Analysis Plan during INTT workshop

Name : Jaein Hwang
Institution : Korea Univ.

- Analysis topic

  Calibration and focusing on QA

- Current knowledge/status of this topic

  1st Bad channel determination algorithm is ready/placed in coresoftware

  BCO calibration files are available

  Some scripts to load/save from/in psql database ready

- Goal for the workshop

  1. Make documentation(analysis note in sPHENIX invenio) for next potential manager/users (Takahiro)

  (DONE) WiKi documentation and README.md files used instread of invenio

  2. Getting information from current analysis module and put them in QA database
     1).Run length (Jaein/Takahiro) **(DONE)**
     2).Acceptance (Jaein/Takahiro) **(DONE)**
     3).BCO peak position (Jaein/Takahiro) **(DONE)**
     4).INTT hit rates (Jaein/Takahiro) **(DONE)**

  3. Implement/test algorithm for bad(especially cold) channel determination **(DONE)**

- Milestones to reach to your goal

  1. Dedicated time only for sharing information with Takahiro about current software status

  2. Several trials for new version of bad channel determination -> One promising way is to evaluate hit rate half-ladder by half-ladder

  3. Careful data selection with corresponding criteria

Wiki documentation

Name : Jaein Hwang
Institution : Korea Univ.

https://wiki.sphenix.bnl.gov/index.php?title=INTT_AnalysisWorkshop2024_INTT_Calibrations_(Jaein)

Abstract [edit | edit source]

This project focuses on advancing the calibration module of the INTT. The calibration updates leverage data from the existing Calibration DataBase TTree (CDBTTree) to extract key parameters relevant to detector quality assessment. Using these parameters, a PostgreSQL database tailored for expert QA analysis has been designed and implemented. This database enables efficient storage, and analysis of critical calibration metrics such as BCO standard deviations, peak values, bad channels, and hit rates.

Materials [edit | edit source]

- Plan presentation

Goal [edit | edit source]

1. **Documentation Creation**
2. **Extract Information from Current Analysis Module**:
    1. Run length analysis
    2. Acceptance evaluation
    3. BCO peak position identification
    4. INTT hit rate calculation
3. **Algorithm Development**: Implement and test algorithms for identifying bad channels, with a focus on cold channels.

Analysis method [edit | edit source]

- **Run length**, **number of events**, **dead channels**, **BCO alignment**, and **hit rate** are the primary QA items.
- Run length and number of events are loaded from the PostgreSQL database (database name: **daq**).

Wiki form follows Akitomo's template to ensure unity of each person

- Abstract
- Materials
- Goals
- Analysis method
- Analysis code and data
- Result

Code available on GitHub with README.md

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Code related to database
https://github.com/sPHENIX-Collaboration/INTT/tree/main/general_codes/Jaein/QA_database

INTT / general_codes / Jaein / QA_database / ↑ Top

README.md

Database Scripts

This directory contains scripts for processing and analyzing data related to the sPHENIX experiment. Below are descriptions of the main scripts:

put_in_database.py

This script processes run files and inserts relevant data into the database.

Functions

- `get_run_events()` : Queries the database for run events of type 'physics'.
- `insert_data(runnum, dead_count, runtime, bco_stdev, bco_peak)` : Inserts processed data into the `intt_qa_expert` table.
- `process_run_file(hot_file_path)` : Processes a run file to count dead, cold, and hot channels.
- `process_bco_file(bco_file_path)` : Processes a BCO file to calculate the standard deviation and peak of BCO differences.
- `calculate_runtime(brtimestamp, ertimestamp)` : Calculates the runtime of a run in minutes.
- `main()` : Main function that orchestrates the processing of run files and insertion of data into the database.

README.md also uploaded in the Github which allows people to understand the code relatively quickly

Main author : Takahiro/Jaein

- put_in_database.py
Load the QA info from other psql database(like daq, spin) and put into intt_qa_expert database(see next slide)

- make_plots.py
Load the QA info from intt_qa_expert database and draw several histograms by PyROOT

Load Map of intt_qa_expert database

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Code related to database
https://github.com/sPHENIX-Collaboration/INTT/tree/main/general_codes/Jaein/QA_database

DAQ PSQL database
Runnumber;
start/end run time,
# of gl1 events, runtype

CDBTTree
Include DeadChannelMap and BCO Timing Offsets
created by InttCalib.cc/h modules

put_in_database.py
Load the QA info from other psql database(like daq, spin) and put into intt_qa_expert database(see next slide)

Intt_qa_expert PSQL database
Runnumber, run-duration, # of DeadChannel, BCO Offset/Standard Dev

make_plots.py
Load the QA info from intt_qa_expert database and draw
several histograms by PyROOT

Plots/TTree

Intt_qa_expert database

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- Runnumber
- Runtime
- bco_stddev
- Bco peak
- Hitrate[0-7] : Gaussian mean extracted from hit-rate fitting ; intt[0-7]

```
0.0001290535596606914635
intt=# select * from intt_qa_expert;
 runnumber | runtime | bco_stddev | bco_peak | deadch |        hitrate0         |        hitrate1         |        hitrate2         |        hitrate3         |        hitrate4
-----------+---------+------------+----------+--------+-------------------------+-------------------------+-------------------------+-------------------------+-------------------------
     40874 |       3 |    23.8413 |       48 |   5022 |  0.0001344834493127025  |  6.453383636926052e-05  |  0.0001603636394721502808  |  5.054889690965099e-05  |  0.0001234295332592515 2
     40875 |       0 |    31.0223 |       40 | 142340 |                       0 |                       0 |  0.0001543568676704477 2  |  5.214234027840953e-05  |  0.0001247139249489031 2
     40876 |       7 |    28.9279 |       80 |   4931 |   5.08898186752655e-05  |  0.0001365903015272073 8  |  0.0001198582961273034 5  |  5.321386277632859e-05  |  0.0001234178355429715 8
     40877 |       4 |    15.5109 |       55 |   4890 |  0.0001225408743965993 2  |  0.000123030407276529 5   |   6.27475523503712e-05  |  0.0001304517288266950 3  |  0.0001243271856780483 5
     40878 |       9 |      11.82 |       40 |   4999 |  0.0001108562237637103 8  |  4.0192742205736944e-05  |  0.0001145113434579486 7  |  0.000114377545704601 7   |  0.0001032777663005077 6
     40879 |       3 |    10.7646 |       40 |   4889 |  0.0001369136919738386 2  |  6.321120434455013e-05   |  0.000133713876287421 5   |  0.000137267467308166 2   |  0.0001232178660921394 8
     40880 |       0 |    28.9447 |       80 |   4968 |  4.730235621930479 5e-05  |  0.0001324860663353608 3  |  0.0001184441020303951 9  |  4.901525465092983e-05  |  0.000119871966517561 4
```

Plan to do (from status presentation)

Name : Jaein Hwang
Institution : Korea Univ.

- **Checking hot channel algorithm with pp data is ongoing - Done**
- Condor run was not successfully done, need to check details in memory leakage - **Done**
- Plotting QA items and want to discuss about the criteria. – Working in progress but can see plot soon
- Will upload our(Jaein / Takahiro) code in github with documentation in wiki **Done**

Plan to do (from stauts presentation)

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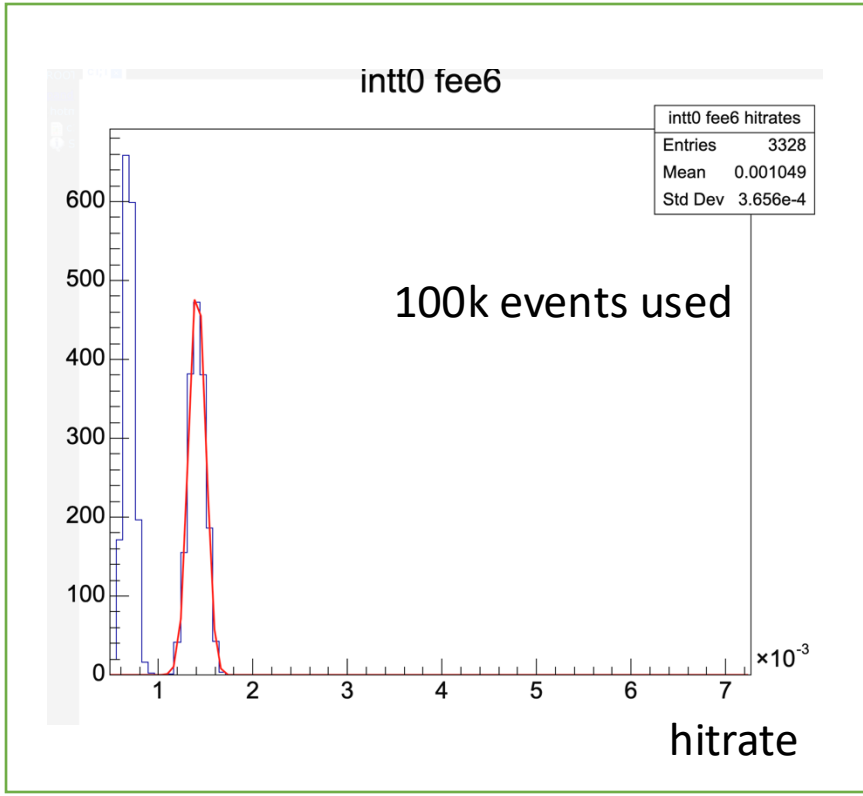
- **Checking hot channel algorithm with pp data is ongoing -> Done**

Distinct half entry chips observed can be separated in hitrate distribution



Even in pp run, Half ladder by ladder fitting also successfully performed.
Feasibility of the current code for both pp is getting promising

Plan to do (from status presentation)

Name : Jaein Hwang
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- **Condor run was not successfully done, need to check details in memory leakage -> Debugging is done**

Status

https://indico.bnl.gov/event/25716/contributions/99897/attachments/58811/100986/ProductionUpdate.pdf

- After some debugging, we discovered that the production scripts were not setup properly and were not running the GL1+subsystem combining
- This has been fixed, and a few test jobs were submitted over the weekend
- Good news:
  - TPC still runs at 40-50 Hz per 2 packets, most jobs churn along at 2 GB memory in a few test runs
- Bad news:
  - Need to reevaluate the silicon timing. There are still large jumps in memory for some runs (despite last weeks fixes), which need to be debugged
- Started implementing parallelized hit unpacking + clustering workflow

In last O2O meeting 26 Nov. Joe Osbron reported about production status

Huge memory jumps(leakge) observed

Temp. solution for Calibration study
Calibration modules does not have strong dependence on production's details.

Now, ~10k condor with old build(ana.443) is running for scanning Run 24 physics runs

Plan to do(cont.)

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- Plotting QA items and want to discuss about the criteria. – Working in progress but can see plot soon

- Keeping help Takahiro for calibration jobs, but want to switch my gear to thesis analysis

  1) Silicon + Calo matching study

  2) Charged hardron A_N

Gain of workshop

Name : Jaein Hwang
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- Rapid discussion between other students help me debug/improve the Calibration modes (especially with CW)

- Calibration code Review with Takahiro

- strengthen relationship with new students will definitely help boost next year INTT operation and analysis and so on

- Several Physics/reviews talk (Thanks to every speakers again!)

- Documentation (Thanks to Akitomo)

BACKUP

Hot Channel determination update

Name : Jaein Hwang
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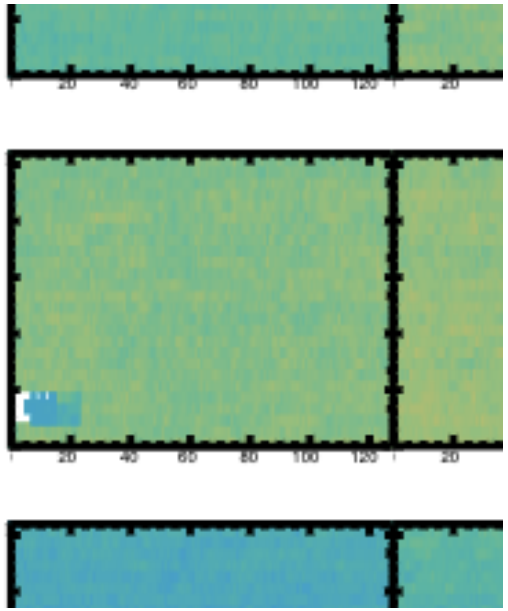
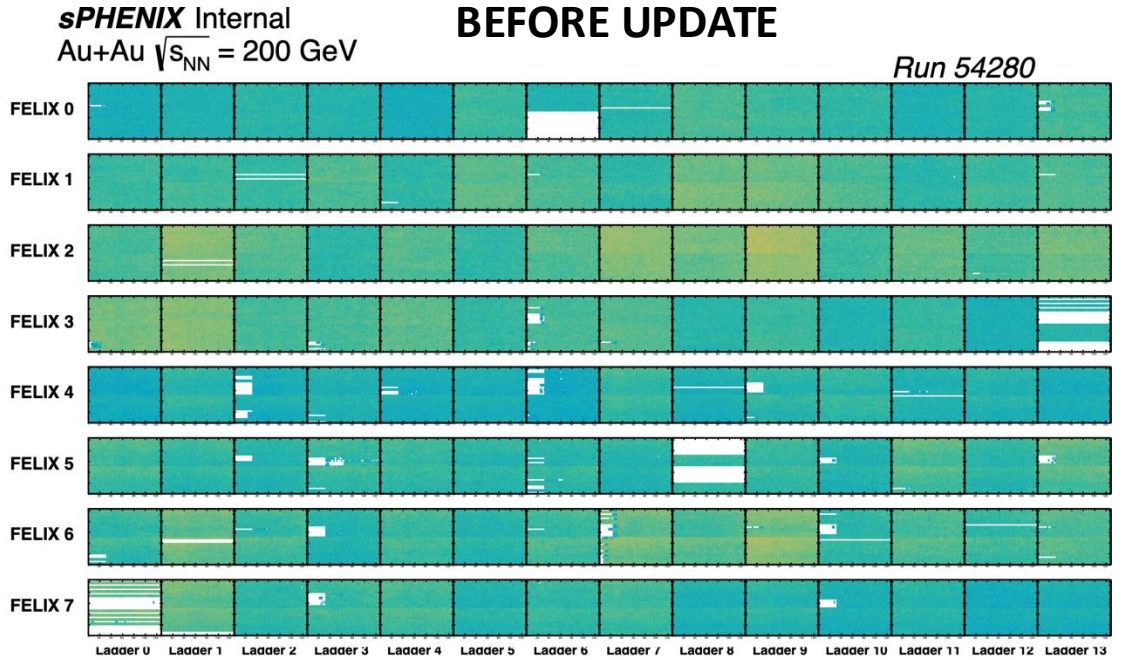
- Last INTT meeting
  Algorithm needed update to detect cold channels more efficiently

BEFORE UPDATE

FELIX 3





Hot Channel determination update

Name : Jaein Hwang
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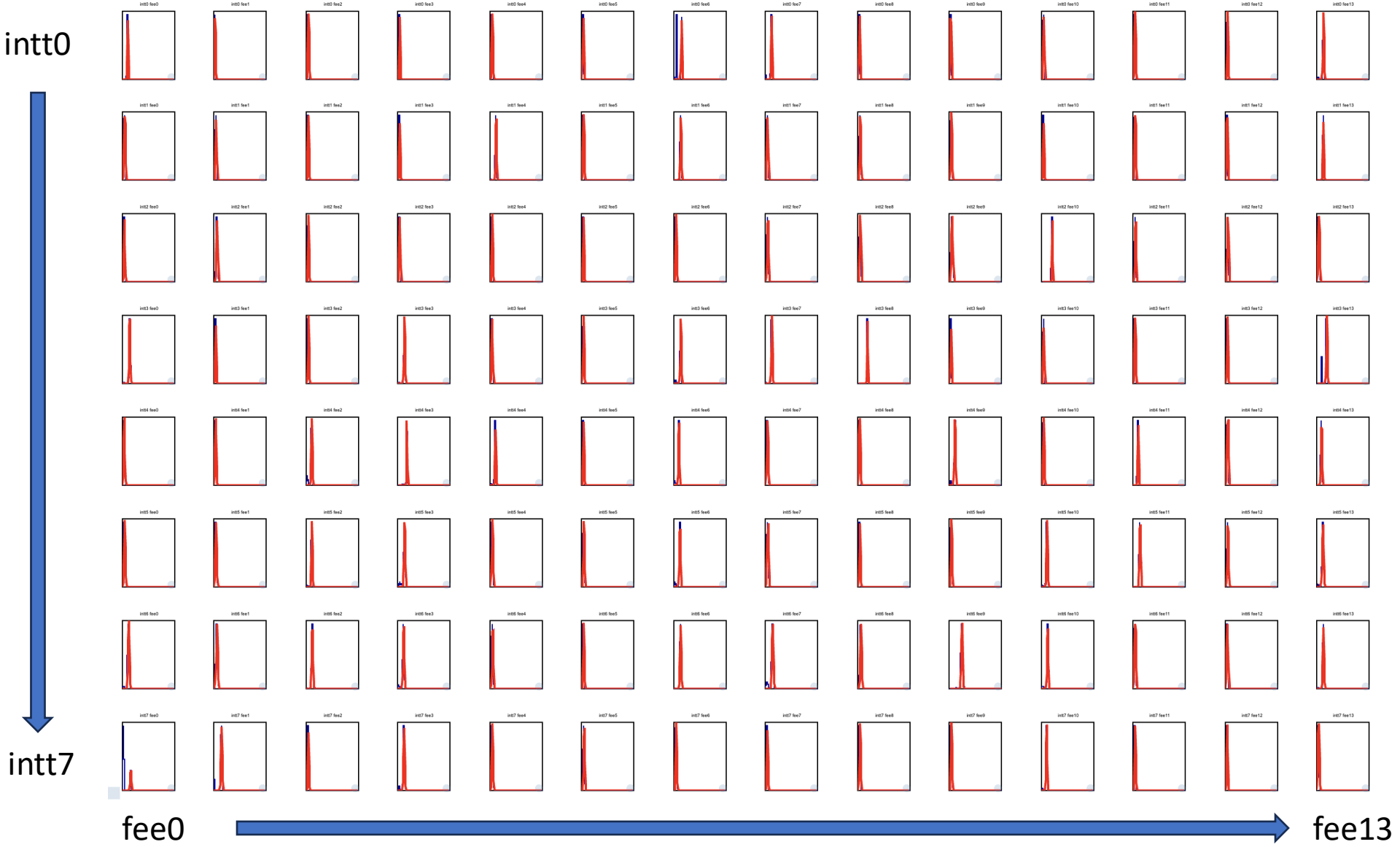
- Do half-ladder by half-ladder fitting(update)



Hot Channel determination update

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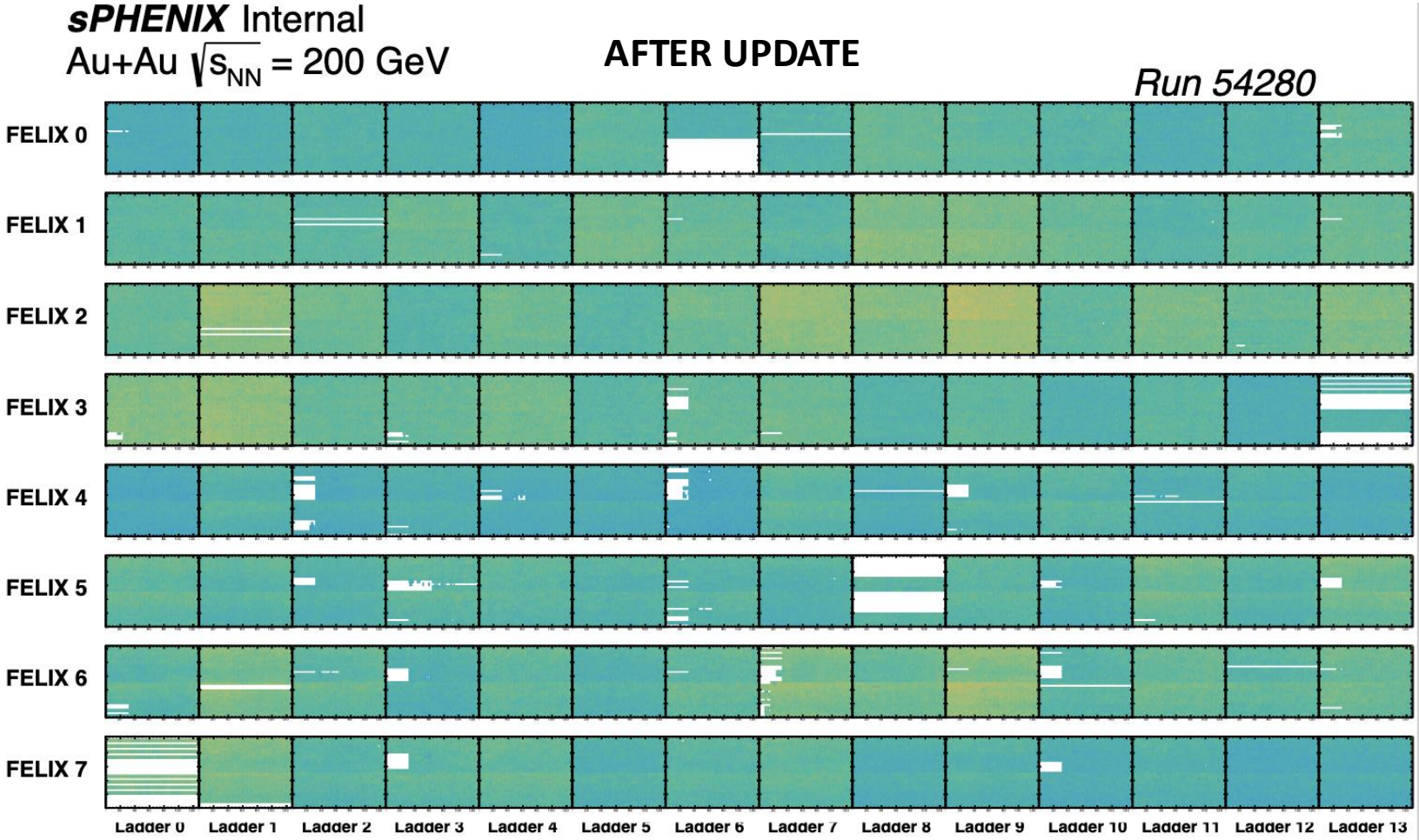

3.9% as bad channel
96.1% as good channels

Hot Channel determination update

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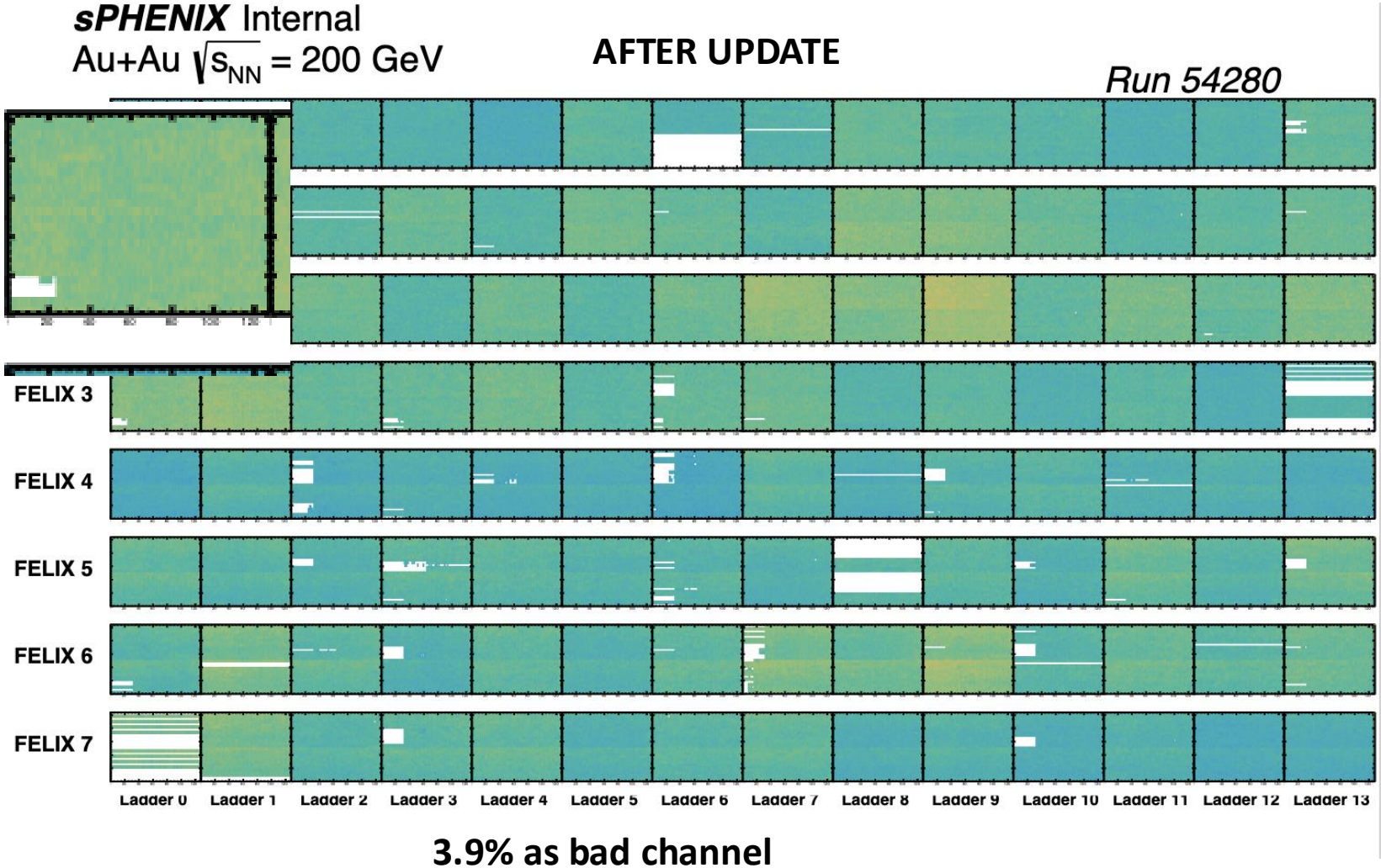
- Do half-ladder by half-ladder fitting(update)

FELIX 3



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