

$B \rightarrow K^* \mu\mu$ update

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Propagation from S_x to P_x

- ▶ Using MoM we have a direct access to S_x .
- ▶ Some theorist (we all know who ;)) like to have instead P_x .
- ▶ We need to provide them the P_x or they will do crazy crazy things with the errors.
- ▶ Reminder:

$$P_1 = 2/(1 - F_l), \quad (1)$$

$$P_2 = \frac{2A_{fb}}{3}/(1 - F_l) \quad (2)$$

$$P_3 = \frac{-S_9}{3}/(1 - F_l) \quad (3)$$

$$P_{4568} = \frac{S_{4578}}{3}/\sqrt{F_l(1 - F_l)} \quad (4)$$

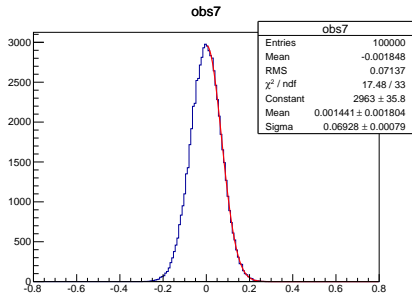
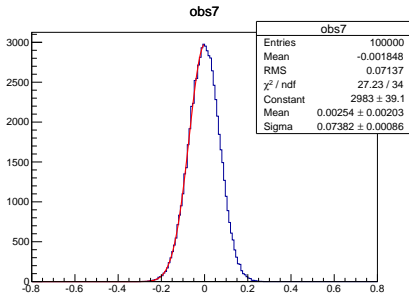
Since we have the full information about the S_x with errors (assymmetric) and correlations we can make a TOY MC and see how the P_x behaves. To make a toy we need to simulate a correlated multidimensional Gaussian. I didn't know before hand how to do it so here is the recipe if some one will need it for the future:

- ▶ Simulate multidimensional gauss with with 1 and centred at 0.
- ▶ Correlate the dimensions using Cholesky matrix decomposition.
- ▶ Scale the left and the right tail to the right $\sigma_{L,R}$.
- ▶ Now after this scalling you will have a bump at 0 since you have 50:50 events on left and on the right, which is correct only for $\sigma_L = \sigma_R$. Reject the $\frac{\sigma_{SMALLER}}{\sigma_{LARGER}}$ events from smaller σ .
- ▶ Move the mean of each Gauss to the value of S_x and voila



MC propagation, X-checks 1/2

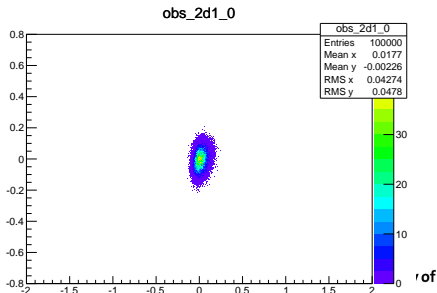
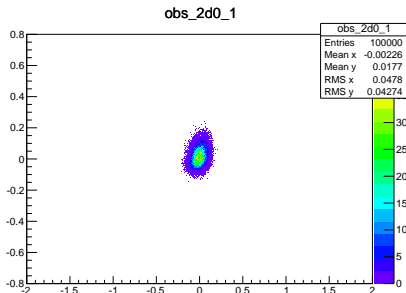
- ▶ Since this procedure is not from books I wanted to be extra careful and performed super tests.
- ▶ Check that the correlation between S_i and S_j in my toys are the same as the one I put in. with 100.000 events the differences that I observed are $\mathcal{O}(0.001)$ so oki doki.
- ▶ Check that the $\sigma_{L,R}$ are the correctly simulate. Fitted left and right separately and compare the results. Oki doki.



rof

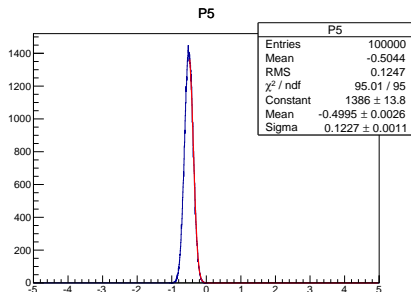
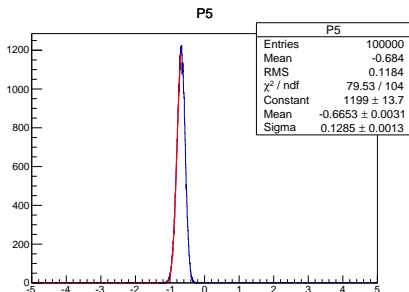
MC propagation, X-checks 2/2

- ▶ Since this procedure is not from books I wanted to be extra careful and performed super tests.
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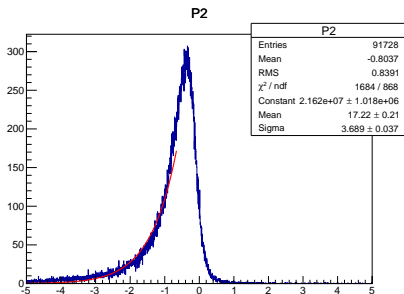
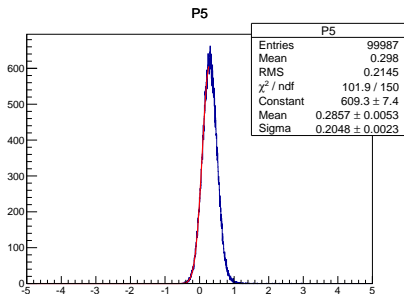
Now how the P_x look like?

- ▶ Now we can make a P_x histogram and fit it.



Huston, we have a problem.

- ▶ The biggest F_I is observed in 1.1 – 2.5 GeV^2 .
- ▶ This is clearly unphysical! We need a smarter way to determine the P_x in this bin.
- ▶ Will try bootstrapping.



F_S pulls, numbers I promised

Bin [GeV^2]	mean	sigma
0.1 – 0.98	0.038 ± 0.029	0.918 ± 0.021
1.1 – 2	-0.024 ± 0.031	0.998 ± 0.022
2 – 3	-0.025 ± 0.029	0.942 ± 0.021
3 – 4	-0.069 ± 0.030	0.971 ± 0.022
4 – 5	0.062 ± 0.030	0.955 ± 0.021
5 – 6	0.081 ± 0.032	0.992 ± 0.022
6 – 7	-0.031 ± 0.031	0.992 ± 0.022
7 – 8	-0.054 ± 0.030	0.962 ± 0.021
11 – 11.75	0.002 ± 0.030	0.947 ± 0.021
11.75 – 12.5	-0.027 ± 0.031	0.979 ± 0.022
15 – 16	0.011 ± 0.029	0.933 ± 0.021
16 – 17	0.02 ± 0.029	0.929 ± 0.020
17 – 18	-0.054 ± 0.030	0.962 ± 0.021
18 – 19	-0.075 ± 0.030	0.964 ± 0.021



- ▶ We are overestimating the error, but we can leave with this.
- ▶ Mean unbiased.



Correlations between S_x and A_x , MC Toys

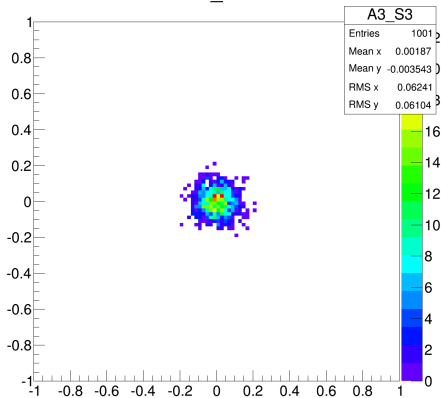
- ▶ Toys with acceptance, background (the ones we all like).
- ▶ Plots in backups.

q^2	$S_3 A_3$	$S_4 A_4$	$S_5 A_5$	$S_6 A_6$	$S_7 A_7$	$S_8 A_8$	$S_9 A_9$
0	0.049	-0.066	-0.001	0.011	-0.034	0.015	0.022
1	0.029	-0.047	-0.003	0.011	-0.003	0.017	0.052
2	0.004	-0.046	0.026	-0.022	-0.010	-0.036	-0.032
3	0.079	0.032	0.035	-0.028	-0.025	0.037	0.027
4	-0.020	0.074	-0.001	0.008	-0.063	-0.015	0.037
5	-0.019	-0.018	-0.041	0.001	0.025	0.015	-0.014
6	0.000	-0.008	-0.021	0.049	-0.014	-0.04	-0.002
7	0.000	-0.008	-0.021	0.049	-0.014	-0.04	-0.002
8	-0.011	-0.009	-0.013	-0.023	0.047	0.006	-0.004
9	-0.009	-0.015	-0.008	-0.009	-0.010	-0.050	-0.029
10	0.030	0.023	0.084	-0.049	0.030	0.002	0.021
11	-0.016	0.006	0.018	-0.029	0.034	-0.049	0.039

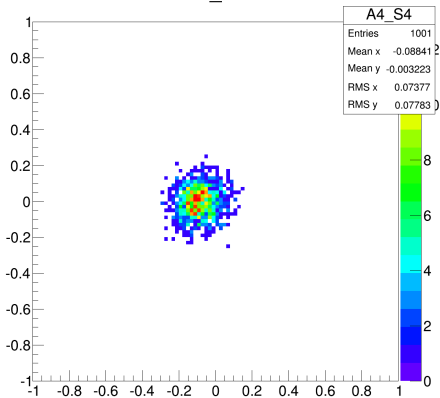
BACKU



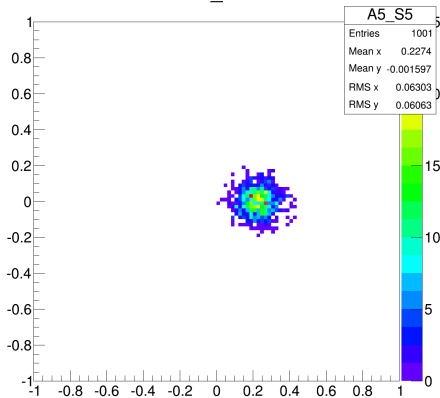
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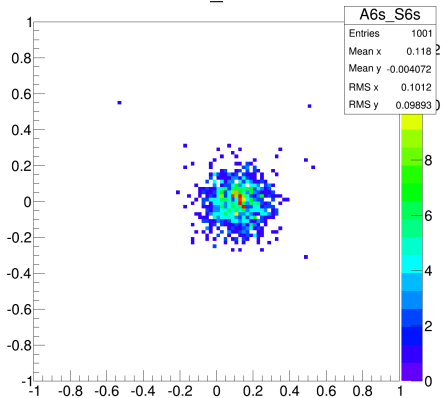
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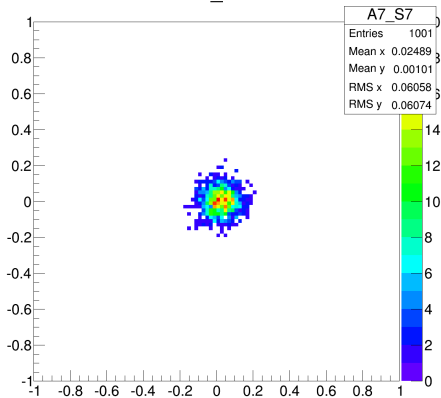
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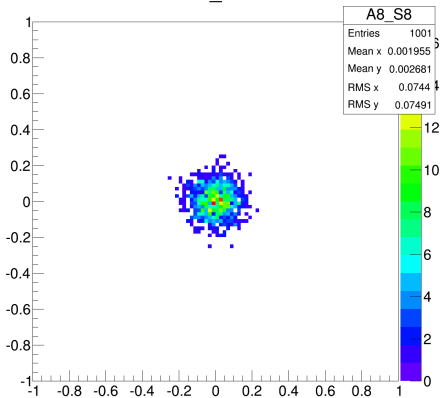
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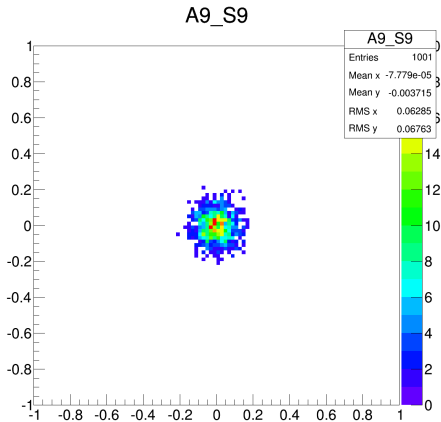


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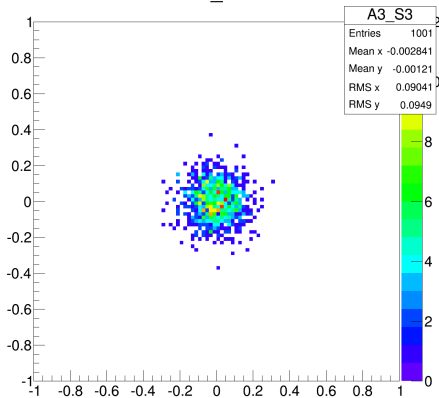


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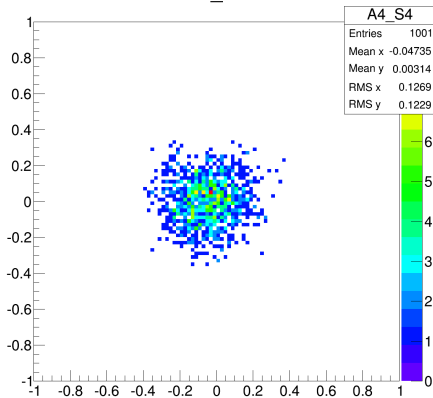




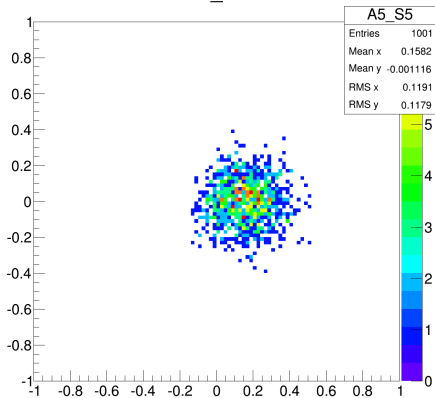
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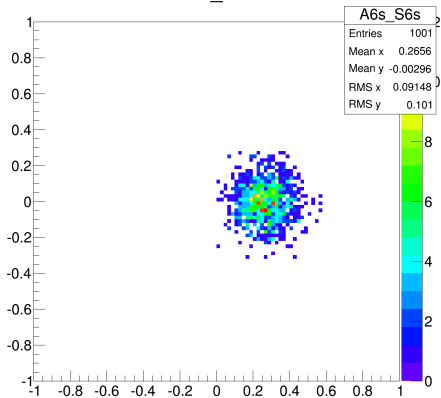
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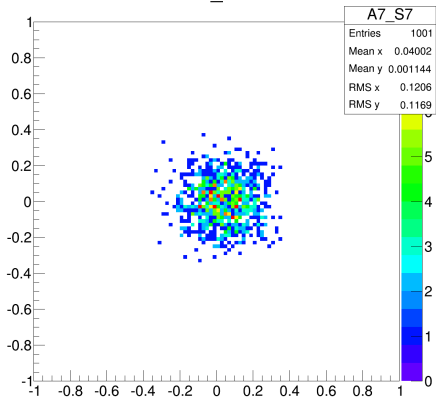
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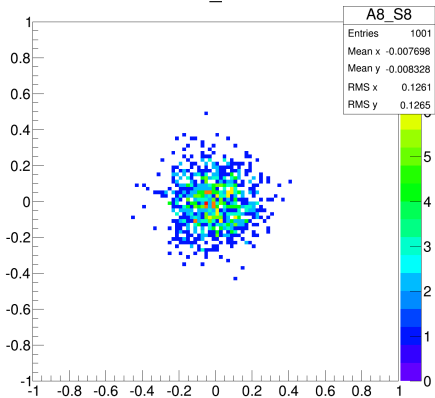
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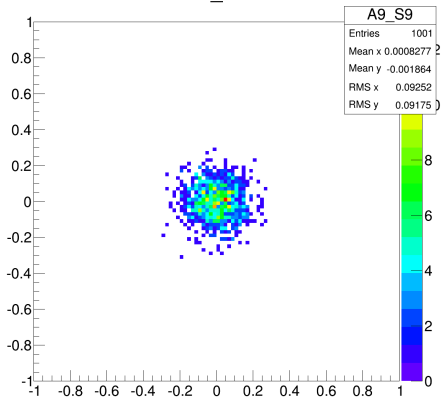
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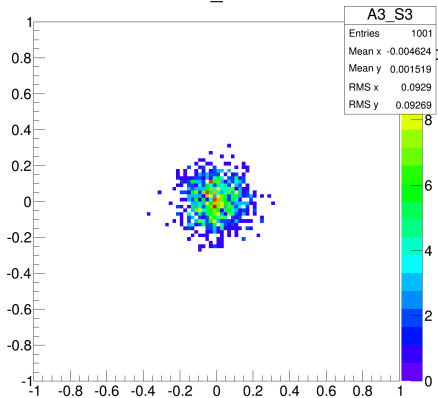
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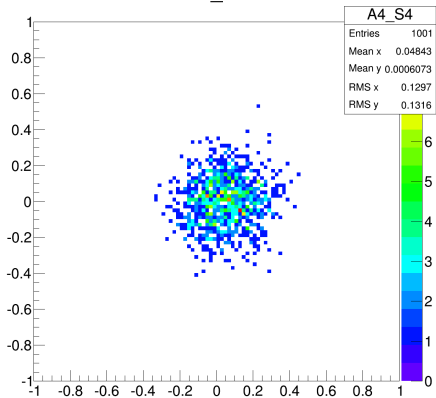
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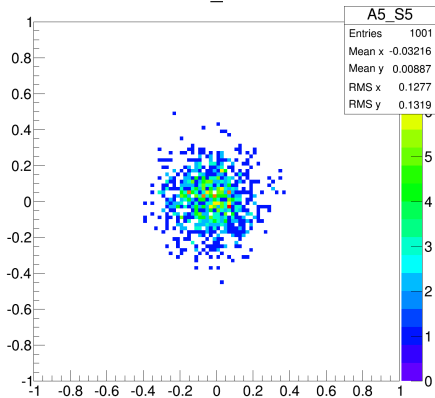
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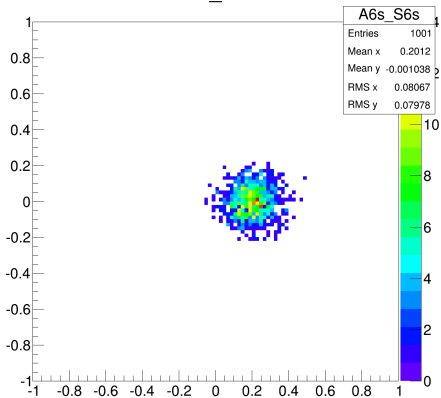
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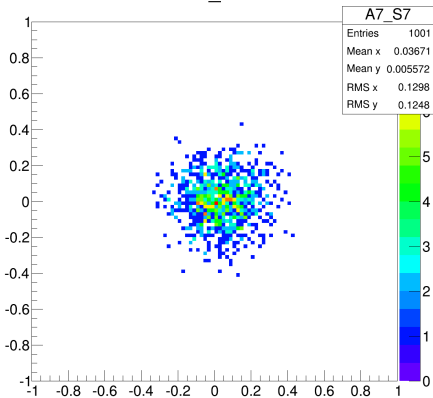
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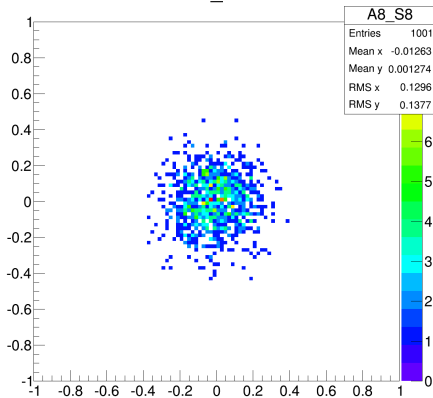
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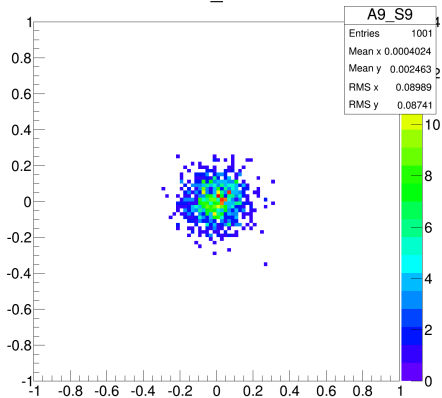
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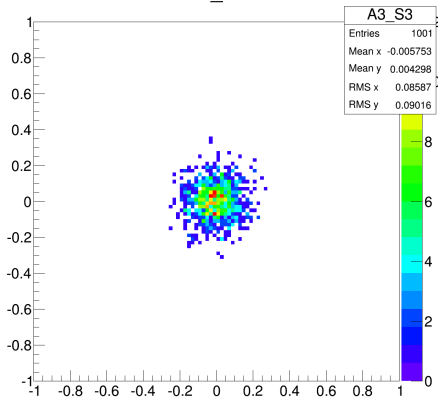
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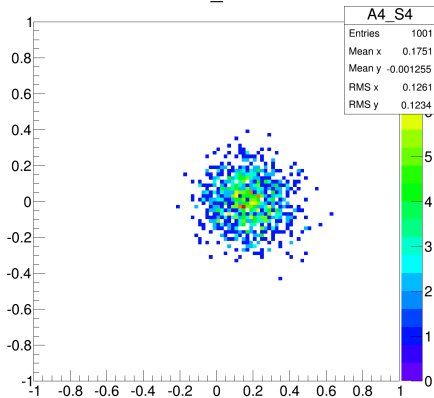
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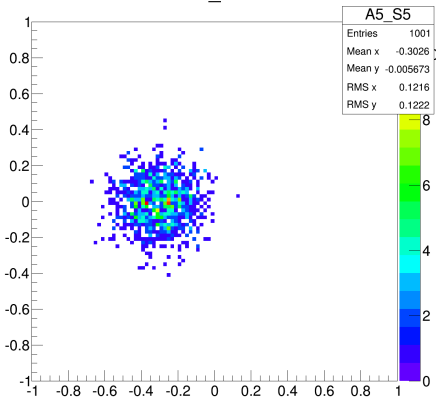
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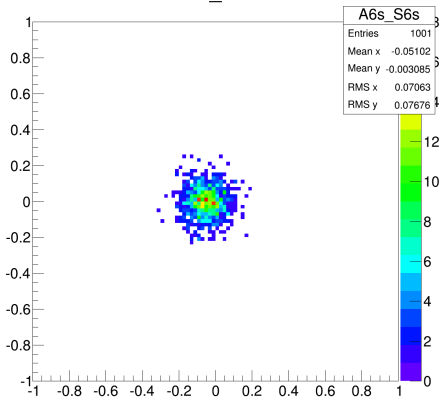
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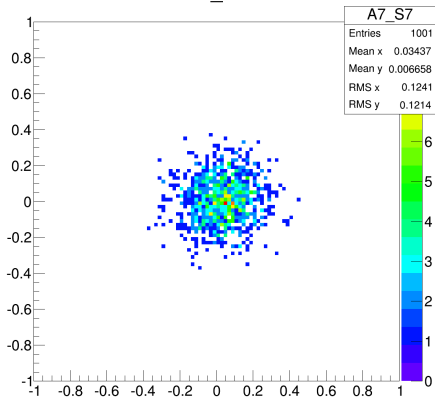
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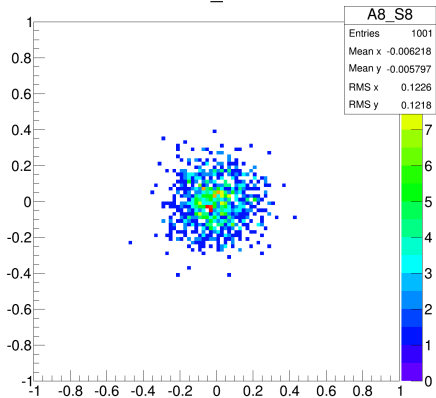
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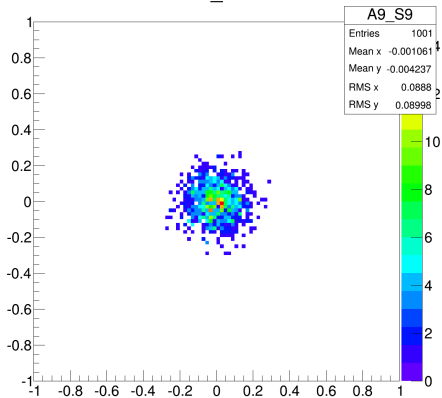
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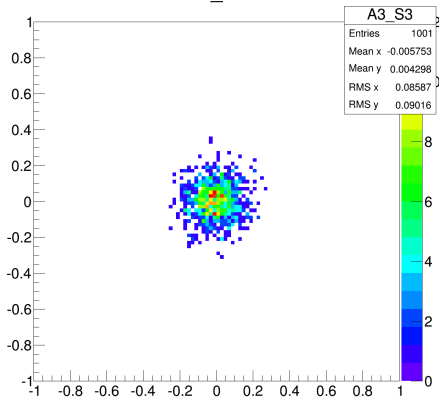
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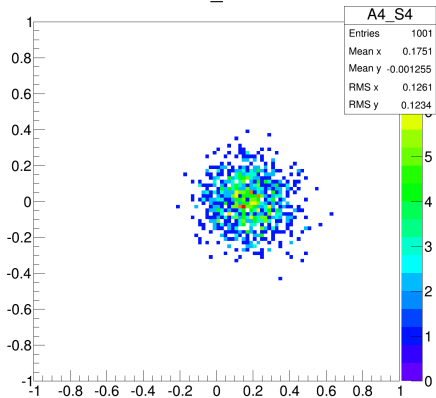
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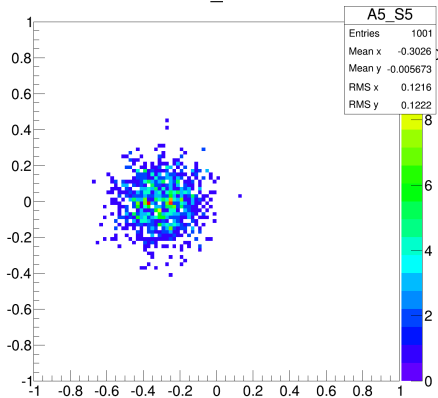
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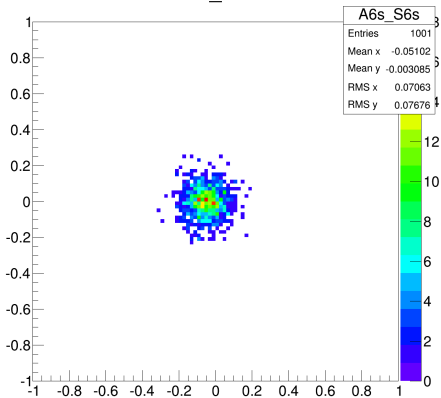
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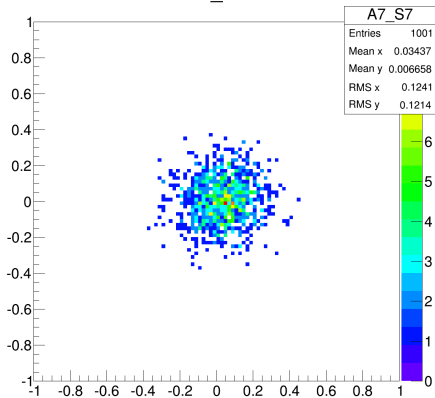
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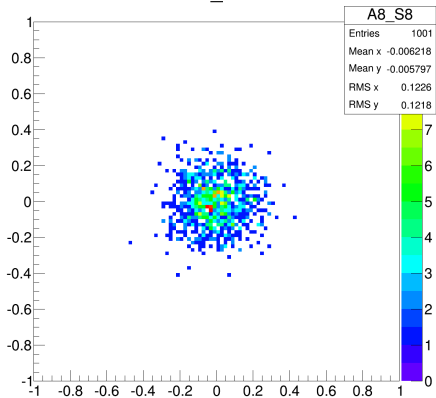
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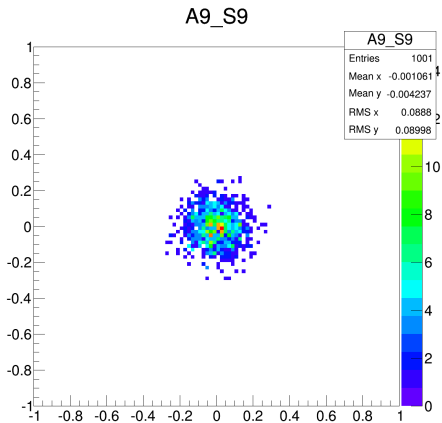


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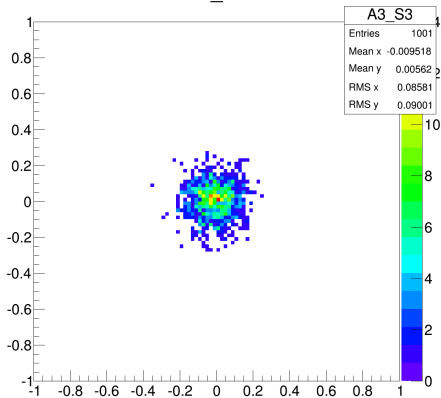


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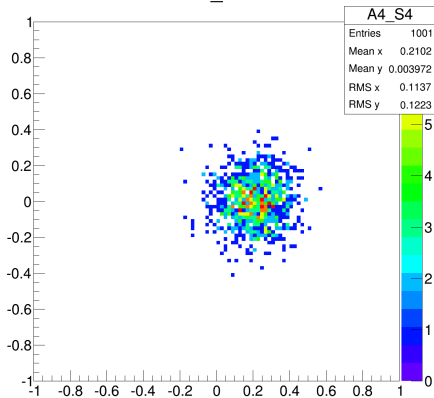




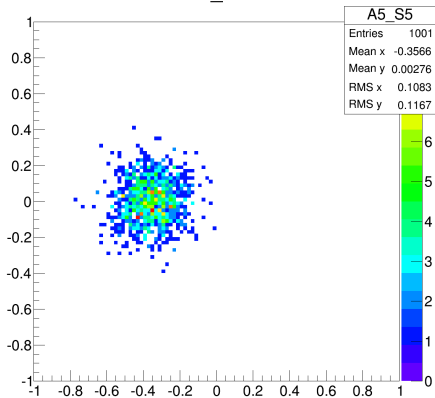
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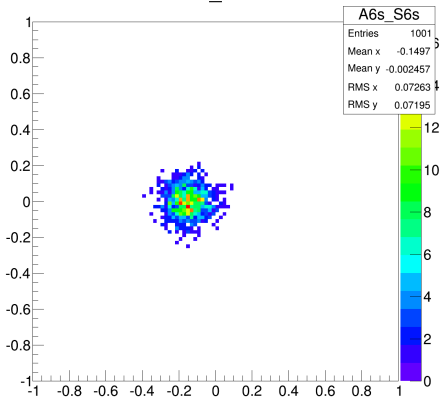
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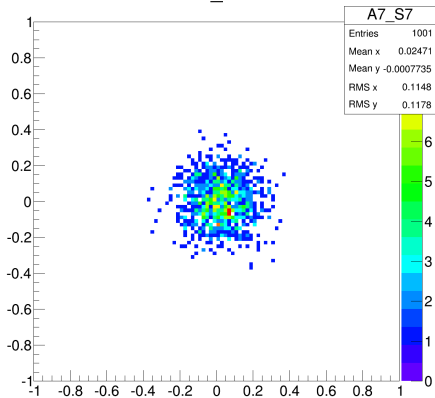
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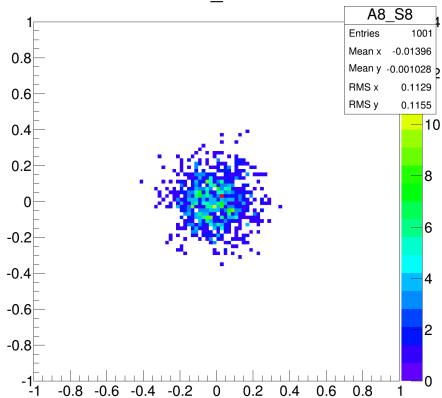
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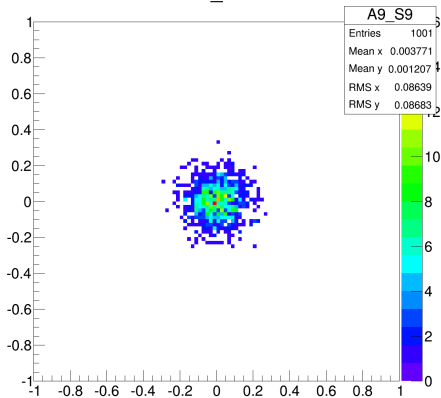
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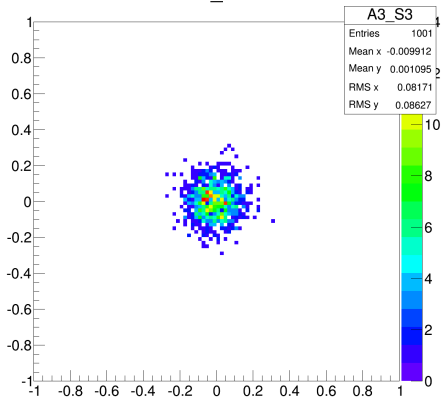
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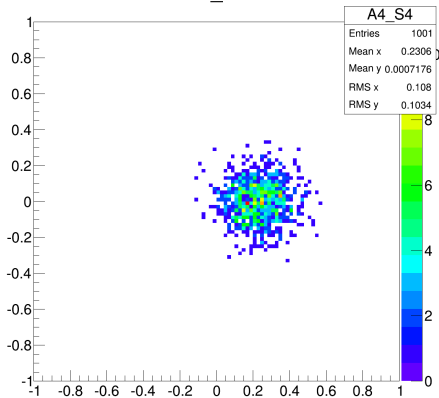
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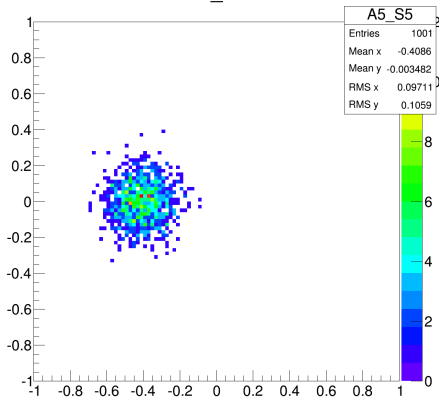
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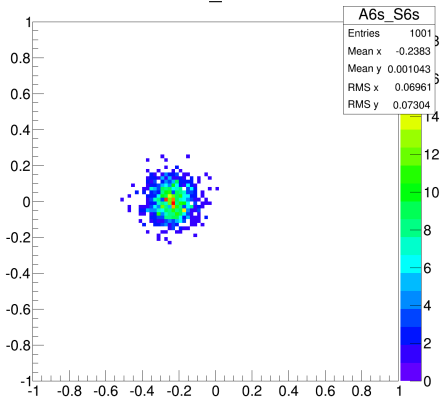
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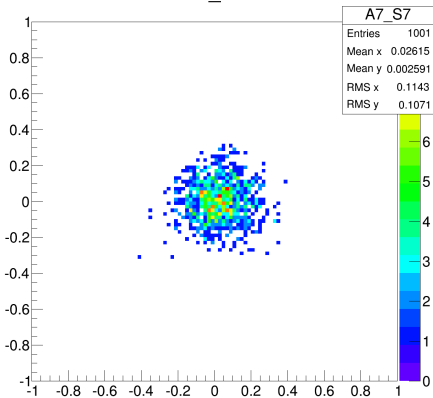
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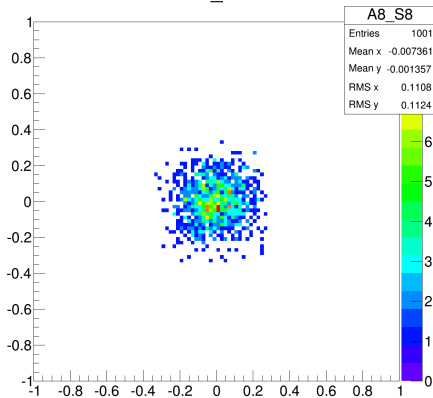
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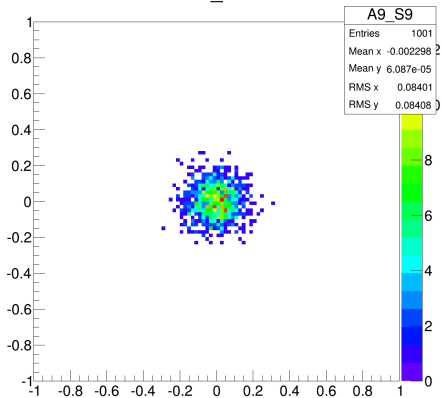
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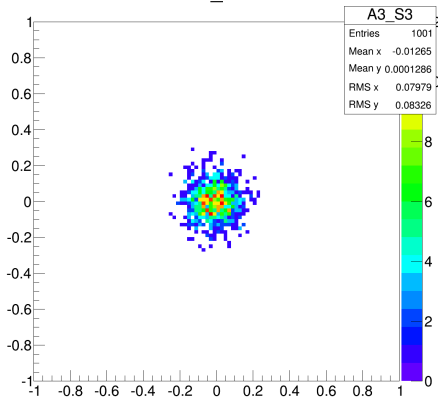
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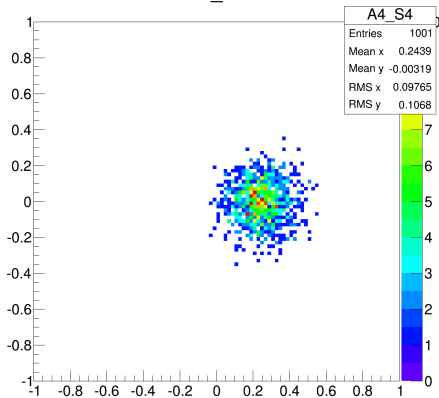
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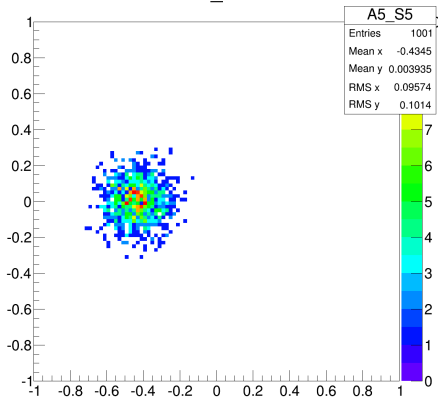
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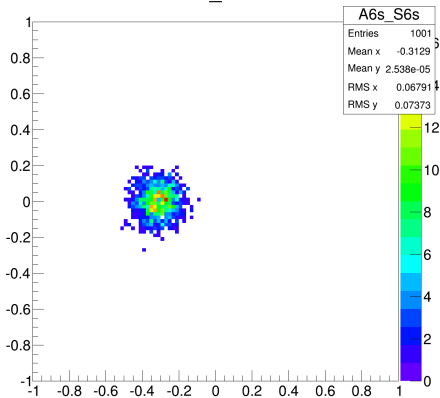
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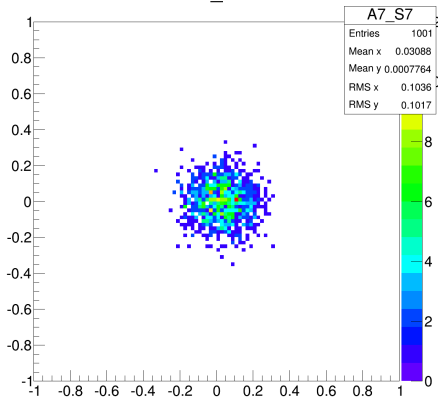
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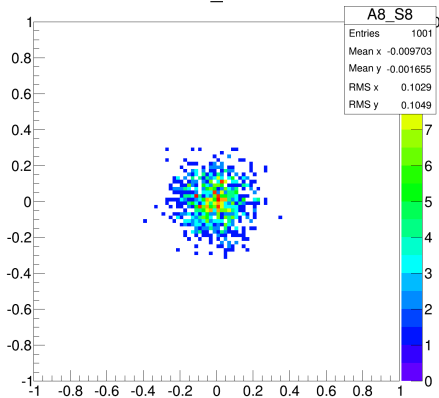
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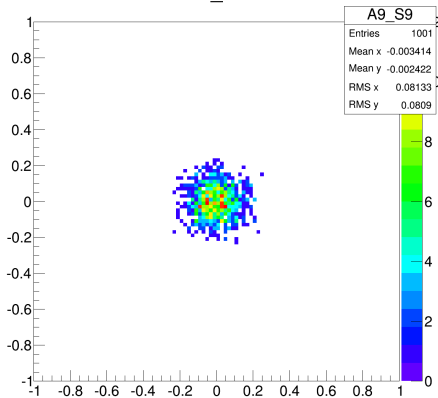
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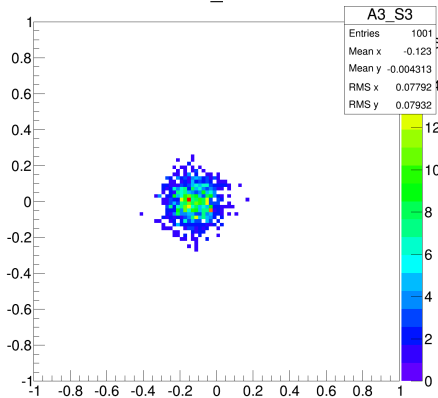
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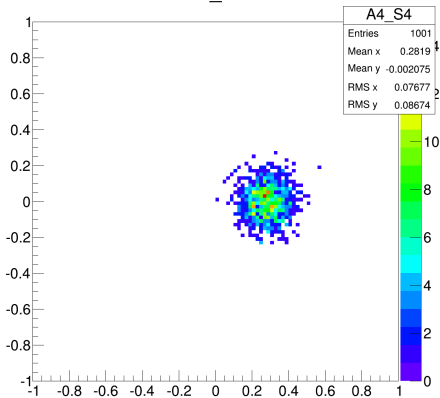
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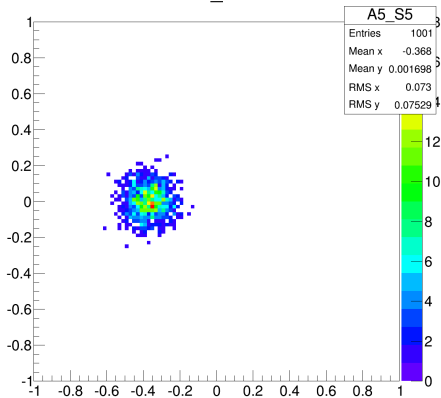
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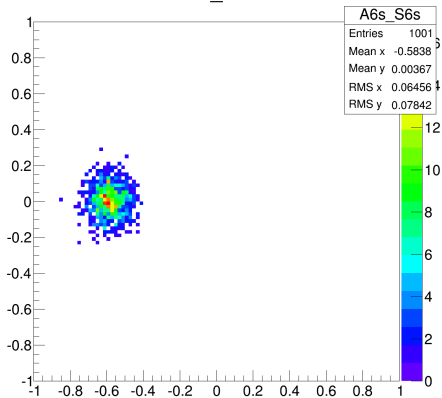
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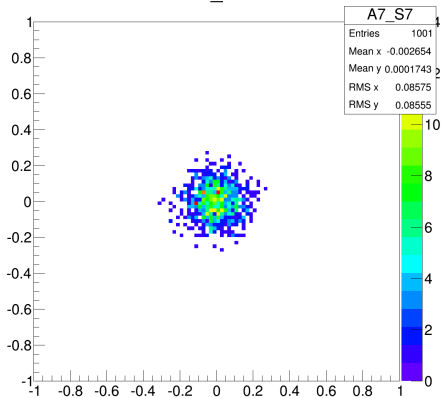
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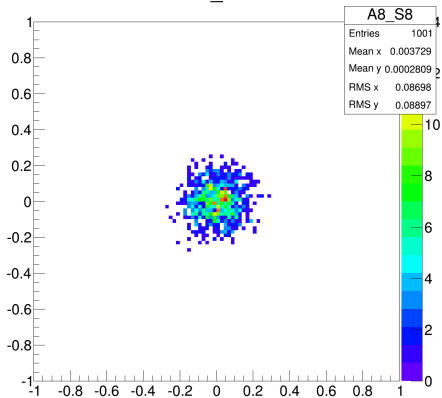
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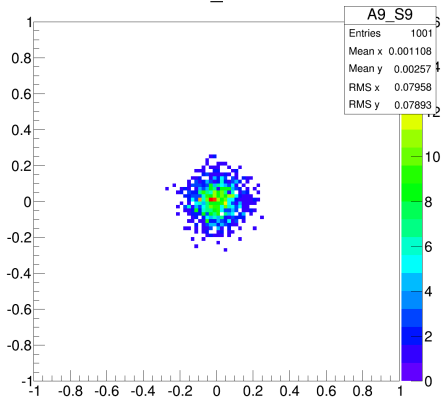
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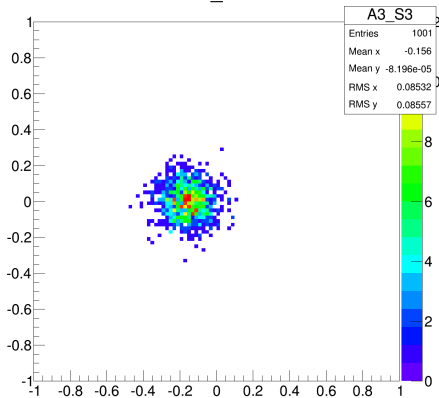
A8_S8



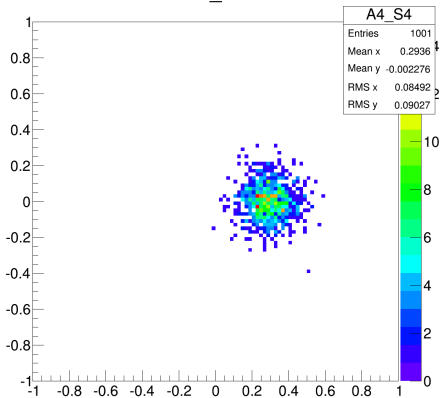
A9_S9



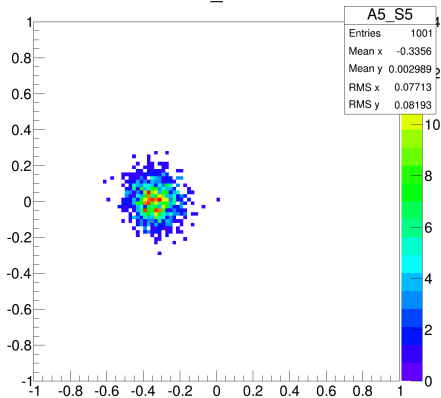
A3_S3



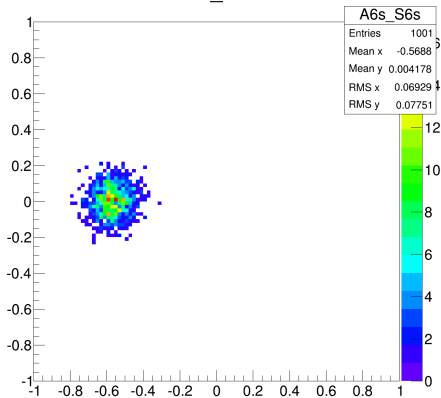
A4_S4



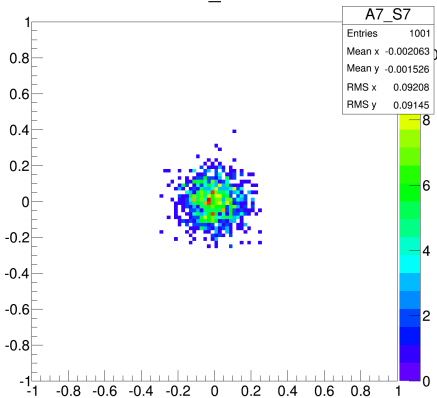
A5_S5



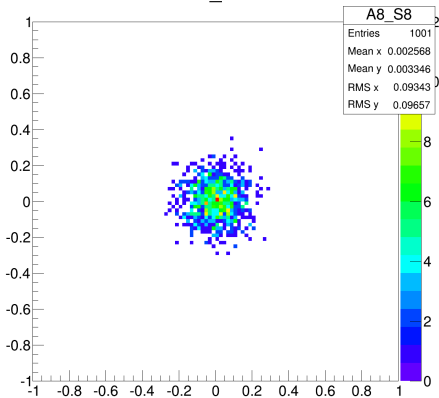
A6s_S6s

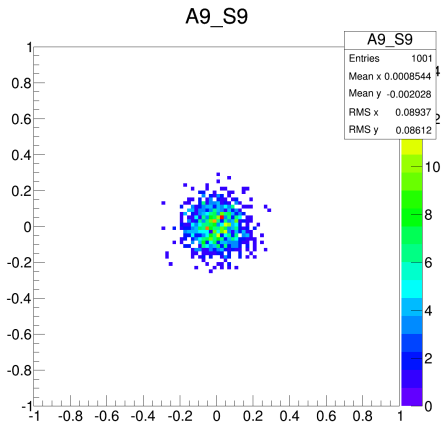


A7_S7

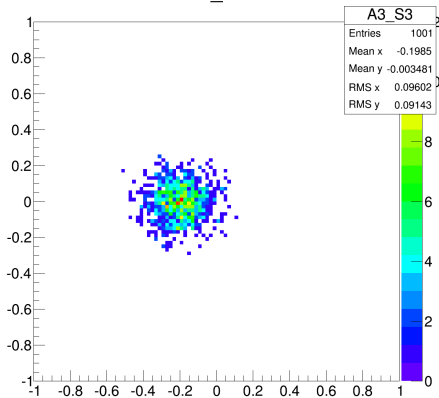


A8_S8

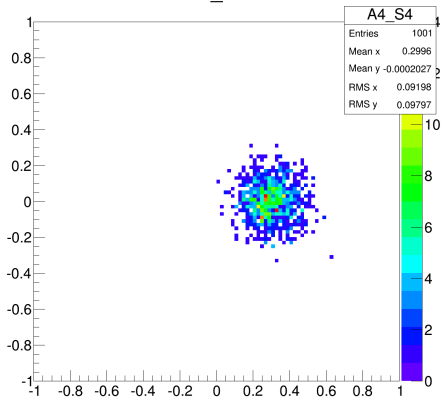




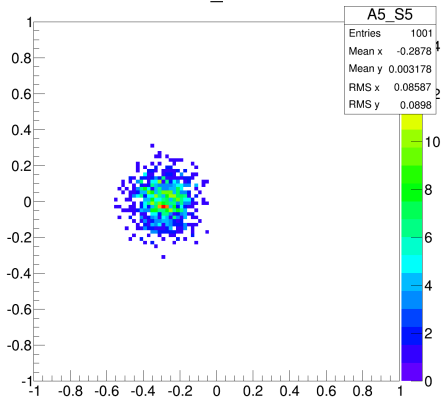
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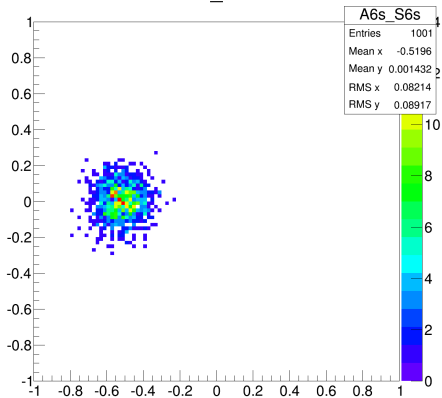
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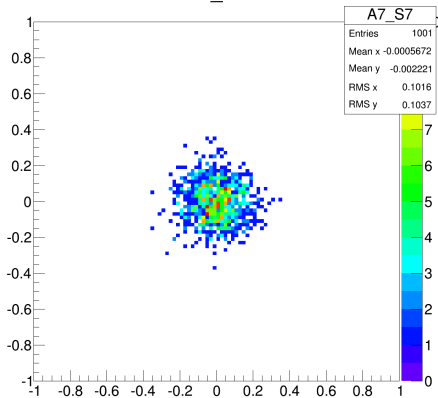
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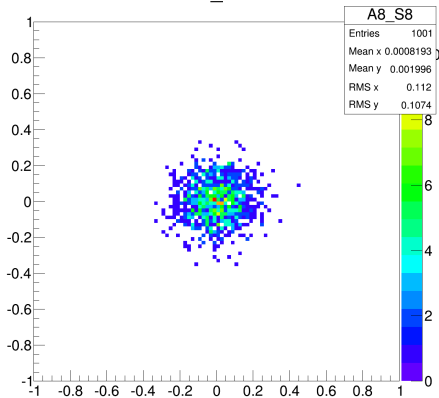
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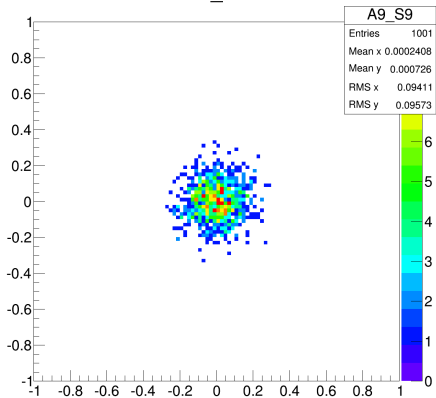
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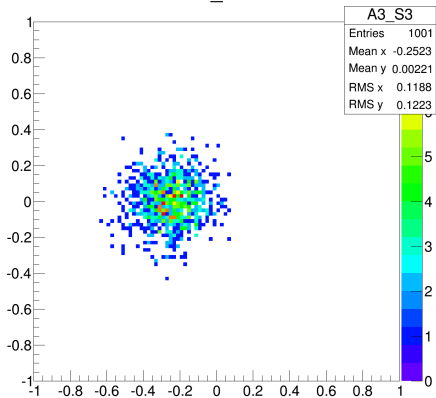
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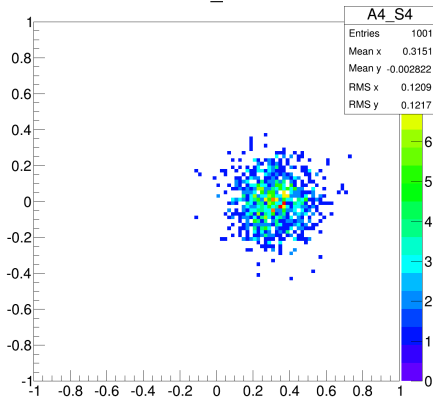
A9_S9



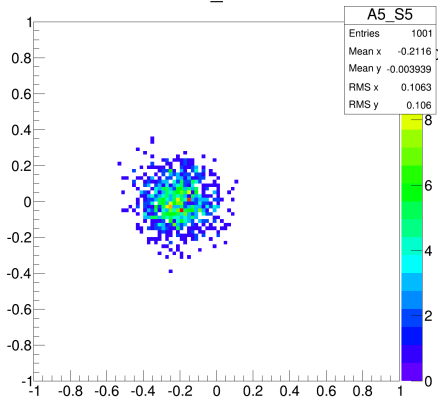
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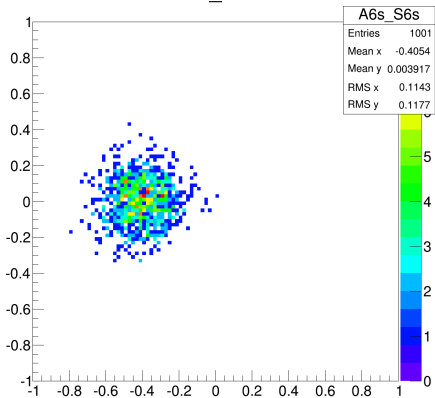
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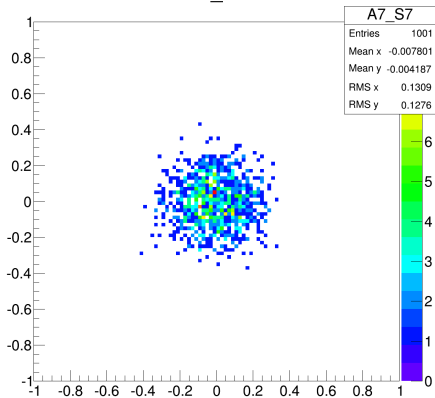
A5_S5



A6s_S6s



A7_S7



A8_S8

