bad-channel map for MC

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MC simulations with a realistic bad-channel map for INTT

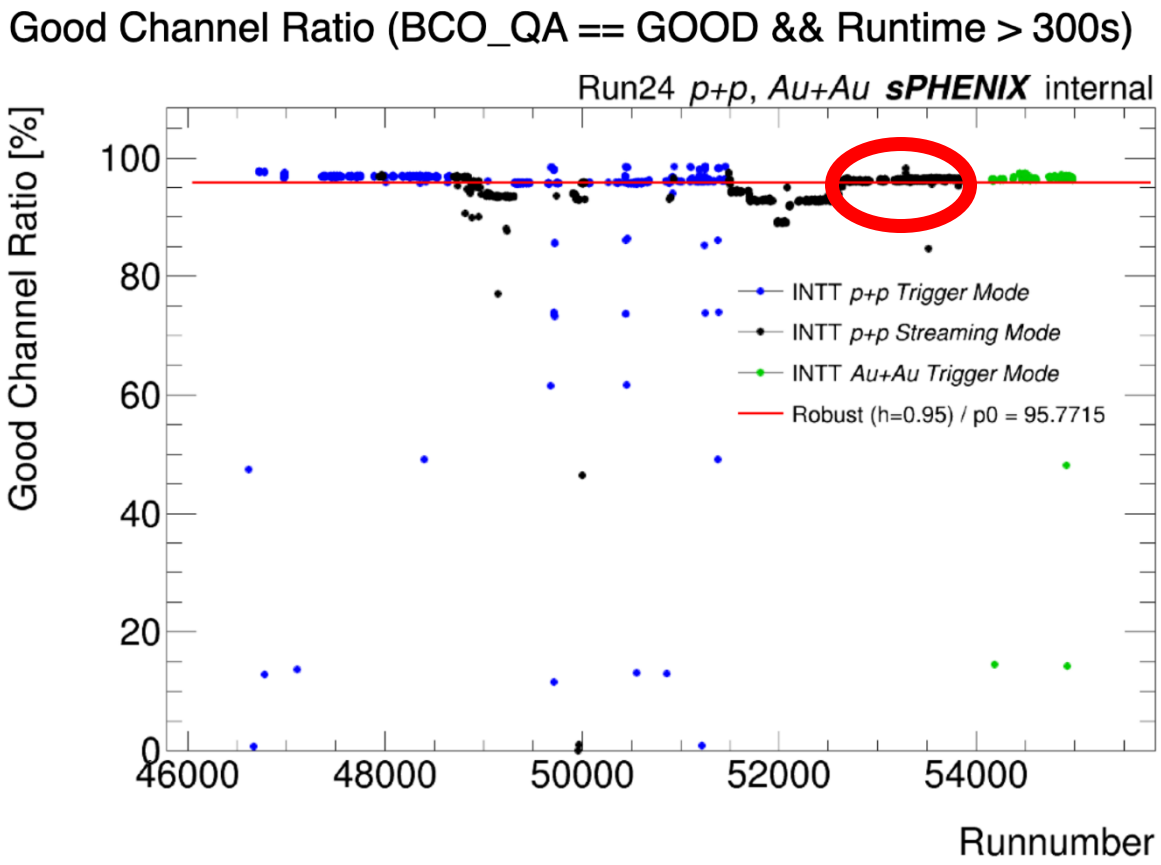
- For data, the INTT hotmap is generated on a run-by-run basis.
- To implement these in the MC, we need something more general.

A general hotmap CDB file for MC has been generated based on 40 recently produced runs by the tracking group.

1. A channel-by-channel logical OR was performed across the 40 runs.
2. If a channel is identified as hot, dead, or cold in five or more of the 40 runs, it is assigned a flag of 1.
3. A CDB tree was created in the same format as the data.

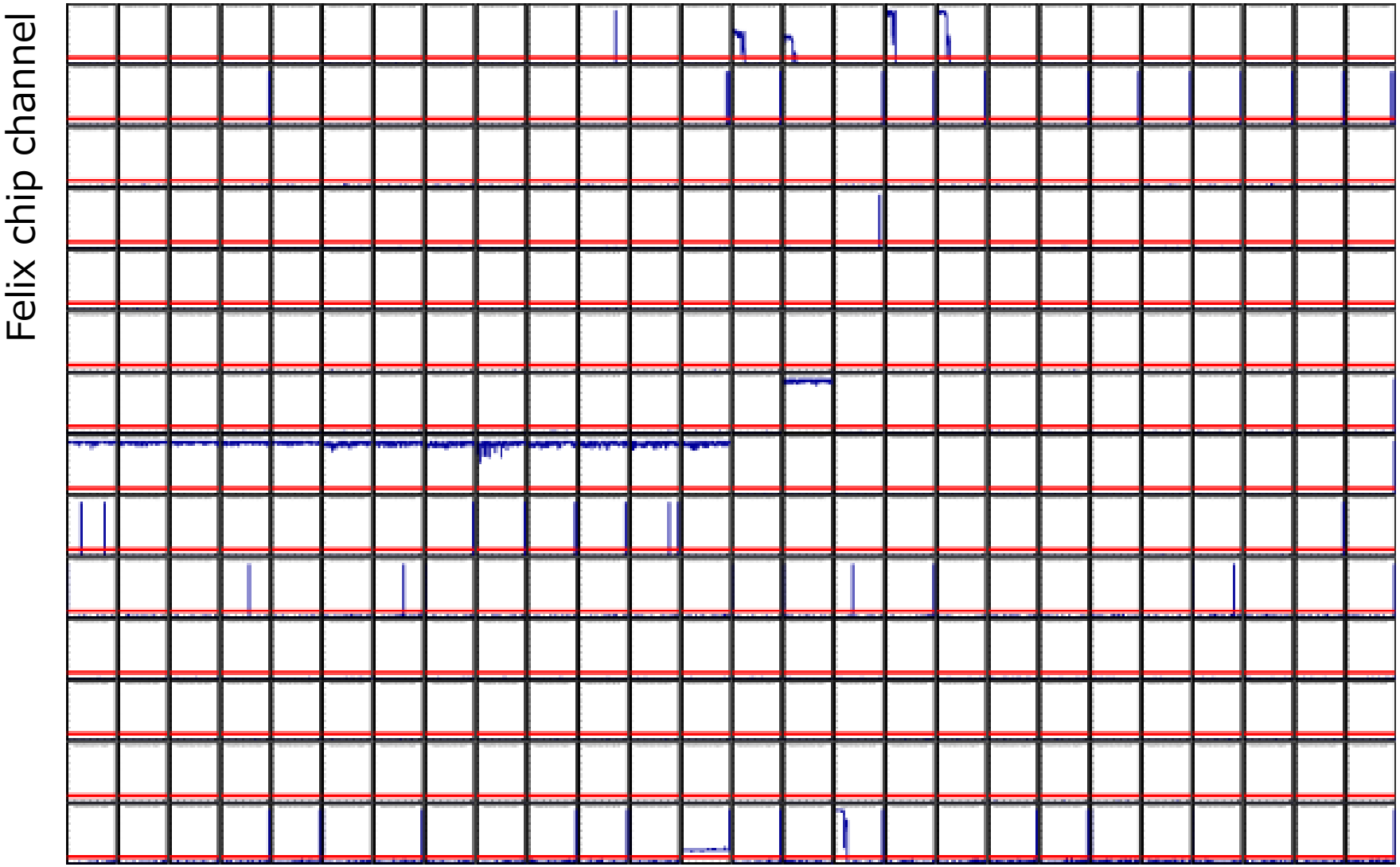
Good channel ratio

- A run is considered a “Golden Run” if the BCO alignment is good, the runtime is at least 5 minutes, and more than 90% of the channels are classified as good: see link.
- All 40 runs used in this study are Golden Runs, with 96% of the channels active in each run.

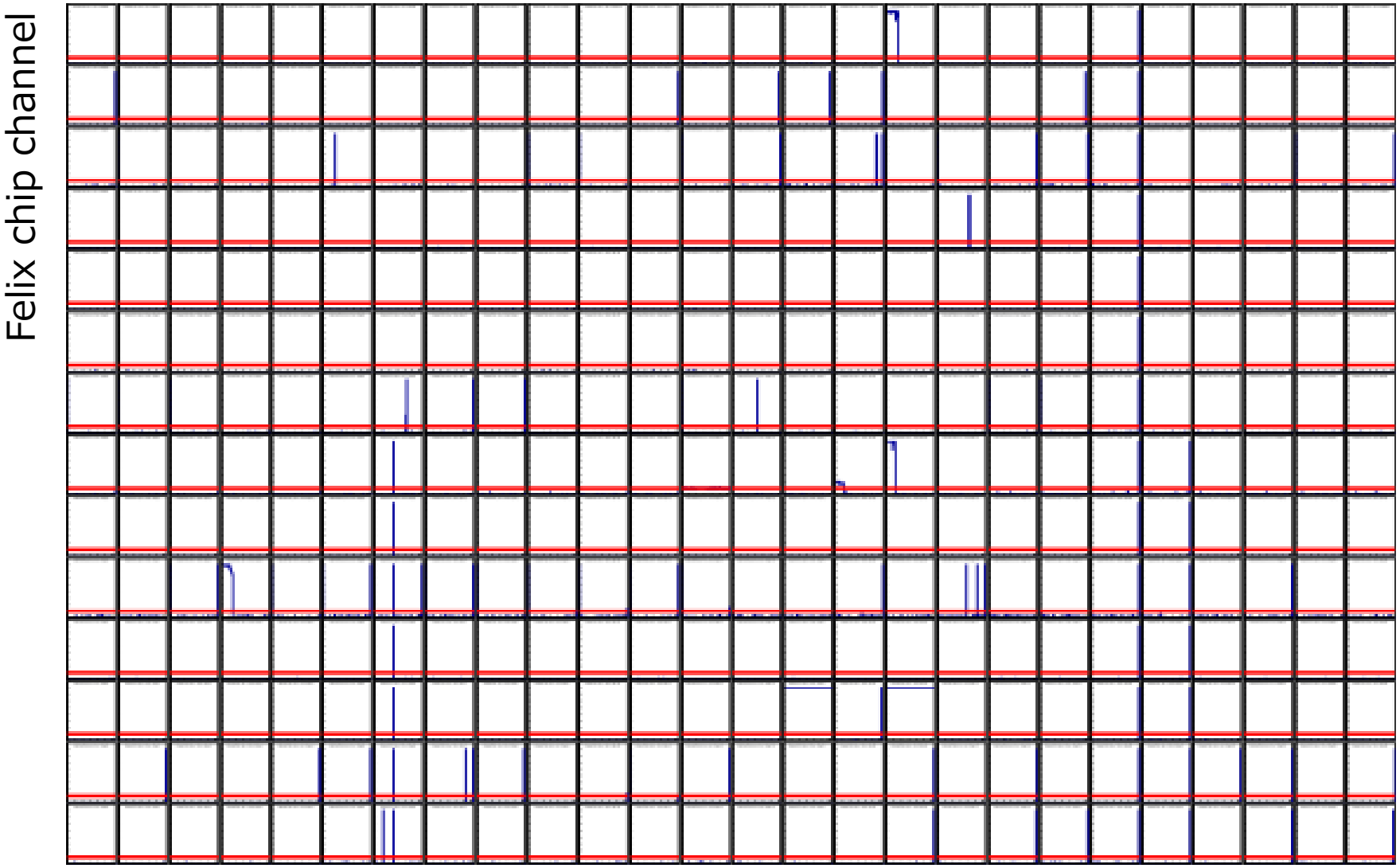


STEP1: A channel-by-channel logical OR across the 40 runs.

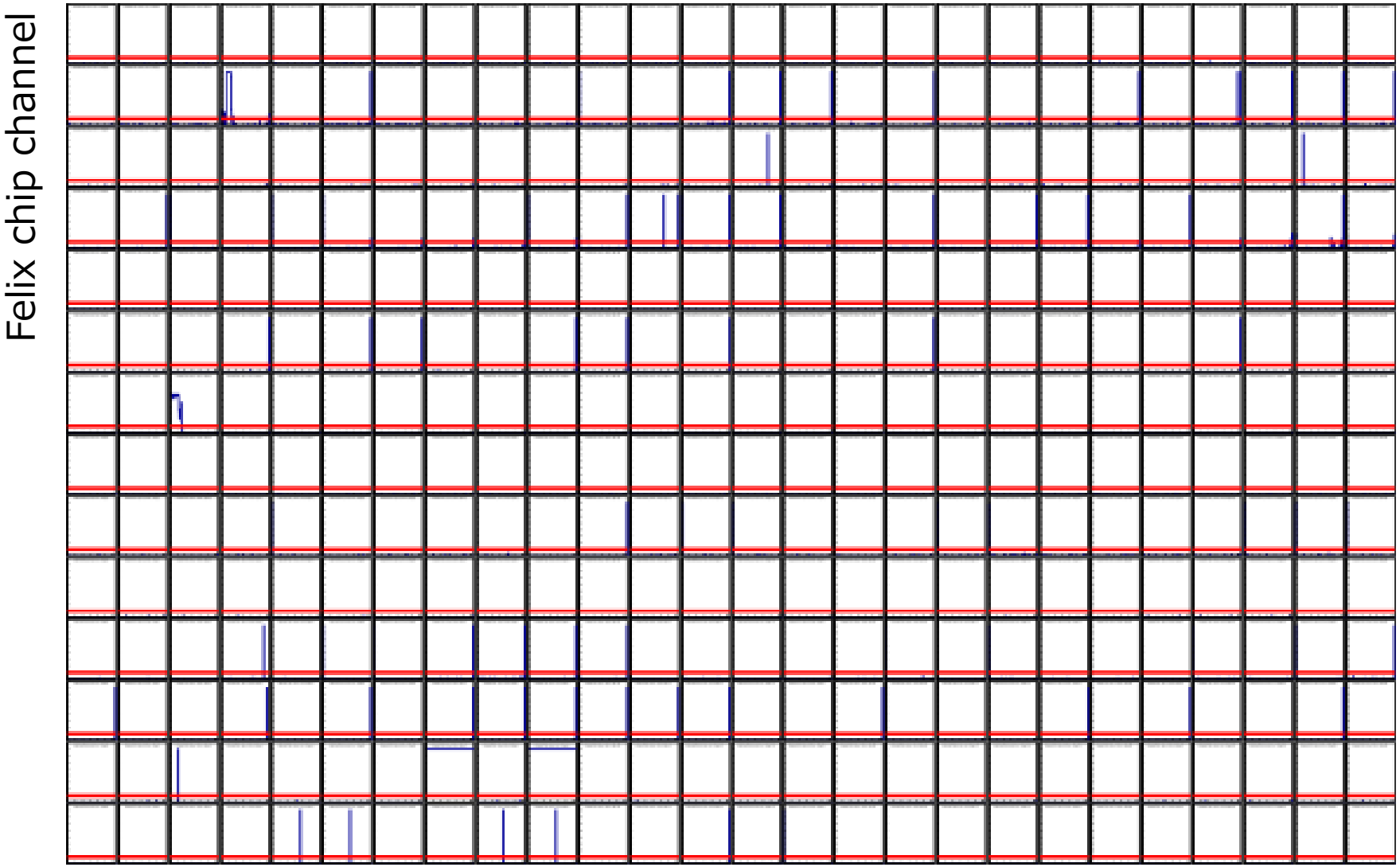
INTT0



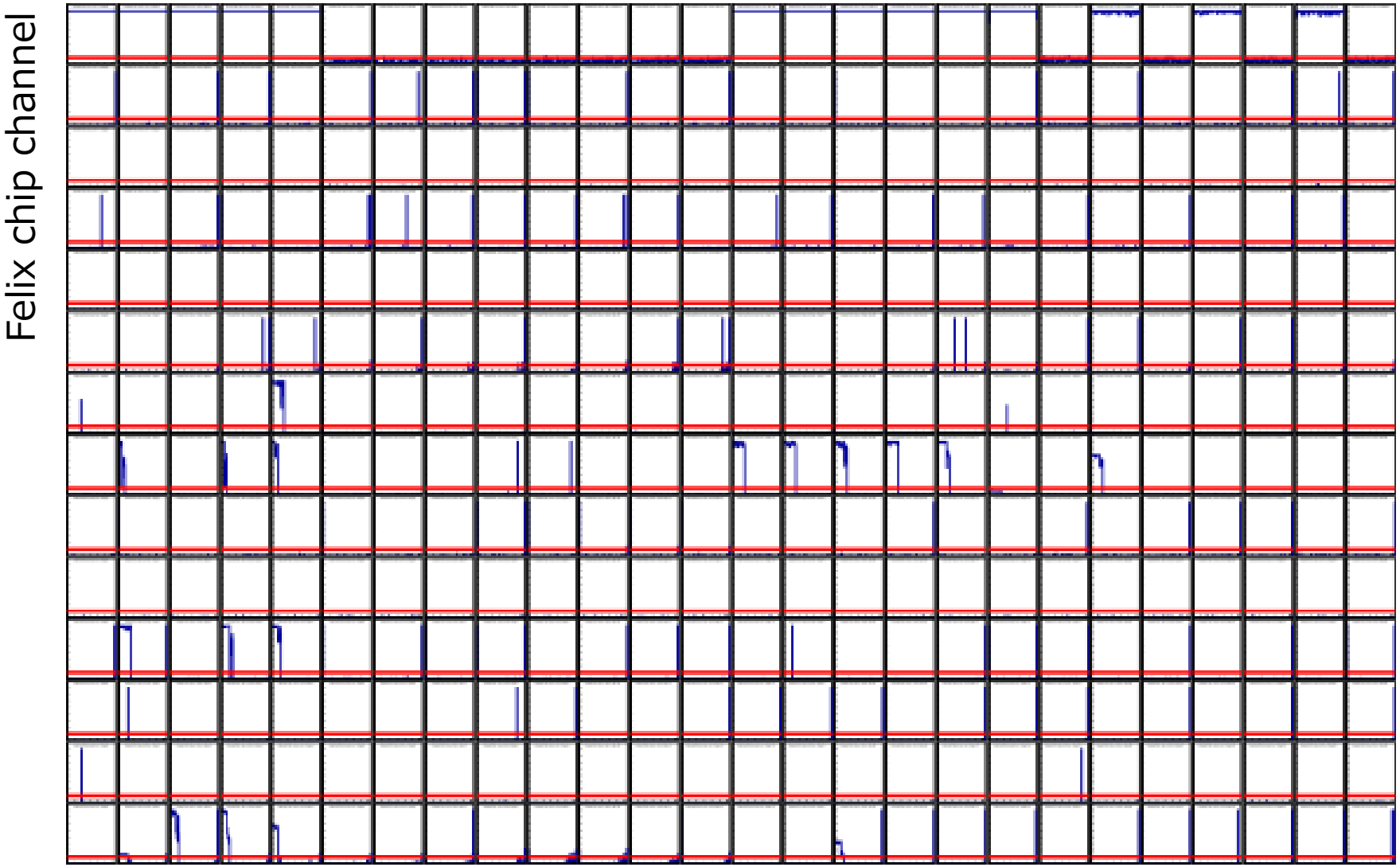
INTT1



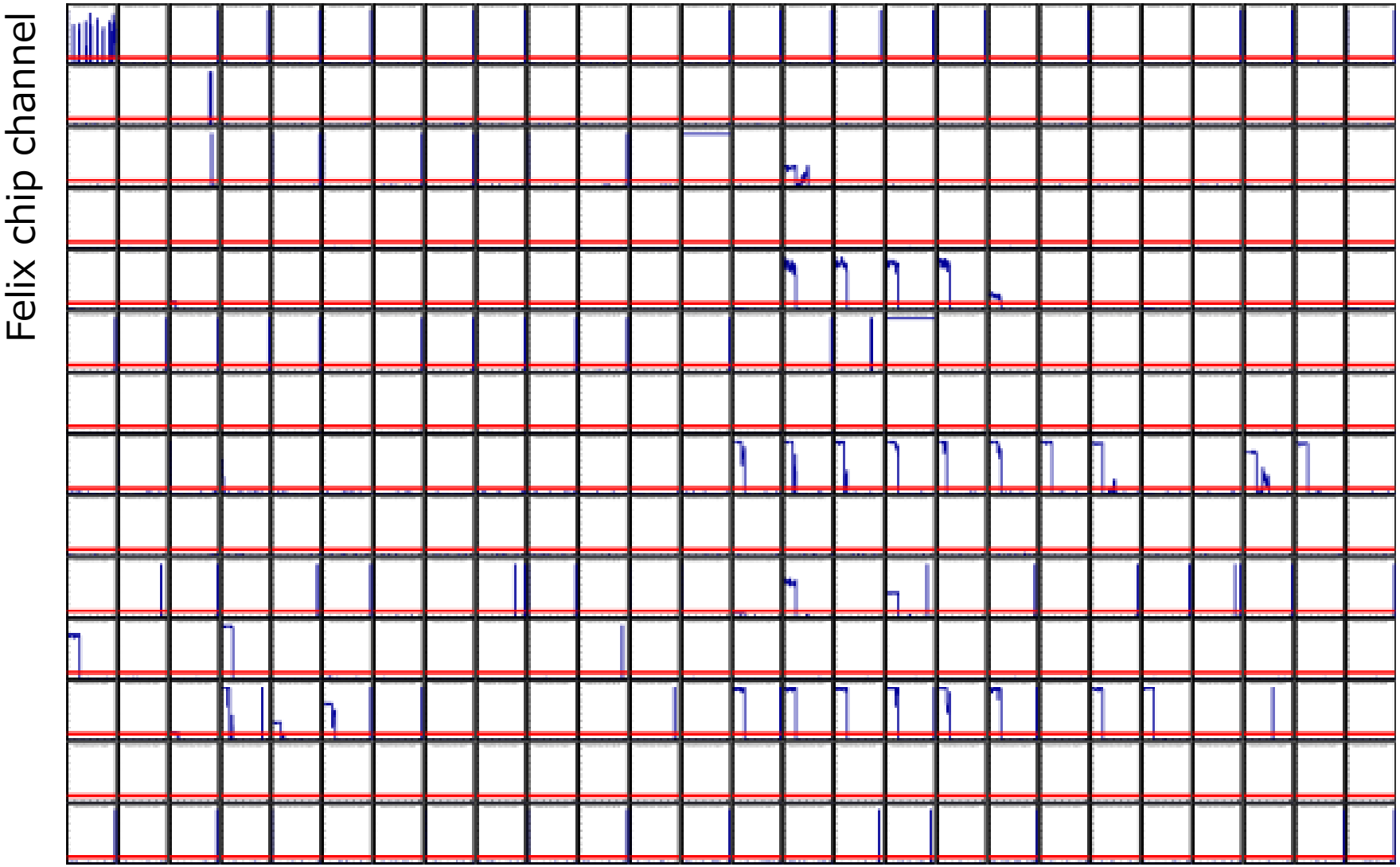
INTT2



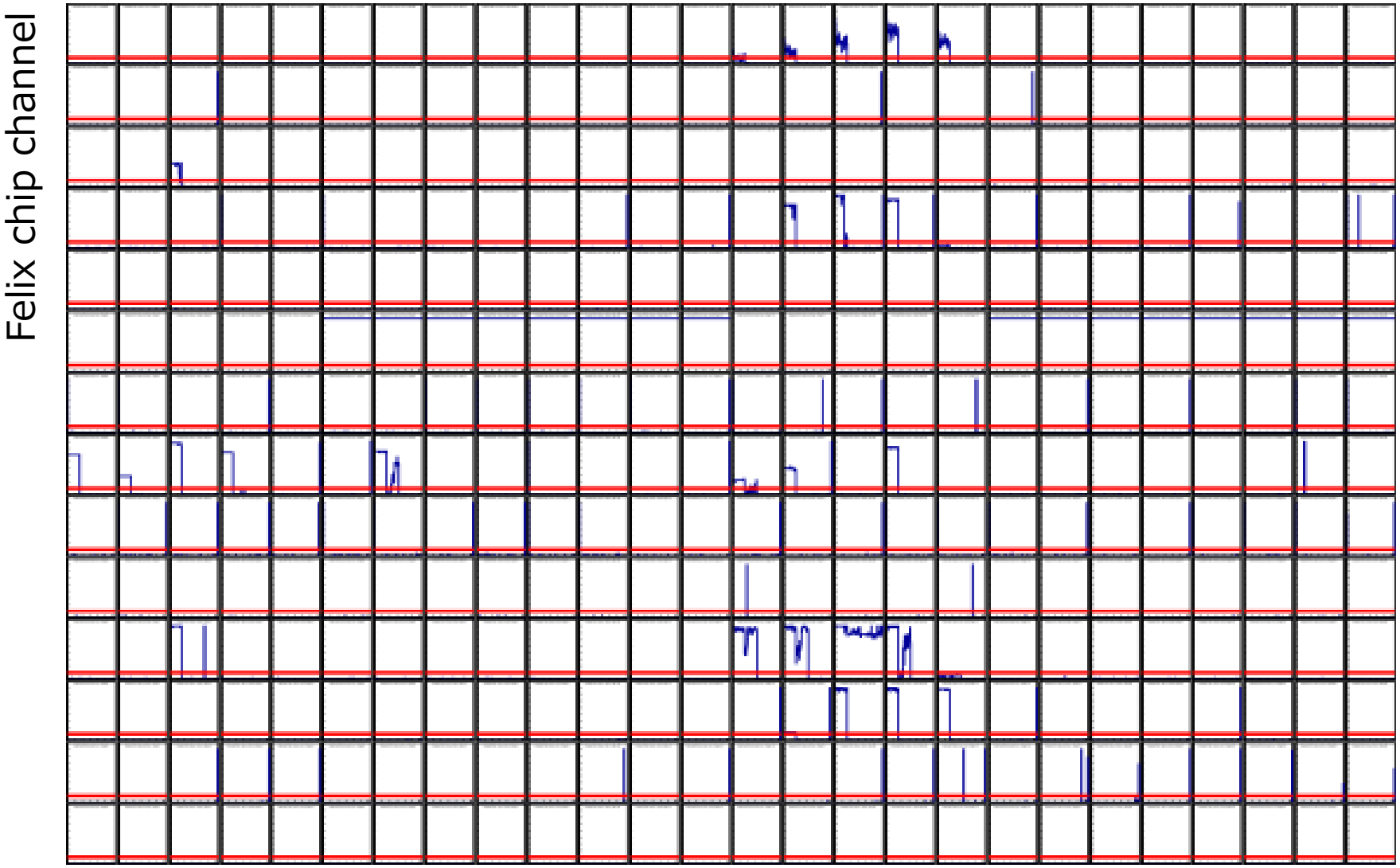
INTT3



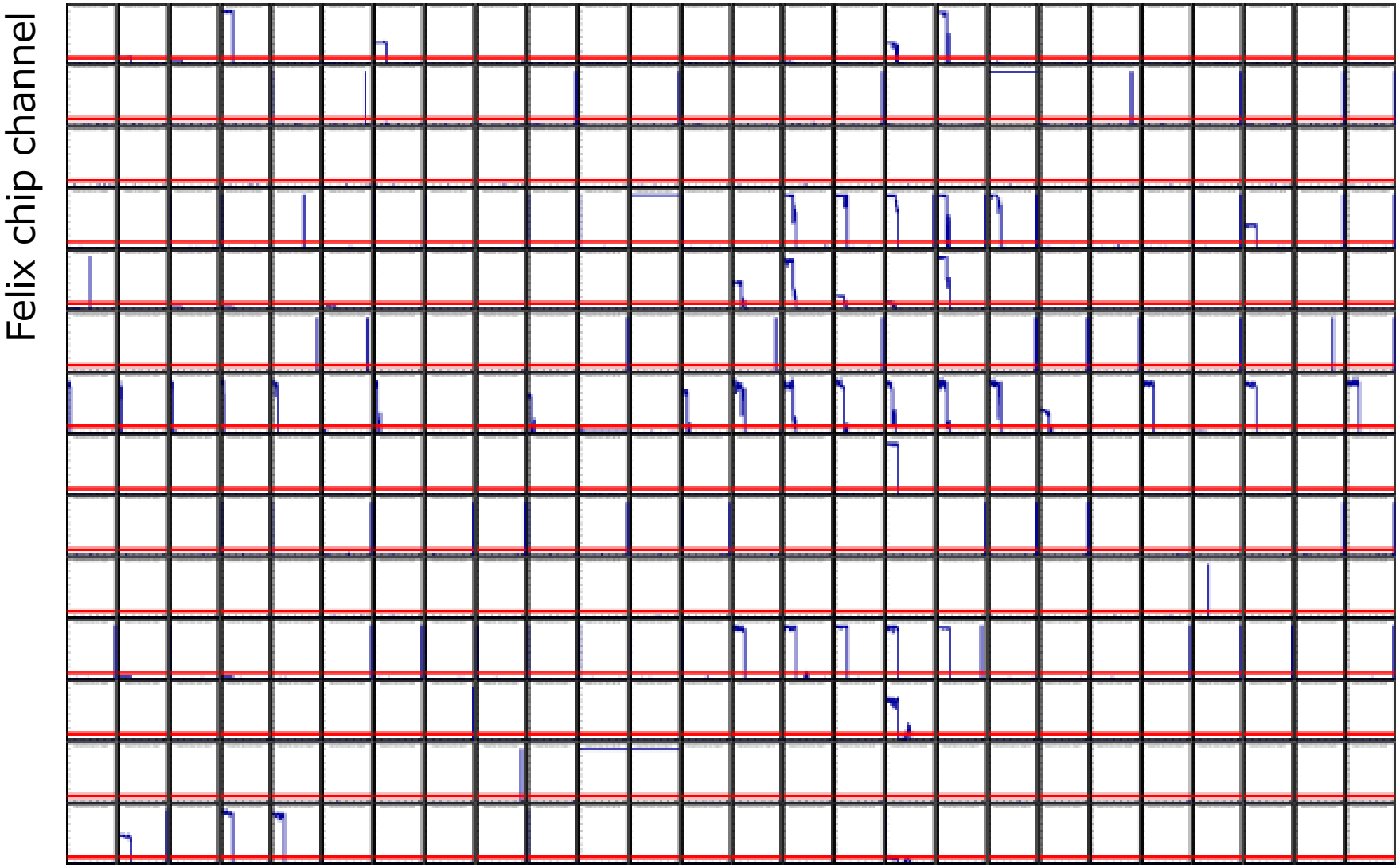
INTT4



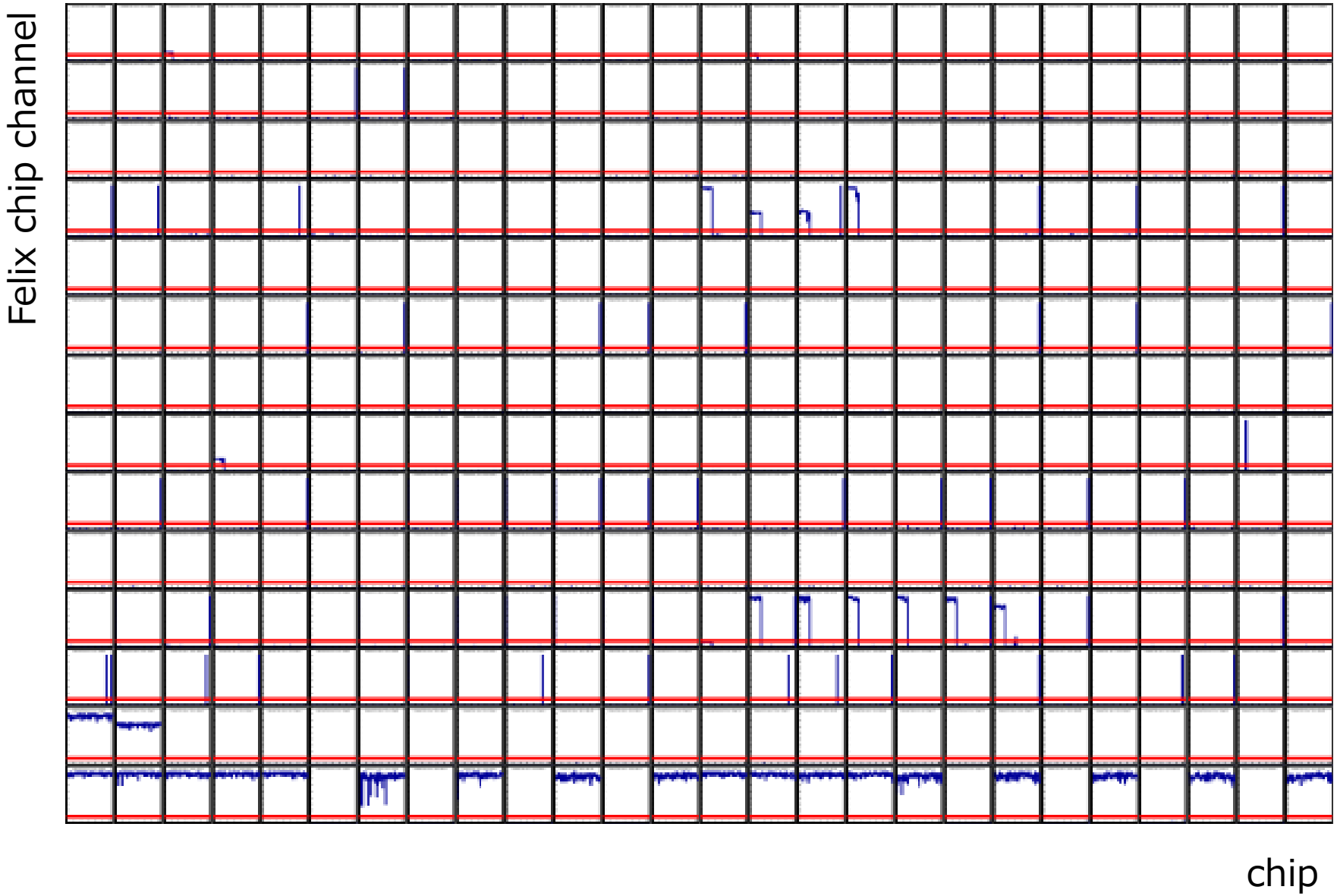
INTT5



INTT6

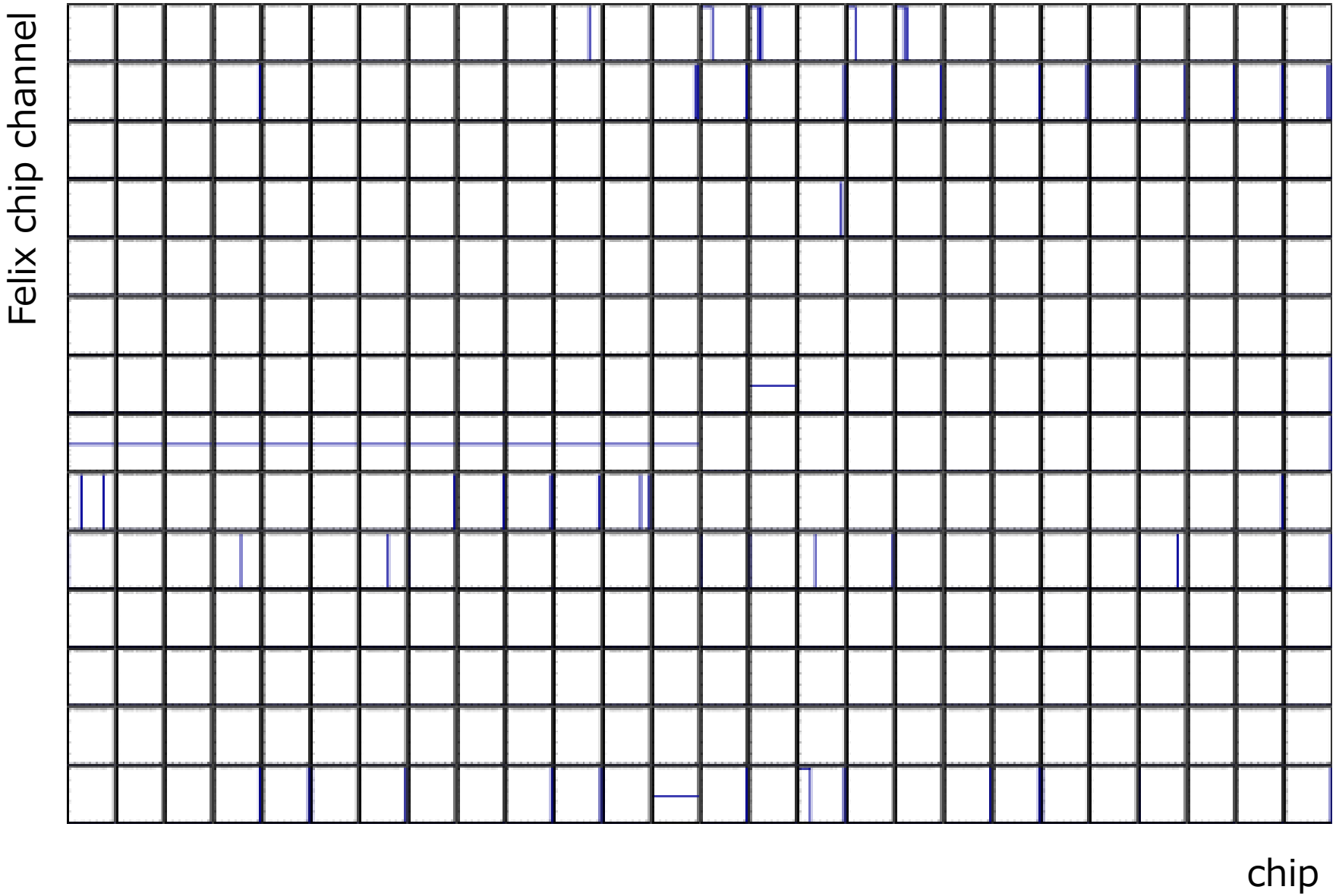


INTT7

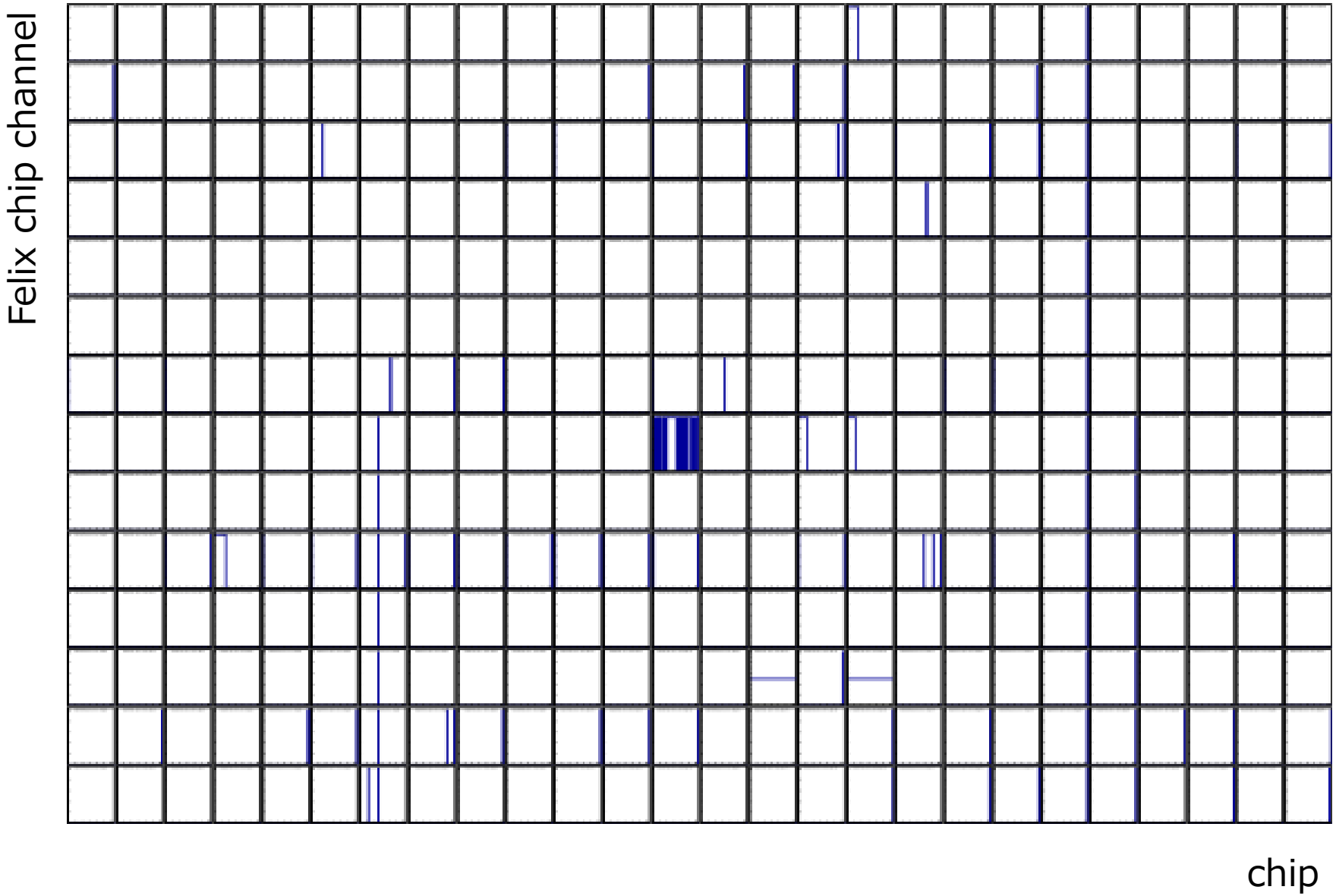


STEP2: The map defines bad channels as those that showed issues in five or more runs.

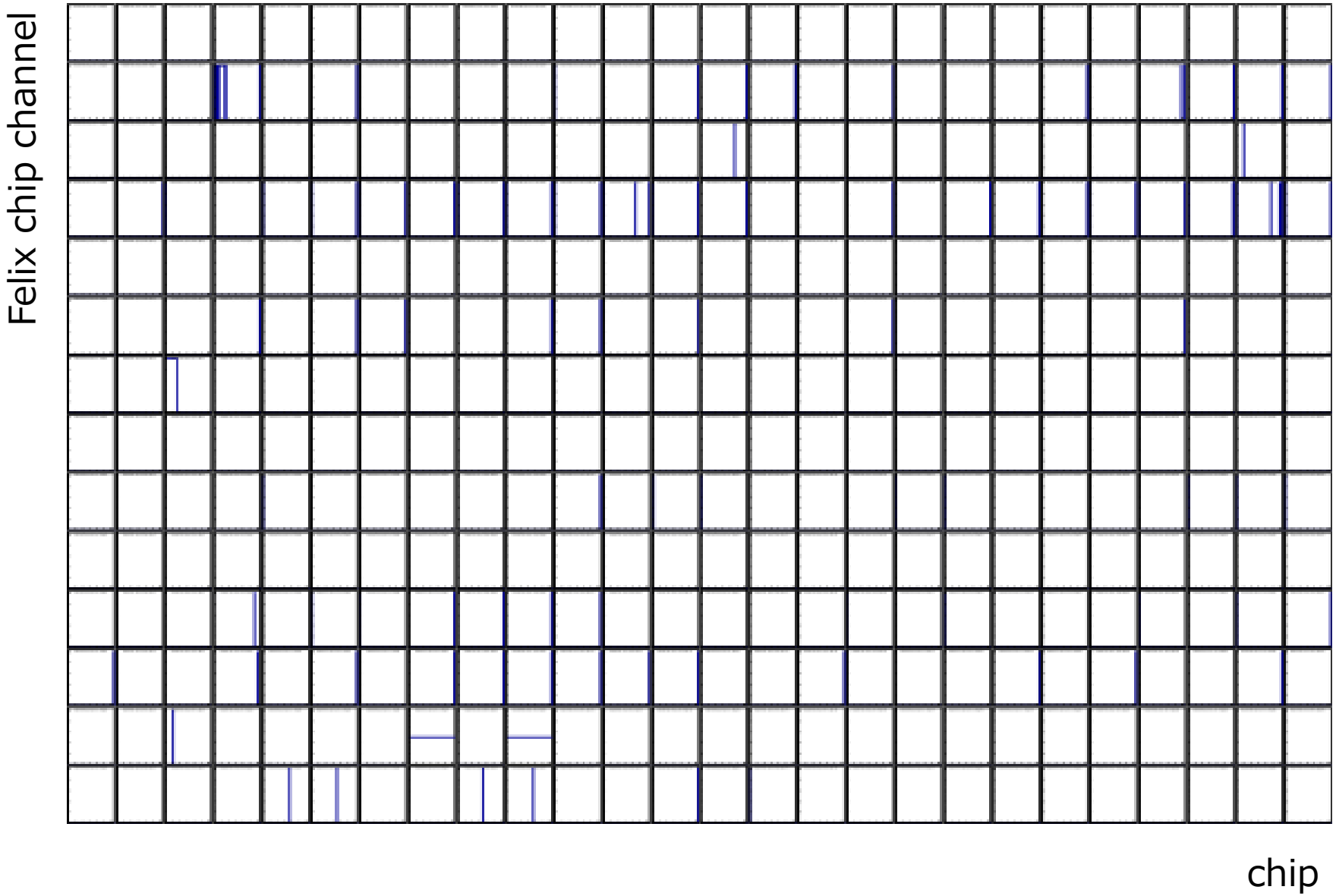
INTT0



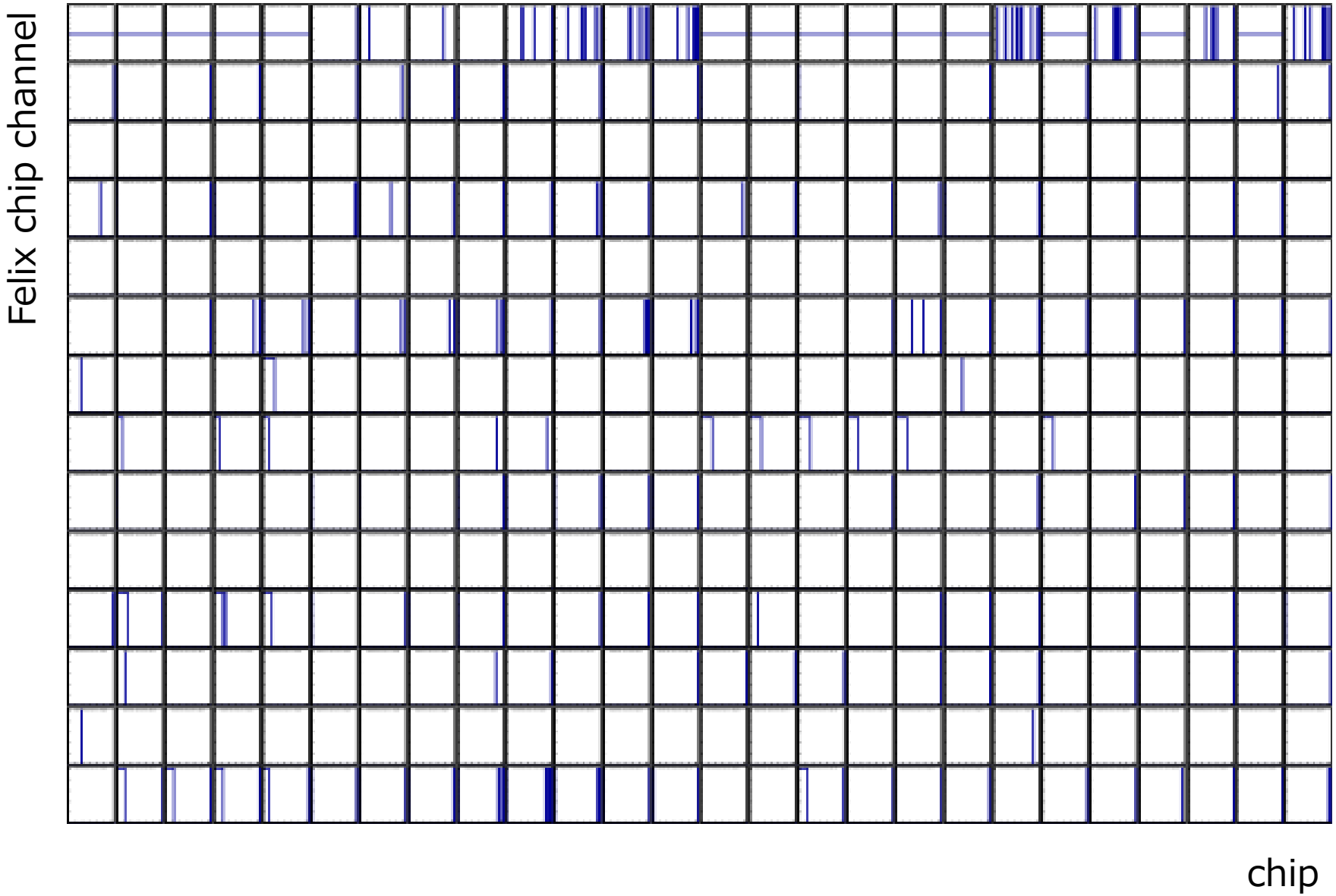
INTT1



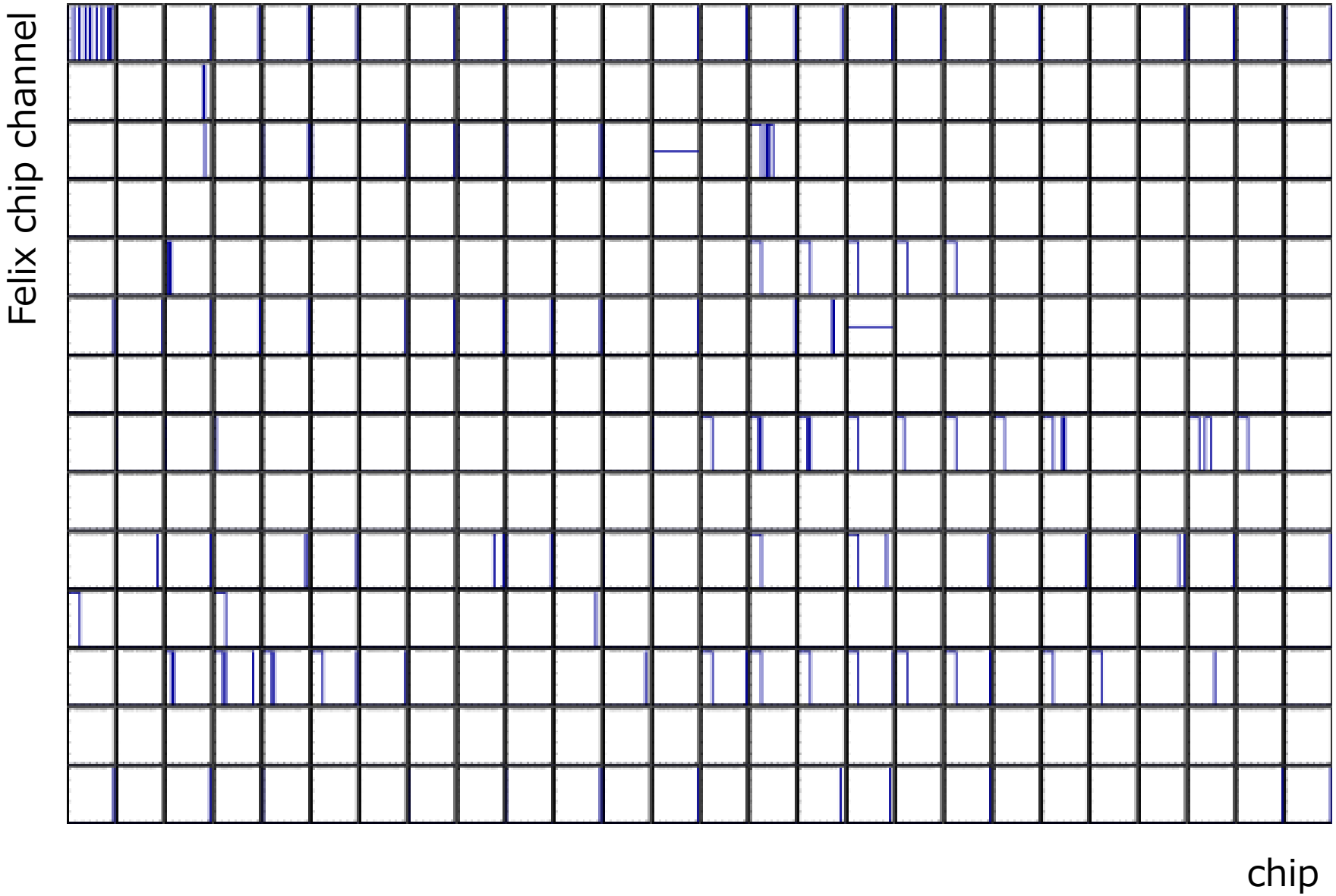
INTT2



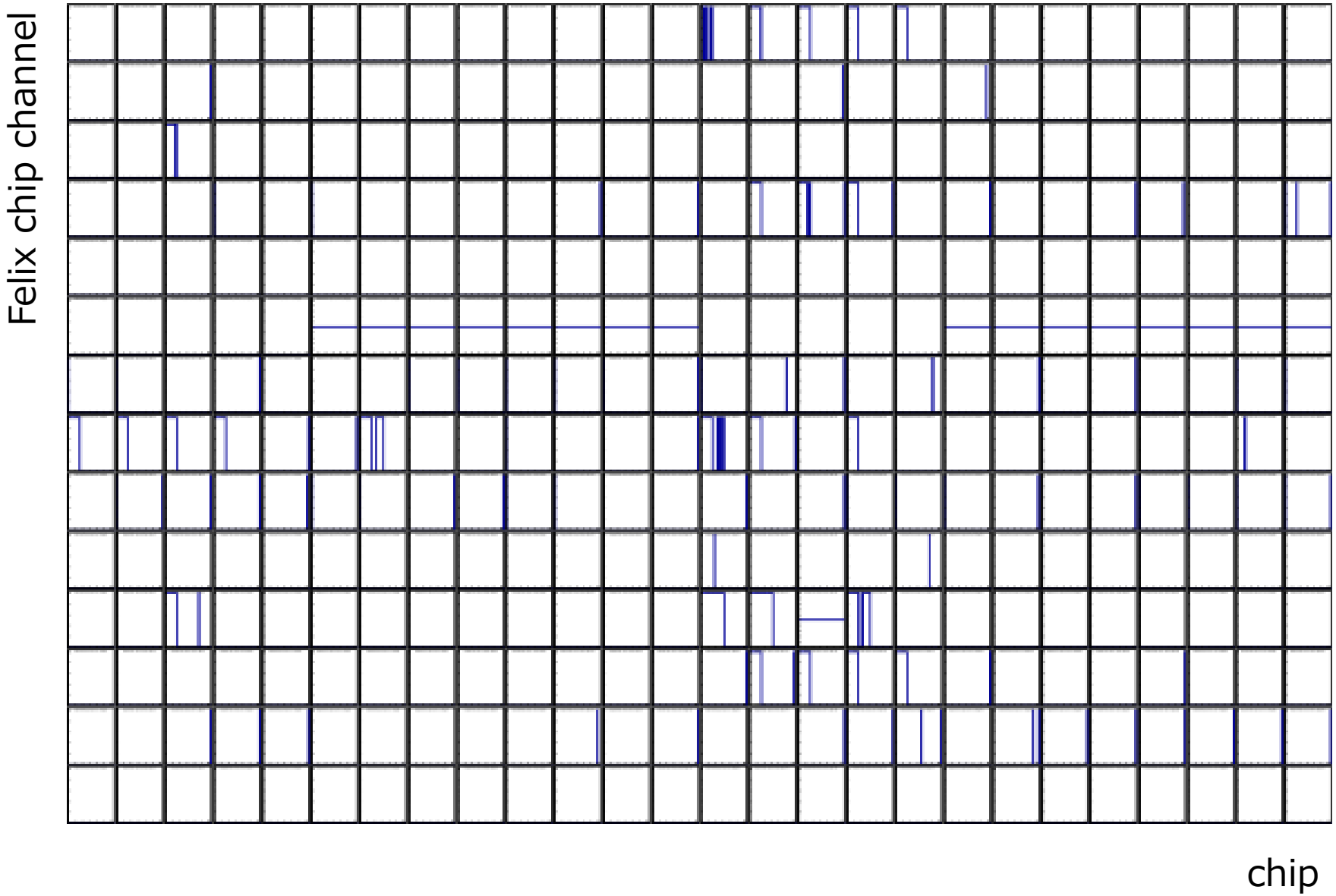
INTT3



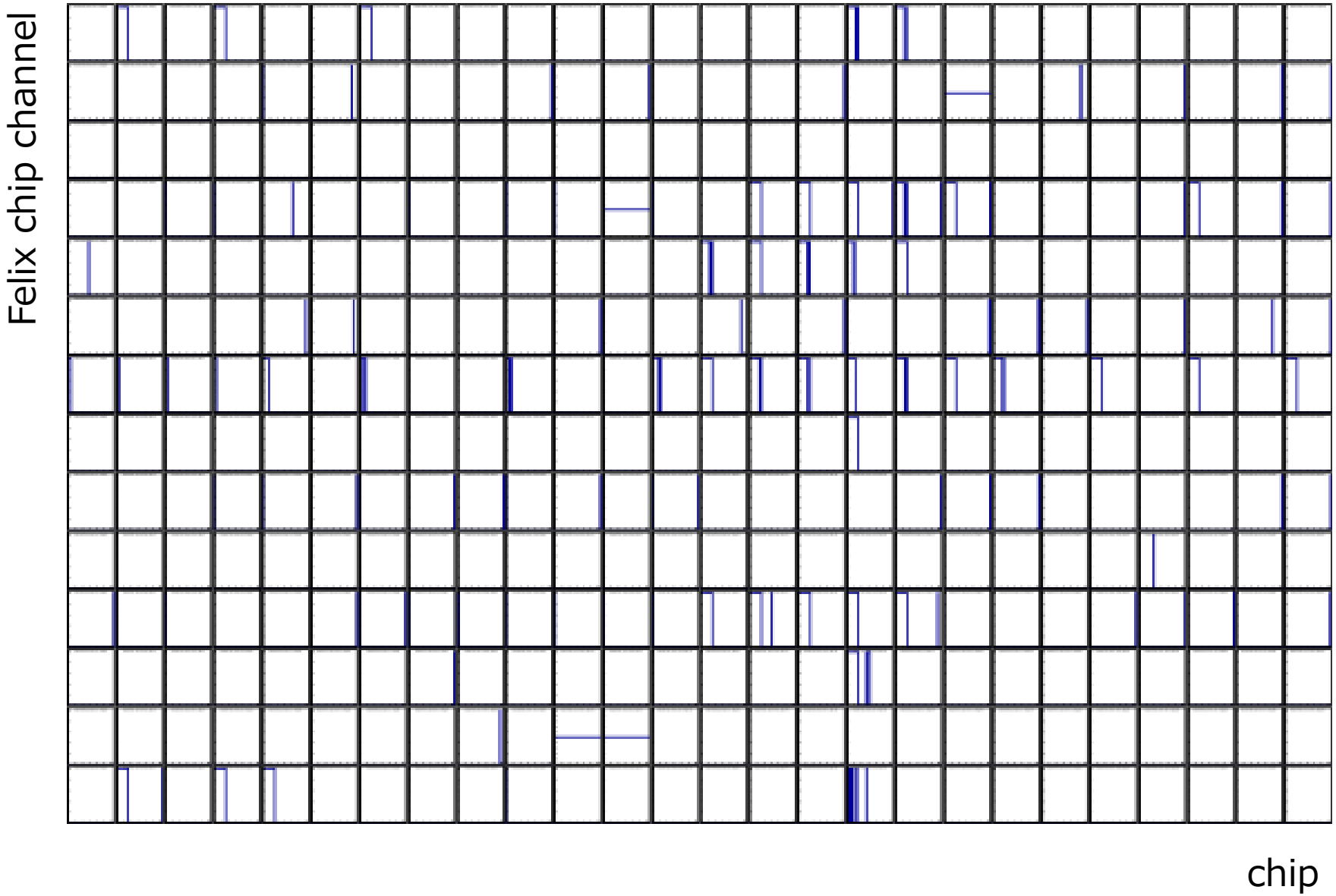
INTT4



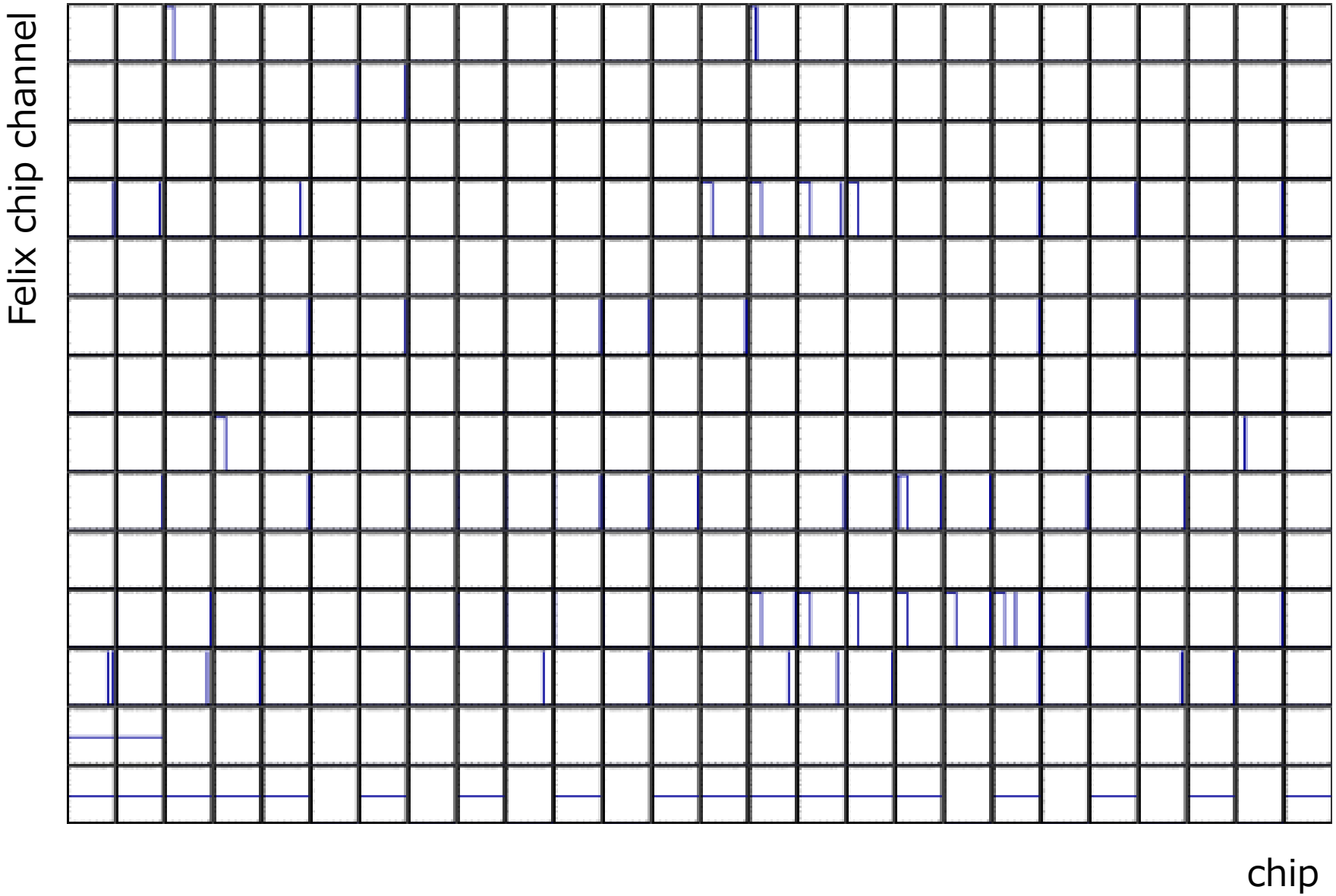
INTT5



INTT6



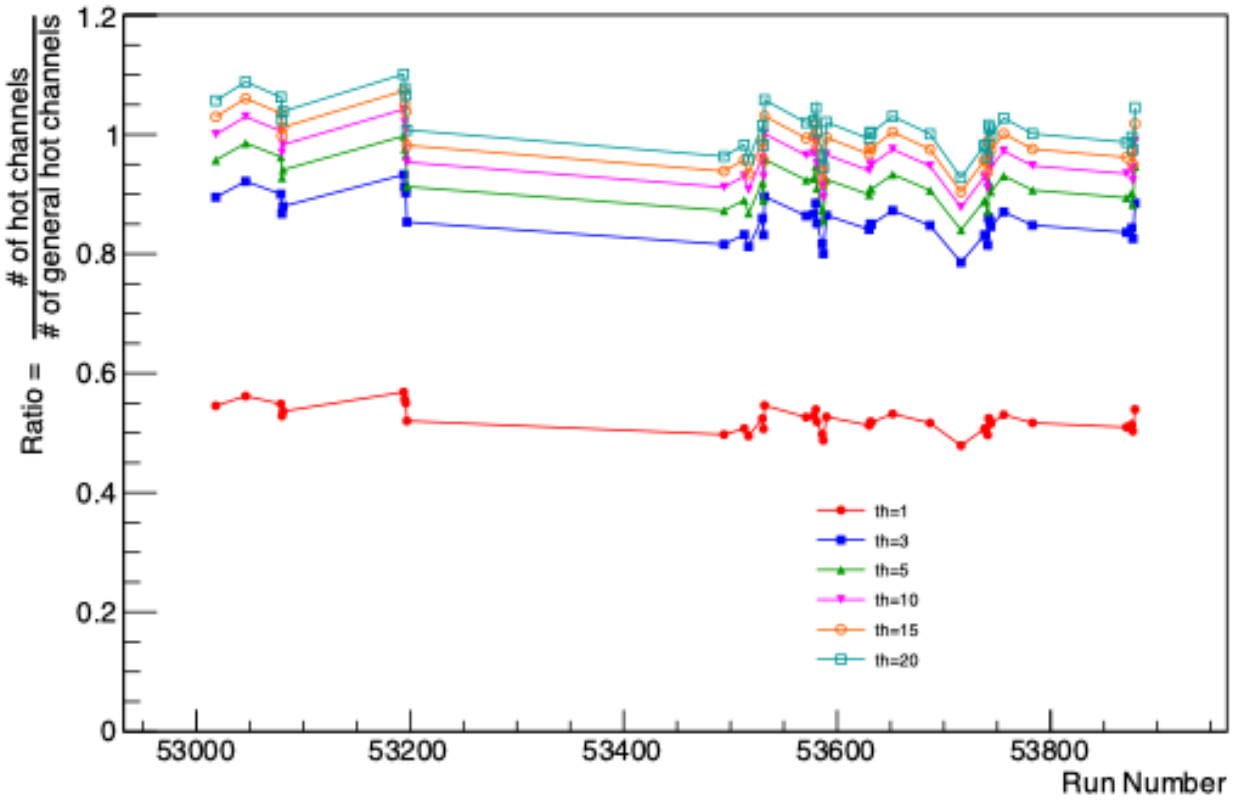
INTT7

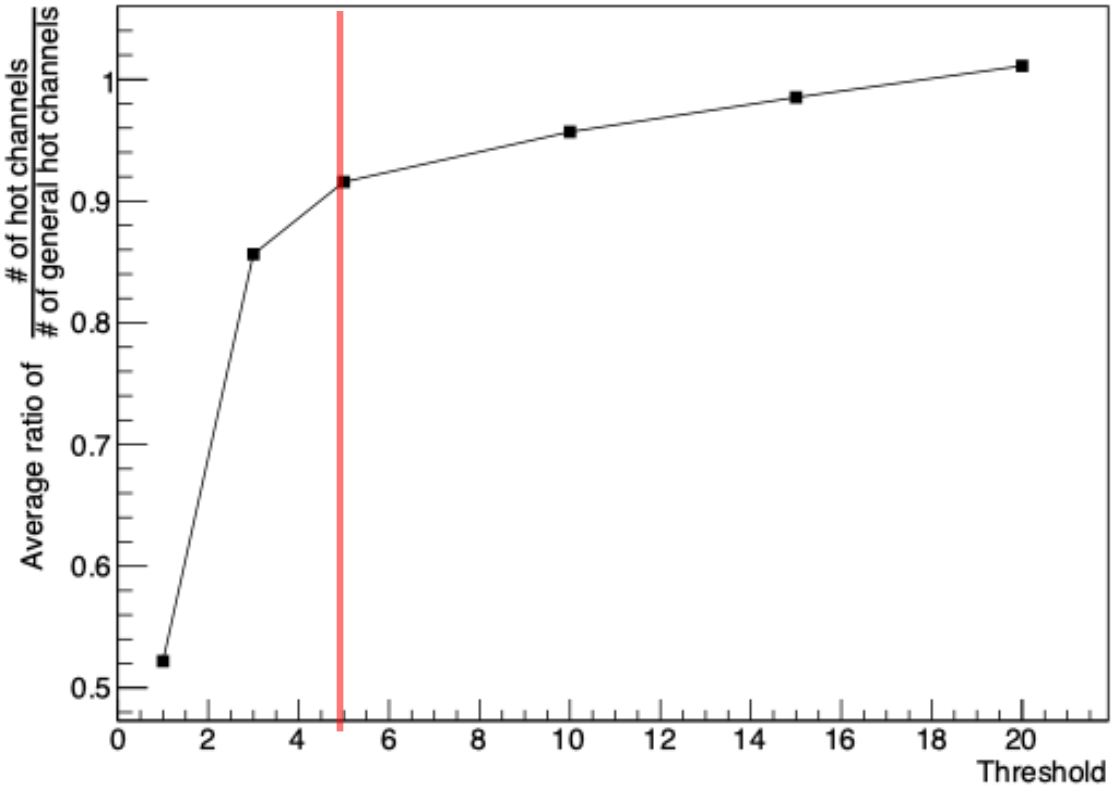


STEP3: The acceptance check

Run-by-Run Comparison with General Bad Channel Map

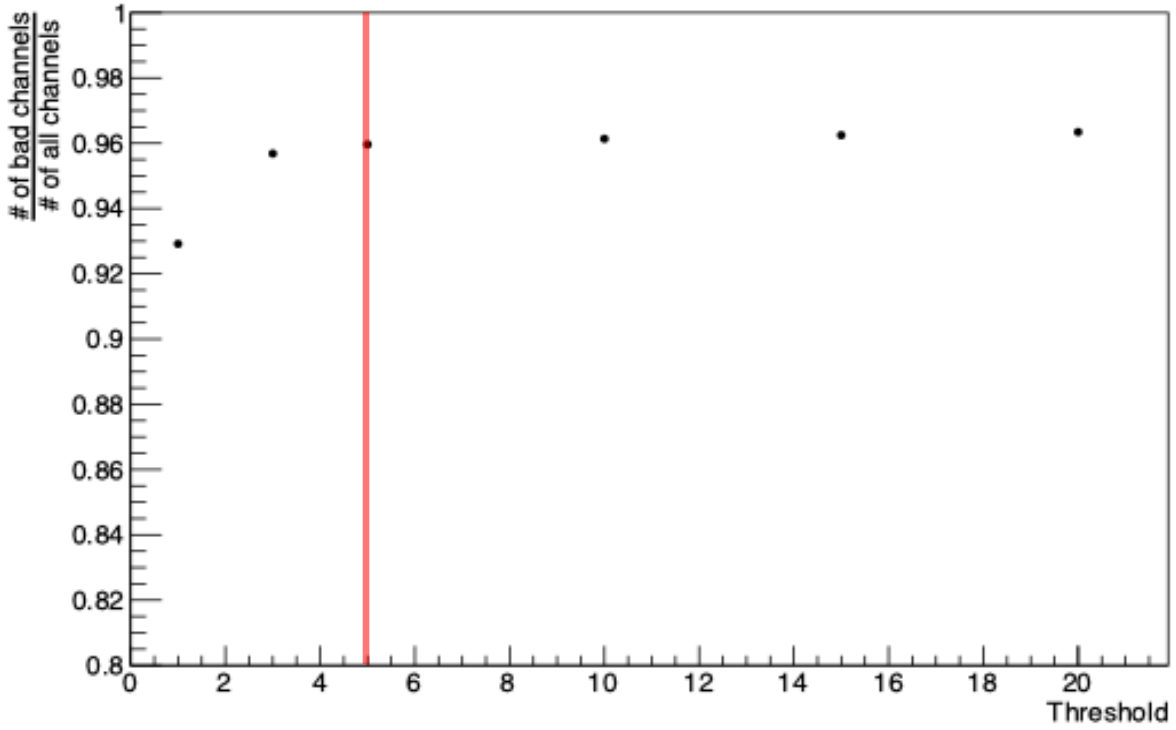
- The ratio between the number of bad channels in each run and the number of bad channels in the newly constructed map.
- The ratio increases as the threshold increases.
  - Most of the bad channels are common across runs, and accidental bad channels that appear in individual runs are relatively few.

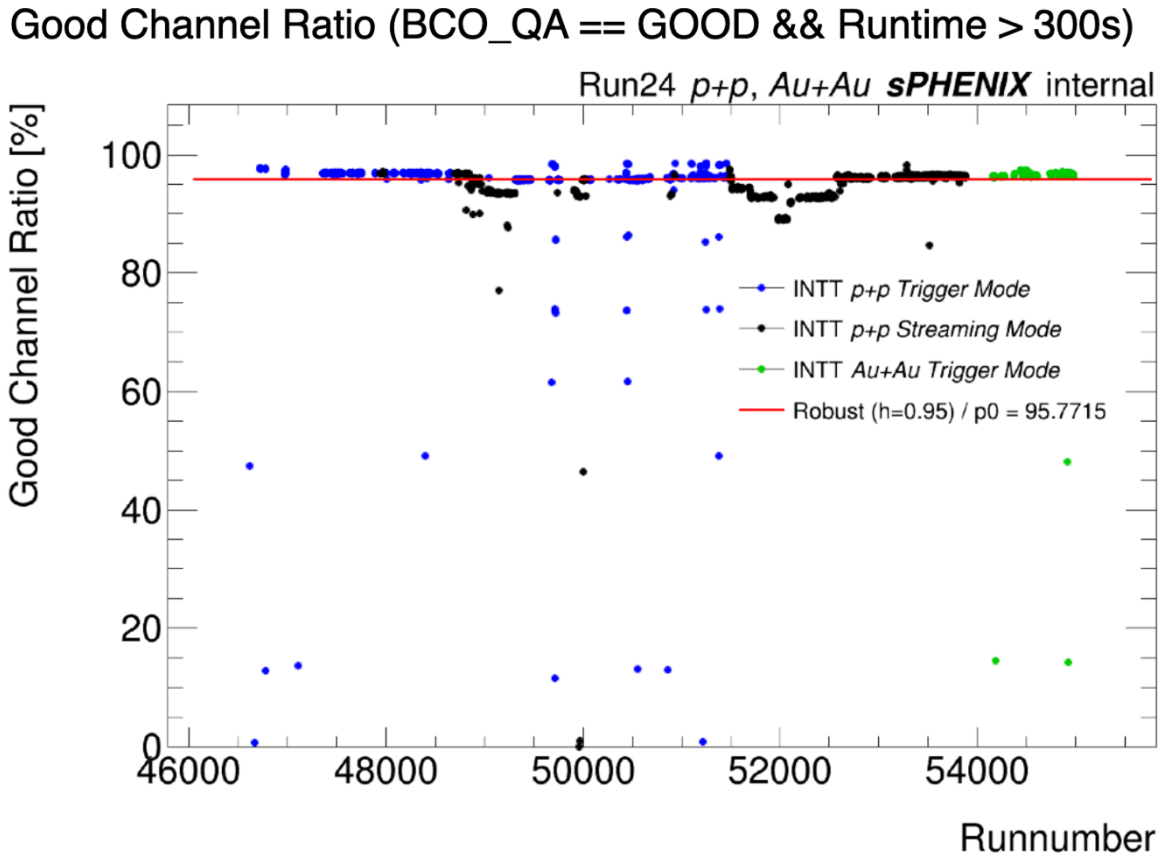




Good channel ratio with different threshold

- With a threshold of five or more, the same 96% of channels is active as in the run-by-run data.





Implementing CDB files in MC

- Joseph updated the BadChannelMap class so that CDB files can be used in MC just like data.
  - https://github.com/sPHENIX-Collaboration/coresoftware/pull/3735

Summary

- Created an INTT hot channel map for MC based on 40 recently produced runs.
- Channels flagged as hot in ≥5 runs
- With threshold = 5:
  - ~90% of run-by-run hot channels are captured
  - 96% of all channels remain active (same as per-run average)
- Joseph updated the BadChannelMap class so that CDB files can be used in MC just like data.
  - I also discussed with Joe.