IST Sti Geometry

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IST Sti geometry status

Active material in StiIst: six silicon sensors are described by a thin planar shape

//IBSS shape (inactive edge excluded) : DX =1.9008cm ; DY = 0.015cm ; DZ = 3.765 cm

```
StiShape *sh  = new StiPlanarShape(name,
                                   kIstNumSensorsPerLadder * (box->GetDZ() + 0.10), // halfDepth + inactive-edge 0.16/2 + sensor gap 0.04/2
                                   2 * box->GetDY(),          // thickness
                                   box->GetDX());             // halfWidth
```

Inactive materials in StiIst: all the in-active materials are defined by box/tube shapes

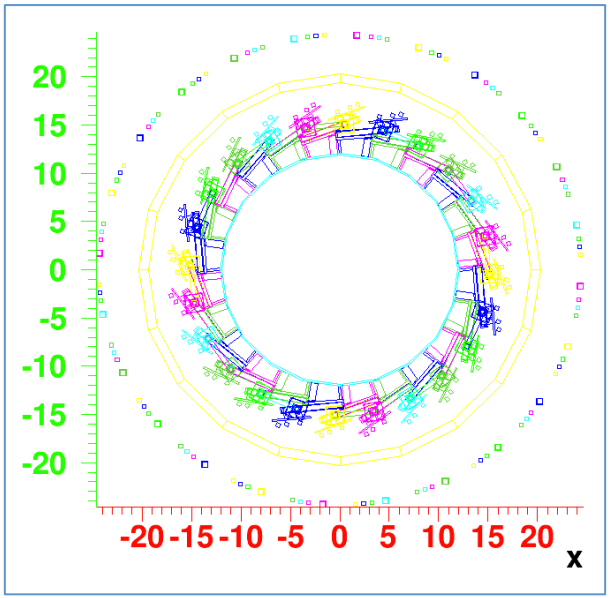
```
// Build average inactive volumes
const VolumeMap_t volumes[] = {
    {"IHTC", "Top Kapton hybrid east box volume",                    "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//kapton hybrid
    {"IHTH", "Top Kapton hybrid west box volume",                    "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"IHBC", "Bottom Kapton hybrid east volume",                     "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"IHBH", "Bottom Kapton hybrid west volume",                     "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"IHHC", "North Kapton hybrid edge tub volume",                  "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICFC", "carbon foam east box volume",                          "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//carbon foam
    {"ICFD", "carbon foam west box volume",                          "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICCU", "CFRPMix honeycomb east box volume",                    "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//carbon honeycomb
    {"ICCD", "CFRPMix honeycomb west box volume",                    "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISTC", "top carbon fiber skin east box volume",                "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//top carbon skin
    {"ISTH", "top carbon fiber skin west box volume",                "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISBC", "bottom carbon fiber skin east box volume",             "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//bottom carbon skin
    {"ISBH", "bottom carbon fiber skin west box volume",             "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"IECE", "east aluminum end-cap box volume",                     "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//east AL end-cap
    {"IECW", "west PEEK CF 30 end-cap box volume",                   "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//west carbon end-cap
    {"ICTC", "middle aluminum cooling tube volume",                  "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//middle cooling tube
    {"ICTE", "middle aluminum cooling tube east cone volume",        "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICTW", "middle aluminum cooling tube west cone volume",        "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"IBCW", "middle Novec 7200 cooling liquid volume",              "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//liquid coolant
    {"IBRB", "G10 T-board box volume",                               "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//T-Board
    {"IRSA", "Delrin T-board slot A box volume",                     "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//connectors
    {"IRSB", "Delrin T-board slot B box volume",                     "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"IRSC", "Delrin T-board slot C box volume",                     "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"IBTS", "Slicon thermal sensor box volume",                     "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//thermal sensor
    {"IBAP", "inactive silicon volume APV chips",                    "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//APV chips
    {"ISCA", "east short cable A volume",                            "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//east short cables
    {"ISCB", "east short cable B volume",                            "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISCC", "east short cable C volume",                            "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICLE", "east short tube liquid volume",                        "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//east liquid coolant
    {"ICTJ", "east short cooling tube joint volume",                 "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//east cooling tube joint volume
    {"ICTA", "east short cooling tube connector volume",             "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//east cooling tube connector volume
    {"ICTB", "east short cooling tube right volume",                 "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//east cooling tube right volume
    {"ICJS", "west cooling loop left tube volume",                   "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICJA", "west cooling loop left cone volume",                   "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICJU", "west cooling loop left connector volume",              "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICLN", "west cooling loop right liquid volume",                "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISRR", "PEEK CF 30 support block south side sub-volume",       "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},//support block
    {"ISRB", "PEEK CF 30 support block north side sub-volume",       "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISRL", "PEEK CF 30 support block trapezoid sub-volume volume","HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISRO", "PEEK CF 30 support block top-right volume",            "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISRC", "PEEK CF 30 support block trapezoid volume",            "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ISRS", "PEEK CF 30 support block small box volume",            "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1/IBMO_1","","",},
    {"ICCT", "Cooling line and cablings in transition area",         "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1","","",},
    {"ICCA", "Copper cablings on PIT",                               "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1","","",},
    {"ICCL", "Al cooling lines on PIT",                              "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1","","",},
    {"ICLP", "Liquid coolant on PIT",                                "HALL_1/CAVE_1/TpcRefSys_1/IDSM_1","","",}
};
```

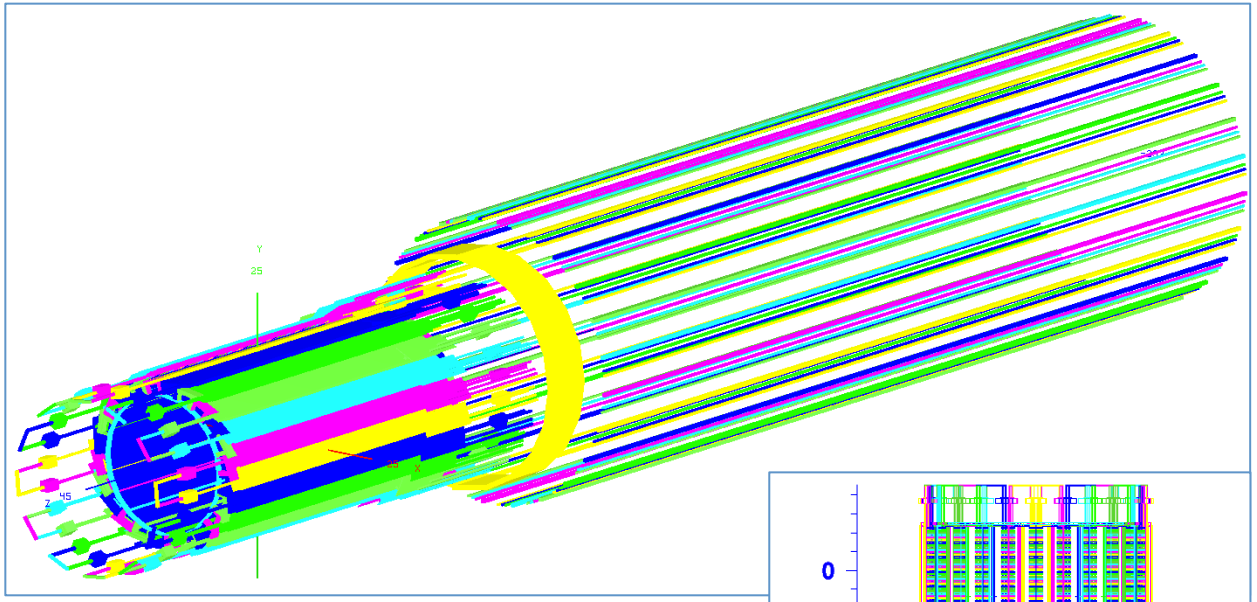
Re-definitions:

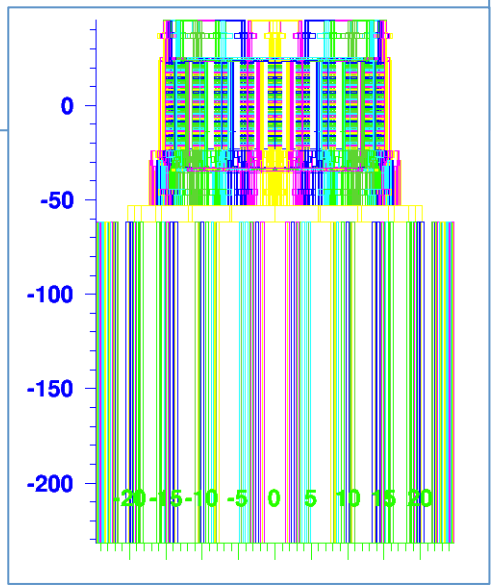
- Re-define/re-place carbon foam stave, west & east end-caps to avoid overlapping for cooling tube/ coolant volumes.
- The support blocks are redefined.
- Minor adjustments for cooling/cabling volume in PST-PIT transition area and west cooling loops.

IST Sti geometry status

The IST inactive materials are described by simple box/tube shapes without overlapping/ enclosed volumes in its latest Sti geometry (closely done in my view).







Top-left: Sti geometry in XOY perspective view
Top-right: Sti geometry in XYZ orthographic view
Bottom-right: Sti geometry in YOZ perspective view

IST sensitive material coverage along Z: (-23.2 cm, 23.2 cm)

Details can be found at drupal page:
https://drupal.star.bnl.gov/STAR/blog/ypwang/ist-sti-geometry

IST Sti geometry test -- data

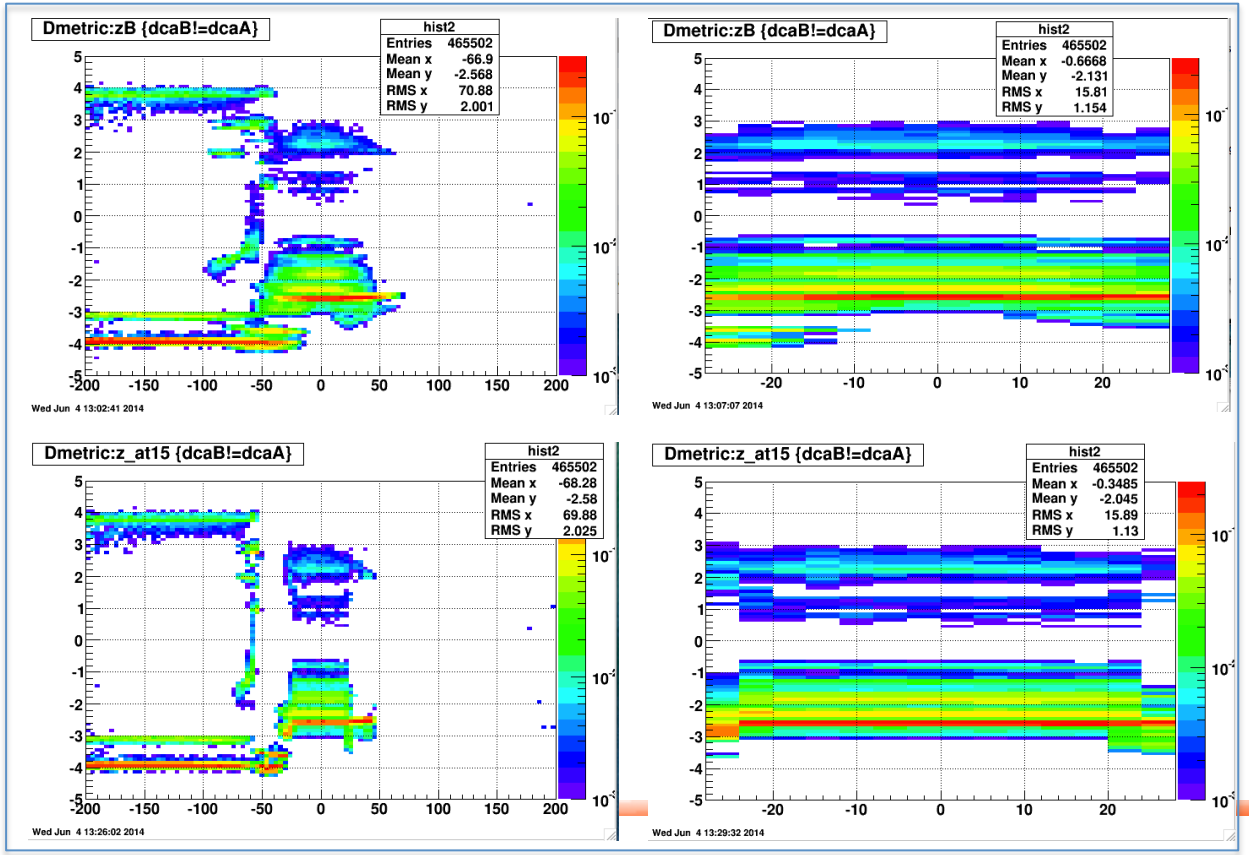
The track-by-track test for the latest IST Sti geometry with the tool provided by Gene.

A) Test with real data: **19985 events in /star/data03/daq/2014/047/15047100/st_physics_15047100_raw_2500001.daq**

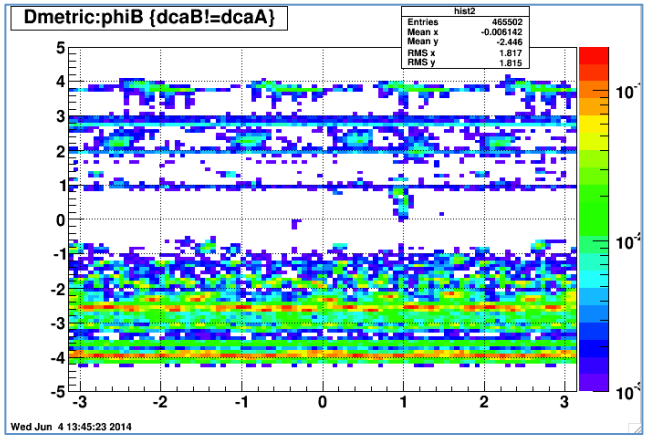
1) Default chain option: **"P2014a,btof,BEmcChkStat,Corr4,OSpaceZ2,OGridLeak3D,SCScalerCal,goptSCE100051,-hitfilt"**

2) Chain without IST geometry: **"P2014a,btof,BEmcChkStat,Corr4,OSpaceZ2,OGridLeak3D,SCScalerCal,goptSCE100051,-hitfilt,-StiIst,-IstIT"**

DMetric vs. Z_DCA (DMetric ~ -2.6):



DMetric vs. Phi:



Details at drupal page: https://drupal.star.bnl.gov/STAR/blog/ypwang/ist-sti-geometry-test

IST Sti geometry test -- simulation

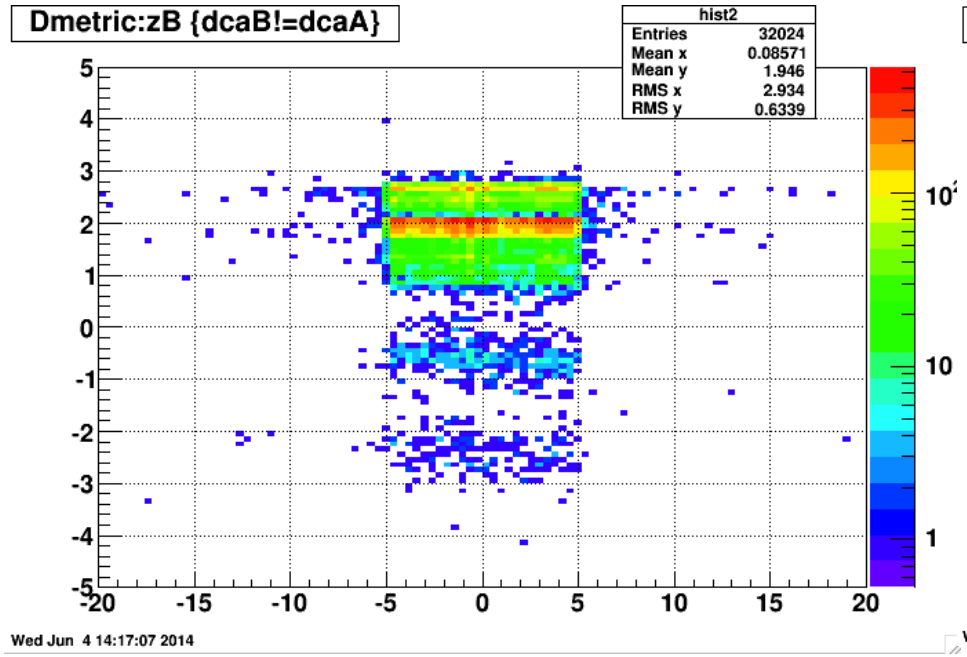
B) Test with simulation data: **simulation samples produced by Yifei (Simple simulation with the Y2014 geometry. 100 pions per events (0-10GeV/c in pT flat, (-1,1) in eta flat), |Vz|<5cm)**

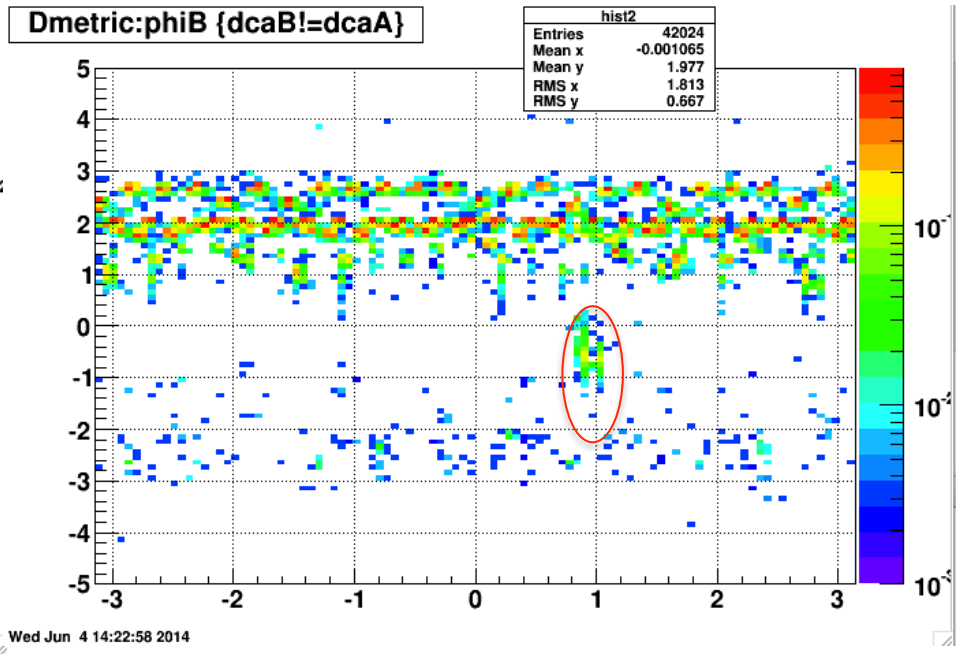
1) Default chain option:

"tpcRS,y2014,AgML,MakeEvent,tables,SimuDb,ITTF,VFMinuit,Idst,BAna,l0,Tree,logger,Sti,StiHftC,TpcHitMover,TpxClu,bbcSim,btofsim,-tags,emcY2,EEfs,evout,geantout,IdTruth,geant,big,fzin,clearmem,HftMatTree,SCScalerCal,goptSCE100051"

2) Chain without IST geometry:

"tpcRS,y2014,AgML,MakeEvent,tables,SimuDb,ITTF,VFMinuit,Idst,BAna,l0,Tree,logger,Sti,StiHftC,TpcHitMover,TpxClu,bbcSim,btofsim,-tags,emcY2,EEfs,evout,geantout,IdTruth,geant,big,fzin,clearmem,HftMatTree,SCScalerCal,goptSCE100051,-StiIst,-IstIT"





Details at drupal page:

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