

Tests for the badly reconstructed momenta

GEANT4/TGEANT

- one chunk of lepto events [/eos/experiment/compass/mc/production/gen/2016/P09/mu+_lepto_slot5.1/o_data/mcr00001-275475.dat](#)
 tgeant source files as
[/cvmfs/compass-mc.cern.ch/sw/tgeant/TGEANT_FILES_2019-12-09](#)
[/cvmfs/compass-mc.cern.ch/sw/tgeant/TGEANT_FILES_2020-03-28](#)
 copied to
[/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/tgeant/](#)
 4 builds

```

cmake3 -DCMAKE_CXX_FLAGS="-fPIC -std=c++14" -DTGEANT_ENABLE_SQLITE=YES -DTGEANT_EXTERNAL_LHAPDF=YES -
DCMAKE_INSTALL_PREFIX=$PWD/../../T
GEANT_INSTALL_NOW/ ${PWD}/../TGEANT_FILES_NOW/ -DXERCESC_INCLUDE=$XERCESC/include -
DXERCESC_LIBRARY_DIR=$XERCESC/lib -DTGEANT_USEQT
5=YES -DCLHEP_ROOT_DIR=$CLHEP

```

 resulting in
[/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/tgeant/TGEANT_INSTALL_2019-12-09_10.4/](#)
[/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/tgeant/TGEANT_INSTALL_2019-12-09_10.5/](#)
[/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/tgeant/TGEANT_INSTALL_2020-03-28_10.4/](#)
[/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/tgeant/TGEANT_INSTALL_2020-03-28_10.5/](#)
- the last digits (10.4 and 10.5) correspond to the geant4.10.4 and geant4.10.5 used for the libs
[/cvmfs/geant4.cern.ch/geant4/10.5/x86_64-centos7-gcc63-opt/](#) (requires and has been verified with CLHEP, release 2.4.1.0)
[/cvmfs/geant4.cern.ch/geant4/10.4p01/x86_64-centos7-gcc63-opt/](#) (requires and has been verified with CLHEP, release 2.4.0.0)

- production was done from
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_tgeant/mu+_lepto_slot5.1_10.4t19
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_tgeant/mu+_lepto_slot5.1_10.4t20
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_tgeant/mu+_lepto_slot5.1_10.5t19
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_tgeant/mu+_lepto_slot5.1_10.5t20
where you find the geant files (mcr00001-275475_run000.tgeant) produced by using
settings_2016P09_nopile_mu+.xml (no beam pileup)
setting files are the same in the 4 directories

reconstruction was performed by
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_coral/mu+_lepto_slot5.1_10.4t19
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_coral/mu+_lepto_slot5.1_10.4t20
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_coral/mu+_lepto_slot5.1_10.5t19
/afs/cern.ch/compass/scratch/monthly/d01_del1/bressan/run_coral/mu+_lepto_slot5.1_10.5t20
using the same coral (/cvmfs/compass-mc.cern.ch/sw/corals/coral_git_2020-01-16) and identical
option files **template_noeff_nopile_mu+.opt**, where I **switched off 2D efficiencies, matrix efficiencies
and hodoscopes efficiencies.**

the mDSTs **mcr00001-275475_hit.root** in all the previous directory also store the hits of most of the tracking detectors.

Scan of 10.5t19 (left) vs 10.4t19

root [4] dis->Scan("beam_pMC:Zprim:ZprMC:mupr_p:mupr_pMC:mupr_p-mupr_pMC", "")

* Row * beam_pMC * Zprim * ZprMC * mupr_p * mupr_pMC * mupr_p-mu *

* 0	* 146.90170	* -164.9400	* -166.9919	* 110.19139	* 110.79181	* -0.600418
* 1	* 159.30511	* -75.87757	* -75.66944	* 139.25053	* 139.79428	* -0.543746
* 2	* 167.51695	* -289.0551	* -292.6948	* 158.68661	* 158.92117	* -0.234558
* 3	* 157.53733	* -237.7773	* -237.3332	* 98.869949	* 99.493164	* -0.623214
* 4	* 157.64006	* -143.3564	* -142.7606	* 143.36039	* 143.63026	* -0.269866
* 5	* 155.54696	* -191.7563	* -191.2633	* 38.754180	* 38.797401	* -0.043220
* 6	* 161.60076	* -168.7985	* -168.9648	* 142.48107	* 142.14033	* 0.3407440
* 7	* 144.76449	* -287.0115	* -286.6488	* 90.615951	* 90.841262	* -0.225311
* 8	* 151.34109	* -184.4265	* -183.3436	* 135.92602	* 136.60850	* -0.682479
* 9	* 157.30500	* -145.8157	* -145.3911	* 29.322935	* 28.676464	* 0.6464710
* 10	* 155.57299	* -125.4214	* -126.8465	* 135.90530	* 136.22164	* -0.316345
* 11	* 150.16101	* -267.0959	* -264.7397	* 133.23242	* 133.15356	* 0.0788574
* 12	* 160.53802	* -260.8156	* -263.9104	* 123.29795	* 129.22839	* -5.930442
* 13	* 161.58512	* -187.5231	* -187.1633	* 127.23155	* 126.83416	* 0.3973922
* 14	* 159.21862	* -231.0133	* -230.7792	* 33.052776	* 33.399158	* -0.346382
* 15	* 160.19700	* -303.6419	* -303.8237	* 139.70585	* 139.70152	* 0.0043334
* 16	* 161.04336	* -294.6781	* -293.8003	* 107.58532	* 107.09574	* 0.4895706
* 17	* 158.70405	* -315.8299	* -312.4812	* 147.27290	* 147.10969	* 0.1632080
* 18	* 165.79402	* -272.6046	* -274.1696	* 158.87939	* 158.75842	* 0.1209716
* 19	* 166.27903	* -219.0833	* -220.8694	* 157.81518	* 158.13822	* -0.323043
* 20	* 162.44001	* -271.2649	* -271.6017	* 97.207504	* 92.707298	* 4.5002059
* 21	* 167.31999	* -122.8001	* -124.9111	* 81.619293	* 78.717521	* 2.9017715
* 22	* 158.34297	* -330.3103	* -332.4259	* 139.02174	* 138.26139	* 0.7603454
* 23	* 150.81498	* -276.2565	* -278.7662	* 119.48779	* 120.12151	* -0.633720
* 24	* 152.24800	* -185.1890	* -184.2375	* 93.011245	* 93.125717	* -0.114471

root [1] dis->Scan("beam_pMC:Zprim:ZprMC:mupr_p:mupr_pMC:mupr_p-mupr_pMC", "")

* Row * beam_pMC * Zprim * ZprMC * mupr_p * mupr_pMC * mupr_p-mu *

* 0	* 146.90170	* -207.5379	* -208.9523	* 110.98503	* 110.79181	* 0.1932220
* 1	* 159.30511	* -227.0844	* -227.7733	* 140.57661	* 139.79426	* 0.7823486
* 2	* 167.51696	* -160.5791	* -159.9294	* 158.55384	* 158.92117	* -0.367324
* 3	* 157.53733	* -175.3885	* -175.5980	* 99.543914	* 99.493171	* 0.0507431
* 4	* 157.64004	* -113.6708	* -114.4890	* 142.75885	* 143.63026	* -0.871414
* 5	* 155.54696	* -306.1986	* -305.0769	* 38.746089	* 38.797401	* -0.051311
* 6	* 161.60076	* -185.5975	* -185.9654	* 142.75209	* 142.14033	* 0.6117553
* 7	* 144.76449	* -319.8401	* -322.7676	* 90.988998	* 90.841262	* 0.1477355
* 8	* 151.34109	* -151.6115	* -151.6994	* 136.18386	* 136.60852	* -0.424652
* 9	* 157.30499	* -114.9167	* -115.3075	* 28.405870	* 28.676466	* -0.270595
* 10	* 155.57299	* -75.87600	* -76.11511	* 135.79982	* 136.22164	* -0.421829
* 11	* 150.16101	* -250.8000	* -249.0746	* 133.51741	* 133.15356	* 0.3638458
* 12	* 160.53802	* -329.4518	* -328.3470	* 127.86454	* 129.22837	* -1.363838
* 13	* 161.58512	* -282.3827	* -279.9987	* 126.45889	* 126.83416	* -0.375274
* 14	* 159.21862	* -277.8177	* -275.9275	* 33.346866	* 33.399158	* -0.052291
* 15	* 160.19702	* -129.3394	* -129.7272	* 140.52526	* 139.70152	* 0.8237457
* 16	* 161.04336	* -81.35971	* -82.04405	* 107.82820	* 107.09574	* 0.7324523
* 17	* 158.70405	* -112.8869	* -116.0481	* 146.66406	* 147.10969	* -0.445632
* 18	* 165.79402	* -72.30281	* -71.81410	* 158.34791	* 158.75842	* -0.410507
* 19	* 166.27903	* -95.07279	* -94.48886	* 159.40062	* 158.13822	* 1.2623901
* 20	* 162.44000	* -328.6280	* -328.2335	* 92.739418	* 92.707290	* 0.0321273
* 21	* 167.32000	* -284.1838	* -285.0474	* 78.597244	* 78.717514	* -0.120269
* 22	* 158.34297	* -253.3822	* -254.2902	* 137.43447	* 138.26139	* -0.826919
* 23	* 150.81498	* -285.9909	* -286.8343	* 119.74535	* 120.12151	* -0.376159
* 24	* 152.24800	* -126.8479	* -127.5237	* 93.209220	* 93.125717	* 0.0835037

Scan of 10.5t20 (left) vs 10.4t19

```
root [1] dis->Scan("beam_pMC:Zprim:ZprMC:mupr_p:mupr_pMC:mupr_p-mupr_pMC", "")
```

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*****
```

```
* Row * beam_pMC * Zprim * ZprMC * mupr_p * mupr_pMC * mupr_p-mu *
```

```
*****
```

```
* 0 * 146.90170 * -331.2910 * -333.3443 * 111.42915 * 110.79181 * 0.6373367 *  
* 1 * 159.30511 * -166.7032 * -166.5761 * 140.20919 * 139.79428 * 0.4149169 *  
* 2 * 167.51695 * -328.5502 * -331.2748 * 159.05316 * 158.92117 * 0.1319885 *  
* 3 * 157.53733 * -137.6756 * -137.2811 * 99.413505 * 99.493164 * -0.079658 *  
* 4 * 157.64004 * -198.9212 * -197.6106 * 143.22024 * 143.63026 * -0.410018 *  
* 5 * 155.54696 * -128.3595 * -129.7582 * 38.772857 * 38.797401 * -0.024543 *  
* 6 * 161.60076 * -325.6738 * -323.7188 * 142.25880 * 142.14032 * 0.1184844 *  
* 7 * 144.76449 * -255.1373 * -256.9733 * 90.944938 * 90.841255 * 0.1036834 *  
* 8 * 151.34109 * -330.6021 * -331.9682 * 136.03433 * 136.60852 * -0.574188 *  
* 9 * 157.30500 * -238.1168 * -238.6572 * 28.605705 * 28.676464 * -0.070758 *  
* 10 * 155.57301 * -221.3665 * -222.4712 * 136.49592 * 136.22164 * 0.2742767 *  
* 11 * 150.16101 * -240.9248 * -237.9536 * 133.79827 * 133.15356 * 0.6447143 *  
* 12 * 160.53802 * -78.60655 * -78.76206 * 128.45228 * 129.22837 * -0.776092 *  
* 13 * 161.58511 * -69.56862 * -70.06826 * 127.14763 * 126.83416 * 0.3134765 *  
* 14 * 159.21862 * -253.6330 * -260.7723 * 33.527236 * 33.399158 * 0.1280784 *  
* 15 * 160.19702 * -321.3251 * -320.2864 * 141.58039 * 139.70150 * 1.8788909 *  
* 16 * 161.04336 * -320.5310 * -318.5879 * 107.30391 * 107.09574 * 0.2081680 *  
* 17 * 158.70405 * -183.1192 * -183.8019 * 147.01788 * 147.10969 * -0.091812 *  
* 18 * 165.79402 * -193.5667 * -194.7225 * 158.72364 * 158.75842 * -0.034774 *  
* 19 * 166.27903 * -327.1225 * -326.0652 * 157.66693 * 158.13822 * -0.471298 *  
* 20 * 162.44001 * -79.39064 * -78.84738 * 96.477226 * 92.707298 * 3.7699279 *  
* 21 * 167.31999 * -239.2868 * -246.3006 * 81.939239 * 78.717514 * 3.2217254 *  
* 22 * 158.34297 * -238.9512 * -242.6385 * 138.98944 * 138.26139 * 0.7280426 *  
* 23 * 150.81498 * -86.50003 * -86.65185 * 120.01099 * 120.12151 * -0.110519 *  
* 24 * 152.24800 * -266.9357 * -267.7218 * 92.744461 * 93.125717 * -0.381256 *
```

```
root [1] dis->Scan("beam_pMC:Zprim:ZprMC:mupr_p:mupr_pMC:mupr_p-mupr_pMC", "")
```

```
*****
```

```
* Row * beam_pMC * Zprim * ZprMC * mupr_p * mupr_pMC * mupr_p-mu *
```

```
*****
```

```
* 0 * 146.90170 * -207.5379 * -208.9523 * 110.98503 * 110.79181 * 0.1932220 *  
* 1 * 159.30511 * -227.0844 * -227.7733 * 140.57661 * 139.79426 * 0.7823486 *  
* 2 * 167.51696 * -160.5791 * -159.9294 * 158.55384 * 158.92117 * -0.367324 *  
* 3 * 157.53733 * -175.3885 * -175.5980 * 99.543914 * 99.493171 * 0.0507431 *  
* 4 * 157.64004 * -113.6708 * -114.4890 * 142.75885 * 143.63026 * -0.871414 *  
* 5 * 155.54696 * -306.1986 * -305.0769 * 38.746089 * 38.797401 * -0.051311 *  
* 6 * 161.60076 * -185.5975 * -185.9654 * 142.75209 * 142.14033 * 0.6117553 *  
* 7 * 144.76449 * -319.8401 * -322.7676 * 90.988998 * 90.841262 * 0.1477355 *  
* 8 * 151.34109 * -151.6115 * -151.6994 * 136.18386 * 136.60852 * -0.424652 *  
* 9 * 157.30499 * -114.9167 * -115.3075 * 28.405870 * 28.676466 * -0.270595 *  
* 10 * 155.57299 * -75.87600 * -76.11511 * 135.79982 * 136.22164 * -0.421829 *  
* 11 * 150.16101 * -250.8000 * -249.0746 * 133.51741 * 133.15356 * 0.3638458 *  
* 12 * 160.53802 * -329.4518 * -328.3470 * 127.86454 * 129.22837 * -1.363838 *  
* 13 * 161.58512 * -282.3827 * -279.9987 * 126.45889 * 126.83416 * -0.375274 *  
* 14 * 159.21862 * -277.8177 * -275.9275 * 33.346866 * 33.399158 * -0.052291 *  
* 15 * 160.19702 * -129.3394 * -129.7272 * 140.52526 * 139.70152 * 0.8237457 *  
* 16 * 161.04336 * -81.35971 * -82.04405 * 107.82820 * 107.09574 * 0.7324523 *  
* 17 * 158.70405 * -112.8869 * -116.0481 * 146.66406 * 147.10969 * -0.445632 *  
* 18 * 165.79402 * -72.30281 * -71.81410 * 158.34791 * 158.75842 * -0.410507 *  
* 19 * 166.27903 * -95.07279 * -94.48886 * 159.40062 * 158.13822 * 1.2623901 *  
* 20 * 162.44000 * -328.6280 * -328.2335 * 92.739418 * 92.707290 * 0.0321273 *  
* 21 * 167.32000 * -284.1838 * -285.0474 * 78.597244 * 78.717514 * -0.120269 *  
* 22 * 158.34297 * -253.3822 * -254.2902 * 137.43447 * 138.26139 * -0.826919 *  
* 23 * 150.81498 * -285.9909 * -286.8343 * 119.74535 * 120.12151 * -0.376159 *  
* 24 * 152.24800 * -126.8479 * -127.5237 * 93.209220 * 93.125717 * 0.0835037 *
```

Scan of 10.4t20 (left) vs 10.4t19

```
root [1] dis->Scan("beam_pMC:Zprim:ZprMC:mupr_p:mupr_pMC:mupr_p-mupr_pMC", "")
```

```
*****
```

```
* Row * beam_pMC * Zprim * ZprMC * mupr_p * mupr_pMC * mupr_p-mu *
```

```
*****
```

```
* 0 * 146.90170 * -273.6643 * -276.8155 * 110.5672 * 110.79181 * -0.224617 *
* 1 * 159.30511 * -164.9998 * -164.2334 * 140.24804 * 139.79426 * 0.4537811 *
* 2 * 167.51696 * -118.6838 * -116.7878 * 159.01097 * 158.92118 * 0.0897827 *
* 3 * 157.53733 * -71.02340 * -70.68788 * 98.898963 * 99.493164 * -0.594200 *
* 4 * 157.64004 * -191.1176 * -189.3821 * 143.80465 * 143.63024 * 0.1744079 *
* 5 * 155.54696 * -294.1223 * -294.7671 * 38.809982 * 38.797401 * 0.0125808 *
* 6 * 161.60076 * -93.50569 * -93.36046 * 142.05155 * 142.14033 * -0.088775 *
* 7 * 144.76449 * -143.1279 * -142.4335 * 91.186660 * 90.841262 * 0.3453979 *
* 8 * 151.34109 * -289.4211 * -286.2444 * 135.60908 * 136.60852 * -0.999435 *
* 9 * 157.30500 * -298.4495 * -297.8309 * 28.597997 * 28.676466 * -0.078468 *
* 10 * 155.57299 * -106.4315 * -104.1622 * 136.18347 * 136.22164 * -0.038177 *
* 11 * 150.16101 * -102.2812 * -103.6582 * 133.27302 * 133.15354 * 0.1194763 *
* 12 * 160.53801 * -103.7089 * -103.3157 * 128.03018 * 129.22839 * -1.198211 *
* 13 * 161.58512 * -275.2387 * -277.3310 * 126.47106 * 126.83416 * -0.363098 *
* 14 * 159.21862 * -162.3610 * -162.7567 * 33.509723 * 33.399158 * 0.1105651 *
* 15 * 160.19702 * -304.5603 * -304.0659 * 139.43637 * 139.70152 * -0.265151 *
* 16 * 161.04338 * -218.8250 * -217.2380 * 106.91749 * 107.09574 * -0.178253 *
* 17 * 158.70405 * -130.6916 * -131.4538 * 146.57222 * 147.10969 * -0.537475 *
* 18 * 165.79402 * -239.1891 * -239.3615 * 158.12219 * 158.75842 * -0.636230 *
* 19 * 166.27903 * -121.4087 * -120.4655 * 158.98597 * 158.13822 * 0.8477478 *
* 20 * 162.44001 * -121.3272 * -121.5995 * 93.032455 * 92.707298 * 0.3251571 *
* 21 * 167.32000 * -74.17087 * -74.74769 * 78.523468 * 78.717521 * -0.194053 *
* 22 * 158.34297 * -244.9412 * -246.2393 * 138.56886 * 138.26139 * 0.3074646 *
* 23 * 150.81498 * -166.0737 * -167.7016 * 120.04190 * 120.12151 * -0.079605 *
* 24 * 152.24800 * -270.7431 * -269.3306 * 92.946716 * 93.125717 * -0.179000 *
```

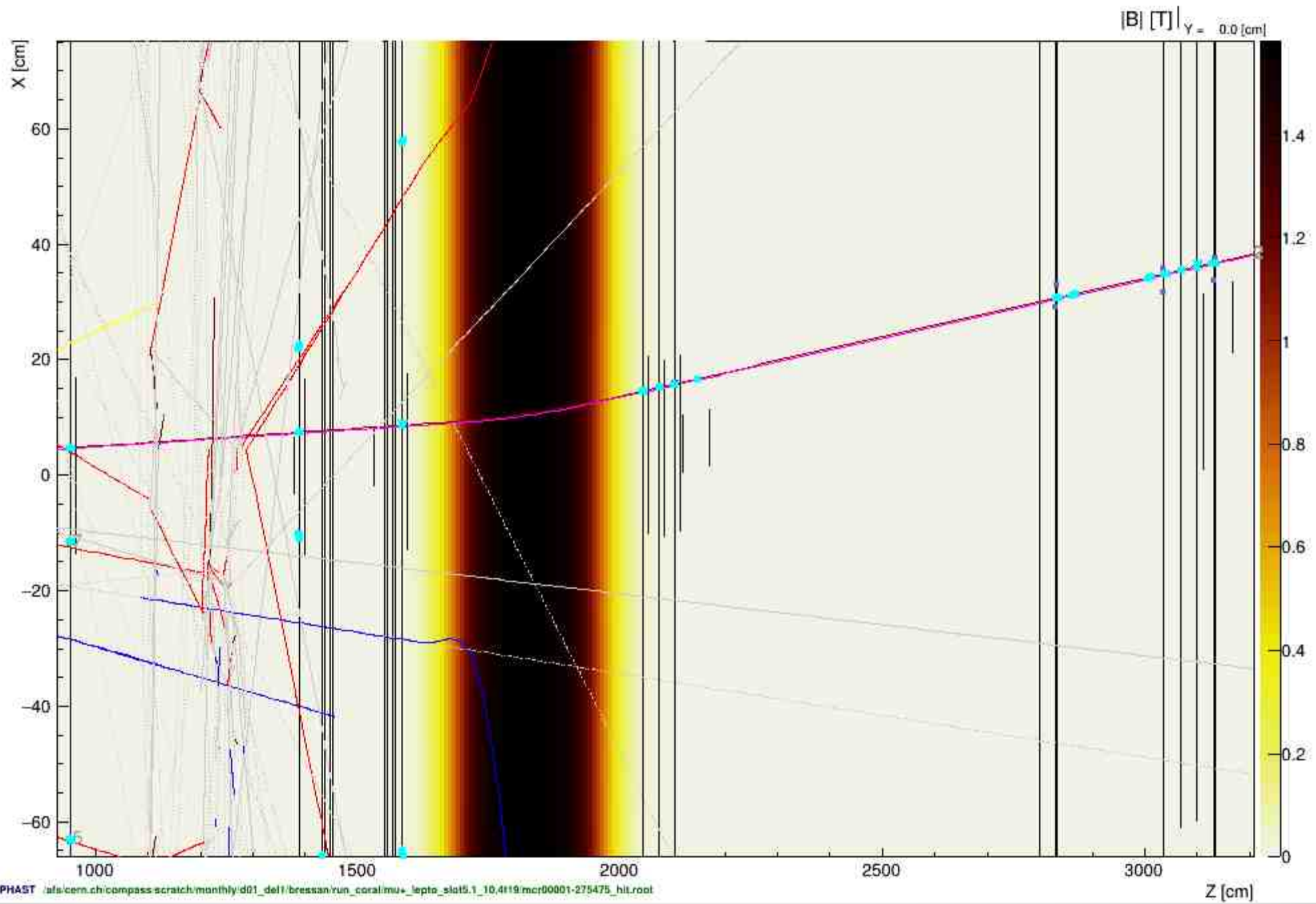
```
root [1] dis->Scan("beam_pMC:Zprim:ZprMC:mupr_p:mupr_pMC:mupr_p-mupr_pMC", "")
```

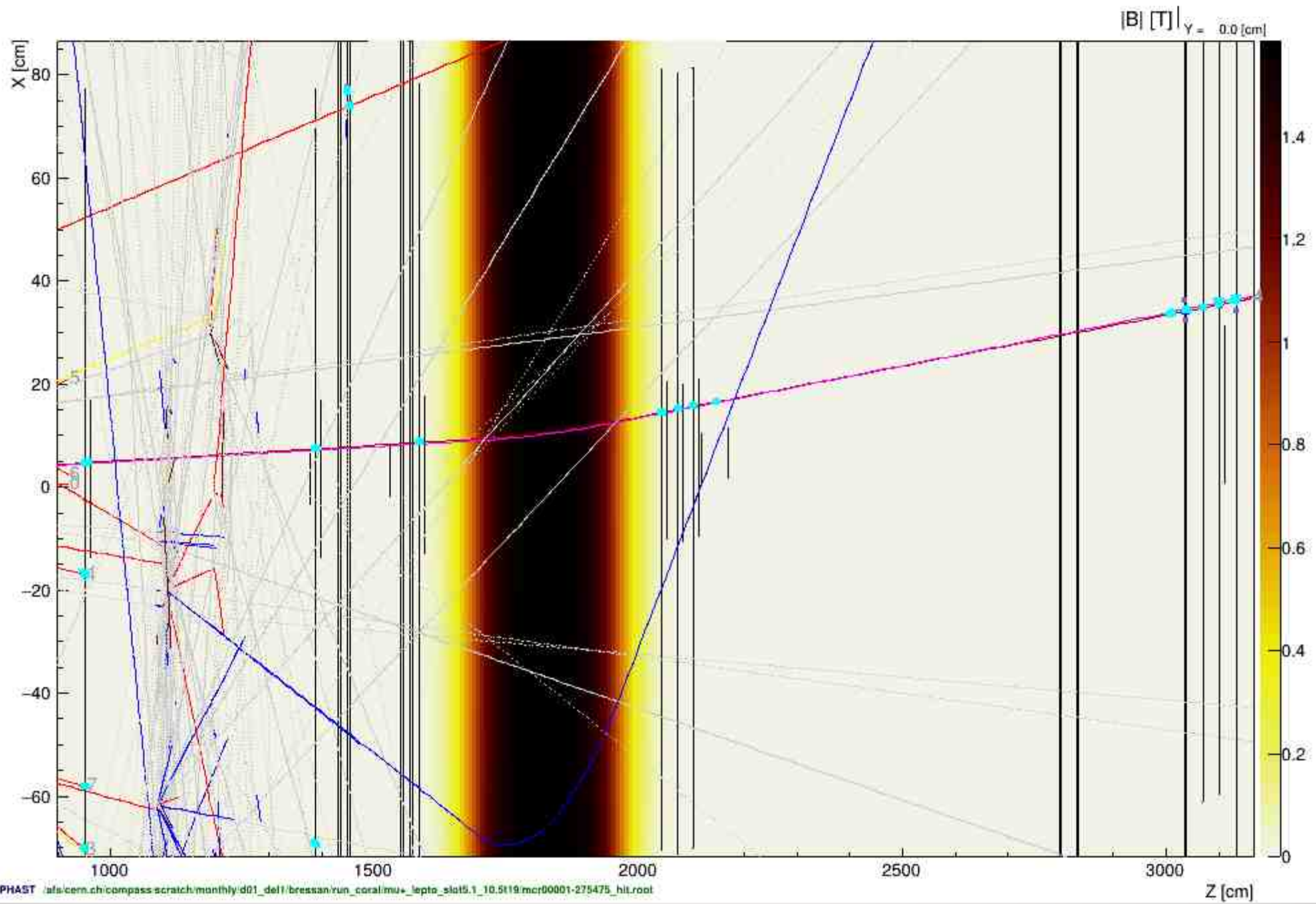
```
*****
```

```
* Row * beam_pMC * Zprim * ZprMC * mupr_p * mupr_pMC * mupr_p-mu *
```

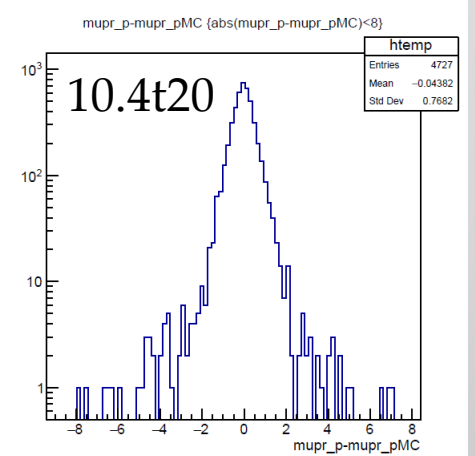
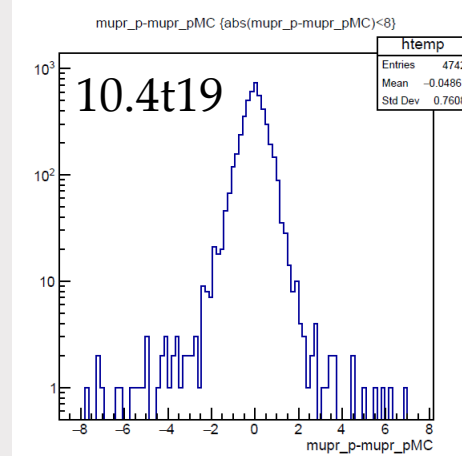
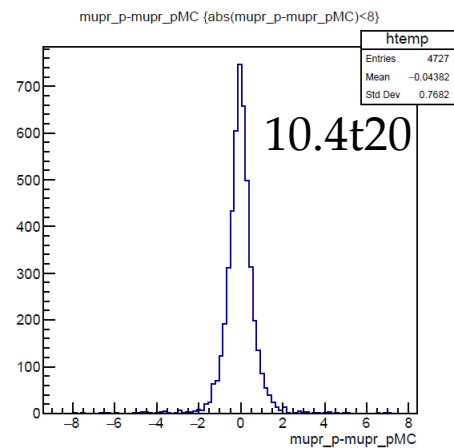
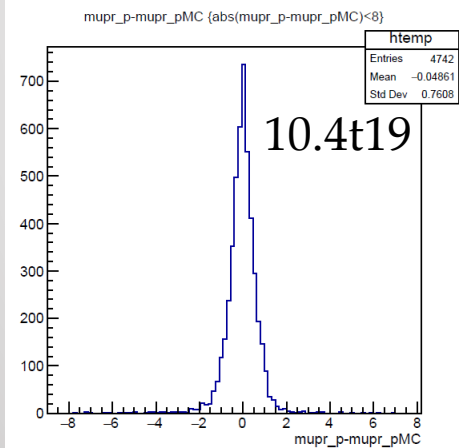
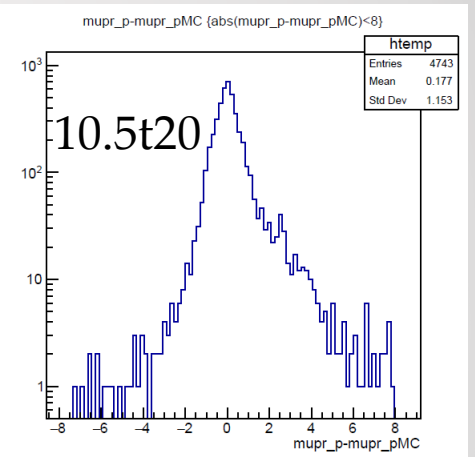
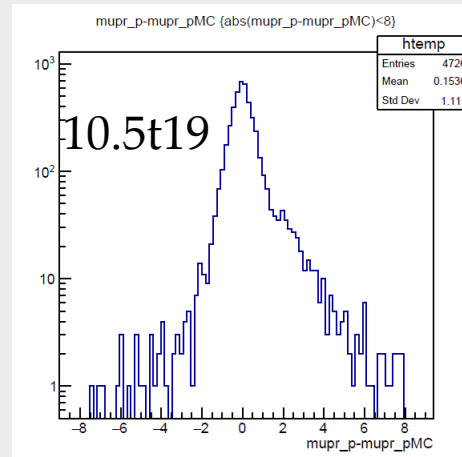
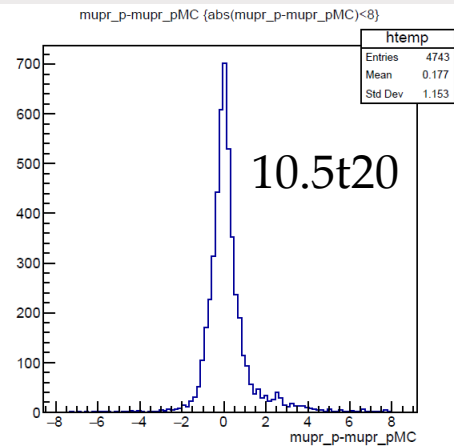
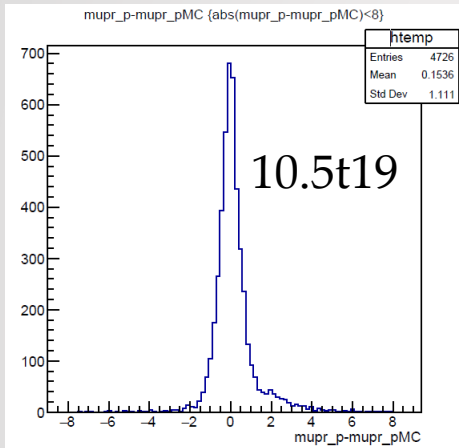
```
*****
```

```
* 0 * 146.90170 * -207.5379 * -208.9523 * 110.98503 * 110.79181 * 0.1932220 *
* 1 * 159.30511 * -227.0844 * -227.7733 * 140.57661 * 139.79426 * 0.7823486 *
* 2 * 167.51696 * -160.5791 * -159.9294 * 158.55384 * 158.92117 * -0.367324 *
* 3 * 157.53733 * -175.3885 * -175.5980 * 99.543914 * 99.493171 * 0.0507431 *
* 4 * 157.64004 * -113.6708 * -114.4890 * 142.75885 * 143.63026 * -0.871414 *
* 5 * 155.54696 * -306.1986 * -305.0769 * 38.746089 * 38.797401 * -0.051311 *
* 6 * 161.60076 * -185.5975 * -185.9654 * 142.75209 * 142.14033 * 0.6117553 *
* 7 * 144.76449 * -319.8401 * -322.7676 * 90.988998 * 90.841262 * 0.1477355 *
* 8 * 151.34109 * -151.6115 * -151.6994 * 136.18386 * 136.60852 * -0.424652 *
* 9 * 157.30499 * -114.9167 * -115.3075 * 28.405870 * 28.676466 * -0.270595 *
* 10 * 155.57299 * -75.87600 * -76.11511 * 135.79982 * 136.22164 * -0.421829 *
* 11 * 150.16101 * -250.8000 * -249.0746 * 133.51741 * 133.15356 * 0.3638458 *
* 12 * 160.53802 * -329.4518 * -328.3470 * 127.86454 * 129.22837 * -1.363838 *
* 13 * 161.58512 * -282.3827 * -279.9987 * 126.45889 * 126.83416 * -0.375274 *
* 14 * 159.21862 * -277.8177 * -275.9275 * 33.346866 * 33.399158 * -0.052291 *
* 15 * 160.19702 * -129.3394 * -129.7272 * 140.52526 * 139.70152 * 0.8237457 *
* 16 * 161.04338 * -81.35971 * -82.04405 * 107.82820 * 107.09574 * 0.7324523 *
* 17 * 158.70405 * -112.8869 * -116.0481 * 146.66406 * 147.10969 * -0.445632 *
* 18 * 165.79402 * -72.30281 * -71.81410 * 158.34791 * 158.75842 * -0.410507 *
* 19 * 166.27903 * -95.07279 * -94.48886 * 159.40062 * 158.13822 * 1.2623901 *
* 20 * 162.44000 * -328.6280 * -328.2335 * 92.739418 * 92.707290 * 0.0321273 *
* 21 * 167.32000 * -284.1838 * -285.0474 * 78.597244 * 78.717514 * -0.120269 *
* 22 * 158.34297 * -253.3822 * -254.2902 * 137.43447 * 138.26139 * -0.826919 *
* 23 * 150.81498 * -285.9909 * -286.8343 * 119.74535 * 120.12151 * -0.376159 *
* 24 * 152.24800 * -126.8479 * -127.5237 * 93.209220 * 93.125717 * 0.0835037 *
```





$$\mu' - \mu'_{MC}$$



Momentum resolution 10.4

