

# PBH Update

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MSU Group Meeting

6/6/2019

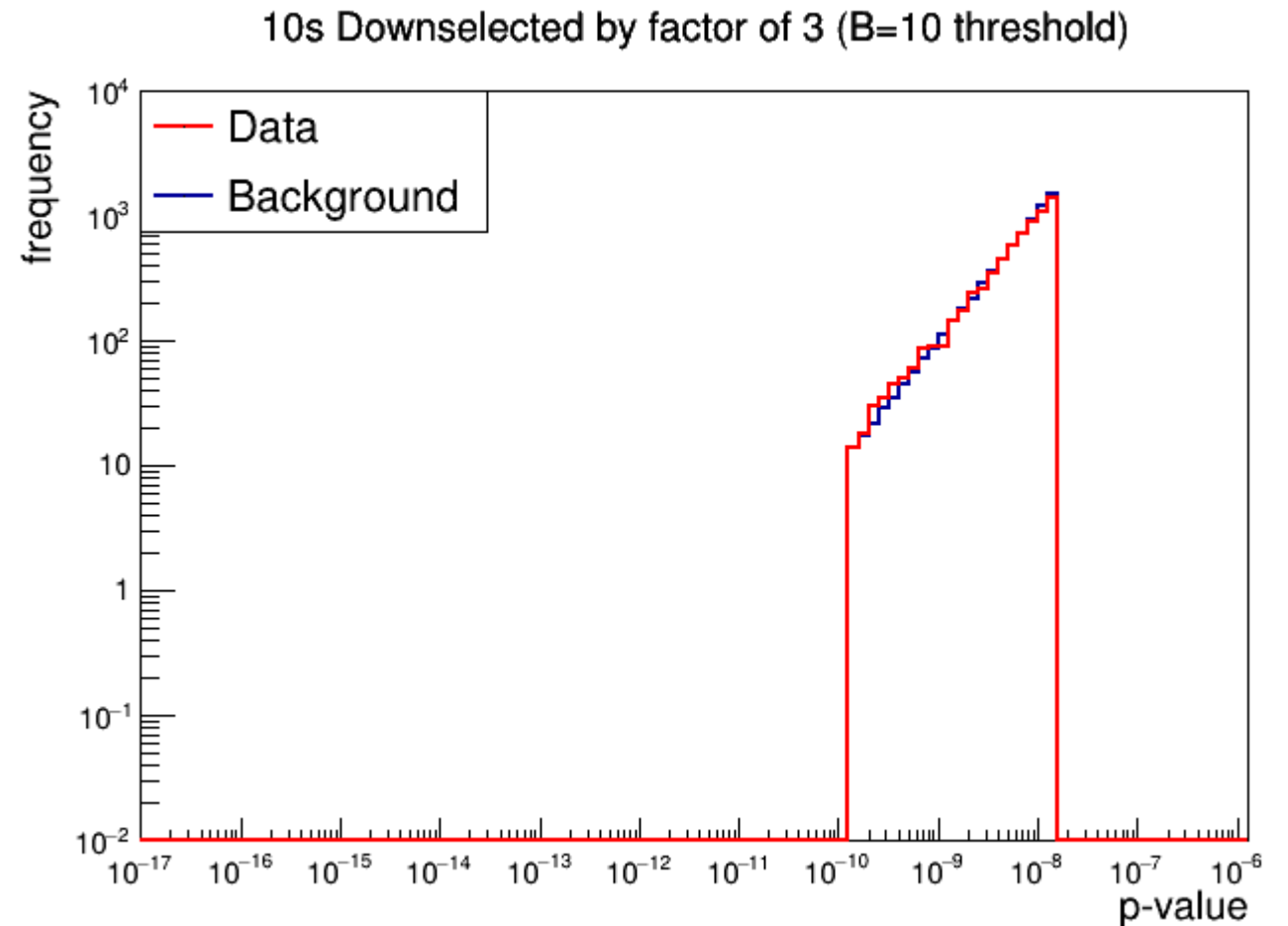
# Determining how much downselecting to use

- Use KS test to determine how well the bkg/data distributions match above the  $\text{bkg}=10$  and  $\text{bkg}=25$  thresholds
- Try downselecting factors of 3 – 7
  - Below 3 the slopes look different by eye
  - Above 7 there is not enough statistics
- In progress

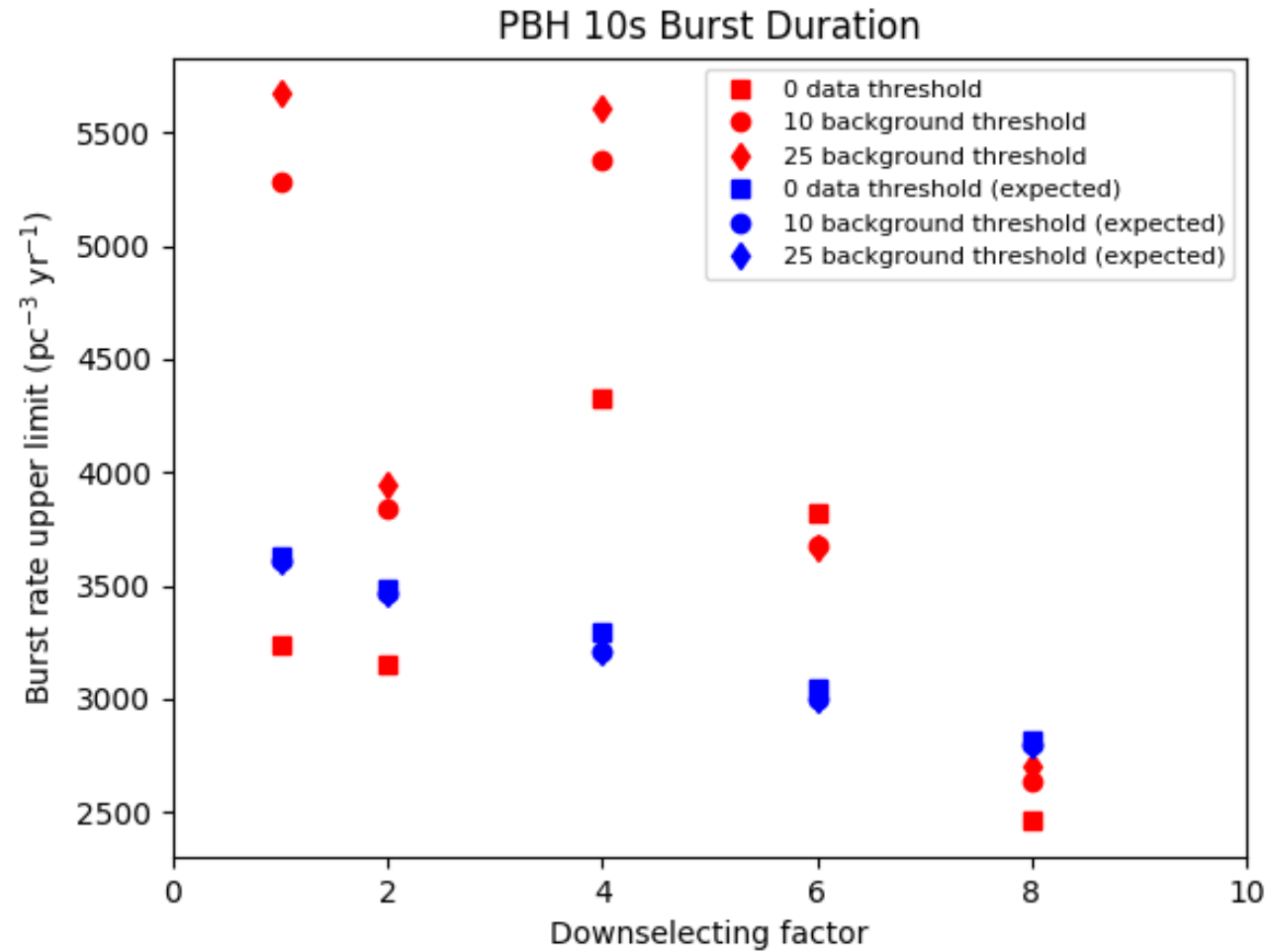
# Example:

## 10s Downselected by 3 with B=10 threshold

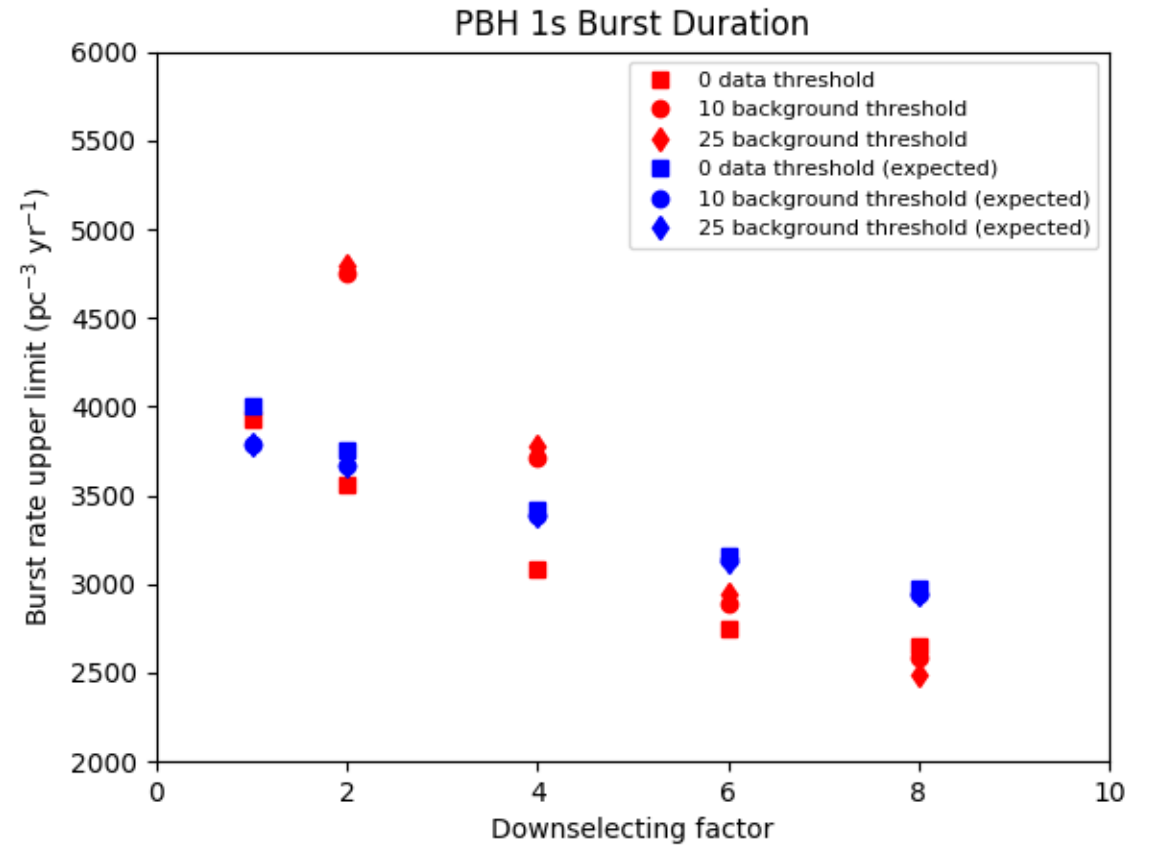
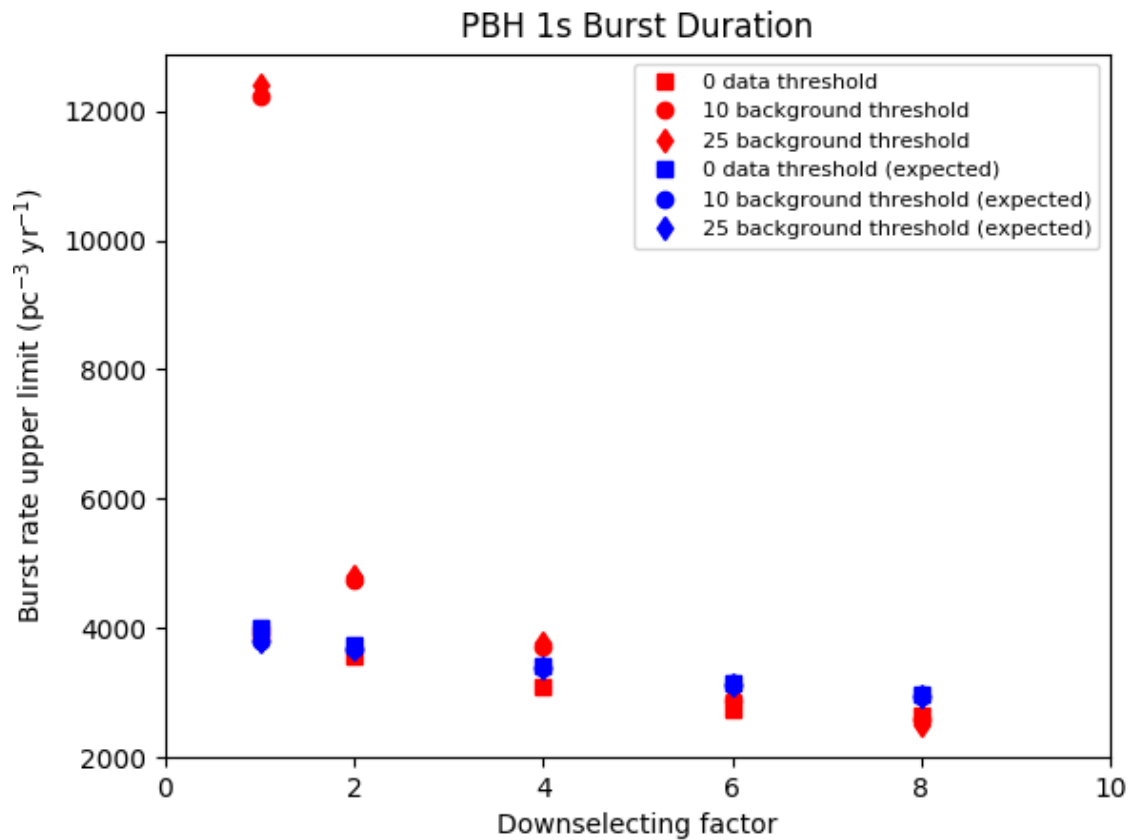
- 6772 events in H\_data
- 6979 events in H\_bkg
- Scipy KS
  - statistic=0.09524
  - pvalue=0.99994
- ROOT KS
  - Max Dist = 0.09524
  - Kolmogorov Probability = 0.99998



# 10s actual and expected limits



# 1s actual and expected limits



Same plot as on the left but zoomed in

# Next Steps

- Finish up downselecting studies
- ICRC proceedings
- Start on HAWC/IceCube project
- Move to IceCube office

Backup

# 10s actual and expected limits

10s	Previous results	Without downselecting	Downselect x2	Downselect x4	Downselect x6	Downselect x8
Data = 0	3242	3242	3150	4332	2817	2459
Bkg = 10	5762	5287	3836	5375	3677	2633
Bkg = 25	6351	5672	3941	5605	3670	2703

10s Expected	Previous results	Without downselecting	Downselect x2	Downselect x4	Downselect x6	Downselect x8
Data = 0	-	3626	3489	3296	3043	2817
Bkg = 10	-	3610	3469	3205	2996	2798
Bkg = 25	-	3610	3469	3204	2996	2798



# 1s actual and expected limits

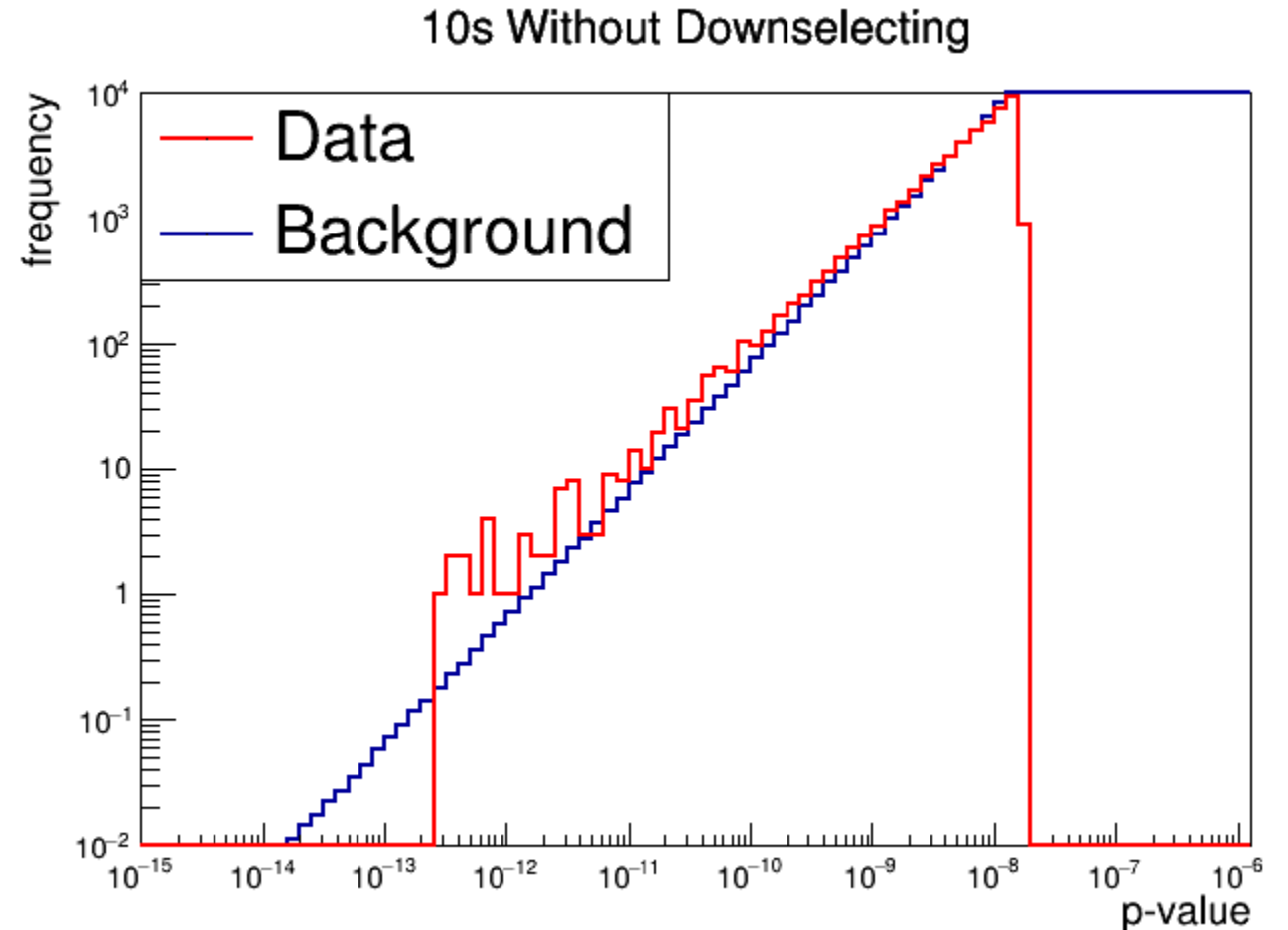
1s	Previous results	Without downselecting	Downselect x2	Downselect x4	Downselect x6	Downselect x8
Data = 0	3928	3929	3562	3088	2750	2651
Bkg = 10	12407	12232	4752	3710	2891	2590
Bkg = 25	12661	12391	4796	3780	2943	2493

1s Expected	Previous results	Without downselecting	Downselect x2	Downselect x4	Downselect x6	Downselect x8
Data = 0	-	4007	3755	3417	3155	2975
Bkg = 10	-	3793	3670	3383	3134	2940
Bkg = 25	-	3793	3670	3383	3133	2940

10s plots

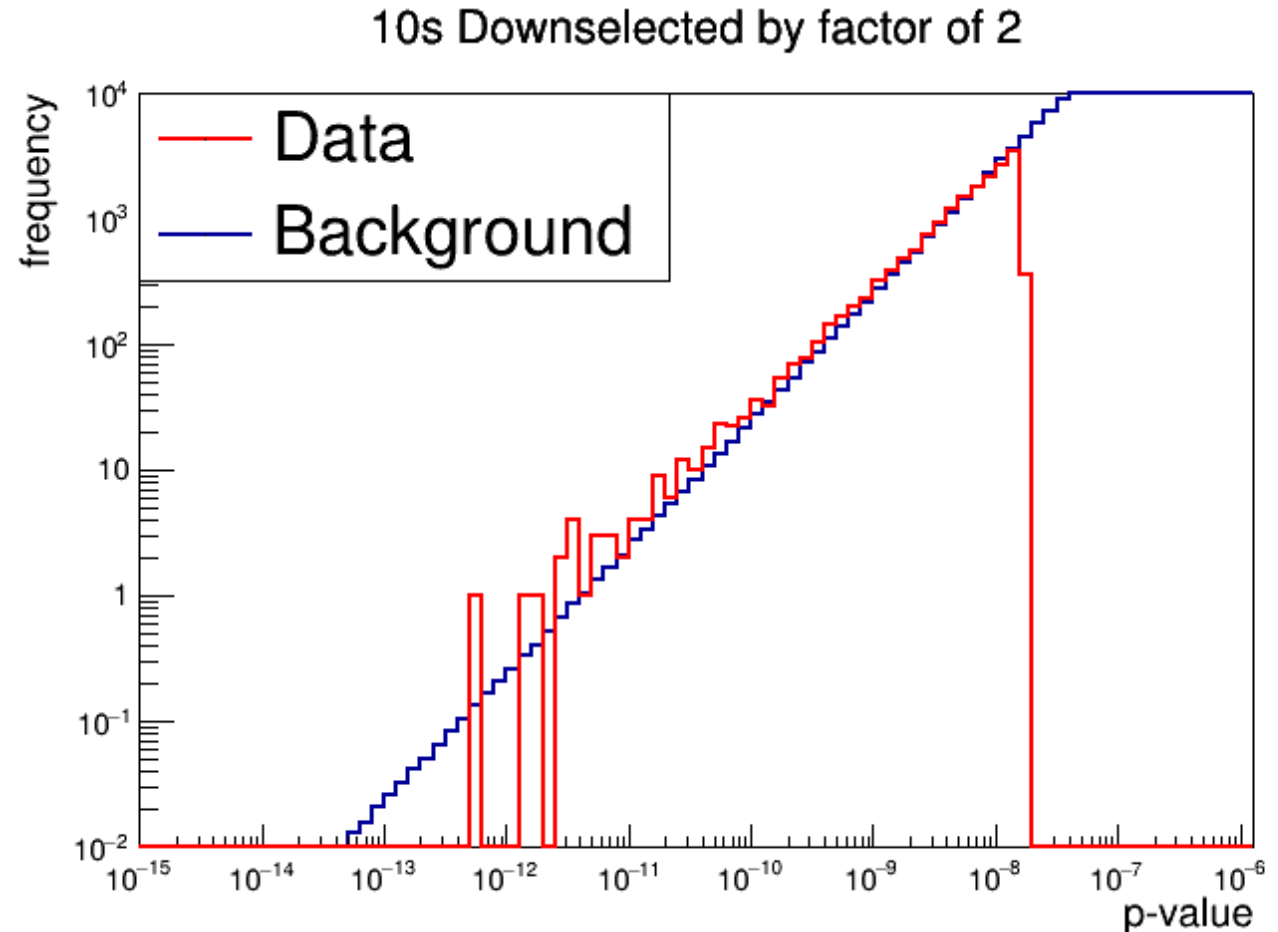
# No downselecting

- Advance spatial bins by  $.11^\circ$  and time bins by 1s
- 48745 events in the H\_data histogram



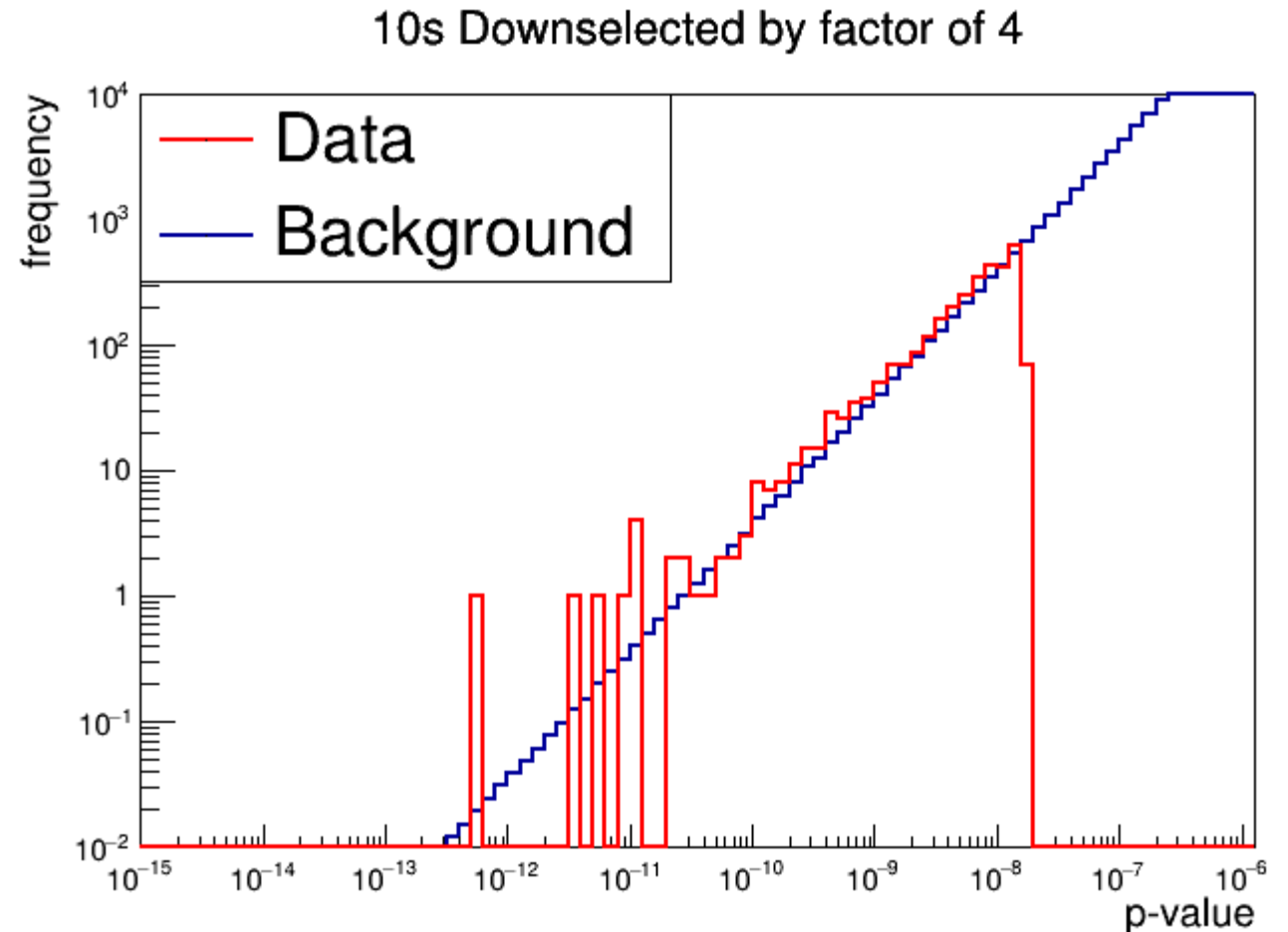
# Downselecting by factor of 2

- Advance spatial bins by  $.22^\circ$  (instead of  $.11^\circ$ ) and time bins by 2s (instead of 1s)
- 17766 events in the H\_data histogram



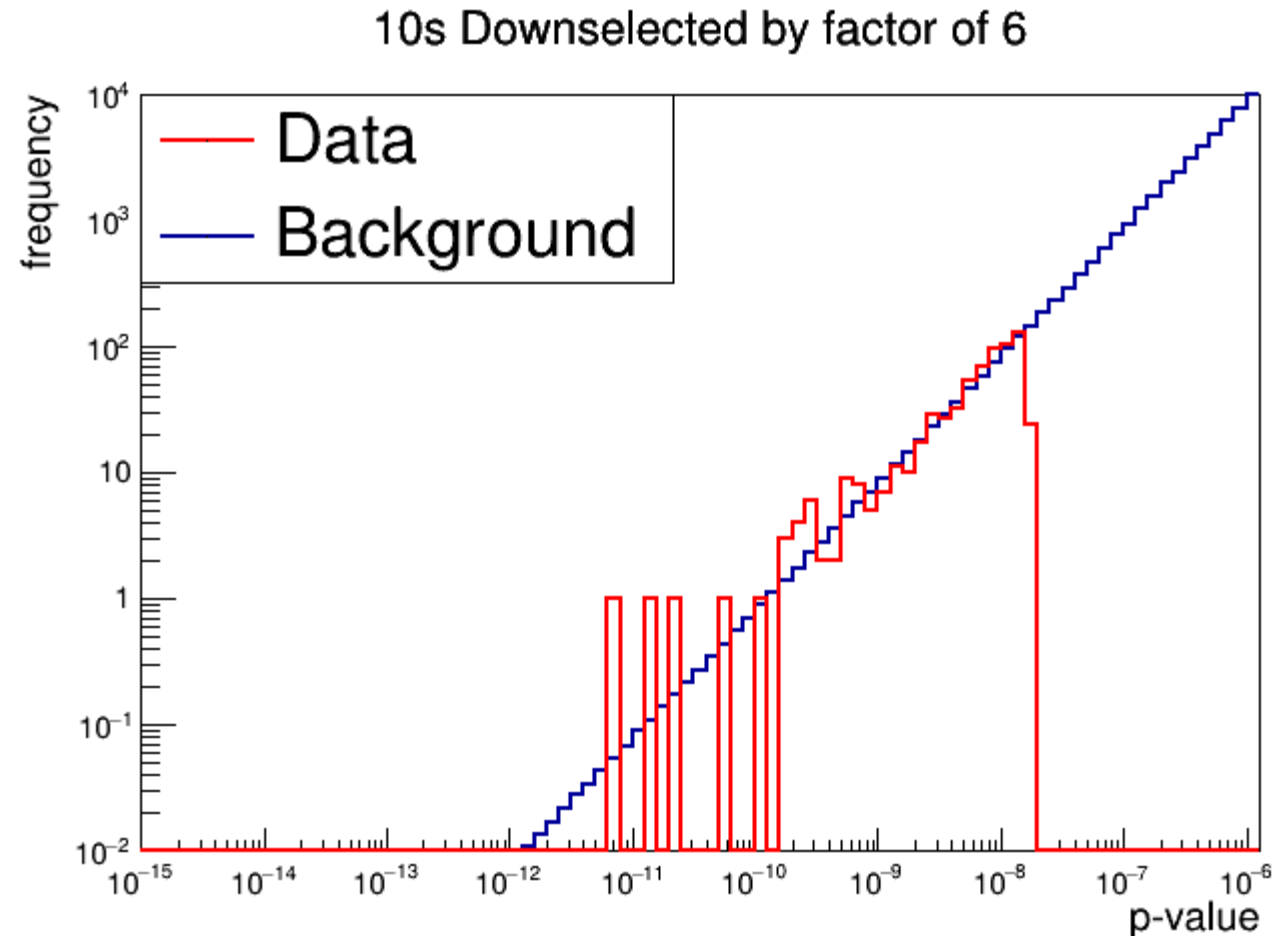
# Downselecting by factor of 4

- Advance spatial bins by  $.44^\circ$  (instead of  $.11^\circ$ ) and time bins by 4s (instead of 1s)
- 3084 events in the H\_data histogram



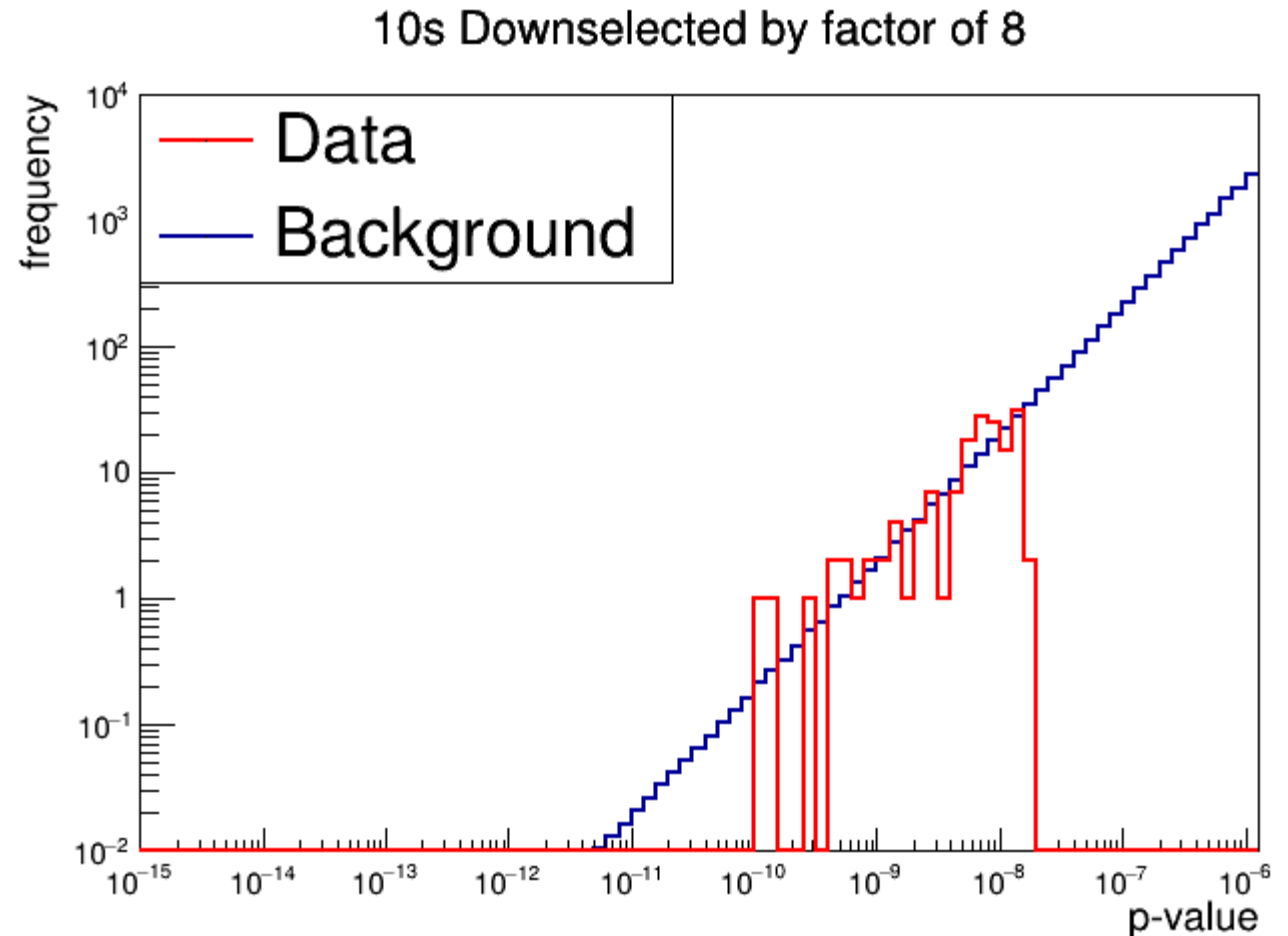
# Downselecting by factor of 6

- Advance spatial bins by  $.66^\circ$  (instead of  $.11^\circ$ ) and time bins by 6s (instead of 1s)
- 649 events in the H\_data histogram



# Downselecting by factor of 8

- Advance spatial bins by  $.88^\circ$  (instead of  $.11^\circ$ ) and time bins by 8s (instead of 1s)
- 155 events in the H\_data histogram

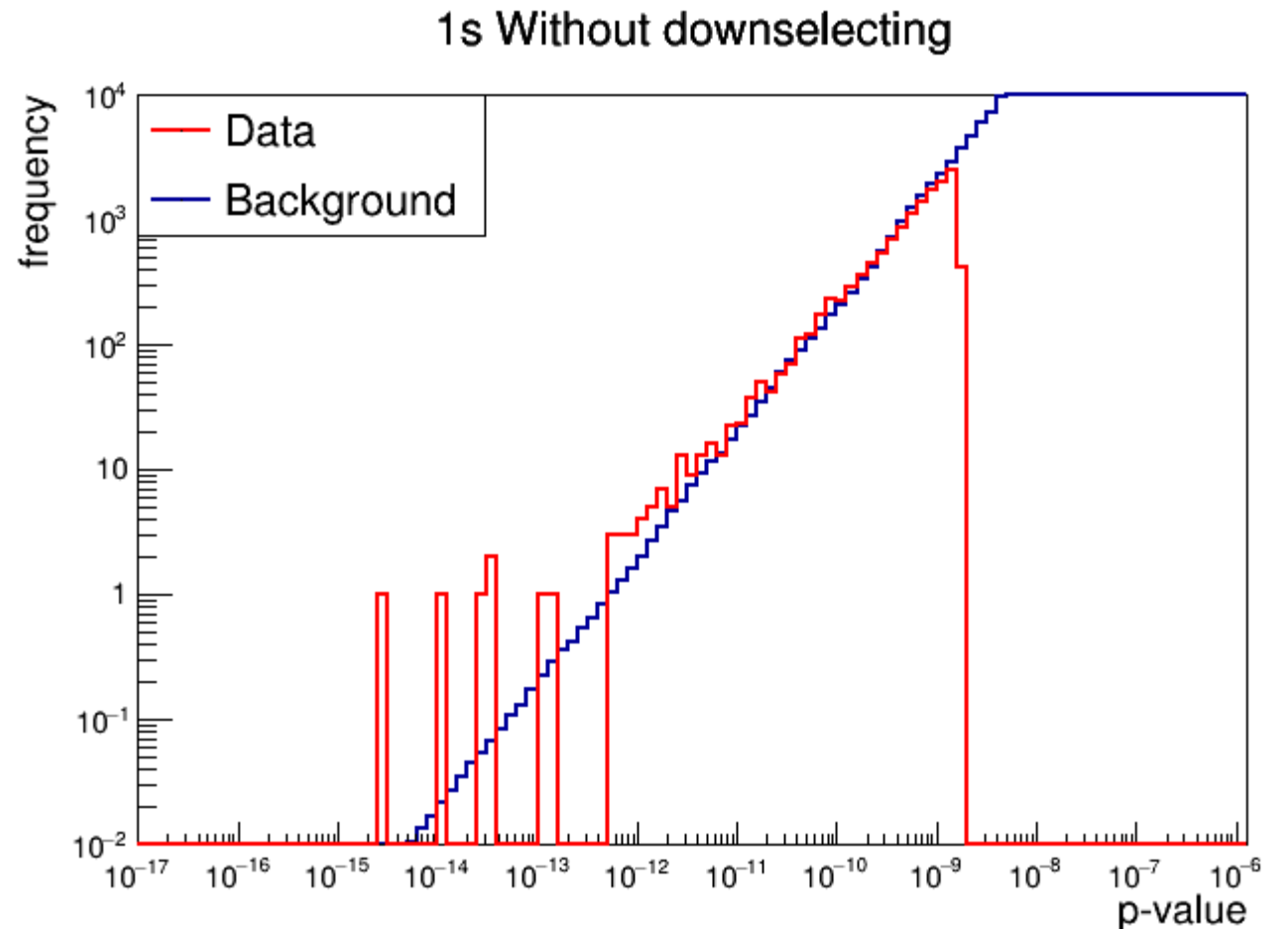


1s plots



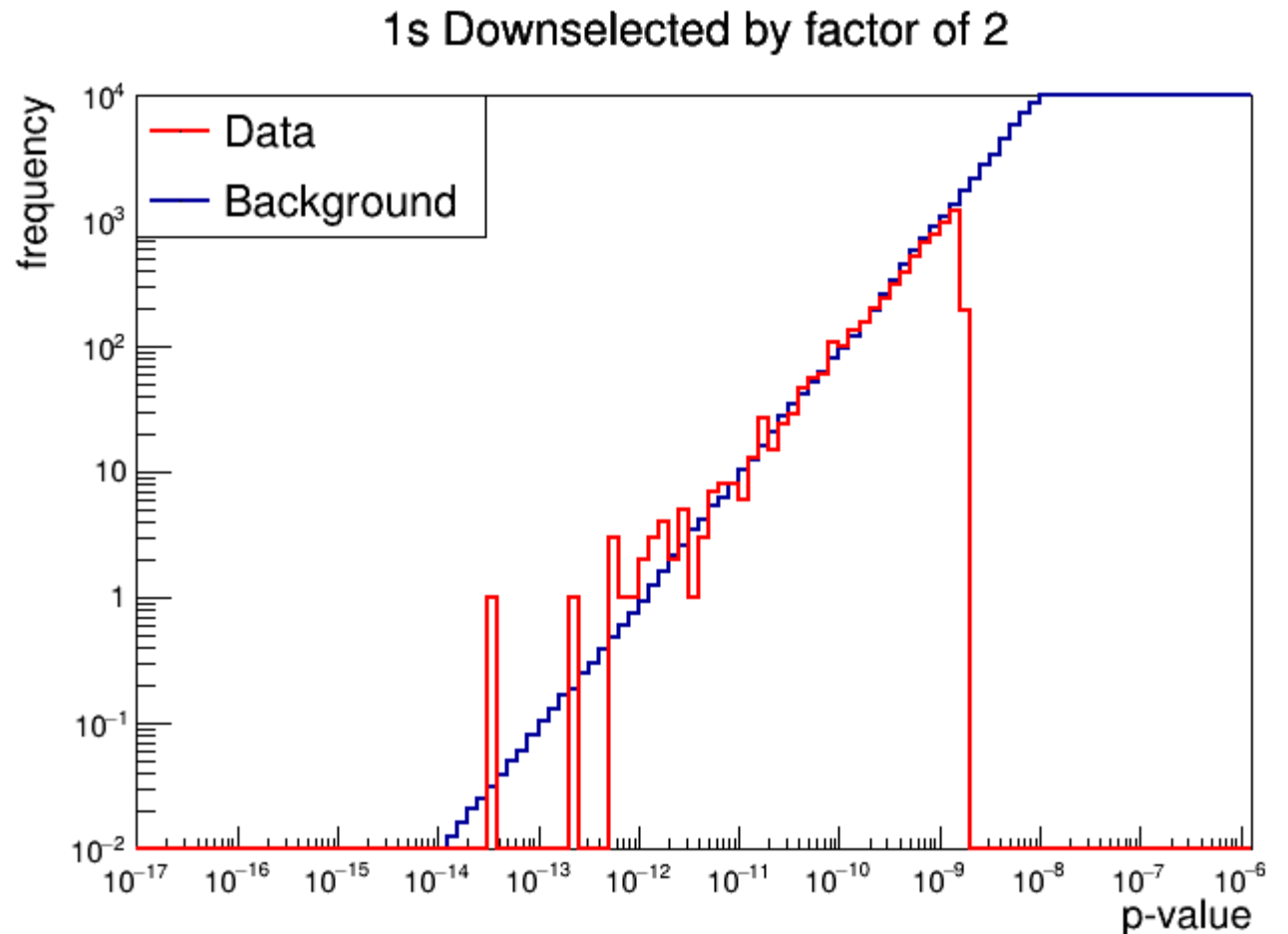
# No downselecting

- Advance spatial bins by  $.11^\circ$  and time bins by 0.1s
- 13590 events in the H\_data histogram



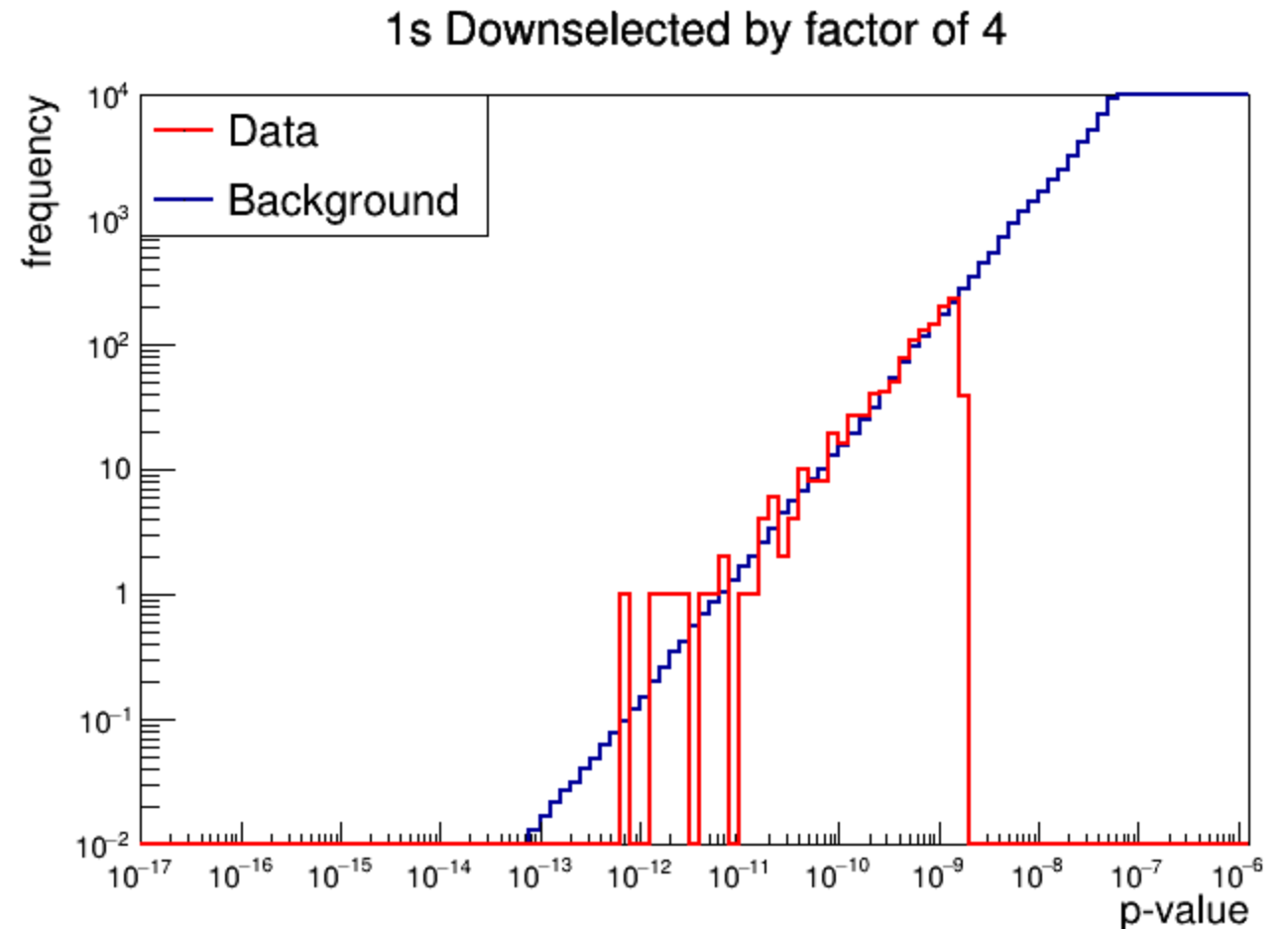
# Downselecting by factor of 2

- Advance spatial bins by  $.22^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.2s (instead of 0.1s)
- 6256 events in the H\_data histogram



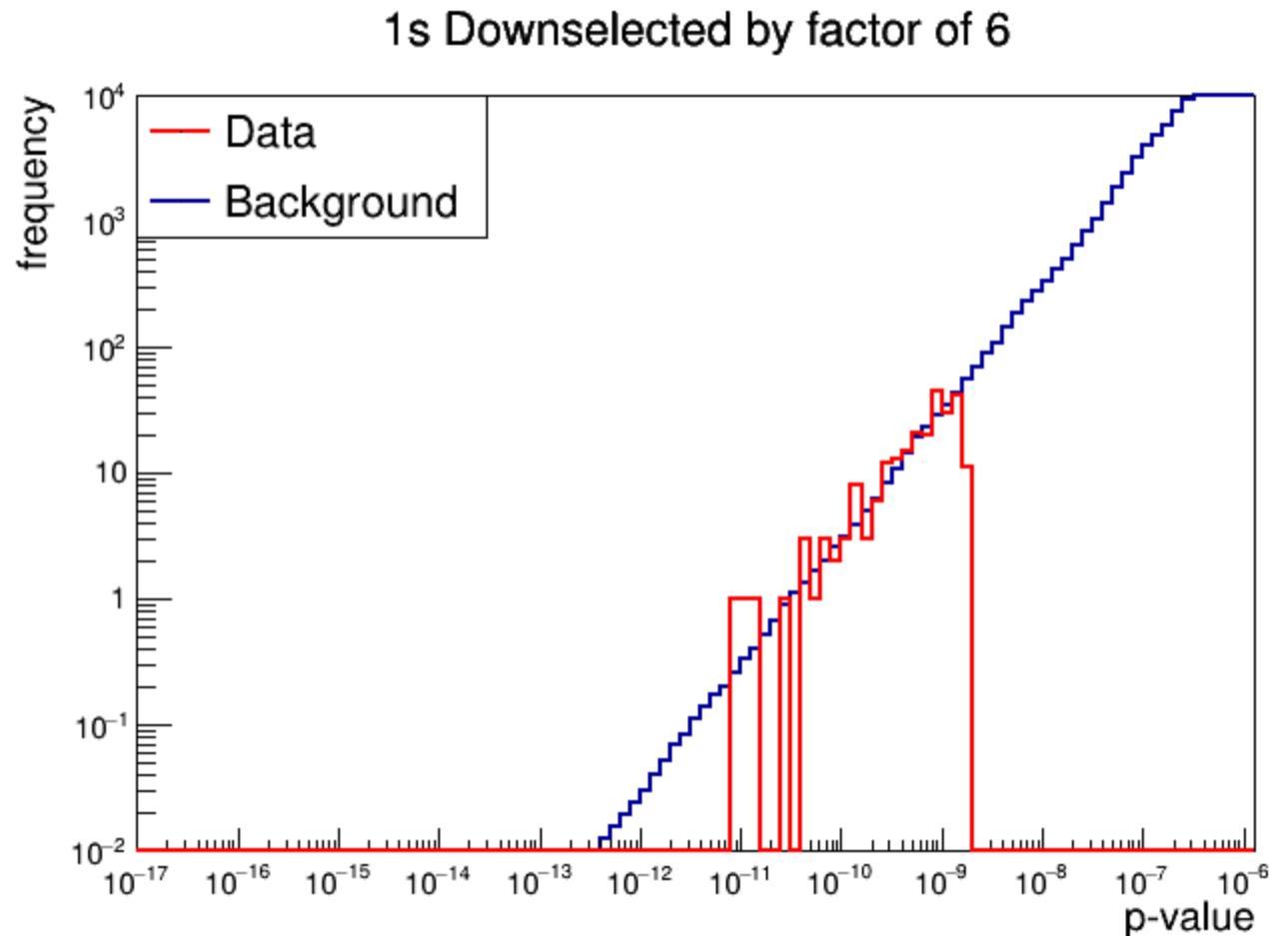
# Downselecting by factor of 4

- Advance spatial bins by  $.44^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.4s (instead of 0.1s)
- 1195 events in the H\_data histogram



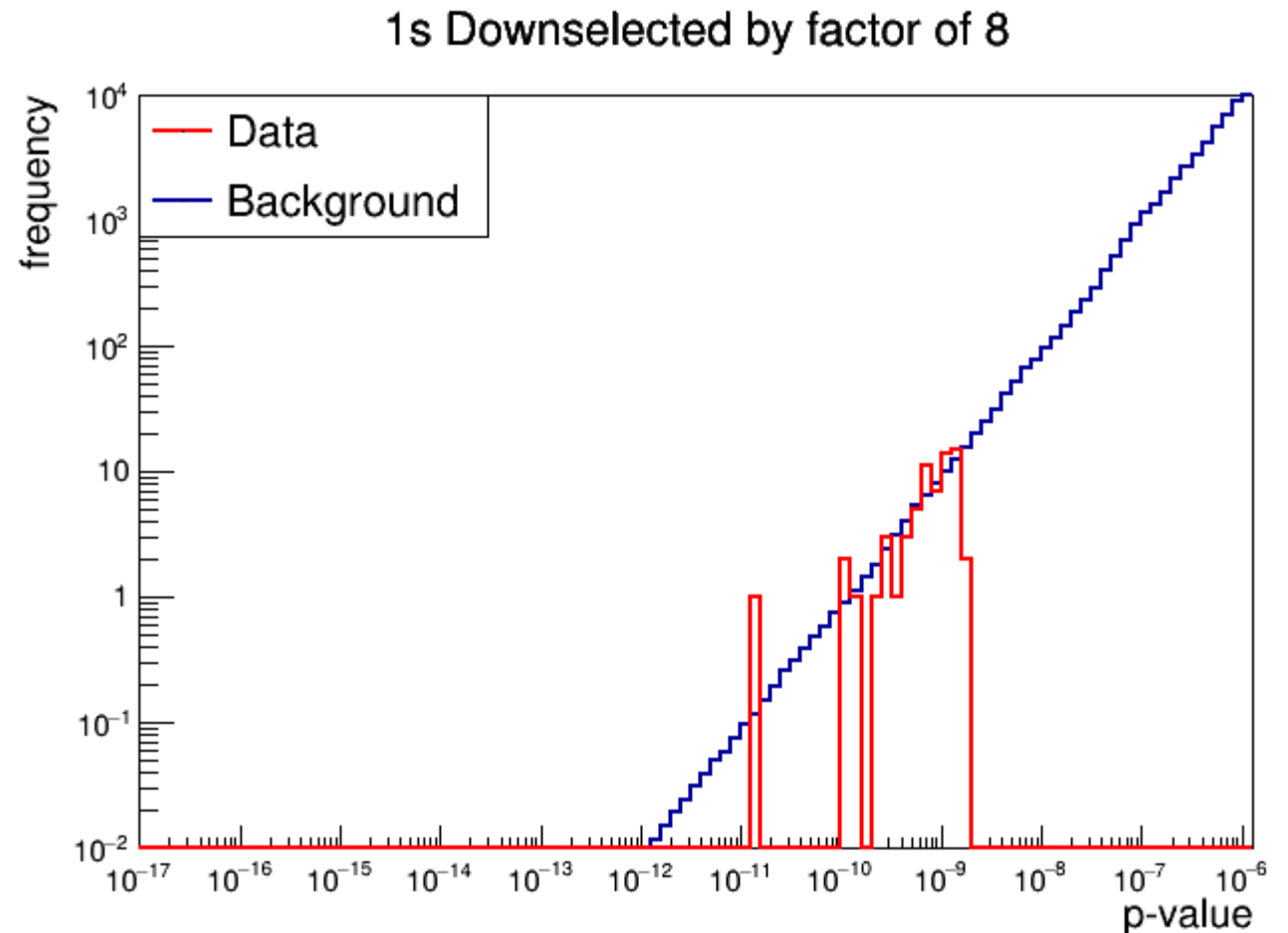
# Downselecting by factor of 6

- Advance spatial bins by  $.66^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.6s (instead of 0.1s)
- 241 events in the H\_data histogram



# Downselecting by factor of 8

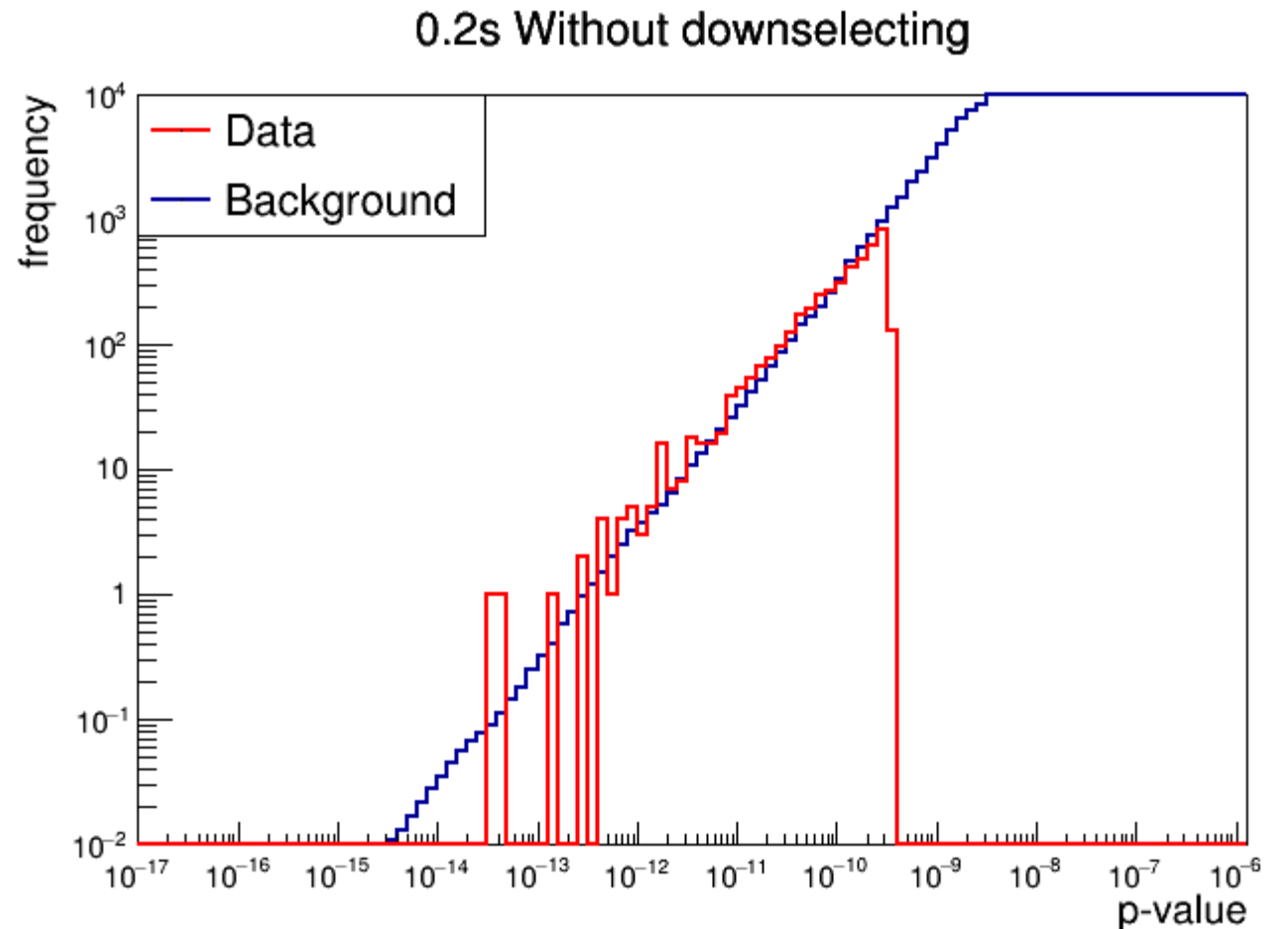
- Advance spatial bins by  $.88^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.8s (instead of 0.1s)
- 66 events in the H\_data histogram



0.2s plots

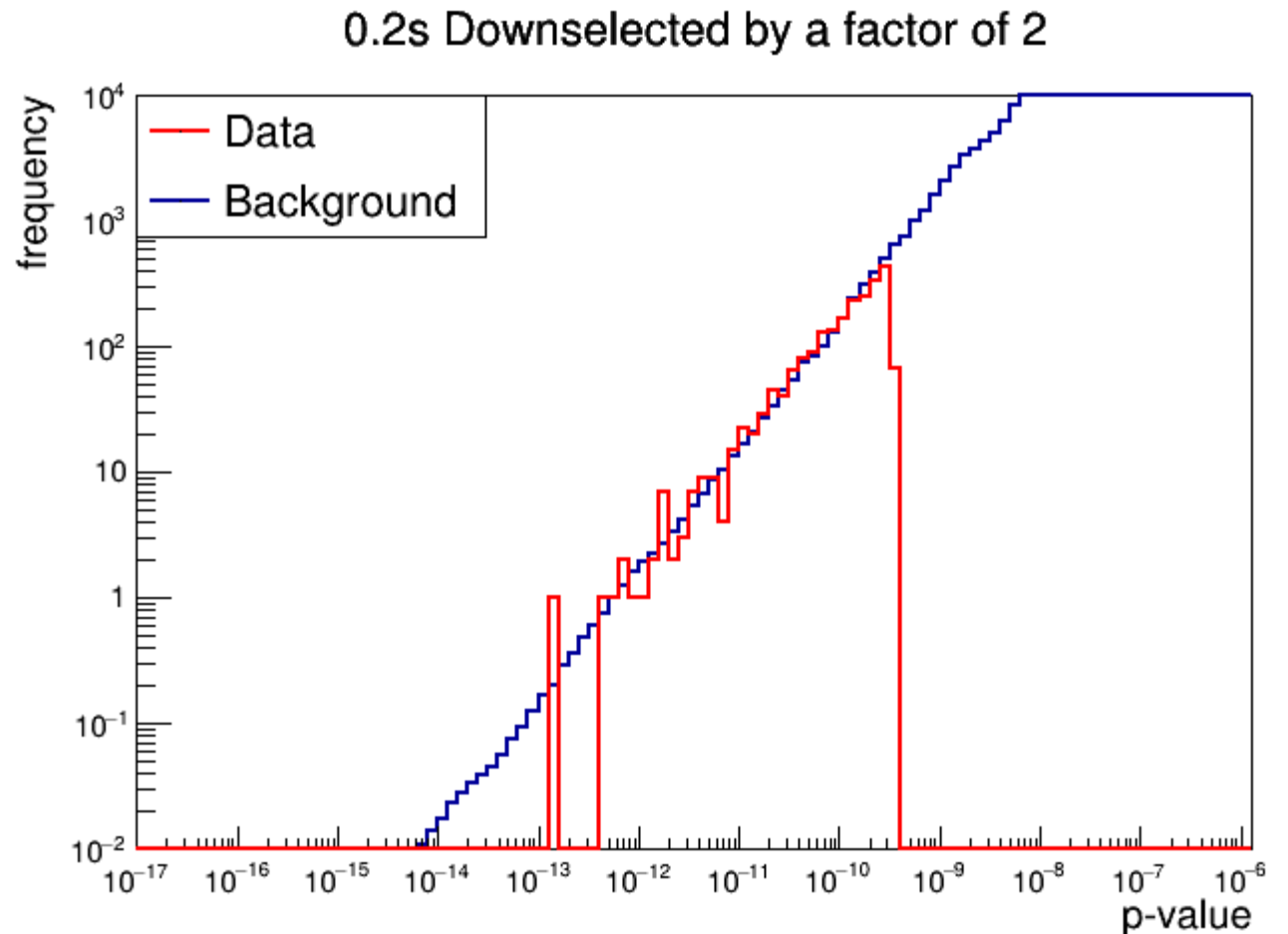
# No downselecting

- Advance spatial bins by  $.11^\circ$  and time bins by 0.02s
- 4280 events in the H\_data histogram



# Downselecting by factor of 2

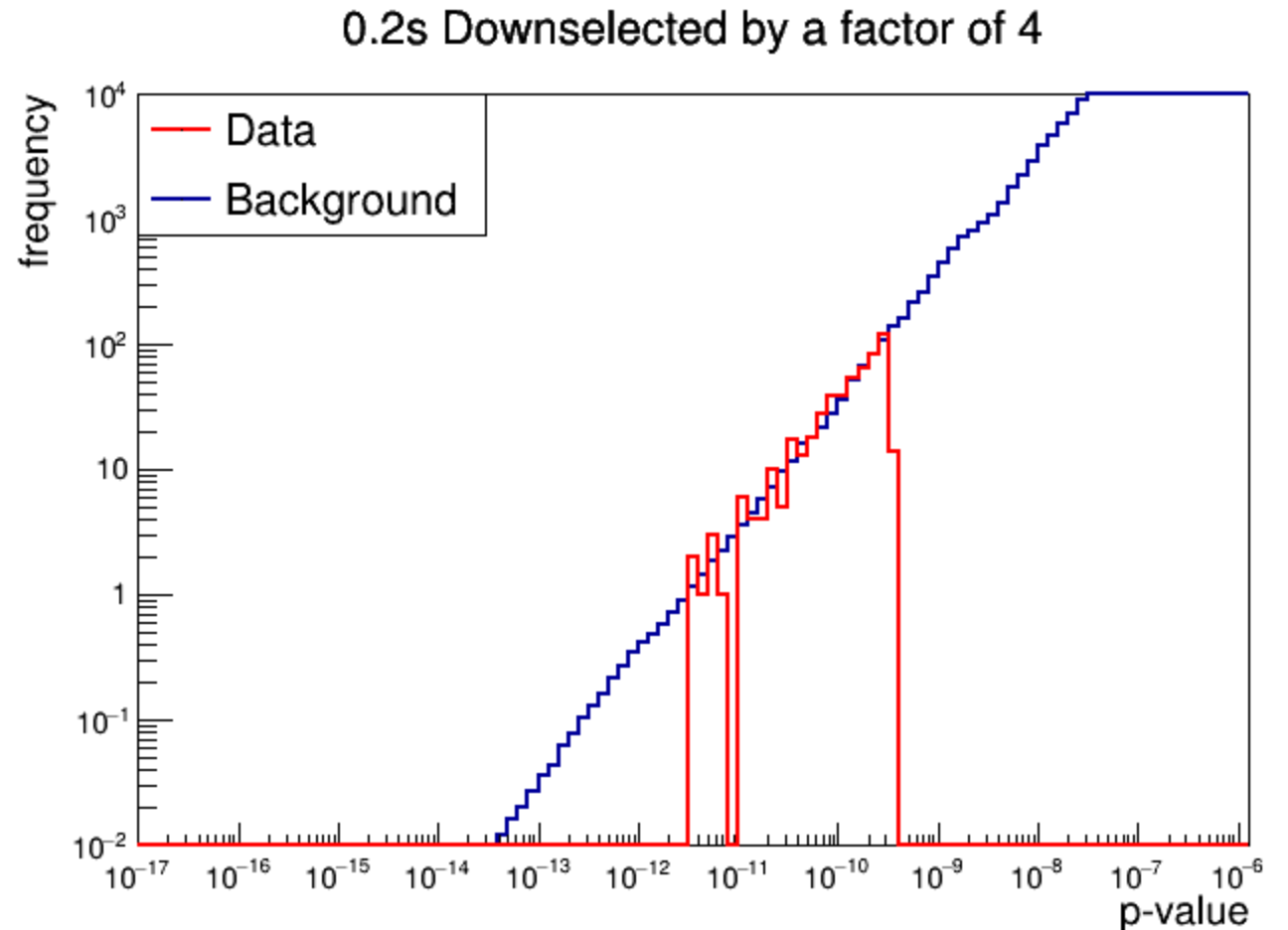
- Advance spatial bins by  $.22^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.04s (instead of 0.1s)
- 2180 events in the H\_data histogram





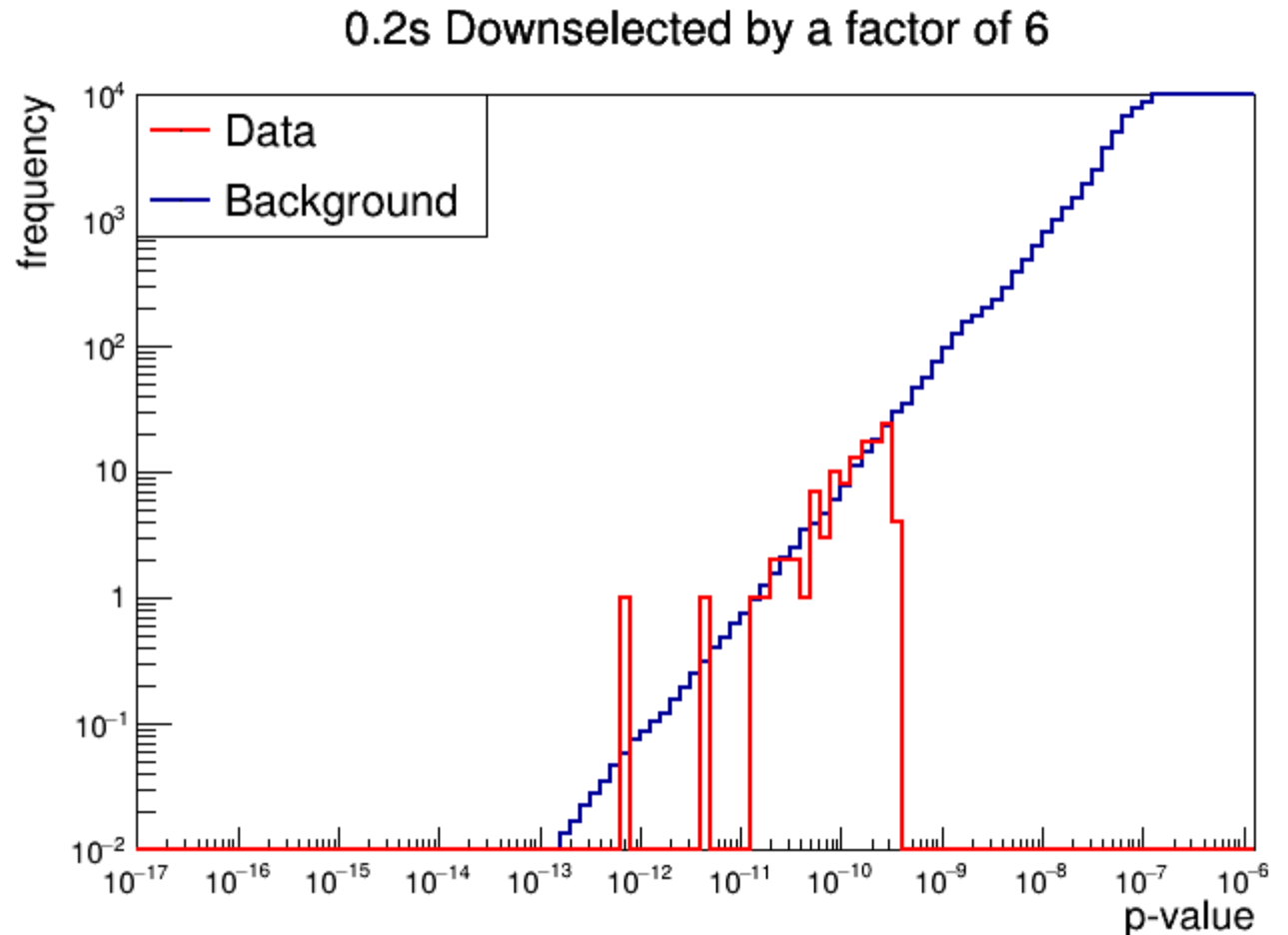
# Downselecting by factor of 4

- Advance spatial bins by  $.44^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.08s (instead of 0.1s)
- 522 events in the H\_data histogram



# Downselecting by factor of 6

- Advance spatial bins by  $.66^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.12s (instead of 0.1s)
- 114 events in the H\_data histogram



# Downselecting by factor of 8

- Advance spatial bins by  $.88^\circ$  (instead of  $.11^\circ$ ) and time bins by 0.16s (instead of 0.1s)
- 38 events in the H\_data histogram

