

EFT Update

2018-10-11

New Stuff

Updated PLR in Several Ways:

- Reverted back to using classes instead of loads of confusing vectors (breaks root5 compatibility)
- Correctly take into account effect of cutting down our S1 and S2 range to a restricted ROI (different for each operator-nucleon-mass-timeBin-zSlice)
- Implemented a toggle that automatically uses the kr85 background if the recoil spectrum includes energy above a set threshold, and doesn't include this background (allowing larger exposure time) otherwise

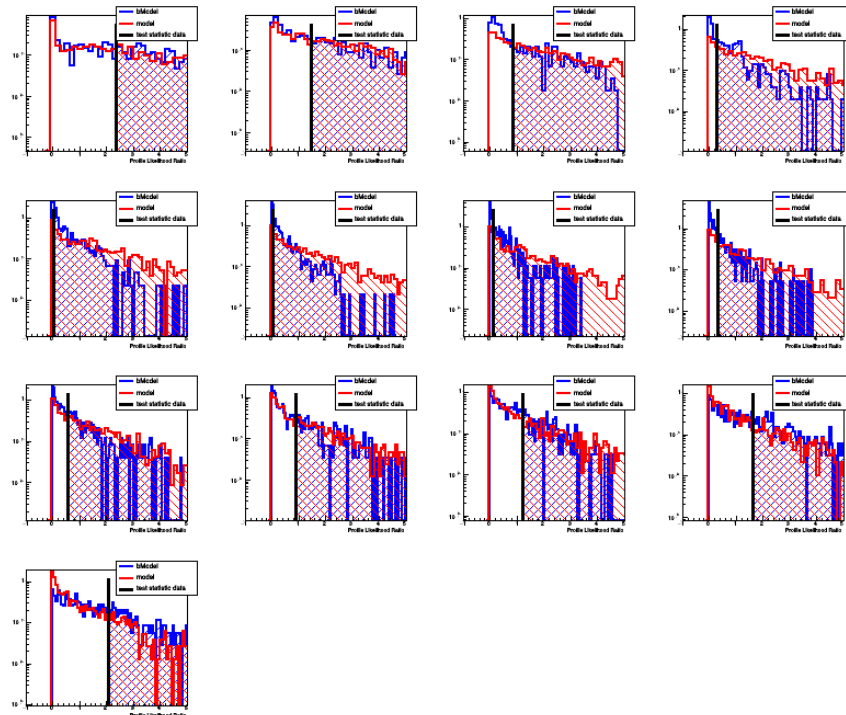
Updated PLR to test only specific POI values

- Then created a script to combine the results into one.

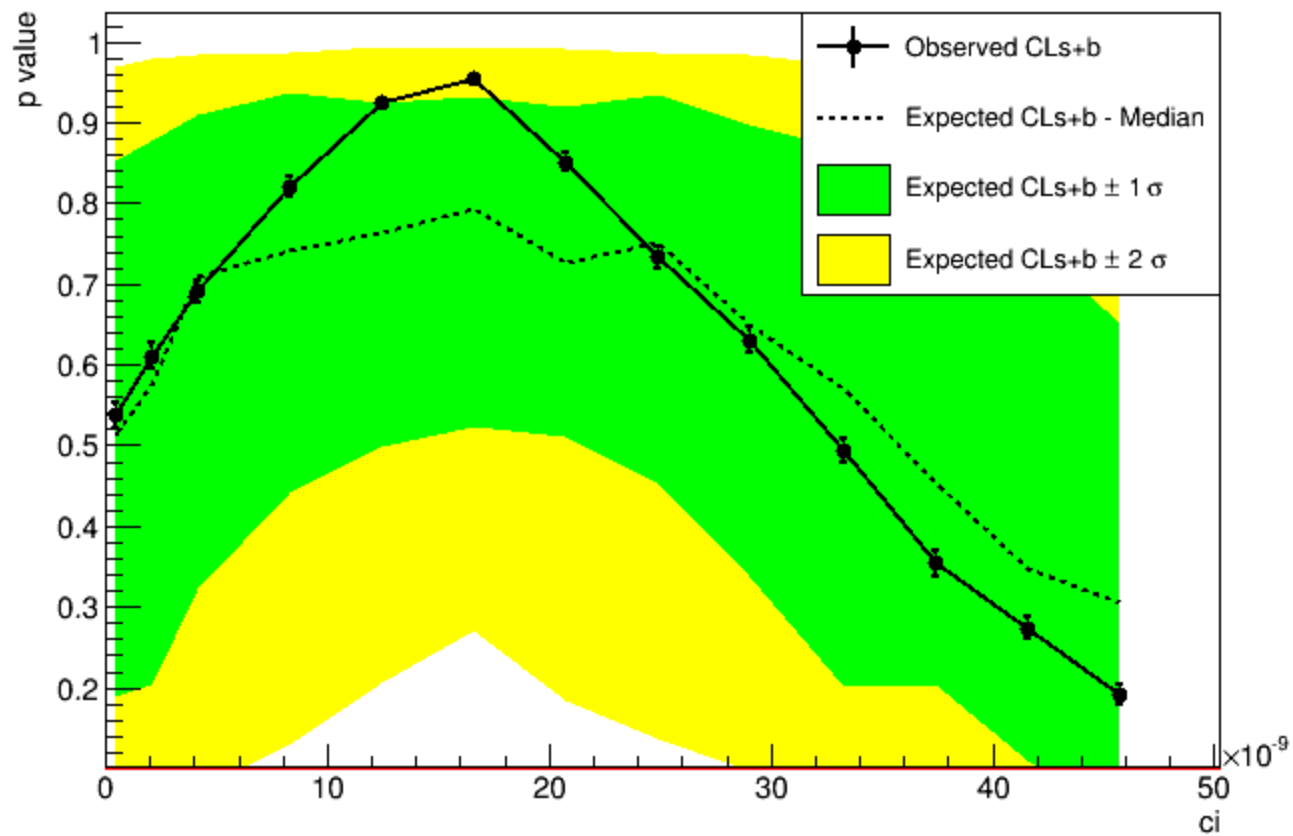
– This gets around the previously mentioned

“too many datasets to track” problem

– Allows more parallelization



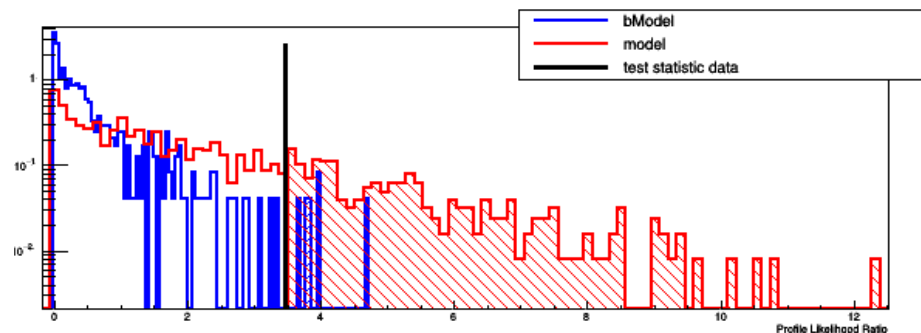
HypoTestInverter Result For ci



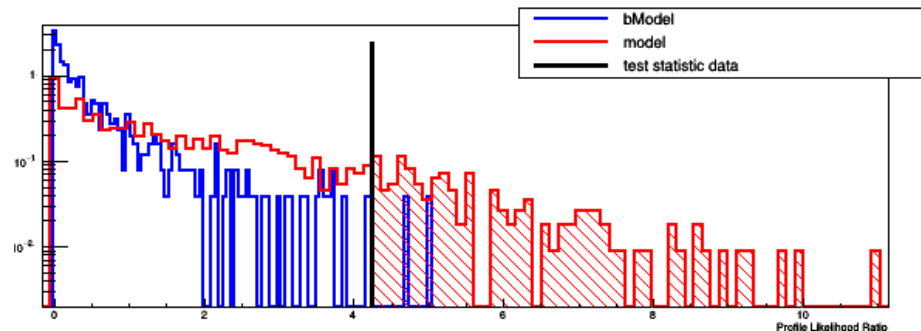
Updated PLR to use background as data

- For the purpose of testing different cuts, etc on our sensitivity, draws a “data” set directly from the background model
- Tried to use, but problem....

6 signal
events
expected



7 signal
events
expected



Another problem...

- PLR maximization to..... data? Always the same background numbers no matter what data I feed in...

Data:
background
model

```

----- VARIABLE IS AT ITS LOWER ALLOWED LIMIT.
MIGRAD MINIMIZATION HAS CONVERGED.
FCN=1262.03 FROM MIGRAD STATUS=CONVERGED 180 CALLS 181 TOTAL
EDM=4.26491e-05 STRATEGY= 0 NO ERROR MATRIX
EXT PARAMETER CURRENT GUESS STEP FIRST
NO. NAME VALUE ERROR SIZE DERIVATIVE
1 ci 6.69500e-15 3.11574e-09 1.93976e-02** at limit **
2 nExpBkg_Accidental 8.81452e-02 8.72627e-02 1.35884e-04 1.21466e-03
3 nExpBkg_Ar37 7.90959e+00 7.82446e+00 -2.78031e-03 5.53305e-02
4 nExpBkg_ComptonBottom 8.29229e+00 8.20437e+00 -2.46293e-03 4.37056e-02
5 nExpBkg_ComptonRest 1.11312e+02 1.10148e+02 -2.15489e-03 3.35140e-02
6 nExpBkg_RnKr 3.83458e+01 3.79494e+01 -1.85563e-03 2.47052e-02
7 nExpBkg_Wall 1.36323e+01 2.00000e+00 3.03503e-03 8.20180e-04
ERR DEF= 0.5
StandardHypoTestInvDemo - Best Fit value : ci = 6.695e-15 +/- 3.11574e-09
Time for fitting : Real time 0:00:00, CP time 0.210
    
```

Data:
background
model x 100

```

MIGRAD MINIMIZATION HAS CONVERGED.
FCN=106935 FROM MIGRAD STATUS=CONVERGED 173 CALLS 174 TOTAL
EDM=4.44989e-05 STRATEGY= 0 NO ERROR MATRIX
EXT PARAMETER CURRENT GUESS STEP FIRST
NO. NAME VALUE ERROR SIZE DERIVATIVE
1 ci 8.30865e-08 3.11574e-09 -3.82123e-02** at limit **
2 nExpBkg_Accidental 8.80958e-02 8.72627e-02 -1.19052e-03 -2.90511e-03
3 nExpBkg_Ar37 7.89914e+00 7.82446e+00 -1.24280e-03 -3.14154e-03
4 nExpBkg_ComptonBottom 8.28267e+00 8.20437e+00 -1.24433e-03 -3.14860e-03
5 nExpBkg_ComptonRest 1.11199e+02 1.10148e+02 -1.24584e-03 -3.15552e-03
6 nExpBkg_RnKr 3.83116e+01 3.79494e+01 -1.00648e-03 -2.92321e-03
7 nExpBkg_Wall 1.36040e+01 2.00000e+00 -4.27708e-02 -5.10538e-03
ERR DEF= 0.5
StandardHypoTestInvDemo - Best Fit value : ci = 8.30865e-08 +/- 3.11574e-09
    
```

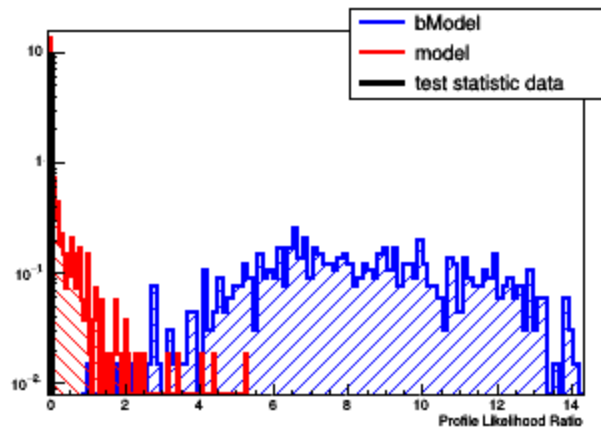
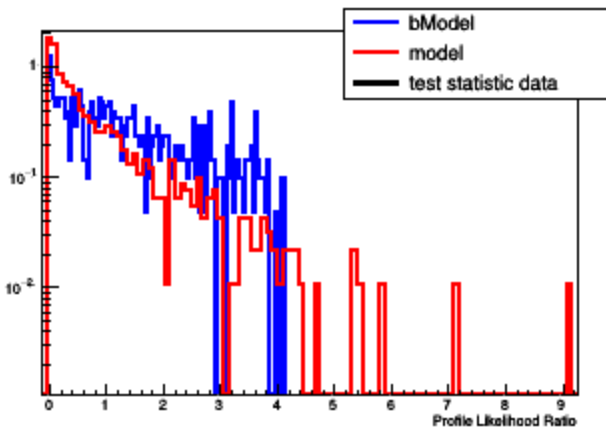
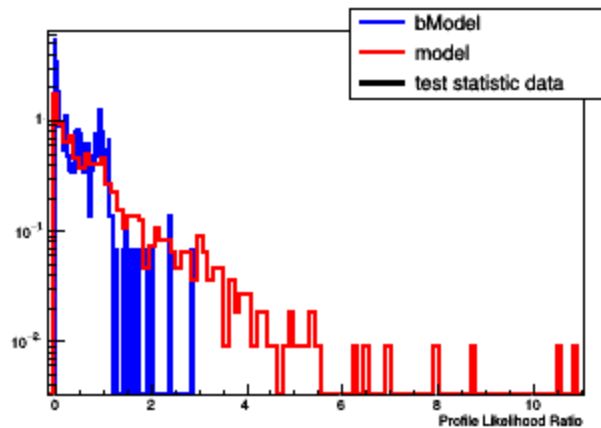
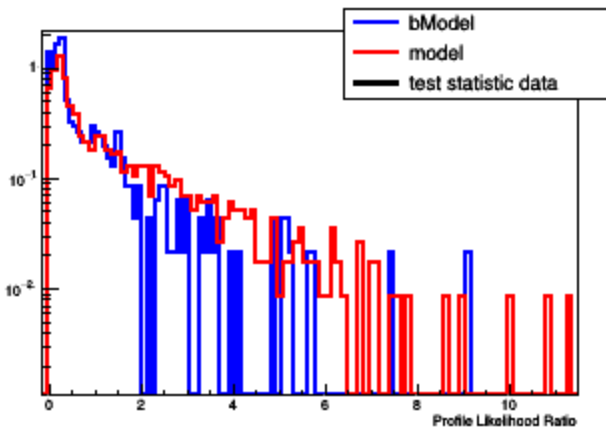
Try Operator 1 Isoscalar

Result!

Red is null hypothesis (WIMP exists with given POI)

Blue is alternative hypothesis (WIMPs do not exist)

Black is the test statistic obtained from our run.

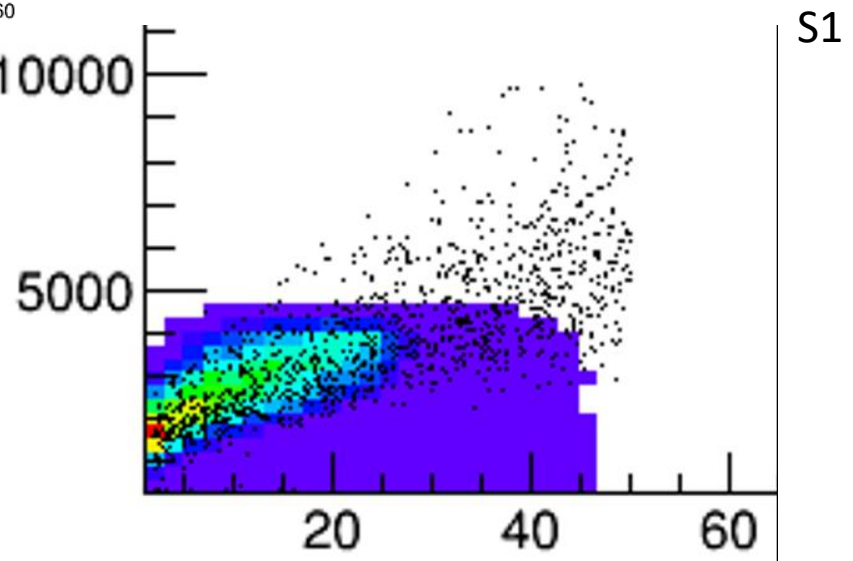
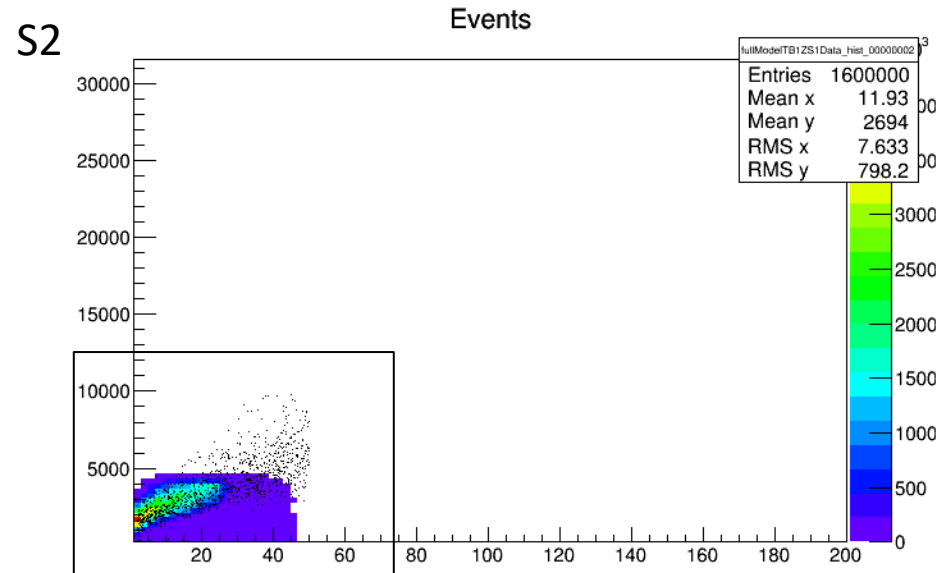
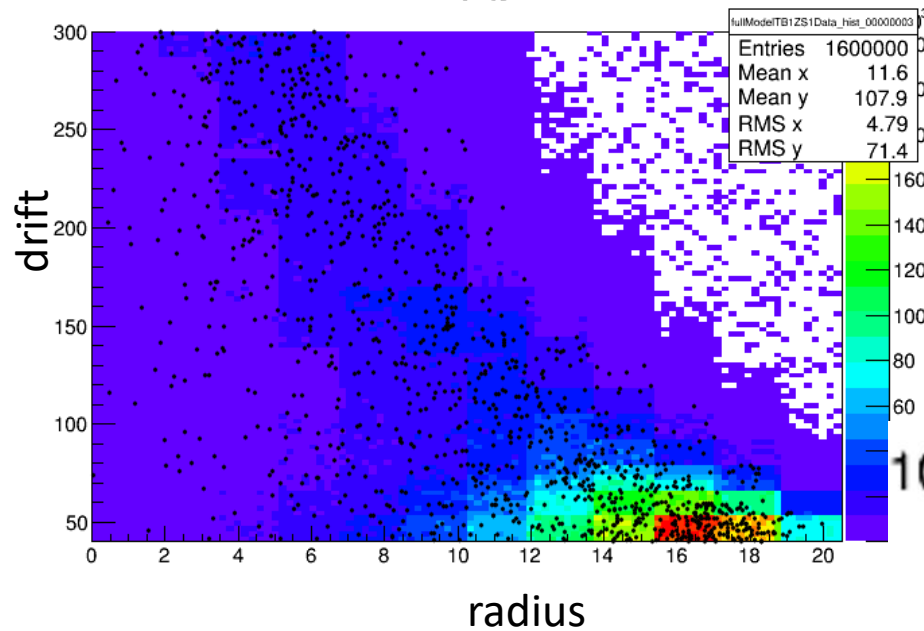


Something's wrong...

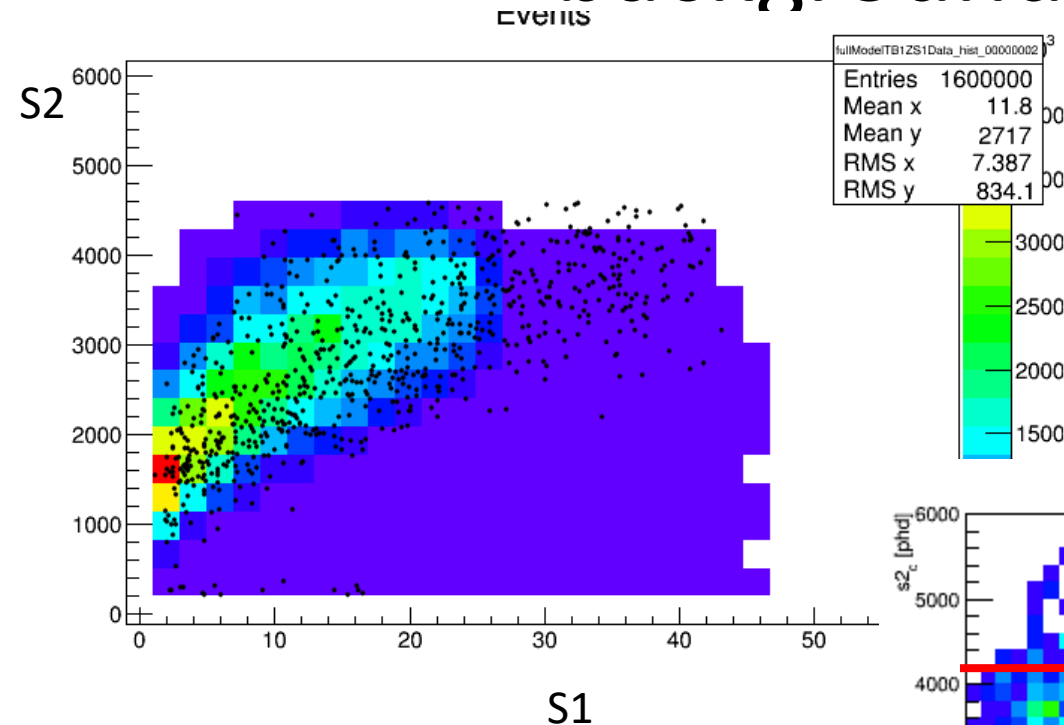
Data-model
likelihood always 0!

Model vs Data

Histogram is model,
Black points are data



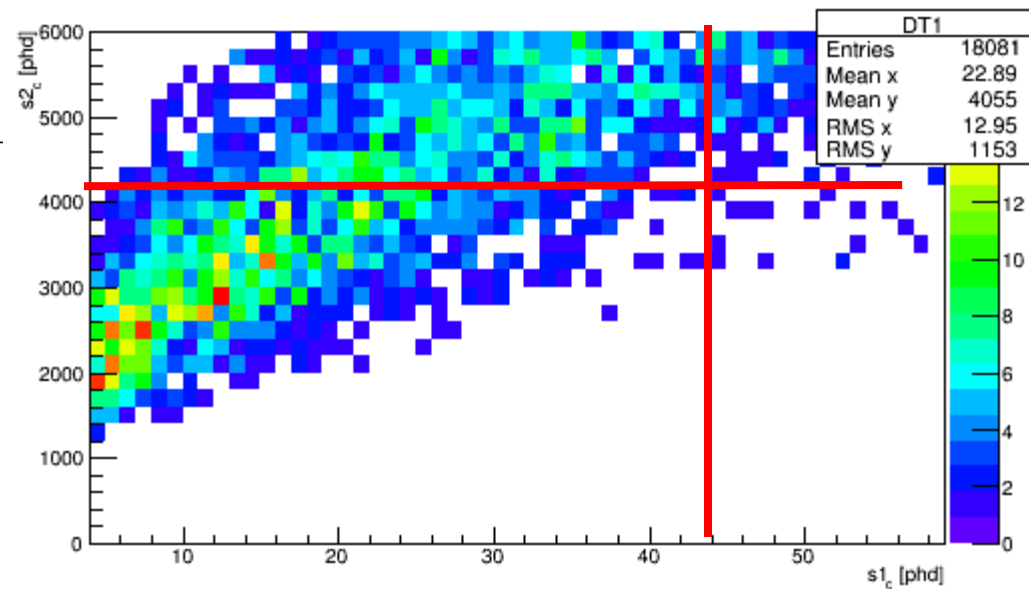
Cut data to same thresholds as background model



Stand-in dummy wall model
is included, not real wall
model

S2

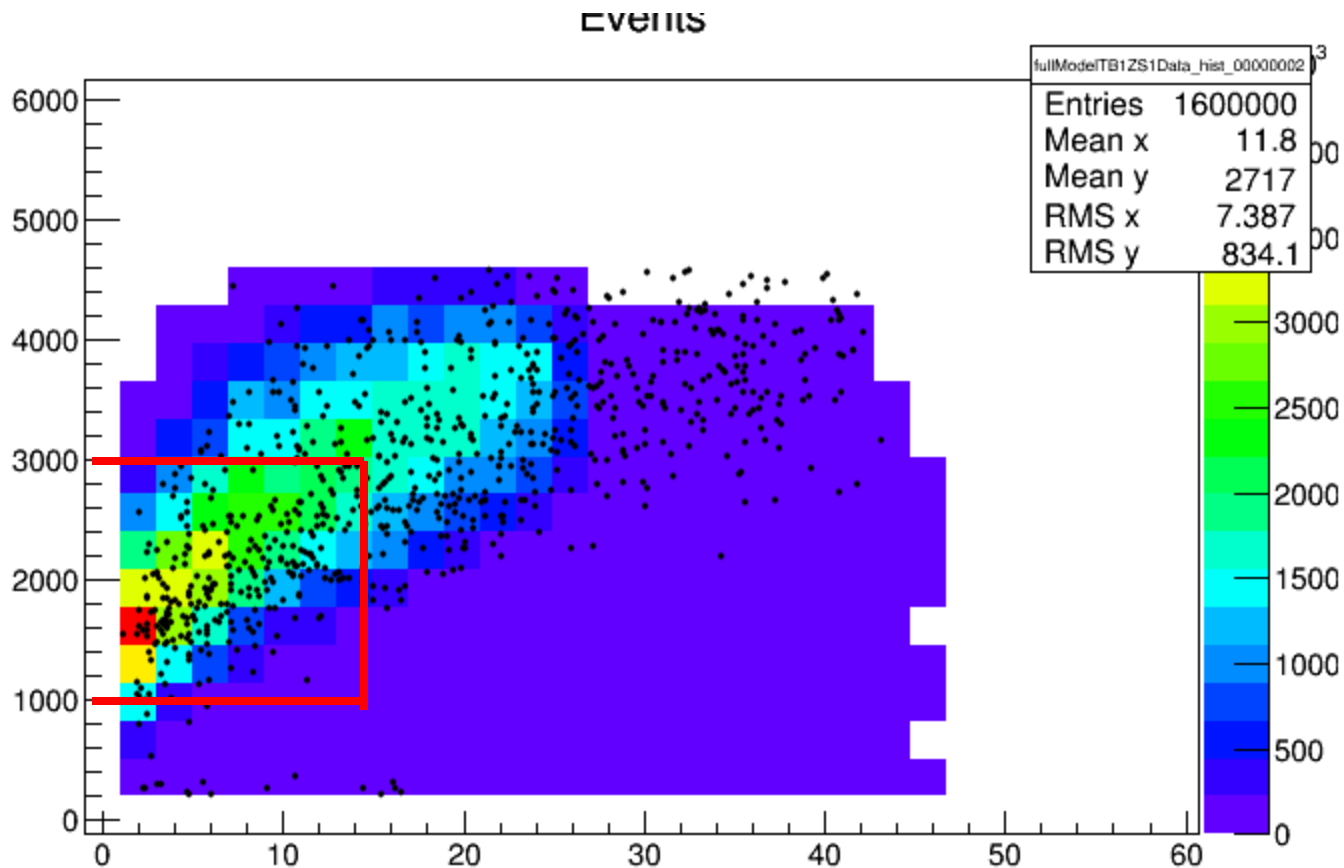
Most dominant component



S1

11

Cut data to only a small region compatible with the model



Non-zero likelihoods!

