Tracking report (2018/05/04)

K. Trabelsi
karim.trabelsi@kek.jp

- GCR 2
- Experiment 3
  - run summary
  - 2 tracks events

- **GCR2a (reprocessing with GT#352, first CDC constants, release-01-01-01)**
  GCR 2b (latest alignment + full calibration), release-01-02-02+GT#359
  - magnetic field solenoid only

https://confluence.desy.de/display/BI/Data+Production+Global+Cosmics+Run+Data

performed on Feb data (no mag field)
→ ~ 50-100 μm shift (x, y) position of forward inner layers

- **implement an offline monitoring of CDC based on MiraBelle (DP)** [V.Bhardwaj] (Mohali)
  - don't waste time to reprocess individually limited amount of data
  - clarify configurations, make sure that whole collaboration can benefit from the improvements in CDC

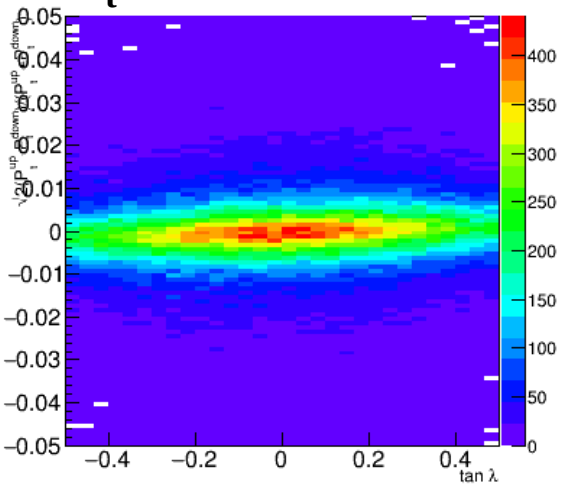
- **selection: reject (Z0m<-5 || Z0m > 10 || fabs(D0m) > 3 || fabs(tanLm) > 0.5)**

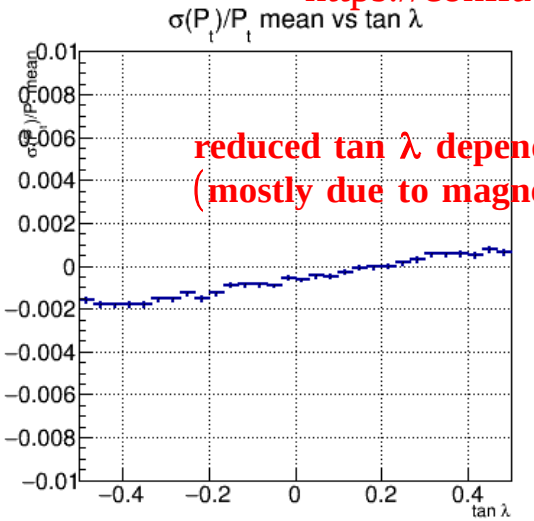
- **monitoring results collected at** [for each reprocessing]
  - /gpfs/group/belle2/group/production/Data/
  - /gpfs/group/belle2/group/production/Data_cdc/
  - https://confluence.desy.de/display/BI/Offline+monitoring+CDC+data

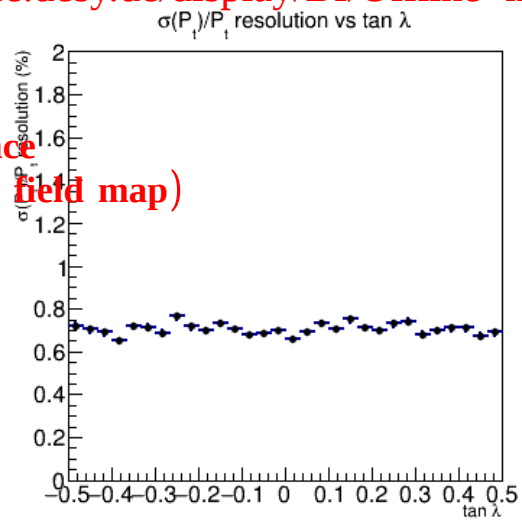
GCR 2b status (CDC constants)

https://confluence.desy.de/display/BI/Offline+monitoring+CDC+data

P_t vs tan λ

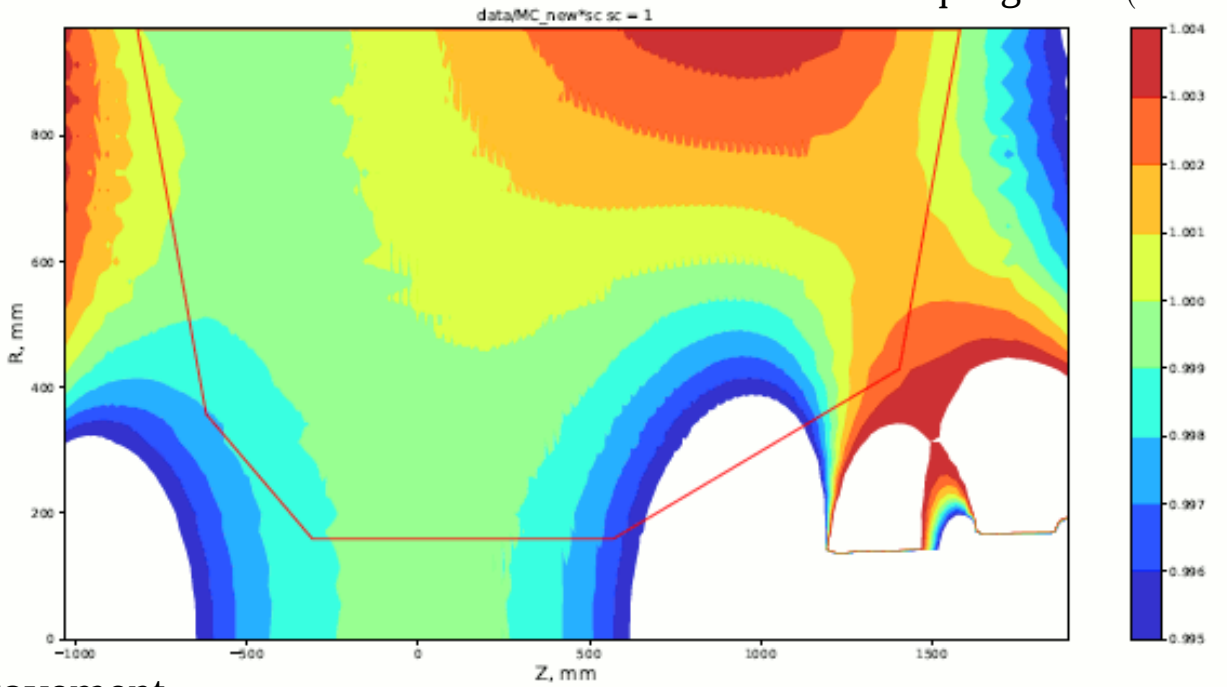






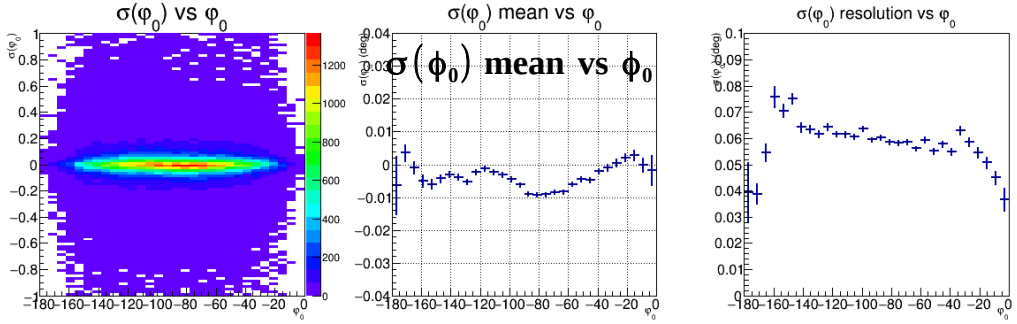
reduced tan λ dependence
(mostly due to magnetic field map)

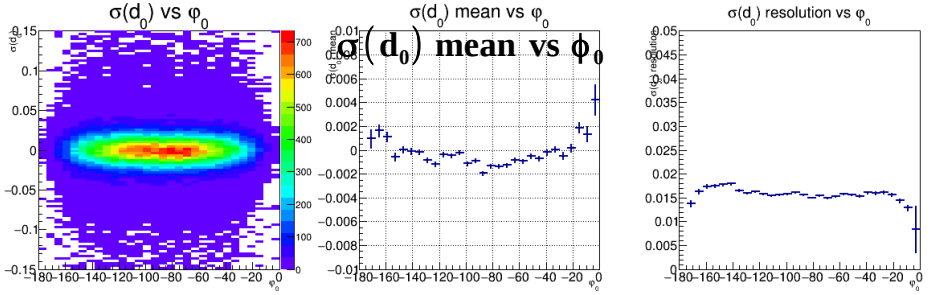
comparison latest magnetic field map (QCS off) and data taken in 2016
Aiqiang Guo (DESY)

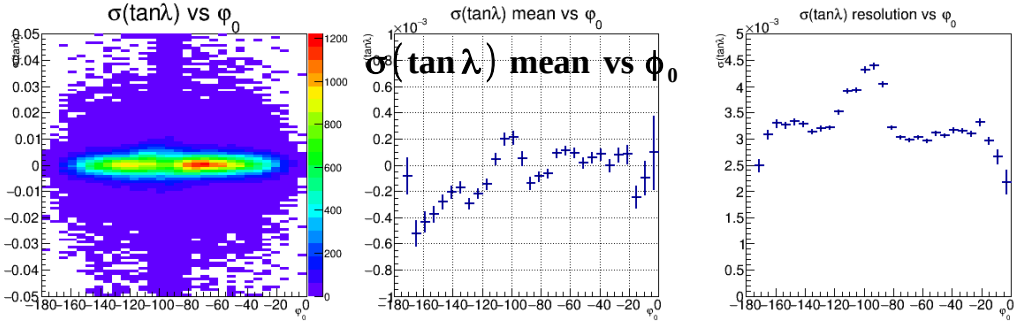


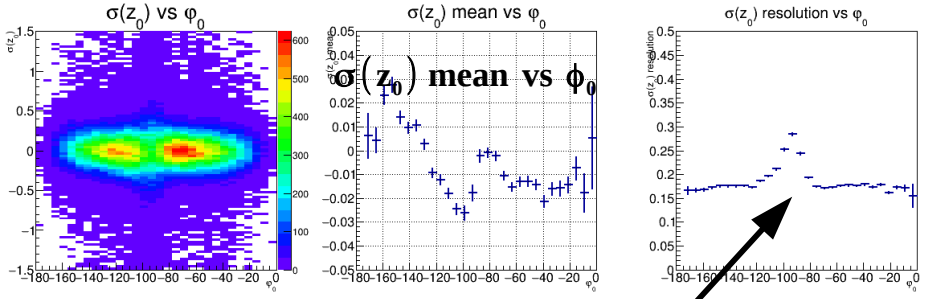
- magnetic field map still needs improvement
- by the way, the current magnetic field (exp 3) probably even worse

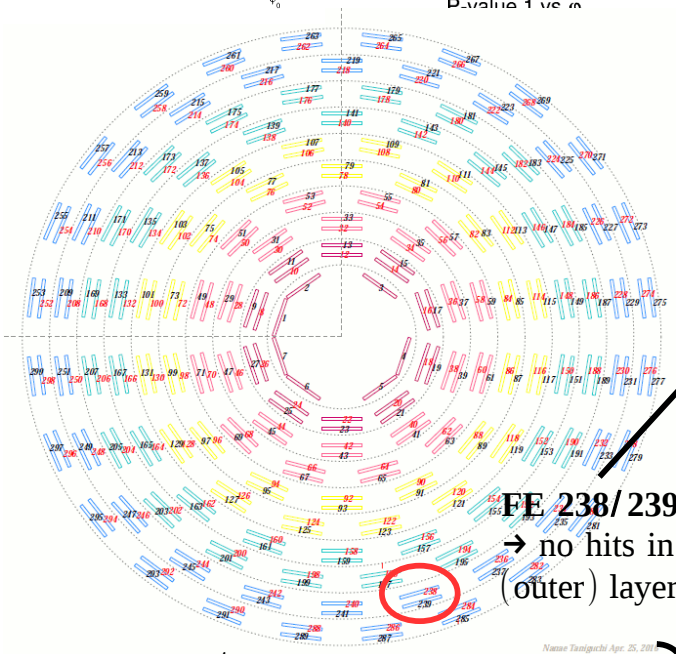
GCR 2b status (CDC constants)

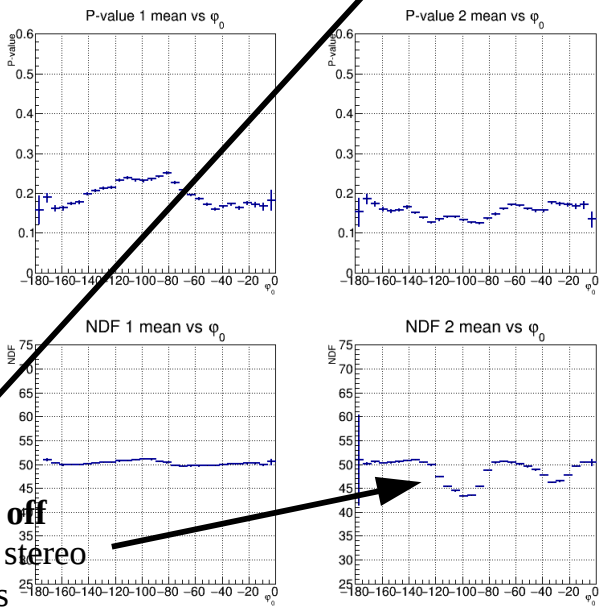












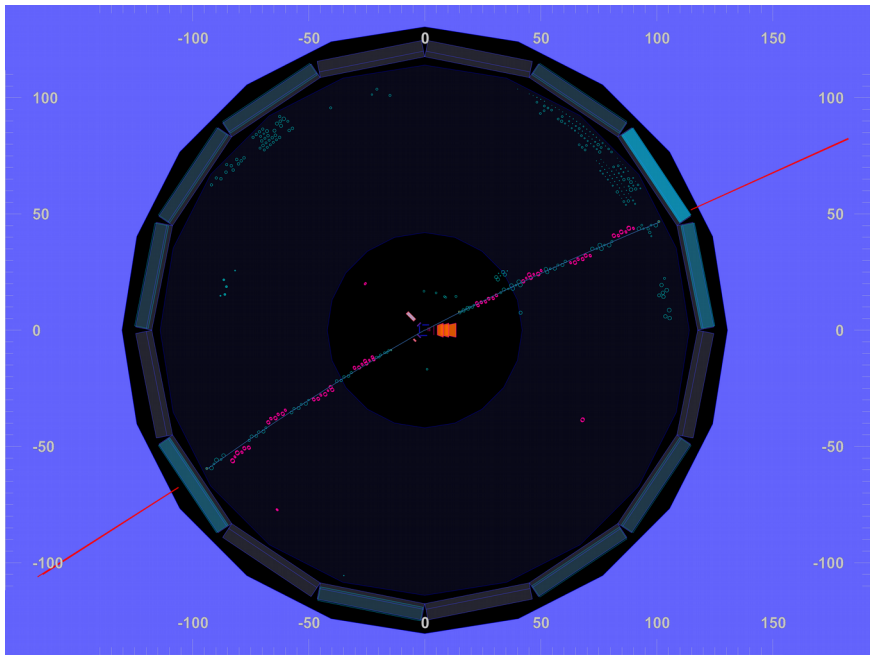
FE 238/239 off
→ no hits in stereo (outer) layers

- magnetic field map still needs improvement
- calibration/alignment should be performed again on full sample
- hits removal (at cell boundary)

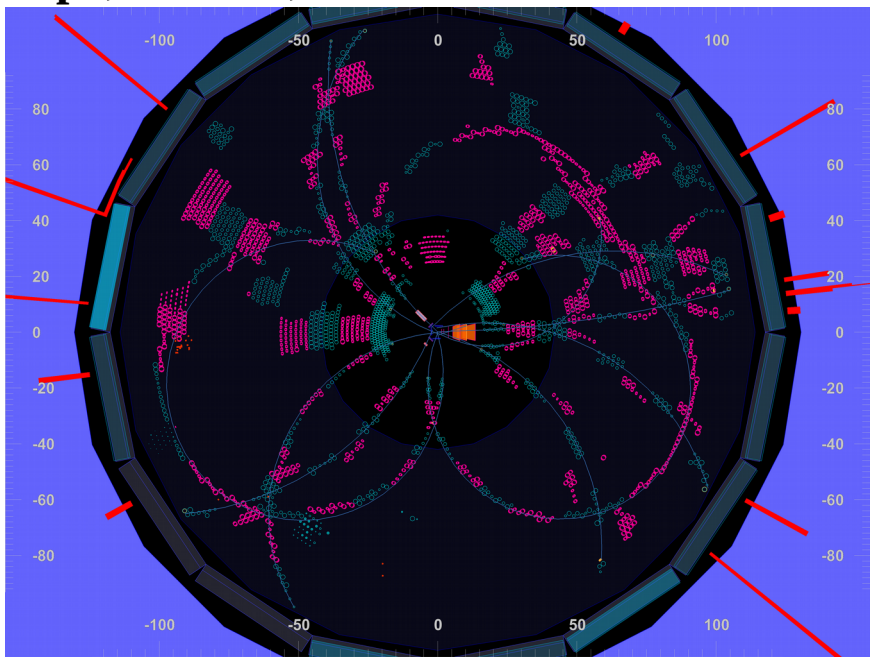
} another reprocessing ? (GCR 2c)

Experiment 3 : first collision data

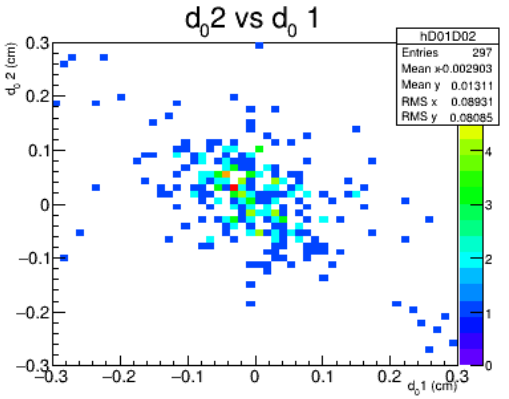
Exp3, Run126, Evt 73

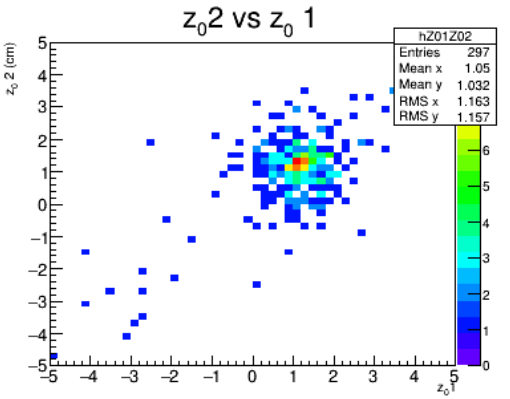


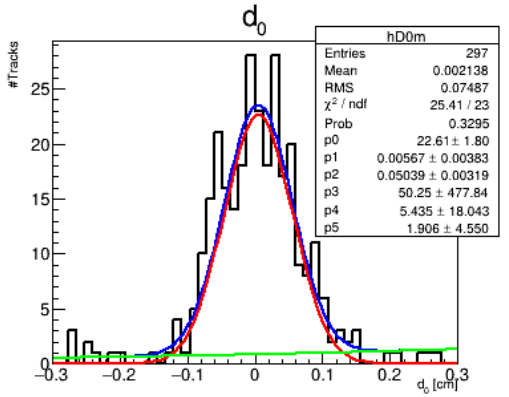
Exp3, Run129, Evt 749

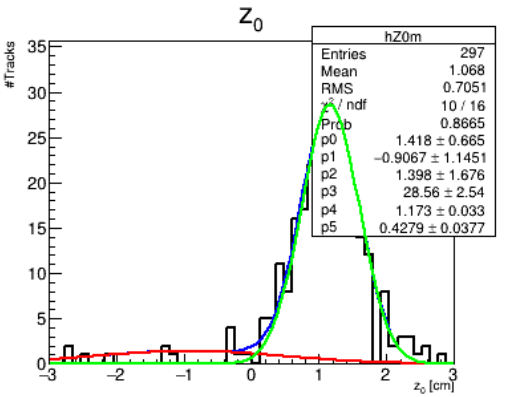


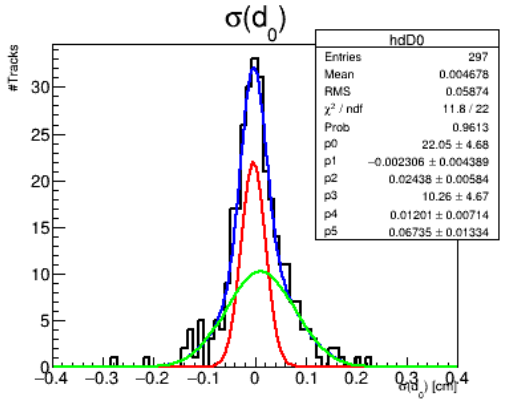
$e^+ e^- \rightarrow e^+ e^-$ (data)

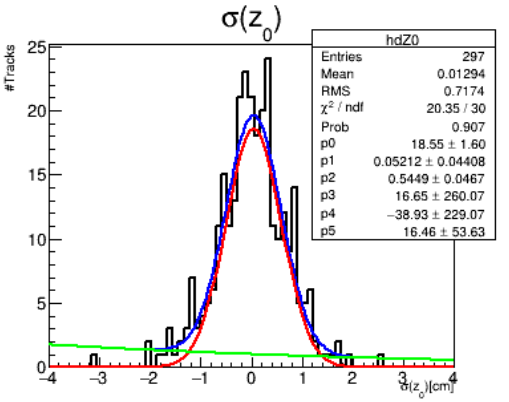












Experiment 3

https://confluence.desy.de/display/BI/Experiment+3

BIIDP-639: feedback on first phase 2 data (experiment 3)

Lum = few $\times 10^{31}$ cm^{-2} s^{-1} (consistency between different estimations)

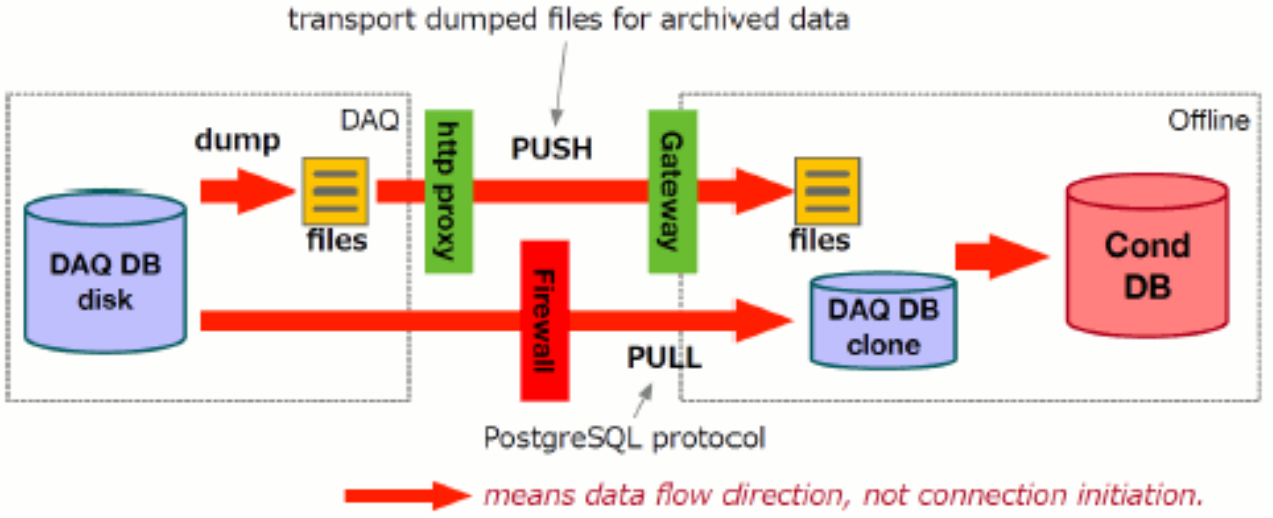
- unstable trigger conditions: under debugging
- names of the raw files not always as expected (should all be beam.*)

→ first collision data

run	start	stop	run time (sec)	detectors involved	trigger	trigger rate (Hz)	# of evts (Online)	# of evts (Offline)	# of files	sroot (MB)	root (MB)
112	2018-04-25 22:04:54	2018-04-25 22:07:48	182	CDC | ECL		497	82511	79241	3	2400	671
114	2018-04-25 22:11:45	2018-04-25 22:23:39	708	CDC | ECL | TRG		502	342887	338048	9	14000	3100
120	2018-04-25 22:42:30	2018-04-25 22:55:40	848	CDC | ECL | TRG		515	408330	403539	9	17000	4300
122	2018-04-25 23:06:37	2018-04-25 23:27:04	1221	CDC | ECL | KLM | TRG	at least 3 tracks	1	1166	424	3	21	6
123	2018-04-25 23:42:35	2018-04-26 00:02:04	1257	CDC | TOP | ECL | KLM | TRG	2 tracks or 3 clusters	0	27885	24305	3	1400	424
125	2018-04-26 00:30:51	2018-04-26 00:41:12	615	SVD | CDC | TOP | ARICH | ECL | KLM | TRG	(full track and ECL timing) || (2 full tracks and ECL timing) || (1 full track) || (2 full tracks)	1.75	1446	337	3	23	8
126	2018-04-26 00:42:45	2018-04-26 01:07:14	1568	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG	(2 full tracks and ECL timing) || (2 full tracks, back to back, bhabha veto)	1.75	2538	764	3	48	17
129	2018-04-26 02:19:28	2018-04-26 03:16:40	3424	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG		0.75	6424	4460	3	371	102
132	2018-04-26 03:43:36	2018-04-26 03:57:33	828	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG		0.50	1842		3	122	24
133	2018-04-26 03:59:19	2018-04-26 04:28:18	1731	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG	1 kHz random trigger	905	1502221				
134	2018-04-26 04:50:02	2018-04-26 05:24:46	2230	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG	1 kHz random trigger	851	1803131				
135	2018-04-26 05:41:29	2018-04-26 05:42:21	44	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG		0	209	15	1	3	N/A
136	2018-04-26 05:43:36	2018-04-26 06:27:49	2644	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG		1.50	6699	4709	3	753	N/A
138	2018-04-26 07:04:06	2018-04-26 07:26:15	1416	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG		1.50	2813	1364	3	217	N/A
140	2018-04-26 07:48:13	2018-04-26 08:30:14	2511	PXD | SVD | CDC | TOP | ARICH | ECL | KLM | TRG		1.40	5860	4504	3	720	N/A

→ more collision data for this week (04/27, 04/30, 05/01, 05/02)

Experiment 3



- script reads the DAQ DB, fills a run summary regularly for all runs
- file transfered to stash, location linked from the experiment 3 page

https://confluence.desy.de/display/BI/Experiment+3

```
--- run 000120
Run type:  beam
Start time:  2018-04-25 22:42:30
Stop time:  2018-04-25 22:55:40
Run length:  848 sec
Number of events:  408330
Trigger rate:  514.750000 Hz
PXD status:  0
SVD status:  0
CDC status:  1
TOP status:  0
ARICH status:  0
ECL status:  1
KLM status:  0
TRG status:  1
```

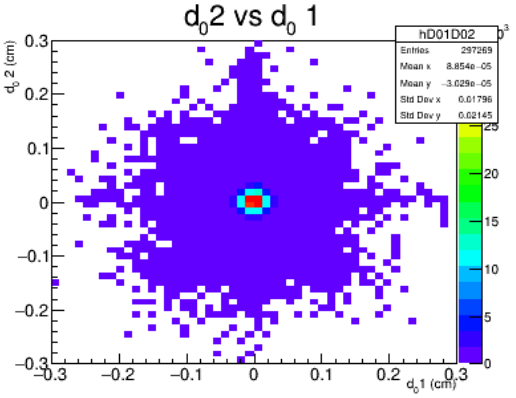
- very scarce information in DAQ DB
- requests for accelerator/luminosity/background/magnets
- https://agira.desy.de/browse/BII-2527
- also prepared the list of PVs:
  https://confluence.desy.de/display/BI/Run+Summary

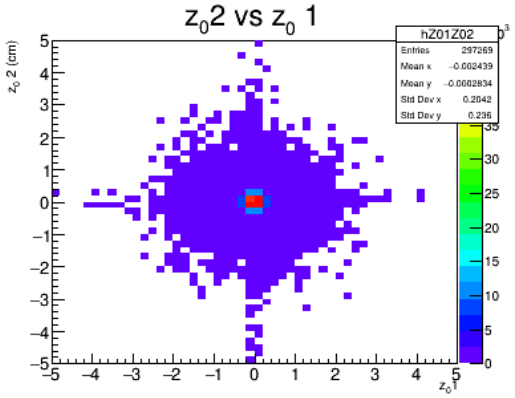
- asked Konno-san to record this information at the start and end of each run → will be added immediately to run summary
- copy as DBobject → cond DB

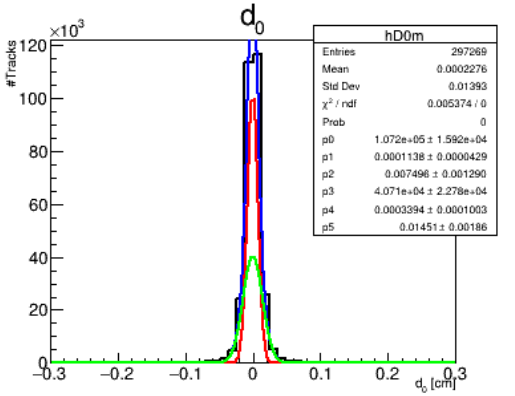
2 tracks events

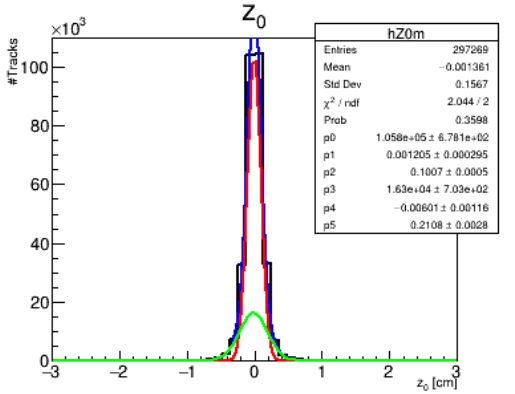
work with Renu Garg (Panjab), M.Uchida (TIT)

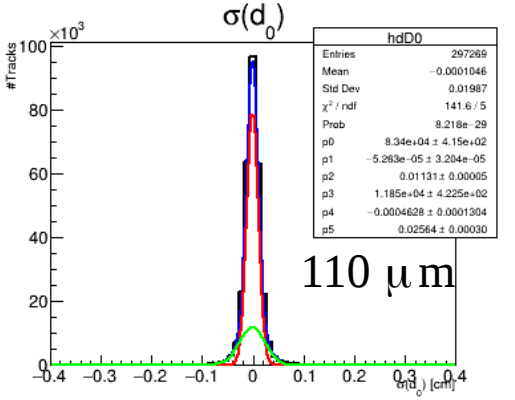
$e^+e^- \to \mu^+\mu^-$ (MC)



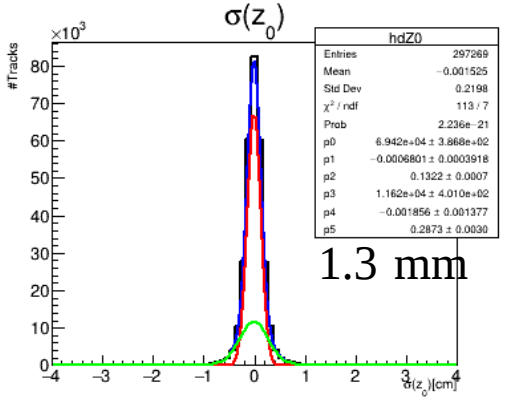






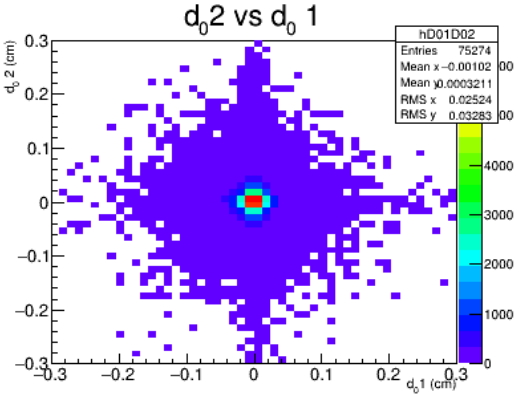


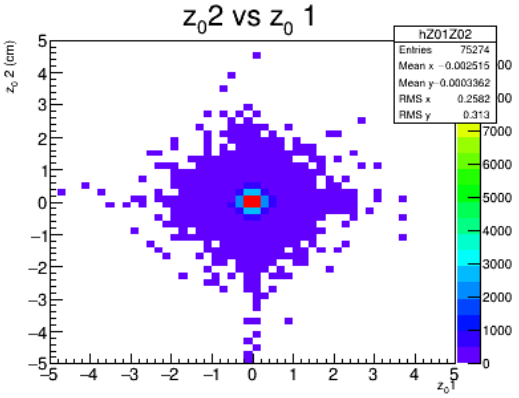
110 μm

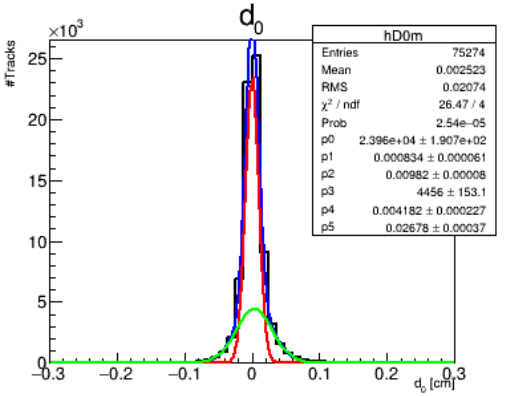


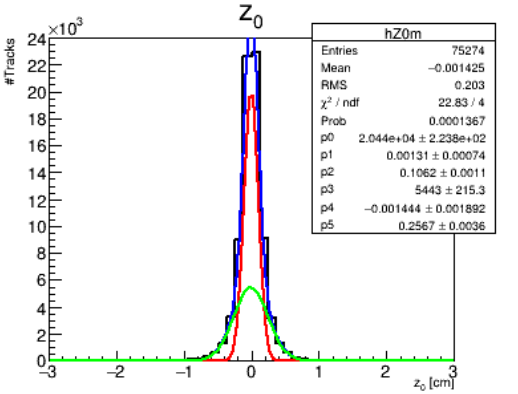
1.3 mm

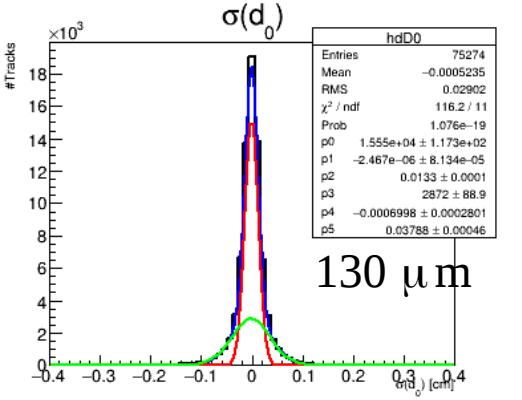
$e^+e^- \to e^+e^-$ (MC)



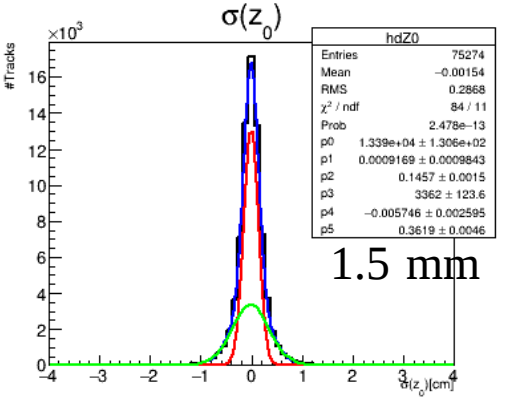








130 μm



1.5 mm

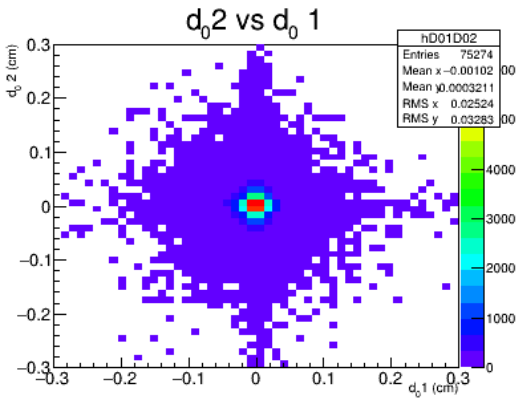
- Bhabha events worse resolution compared to dimuons, as expected
- no IP profile in these MC samples

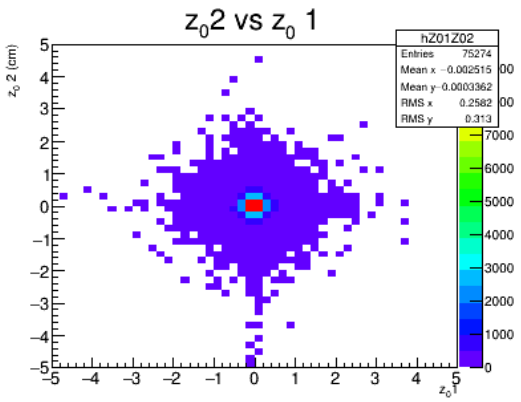
2 tracks events

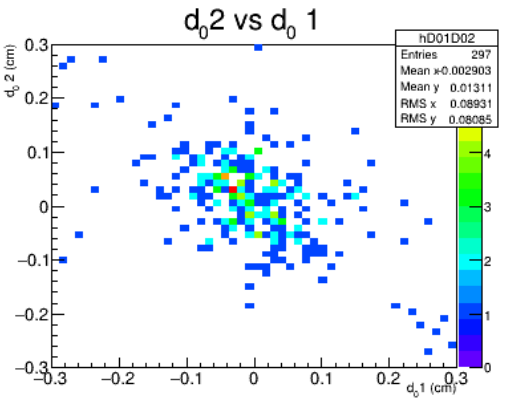
high momentum tracks
ndf > 20

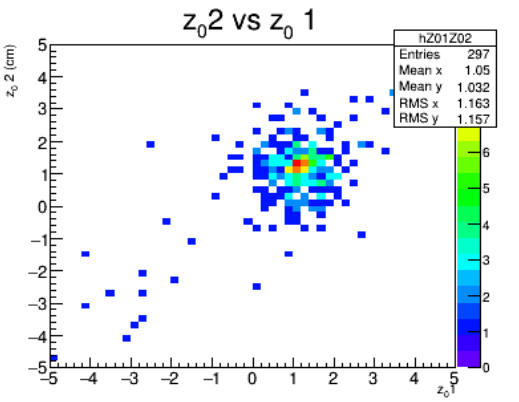
$e^+ e^- \rightarrow e^+ e^-$ (MC)

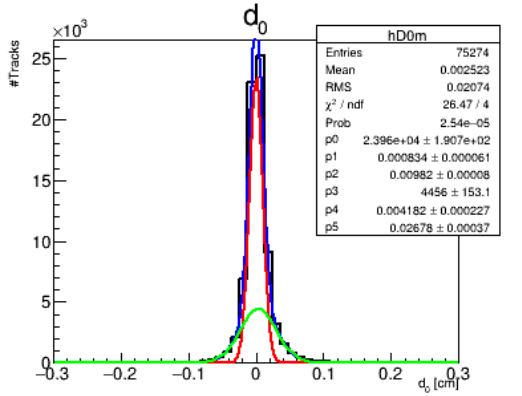
$e^+ e^- \rightarrow h^+ h^-$ (data exp 3 : run 112-140)

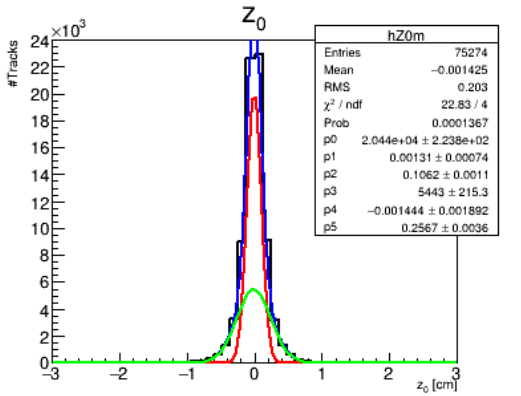


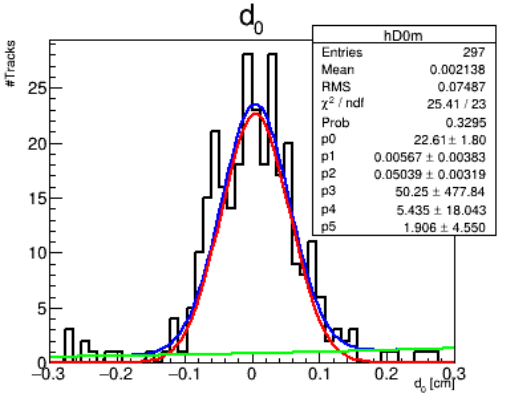


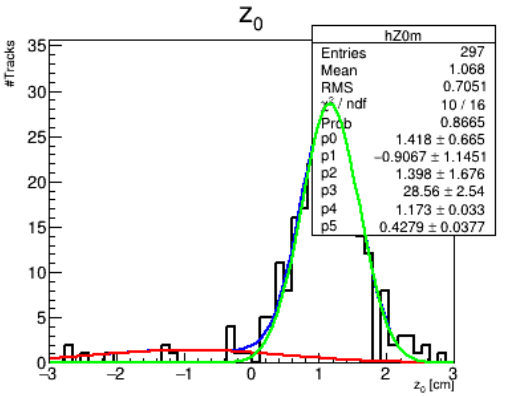


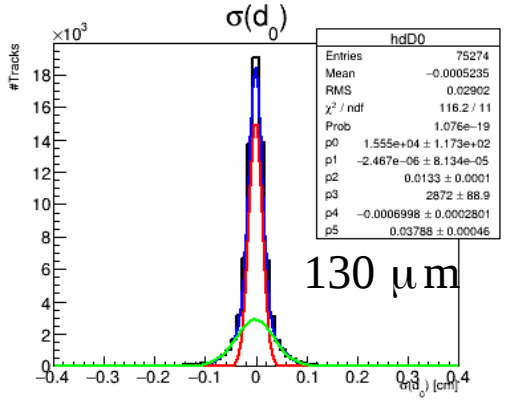


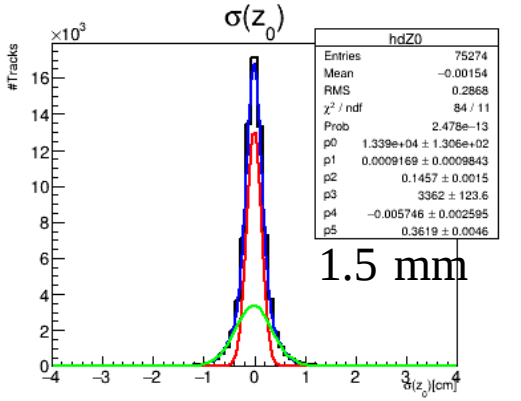


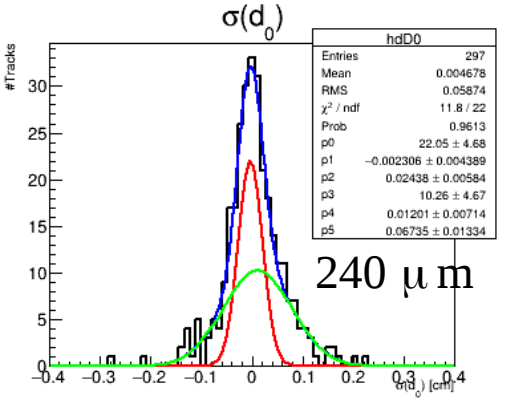


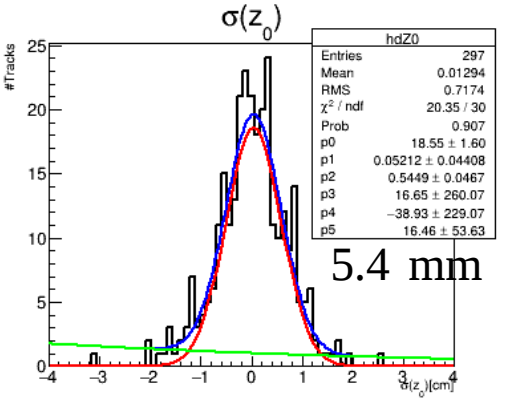








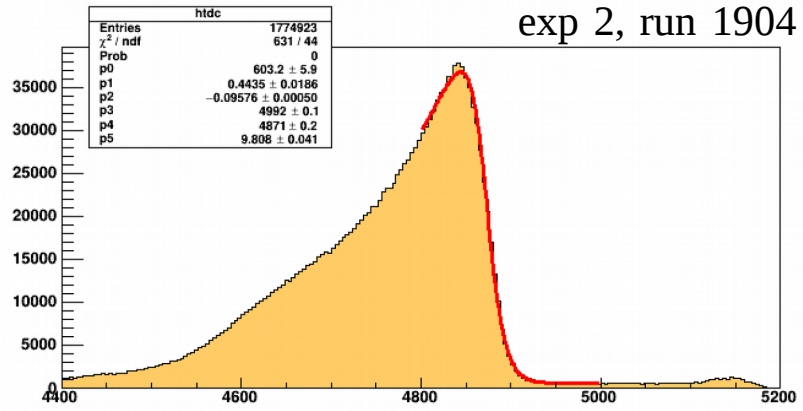




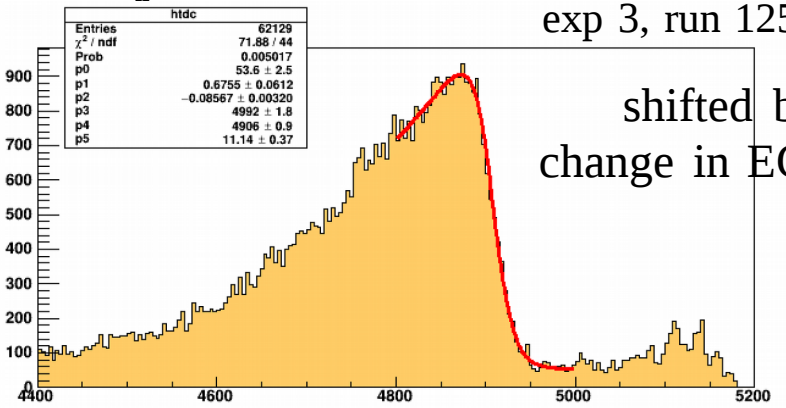
- IP shifted by 1 cm in z
- track resolution worse than naively expected → dominates the IP profile measurement

shift in t_0

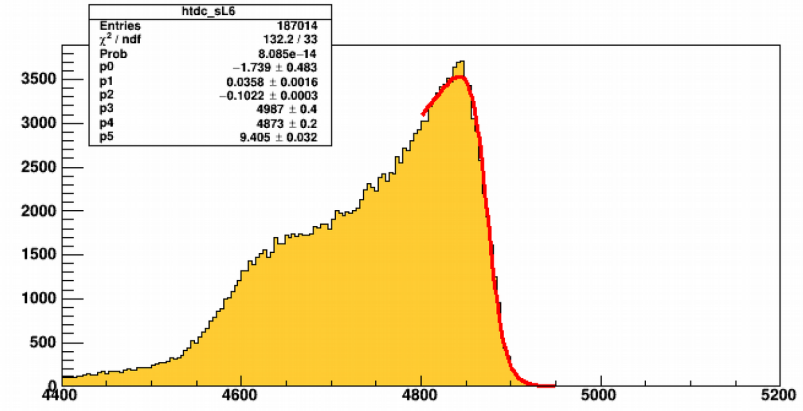
exp 2, run 1904

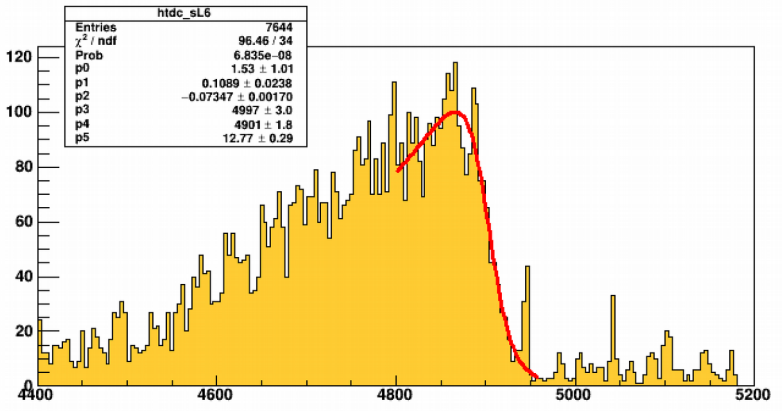


exp 3, run 125

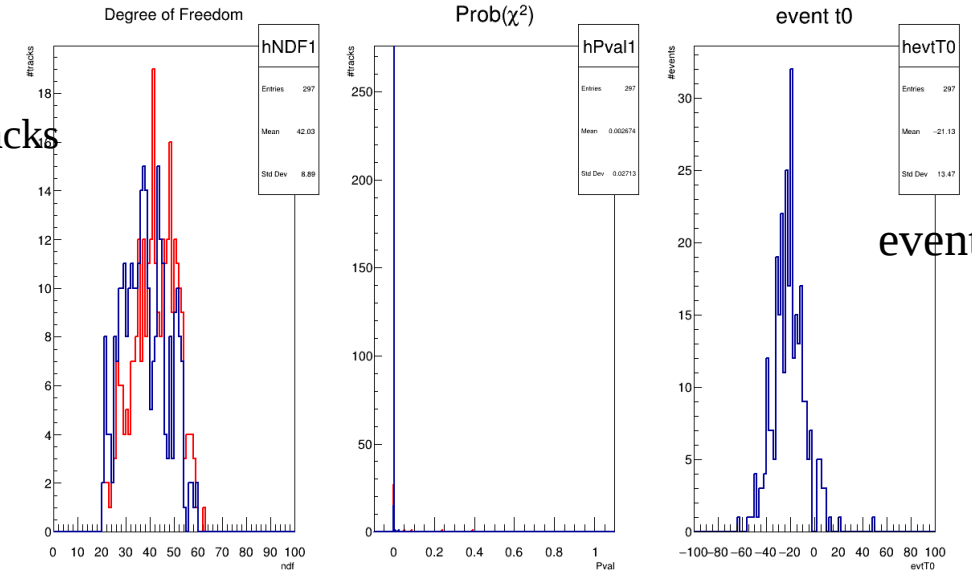


shifted by 30 ns
change in ECL firmware





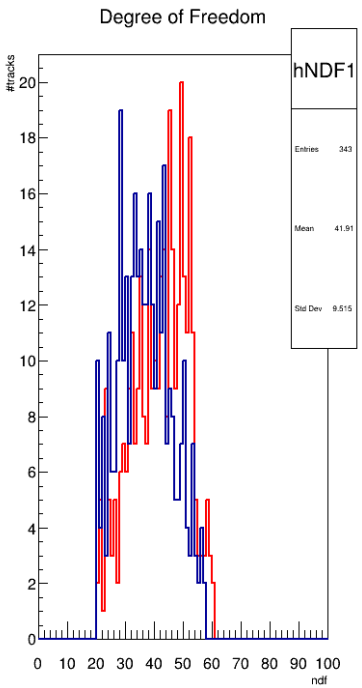
high momentum tracks
ndf > 20

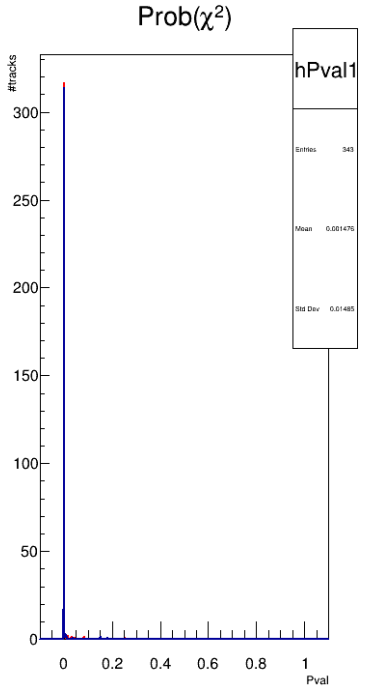


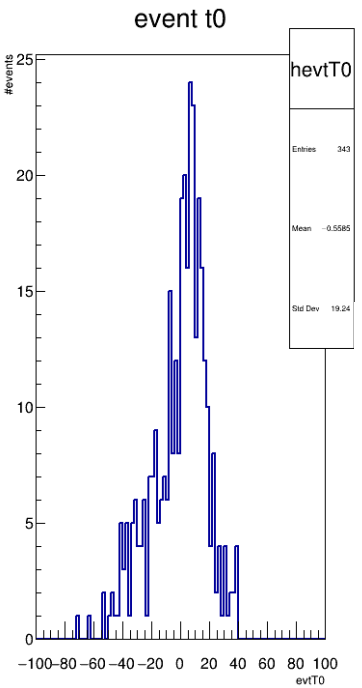
event $t0 = -21$ ns

corrected t_0 constants

very preliminary

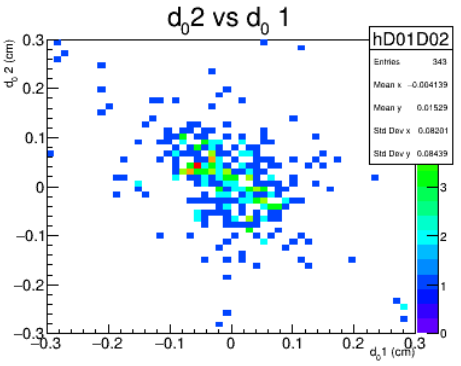


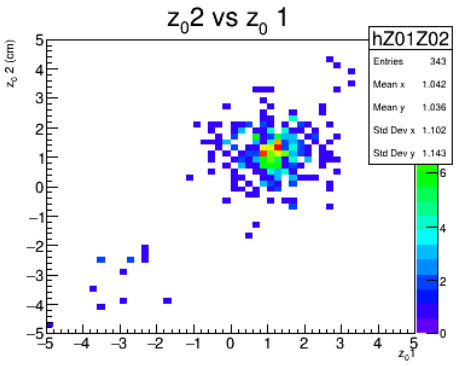


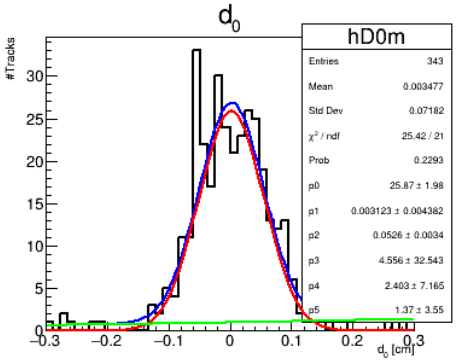


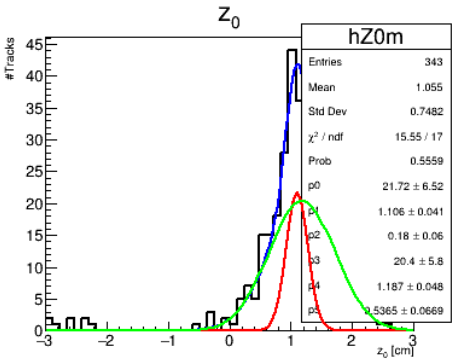
event t0 = 0 ns

number of evts = 297 → 343

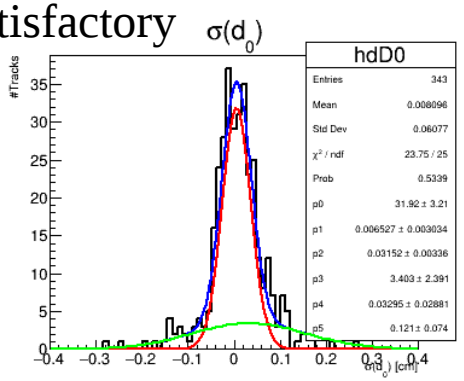


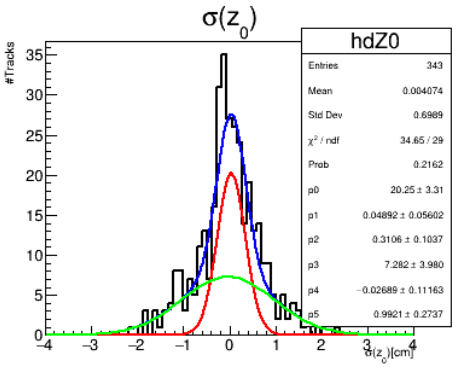






still resolution not satisfactory





Skims

- main interest is calibration skims
- for this purpose used the HLT tags (see January DP/B2GM talks from Prasanth/KT) change cuts from condDB
- getting also prepared for skimming out ''physics'' skims (a la HadronBJ)
- expect the HLT to be ran online but not systematically (possibility to rerun offline, eventually modified/improved trigger lines)

discussing with Thomas H, Nils

No	Trigger	Selection
1	accept_mu_mu	[[[nTracksLE >= 2] and [[P12CMSBhabhaLE > 4] and [[P1CMSBhabhaLE > 3] and [EC12CMSLE < 2]]]] or [[nTracksLE == 1] and [[P1CMSBhabhaLE > 3] and [nEidLE == 0]]]]
2	accept_mumu_1trk	[[nTracksLE == 1] and [[nEidLE == 0] and [[P1OEbeamCMSBhabhaLE > 0.1] and [[EC1CMSLE < 1] and [EtotLE < 7]]]]]
3	accept_mumu_2trk	[[nTracksLE >= 2] and [[nEidLE == 0] and [[P1OEbeamCMSBhabhaLE > 0.35] and [[P2OEbeamCMSBhabhaLE > 0.2] and [[EtotLE < 7] and [[EC2CMSLE < 1] and [maxAngleTTLE > 0.785]]]]]]
4	**accept_hadron**	**[[nTracksLE >= 3] and [Bhabha2Trk == 0]]**
4	**accept_hadron**	**[[nTracksLE >= 3] and [Bhabha2Trk == 0]]**
5	accept_single_photon	[[G1CMSBhabhaLE > 1] and [[GG == 0] and [[Bhabha2Trk == 0] and [Bhabha1Trk == 0]]]]
6	accept_single_photon_1GeV	[[G1CMSBhabhaLE > 1] and [[Bhabha2Trk == 0] and [GG == 0]]]
7	accept_single_photon_2GeV_barrel	[[G1CMSBhabhaLE > 2] and [Bhabha2Trk == 0]]
8	accept_single_photon_2GeV_endcap	[[G1CMSBhabhaLE > 2] and [[Bhabha2Trk == 0] and [GG == 0]]]
9	accept_tau_tau	[[nTracksLE >= 2] and [[P1CMSBhabhaLE < 5] and [[EtotLE < 9] and [VisibleEnergyLE < 9]]]]
10	accept_1_track1_cluster	[[[2 >= nTracksLE] and [nTracksLE >= 1]] and [[ENeutralLE > 1] and [[AngleGTLE > 0.785] and [nEidLE == 0]]]]
11	accept_2_tracks	[[[5 >= nTracksLE] and [nTracksLE >= 2]] and [[P1CMSBhabhaLE < 5] and [P12CMSBhabhaLE < 9]]]
12	accept_b2bcluster_3D	[[nB2BCC3DLE >= 1] and [G1CMSBhabhaLE < 2]]
13	accept_b2bclusterhigh_phi	[[nB2BCCPhiHighLE >= 1] and [G1CMSBhabhaLE < 2]]
14	accept_b2bclusterlow_phi	[[nB2BCCPhiLowLE >= 1] and [G1CMSBhabhaLE < 2]]
15	**accept_bhabha**	**[Bhabha2Trk == 1]**
15	**accept_bhabha**	**[Bhabha2Trk == 1]**
16	accept_gamma_gamma	[[nTracksLE <= 1] and [[nEidLE == 0] and [[EC12CMSLE > 4] and [EC1CMSLE > 2]]]]

accept_bhabha prescaled by 10

Skims

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- for this purpose used the HLT tags (see January DP/B2GM talks from Prasanth/KT) change cuts from condDB
- getting also prepared for skimming out ''physics'' skims (a la HadronBJ)
- expect the HLT to be ran online but not systematically (possibility to rerun offline, eventually modified/improved)

run	**112-140** (862 k evts)	**120** (408 k evts)	**μμ MC** (%)	**eeγ MC** (%)	**γγ MC** (%)	**DR2** ($0.1\ fb^{-1}$)
total	114587	57734	81.1	85.9		96.2
accept_bhabha	35	28	0.004	**2.3**	0.001	0.01
accept_mumu_2trk	282	97	**67.1**	0.3	0.0	23.9
accept_mumu_1trk	11170	5104	10.6	0.5	0.01	4.7
accept_gamma_gamma	1859	1018	0.9	20.6	**78.0**	0.7
accept_1_track1_cluster	114	73	6.6	2.6	0.6	5.6
accept_2_tracks	520	228	10.4	4.1	3.5	40.0
accept_hadron	184	60	0.3	0.10	0.04	62.0
accept_tau_tau	546	226	6.0	1.7	0.5	53.7
accept_single_photon_1GeV	11613	5614	7.2	40.8	25.0	24.8
accept_single_photon_2GeV_barrel	4205	2166	5.0	46.2	**89.0**	5.5
accept_single_photon_2GeV_endcap	3883	1898	4.9	34.3	**21.3**	5.2

- DR2: $0.1\ fb^{-1} = 0.7$ M evts ($b\bar{b}$, $c\bar{c}$, $s\bar{s}$, $d\bar{d}$, $u\bar{u}$, $\tau\tau$, $\mu\mu$)
- accept_bhabha prescaled by 10
- description of the samples in the next page

Signal samples

- **$ee \rightarrow ee(\gamma)$**
  - $15^{o} < \theta_{CMS} < 165^{o}$ $(xs = 125\ nb)$
- **$ee \rightarrow \mu\mu$**
  - $xs = 1\ nb$
- **$ee \rightarrow \gamma\gamma$**
  - $xs = 25.2\ nb$
  - $skim\ at\ generator = 16\,\%$ $(at\ least\ one\ photon\ of\ 1.5\ GeV\ inside\ the\ detector\ acceptance)$