

05/10/2024 GELATO Weekly

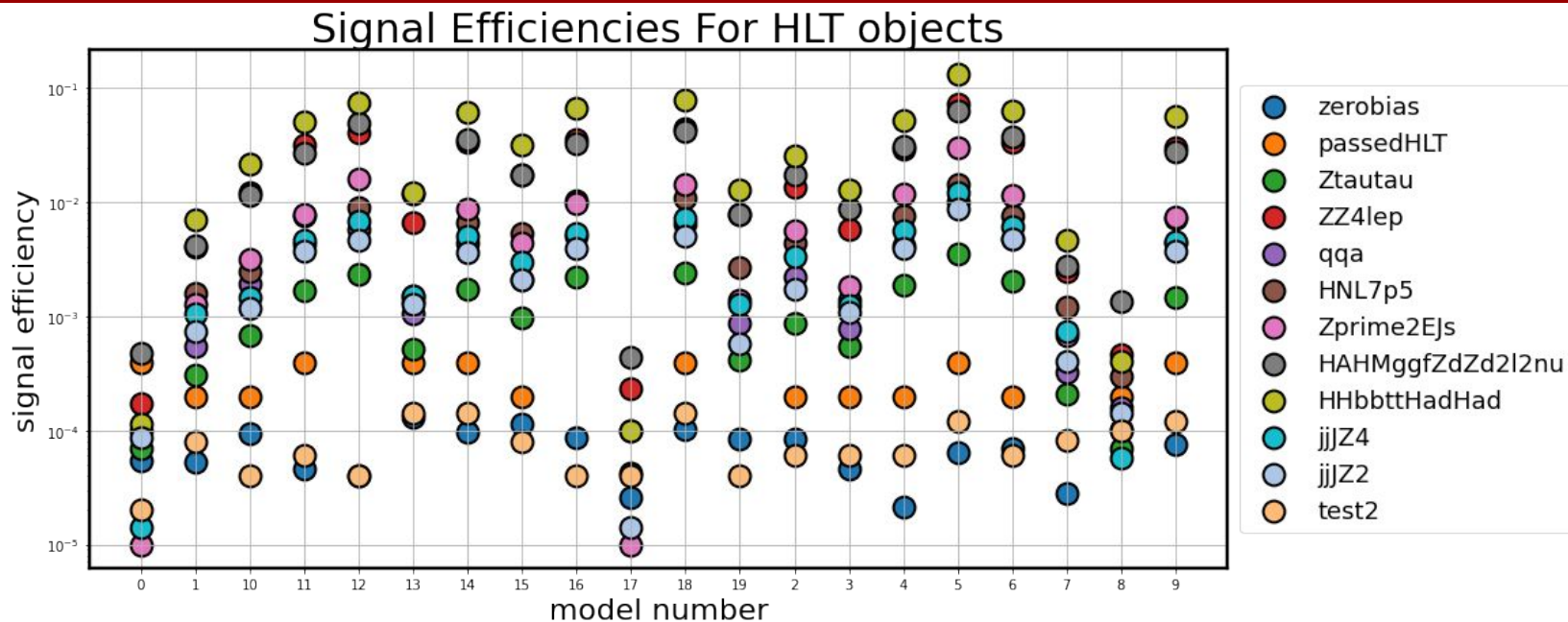
Max Cohen



Updates from this week

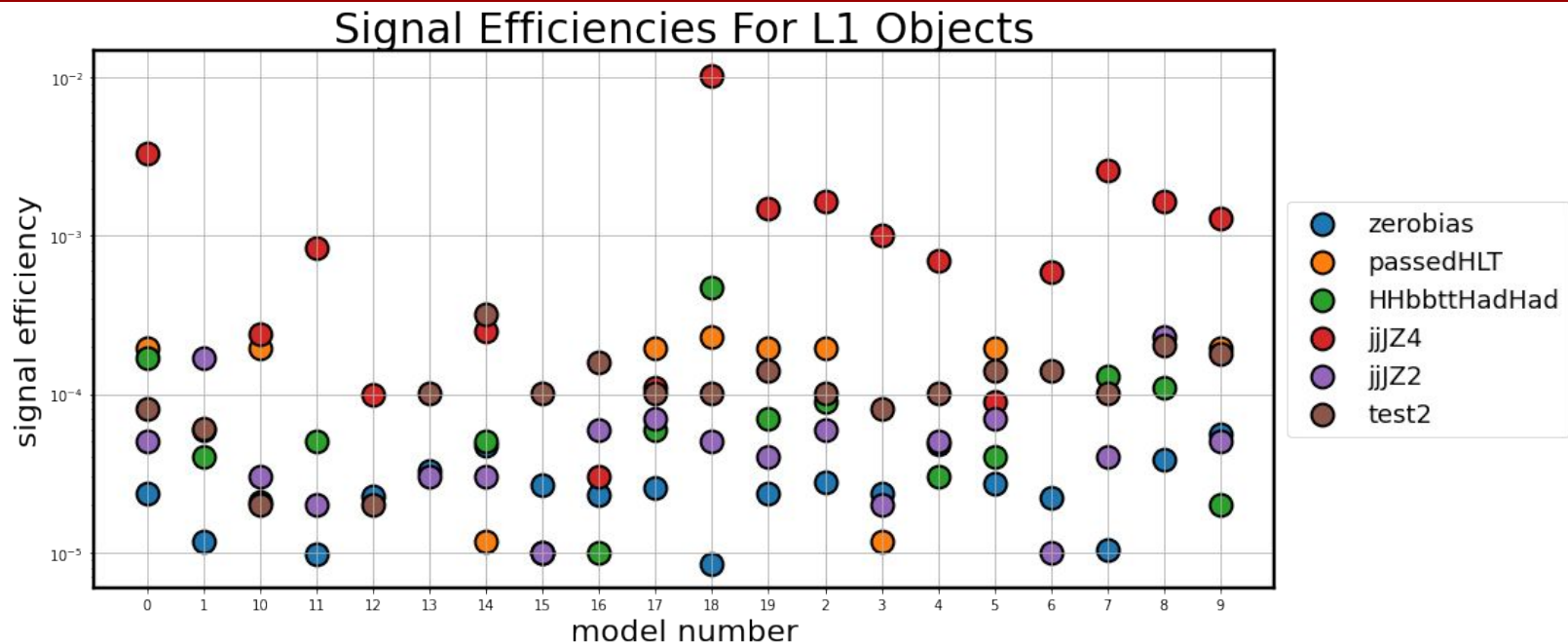
- MC samples were submitted: <https://its.cern.ch/jira/browse/ATLMCPROD-11238>
- Some of the new EB files don't have trigger decisions saved...
- Looked at the variance between trainings + latent space entropy

Variance between trainings



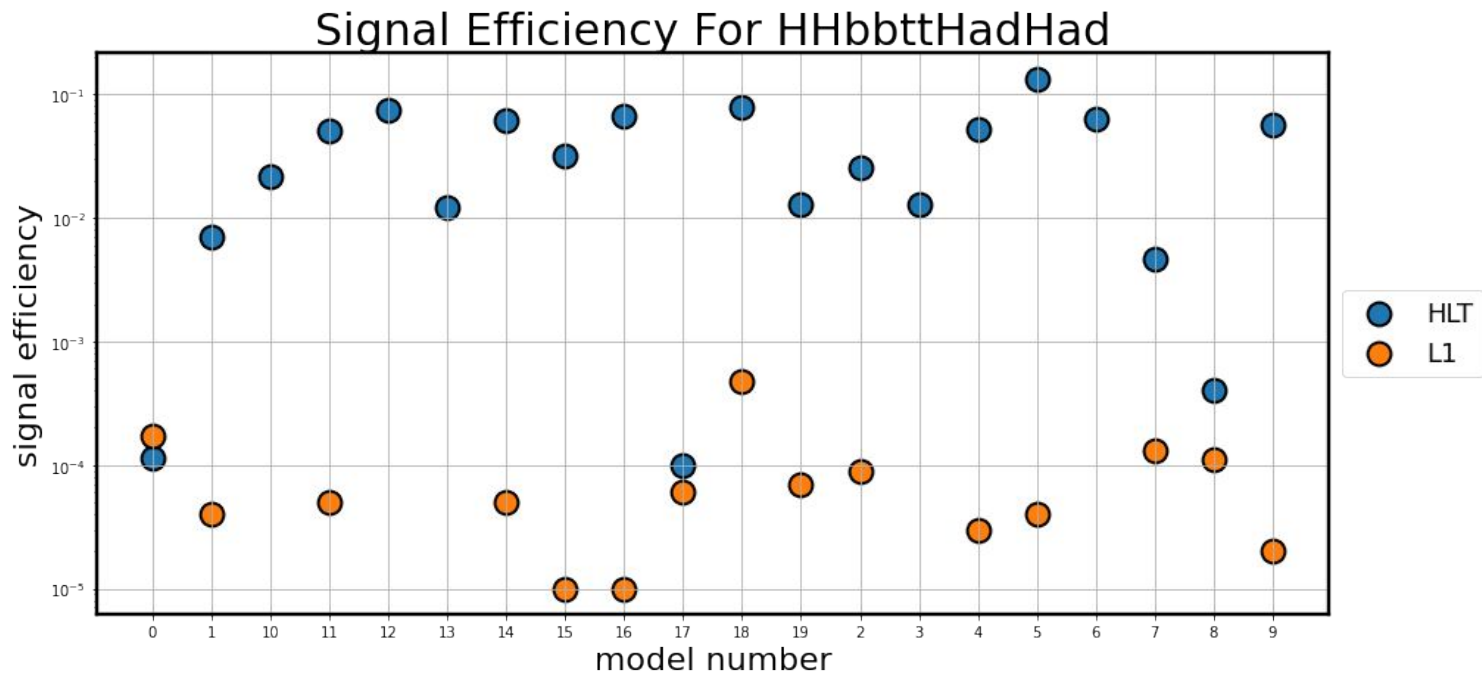
- Ordering of signals doesn't change much; mostly go up and down together
 - Maybe entropy of the latent space would track on to these?

Variance between trainings



- Ordering is much more volatile
 - Makes sense: we think training over the L1 objects makes the model learn less

Variance between trainings



Updated with zero padding

abs(HLT event - reconstruction)

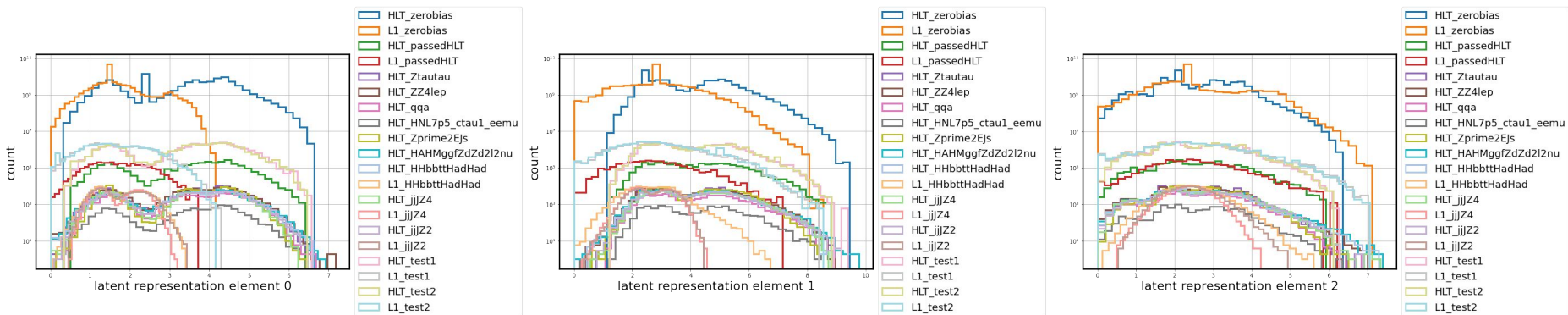
0.056 +- 0.004	1.067 +- 0.592	1.268 +- 0.744
0.038 +- 0.001	1.441 +- 1.204	1.464 +- 0.888
0.025 +- 0.001	0.591 +- 0.340	1.522 +- 0.874
0.022 +- 0.000	0.684 +- 0.378	1.507 +- 0.885
0.019 +- 0.000	0.777 +- 0.506	1.480 +- 0.915
0.017 +- 0.000	1.221 +- 1.192	1.442 +- 0.941
0.015 +- 0.000	1.088 +- 1.071	1.395 +- 0.982
0.013 +- 0.000	1.282 +- 1.527	1.314 +- 1.017
0.012 +- 0.000	1.222 +- 1.513	1.226 +- 1.051
0.011 +- 0.000	1.130 +- 1.488	1.160 +- 1.080
0.000 +- 0.000	0.003 +- 0.005	0.004 +- 0.008
0.000 +- 0.000	0.001 +- 0.001	0.001 +- 0.002
0.000 +- 0.000	0.000 +- 0.000	0.000 +- 0.000
0.006 +- 0.000	0.190 +- 0.251	0.294 +- 0.538
0.000 +- 0.000	0.019 +- 0.028	0.027 +- 0.056
0.000 +- 0.000	0.003 +- 0.005	0.004 +- 0.010
0.021 +- 0.000	0.708 +- 0.449	0.722 +- 0.433
0.019 +- 0.000	0.623 +- 0.432	0.663 +- 0.434
0.011 +- 0.000	0.622 +- 0.479	1.007 +- 1.031
0.007 +- 0.001	0.000 +- 0.000	0.154 +- 0.156

abs(L1 event - reconstruction)

0.056 +- 0.004	0.736 +- 0.552	0.657 +- 0.617
0.029 +- 0.001	0.849 +- 1.129	0.746 +- 0.780
0.015 +- 0.000	0.802 +- 1.287	0.756 +- 0.934
0.008 +- 0.000	0.669 +- 1.291	0.621 +- 0.944
0.005 +- 0.000	0.537 +- 1.239	0.481 +- 0.823
0.003 +- 0.000	0.482 +- 1.209	0.367 +- 0.691
0.002 +- 0.000	0.347 +- 0.966	0.290 +- 0.575
0.002 +- 0.000	0.173 +- 0.369	0.222 +- 0.464
0.001 +- 0.000	0.258 +- 0.865	0.179 +- 0.393
0.001 +- 0.000	0.221 +- 0.797	0.137 +- 0.329
0.036 +- 0.002	0.676 +- 0.441	0.680 +- 0.595
0.012 +- 0.000	0.621 +- 0.511	0.759 +- 0.770
0.006 +- 0.000	0.496 +- 0.503	0.669 +- 0.820
0.001 +- 0.000	0.428 +- 0.403	0.597 +- 0.633
0.000 +- 0.000	0.149 +- 0.165	0.228 +- 0.255
0.000 +- 0.000	0.029 +- 0.044	0.042 +- 0.066
0.035 +- 0.002	0.581 +- 0.409	0.478 +- 0.373
0.013 +- 0.000	0.520 +- 0.481	0.525 +- 0.609
0.005 +- 0.000	0.382 +- 0.449	0.492 +- 0.761
0.140 +- 0.016	0.000 +- 0.000	0.323 +- 0.124

- Notice HLT reconstructed angles are WORSE than L1
 - Maybe the model trained over L1 objects is worse because it's better able to reconstruct the signals

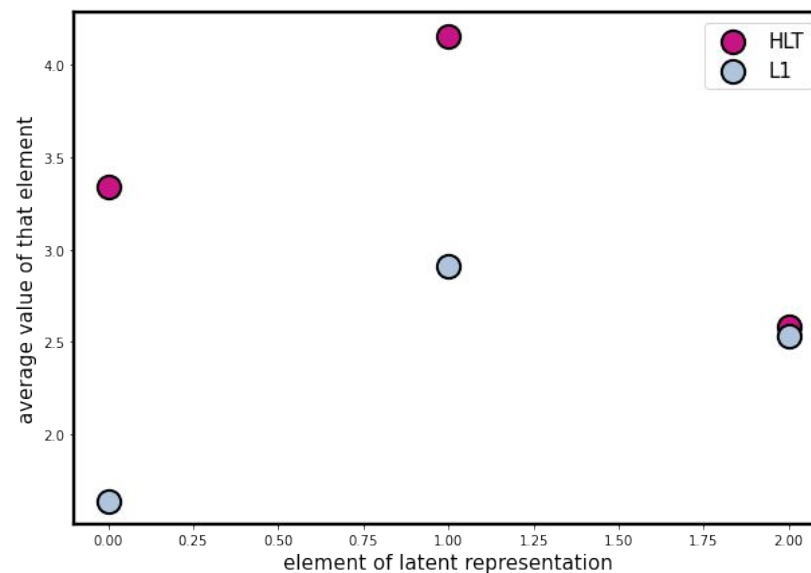
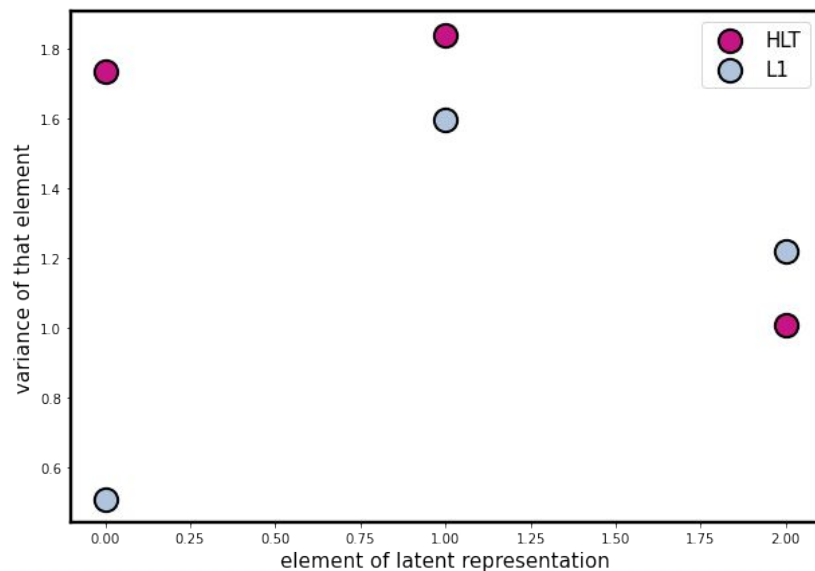
A closer look at the latent space



The latent representation is some vector $[v_1, v_2, v_3]$, these show the distributions of v_1 , v_2 , and v_3 for each dataset.

We can see that there is a wide range of values, meaning that the AE is not collapsing

A closer look at the latent space

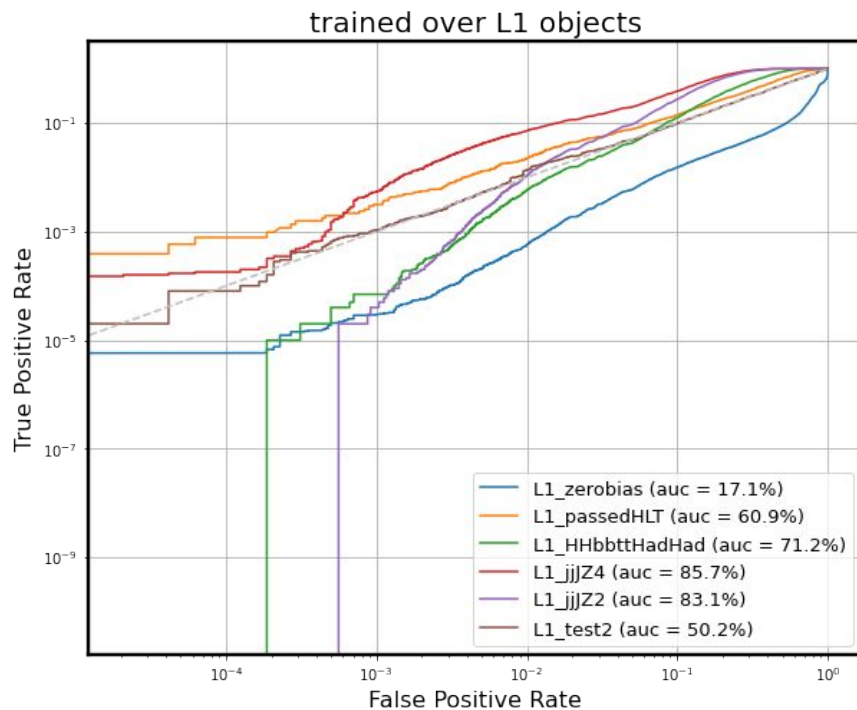
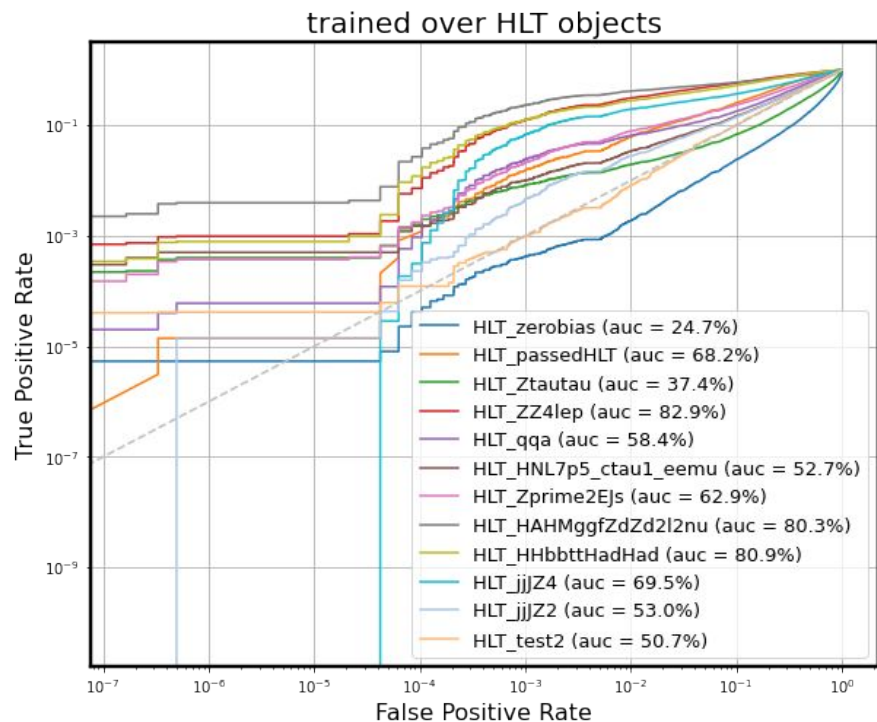


- Idea: use these variances (after normalizing) to calculate entropy

HLT entropy using variances = 1.0672444013750457

L1 entropy using variances = 1.0076613351061285

Training with $\sum pt = 100$



Training with $\sum pt = 100$

abs(HLT event - reconstruction)

1.042 +- 0.787	1.725 +- 1.398	1.569 +- 0.840
1.206 +- 1.137	1.644 +- 1.374	1.562 +- 0.847
1.054 +- 0.782	1.840 +- 1.604	1.553 +- 0.863
0.951 +- 0.775	1.844 +- 1.720	1.518 +- 0.880
0.754 +- 0.464	1.805 +- 1.749	1.489 +- 0.912
0.614 +- 0.348	1.655 +- 1.723	1.444 +- 0.941
0.543 +- 0.279	1.558 +- 1.723	1.397 +- 0.983
0.503 +- 0.245	1.406 +- 1.686	1.314 +- 1.017
0.500 +- 0.255	1.275 +- 1.606	1.226 +- 1.050
0.501 +- 0.277	1.162 +- 1.542	1.160 +- 1.080
0.005 +- 0.033	0.005 +- 0.008	0.007 +- 0.018
0.000 +- 0.000	0.001 +- 0.001	0.001 +- 0.003
0.000 +- 0.000	0.000 +- 0.000	0.000 +- 0.000
0.318 +- 0.837	0.205 +- 0.276	0.298 +- 0.555
0.021 +- 0.062	0.020 +- 0.030	0.027 +- 0.058
0.003 +- 0.010	0.003 +- 0.005	0.004 +- 0.010
0.625 +- 0.633	0.899 +- 0.570	1.276 +- 1.045
0.504 +- 0.474	0.814 +- 0.592	1.170 +- 1.078
0.792 +- 1.141	0.723 +- 0.574	1.037 +- 1.090
0.379 +- 1.207	0.000 +- 0.000	0.155 +- 0.156

abs(L1 event - reconstruction)

0.788 +- 1.078	1.110 +- 1.239	1.186 +- 1.070
0.723 +- 0.926	1.068 +- 1.479	1.047 +- 1.090
0.859 +- 1.662	1.020 +- 1.776	0.845 +- 1.075
0.561 +- 0.972	0.902 +- 1.940	0.638 +- 0.983
0.341 +- 0.564	0.738 +- 1.856	0.491 +- 0.839
0.212 +- 0.311	0.607 +- 1.649	0.370 +- 0.699
0.138 +- 0.180	0.468 +- 1.442	0.291 +- 0.579
0.094 +- 0.113	0.388 +- 1.253	0.224 +- 0.469
0.070 +- 0.074	0.312 +- 1.085	0.179 +- 0.394
0.052 +- 0.057	0.253 +- 0.930	0.138 +- 0.329
1.392 +- 2.379	0.855 +- 0.582	1.258 +- 1.052
0.779 +- 1.073	0.686 +- 0.583	0.981 +- 1.092
0.420 +- 0.418	0.541 +- 0.557	0.805 +- 1.047
0.072 +- 0.031	0.633 +- 0.613	0.838 +- 0.954
0.007 +- 0.001	0.196 +- 0.234	0.271 +- 0.343
0.001 +- 0.000	0.038 +- 0.064	0.053 +- 0.087
1.181 +- 2.147	0.783 +- 0.614	1.113 +- 1.090
0.794 +- 1.375	0.596 +- 0.571	0.864 +- 1.076
0.416 +- 0.581	0.422 +- 0.514	0.613 +- 0.988
0.821 +- 0.890	0.000 +- 0.000	0.323 +- 0.124