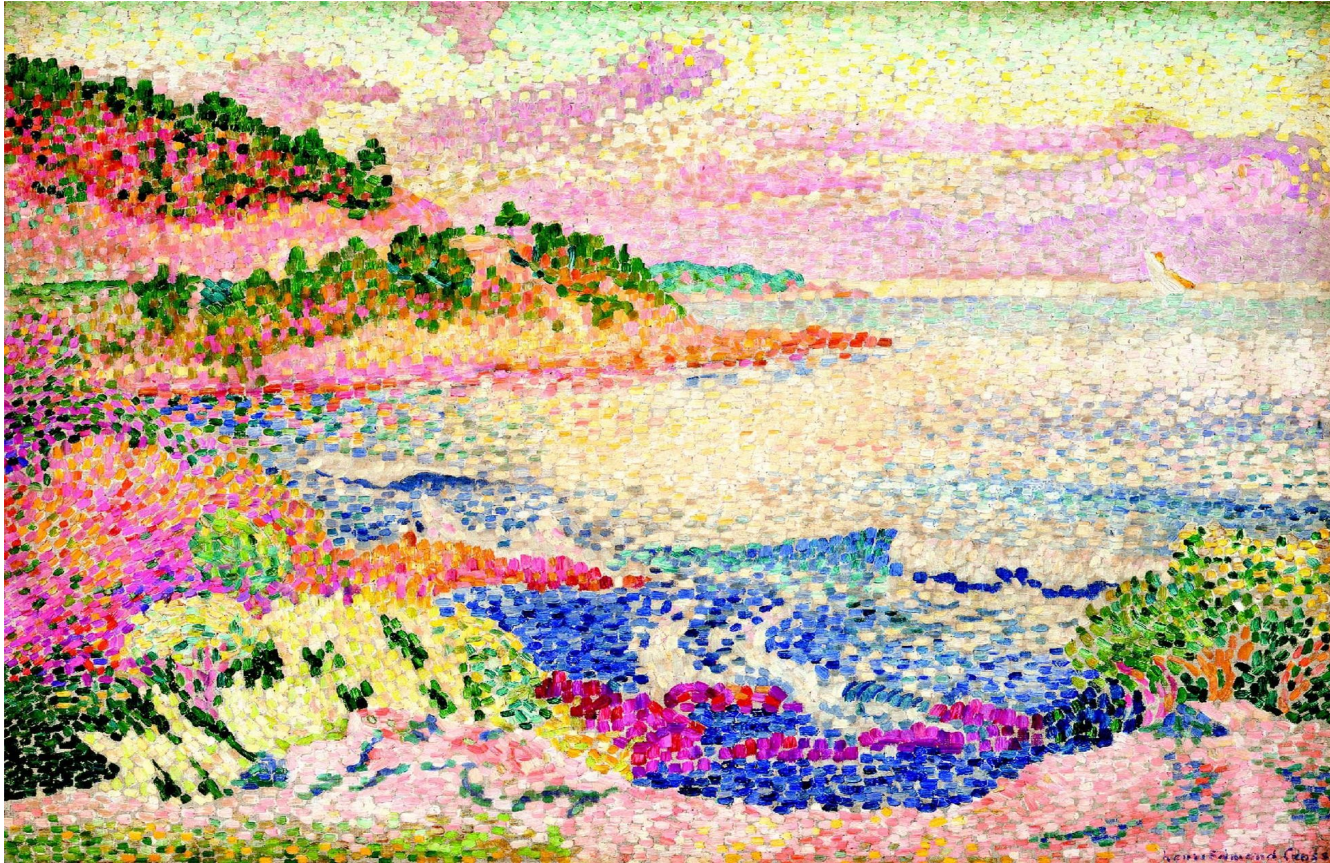
⇒ Theorists : new models and predictions

~~10^{-9} > realistic~~

10^{-4} > realistic

Cost to pay for discovery : most of our production is useless

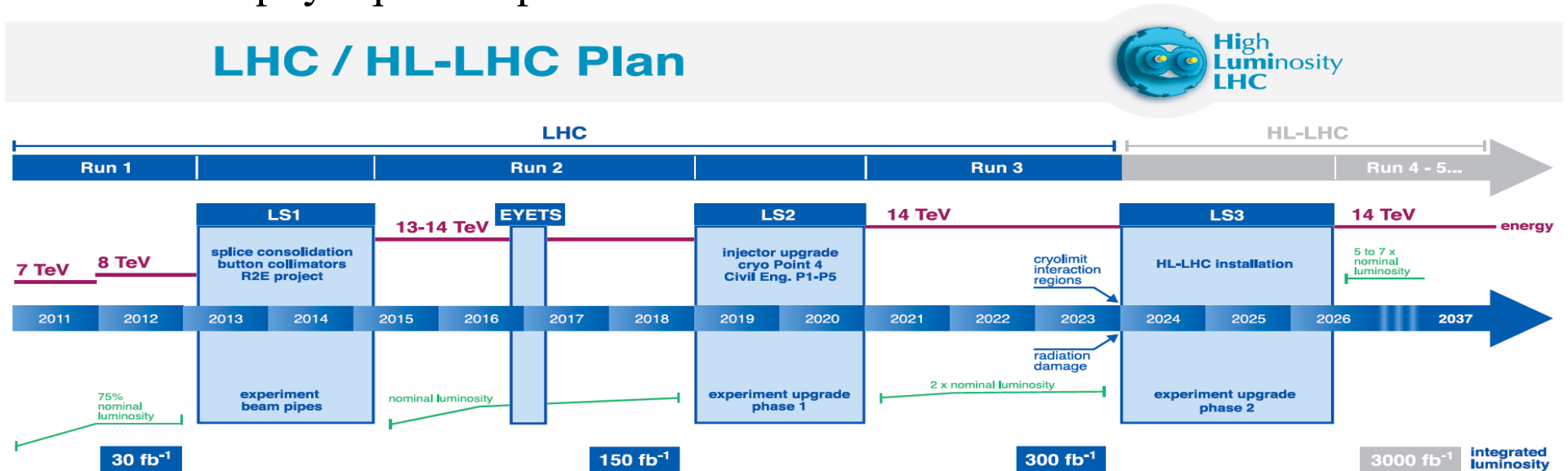
All collider physicists are bound to failure except for once or twice in their life !



4

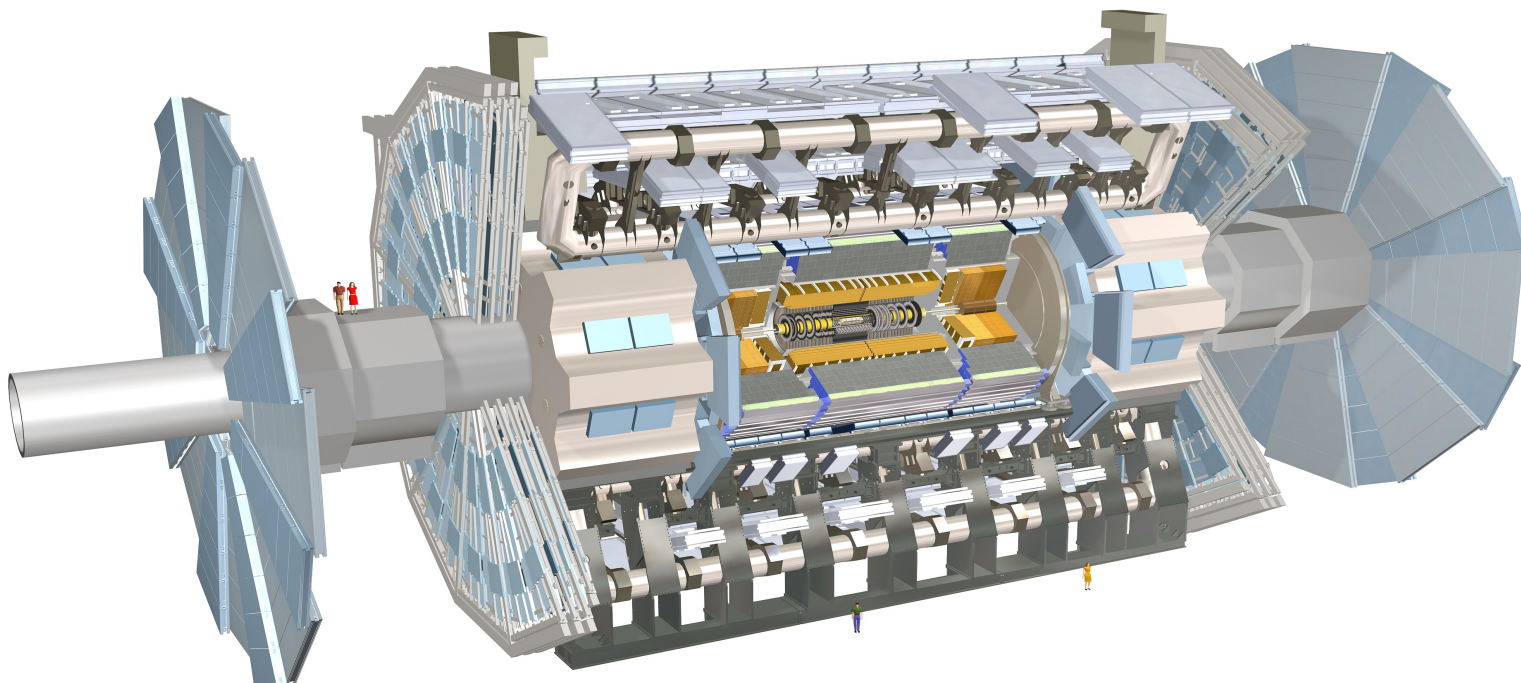
Programme & planning LHC

- découverte ou pas de nouvelle physique, le LHC restera la première priorité européenne pour les deux prochaines décennies en physique des particules



ATLAS : ITk (Internal Tracker)
remplacement du trajectomètre
actuel du fait des dommages dus
aux radiations et multiplicité accrue
des particules

ATLAS detector



Precision measurement of Higgs signal strengths

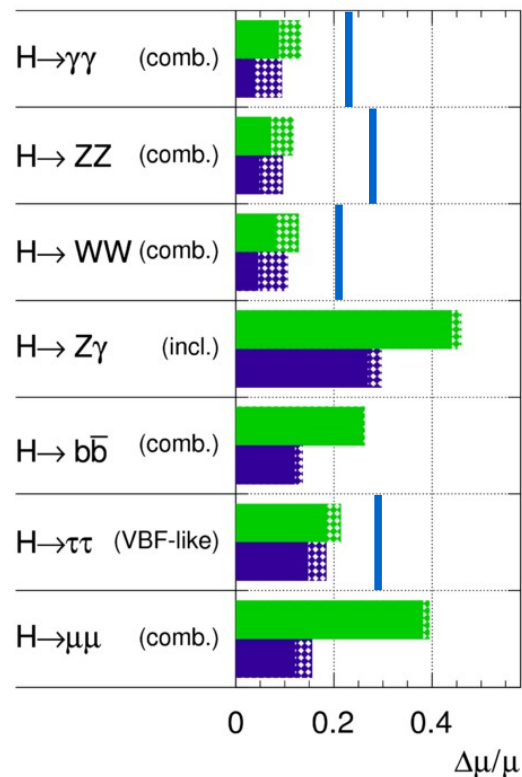
Dashed areas indicate $\Delta\mu/\mu$ with current theory uncertainties.

Vertical blue lines are Run 1 values.

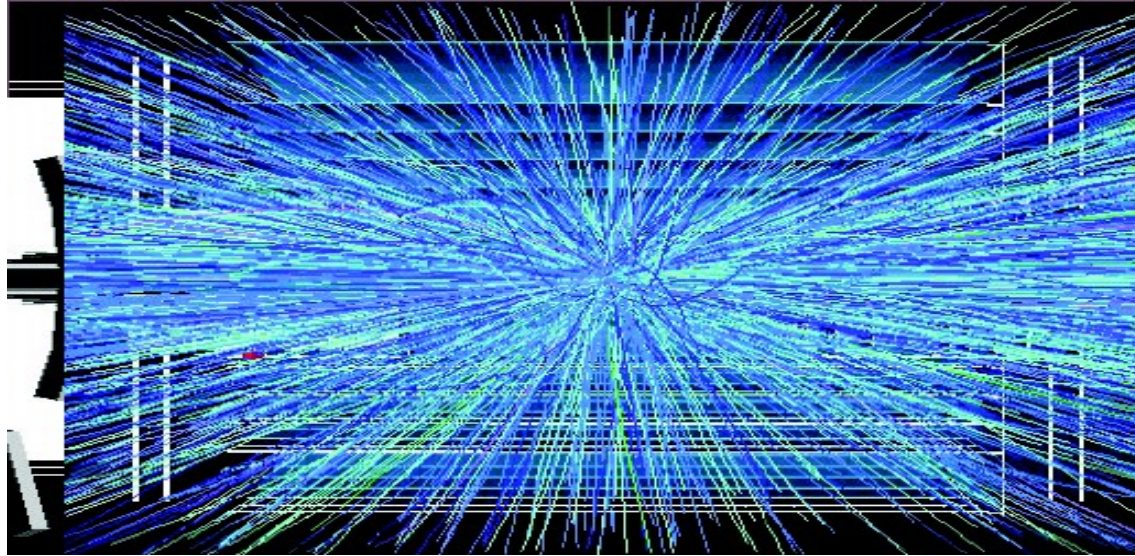
Run 3 and HL-LHC

ATLAS Simulation Preliminary

$\sqrt{s} = 14$ TeV: $\int Ldt = 300 \text{ fb}^{-1}$; $\int Ldt = 3000 \text{ fb}^{-1}$



HL-LHC



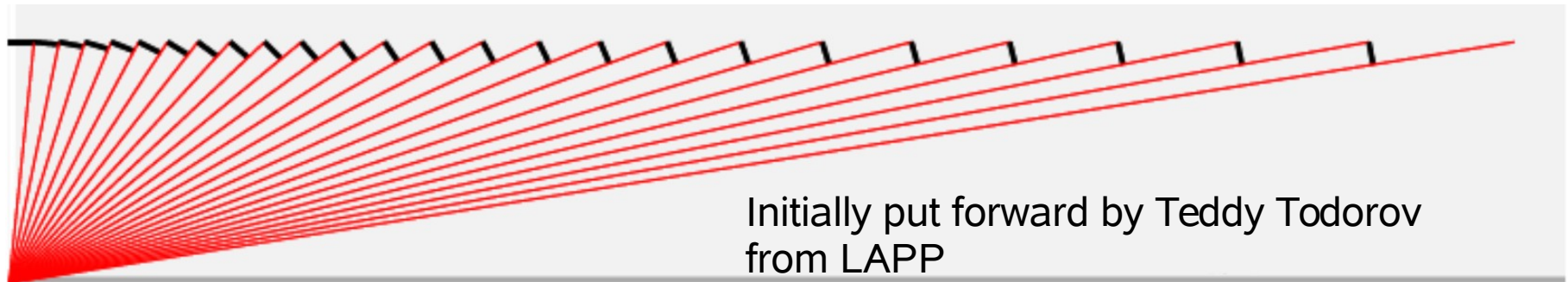
~140 collisions proton-proton au biais minimal
au-delà de 2023

ITk specifications

- ⇒ At the HL-LH, we expect $\mu > 100$ within a similar or shorter bunch collision space.
- ⇒ Higher track density requires a better Inner Detector to maintain tracking and b-tagging performance.
- ⇒ We will also increase η coverage to 3.2 or 4.0 (currently 2.5) to increase acceptance and reconstruct forward jets for VBF and VBS.

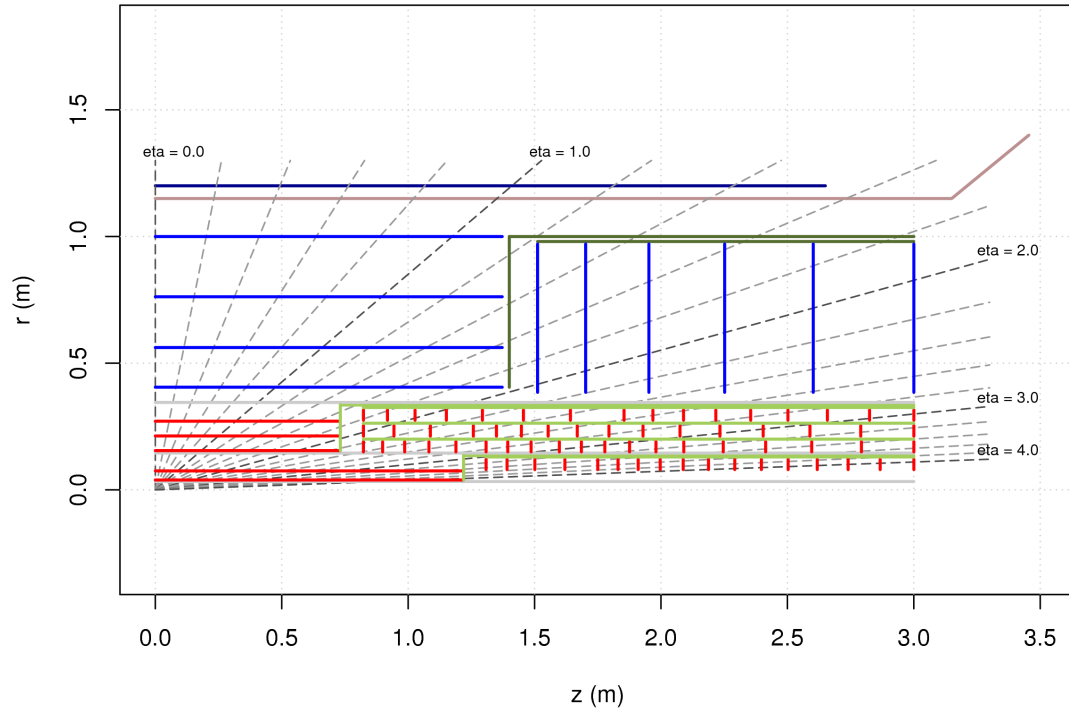
Pixel detector

- ⇒ Several designs for pixel detector are being considered. We are performing studies to determine which one will be best for physics results – Final layout to be decided by mid 2016.
- ⇒ The 'inclined' sensor layout is one such proposal

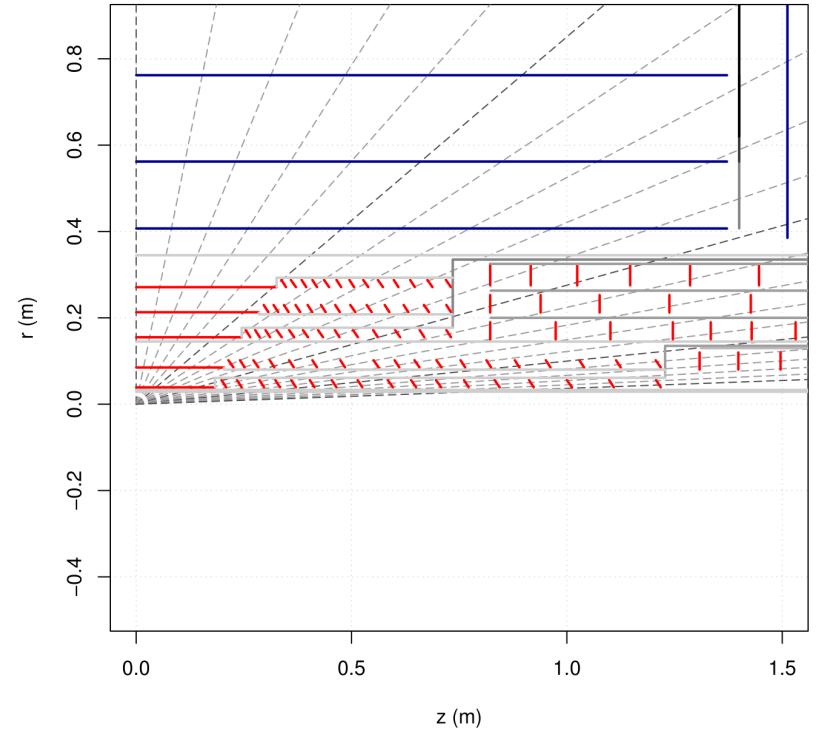


Baseline layout vs inclined layout

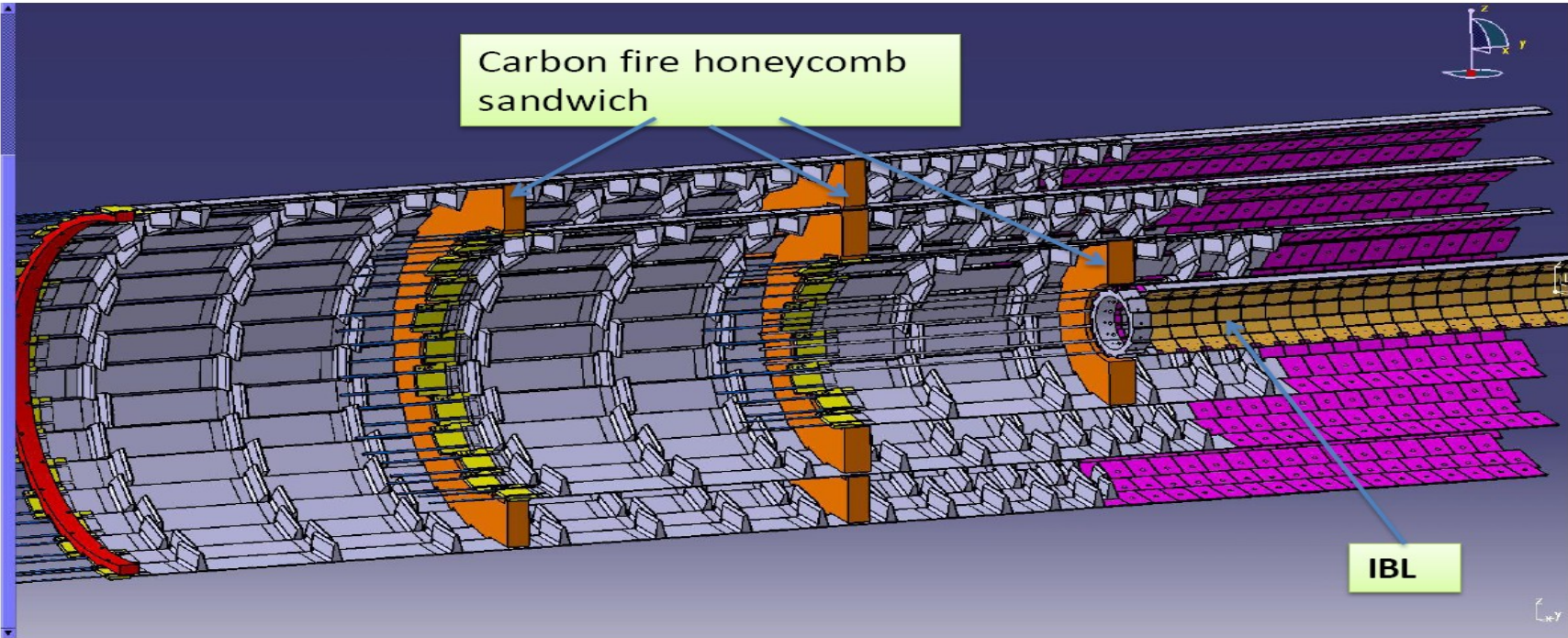
ITK geometry



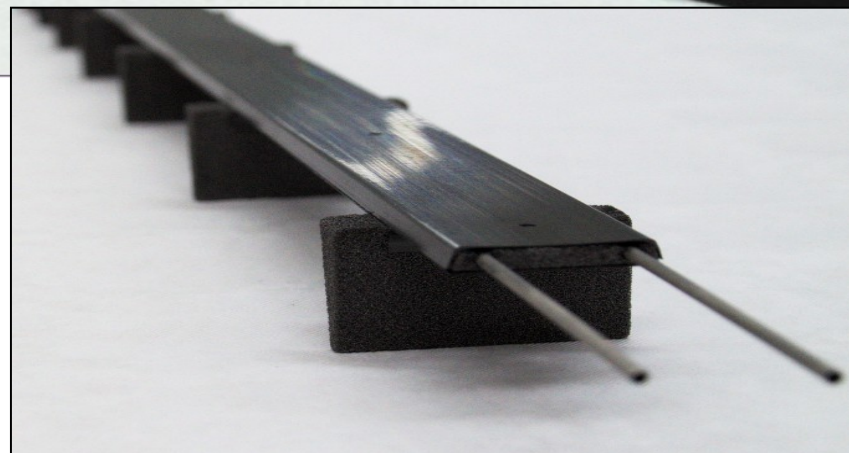
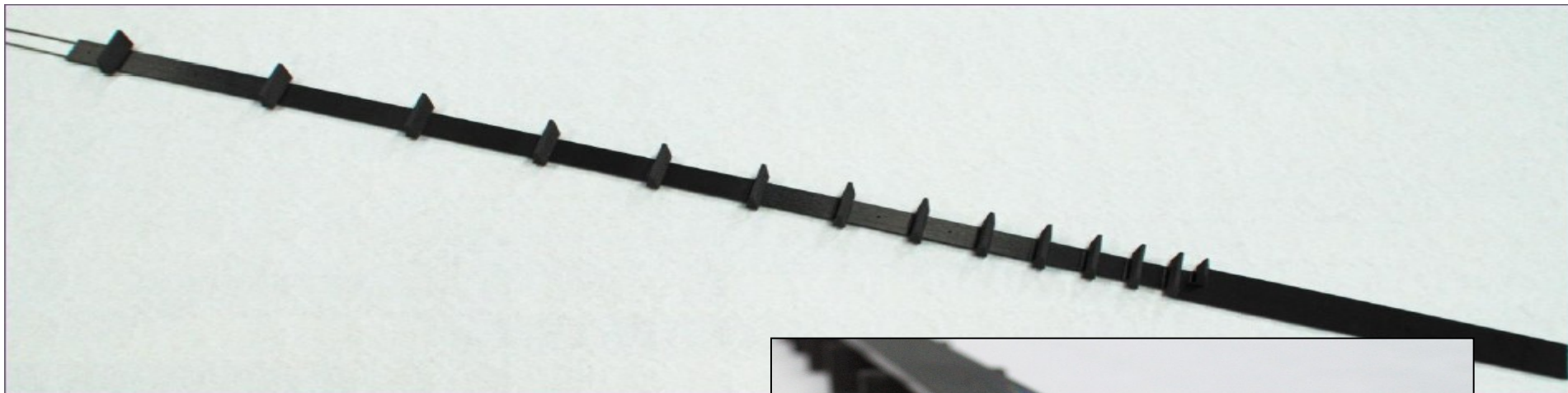
ID geometry from Slim3_RingOpt.geom 13:43:42 18/11/15



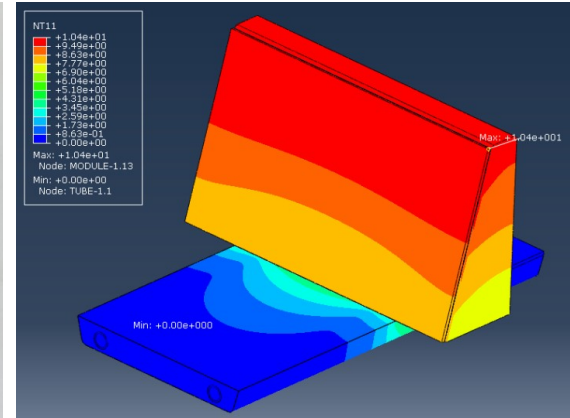
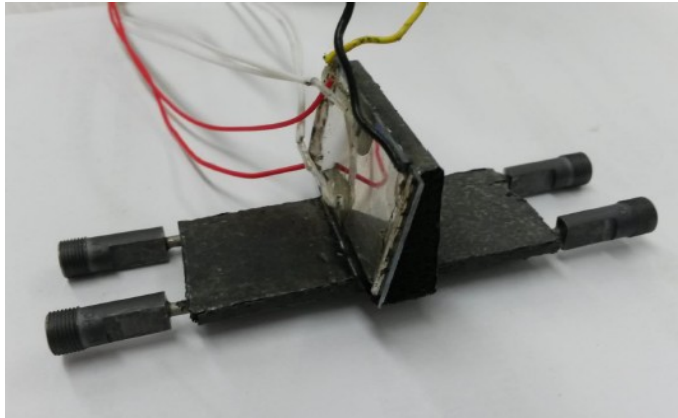
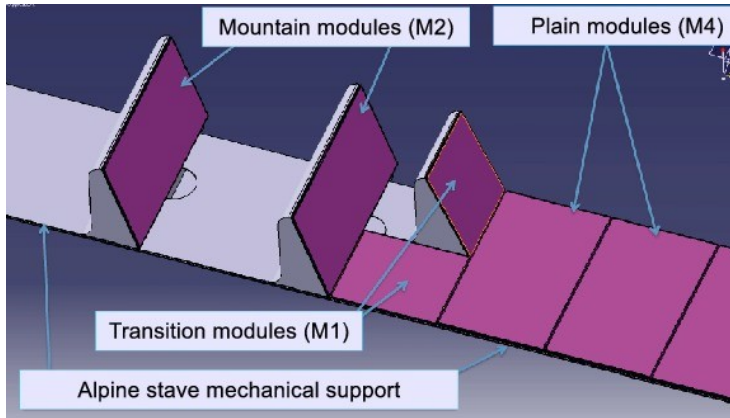
Pixels inclinés



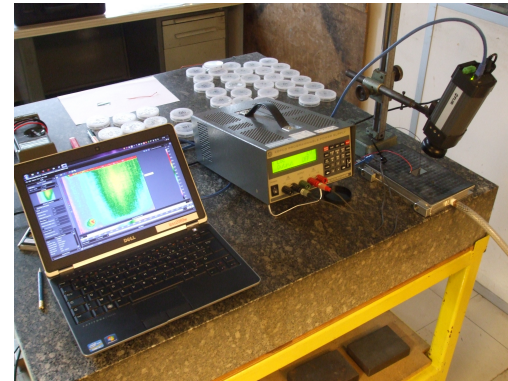
Proto d'échelle à pixels inclinés



Prototypes

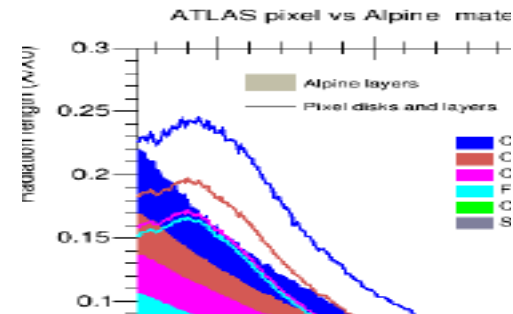
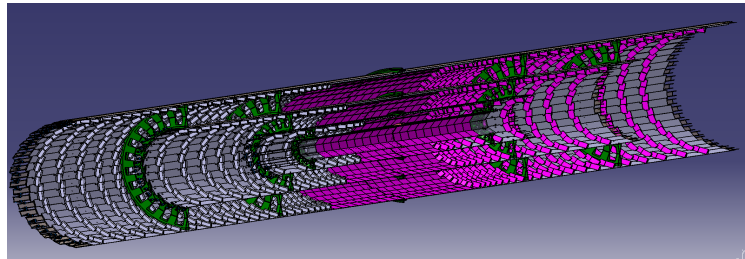


Collaboration
LAPP
LPSC



Performance Simulation

- Inclined-specific software developed by LAPP and LPSC.
 - Detector geometry description (including services)
 - Tracking geometry description
 - Simulation studies being performed
 - Trigger performance studies
- Test different layouts - determine best layout for physics results.
- Optimisation of layouts:
 - Minimal material required: less material → better physics results
 - Determine best sensor layout for particle track resolution



Conclusion

- ⇒ Projet ITk : projet de 10 ans
- ⇒ TDR dû fin 2017.
- ⇒ Collaboration possible sur les aspects :
 - ⇒ simulation de performances
 - ⇒ mécaniques
 - ⇒ test de prototypes sur faisceau