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Status of preprocessing of data from TB DESY, tracking/alignment/database experience

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Outline

1. Data – resources for analysis (Peter Kodys)
2. First sweep and statistics (Peter Kodys)
3. DQM on/off line monitor (Peter Kodys)
4. Alignment (Tadeas Bilka)
5. Problems (Peter Kodys)
6. Plan

Data – resources for analysis

People who helped directly with this task: Hua, Ulf, Hao, 2xPeter and Daniel

1. Data moved and collected on the ipnp30 Prague server, the other store should be a grid site in DESY
2. Anyone from the collaboration can ask for an account there, contact person: peter.kodys@mff.cuni.cz
3. Available files:
 - Source files “.sroot.gz” (complete and done)
 - Converted files to root “.root” (complete and done)
 - SVD Global hardware “.xml” files (complete and done)
 - Eudet telescope files “.raw” (complete and done)
 - Quality check histograms and summaries (in progress)
4. We are preparing table for usability for further analysis in basf2 for alignment, tracking, corrections,...

First sweep and statistics (preliminary)

After processing 4/5 of data:

- 280 mil events in 3.63 days of acquisition time
- Second biggest run: 41 000 000 events
- Second longest run: 12.7 hours
- Biggest subrun (collected in 1 file): 790 000 events
- Longest subrun (collected in 1 file): 46.1 minutes
- Highest rate: 3070 events/sec

For basf2 physics tests:

- 2 runs 339 + 340 with secondary target lead 5mm in front of the telescopes
- 680 + 630 kEvents in 17.6 minutes (rate 1200 events/sec)
- Run 339 unstable rate
- Magnet ON
- Beam energy 4 GeV
- Full PXD and SVD work
- Telescopes OFF (?)

What is missing – tasks for the next TB:

- Magnet OFF
- Different beam energies and angles
- Telescopes ON
- High statistics

First sweep and statistics

Example of summary table, many runs without logbook info:

RunNo	SubRunNo	Events	Time[sec]	Rate[Ev/s]	RateLocal	RateDiff	RateBreak	PXDSVD	Magnet	BeamEne	SecTarget
335	46	3783503	2991	1265.0	1198.7	35.6	0	2	0.5	?	?
335	47	3863291	3052	1265.8	1308.0	35.6	0	2	0.5	?	?
335	48	3891734	3077	1264.8	1137.7	35.6	1	2	0.5	?	?
338	0	53876	96	561.2	561.2	23.7	0	0	?	?	?
339	0	91297	69	1323.1	1323.1	36.4	0	2	1	4	1
339	1	183172	139	1317.8	1312.5	36.3	0	2	1	?	?
339	2	274061	204	1343.4	1398	?	?	2	1	?	?
339	3	365788	275	1330.1	1291	?	?	2	1	?	?
339	4	458557	346	1325.3	1306	?	?	2	1	?	?
339	5	552703	417	1325.4	1326	?	?	2	1	?	?
339	6	643726	511	1259.7	968.3	35.5	1	2	1	4	1
339	7	687572	564	1219.1	827.3	34.9	1	2	1	4	1
340	0	91722	75	1223.0	1223.0	35.0	0	2	1	4	1
340	1	182941	148	1236.1	1249.6	35.2	0	2	1	4	1
340	2	273920	219	1250.8	1281.4	35.4	0	2	1	4	1
340	3	365784	291	1257.0	1275.9	35.5	0	2	1	4	1
340	4	457577	368	1243.4	1192.1	35.3	0	2	1	4	1
340	5	551687	440	1253.8	1307.1	35.4	0	2	1	4	1
340	6	636647	507	1255.7	1268.1	35.4	0	2	1	4	1
341	0	81810	72	1136.3	1136.3	33.7	0	3	?	?	?
341	1	164787	128	1287.4	1481.7	35.9	1	3	?	?	?
341	2	247276	179	1381.4	1617.4	37.2	1	3	?	?	?
341	3	330176	225	1467.4	1802.2	38.3	1	3	?	?	?
341	4	415135	275	1509.6	1699.2	38.9	1	3	?	?	?
341	5	466291	352	1324.7	664.4	36.4	1	3	?	?	?
343	0	81680	115	710.3	710.3	26.7	0	3	0	4	0
343	1	163157	257	634.9	573.8	25.2	0	3	0	4	0
343	2	205541	442	465.0	229.1	21.6	1	3	0	4	0
344	0	80639	206	391.5	391.5	19.8	0	3	0	3	0

No info of run

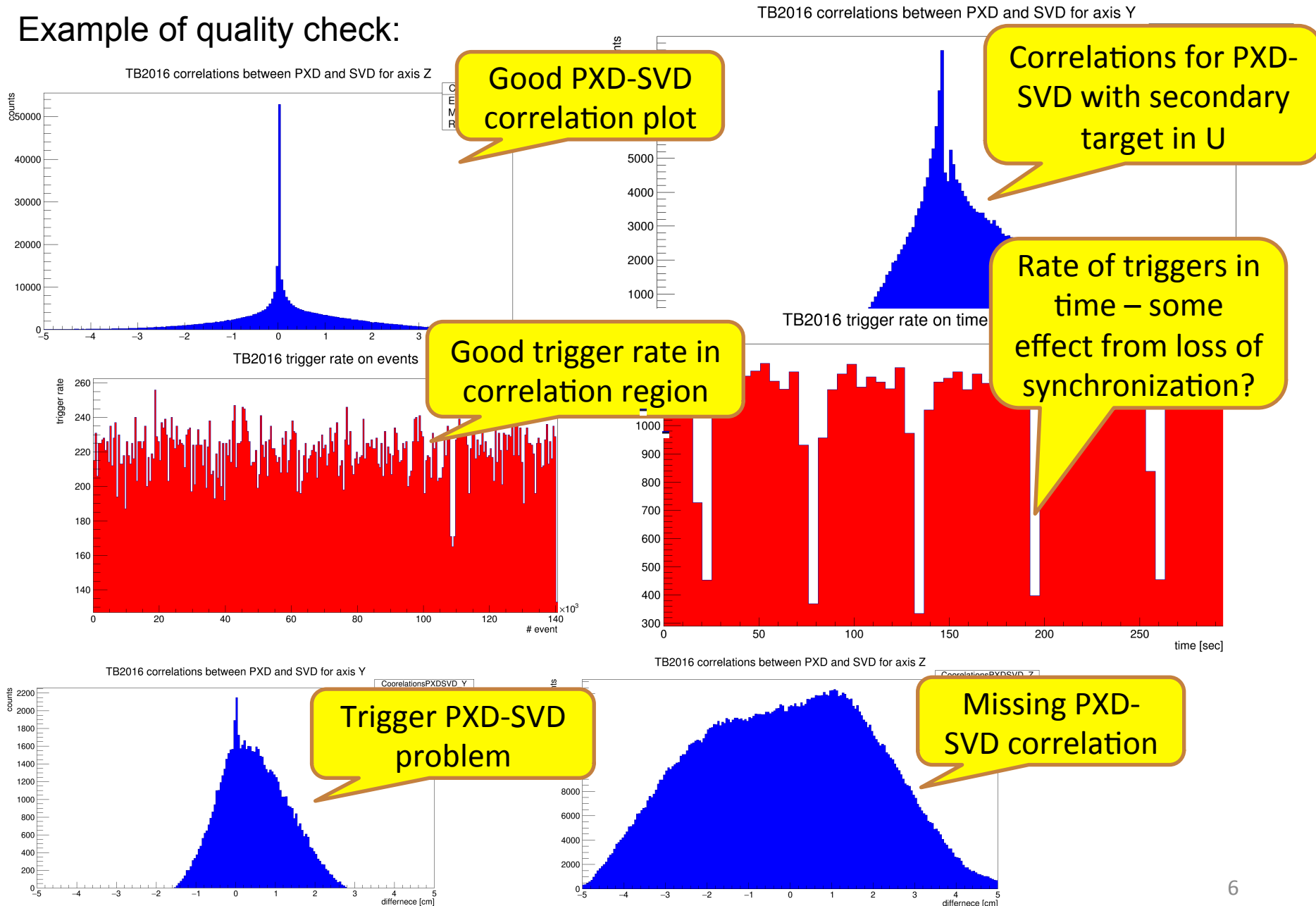
Trigger rate problem

Only runs with secondary target

No info of run

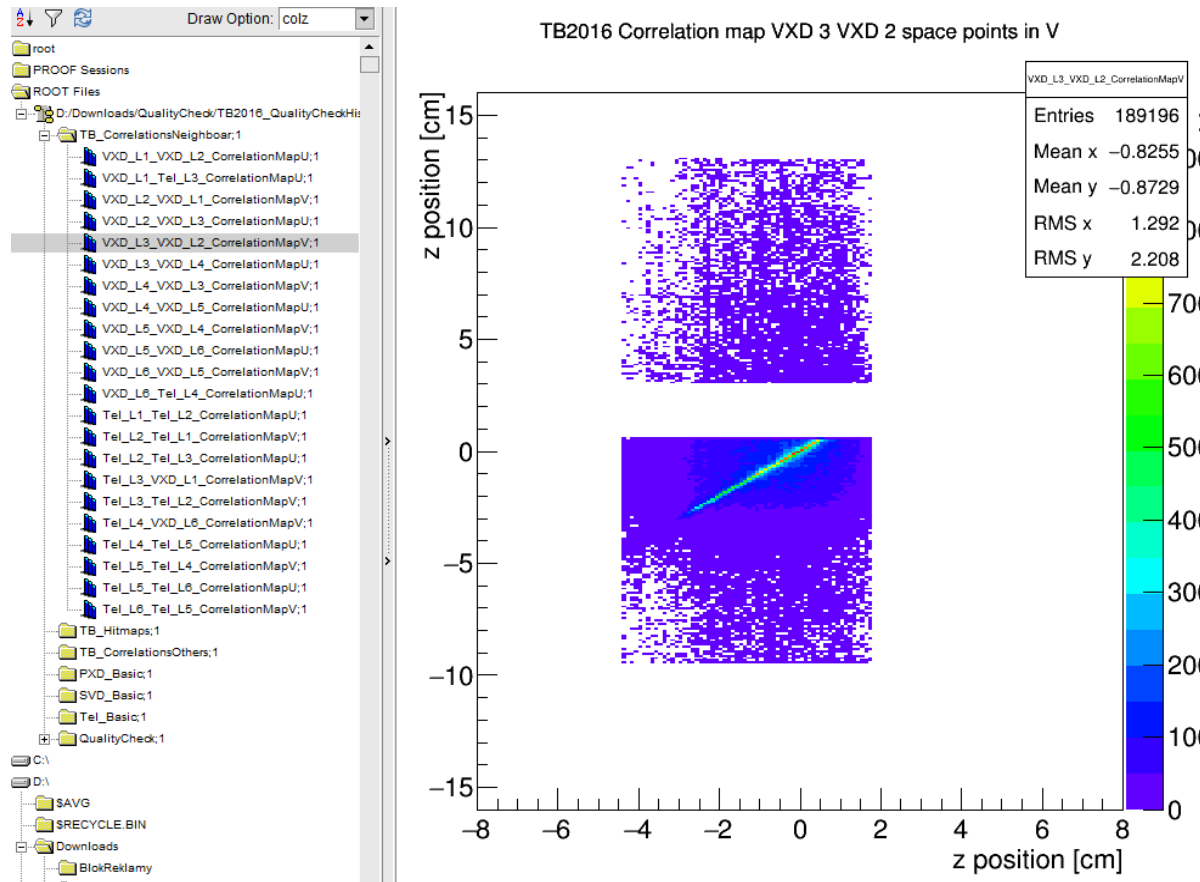
First sweep and statistics

Example of quality check:



DQM on/off line monitor

- DQM offline monitor for quick check of quality of data in final files for basf2 was created for PXD+SVD+Tels
- DQM on-line monitor of 2D and 1D correlations evolved from offline
- For correlations all combinations of hit coordinates were created with granularity of 0.5 mm



Geometry + Mapping → Tracking

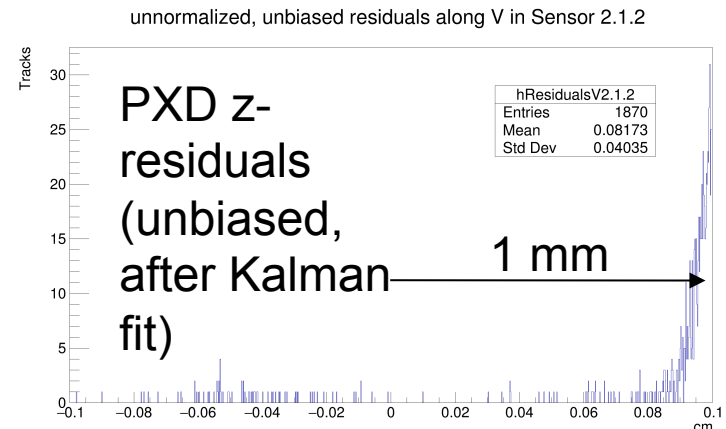
- We directly imported Beast Phase II geometry with small modifications
- After SVD and PXD mapping was corrected and correlations seen, tracking started to work
- Visual check of residual distributions → PXD displaced by 1 mm w.r.t. SVD along Z → absorbed into PXD sensor displacements

Even with large misalignment and non-optimized sensors, (some) tracks were found and fitted.

Beast geometry checked,
only mapping needed
hardware and software
experts to work together.

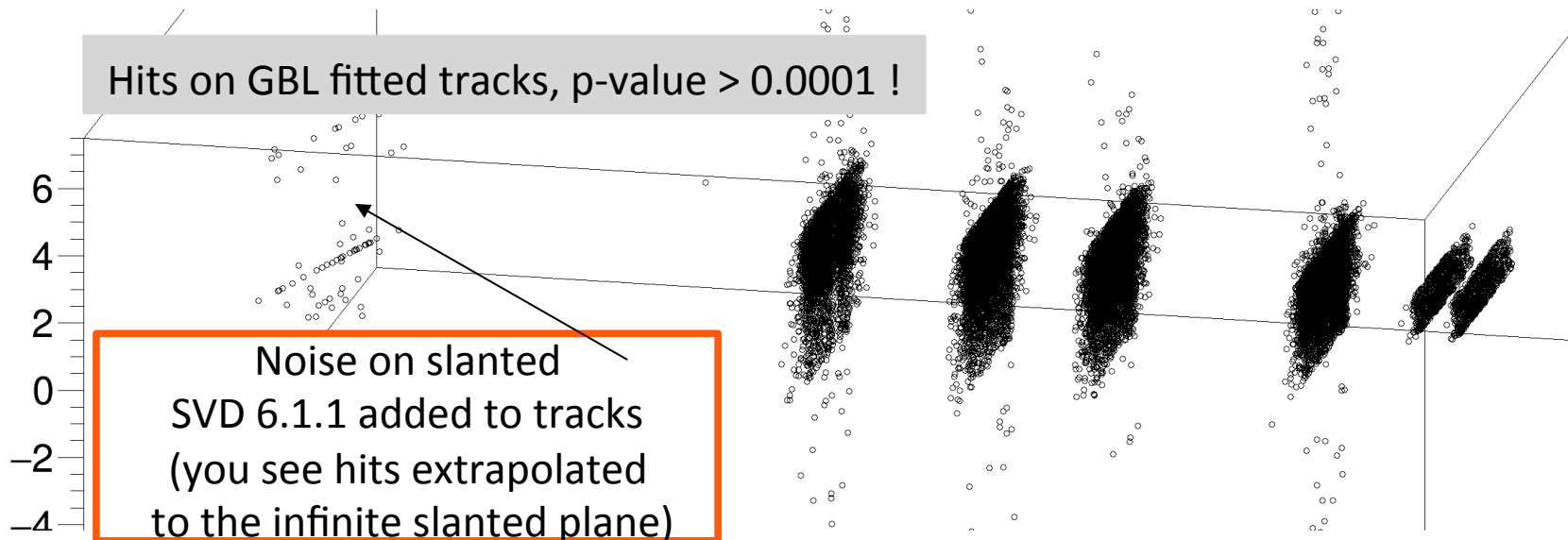
Good message for Beast Phase II

Plot from Track Fit DQM:



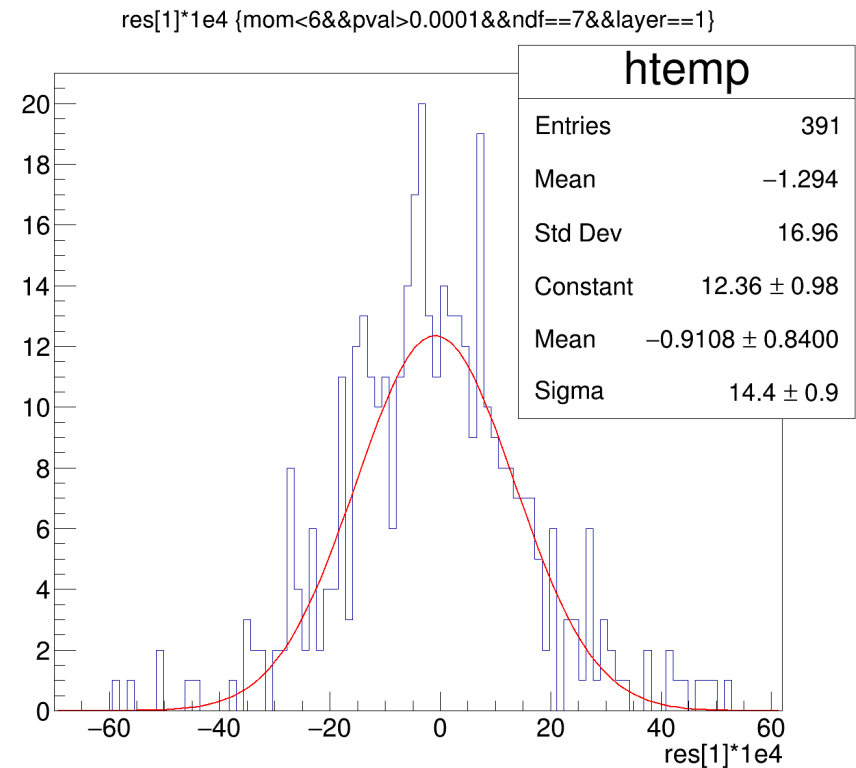
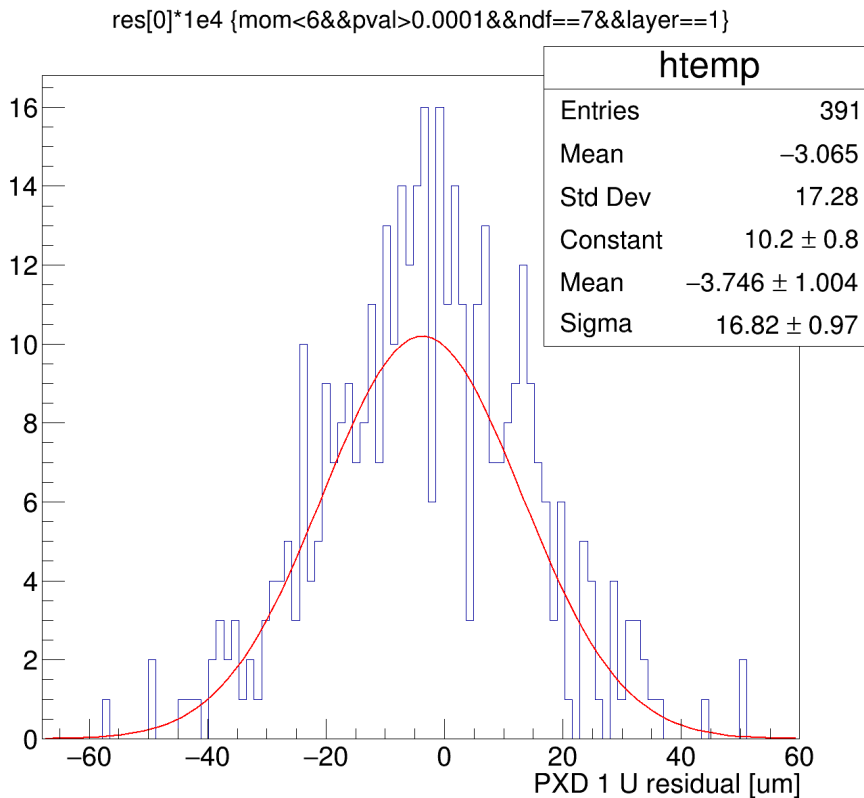
Initial Alignment & Issues

- Can be done with first messy data, but needs manual playing with Millepede (can get rid of fake tracks during iterating alignment and removing outliers)
- Many SVD sensors cannot be aligned due to low statistics, sometimes PXD not in data → big complications for alignment parametrization (e.g. which sensors to fix) – easy to introduce inconsistencies in DB (alignment is defined relative to displaced geometry), fixed 1st and last SVD layer for alignment with no field
- **Even after alignment, VXDTF gives plenty of non-sense track fitters**
- Working on some way to get rid of them for analysis + we should look into the VXDTF (sector maps problem?)



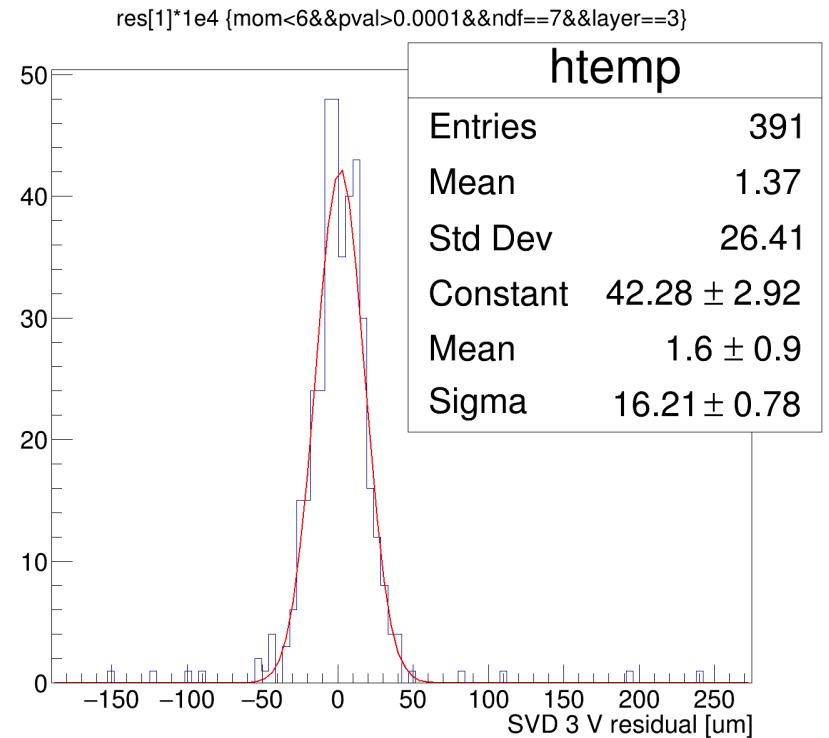
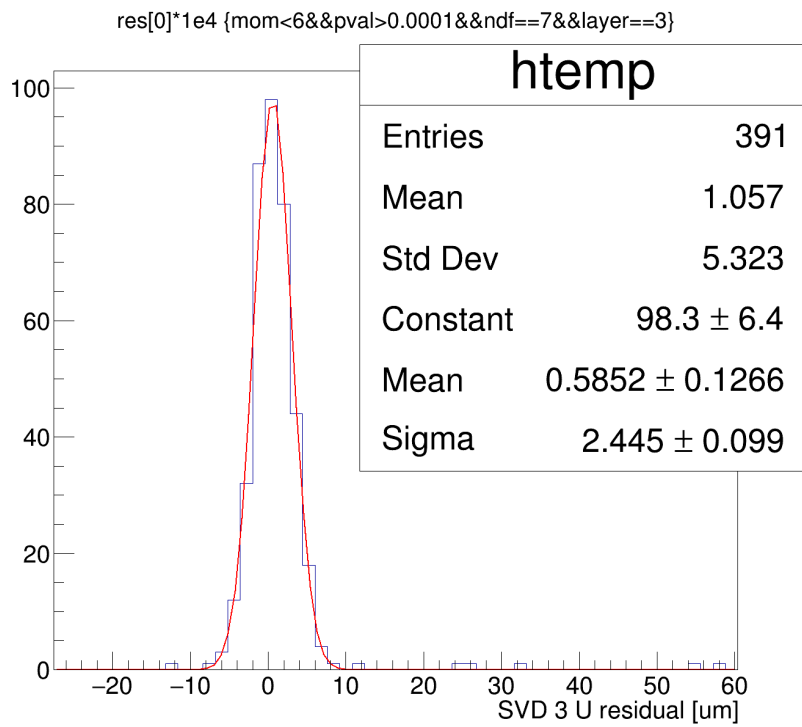
Preliminary Results

- PXD layer 1 residuals in run 340 (magnet + secondary target) – only high quality tracks, all cluster sizes, after initial alignment



Preliminary results

- Same run, same tracks, SVD layer 3



Alignment & Database

- We started with framework fall-back DB (nominal alignment)
- After run 96 (no magnet), DB with alignment was produced and used for fitting at HLT/expreco
- DB was distributed over e-mail. Only local DB used during whole TB
- After reprocessing we will provide a complete local DB at ipnp30, including e.g. masking
- Should go into PNNL central DB

Plans & Conclusions (Tadeas)

- Once full data quality analysis is finished, we will produce alignment data for all usable runs (and upload to PNNL)
 - Perfect exercise for calibration framework and anyone interested in PXD/SVD calibration, database, Beast Phase II, real data ...
- Message to Beast Phase II and next beam test
 - Geometry fine, just check the mapping, track finding will work and we can do alignment
 - In next beam test, we need DB operational to test the calibration framework and distribute calibration constants to analyzers

- TB DESY 2016 produced tracks with correlation in “off-line” check in basf2 delayed by hours to one day – still a bit long
 - Source of delay: data transfer to a visible place on the net (ipnp30)
 - On-line monitor was tuned and should be usable
- Very poor logbook, sometimes not editable for shifters because “open with other one”, only small subset of runs marked in, mistakes inside
- Missing in the logbook is a set of basic fixed-format information immediately available for parsing for analysis:
 - Which subdetectors are working
 - Status of subdetectors/planes
 - Telescope IDs
 - Magnet status
 - Beam parameters
 - Secondary target present
- Unclear naming convention: “physics”, “beam”, “test.all”, “test.pxd”, “test.svd”
- Communication between subgroups: geometry vs. pixel/strip counting and directions of axes at every step of data chain – **needs to be solved before Belle II experiment**

Plan (Peter)

- Continue screening the data for usability for analysis
- Cross-check basf2 results with Benjamin's results
- Create tools for Belle II based on TB DESY 2016 experience
- Check usability of shape and eta corrections
- Tracking/alignment/database improvements
- Prepare tools for the next TB DESY end of 2016

Thank you for your attention