

# AT Pedestal/MIP Constants

Update 6

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Tokyo, 22. August, 2018

**HELMHOLTZ** RESEARCH FOR  
GRAND CHALLENGES



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SEIT 1386

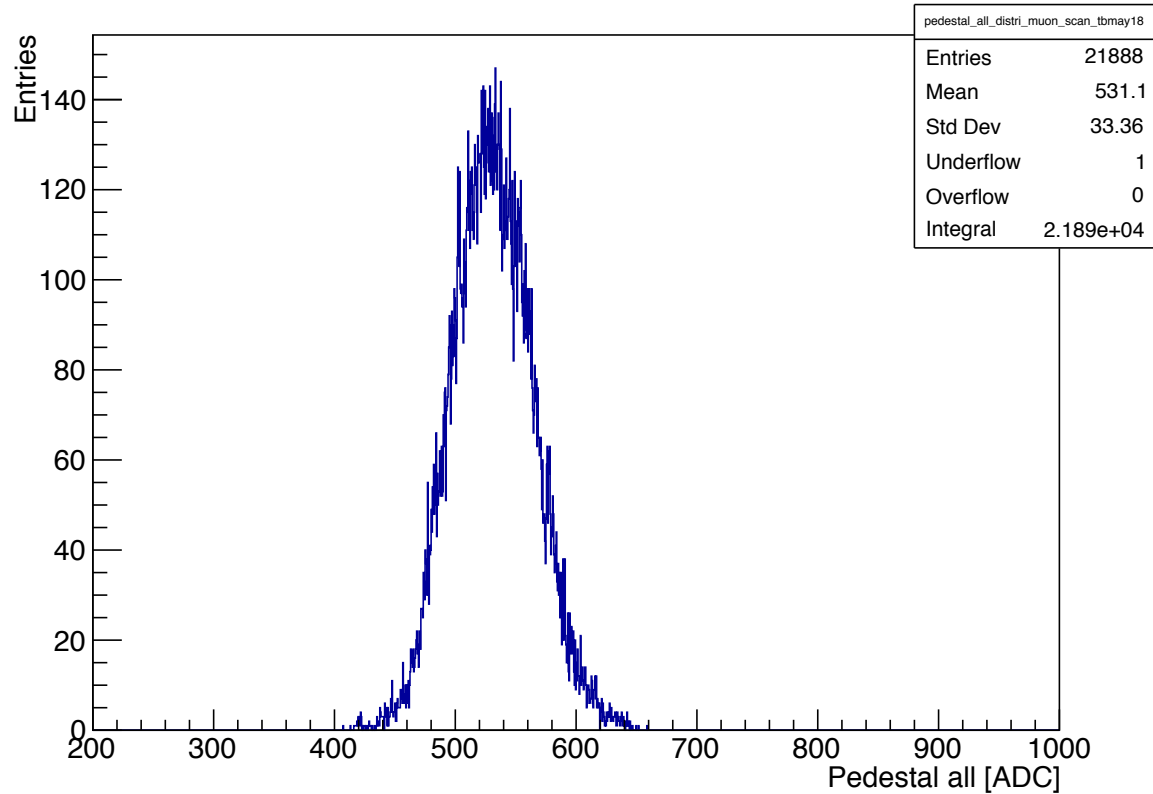


# AT Pedestals

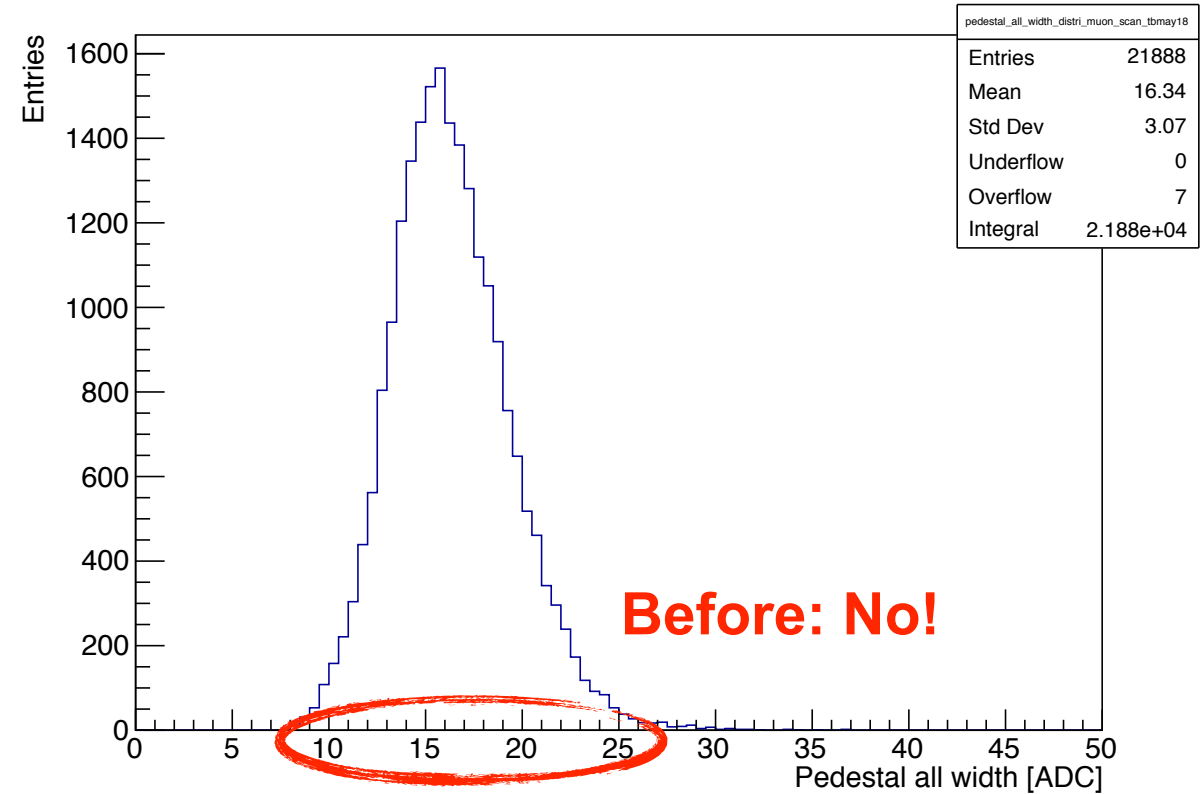
## What is uploaded to the data base?

- AT Pedestal extraction for full muon scan testbeam may 2018 = table with ~22000 entries for chip and channel

pedestal\_all\_distri\_muon\_scan\_tbmay18



pedestal\_all\_width\_distri\_muon\_scan\_tbmay18

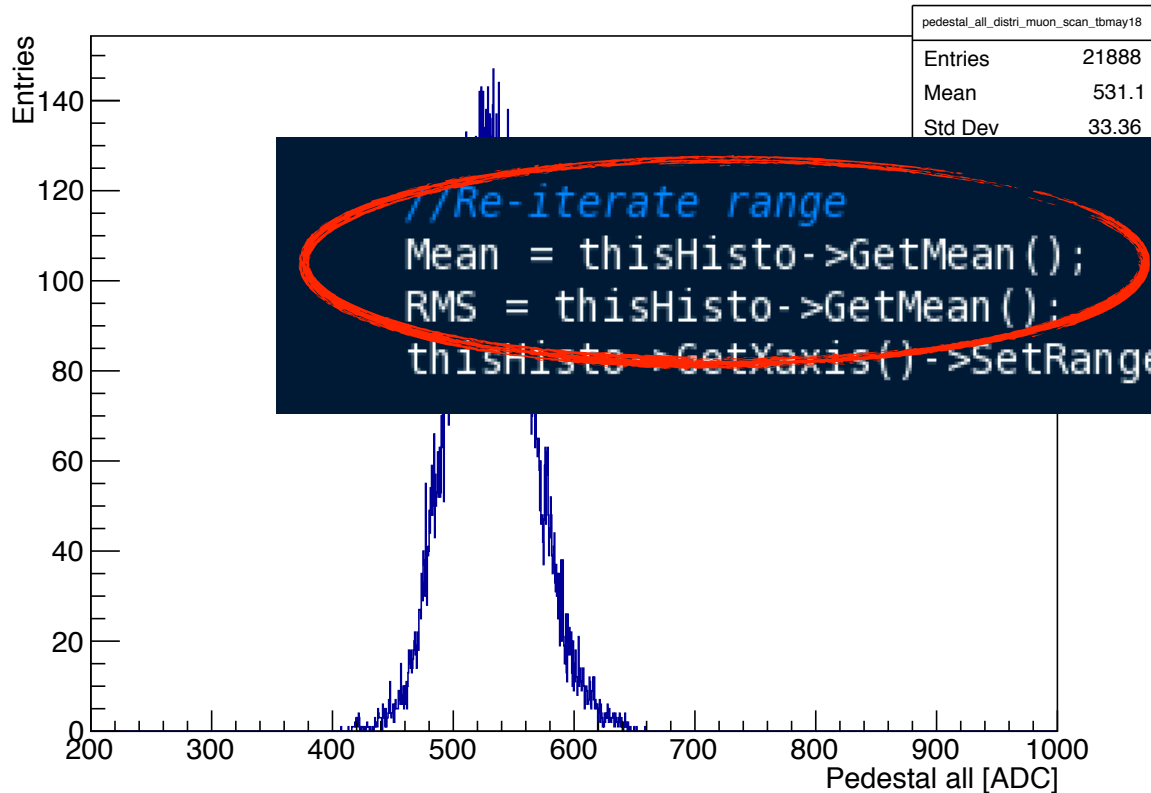


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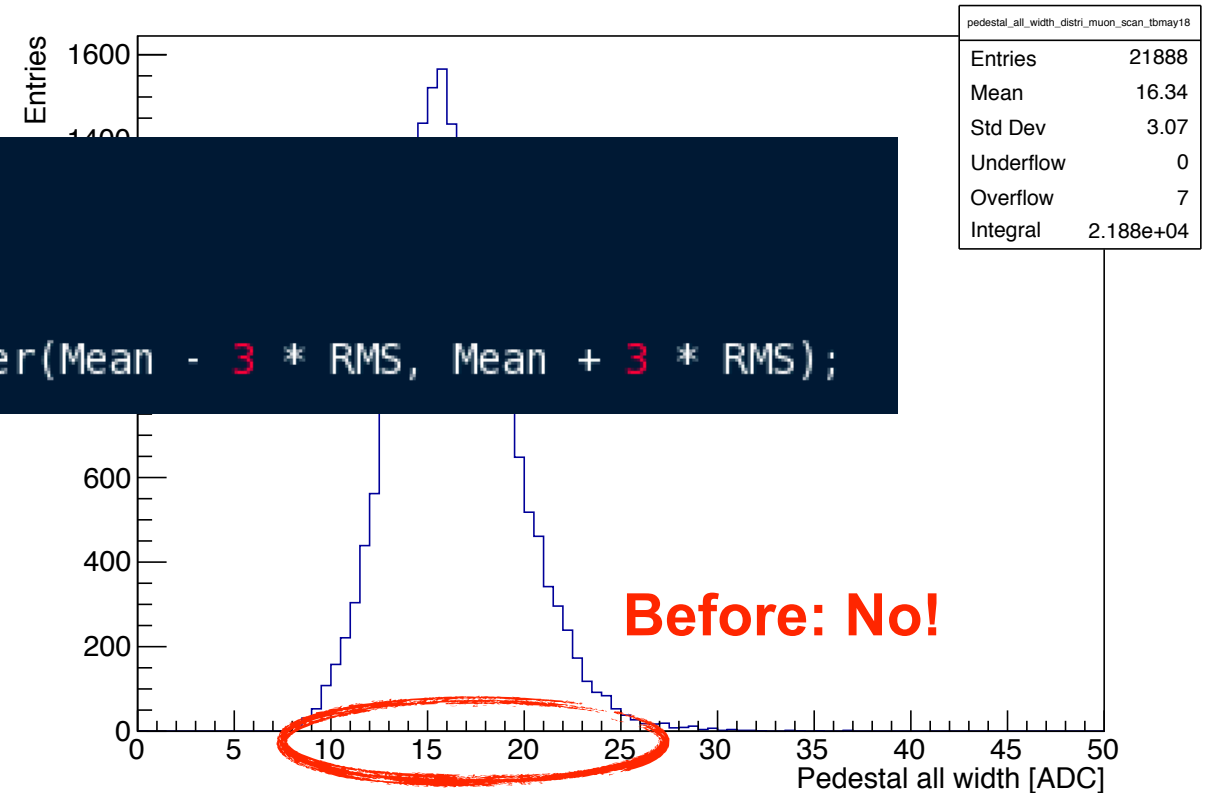
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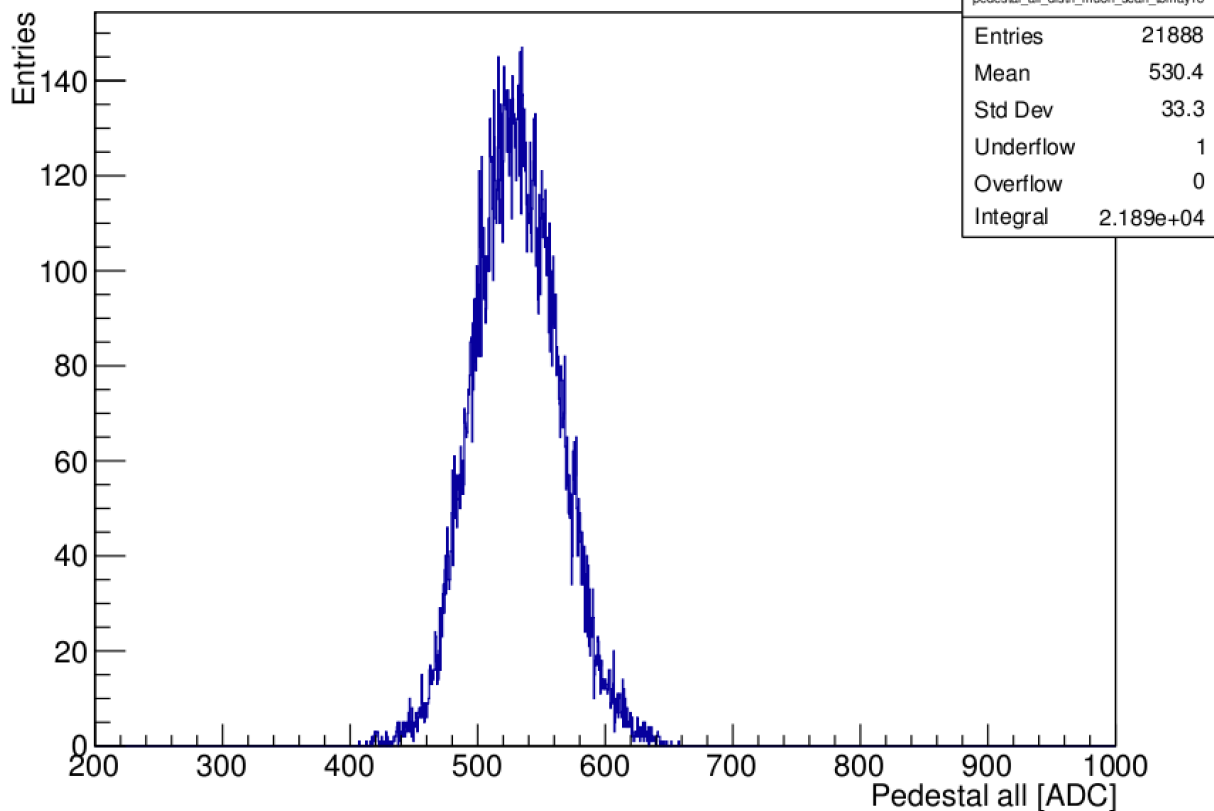


# AT Pedestals

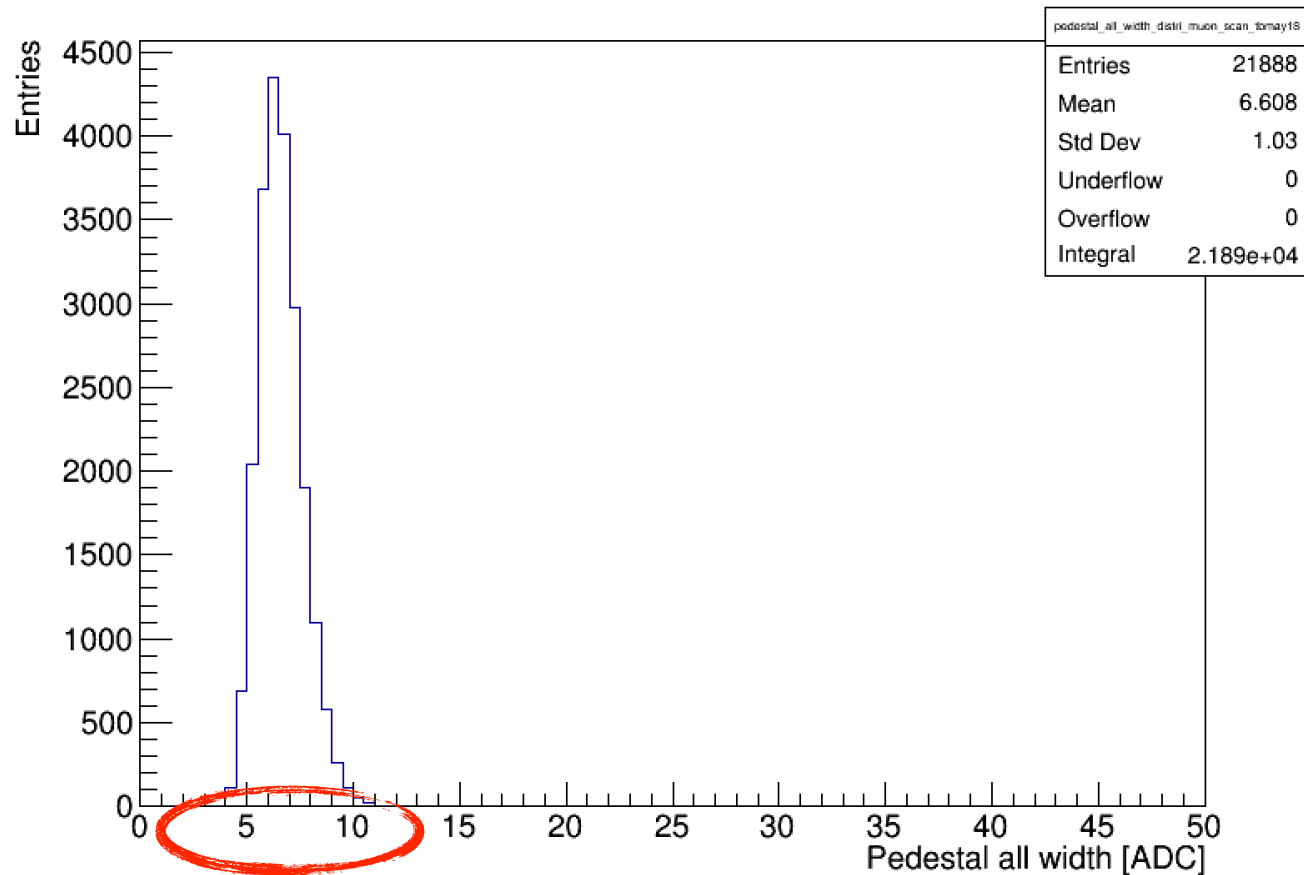
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pedestal\_all\_width\_distri\_muon\_scan\_tbmay18



**Now: How its supposed to be!**

# AT Pedestals

## Conversion to DB format

- Retranslate ChipID to Module, Chip...
  - ➔ Table with Module, Chip (0-15), Channel (0-35), pedposall, pedposall\_error (error of mean), status (1)

1	#Module	ChipNumber	Channel	Pedestal	Pedestal_error	status (status = 1)
2	1	0	0	481.785305136	0.00889661579236	1
3	1	0	1	491.832580856	0.00726658521666	1
4	1	0	2	485.582325424	0.0121490242206	1
5	1	0	3	493.012708251	0.00931112833414	1
6	1	0	4	486.898452624	0.0100909476184	1
7	1	0	5	498.078916064	0.00869245020741	1
8	1	0	6	489.97324745	0.00988652640216	1
9	1	0	7	483.055672201	0.00970714543338	1
10	1	0	8	498.00531466	0.008171518852	1
11	1	0	9	483.878142529	0.00921448359207	1
12	1	0	10	478.838142878	0.00951221150643	1
13	1	0	11	488.876983539	0.0103830396268	1
14	1	0	12	494.214402692	0.00798354212068	1
15	1	0	13	485.218434259	0.0106420156018	1
16	1	0	14	486.231247159	0.0127016574687	1
17	1	0	15	485.421464382	0.0101482023256	1
18	1	0	16	478.026694018	0.00925337109868	1
19	1	0	17	495.388808605	0.0101332922433	1
20	1	0	18	485.91379114	0.00895164260169	1
21	1	0	19	476.119294634	0.00893082595148	1
22	1	0	20	488.241596914	0.00865996606029	1
23	1	0	21	480.217074408	0.00969488543337	1
24	1	0	22	492.233192854	0.00877672892617	1
25	1	0	23	486.677299684	0.00954093740945	1
26	1	0	24	484.271467479	0.00859972385439	1
27	1	0	25	494.56972085	0.00934121936551	1

➔ Uploaded  
successfully to DB

**Tag: ahc2\_pedestal\_180821\_003**

# AT Pedestals

## Modification in Pedestal\_Extraction AT

- Now extraction of absolute values of each memory cell and pedposall
  - ➔ Calculation of offsets with reference to pedposall possible now!

```
2 #format: the ordering of memory cells is inverted for DAQ HBO
3 #chip  chn  pedposall  pedwidthall  pedOffsetcell1  pedOffsetcell2  pedOffsetcell3  ...  pedOffsetcell16
4 256    0    481.785 5.93478 489.536 478.881 485.024 478.375 478.413 482.462 476.177 475.912 477.739 485.246 483.69 483.988 488.229
   485.095 489.747 478.942
5 256    1    491.833 4.84366 489.802 494.461 493.709 486.434 494.906 486.545 490.649 493.348 492.347 493.551 493.976 496.751 491.087
   494.14 492.355 490.526
6 256    2    485.582 8.13804 486.576 475.169 493.617 479.001 484.427 489.664 493.742 473.036 496.672 483.822 484.29 489.681 489.315
   489.281 491.04 482.625
7 256    3    493.013 6.24024 492.945 494.155 498.448 489.943 487.838 492.188 497.063 484.532 496.004 491.498 485.261 507.293 496.845
   493.15 495.387 500.158
8 256    4    486.898 6.77252 491.065 488.88 491.408 478.908 486.826 478.074 492.837 488.274 479.699 481.374 487.267 485.824 500.441
   490.163 487.173 491.195
9 256    5    498.079 5.83483 498.488 497.862 493.755 496.794 502.642 497.632 502.319 496.226 500.981 491.781 496.347 503.216 498.015
   497.469 504.127 505.236
0 256    6    489.973 6.59932 489.716 489.286 492.282 486.524 492.372 483.05 487.44 490.67 481.008 500.867 500.877 495.942 490.642
   482.978 492.702 489.859
1 256    7    483.056 6.48473 489.458 484.401 485.94 478.049 488.316 480.838 479.317 480.238 470.564 478.461 481.253 482.291 492.102
   490.592 484.43 492.263
2 256    8    498.005 5.46142 497.547 500.392 498.463 492.047 494.19 497.909 499.773 503.532 492.823 502.734 497.842 495.357 501.668
   508.522 498.56 502.538
3 256    9    483.878 6.16756 480.685 486.513 486.704 481.233 477.466 482.034 488.144 479.273 480.963 492.28 481.186 498.046 489.944
   479.751 490.667 493.335
```

# AT Pedestals Offsets

DB

```
1 #Module ChipNumber Channel memcell0_offset memcell0_offset_error status (status = 1)memcell1_offset memcell1_offset_error
status (status = 1)memcell2_offset memcell2_offset_error status (status = 1)memcell3_offset memcell3_offset_error status
(status = 1)memcell4_offset memcell4_offset_error status (status = 1)memcell5_offset memcell5_offset_error status (status =
1)memcell6_offset memcell6_offset_error status (status = 1)memcell7_offset memcell7_offset_error status (status =
1)memcell8_offset memcell8_offset_error status (status = 1)memcell9_offset memcell9_offset_error status (status =
1)memcell10_offset memcell10_offset_error status (status = 1)memcell11_offset memcell11_offset_error status (status =
1)memcell12_offset memcell12_offset_error status (status = 1)memcell13_offset memcell13_offset_error status (status =
1)memcell14_offset memcell14_offset_error status (status = 1)memcell15_offset memcell15_offset_error status (status = 1)
2 1 0 0 7.751 0.0191798207637 1 -2.904 0.0183161306626 1 3.239 0.0193373790115 1 -3.41
0.0205897095745 1 -3.372 0.0216296020876 1 0.677 0.0219600849448 1 -5.608 0.0223278777423 1 -5.873
0.021713797024 1 -4.046 0.0261125566276 1 3.461 0.0288800998395 1 1.905 0.0248690076202 1 2.203
0.0421186722925 1 6.444 0.036705803267 1 3.31 0.0393820129239 1 7.962 0.0555415373393 1 -2.843
0.124727824442 1
3 1 0 1 -2.031 0.018320504328 1 2.628 0.0172221174549 1 1.876 0.0199082916261 1 -5.399
0.0196911346544 1 3.073 0.0210563575978 1 -5.288 0.0216163210064 1 -1.184 0.0225354793044 1 1.515
0.021581372774 1 0.514 0.0255253858271 1 1.718 0.0282260726459 1 2.143 0.0249141927763 1 4.918
0.040123121584 1 -0.746 0.0368409750292 1 2.307 0.0378229149412 1 0.522 0.0549172435432 1 -1.307
0.123786893658 1
4 1 0 2 0.994 0.0212595893748 1 -10.413 0.0203543775909 1 8.035 0.0223405562502 1 -6.581
0.0233487418268 1 -1.155 0.023898224846 1 4.082 0.0243450213866 1 8.16 0.0257404390778 1 -12.546
0.0240605068975 1 11.09 0.0287243172915 1 -1.76 0.0304057747025 1 -1.292 0.0270163585744 1 4.099
0.0398377254202 1 3.733 0.0362536384343 1 3.699 0.0392738122017 1 5.458 0.0588283074644 1 -2.957
0.116797410144 1
5 1 0 3 -0.068 0.019335018054 1 1.142 0.0180146303516 1 5.435 0.0199569103349 1 -3.07
0.021093090292 1 -5.175 0.0218188966074 1 -0.825 0.0221884309019 1 4.05 0.0222706877241 1 -8.481
0.0220509091911 1 2.991 0.029026538125 1 -1.515 0.031424547589 1 -7.752 0.0252814861208 1 14.28
0.0423279857883 1 3.832 0.0349862317489 1 0.137 0.0385971328454 1 2.374 0.0561399373954 1 7.145
0.134192076332 1
6 1 0 4 4.167 0.0195283464582 1 1.982 0.0182630296725 1 4.51 0.0203934237946 1 -7.99
0.0207996173671 1 -0.072 0.0220188345083 1 -8.824 0.0226406181141 1 5.939 0.0234514774464 1 1.376
0.0223956793039 1 -7.199 0.0276552102012 1 -5.524 0.0290575848053 1 0.369 0.0253507741887 1 -1.074
0.0459462836796 1 13.543 0.0372588256321 1 3.265 0.0398937946637 1 0.275 0.0556304256362 1 4.297
0.131785916561 1
7 1 0 5 0.409 0.0231469418368 1 -0.217 0.0218316524476 1 -4.324 0.0233994171269 1 -1.285
0.0261974884238 1 4.563 0.0270882275914 1 -0.447 0.0274055607459 1 4.24 0.0305076235817 1 -1.853
0.0268635033644 1 2.902 0.034036380856 1 -6.298 0.0356277321017 1 -1.732 0.03099312376 1 5.137
0.0538740035126 1 -0.064 0.0422226989127 1 -0.61 0.0493713217281 1 6.048 0.0703847239105 1 7.157
0.148115102324 1
```

➔ Uploaded successfully to DB

➔ Ready to be tested in reconstruction!

Tag: **ahc2\_pedestalmemorycelloffset\_180822**

# AT Pedestals Offsets

## DB - Tags

### E4DPedestal

Tag	recommend	CalSoft	Remark	Date
ahc2_001			Annas merged calibration constants (problems encountered with module one pedestal values and missing MIP values)	18-04
ahc2_002	x		based on ahc_001 corrected by Daniel	18-05
ahc2_pedestal_180821_003	to be checked		Latest AT pedestal constants extracted from a full muon scan of TB SPS May 2018	18-08

### E4DPedestalMemoryCellOffset

Tag	recommend	CalSoft	Remark
dummy_pedestal_180821_001	For testing		Dummy values for pedestal offsets (100 for even, -100 for odd memcell)
ahc2_pedestalmemorycelloffset_180822	x		AT pedestal offset values for memory cell 0-15 per channel from SPS Cern testbeam may 2018 extracted from a full muon scan



# MIP Constants

## On their way...

- MIP Extraction code successfully modified: Absolute memorycell-wise pedestal subtraction before Landau-Gaussian is fitted, no need to use pedestal\_all for MIP extraction!
- Currently running ... Still waiting for solving problem to get access to HTC BIRD, anyway almost done on naf/local
- Script prepared/adapted for: Quality checks, outlier check, spectra check, DB upload etc..

# MIP Constants

On their way...

- 
- 
- 

ChipID	Chn	MPV	MPV_Error	lw	gw	Chi2	NDF
256	0	222.43	0.968521	23.8988	51.2448	266.697	230
256	1	225.342	1.54883	20.1859	58.4743	276.766	236
256	2	226.289	1.14834	23.5211	55.2457	285.345	250
256	3	210.192	1.59014	20.213	57.0191	306.451	236
256	4	241.146	1.30751	23.3649	56.3492	282.53	263
256	5	230.5	2.09303	19.2515	59.1547	296.068	242
256	6	256.606	1.23397	24.3602	58.6469	249.519	252
256	7	223.452	1.22144	21.0882	53.7953	278.74	235
256	8	228.89	1.16448	22.5546	52.7687	219.026	236
256	9	229.862	1.07306	25.0911	52.1052	270.833	248
256	10	233.133	1.41386	22.366	55.1102	301.927	234
256	11	228.172	1.40845	24.1574	53.8568	269.129	237
256	12	235.288	1.03834	26.6768	54.968	285.679	251
256	13	252.328	1.34282	23.6703	58.1489	236.292	251
256	14	231.917	0.938549	29.4376	45.7155	297.605	241
256	15	233.805	1.08705	27.3773	52.0384	291.046	248
256	16	252.631	2.52419	17.7044	63.9924	314.507	261
256	17	225.499	1.11148	26.1481	49.2205	250.243	243
256	18	189.136	1.01629	22.4277	48.854	312.269	216
256	19	243.098	1.0217	28.3372	51.4154	375.658	256
256	20	219.032	1.5285	20.3182	55.0953	283.108	234
256	21	244.354	1.50569	22.9405	57.7449	228.469	246
256	22	249.238	1.6507	23.2141	58.33	309.297	258
256	23	220.207	1.15314	28.1905	48.1169	292.969	240
256	24	213.785	1.06801	24.7226	49.7225	287.52	232
256	25	230.828	1.80295	19.529	57.7859	315.722	238
256	26	188.968	1.0275	27.8899	43.5613	318.455	227
256	27	216.784	1.37394	24.0646	53.5669	291.453	245

memorycell-wise pedestal subtraction before Landau-extraction!








get access to HTC BIRD, anyway almost done on naf/local

ck, spectra check, DB upload etc..

513	35	249.119	1.30616	30.1194	55.7719	555.26	264	
515	0	232.821	0.870127		28.5642	48.0573	506.105	238

➔ Today/Tomorrow MIP constant results for all ~22000 channels

# ToDos / Plan

- Properly define pedestal\_all and its width, outlier check, quality of pedestal.tsv file 
  - ➔ Data base format, upload to data base 
- Modify pedestal extraction code for proper MIP calibration: 
  - ➔ Memcell-wise absolute pedestal values + RMS, DB 
- Modify MIP extraction code: 
  - ➔ Memcell-wise (0-8, for 9-15 value of 1) absolute pedestal subtraction, get MIP directly 
- Run modified MIP calibration on cluster and check results quality, outliers, width, etc. 
  - ➔ Data base format, upload to data base
- ➔ Close the circle: Run Reco with new Pedestals (Memcell corrected) and MIP constants
  - ➔ Check energy deposition and if it peaks at 1 MIP for muon runs
- Further studies:
  - ➔ Run vs. Run comparison pedestal (also LG/HG mode vs. HG/TDC mode) and MIP, Low Gain Pedestals
  - ➔ Pedestal effects? Shift? Whats going on?
  - ➔ MIP constant memory-cell dependence?
  - ➔ T influence on pedestal/mip-constant?

 **Next**

# Backup

# AT Pedestals

## What is uploaded to the data base?

- Pedposall per chip and channel: The mean of all pedestal values from all memory cells of a specific chip, channel
- The RMS of this quantity (pedwidthall) as a reference of the width of this total distribution
  - ➔ Features all effects seen for individual memcell spectra

$$pedposall_{chip,chan} = \frac{\sum_{i=1}^{N_{max\_entry,chip,chan}} A_{chip,chan,memcell[i]}}{N_{max\_entry,chip,chan}}$$

$$pedwidthall = \sigma_{pedposall_{chip,chan}} = \sqrt{\frac{\sum_{i=1}^{N_{max\_entry,chip,chan}} (A_{chip,chan,memcell[i]} - pedposall_{chip,chan})^2}{N_{max\_entry,chip,chan}}}$$

```
#pedestal positions & memory cell dependent offsets (tpedOffsetcellX = tpedOffsetcell2 - tpedOffsetcellX) from file "/afs/desy.de/group/flc/pool/heuchel/workspace/mip_calib/tb_cern_may18/test_Run60300//pedestal_offsets_in.tsv"
#format: the ordering of memory cells is inverted for DAQ HBU
#chip  chn  pedposall  pedwidthall  pedOffsetcell1  pedOffsetcell2  pedOffsetcell3  ...  pedOffsetcell16
271   9    558.551  1.4964  7.74366  0    6.66062  11.9182  4.25365  -5.00803    0.97751  7.53793  9.21107  17.9237  -1.70654    1.7547  12.0196  7.67841  13.4744  -1.82571
271  10    591.152  14.7697  3.33799  0    7.93552  8.639   -2.95822    4.23467  10.7301  11.0614  16.7624  3.93781  -2.27164    18.0629  9.58617  18.6462  -11.0692    15.7176
271  11    582.666  15.3139  6.4772  0    19.8698  12.6352  15.0605  2.39024  11.596  4.56609  18.1837  14.6171  6.26952  7.13976  16.0034  14.1037  4.15006  11.1487
271  12    590.893  14.6599  -2.02211  0    0    13.1367  10.7085  -5.02162    1.14644  3.66356  4.80892  0.979461    4.83139  1.81398  3.5496  12.4306  12.6894  2.49631  3.63031
271  13    592.848  17.0129  1.64906  0    10.3883  -1.42588    1.05478  9.9227  6.06266  1.96027  7.40683  6.71649  -6.88181    2.06115  3.84188  -4.62579    3.7894  4.72878
271  14    561.369  13.745  -4.48405  0    0    8.12329  8.16825  10.3668  12.123  20.5284  8.41518  10.222  14.1574  9.5587  4.05037  -2.77539    3.1929  6.51363  4.93882
271  15    591.966  15.557  9.04309  0    9.26293  12.123  -3.5276  17.8027  11.2772  -2.91484    -0.0347748    3.52134  5.30886  11.2422  8.93613  6.85962  -4.46172    4.1089
```