MVTX Fake Hit Rate Update

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Motivation

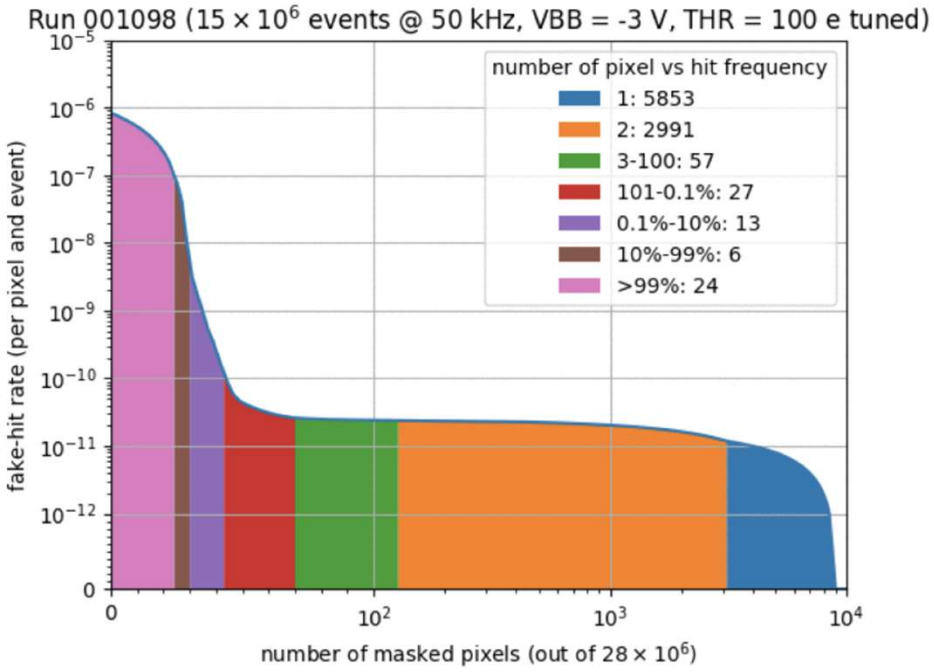
- **Goals:**
  - Compare this year's fake hit rate to last years noisy pixel mask.
  - Determine optimal new fake hit mask that prioritizes physics performance.
- Using cosmic runs (without mask applied) from May 15th, 2024.

Run Number	Trigger Rate [kHz]	Number of strobes
42640	101	$5.3x10^7$
42641	44	$2.9x10^7$

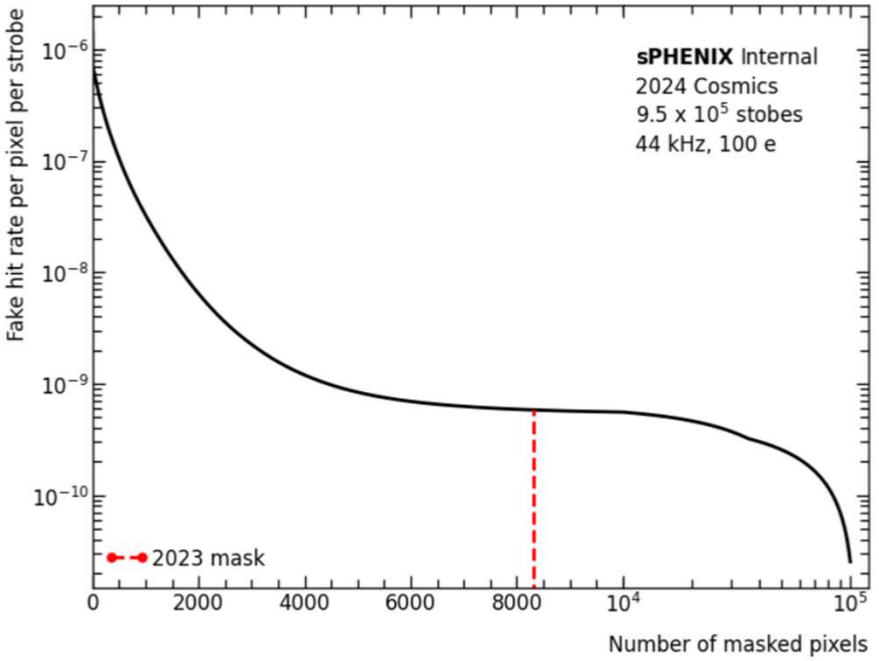
Table 1: Cosmic runs used and corresponding trigger rates and number of strobes

Status

- Trigger ramping period has been successfully suppressed in analysis (see back up)
- Initial results showing the fake hit rate as a function of # of masked pixels from 9 x10^5 strobes.



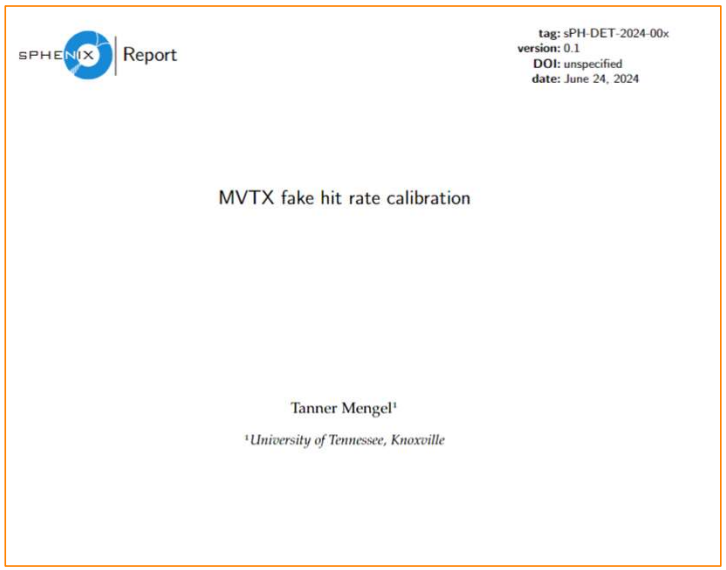
Fake hit rate for ITS



Fake it rate vs number of masked pixels

Moving forward

- Analysis note shell exists here.
  - This is a work in progress. Please email me any questions
- GitHub repo available here.
- **Need to look at fake hit rate for each layer**
- **Also want to look into percentage that certain pixel's fire**
- **Optimize FHR mask for physics performance?**


sPHENIX Report

tag: sPH-DET-2024-00x
version: 0.1
DOI: unspecified
date: June 24, 2024

MVTX fake hit rate calibration

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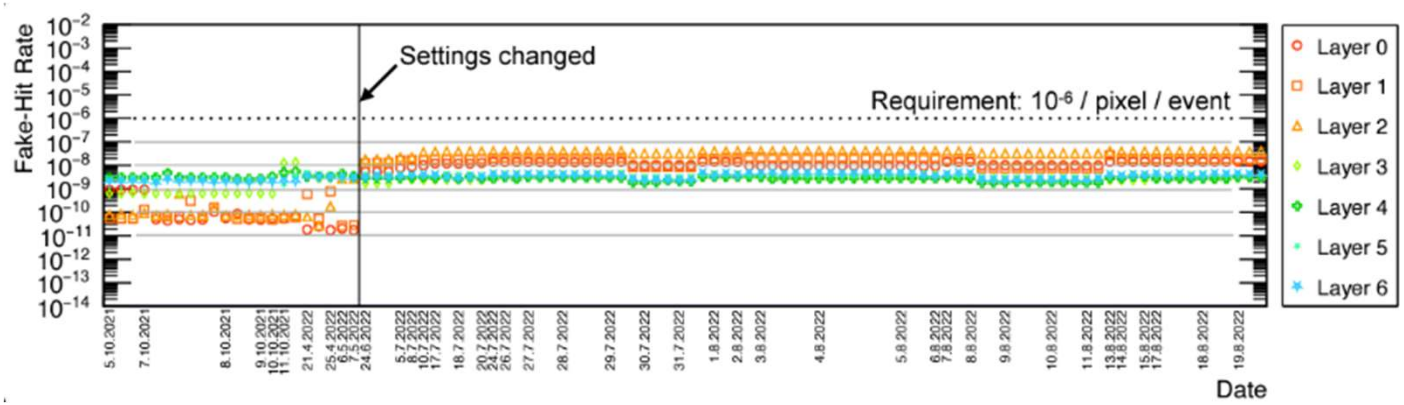
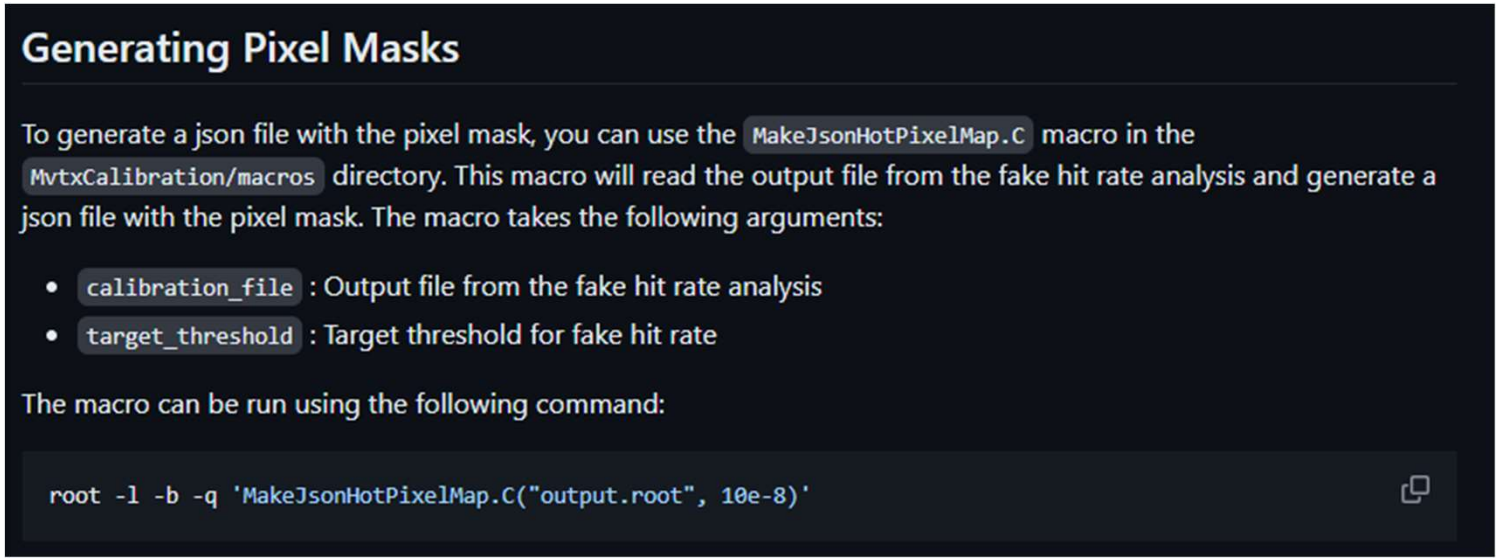


ITS FHR threshold for each layer (optimized for physics performance rather than data rate suppression)

Back up

Generating Pixel Masks

- Json pixel maps can be generated using the resulting TTree file and this macro:
- More details in GitHub repo.



Generating Pixel Masks

To generate a json file with the pixel mask, you can use the `MakeJsonHotPixelMap.C` macro in the `MvtxCalibration/macros` directory. This macro will read the output file from the fake hit rate analysis and generate a json file with the pixel mask. The macro takes the following arguments:

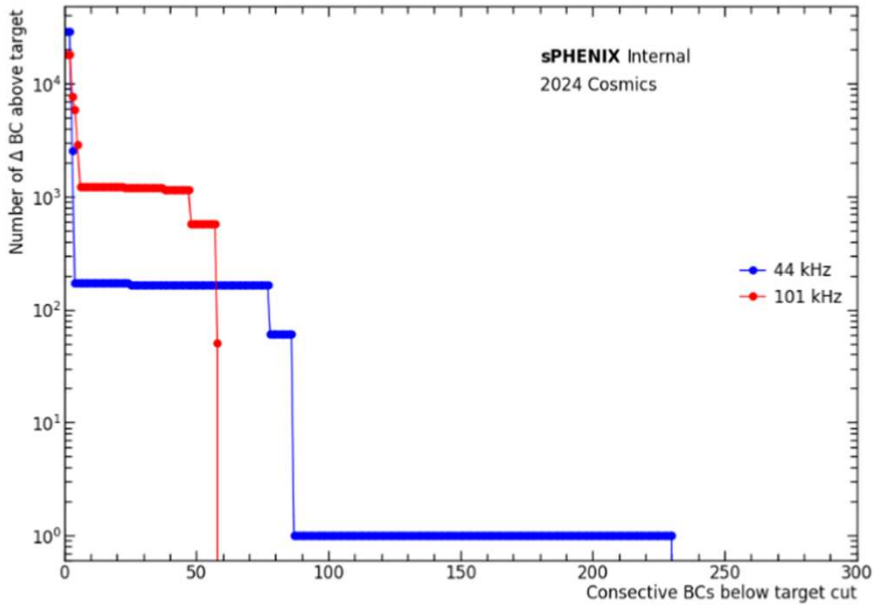
- `calibration_file` : Output file from the fake hit rate analysis
- `target_threshold` : Target threshold for fake hit rate

The macro can be run using the following command:

```
root -l -b -q 'MakeJsonHotPixelMap.C("output.root", 10e-8)'
```

Trigger Ramp cut

- When the △BCO is less than or equal to this target increment for longer than 300 consecutive strobes, the trigger ramp period is considered over, and the fake hit analysis begins
- The value 300 was selected based off when all the strobes that were longer than expected can be removed from the analysis



Trigger ramp cut efficiency