



Tracking Software Status for FCC-hh

A. Salzburger (CERN) - for the ACTS developers

ACTS status - **framework**

- ▶ ATLAS TIM meeting in Glasgow
 - ACTS hands-on session:
 - solved big outstanding issue how to encapsulate ACTS fully from ATLAS and still use it, in ATLAS, Gaudi, elsewhere as part of the framework
- ▶ ACTS now can run stand-alone on your laptop
 - with a mini framework to mimic Athena/Gaudi behaviour
 - boost in development speed
 - easier to start development on pattern strategy

ACTS status - geometry

- ▶ Geometry modules are almost complete now (for Tracker)

- input from different sources:

DD4Hep (with TGeo modelling):

FCC description

GDML (with TGeo modelling)

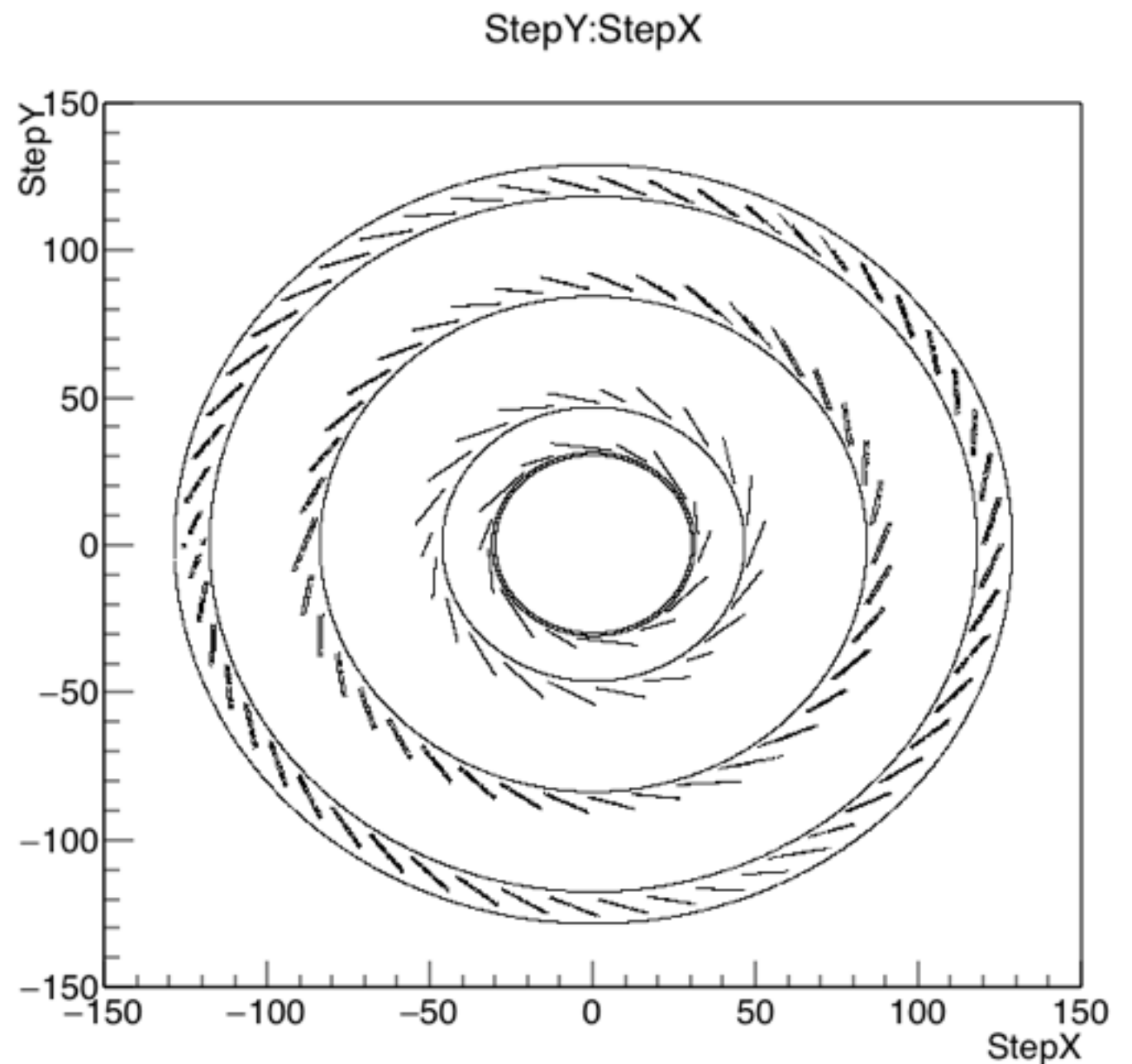
Geant4 description

Generic input via python

Test description, ML challenge

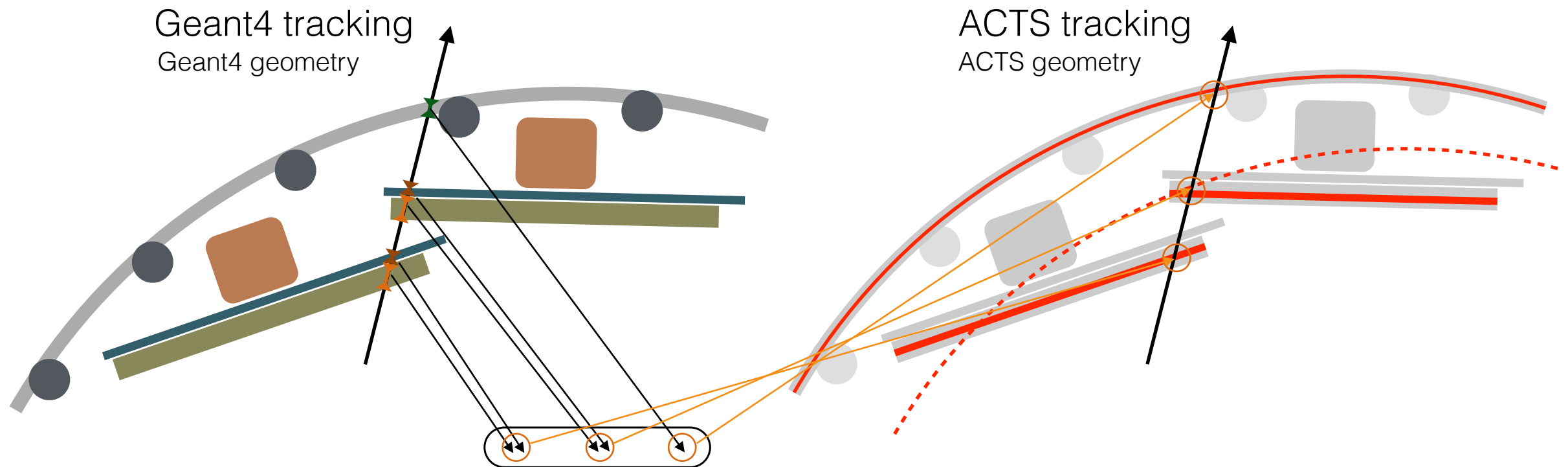
- ▶ Next steps:

- integration of calorimeter description
dense volumes and cell description,
for particle flow, etc.



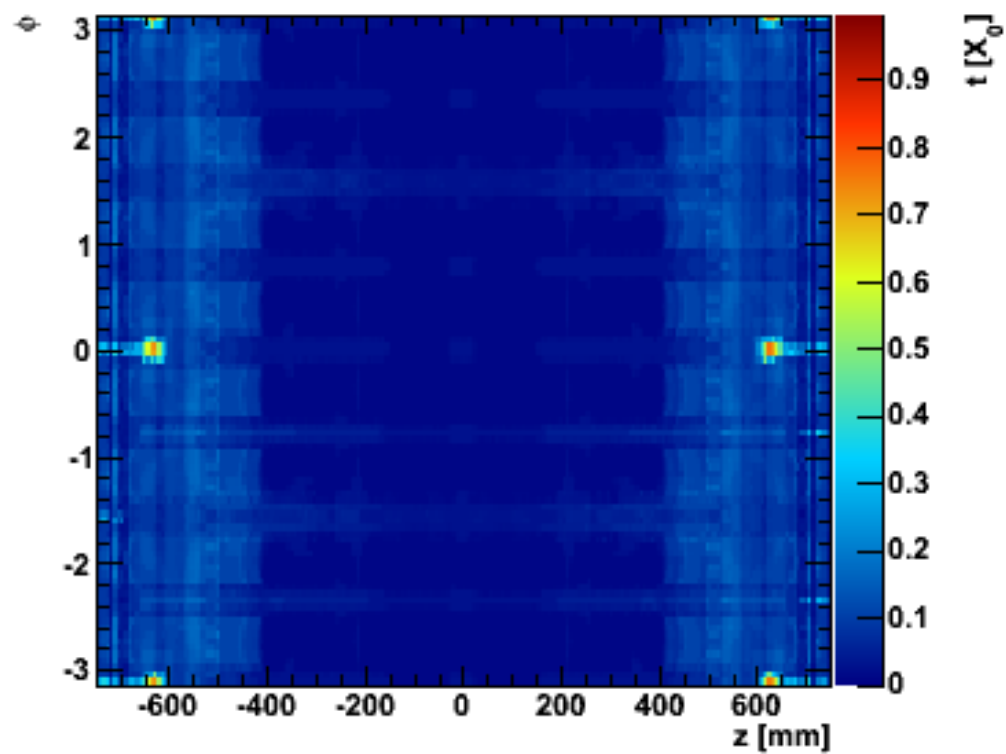
ACTS status - material

- ▶ Material mapping mechanism implemented
 - automated transcription from Geant4 to ACTS (fast turnaround)

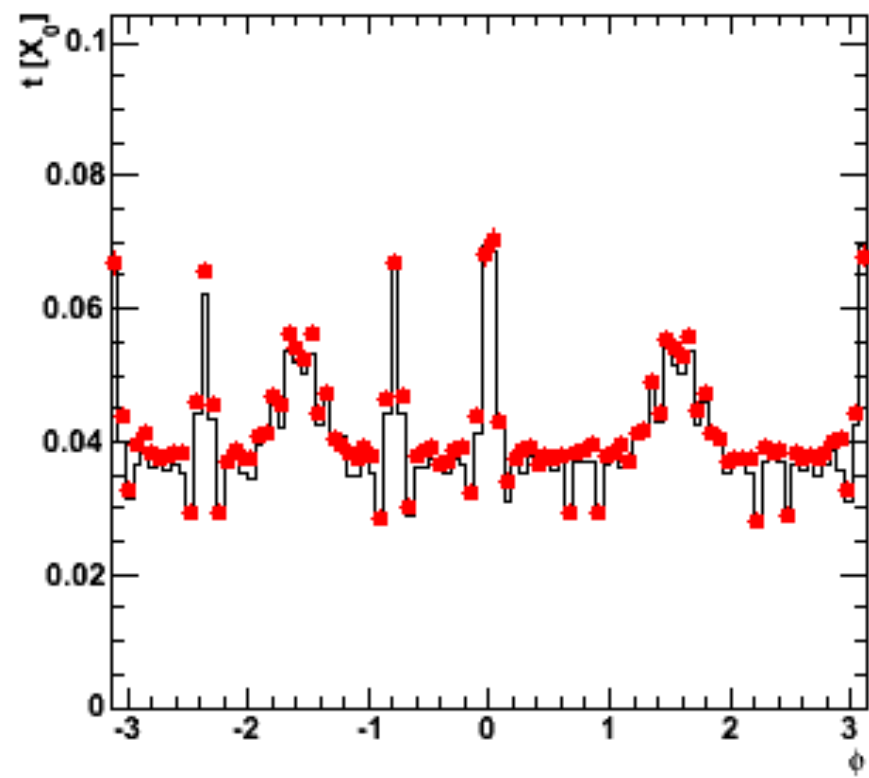
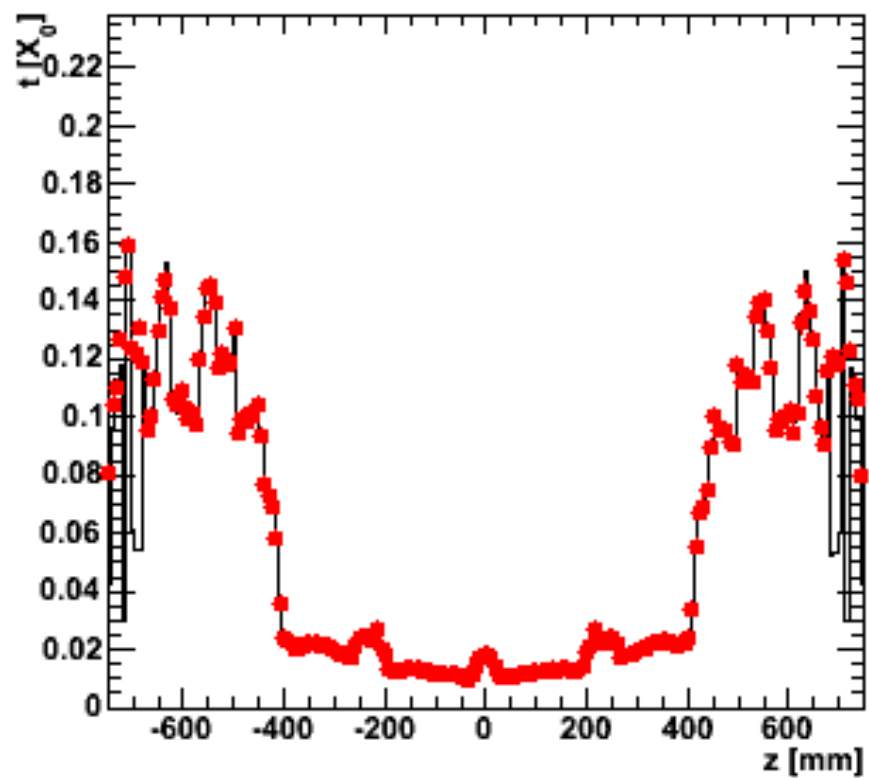
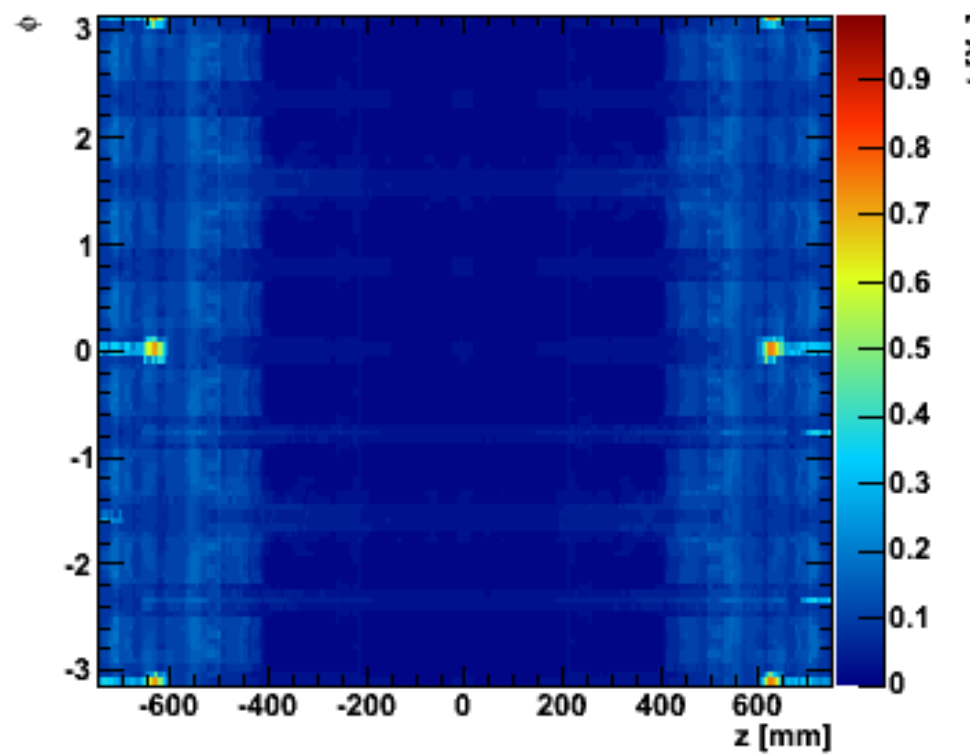


- ▶ Next steps:
 - demonstration with ATLAS, FCC description
target: avg. $\sim 1\%$ discrepancy Geant4/ACTS
 - full support of atomic properties for nuclear interactions in fast track simulation

Geant4 geometry



ATLAS Tracking geometry



ACTS status - **track fitting**

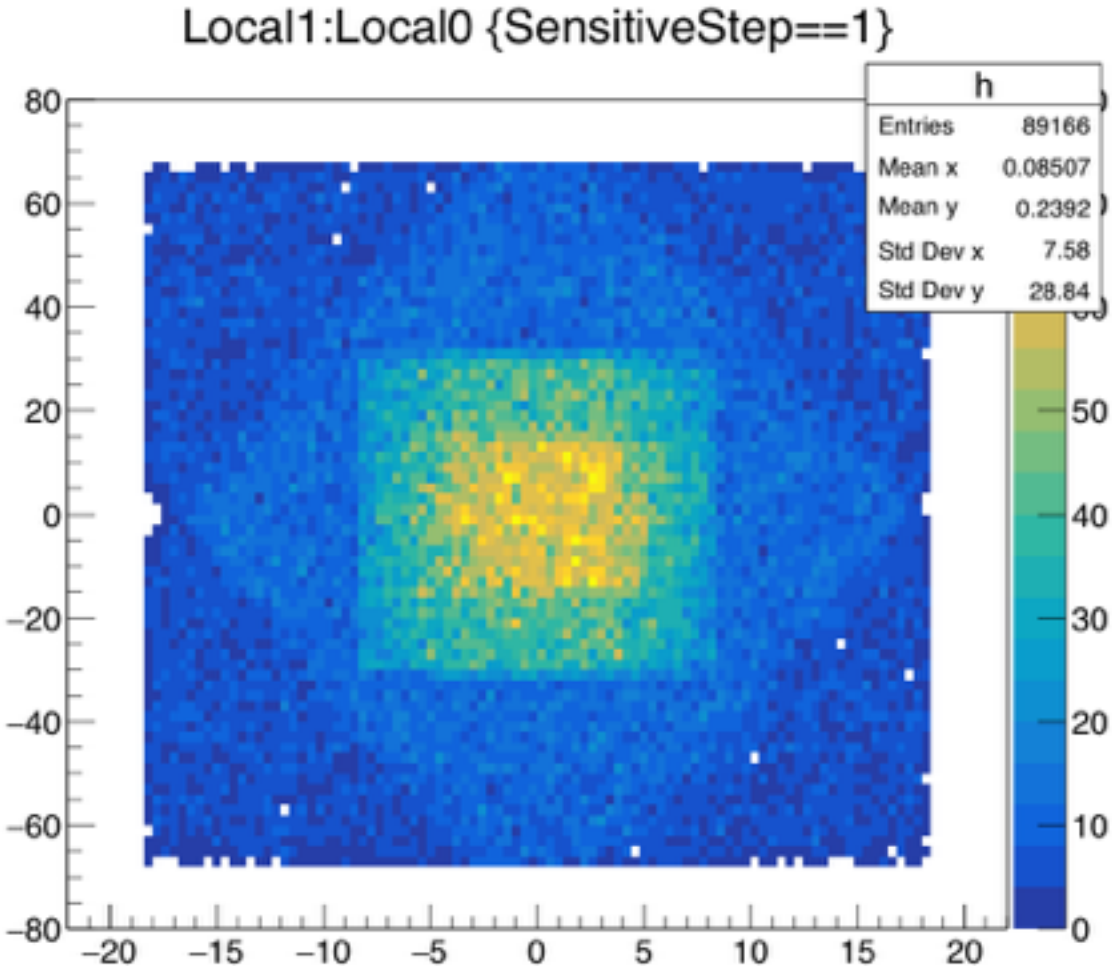
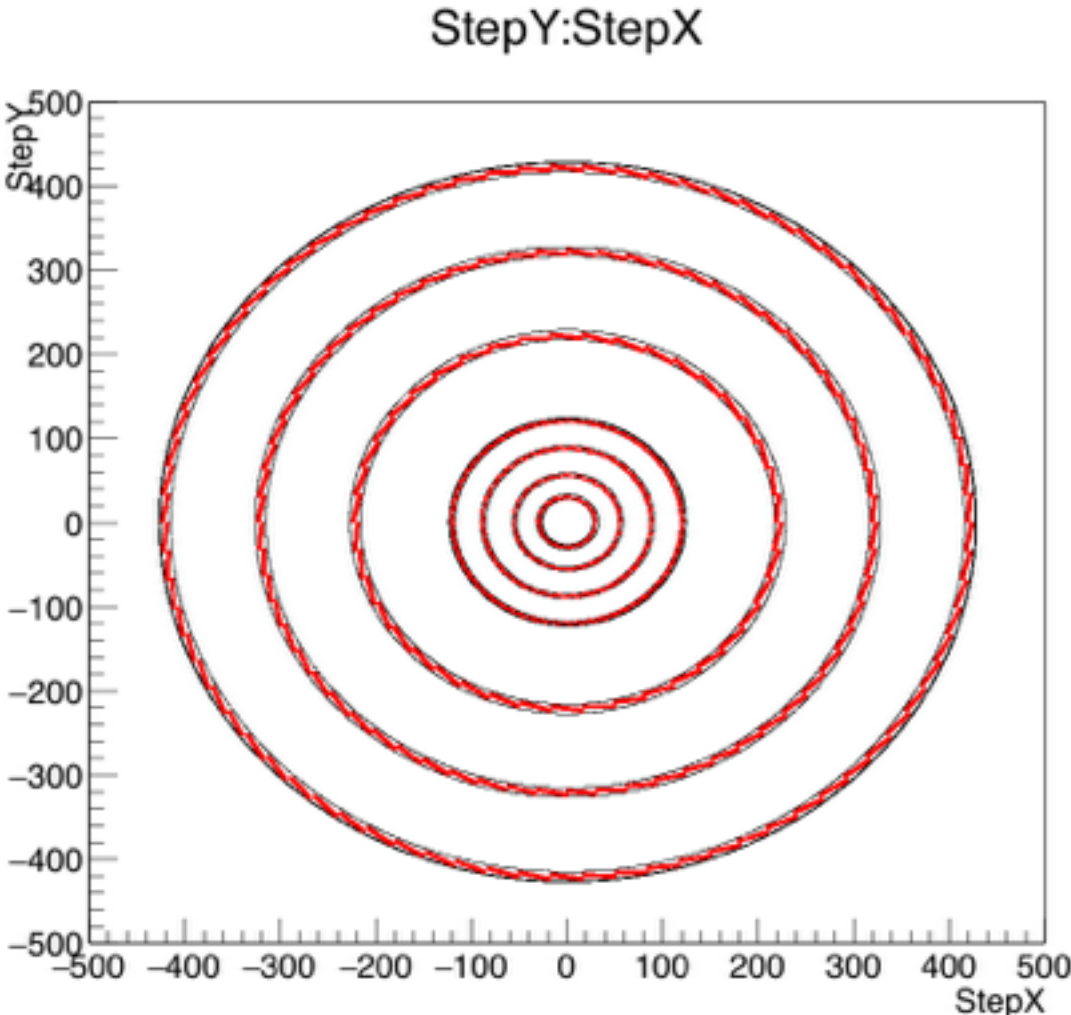
- ▶ First Kalman filter implemented
 - uses ACTS fast simulation engine (limited for the moment)
 - uses resolution smearing
 - test version running with
Generic detector in ACTS

- ▶ Next steps
 - extend with fully implemented ACTS fast simulation & clustering
 - test with ATLAS setup & validate against ATLAS results
 - test with FCC-hh setup

ACTS status - **fast track simulation**























- ▶ Basic hit simulation is already part of ACTS core
 - MC based material interactions needed, most code available in ATLAS/CMS/Geant4 repository opened
 - ACTS Core already designed to have this functionality
- ▶ Next steps
 - transcribe material interaction samplers
 - validate on ATLAS vs ACTS-ATLAS
 - run on FCC-hh detector

ACTS generic layer detector with pixels & strips
sensitive hits in red



ACTS status - pattern recognition

- ▶ No implementation so far
 - putting together a small developers team (currently growing)

acts group members 8		Find existing member by name	🔍
 Robert Johannes Langenberg rlangenb	Developer		
 Moritz Kiehn msmk	Developer		
 Davide Costanzo costanzo	Developer		
 Valentin Volkl vavolkl	Developer		
 Noemi Calace ncalace	Developer		
 Julia Hrdinka jhrdinka	Developer		
 Christian Gumpert cgumpert	Master		
 Andreas Salzburger asalzbur it's you	Owner		

- ▶ Next steps:
 - transcribe ATLAS pattern recognition into ACTS
 - implement a tracklet based pattern recognition

FCC-hh rough integration timeline

- a) Finalisation of DD4Hep tracker to ACTS geometry
 - O(1 month) with validation of material budget

- b) Implementation of fast simulation
 - end of september (but full sim can be used as input earlier)

- c) Track fitting test
 - needs geometry first and the fast simulation

- d) First pattern recognition tests
 - end of the year (?)