FST Software Status

Xu Sun
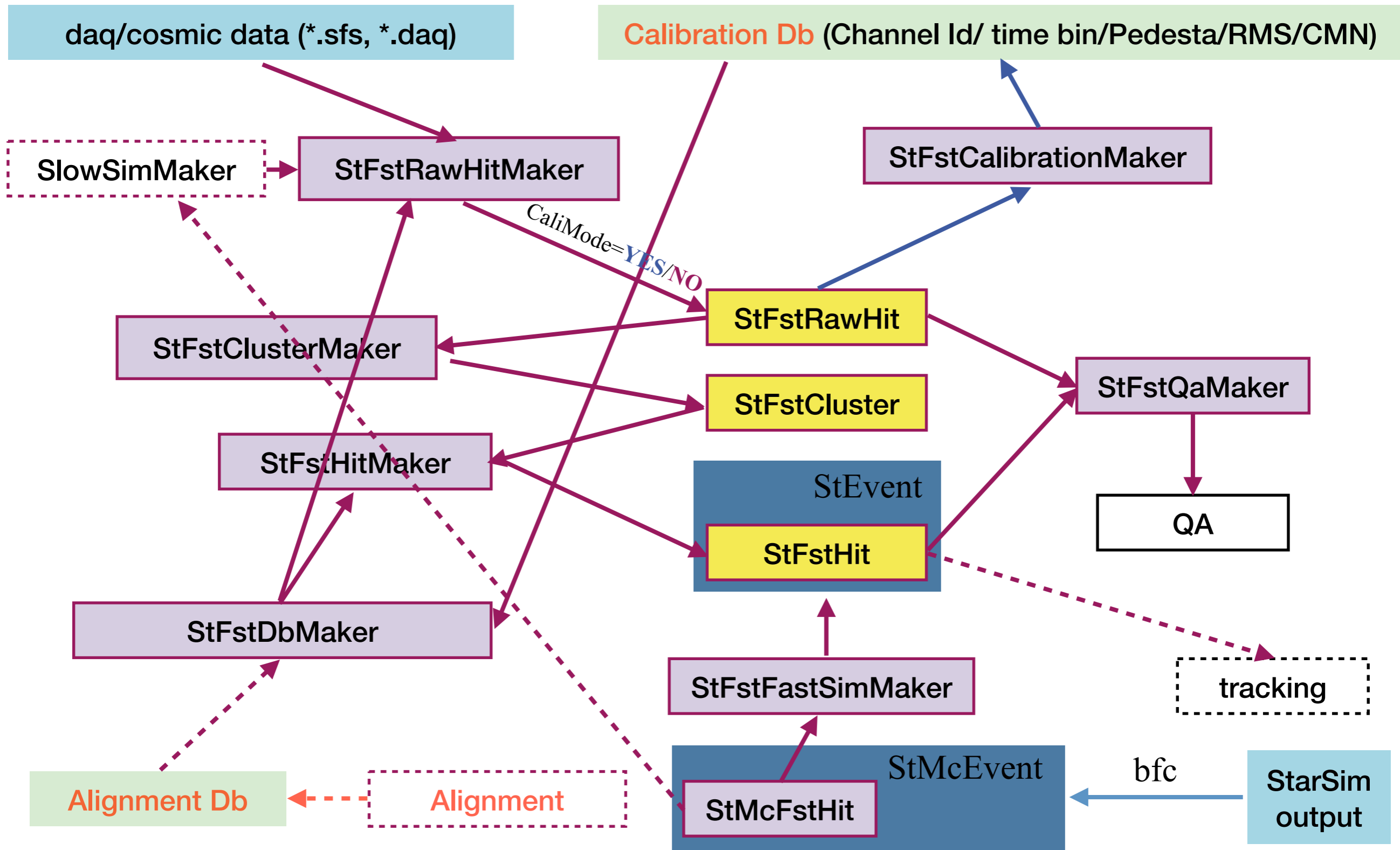**University of Illinois at Chicago**

Offline Software Status

- Offline Software
  - FST Database: PR214 & merged on 12/14/2021
    - Calibration Database: all run22 pedestal runs have been uploaded to database
    - Geometry Database: under development & will be updated once per run
  - FST StEvent: PR265 & merged on 01/04/2022
  - FST Hit Maker: PR266 & merged on 01/25/2022
    - RawHitMaker: reconstruct raw hits from daq files
    - ClusterMaker: combine raw hits to clusters
    - HitMaker: apply geometry info to clusters to get real hits <= still need to include real geometry data from survey
    - PR338 & merged on 04/26/2022 to fix BFC chain issue
  - FST Calibration & QA Maker: PR282 & merged on 02/15/2022
    - Calibration Maker: calculate pedestal & noise with non-ZS data stream
    - QA Maker: produce QA histograms
  - PR341: Add FST hits in MuDst is current & merged on 05/16/2022
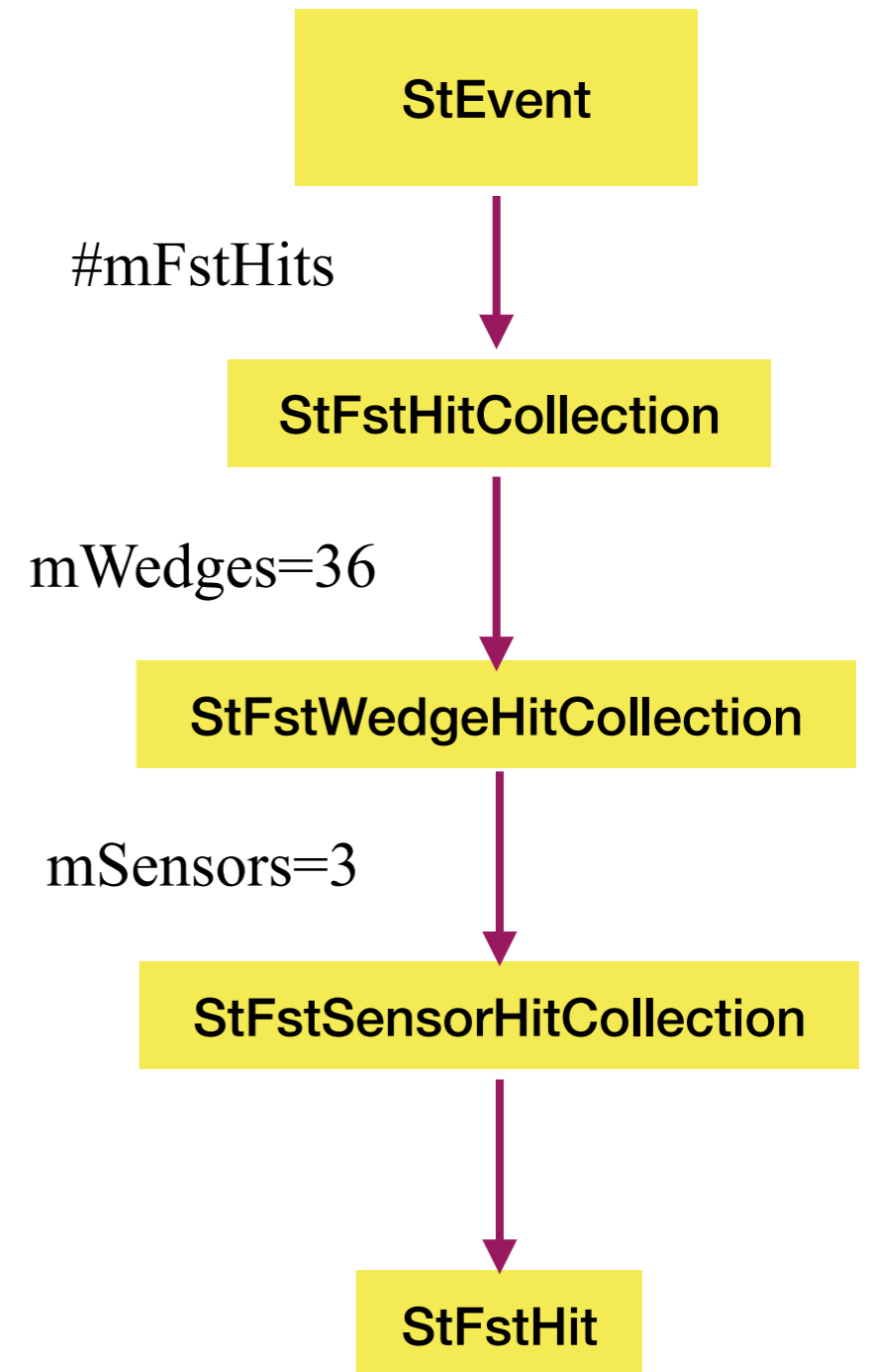 - Ready for zero field run production

Offline Software Structure UIC

daq/cosmic data (*.sfs, *.daq)

Calibration Db (Channel Id/ time bin/Pedesta/RMS/CMN)

SlowSimMaker

StFstRawHitMaker

StFstCalibrationMaker

CaliMode=**YES**/**NO**

StFstClusterMaker

StFstRawHit

StFstQaMaker

StFstCluster

StFstHitMaker

StEvent

StFstHit

QA

StFstDbMaker

StFstFastSimMaker

tracking

StMcEvent

Alignment Db

Alignment

StMcFstHit

bfc
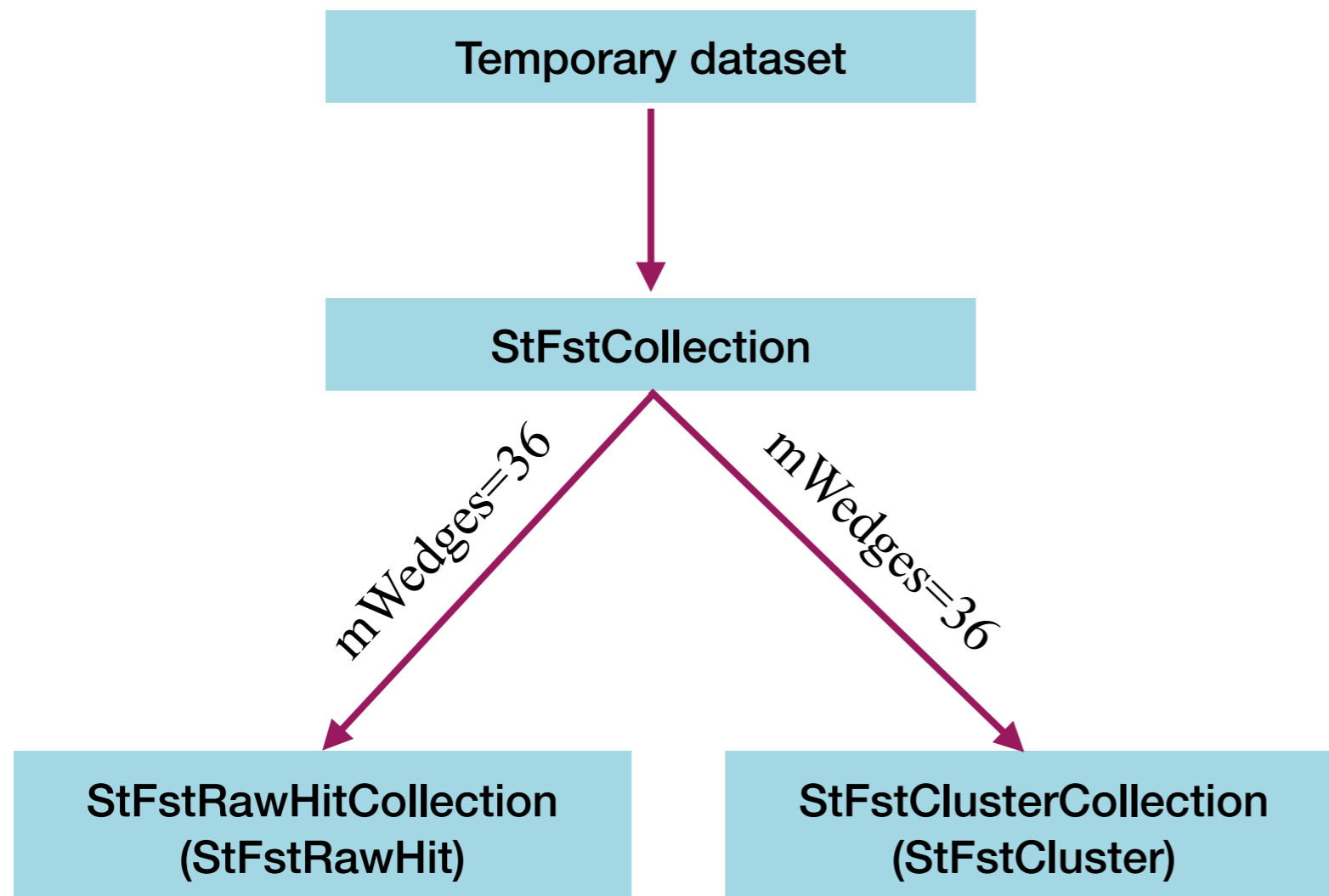
StarSim output

FST Data Structure

FST raw hit and cluster information will not be stored into StEvent, and only hit information will be written to the StEvent container.
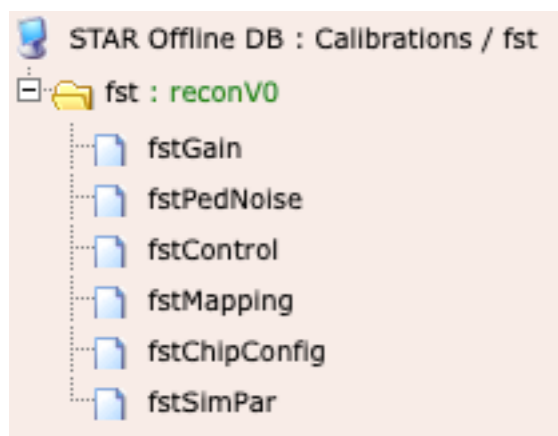
```
Temporary dataset
        |
        v
  StFstCollection
     /          \
mWedges=36    mWedges=36
   /              \
  v                v
StFstRawHitCollection    StFstClusterCollection
(StFstRawHit)            (StFstCluster)
```

```
StEvent
   |  #mFstHits
   v
StFstHitCollection
   |  mWedges=36
   v
StFstWedgeHitCollection
   |  mSensors=3
   v
StFstSensorHitCollection
   |
   v
StFstHit
```

FST Calibration Database

- all information could be found at: https://online.star.bnl.gov/dbExplorer/#
- Calibration Database: all run22 pedestal runs have been uploaded to database
  - fstGain: 1 for all channels
  - fstPedNoise: pedestal, total noise, random noise, cmn => updated every week
  - fstControl: minNoise, maxNoise, #TB, etc.
  - fstMapping: glbElecChanIdx <=> glbGeomChanIdx
  - fstChipConfig: 0: off; 1 enable
  - fstSimPar: fast simulation parameters

Timestamp in GMT

STAR Offline DB : Calibrations / fst

fst : reconV0
- fstGain
- fstPedNoise
- fstControl
- fstMapping
- fstChipConfig
- fstSimPar

dataID	entryTime	nodeID	elementID	beginTime	endTime	flavor	schemaID
126	2022-02-21 03:48:47	3	0	2022-02-18 16:36:49	2037-01-01 00:00:00	ofl	1
125	2022-02-21 03:48:44	3	0	2022-02-17 18:16:50	2037-01-01 00:00:00	ofl	1
124	2022-02-21 03:48:41	3	0	2022-02-16 14:32:27	2037-01-01 00:00:00	ofl	1
123	2022-02-21 03:48:38	3	0	2022-02-15 22:09:58	2037-01-01 00:00:00	ofl	1
122	2022-02-21 03:48:35	3	0	2022-02-15 20:36:21	2037-01-01 00:00:00	ofl	1
121	2022-02-21 03:48:31	3	0	2022-02-15 20:26:25	2037-01-01 00:00:00	ofl	1

FST Geometry Database

- all information could be found at: https://online.star.bnl.gov/dbExplorer/#
- Geometry Database: updated once per run
  - fstOnTpc: survey does not provide any reliable values
  - hssOnFst: from survey
  - fstWedgeOnHss: from survey
  - fstSensorOnWedge: from survey
- Gavin will upload the final table to Geometry database once finished
- Need to analyze low lumi runs for further alignment

FST halves (hssOnFst)

- Use survey points on outermost FST half planes to determine x,y-shifts.

STAR Offline DB : Geometry / fst
- fst : reconV0
  - fstOnTpc
  - hssOnFst
  - fstWedgeOnHss
  - fstSensorOnWedge
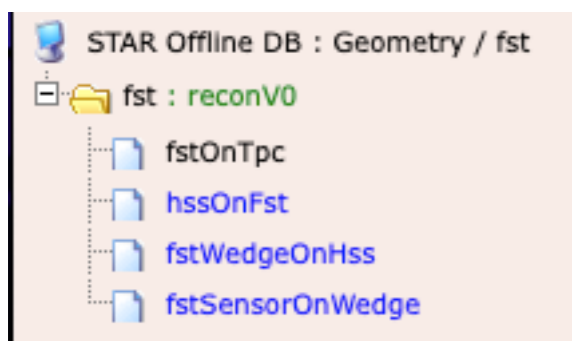
Survey in situ i.e. ring 3 outer surface.

	Drawing		Y	X	Survey Left			Diff measured-model	
B!	-12.92	2.35	-328.168	59.69					
B2	12.92	2.35	328.168	59.69					
B3	0.613	12.981	15.5702	329.7174	12.24	331.98	1796.9	-3.3302	2.2626
					Survey right				
B3	0.613	12.981	15.5702	329.7174	12.56	-330.43	1797.58	-3.0102	-0.7126
C surface					From survey		1791.81		
Ring 3 surface					From B3 survey -5.5		1791.74		
Ring 3 center							1787.81		
Ring 2 center							1,652.48		
Ring 1 center							1,517.50		

2/14/22

Offline Analysis — FST HV Scan 12/27/2022

Run #	22361035	22361041	22361032	22361039	22361030	22361037
HV (in/out)	45/55V	70/80V	90/110V	115/135V	140/160V	160/175V
<# of hits> 1	5.38/2.45	6.00/2.73	5.92/2.79	5.96/2.89	6.02/2.91	6.01/3.02
<# of hits> 2	6.43/2.89	7.03/3.12	6.96/3.16	7.02/3.30	7.03/3.33	7.03/3.47
<# of hits> 3	6.72/2.91	7.24/3.10	7.18/3.13	7.24/3.25	7.30/3.31	7.28/3.43
<efficiency> 2	0.86/0.79	0.90/0.85	0.90/0.85	0.90/0.87	0.90/0.85	0.91/0.88

22361030
Inner 140V
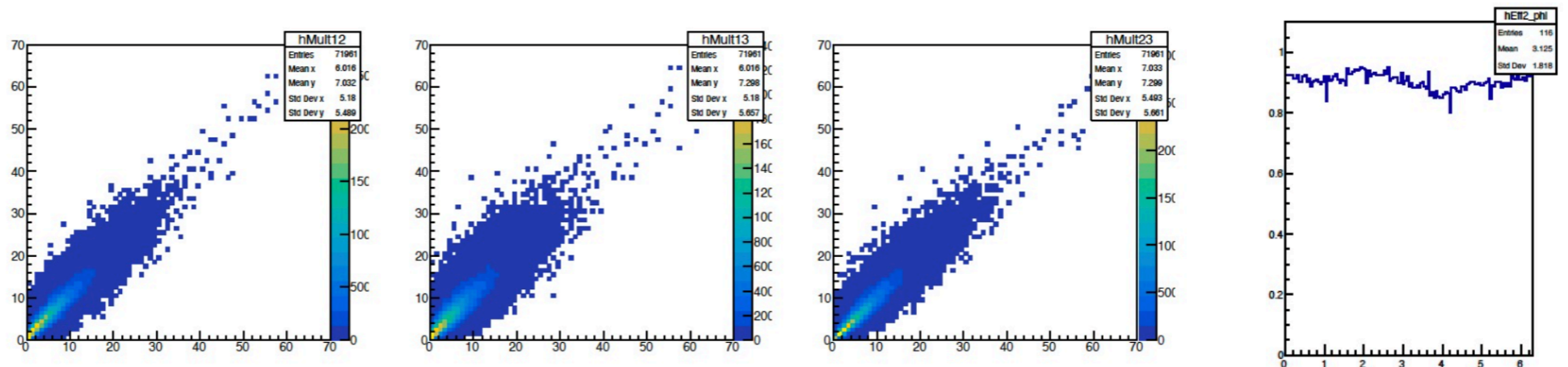
22361030
Outer 160V
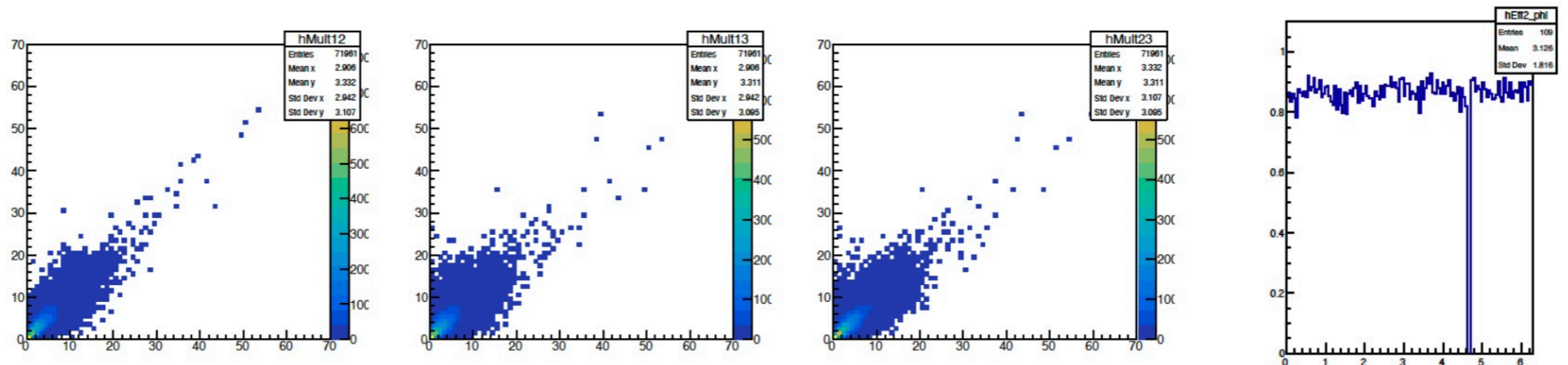
Summary and Outlook

- Offline software

  - Essential parts of offline software are all completed and merged to STAR main software

  - Calibration databases: all pedestal runs of run22 have been uploaded

  - Geometry databases: will upload geometry & alignment table once finished

- To Do

  - Correlate FST info with sTGC for tracking/performance check

  - Produce zero field low lumi runs for alignment study

  - Slow simulation => embedding for efficiency study