TMS MAGNET UPDATE

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TMS Meeting
04/27/2022

U.S. DEPARTMENT OF ENERGY
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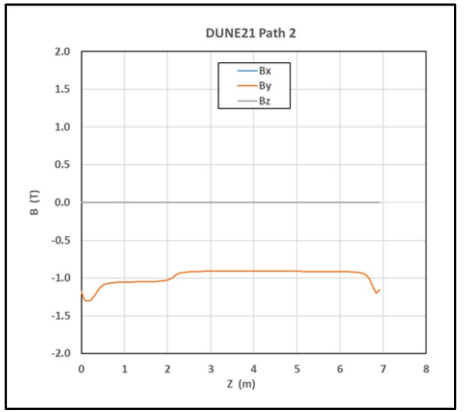
MAGNETIC FIELD MAP

- More realistic magnetic field map has been produced by ANL engineering team
- The next step is to implement this into TMS simulation software
  - TMS current software assumes 1 T constant field throughout the detector
- The initial B-field map file had some problems (missing rows, duplicated values) that has now been corrected

x[mm]	y[mm]	z[mm]	B_x[T]	B_y[T]	B_z[T]	B_T[T]
0.00000	0.00000	0.00000	0.53538	0.43597	0.17012	0.71973
0.00000	0.00000	110.00000	0.39745	0.38324	0.08871	0.56251
0.00000	0.00000	220.00000	0.40520	0.38221	0.05944	0.56370
0.00000	0.00000	330.00000	0.40130	0.37467	0.03924	0.55399
0.00000	0.00000	440.00000	0.39164	0.36430	0.02546	0.53901
0.00000	0.00000	550.00000	0.37977	0.35315	0.01616	0.52226
0.00000	0.00000	660.00000	0.36757	0.34233	0.01002	0.50568
0.00000	0.00000	770.00000	0.35617	0.33248	0.00615	0.49043
0.00000	0.00000	880.00000	0.34622	0.32406	0.00383	0.47726
0.00000	0.00000	990.00000	0.33788	0.31710	0.00248	0.46630
0.00000	0.00000	1110.00000	0.33046	0.31114	0.00167	0.45670
0.00000	0.00000	1210.00000	0.32524	0.30676	0.00124	0.44983
0.00000	0.00000	1320.00000	0.32045	0.30286	0.00100	0.44360
0.00000	0.00000	1430.00000	0.31638	0.29953	0.00089	0.43830
0.00000	0.00000	1540.00000	0.31292	0.29663	0.00092	0.43374
0.00000	0.00000	1650.00000	0.30998	0.29402	0.00109	0.42978
0.00000	0.00000	1760.00000	0.30762	0.29164	0.00148	0.42641
0.00000	0.00000	1870.00000	0.30604	0.28942	0.00218	0.42376
0.00000	0.00000	1980.00000	0.30577	0.28742	0.00342	0.42226
0.00000	0.00000	2090.00000	0.30794	0.28587	0.00574	0.42294
0.00000	0.00000	2200.00000	0.15440	0.18514	0.00681	0.24145
0.00000	0.00000	2310.00000	0.15295	0.18012	0.00251	0.23668
0.00000	0.00000	2420.00000	0.15196	0.17739	0.00085	0.23394
0.00000	0.00000	2530.00000	0.15142	0.17610	0.00045	0.23263
0.00000	0.00000	2640.00000	0.15075	0.17514	0.00023	0.23147
0.00000	0.00000	2750.00000	0.15026	0.17460	0.00016	0.23073
0.00000	0.00000	2860.00000	0.14982	0.17420	0.00011	0.23014
0.00000	0.00000	2970.00000	0.14943	0.17380	0.00008	0.22958
0.00000	0.00000	3080.00000	0.14913	0.17356	0.00006	0.22920
0.00000	0.00000	3190.00000	0.14889	0.17337	0.00005	0.22890
0.00000	0.00000	3300.00000	0.14869	0.17318	0.00003	0.22862
0.00000	0.00000	3410.00000	0.14856	0.17307	0.00003	0.22845
0.00000	0.00000	3520.00000	0.14847	0.17299	0.00002	0.22833
0.00000	0.00000	3630.00000	0.14841	0.17294	0.00001	0.22826
0.00000	0.00000	3740.00000	0.14841	0.17293	-0.00000	0.22824
0.00000	0.00000	3850.00000	0.14845	0.17295	-0.00001	0.22829
0.00000	0.00000	3960.00000	0.14852	0.17300	-0.00002	0.22838
0.00000	0.00000	4070.00000	0.14864	0.17308	-0.00003	0.22852
0.00000	0.00000	4180.00000	0.14882	0.17323	-0.00004	0.22874
0.00000	0.00000	4290.00000	0.14903	0.17338	-0.00004	0.22900
0.00000	0.00000	4400.00000	0.14930	0.17362	-0.00006	0.22936



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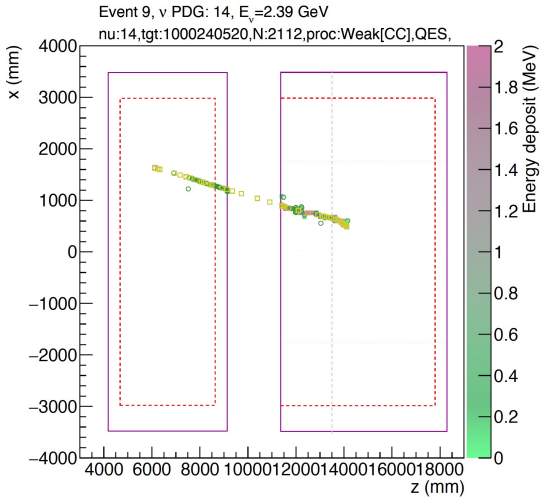
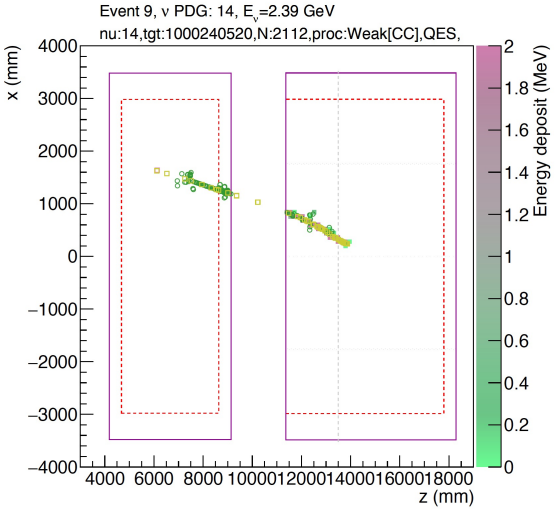
SAMPLE GENERATION

- Made a new geometry file that includes the B-field map file instead of the constant 1T field.
  - /dune/app/users/arafique/ND_production/ND_Production/scripts/job_submit/nd_hall_with_lar_tms_nosand_Bfield.gdml
- Generated ~3500 events (POT 1e16) with top volume “volArgonCubeDetector75”
- Ran edep-sim through following geometries having:
  - No B-field at all
  - 1T constant field
  - More realistic B-field map
- ~1500 events have charge deposition inside TMS

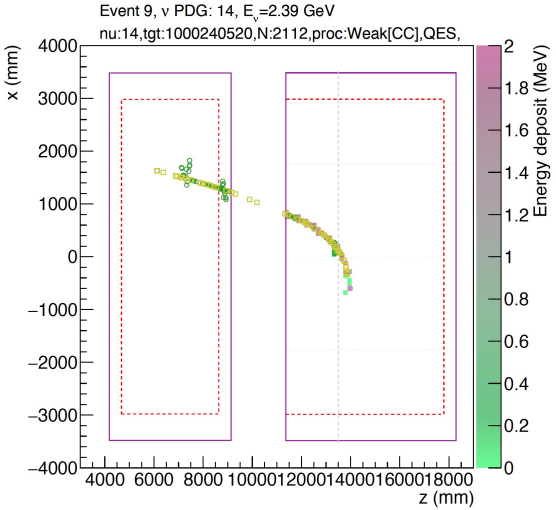
EVENT DISPLAYS



Without B-field

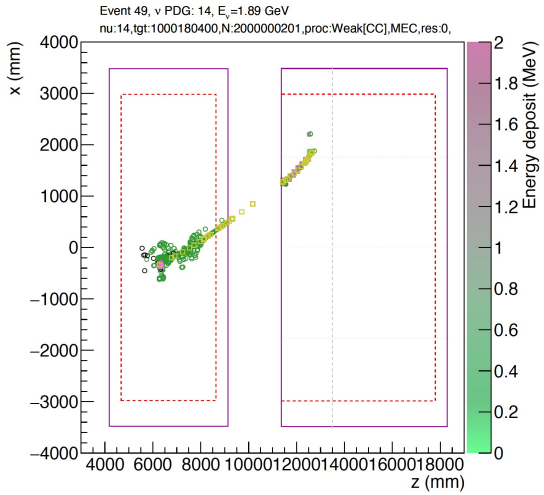


With a constant B = 1T

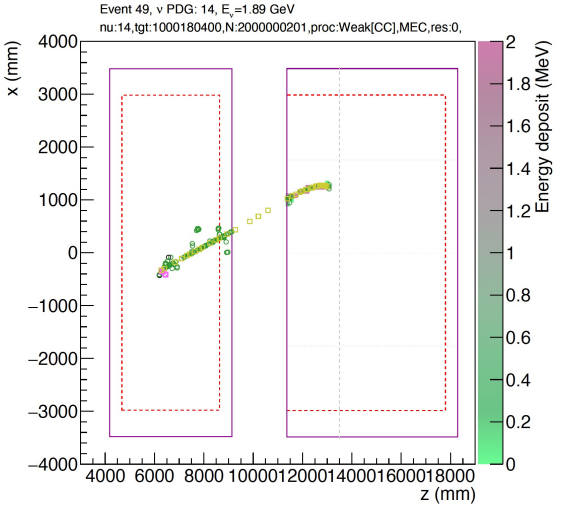


With B-field map

EVENT DISPLAYS



Without B-field



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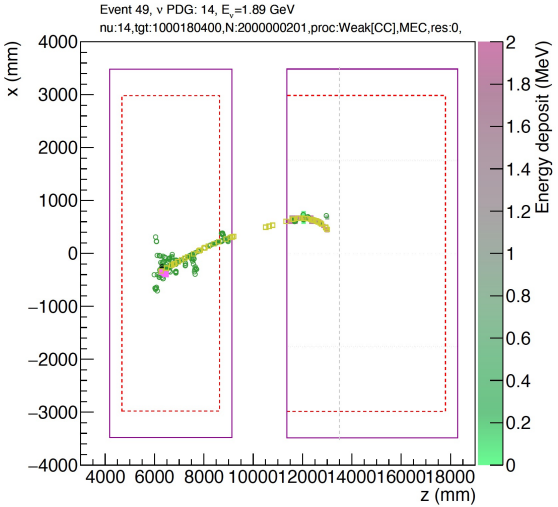
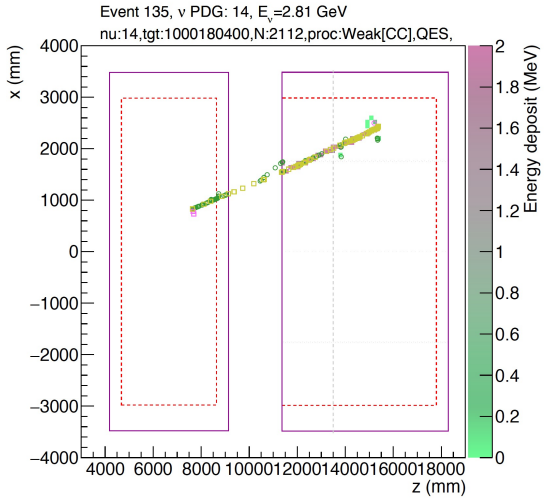


With B-field map

EVENT DISPLAYS



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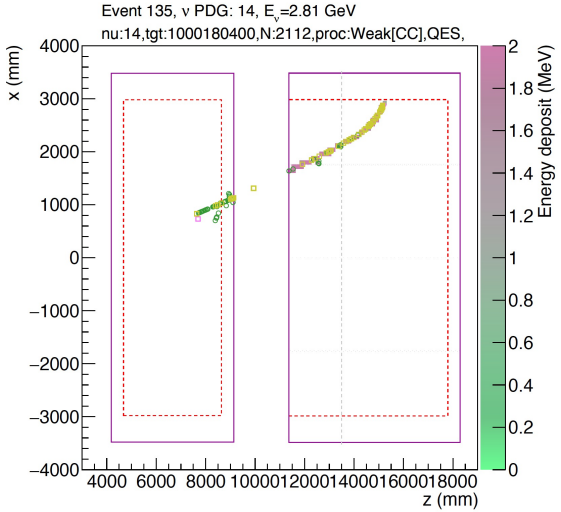

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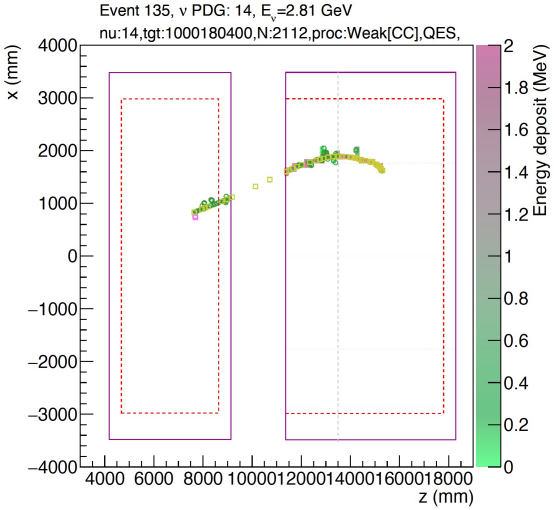

With B-field map

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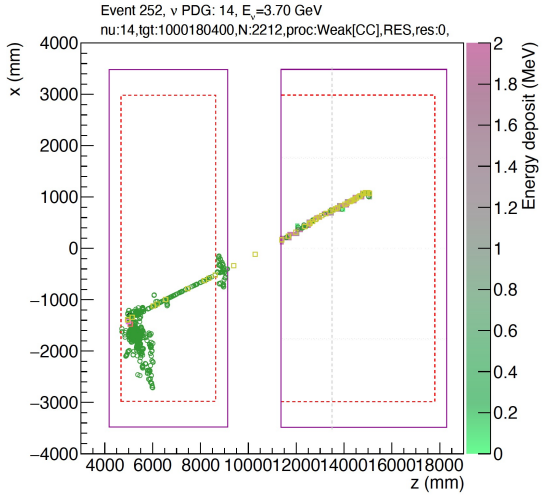

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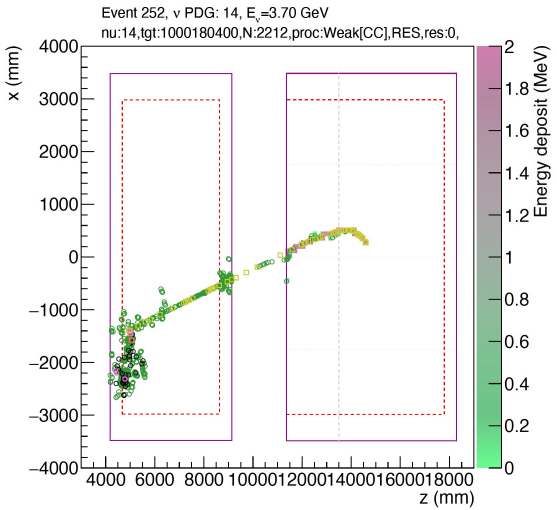

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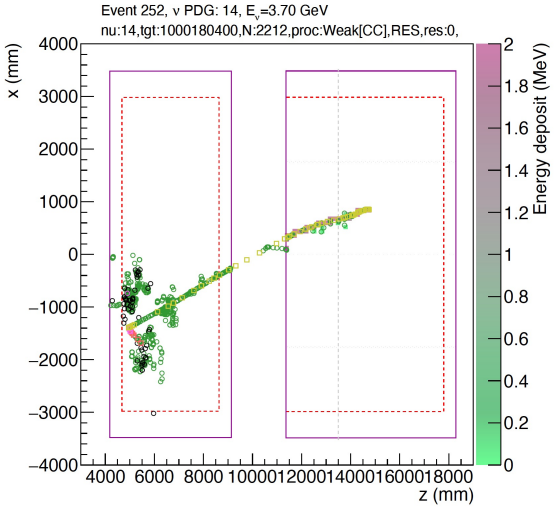
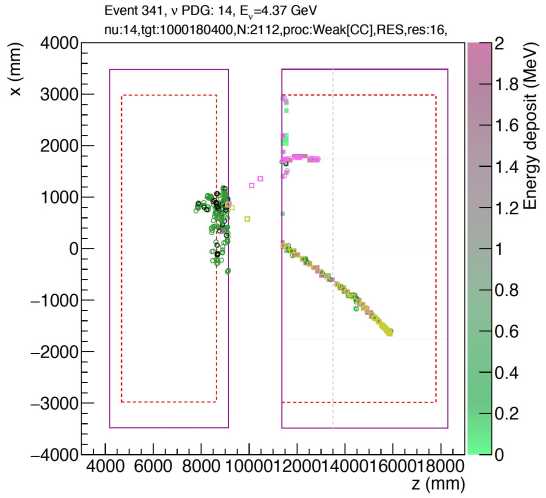


With B-field map

EVENT DISPLAYS



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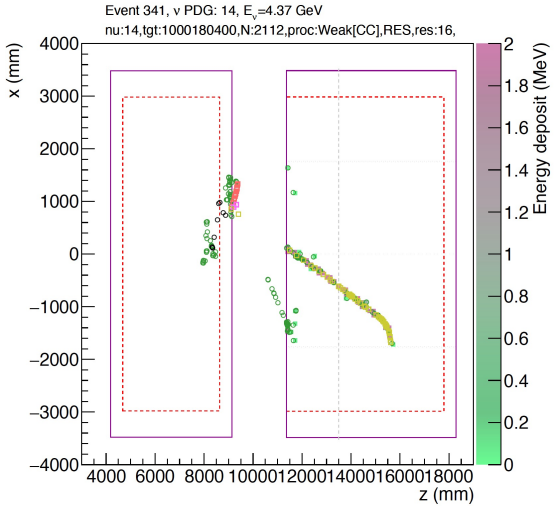

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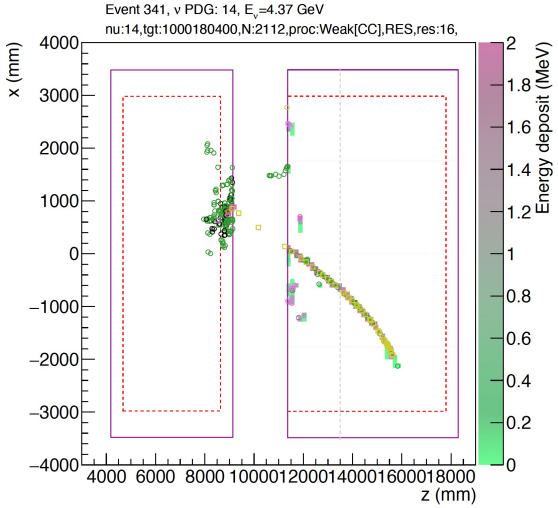
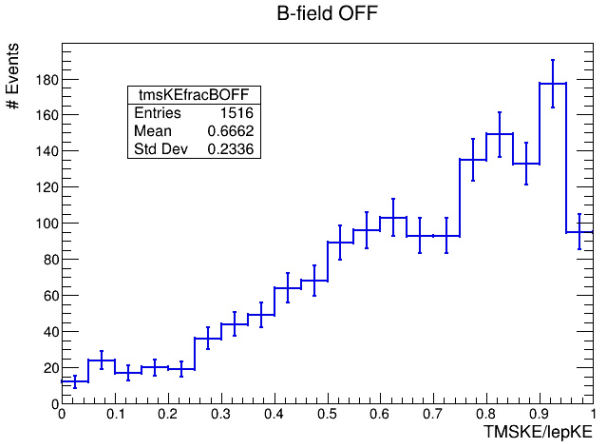


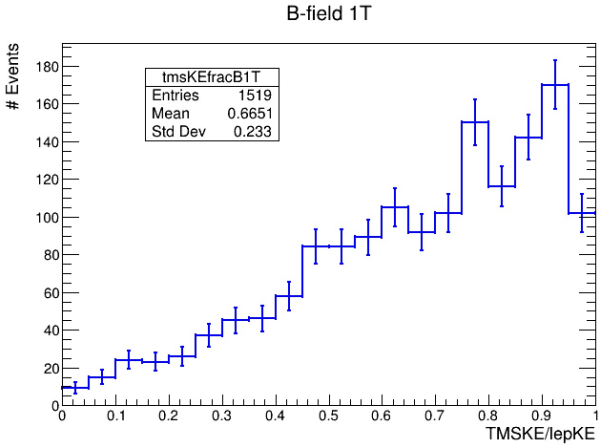
With B-field map

TMS KINETIC ENERGY FRACTION

- Ran the “dumpSSRITree.py” on the edep-sim files.
- Plotted fraction of TMS KE over leptonic KE on event-by-event basis



Without B-field



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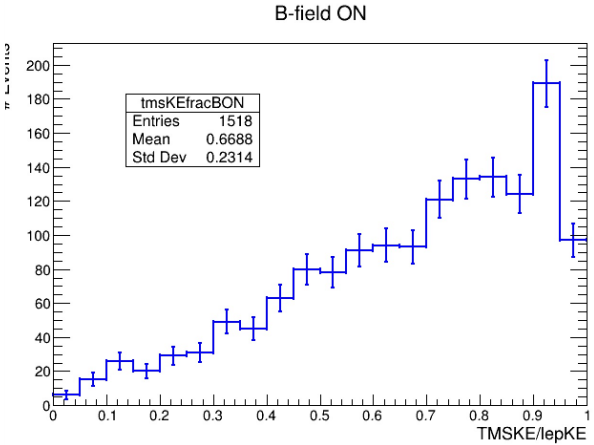
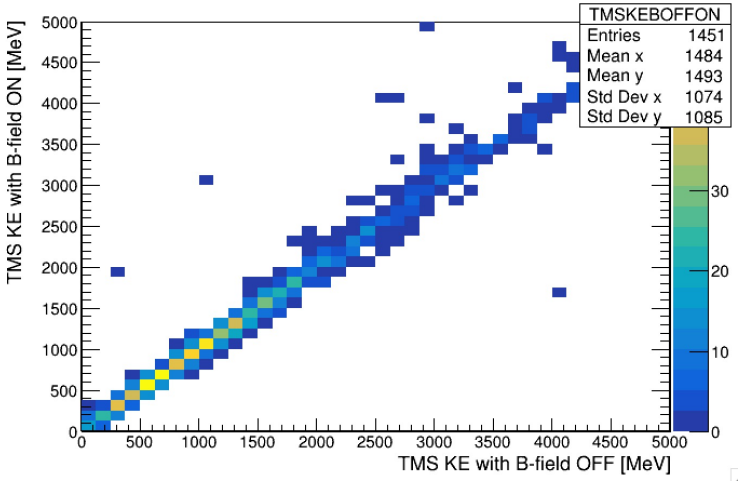
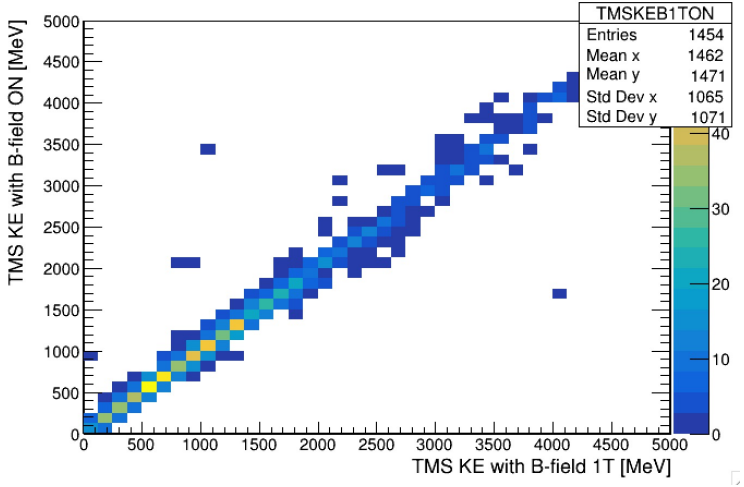


With B-field map

TMS KE 2D PLOTS





Looking for a metric such as energy resolution etc to compare results from with/without B-field map.

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