

Continued Study: 2x2 Hot Channels

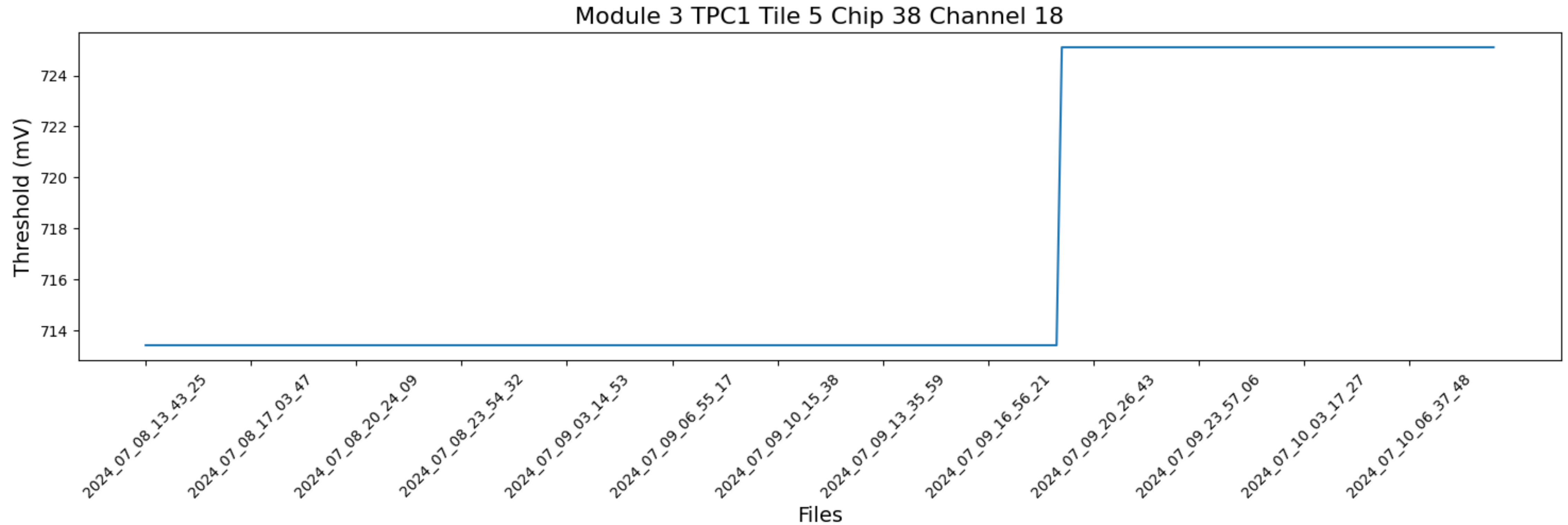
Zhongyi Wu



Checklist

- Channel threshold
- Pedestal dataword
- Channel mask
- Dataword per hit
- Expanded searching range
- Hot channel filter

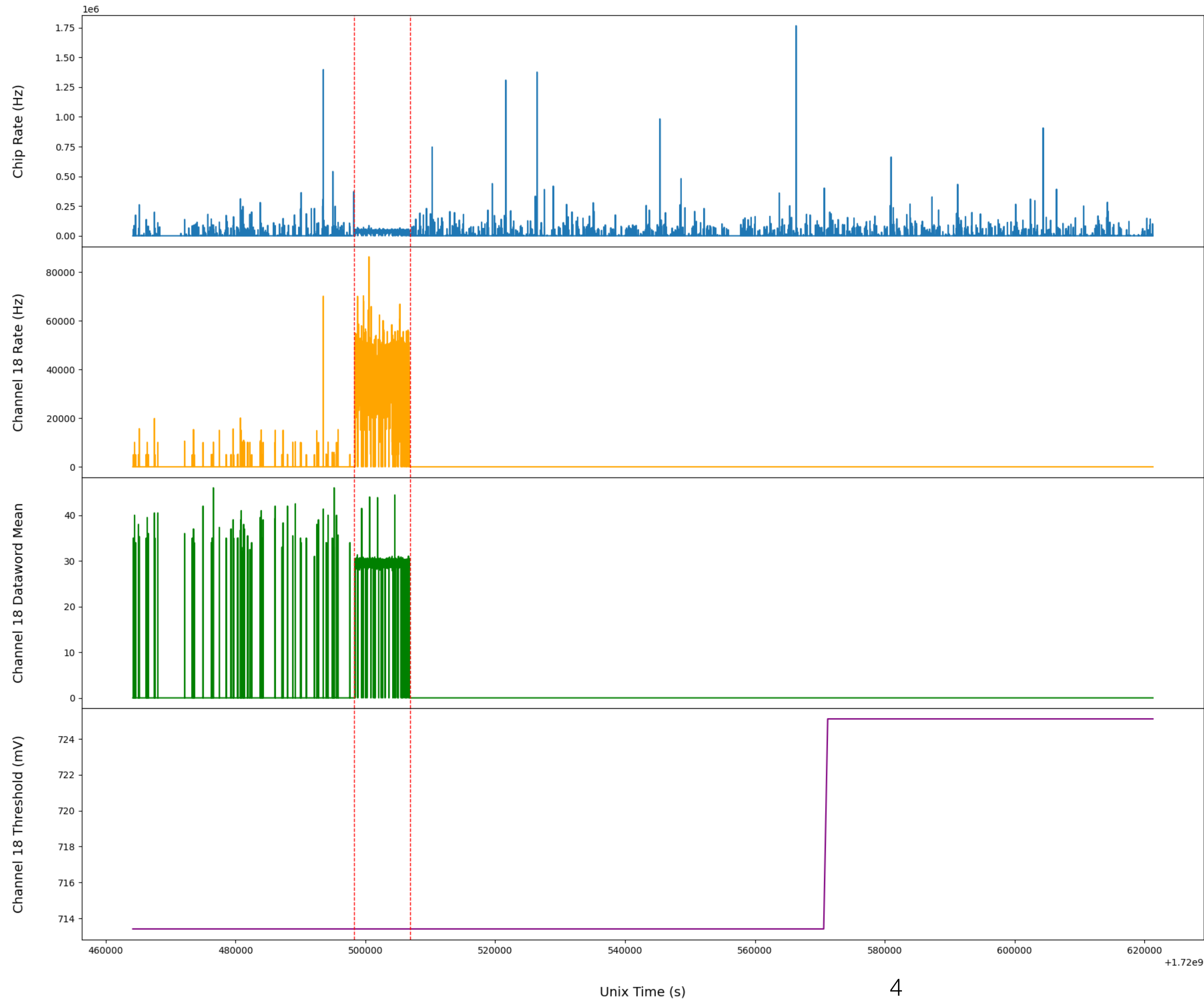
Channel Threshold



Channel threshold approximation: $1800/256 * \text{threshold_global (chip level)} + 465 + 2.34 * \text{pixel_trim_dac}$ [mV]

Constant zero channel threshold → Chip was overlooked when setting thresholds

Module 3 TPC1 Tile 5 Chip 38



Run 50017 (~ 2 days)

packet-0050015-2024_07_08_13_37_49_CDT.FLOW.hdf5

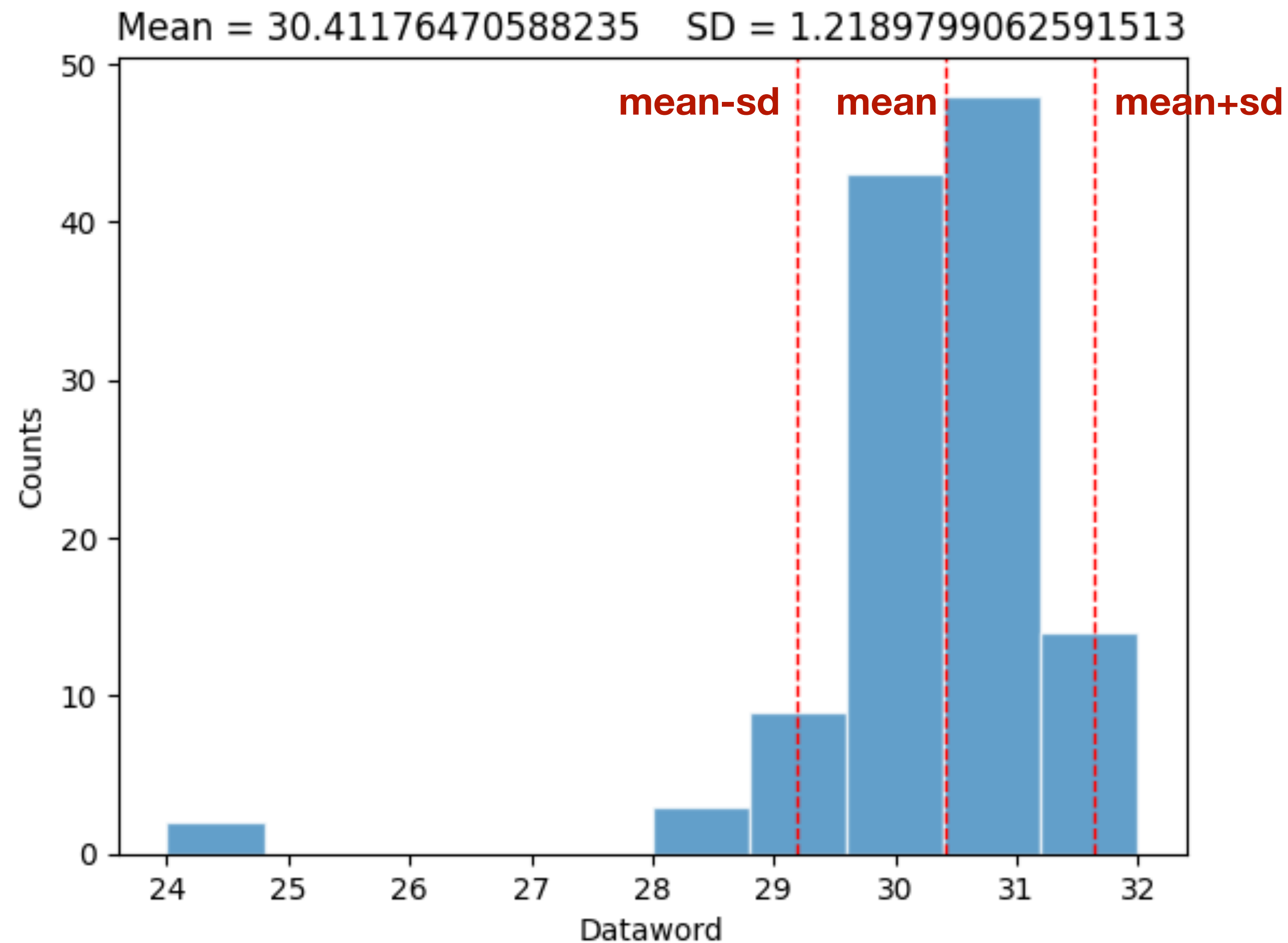
to

packet-0050017-2024_07_10_09_18_05_CDT.FLOW.hdf5

- Threshold of channel 18 didn't change during the constant chip rate period.
- During the constant chip rate period, the dataword mean is ~ 30.

Pedestal

Module 3 TPC1 Tile 5 Chip 38 Channel 18



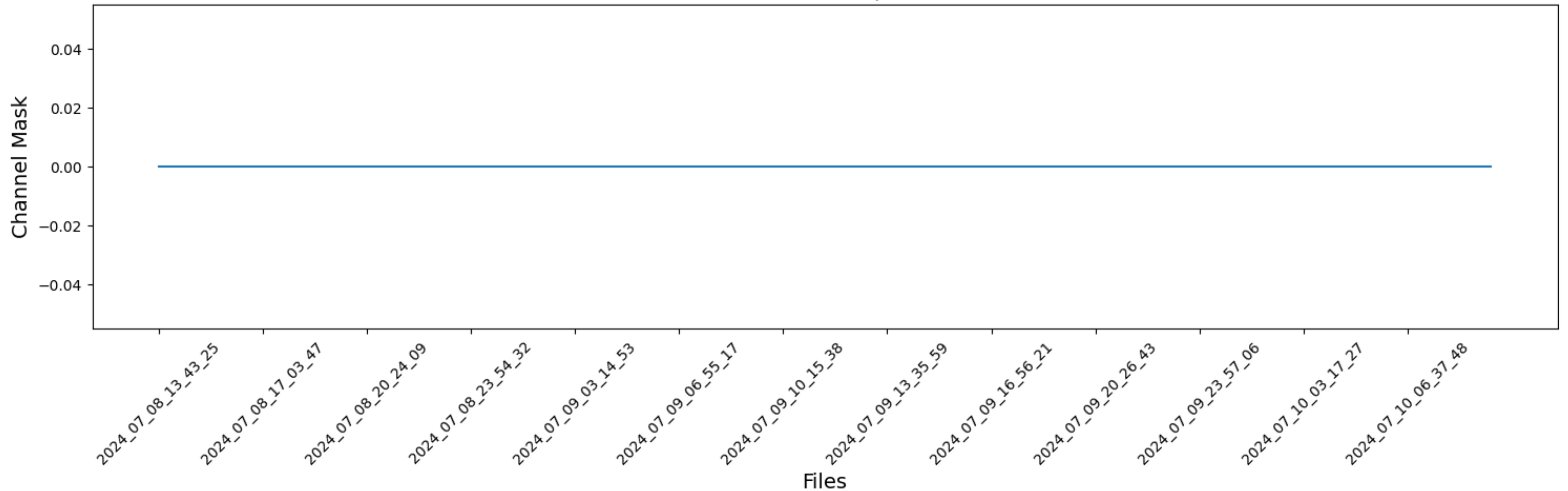
https://portal.nersc.gov/project/dune/data/2x2/CRS/commission/June2024/global_dac_06_06/reference-cold-pedestal-2024_06_05_08_28_19_CDT.h5

- Consistent with the channel 18 dataword mean during the constant chip rate period.

Channel Mask

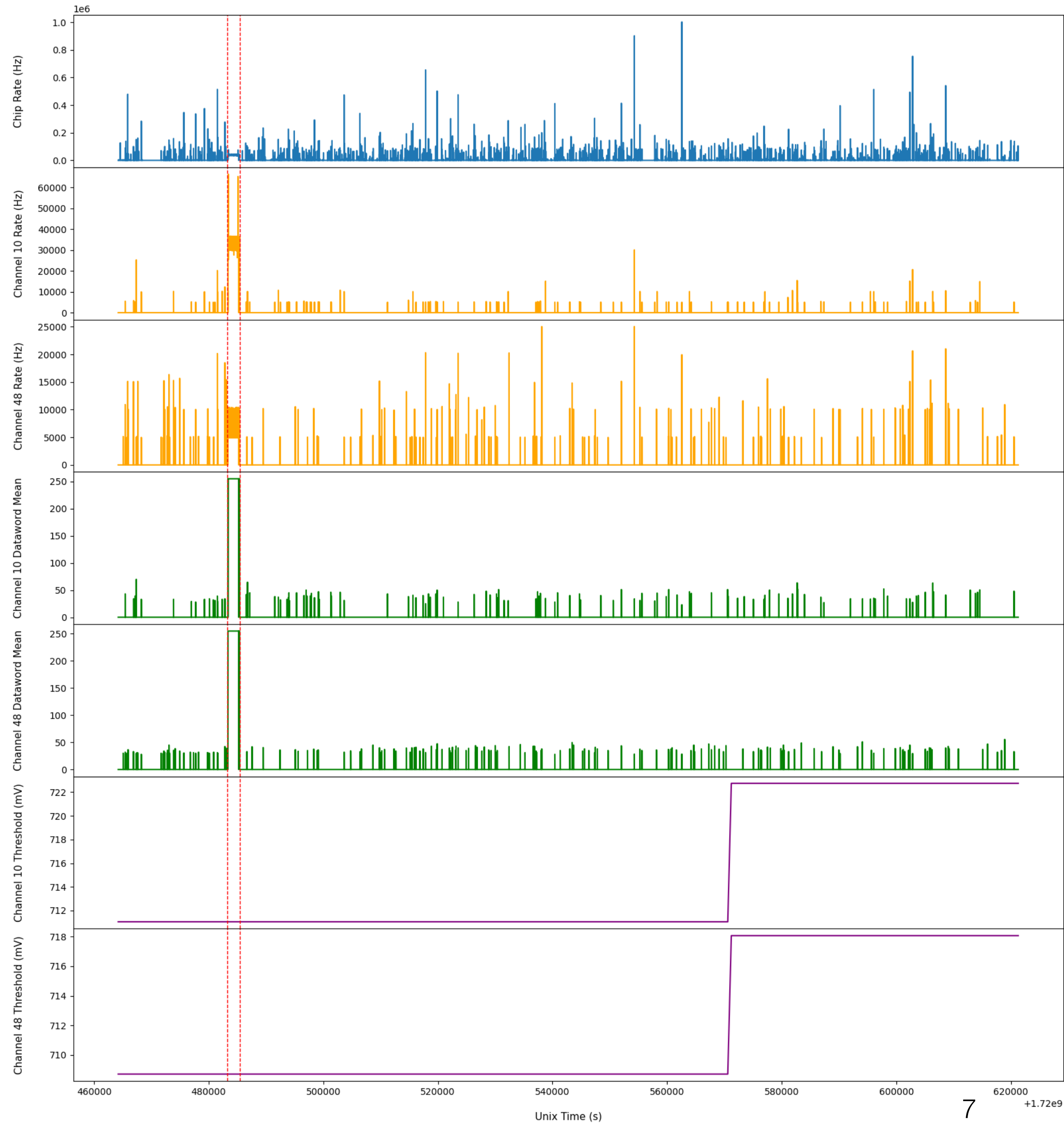
packet-0050015-2024_07_08_13_37_49_CDT.FLOW.hdf5
to packet-0050017-2024_07_10_09_18_05_CDT.FLOW.hdf5

Module 3 TPC1 Tile 5 Chip 38 Channel 18



channel_mask == 0 during runtime, but channel 18 no longer sent signals after the constant chip rate period.

Module 3 TPC2 Tile 6 Chip 13

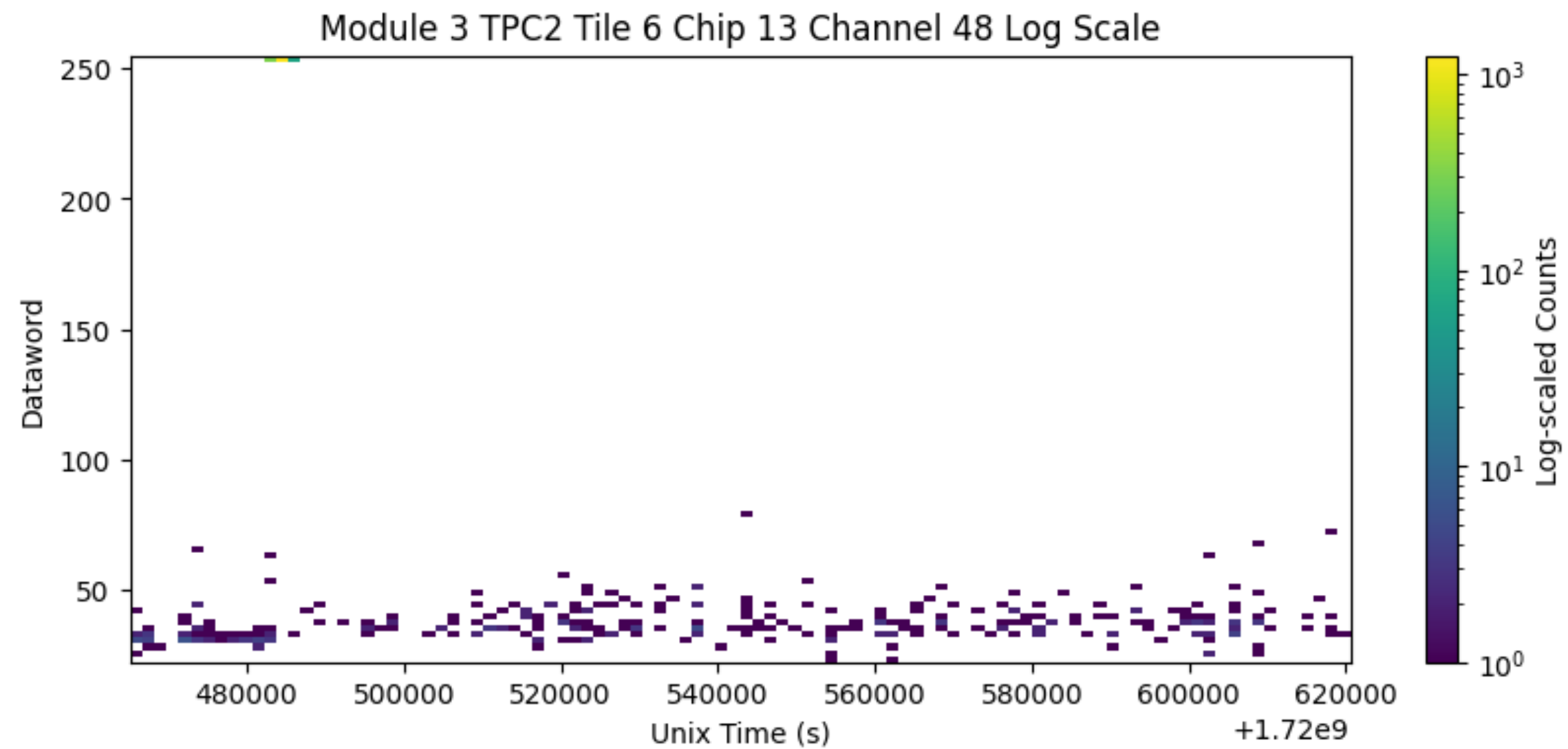
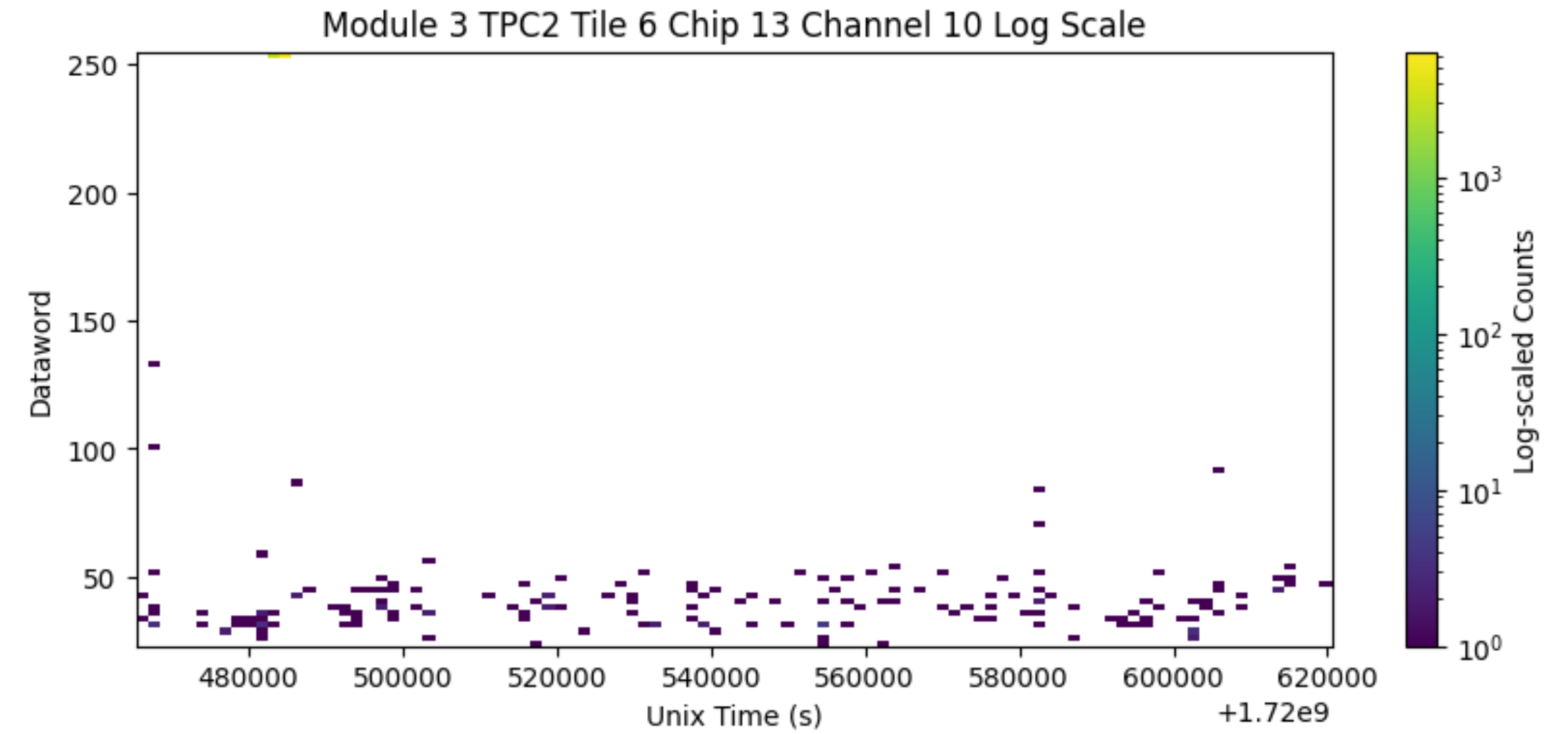
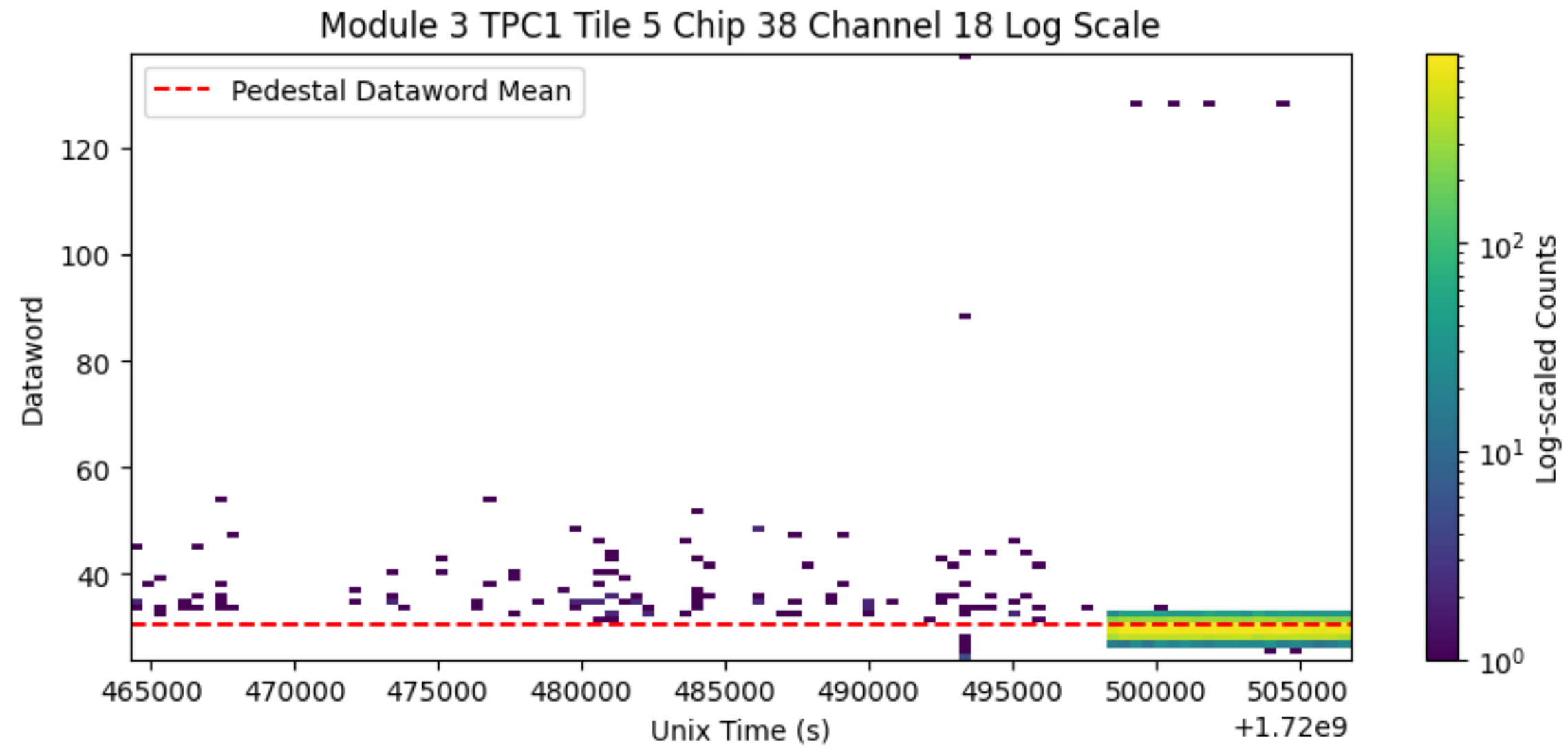


Run 50017 (~ 2 days)

packet-0050015-2024_07_08_13_37_49_CDT.FLOW.hdf5
to
packet-0050017-2024_07_10_09_18_05_CDT.FLOW.hdf5

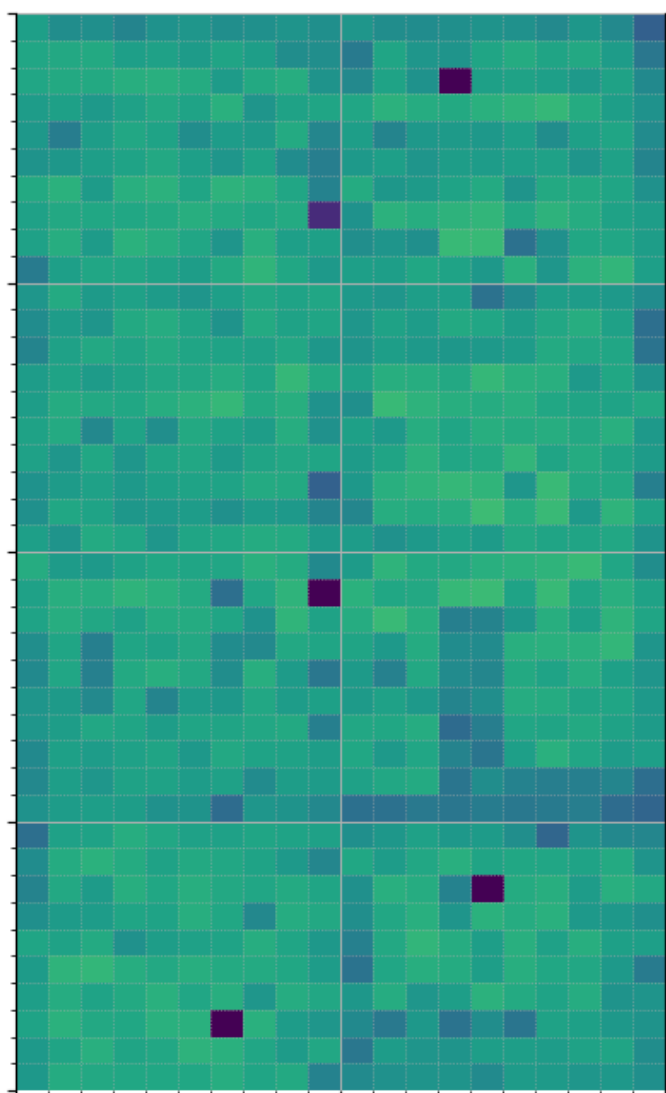
- Thresholds of channel 10 and 48 didn't change during the constant chip rate period.
- Most entries of channel dataword mean is ~ 40.

Dataword Per Hit

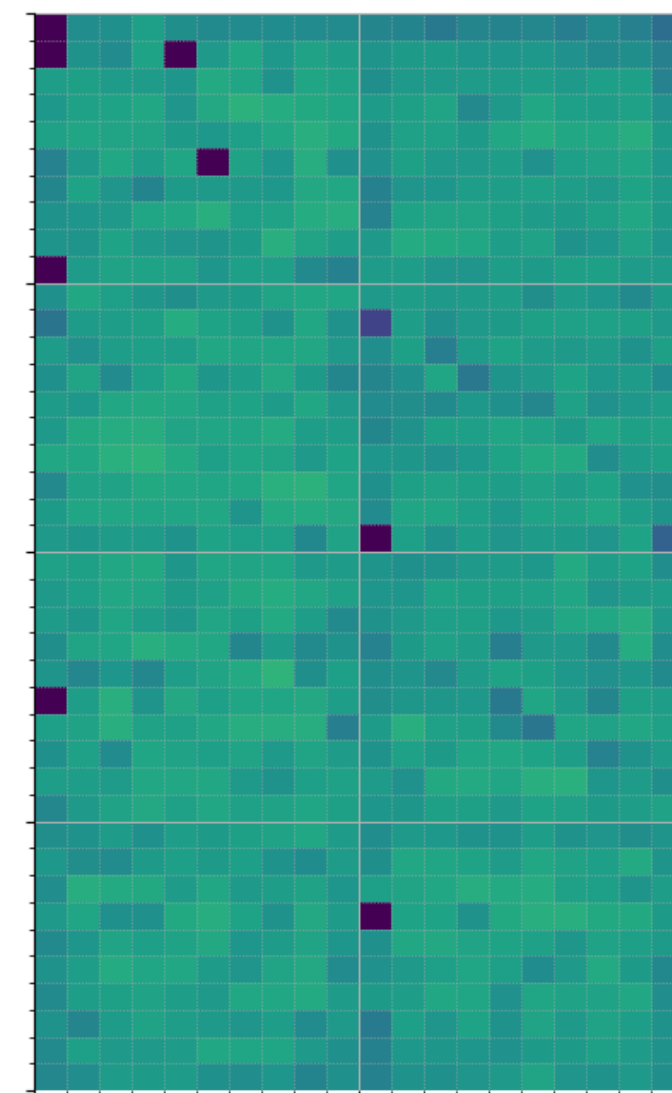
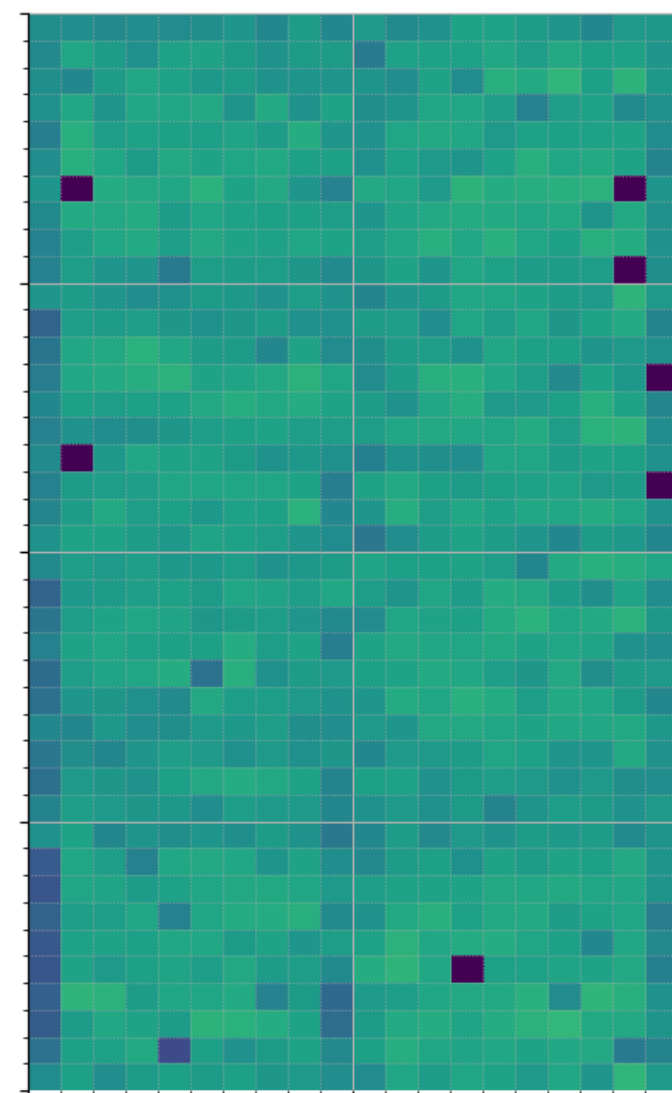
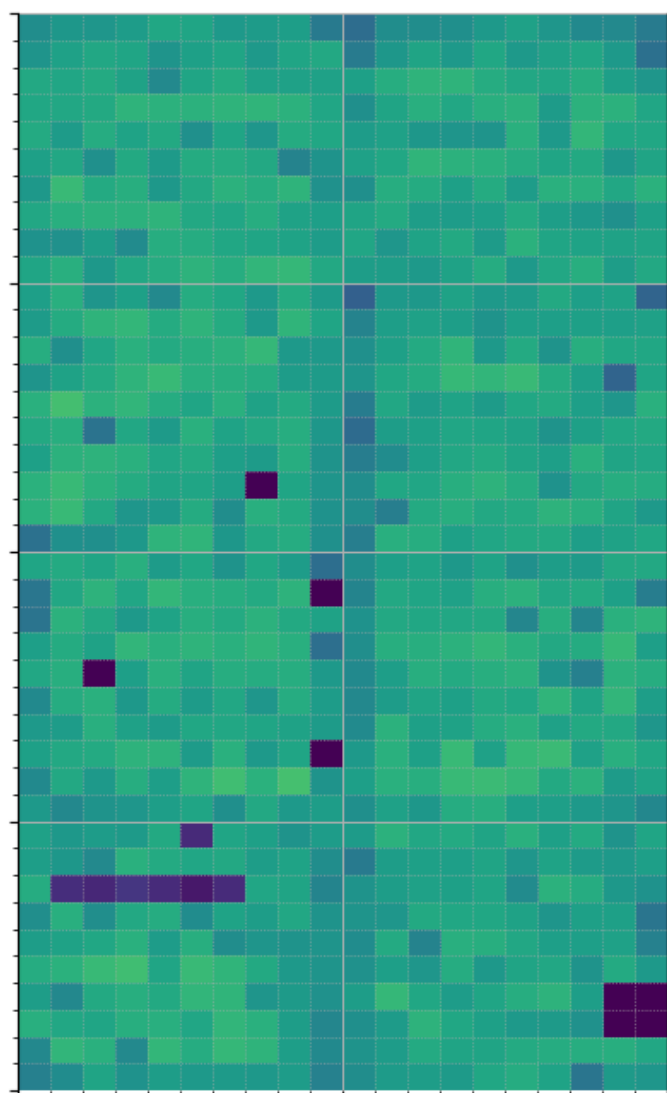


Not only the channel dataword mean over spill, most hits also have the dataword of ~ 40 except for the constant chip rate period.

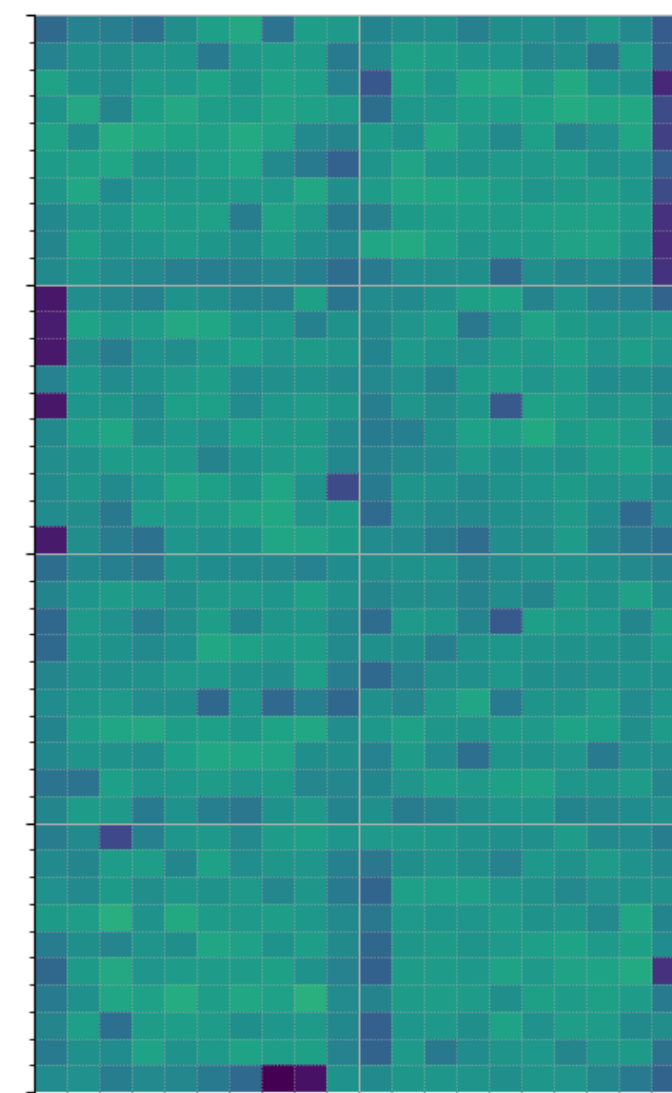
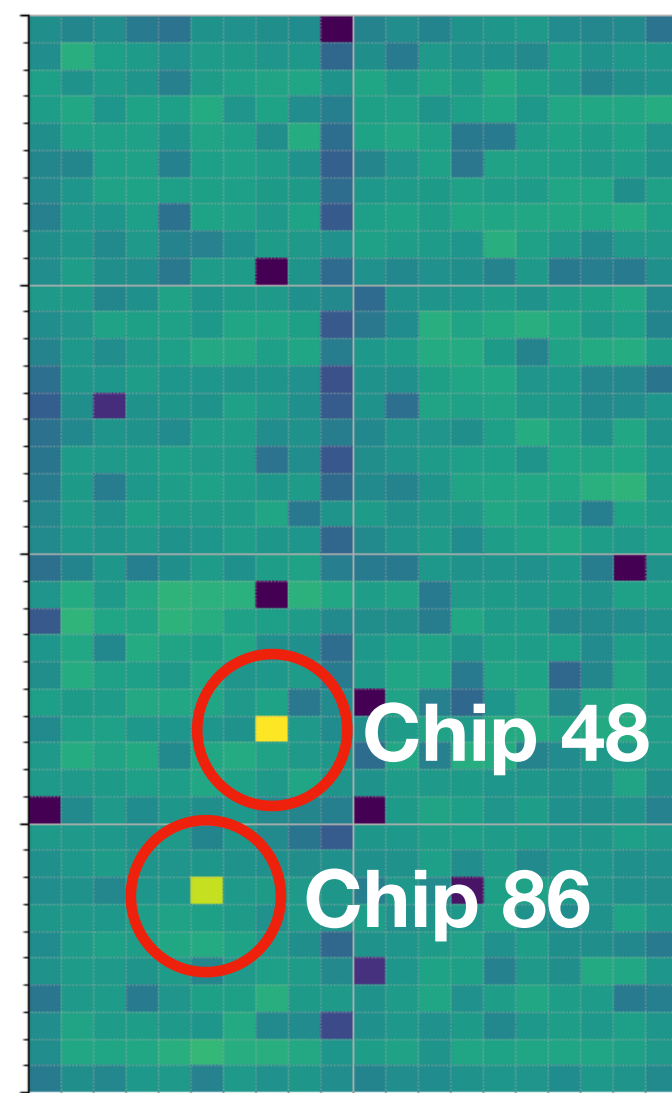
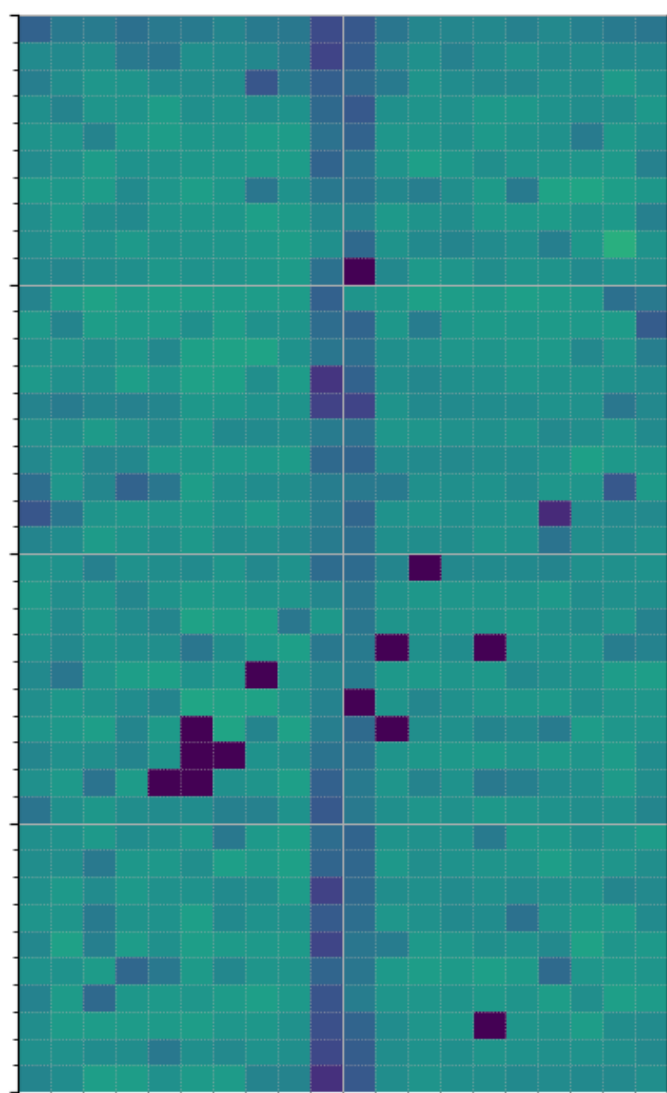
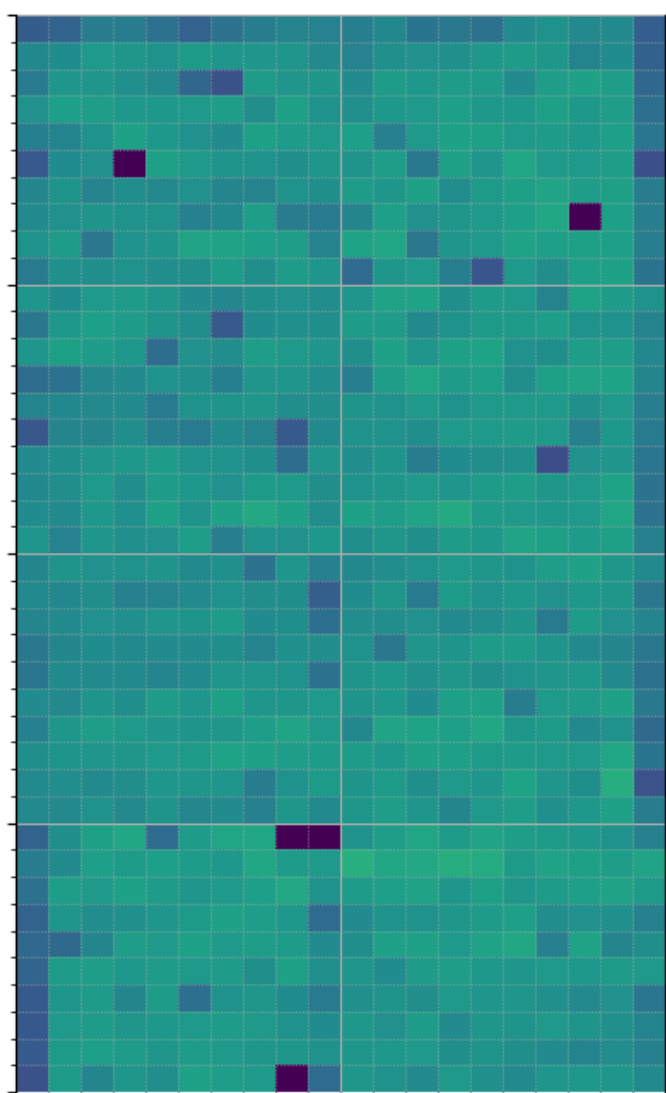
Module 0





Module 1



Module 2



Module 3

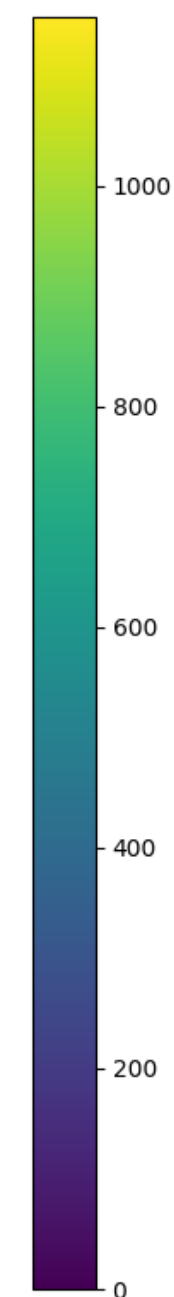
 Chip 48
 Chip 86

Run 50018 (~ 43 hours)

packet-0050018-2024_07_10_09_36_12_CDT.FLOW.hdf5

to

packet-0050018-2024_07_12_04_00_44_CDT.FLOW.hdf5

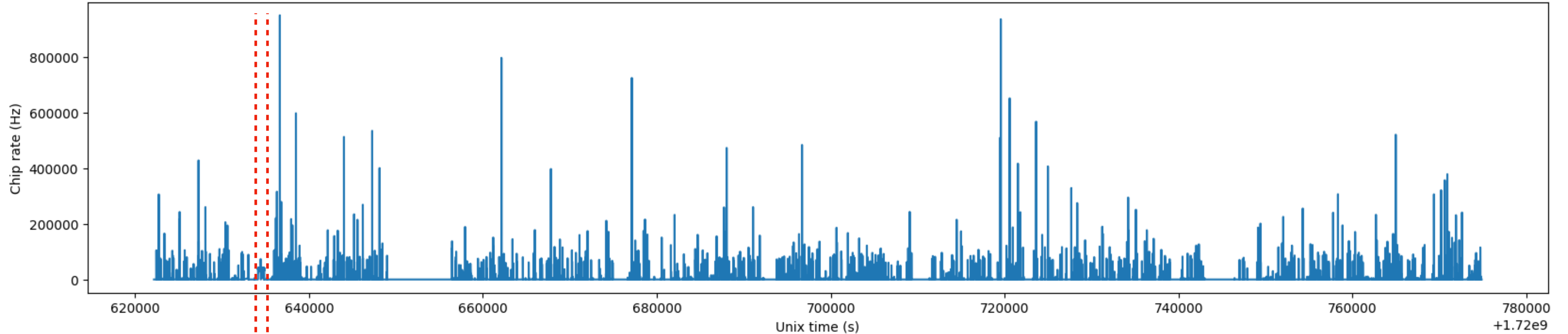


Counts

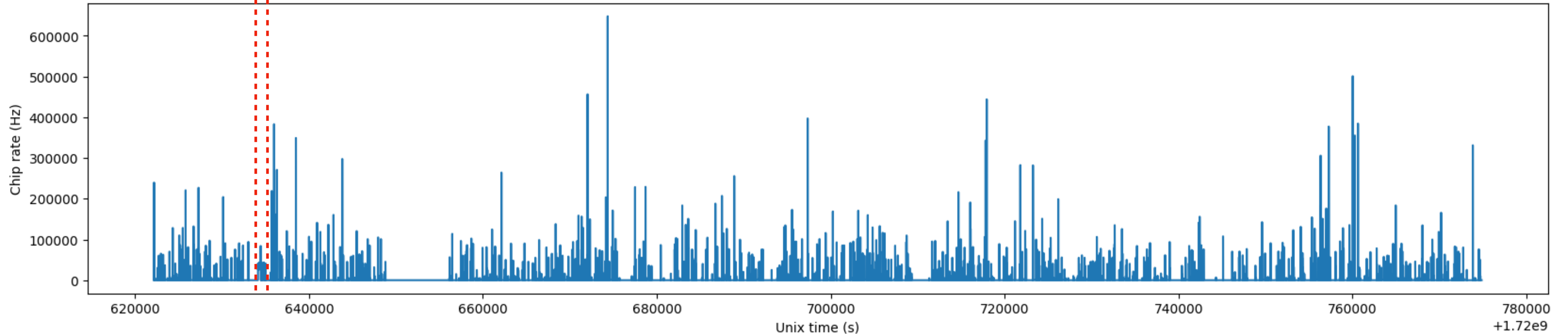
- Module 3 TPC1 Tile 5 Chip 48
- Module 3 TPC1 Tile 7 Chip 86

Chip Rate vs. Time

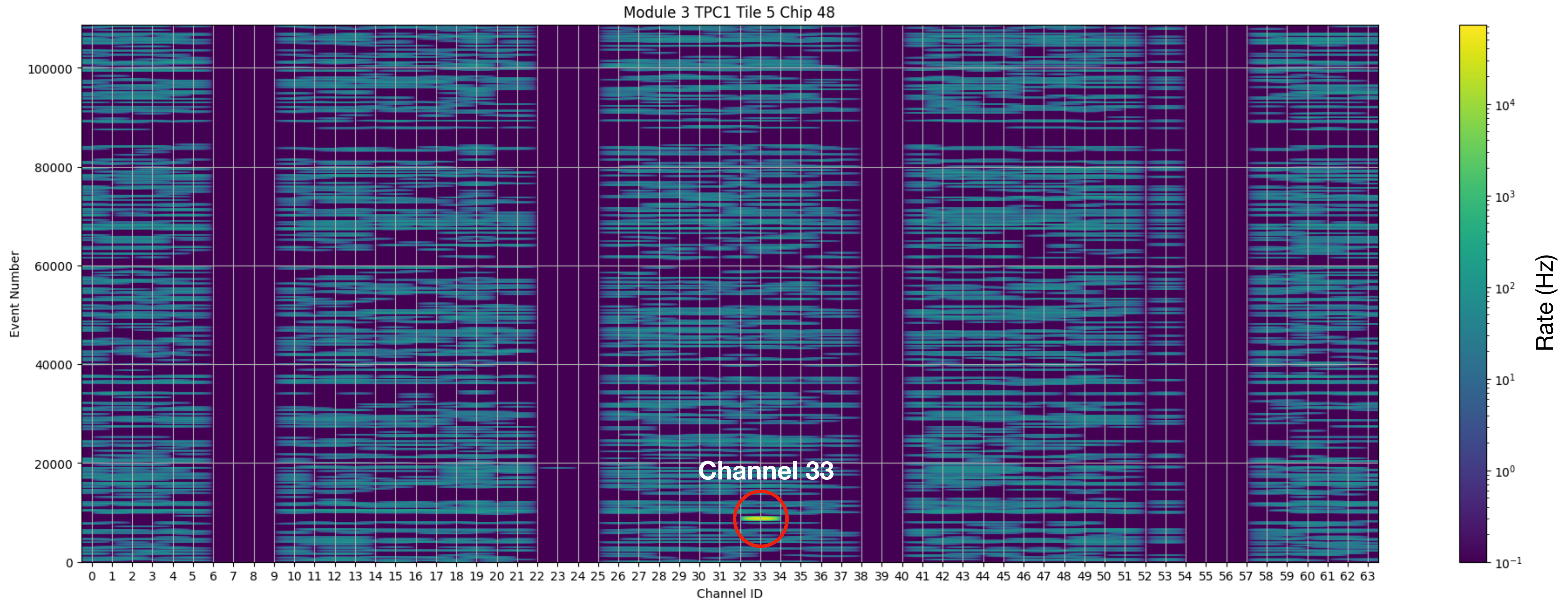
Module 3 TPC1 Tile 5 Chip 48



Module 3 TPC1 Tile 7 Chip 86

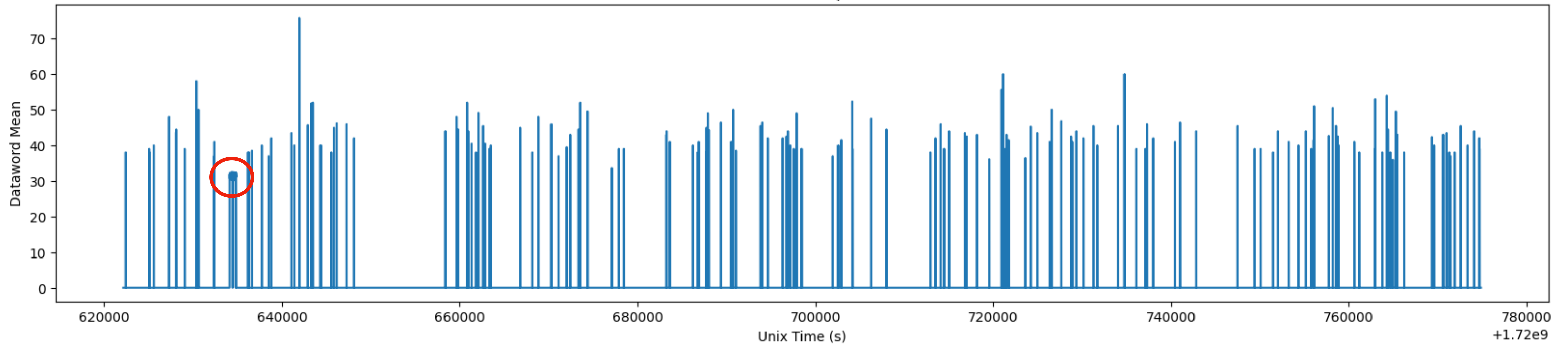


Module 3 TPC1 Tile 5 Chip 48

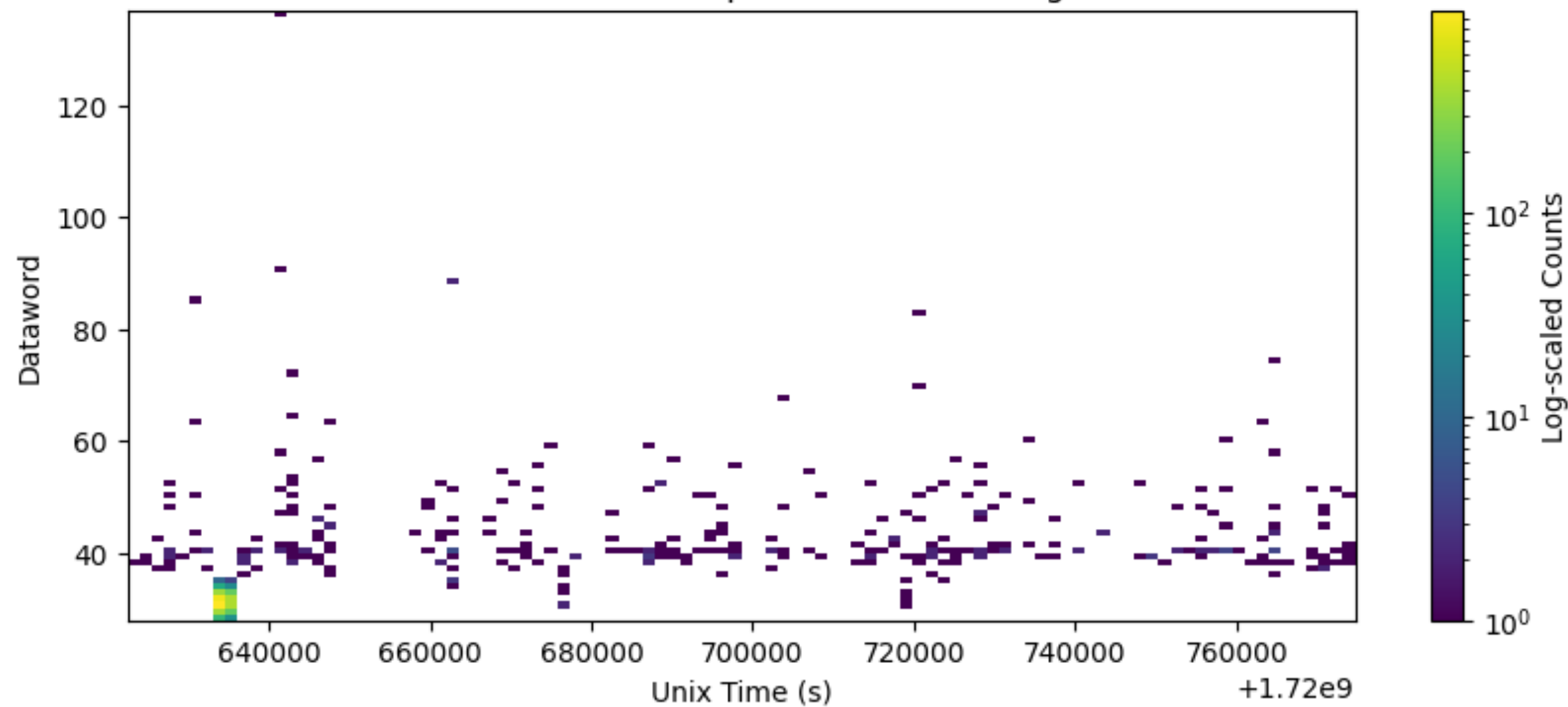


Dataword: Module 3 TPC1 Tile 5 Chip 48 Channel 33

Module 3 TPC1 Tile 5 Chip 48 Channel 33

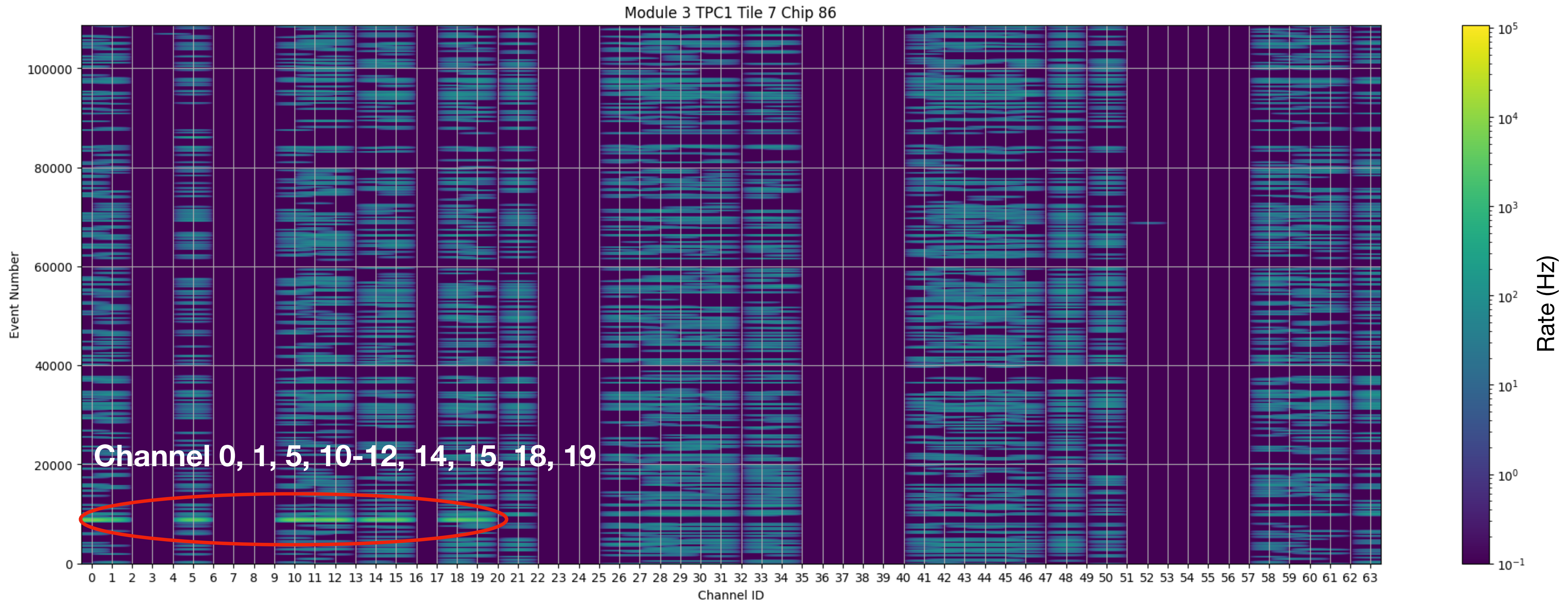


Module 3 TPC1 Tile 5 Chip 48 Channel 33 Log Scale



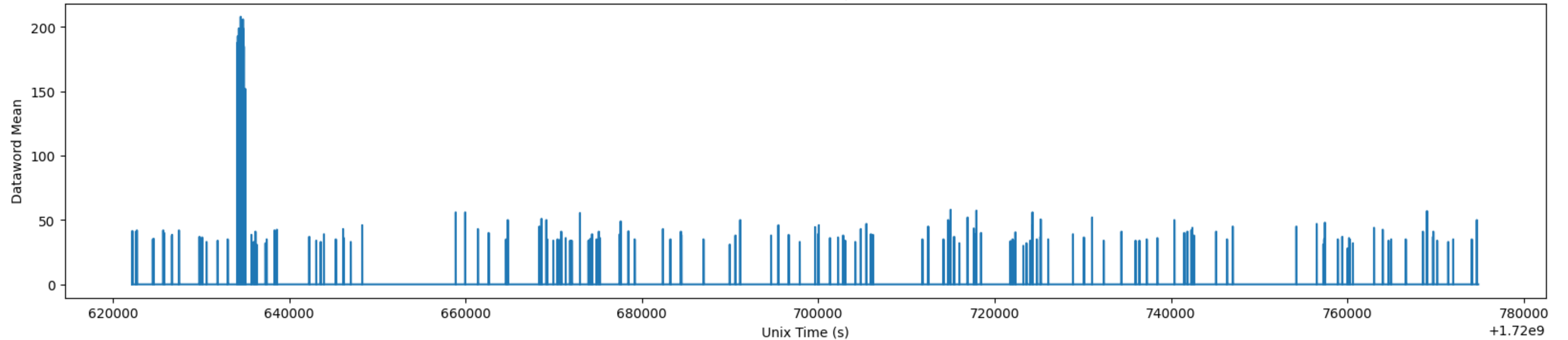
- Dataword mean is ~ 30 during the constant chip rate period.
- Most of the dataword mean over spill and dataword per hit are ~ 40.

Module 3 TPC1 Tile 7 Chip 86

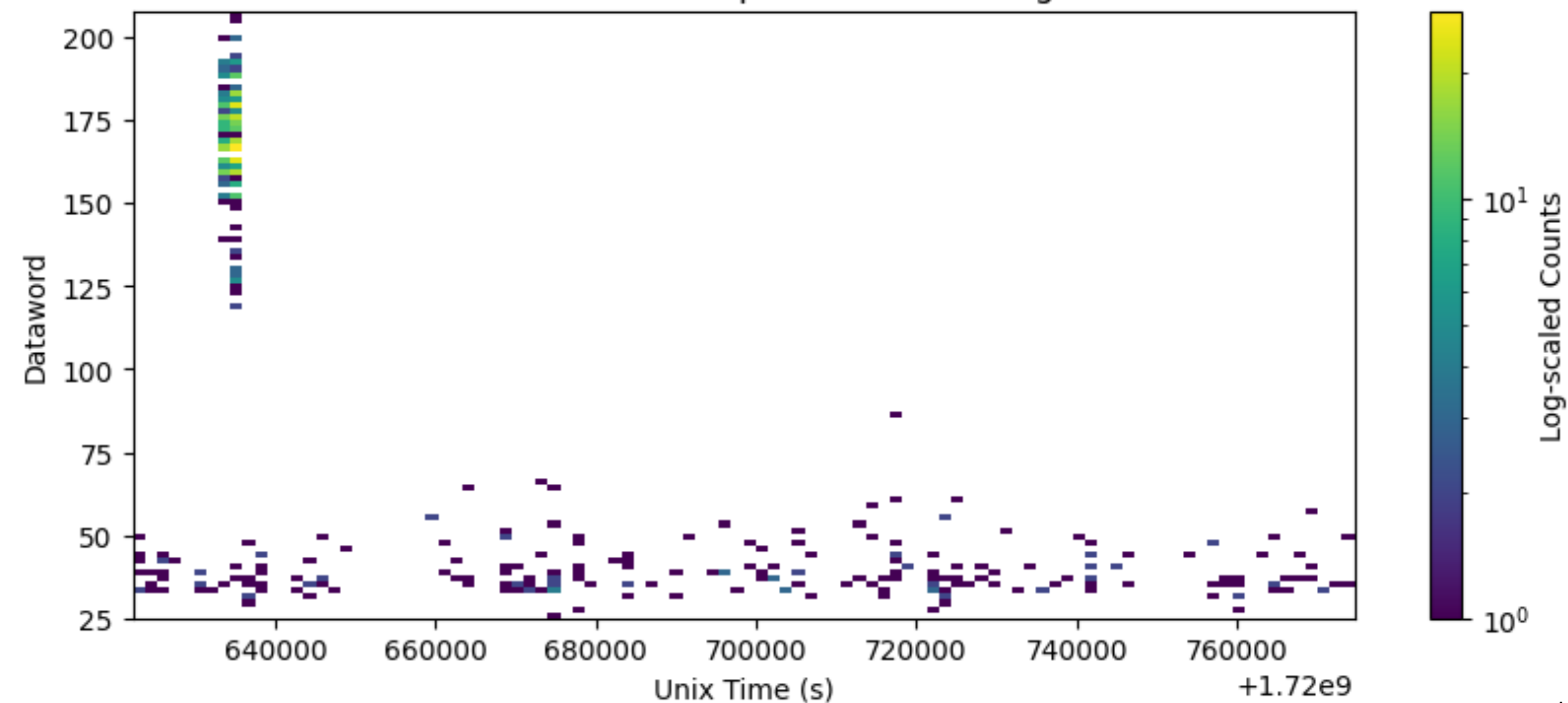


Dataword: Module 3 TPC1 Tile 7 Chip 86

Module 3 TPC1 Tile 7 Chip 86 Channel 5



Module 3 TPC1 Tile 7 Chip 86 Channel 5 Log Scale

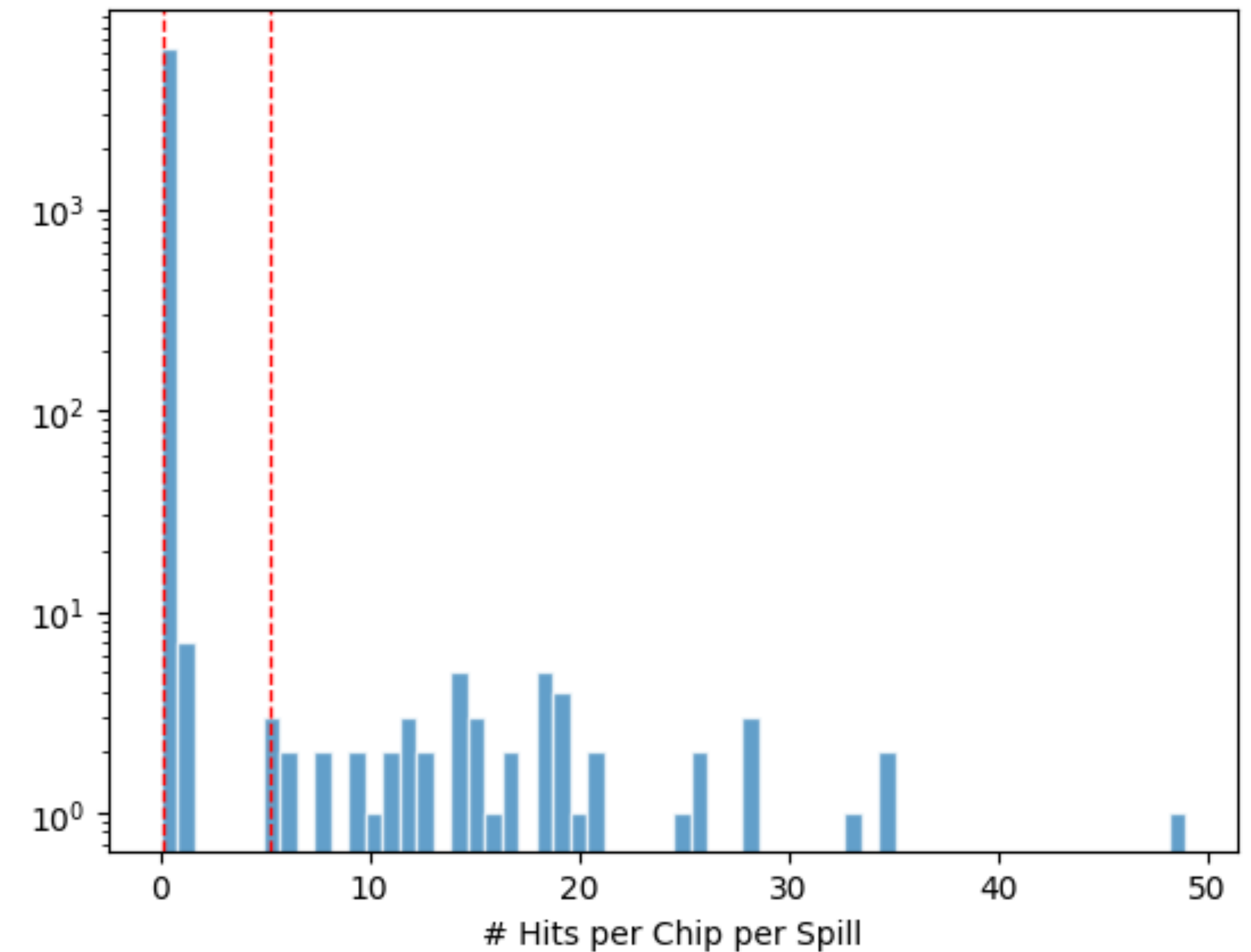
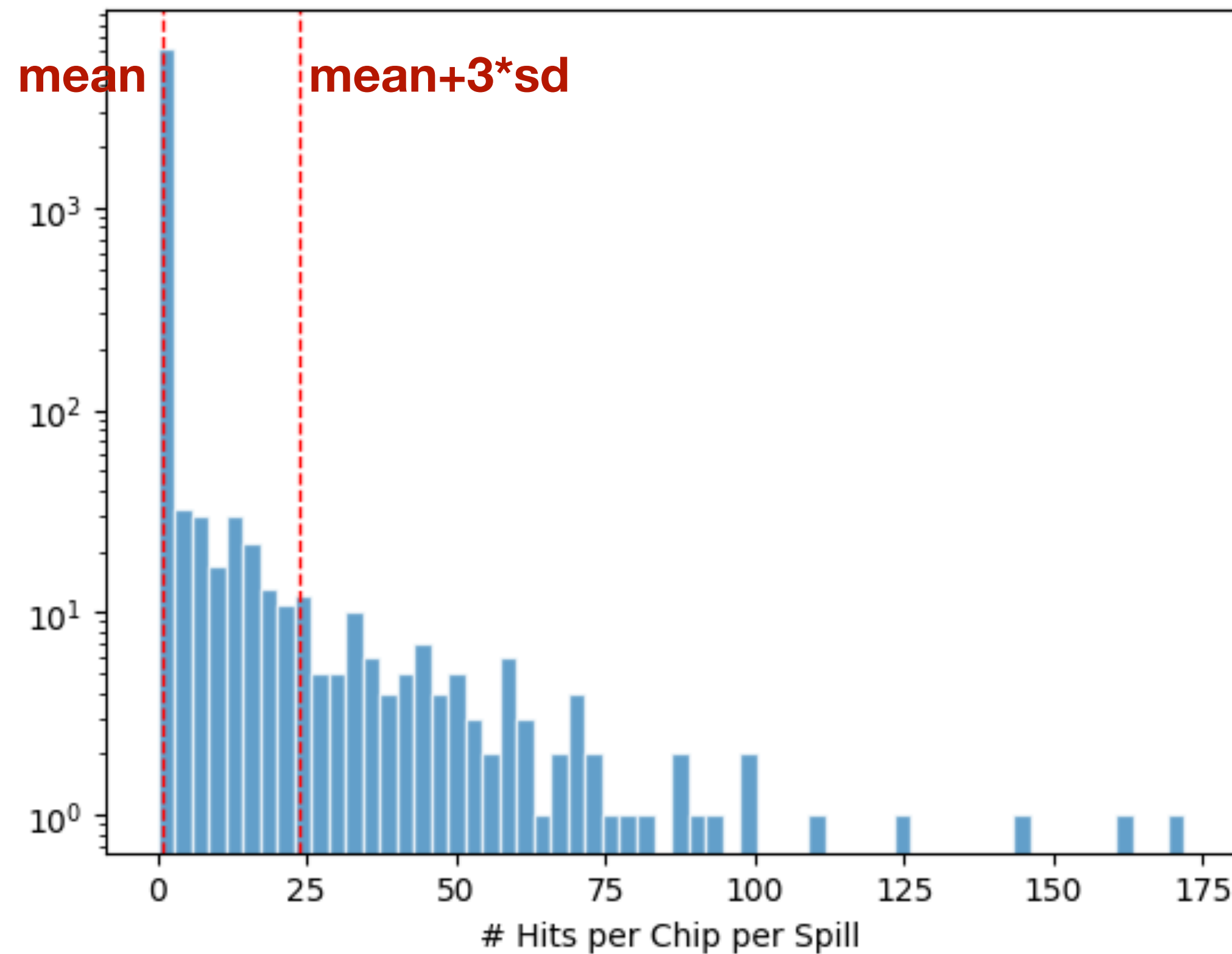


- Hot channels in chip 86 do not have constant dataword mean during the constant chip rate period.
- Datawords of hits have a much wider band than other hot channels that were found previously during the constant chip rate period.

Better Method to Locate Hot Channels?

packet-0050017-2024_07_08_16_23_43 evt125

packet-0050017-2024_07_09_01_04_39 evt125



Distribution of the number of hits per chip per spill doesn't have a single pattern.

Conclusions

- **Run 50017 (Module 3 TPC1 Tile 5 Chip 38 & Module 3 TPC2 Tile 6 Chip 13)**
 - No channel threshold change is observed during the constant chip rate periods.
 - Channel mask of Module 3 TPC1 Tile 5 Chip 38 shows the was permitted to trigger during the runtime, but it no longer sent signals after the constant chip rate period.
 - Dataword mean of Module 3 TPC1 Tile 5 Chip 38 is consistent with the mean of pedestal dataword.
 - Most hits in hot channels have a dataword of ~ 40 except for the constant chip rate period.
- **Run 50018 (Module 3 TPC1 Tile 5 Chip 48 & Module 3 TPC1 Tile 7 Chip 86)**
 - Two hot chips have the same constant chip rate period.
 - Hot channels in Module 3 TPC1 Tile 7 Chip 86 do not have constant dataword mean during the constant chip rate period.
- Current filter to find hot chips do not give uniform distributions. Better method?