1

BFC TESTS WITH DEV13 GEOMETRY

1. Timing : comparison with simplified geometry
2. Issues, clarity (The many/only problem)
3. Numbering schemes
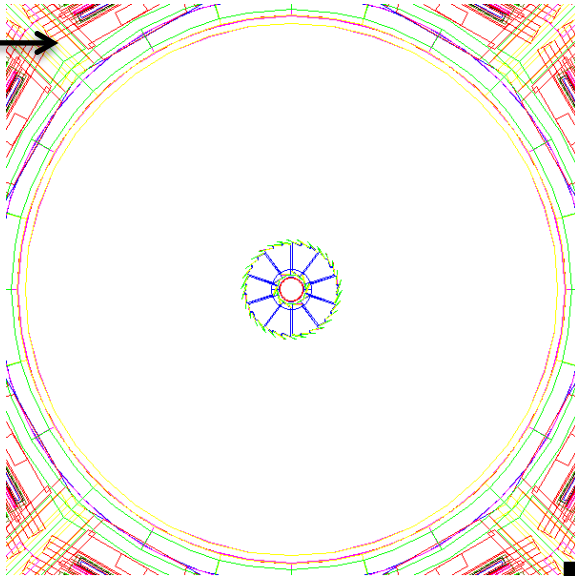4. Code the BFC work with simple tracks

HIJING TIME PROCESSING

- Use STARSIM to record the mean time per event (the value is provided by STARSIM itself at the end of the process).
- Pions in $0.1 < Pt < 5$ flat, uniform in φ, $|\eta| < 1$
- Number of pions per event goes from 10 to 100
  - pixlGeo00 : simplified PXL + new beam pipe
  - pixlGeo4 : detailed PXL + new beam pipe
  - Both use dev13 geometry to have the same STAR detectors environment.
- The average is done over 10,50 and 100 events
  - The difference when choosing a larger number of events is small and is represented in the error bars.
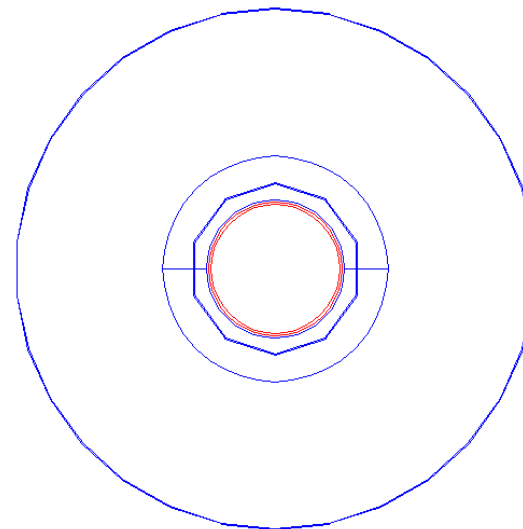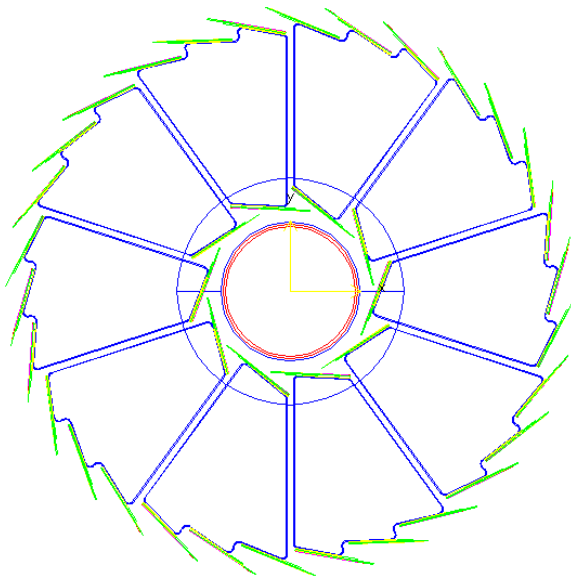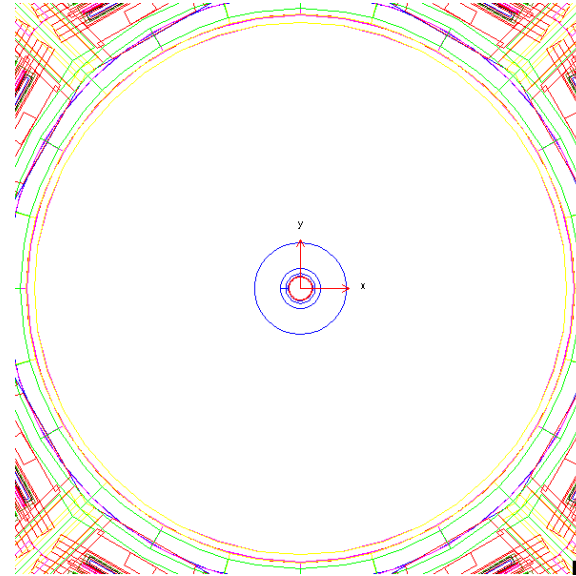
GEOMETRIES
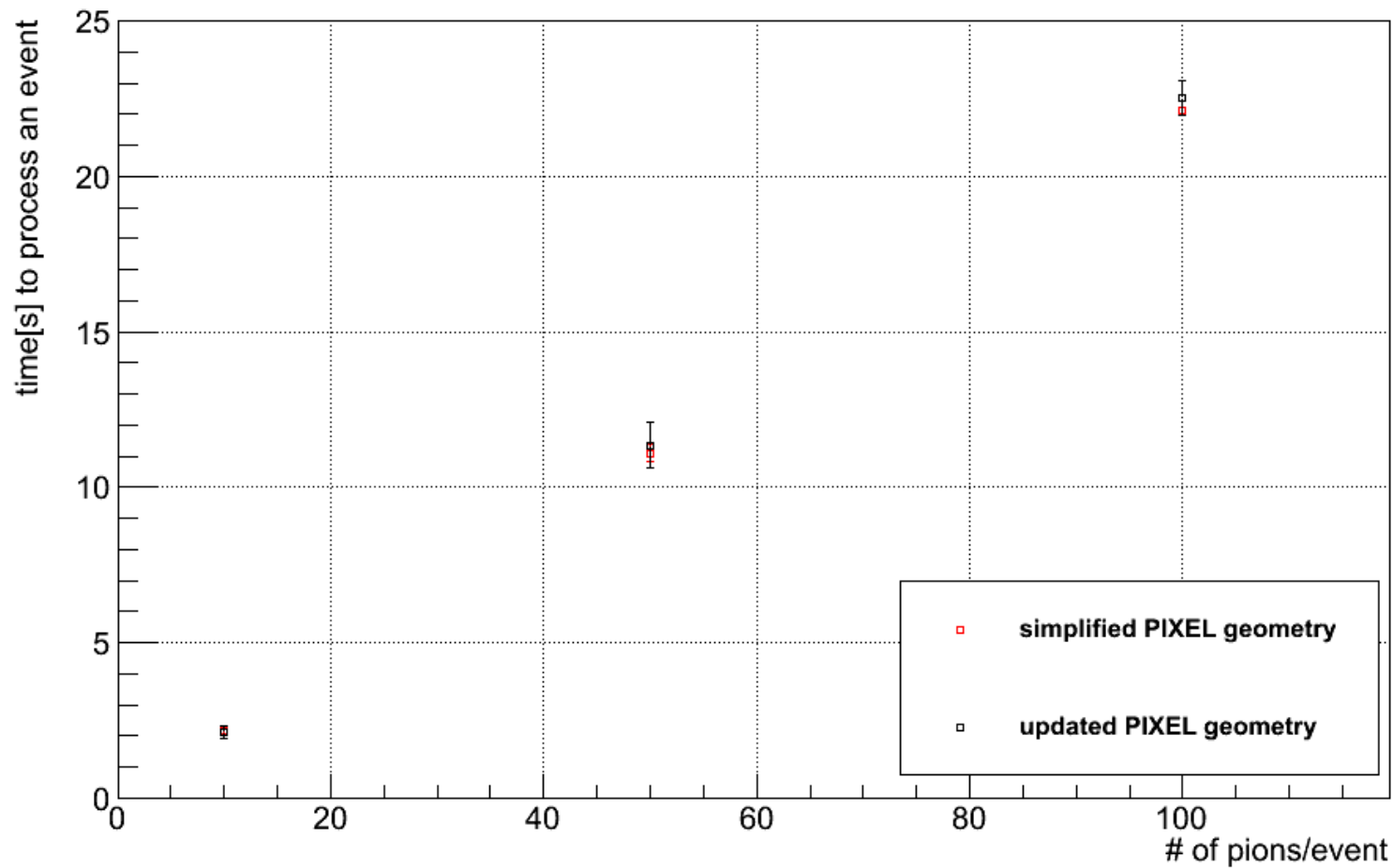
Including new pixel geometry   Including simplified pixel geometry

TPC →

outer

inner

- The difference in HIJING event time processing is very small between a simplified PXL (**pixlgeo00 : 2 cylinders**) and the detailed PXL geometry (**pixlGeo4**).

KONLY CHOICE
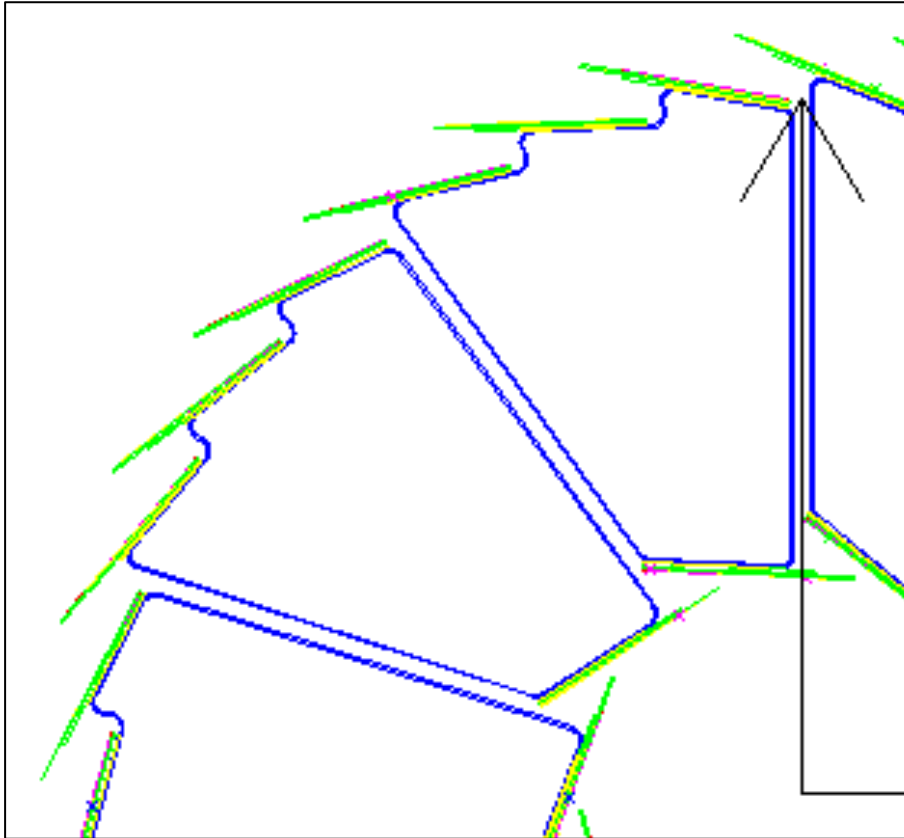
- Konly is used to indicate whether or not the volume is expected to overlap another volume at the same level in the geometry tree.
  - Konly="ONLY" means no overlap.
  - Konly="MANY" means overlap is possible.
- Left : hits in PIXEL (from pions event).

- We see a track giving a hit in the inner layer of a sector and 2 hits in the adjacent sector.

- therefore *MANY* for the sector volume is needed.

# LADDER/SECTOR NUMBERING SCHEME

- Goal : follow STARNOTE CSN-229B related to STAR numbering elements : counterclockwise when looking from the WEST to the EAST).

- For the pixel the goal was to implement ladders/sectors numbering scheme in the simulation file (PixlGeo04.xml) so that it has the "right" scheme.

- Each GEANT hit has a volume_id (combination of sector_id and ladder_id) :

  - Taking the existing decoding used for the simplified geometry (2 layers, 10 and 30 ladders) gives the desired decoding :

    - $1 \leq$ sector ≤ 10
    - $1 \leq$ ladder ≤ 4
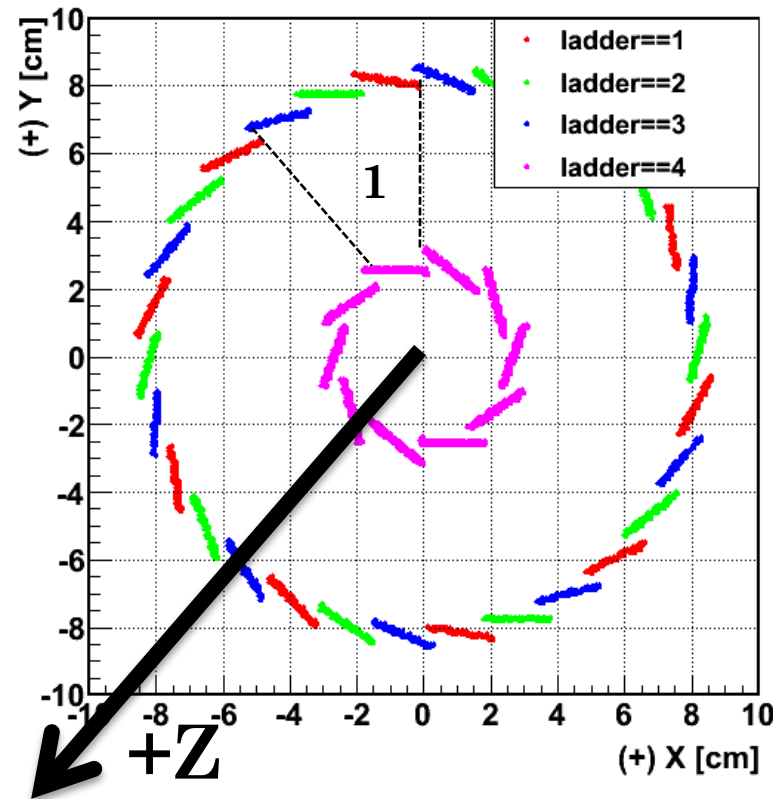
SOFTWARE

- For starsim :
  - geometry with AgML has to be built with the command :
    ```
    gexe .$STAR_HOST_SYS/lib/xgeometry.so
    ```
- Makers:
  - StPixelFastSimMaker and StMcEvent have been modified to use the new decoding of active ladders.
  - StiPixelDetectorBuilder and StiPixelHitLoader have to be modified.
- BFC chain :
  - An option has been created in BFC chain to run the new geometry 'dev13' : the timestamp is set to 2020
  - library used = eval
  - Code crashed when I used trs (aka old TPC code)
    - Using new TPC reco (TpcRs,TpcRaw,TpcClu) works perfectly but 'perfect' tables have to be used (Yuri suggested to use tables from year 2010 and rename them by dev13)
  - Chain is : run 'bfc.C(1,1,"dev13,AgML,-ITTF,-Sti,tpcI,TpcRS,TpxRaw,TpxClu,pixFastSim,-ssdfast,VFMCE,McEvent,geant,IdTruth,fzin,StiRnd,PixelIT,-IstIT,NoSvtIt,NoSsdIt,StiPulls,analysis,IdTruth,tags, "myfile.fz")'

SOFTWARE STATUS

Task

MAKER/code

GEOMETRY	PixlGeo4.xml Pipev1.xml PxstGeo1.xml	YES
GEANT	StMcPixelHitCollection StMcPixelHits	YES
RECONSTRUCTION	StPixelFastSimMaker	YES
TRACKING (Sti)	StiPixelDetectorBuilder StiPixelHitLoader	partially
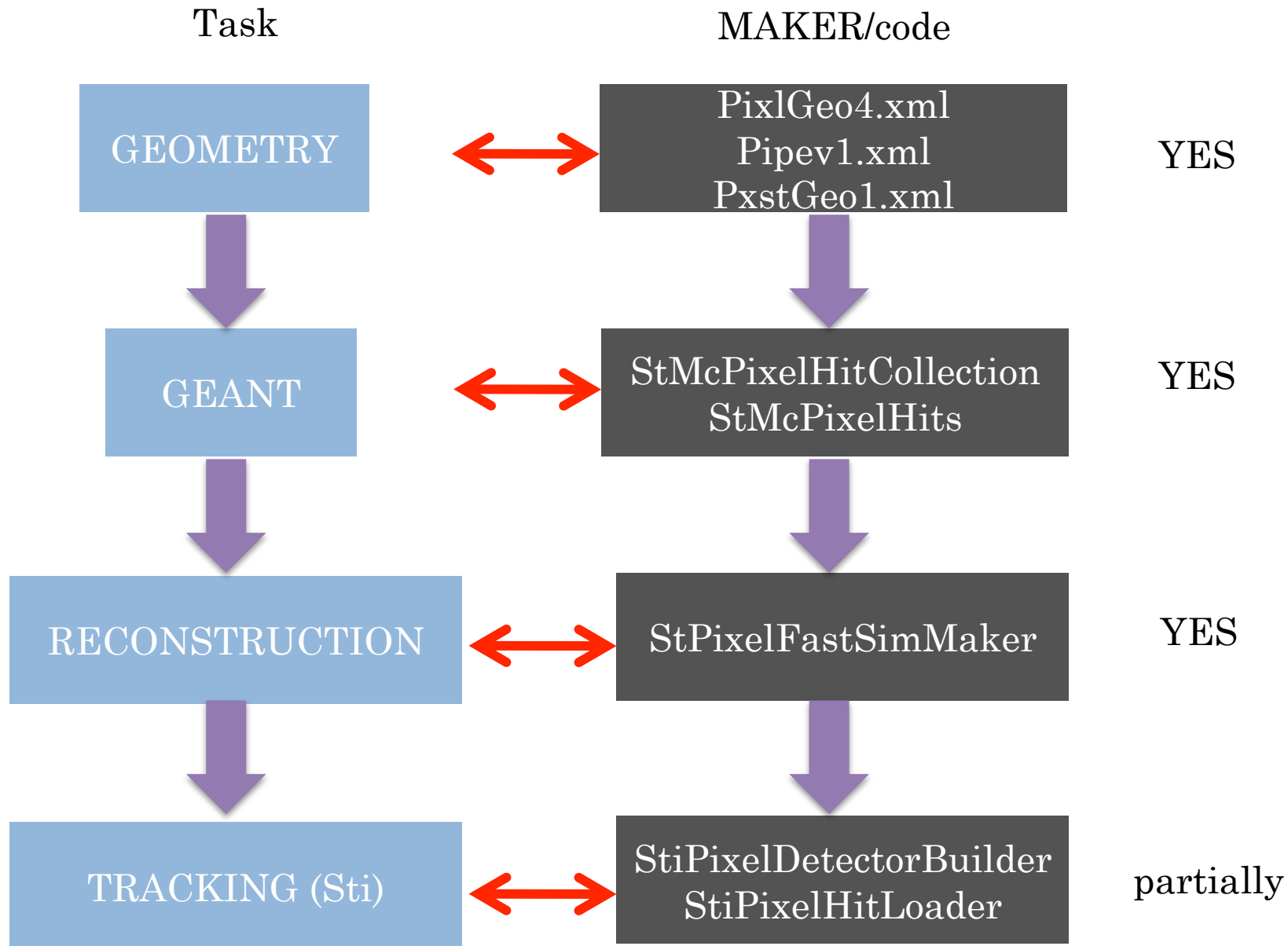
STATUS : BREAKDOWN BY SUBSYSTEM

Subsystem/ GEANT volume	in AgML	source	Compile ?	BFC working	Material, radiation length OK ?	Overlap test (slide 14 to 16)
PXL	yes	Translati on SW to TGeo	yes	Yes ; issue with tracking*	yes	yes
PIT	yes	SW	yes	X	To do	yes
PST	yes	SW	yes	X	To do	yes

* paths, GEANT names are correct when loaded in StiPixelDetectorBuilder.

• Hits are loaded at the correct locations but the tracker (Sti) reports no Hft hits used.

➔ mix between active and passive layer (?)

☹ Overlap test shows that the new volumes are within the top 10 (over 2550 volumes of `dev13` geometry) having the large number of overlaps/extrusions.

SUMMARY

- The first steps of the reconstruction chain within STAR-software is done :
  - Decoding GEANT hits.
  - Reconstruction (actually loading) of hits with a FastSimulator.
- The final step (hits used in tracking) is in progress.
- Some checks need to be done :
  - Impact of the new (detailed) geometry vs. the old (simpler) geometry on the tracking (single track) : (orientation of ladders.
  - Impact on physics (additional material budget impact).
  - Comparison with previous studies.
- Near future : single track/D^0 studies with Hft prototype including the detailed geometry.
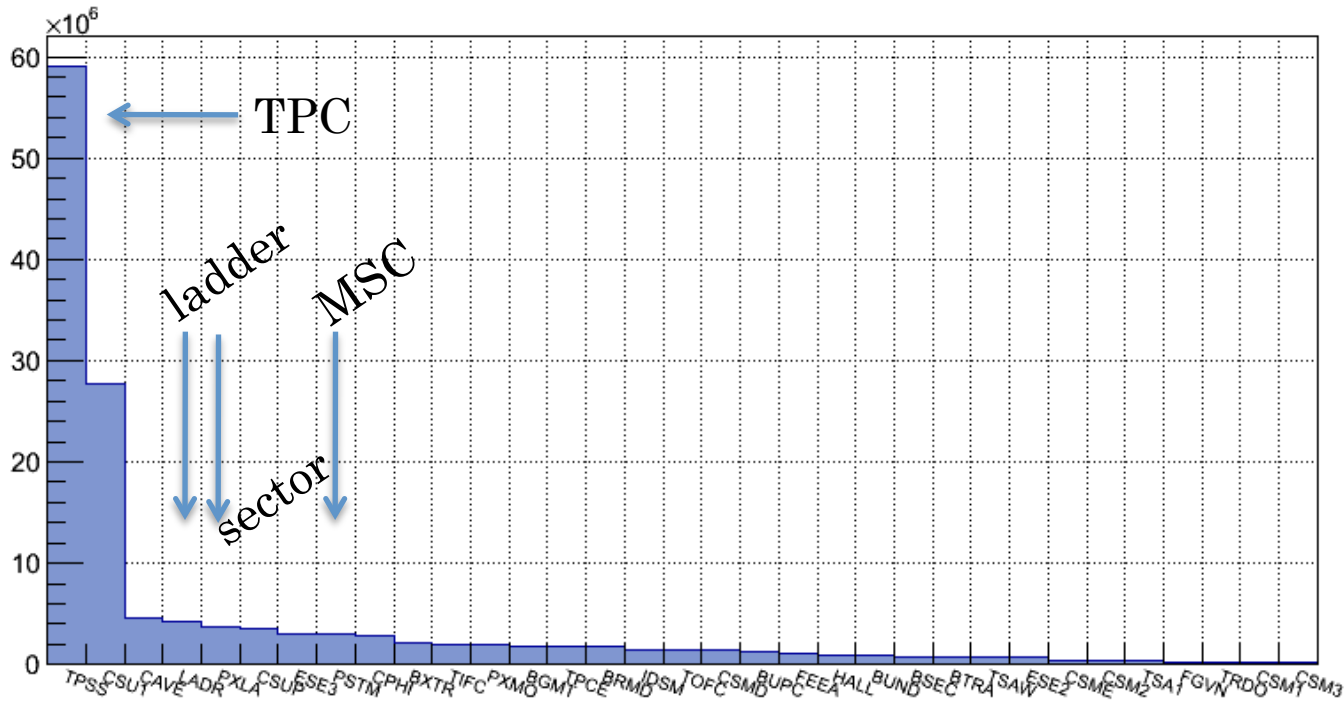
END

11

TGEOCHECKER

percent of time spent per volume
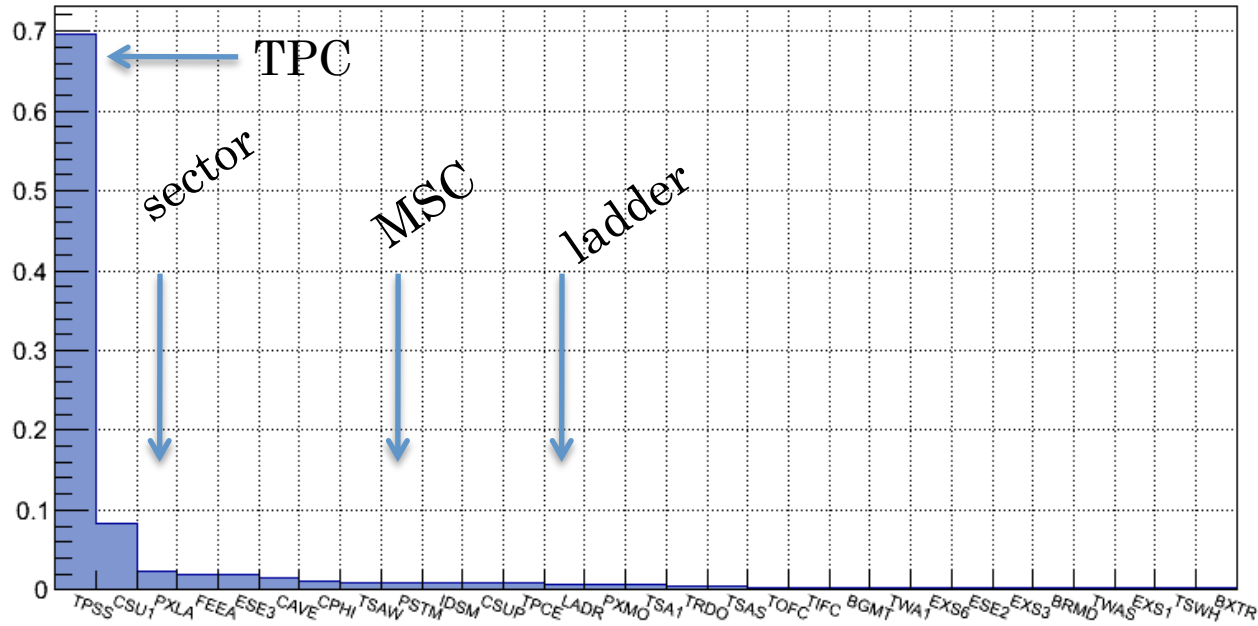
- It looks like the volumes corresponding for the sector and ladder (PIXL), as well the MSC show a large amount of time per volume.

TGEOCHECKER

number of boundary crossings per volume

- It looks like the volumes corresponding for the sector and ladder (PIXL), as well the MSC show a large number of crossings volumes (potential overlap)

- root [2] dev13->CheckOverlaps()Warning in <TGeoManager::Init>: Deleting previous geometry: dev13/dev13 | dysonInfo in <TGeoManager::CloseGeometry>: Geometry loaded from file...Info in <TGeoManager::SetTopVolume>: Top volume is HALL. Master volume is HALLInfo in <TGeoManager::CloseGeometry>: Voxelization retrieved from fileInfo in <TGeoManager::CloseGeometry>: 257153 nodes/ 2553 volume UID's in dev13 | dysonInfo in <TGeoManager::CloseGeometry>: ----------------modeler ready---------------Info in <TGeoNodeMatrix::CheckOverlaps>: Checking overlaps for HALL and daughters within 0.1Check overlaps: [==========] 257153 [100.00 %]   TIME 00:00:06   Info in <TGeoNodeMatrix::CheckOverlaps>: **Number of illegal overlaps/ extrusions : 136**

- root [3] dev13->PrintOverlaps()=== Overlaps for dev13 === = Overlap ov00000: PSTM extruded by: PSTM/PITN_1 ovlp=219.5 = Overlap ov00001: PSTM extruded by: PSTM/APFE_1 ovlp=219.5 = Overlap ov00002: PSTM extruded by: PSTM/APRD_1 ovlp=219.5 = Overlap ov00003: PSTM extruded by: PSTM/APRC_1 ovlp=219.5 = Overlap ov00004: PSTM extruded by: PSTM/APRB_1 ovlp=219.5 = Overlap ov00005: PSTM extruded by: PSTM/APRA_1 ovlp=219.5 = Overlap ov00006: PSTM extruded by: PSTM/APFD_1 ovlp=219.4 = Overlap ov00007: PSTM extruded by: PSTM/APFF_1 ovlp=219.4 = Overlap ov00008: PSTM extruded by: PSTM/APFH_1 ovlp=167.8 = Overlap ov00009: PSTM extruded by: PSTM/APFG_1 ovlp=167.7 = Overlap ov00010: PSTM extruded by: PSTM/APFI_1 ovlp=167.7=

- Overlap ov00013: PSTM extruded by: PSTM/APFA_1 ovlp=6.3 = Overlap ov00014: PSTM extruded by: PSTM/APFC_1 ovlp=4.4 = Overlap ov00015: PSTM extruded by: PSTM/APFB_1 ovlp=3.8 = Overlap ov00016: PSTM extruded by: PSTM/MTPA_1 ovlp=3.7 = Overlap ov00017: PSTM extruded by: PSTM/MTPF_1 ovlp=3.7 = Overlap ov00018: PSTM extruded by: PSTM/MTPF_2 ovlp=3.7 = Overlap ov00019: PSTM extruded by: PSTM/MTPB_1 ovlp=3.7 = Overlap ov00020: PSTM extruded by: PSTM/BPRS_1 ovlp=3.4 = Overlap ov00021: PSTM extruded by: PSTM/MTPG_2 ovlp=3.1 = Overlap ov00022: PSTM extruded by: PSTM/MTPG_1 ovlp=3.1 = Overlap ov00023: PSTM extruded by: PSTM/RBPP_1 ovlp=2.5 = Overlap ov00024: PSTM extruded by: PSTM/BPPC_1 ovlp=2.5 = Overlap ov00025: PSTM extruded by: PSTM/EBPP_1 ovlp=2.5=

Overlap ov00034: PXLA extruded by: PXLA/PXCG_1 ovlp=2.26 = Overlap ov00035: PXLA extruded by: PXLA/PXCE_1 ovlp=2.26 = Overlap ov00036: PXLA extruded by: PXLA/PXCF_1 ovlp=2.26 = Overlap ov00037: PXLA extruded by: PXLA/PXCB_1 ovlp=2.26 = Overlap ov00038: PXLA extruded by: PXLA/PXCH_1 ovlp=2.26 = Overlap ov00039: PXLA extruded by: PXLA/PXCC_1 ovlp=2.26 = Overlap ov00040: PXLA extruded by: PXLA/PXCD_1 ovlp=2.26 = Overlap ov00041: PXLA extruded by: PXLA/PXRB_1 ovlp=2.26 = Overlap ov00042: PXLA extruded by: PXLA/PXLB_1 ovlp=2.26 = Overlap ov00043: PXLA extruded by: PXLA/PXIB_1 ovlp=2.26 = Overlap ov00044: PXLA extruded by: PXLA/PXTR_1 ovlp=2.26 = Overlap ov00045: PXLA extruded by: PXLA/PXTM_1 ovlp=2.26 = Overlap ov00046: PXLA extruded by: PXLA/PXTL_1 ovlp=2.26 = Overlap ov00047: PXLA extruded by: PXLA/PXTJ_1 ovlp=2.26 = Overlap ov00048: PXLA extruded by: PXLA/PXTJ_2 ovlp=2.26 = Overlap ov00049: PXLA extruded by: PXLA/PXCA_1 ovlp=2.26 = Overlap ov00056: PSTM extruded by: PSTM/MTPC_1 ovlp=1.1 = Overlap ov00057: PSTM extruded by: PSTM/MTPD_1 ovlp=0.7694 Overlap ov00058: PXLA extruded by: PXLA/LADR_4 ovlp=0.620322 Overlap ov00060: PXLA extruded by: PXLA/LADR_3 ovlp=0.56956 Overlap ov00093: CAVE/PIPE_1 overlapping CAVE/IDSM_1 ovlp=1.2425