SoLID Simulation and Baffles

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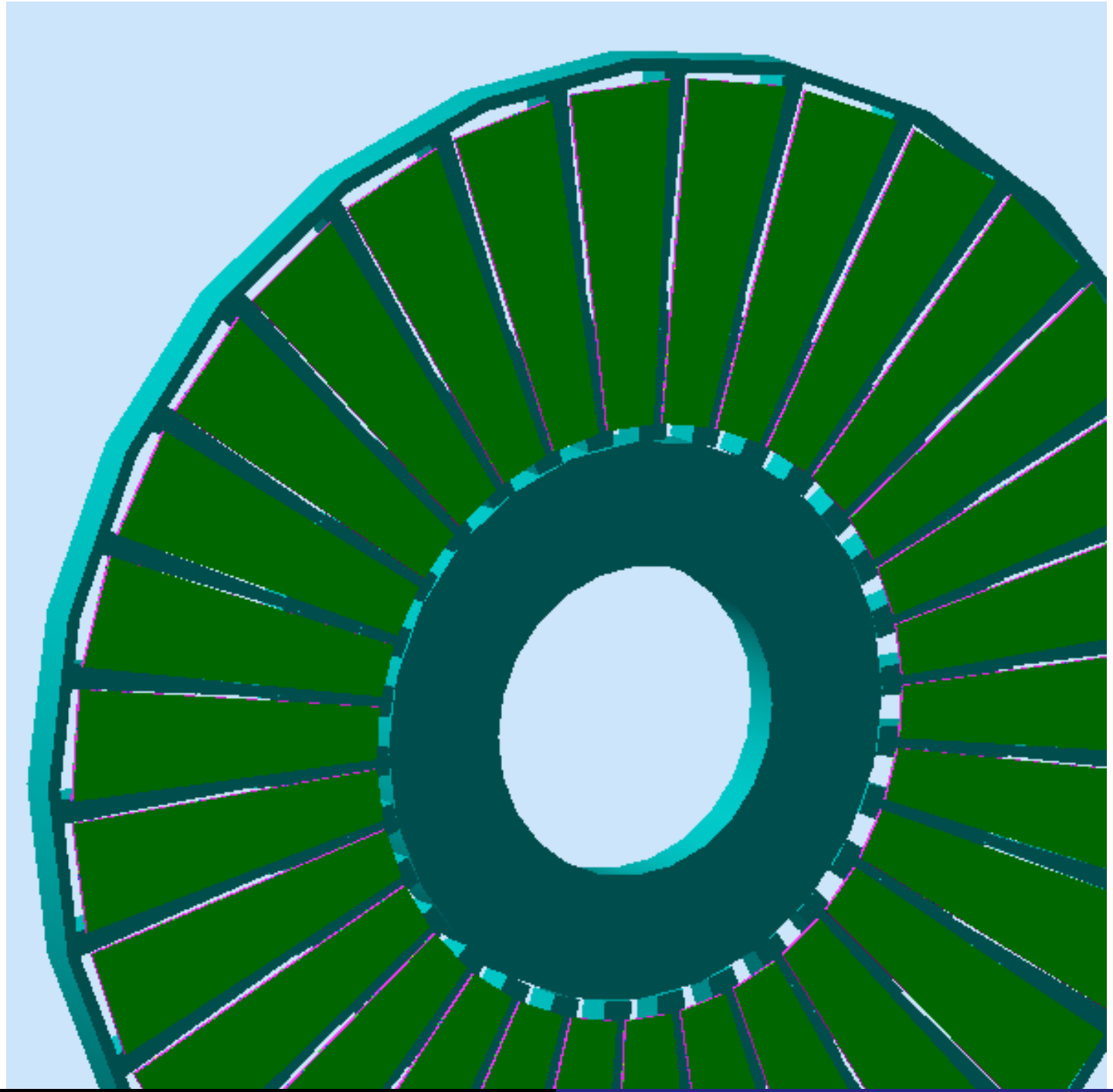
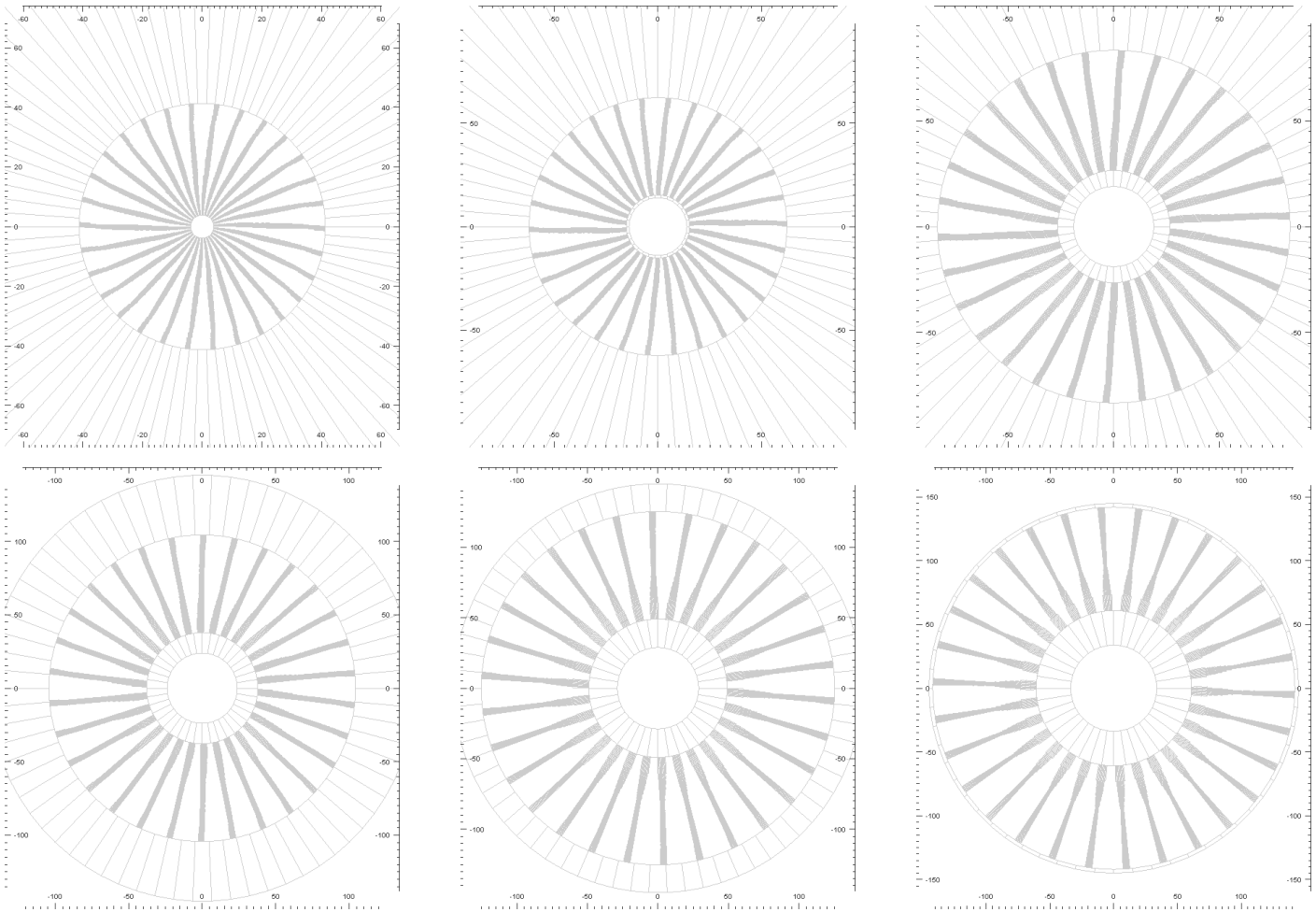
Outline

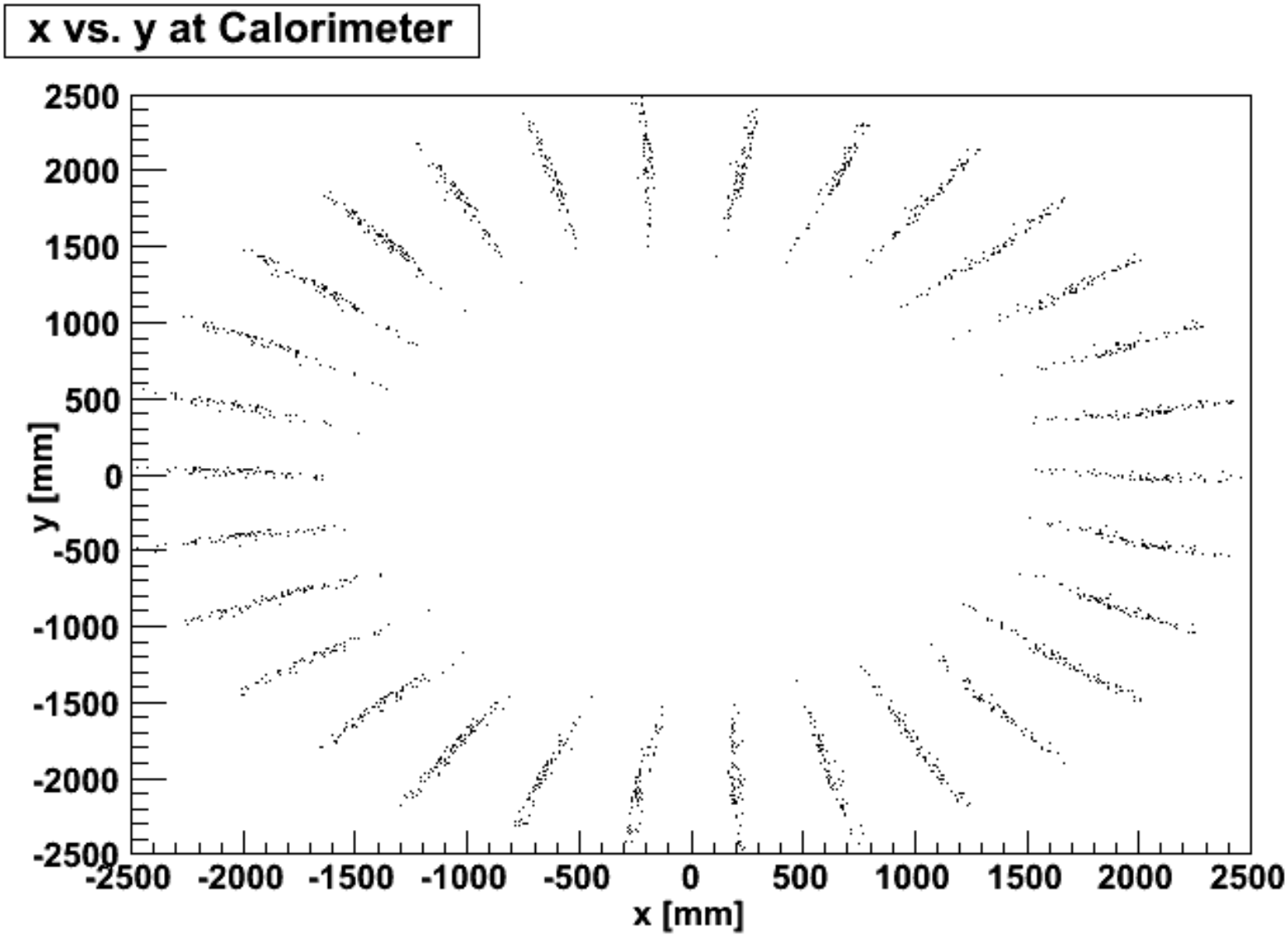
- Latest in Baffles
- Simulation
- To do list



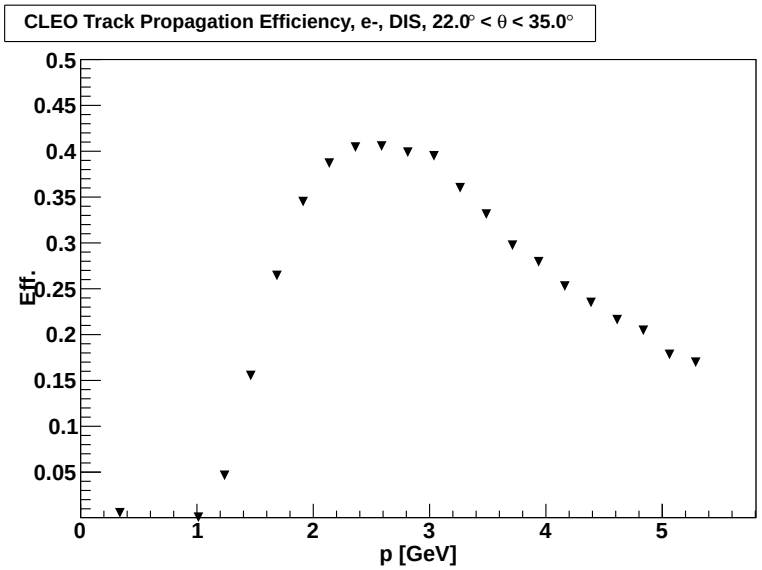
Baffle Profiles

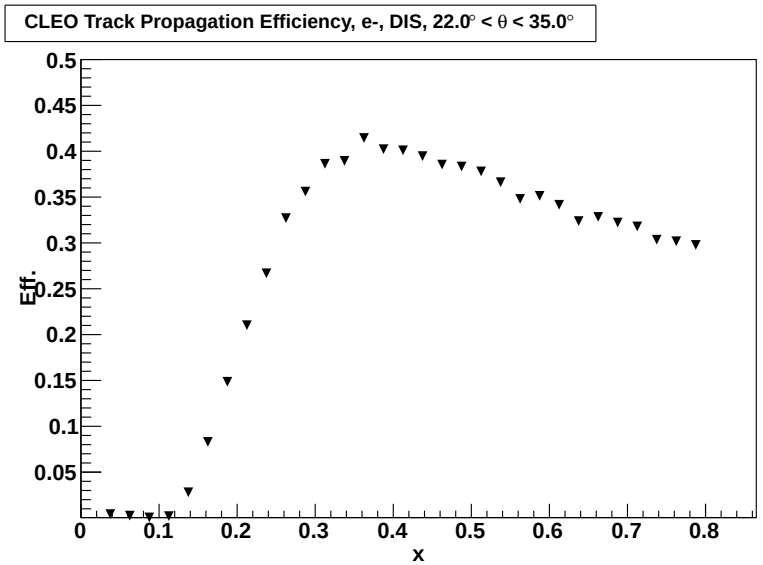


Photon Leak


x vs. y at Calorimeter
2500
2000
1500
1000
500
0
-500
-1000
-1500
-2000
-2500
y [mm]
-2500
-2000
-1500
-1000
-500
0
500
1000
1500
2000
2500
x [mm]

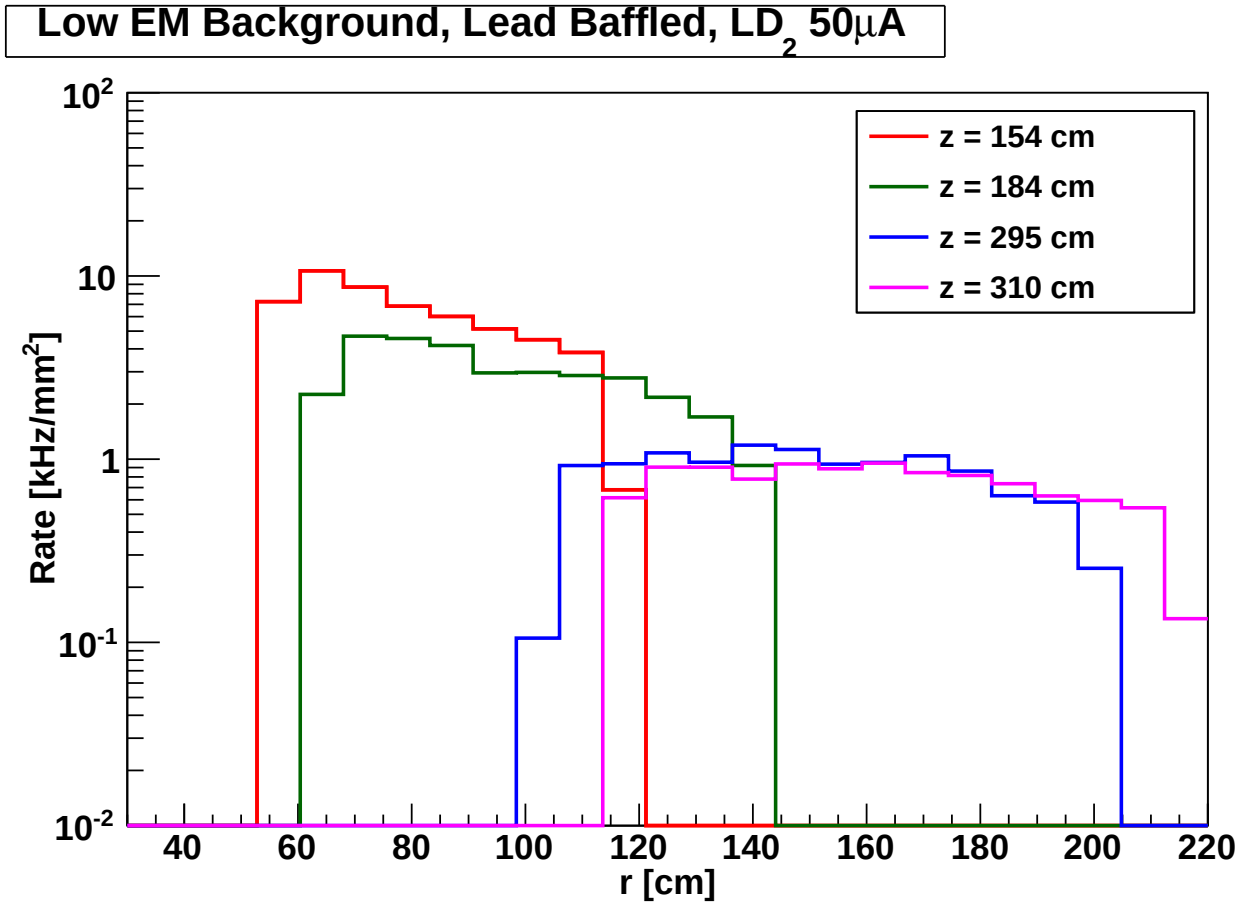
Propagation Efficiency





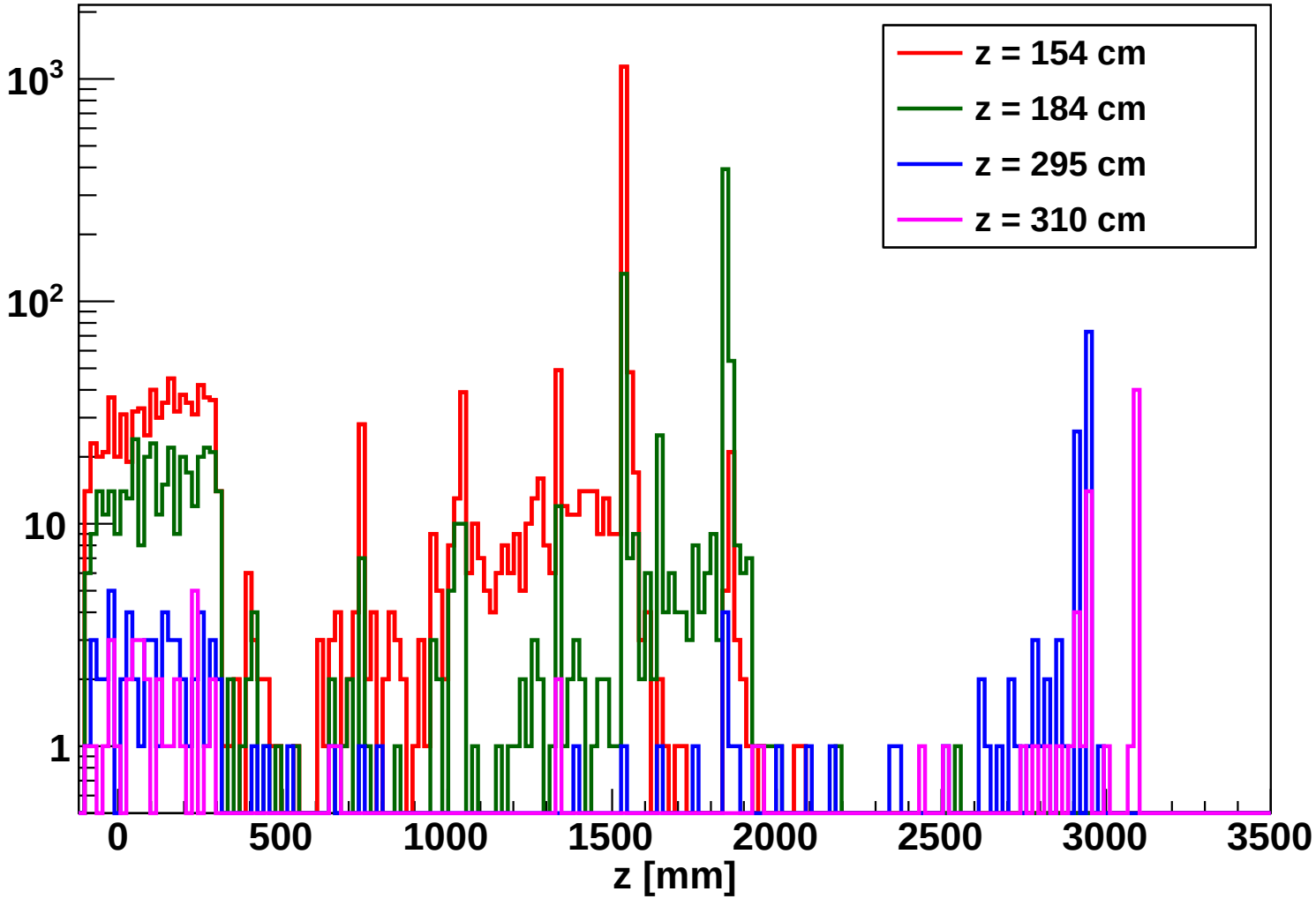
- Pretty much the same as before
- FoM about the same too

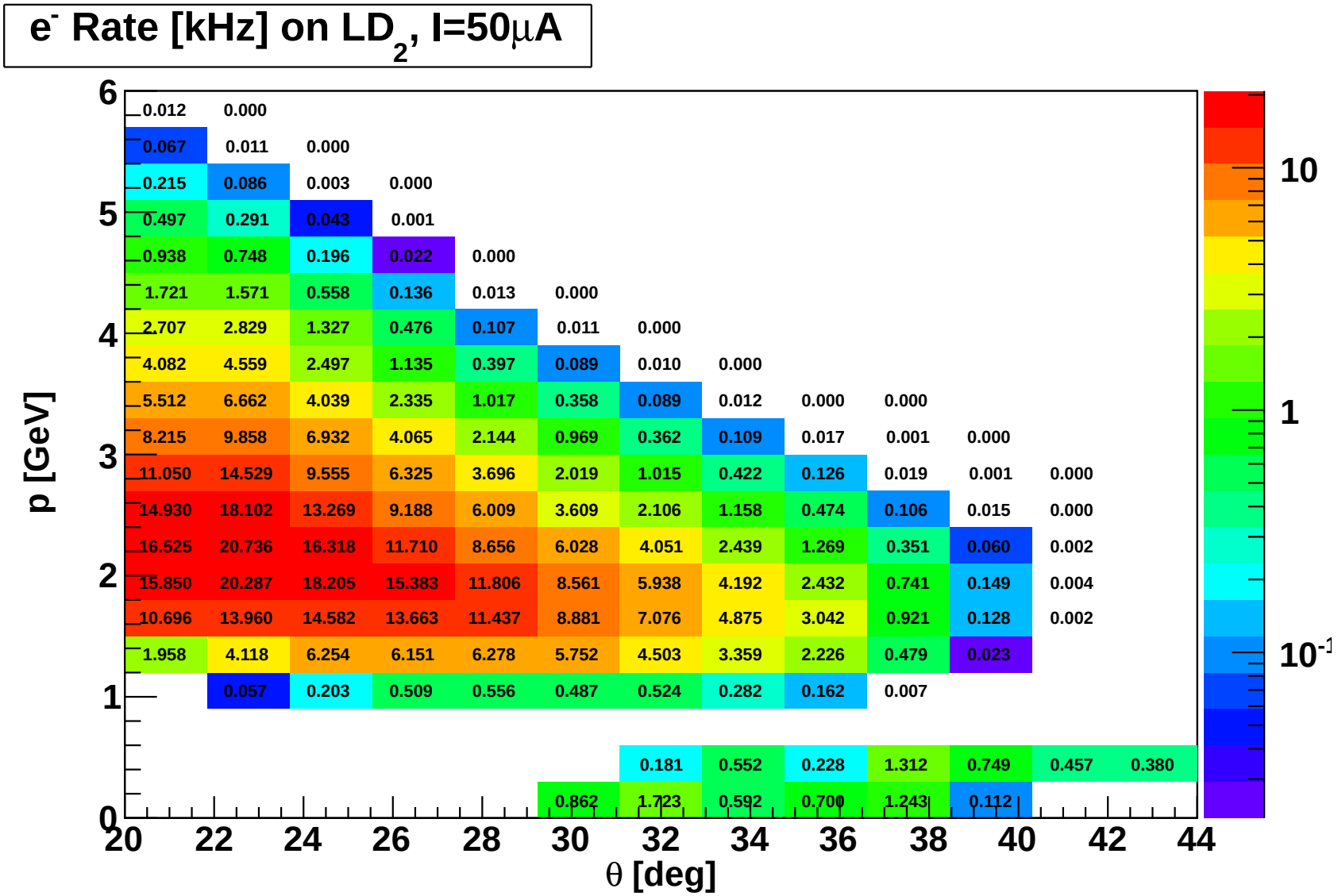
GEM Rates



- Includes full lead geometry, all detectors, beamline
- Rates a bit worse on LD_2, weaker magnet

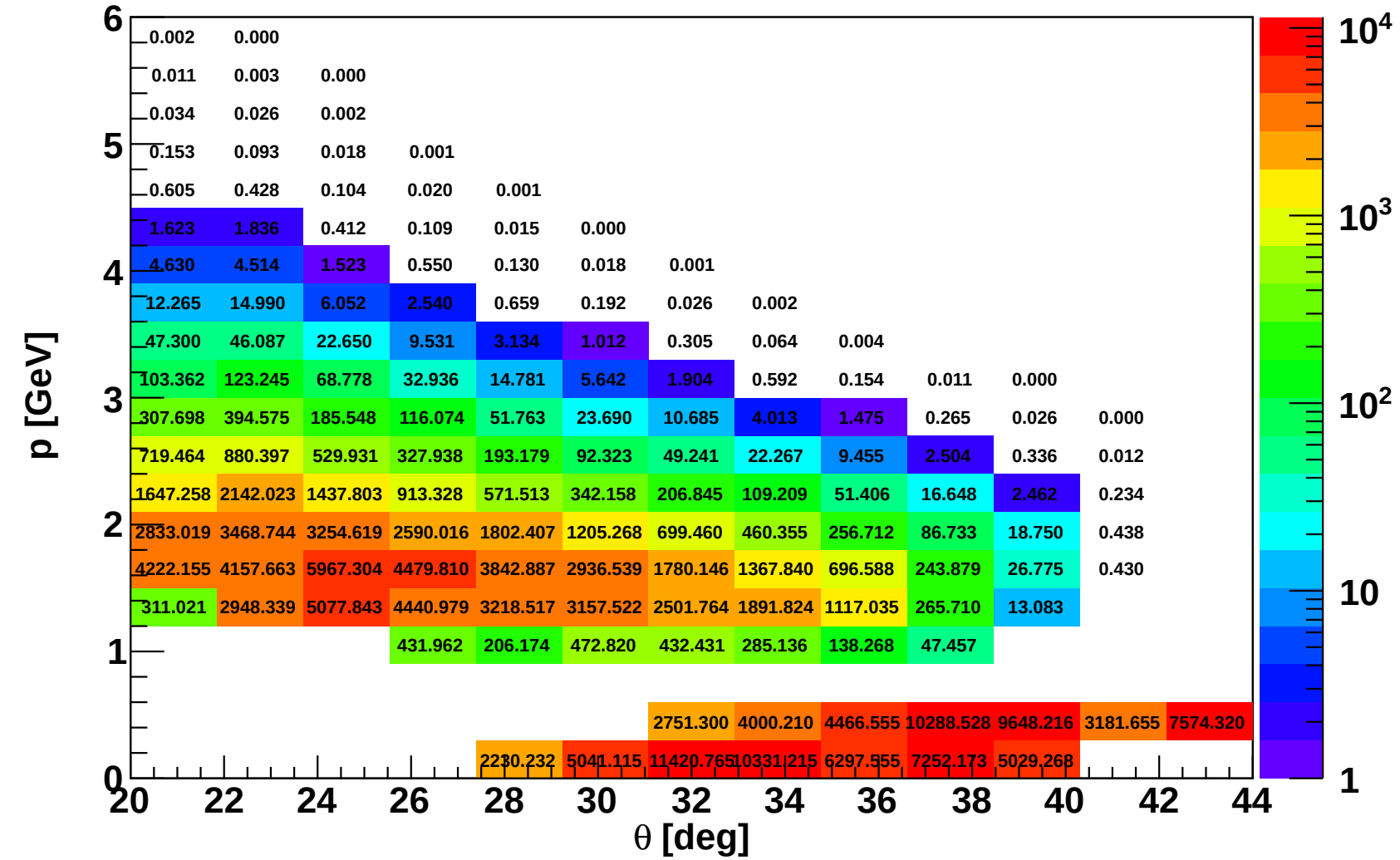
Low EM Background Origin, Lead Baffled




e- Rate [kHz] on LD2, I=50μA
p [GeV]
θ [deg]
0.012 0.000
0.067 0.011 0.000
0.215 0.086 0.003 0.000
0.497 0.291 0.043 0.001
0.938 0.748 0.196 0.022 0.000
1.721 1.571 0.558 0.136 0.013 0.000
2.707 2.829 1.327 0.476 0.107 0.011 0.000
4.082 4.559 2.497 1.135 0.397 0.089 0.010 0.000
5.512 6.662 4.039 2.335 1.017 0.358 0.089 0.012 0.000 0.000
8.215 9.858 6.932 4.065 2.144 0.969 0.362 0.109 0.017 0.001 0.000
11.050 14.529 9.555 6.325 3.696 2.019 1.015 0.422 0.126 0.019 0.001 0.000
14.930 18.102 13.269 9.188 6.009 3.609 2.106 1.158 0.474 0.106 0.015 0.000
16.525 20.736 16.318 11.710 8.656 6.028 4.051 2.439 1.269 0.351 0.060 0.002
15.850 20.287 18.205 15.383 11.806 8.561 5.938 4.192 2.432 0.741 0.149 0.004
10.696 13.960 14.582 13.663 11.437 8.881 7.076 4.875 3.042 0.921 0.128 0.002
1.958 4.118 6.254 6.151 6.278 5.752 4.503 3.359 2.226 0.479 0.023
0.057 0.203 0.509 0.556 0.487 0.524 0.282 0.162 0.007
0.181 0.552 0.228 1.312 0.749 0.457 0.380
0.862 1.723 0.592 0.700 1.243 0.112
10
1
10-1

e^- Rate Comparison

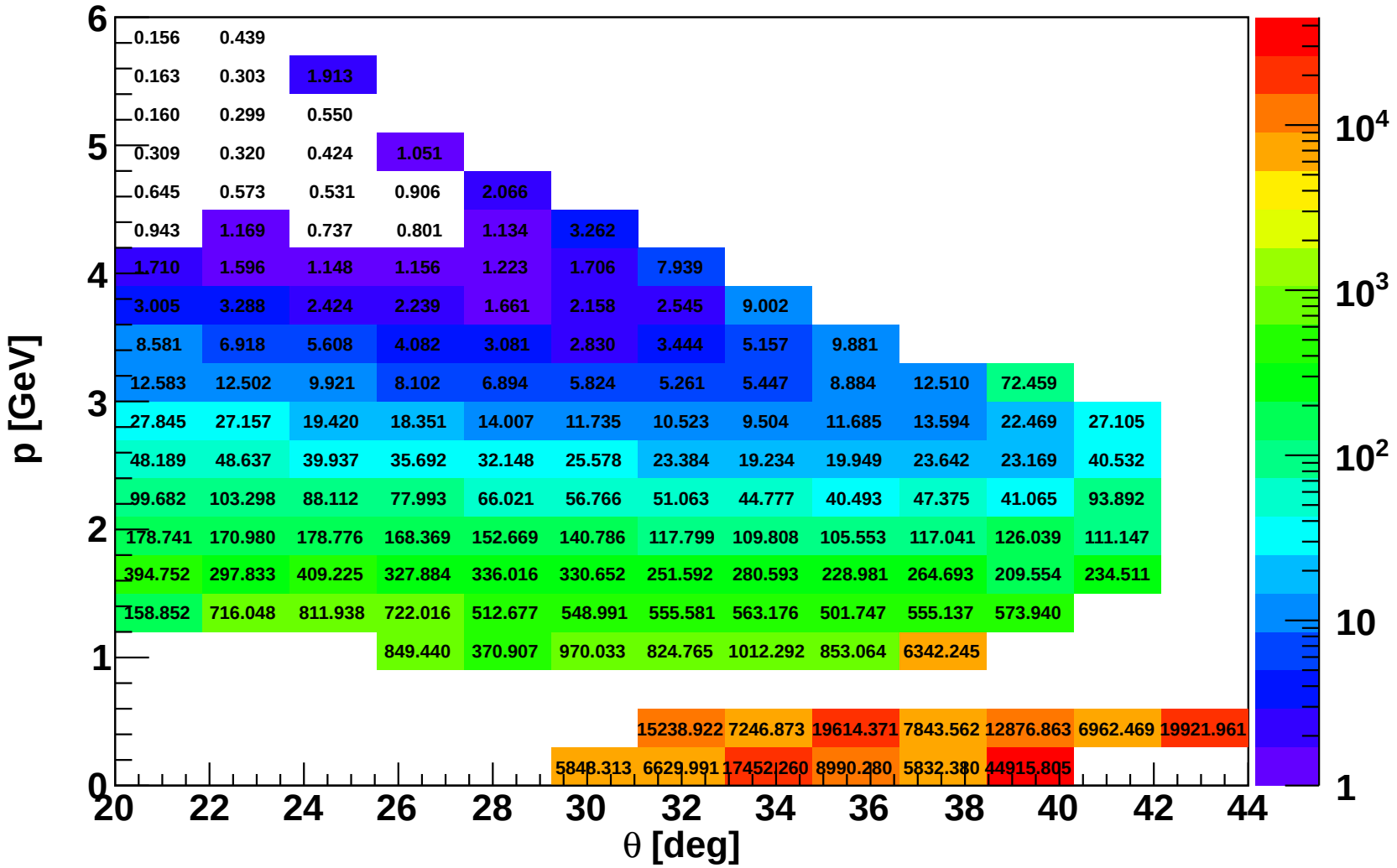
	Proposal (LH_2)	Now (LD_2)
All DIS	110 kHz	532.8 kHz
$W > 2$ GeV, $x > 0.20$	110 kHz	425.1 kHz
$W > 2$ GeV, $x > 0.55$	12 kHz	20.7 kHz
$W > 2$ GeV, $x > 0.65$	3 kHz	5.0 kHz


π⁻ Rate [kHz] on LD2, I=50μA
p [GeV]
θ [deg]
0.002 0.000
0.011 0.003 0.000
0.034 0.026 0.002
0.153 0.093 0.018 0.001
0.605 0.428 0.104 0.020 0.001
1.623 1.836 0.412 0.109 0.015 0.000
4.630 4.514 1.523 0.550 0.130 0.018 0.001
12.265 14.990 6.052 2.540 0.659 0.192 0.026 0.002
47.300 46.087 22.650 9.531 3.134 1.012 0.305 0.064 0.004
103.362 123.245 68.778 32.936 14.781 5.642 1.904 0.592 0.154 0.011 0.000
307.698 394.575 185.548 116.074 51.763 23.690 10.685 4.013 1.475 0.265 0.026 0.000
719.464 880.397 529.931 327.938 193.179 92.323 49.241 22.267 9.455 2.504 0.336 0.012
1647.258 2142.023 1437.803 913.328 571.513 342.158 206.845 109.209 51.406 16.648 2.462 0.234
2833.019 3468.744 3254.619 2590.016 1802.407 1205.268 699.460 460.355 256.712 86.733 18.750 0.438
4222.155 4157.663 5967.304 4479.810 3842.887 2936.539 1780.146 1367.840 696.588 243.879 26.775 0.430
311.021 2948.339 5077.843 4440.979 3218.517 3157.522 2501.764 1891.824 1117.035 265.710 13.083
431.962 206.174 472.820 432.431 285.136 138.268 47.457
2751.300 4000.210 4466.555 10288.528 9648.216 3181.655 7574.320
2230.232 5041.115 11420.765 10331.215 6297.555 7252.173 5029.268
0 1 2 3 4 5 6
20 22 24 26 28 30 32 34 36 38 40 42 44
1 10 10² 10³ 10⁴

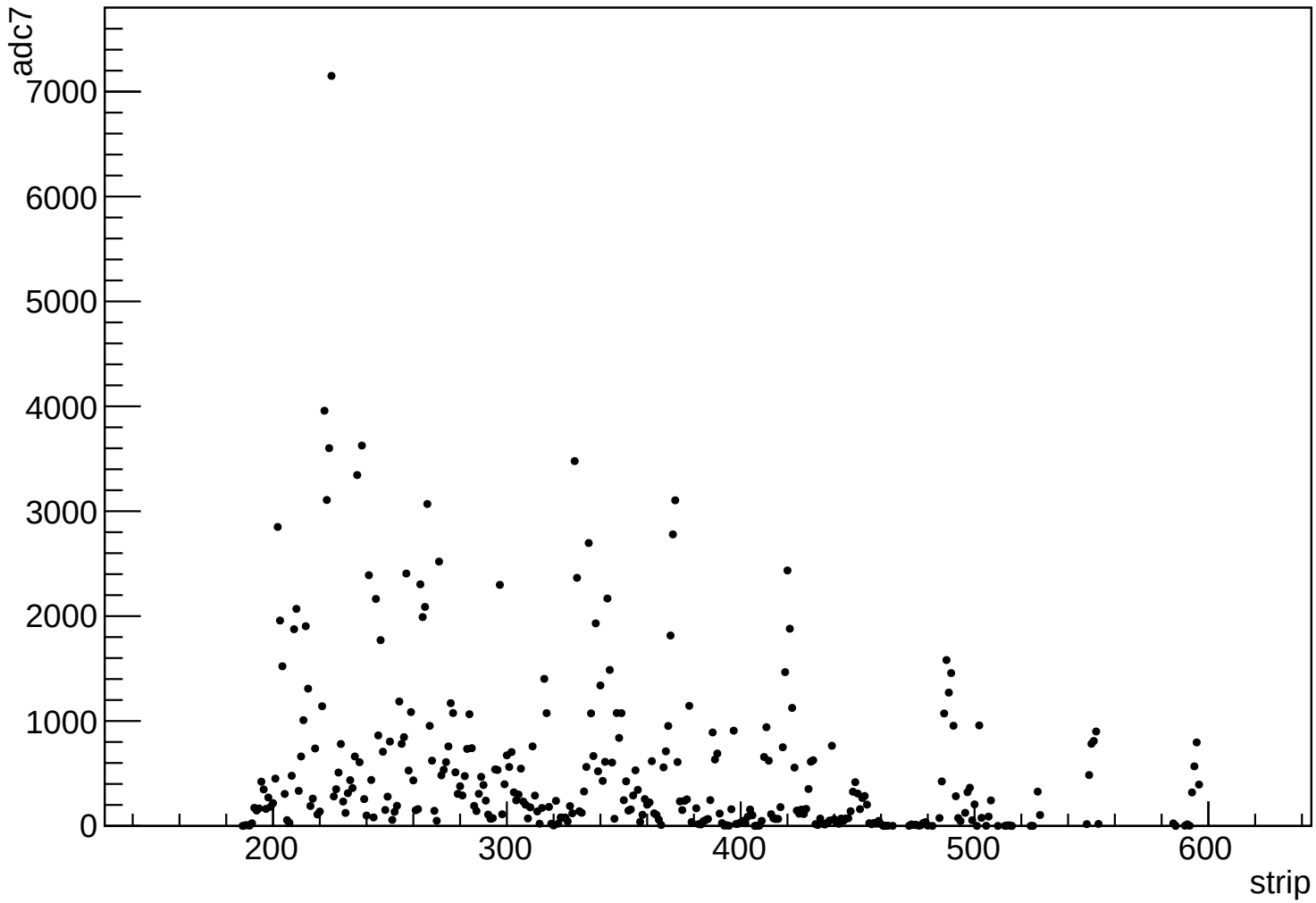
π^- Rate Comparison

	Proposal (LH_2)	Now (LD_2)
All pi^-D	-	176.5 MHz
π^-D, $p > 0.3$ GeV	140 MHz	128.9 MHz
π^-D, $p > 1.0$ GeV	70 MHz	85.5 MHz
π^-D, $p > 2.0$ GeV	8 MHz	16.5 MHz

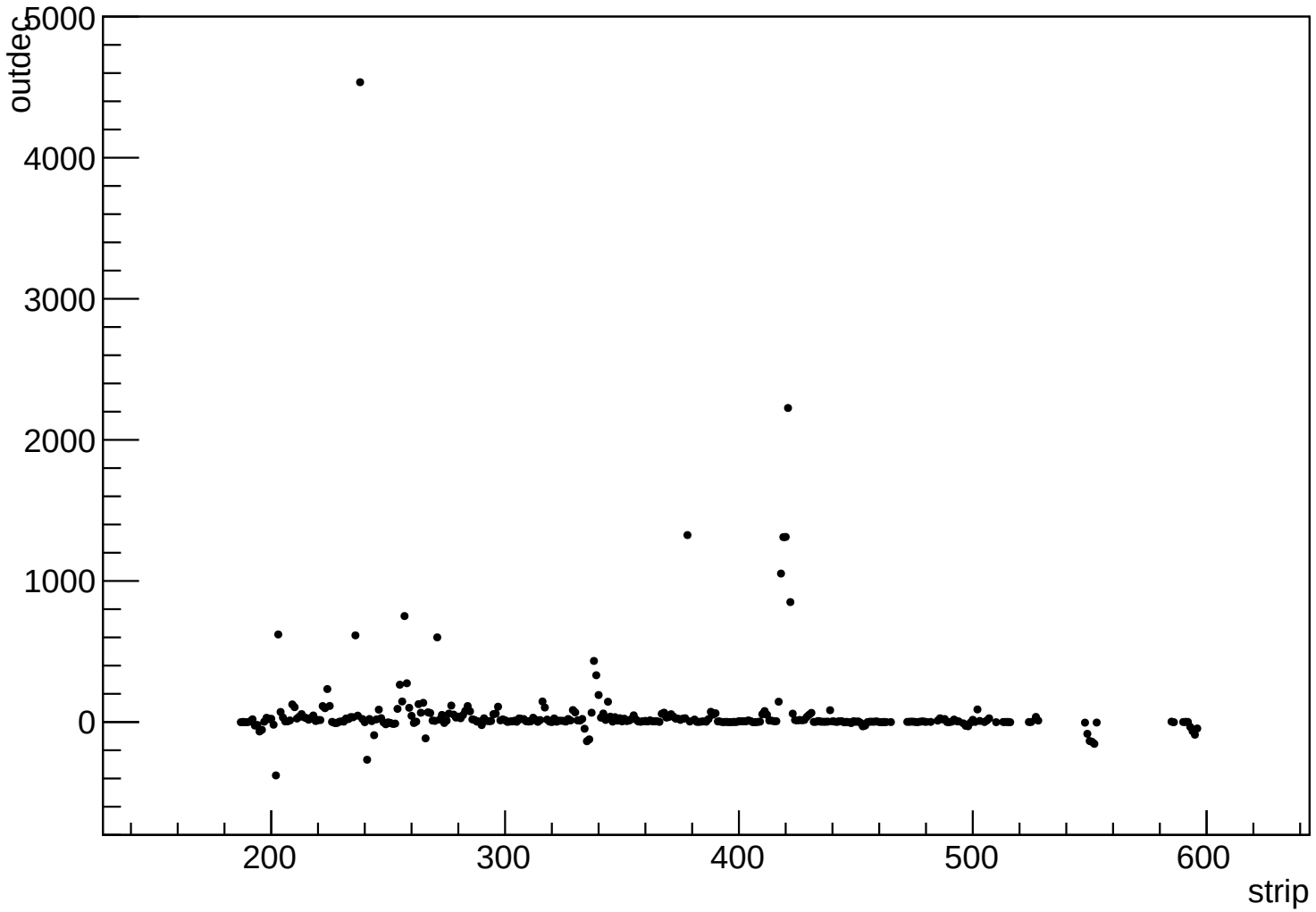
PVDIS π^-/e^- LD_2



One PVDIS Background Event - No Deconvolution



One PVDIS GEM Event - Deconvoluted



GEM Occupancies

PVDIS

Cham	N. Strip
1	316.5
2	303.6
3	282.8
4	279.6

SIDIS

Cham	N. Strip
1	16.8
2	62.4
3	33.6
4	28.9
5	27.0
6	25.5

Resolution Studies from Rich

- Uses form for momentum fit and find coefficients with perfect resolution, no multiple scattering:

$$f\left(\frac{dr}{dz}, R\right) = \sum_{i=0}^{3}\left(a_i + b_i\frac{dr/dz}{R}\right)(dr/dz)^i$$

$$p = \left[\frac{d\phi}{dz} f\left(\frac{dr}{dz}, R\right)\right]^{-1}$$

- Finds most combinations of layers give better than 1% momentum resolution, proposal limit is 3%
- Has draft writeup which should go on the wiki

To Do List - Writing

- Simulation should be at a good point - no new real work needed I think
- Baffles section figures in place. Just need to put down the words
- Baffles cost analysis needs to be done - scaling from BigBite sieve
- Simulation needs a few nice pictures made and summary needs to be written

To Do List - GEMC

- Generators
  - Radiative effects, need to enumerate needs
  - π asymmetry
  - F_2 inelastic for lower Q^2, resonance data - fits by Bosted on LH_2 and LD_2
    - Written, just need to be implemented
  - Hyperon decay
    - Working on with Konrad Aniol
  - Resolution studies
    - Progress from Rich

To Do List - Detectors

- Review/clean up GEM digitization, double check multisampling filtering
  - Should be good to go
- Cerenkov and calorimeter need similar framework developed
  - Michael Paolone?
- Charged flux through PMT glass in GEMC based on background rates
- Need to evaluate pileup/digitization in full background simulation
- Need to look at pion asymmetry effects in pion-sensitive detectors
- Low energy pions in Ecal and their response
- Response to electromagnetic background in calorimeter