~~Jumping Track Rate~~ → Fixed Sector Health → Under Investigation

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KLM Weekly Meeting – March 27th, 2018

Date	Run	Trigger Type	Events Sampled	Track Rate	Scint HV	RPC HV
March 8, 2018	01898	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.3%	ON	ON
March 8, 2018	01900	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 8, 2018	01901	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.3%	ON	ON
March 8, 2018	01903	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	60.2%	ON	ON
March 8, 2018	01904	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	59.8%	ON	ON
March 8, 2018	01905	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.3%	ON	ON
March 8, 2018	01972	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 8, 2018	01973	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 8, 2018	01974	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.5%	ON	ON
March 9, 2018	01979	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.3%	ON	ON
March 9, 2018	01980	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 9, 2018	01982	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	57.4%	ON	ON
March 9, 2018	01983	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.5%	ON	ON
March 9, 2018	01984	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	56.5%	ON	ON
March 9, 2018	01989	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 9, 2018	01990	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	56.4%	ON	ON
March 9, 2018	01991	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.5%	ON	ON
March 9, 2018	01992	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 9, 2018	01993	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 9, 2018	01994	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	56.6%	ON	ON
March 9, 2018	01995	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.5%	ON	ON
March 9, 2018	01996	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	56.8%	ON	ON
March 9, 2018	01997	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	56.4%	ON	ON
March 9, 2018	02062	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	67.9%	ON	ON
March 9, 2018	02063	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.5%	ON	ON
March 9, 2018	02064	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	67.2%	ON	ON
March 9, 2018	02066	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	67.2%	ON	ON
March 10, 2018	02067	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.5%	ON	ON
March 10, 2018	02072	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	67.9%	ON	ON
March 10, 2018	02073	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 10, 2018	02074	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.5%	ON	ON
March 11, 2018	02091	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	69.3%	ON	ON
March 11, 2018	02092	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	0.4%	ON	ON
March 11, 2018	02094	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	68.8%	ON	ON
March 11, 2018	02100	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	68.8%	ON	ON
March 11, 2018	02101	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	68.6%	ON	ON
March 12, 2018	02116	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	68.5%	ON	ON
March 12, 2018	02117	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0)||(Random 1Hz)	10.0k	69.4%	ON	ON
March 12, 2018	02161	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || (Random 1 Hz) || ecl_timing)	10.0k	65.6%	ON	ON
March 12, 2018	02162	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || (Random 1 Hz) || ecl_timing)	10.0k	0.7%	ON	ON
March 12, 2018	02168	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || (Random 1 Hz) || ecl_timing)	10.0k	65.3%	ON	ON
March 12, 2018	02169	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || (Random 1 Hz) || ecl_timing)	10.0k	0.7%	ON	ON
March 12, 2018	02170	((ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || (Random 1 Hz) || ecl_timing)	10.0k	0.6%	ON	ON
March 13, 2018	02178	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	0.7%	OFF	ON
March 13, 2018	02181	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	65.4%	OFF	ON
March 13, 2018	02196	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	0.6%	OFF	ON
March 13, 2018	02275	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	65.3%	OFF	ON
March 13, 2018	02276	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	0.6%	OFF	ON
March 13, 2018	02277	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	0.6%	OFF	ON
March 13, 2018	02278	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	64.3%	OFF	ON
March 14, 2018	02280	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	0.6%	OFF	ON
March 15, 2018	02411	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	66.0%	OFF	ON
March 15, 2018	02414	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	0.7%	OFF	ON
March 15, 2018	02415	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	66.0%	OFF	ON
March 15, 2018	02416	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	10.0k	65.8%	OFF	ON

Jumping Track Rate

VIRGINIA TECH

RECAP:

- Prior to March 17th, we were plagued by a jumping track rate.
- It was present in both global and local runs.
- After much study, Yinghui discovered that the fine lookback window was most likely the source of the problem. → See her slides from previous KLM meeting.
- The Fix: Brandon removed the fine lookback window from the lookback logic.
- This firmware was tested on March 17th.

JUMPING Track Rate IN LOCAL RUNS

Run	Trigger Type	Events Sampled	Track Rate	Scintillator HV	RPC HV
01481	UT3	10.0k	23.8%	ON	ON
01482	UT3	10.0k	23.7%	ON	ON
01484	UT3	10.0k	23.5%	ON	ON
01485	UT3	10.0k	24.2%	ON	ON
01486	UT3	10.0k	24.5%	ON	ON
01487	UT3	10.0k	24.0%	ON	ON
01488	UT3	10.0k	32.1%	ON	ON
01489	UT3	10.0k	24.0%	ON	ON
01490	UT3	10.0k	23.7%	ON	ON
01493	UT3	10.0k	32.5%	ON	ON
01494	UT3	10.0k	23.8%	ON	ON
01495	UT3	10.0k	24.2%	ON	ON
01496	UT3	10.0k	24.0%	ON	ON
01497	UT3	10.0k	23.5%	ON	ON
01498	UT3	10.0k	31.9%	ON	ON
01506	UT3	10.0k	32.1%	ON	ON
01507	UT3	10.0k	30.5%	ON	ON
01508	UT3	10.0k	24.7%	ON	ON
01509	UT3	10.0k	31.0%	ON	ON
01517	UT3	10.0k	28.2%	ON	ON
01518	UT3	10.0k	26.7%	ON	ON

FIXED! →Stable Track Rate Achieved←

Run	Trigger Logic	Events Sampled	Trigger Rate	Scint HV	RPC HV
01620	UT3	10.0k	47.4%	ON	ON
01621	UT3	10.0k	47.3%	ON	ON
01625	UT3	10.0k	47.0%	ON	ON
01626	UT3	10.0k	47.7%	ON	ON
01627	UT3	10.0k	47.2%	ON	ON
01636	UT3	10.0k	49.9%	ON	ON
01637	UT3	10.0k	49.7%	ON	ON
01638	UT3	10.0k	50.0%	ON	ON
01639	UT3	10.0k	49.8%	ON	ON
01640	UT3	10.0k	49.1%	ON	ON
01641	UT3	10.0k	49.8%	ON	ON
01643	UT3	10.0k	49.3%	ON	ON
01644	UT3	10.0k	49.9%	ON	ON
01645	UT3	10.0k	49.9%	ON	ON
01646	UT3	10.0k	49.6%	ON	ON

Stable Track Rate

Local RUNS

- Jumping track rates were observed in local runs prior to March 17th, though the swing in the rate was smaller.
- Running with the new firmware, the track rate was found to be stable (~49%) over the course of 15 runs!

Stable Track Rate

GLOBAL RUNS

Date	Run	Trigger Logic	Events Sampled	Trigger Rate	Scint HV	RPC HV
March 15, 2018	02518	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	54.5k	70.9%	OFF	ON
March 15, 2018	02519	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing)	45.0k	70.8%	OFF	ON
March 15, 2018	02522	(ecl_timing&&TSF2single)||(Random 1Hz)	31.3k	70.0%	OFF	ON
March 15, 2018	02523	(ecl_timing&&TSF2single)||(Random 1Hz)	16.1k	69.8%	OFF	ON
March 16, 2018	02524	(ecl_timing&&TSF2single)||(Random 1Hz)	16.3k	70.3%	OFF	ON
March 16, 2018	02526	(ecl_timing&&TSF2single)||(Random 1Hz)	14.2k	70.7%	OFF	ON
March 16, 2018	02527	(ecl_timing&&TSF2single)||(Random 1Hz)	11.4k	70.5%	OFF	ON
March 16, 2018	02528	(ecl_timing&&TSF2single)||(Random 1Hz)	13.8k	70.4%	OFF	ON
March 16, 2018	02529	(ecl_timing&&TSF2single)||(Random 1Hz)	20.2k	70.2%	OFF	ON
March 16, 2018	02530	(ecl_timing&&TSF2single)||(Random 1Hz)	30.7k	70.1%	OFF	ON
March 16, 2018	02531	(ecl_timing&&TSF2single)||(Random 1Hz)	10.3k	70.1%	OFF	ON
March 16, 2018	02532	(ecl_timing&&TSF2single)||(Random 1Hz)	10.8k	70.7%	OFF	ON
March 16, 2018	02533	(ecl_timing&&TSF2single)||(Random 1Hz)	11.4k	69.9%	OFF	ON
March 16, 2018	02541	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	68.5%	OFF	ON
March 16, 2018	02542	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	68.6%	OFF	ON
March 16, 2018	02543	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	68.4%	OFF	ON
March 16, 2018	02544	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	69.0%	OFF	ON
March 16, 2018	02615	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.0%	OFF	ON
March 16, 2018	02626	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	65.9%	OFF	ON
March 16, 2018	02633	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.4%	OFF	ON
March 16, 2018	02641	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.2%	OFF	ON
March 17, 2018	02643	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.0%	OFF	ON
March 17, 2018	02646	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.9%	OFF	ON
March 17, 2018	02647	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.9%	OFF	ON
March 17, 2018	02649	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.9%	OFF	ON
March 17, 2018	02650	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.3%	OFF	ON
March 17, 2018	02654	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	65.8%	OFF	ON
March 17, 2018	02678	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	66.9%	OFF	ON
March 17, 2018	02684	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	67.3%	OFF	ON
March 17, 2018	02688	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	71.4%	OFF	ON
March 17, 2018	02701	(ecl_timing&&(tsf2single || f>0 || f>1) || f>0 || (Random 1 Hz) || ecl_timing	10.0k	70.5%	OFF	ON
March 17, 2018	02709	ecl_timing || random1Hz	10.0k	65.8%	OFF	ON
March 17, 2018	02712	ecl_timing || random1Hz	10.0k	67.0%	OFF	ON
March 17, 2018	02719	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	41.5%	ON	ON
March 17, 2018	02729	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	41.4%	ON	ON
March 17, 2018	02738	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	42.1%	ON	ON
March 17, 2018	02747	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	40.6%	ON	ON
March 17, 2018	02748	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	40.8%	ON	ON
March 17, 2018	02753	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	43.0%	ON	ON
March 18, 2018	02802	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	39.1%	ON	ON
March 18, 2018	02803	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	38.6%	ON	ON
March 18, 2018	02804	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	38.5%	ON	ON
March 18, 2018	02805	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	39.1%	ON	ON
March 18, 2018	02811	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	40.4%	ON	ON
March 18, 2018	02823	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	38.2%	ON	ON
March 18, 2018	02825	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	40.6%	ON	ON
March 18, 2018	02829	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	38.7%	ON	ON
March 19, 2018	02838	ecl_timing || random1Hz	10.0k	40.3%	ON	ON
March 19, 2018	02839	ecl_timing || random1Hz	10.0k	40.4%	ON	ON
March 19, 2018	02840	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	39.7%	ON	ON
March 19, 2018	02841	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	40.7%	ON	ON
March 19, 2018	02843	(ecl_timing && (tsf2single || f>0 || f>1)) || f>0 || random1Hz || ecl_timing	10.0k	39.9%	ON	ON

- Following the implementation of the new firmware, the track rate has remained stable!

The decrease in the track rate between runs 2541 & 2712 were attributed to problems with sectors BB6 & BF1.

Here the ECL trigger was adjusted to yield an overall trigger rate of ~1kHz.

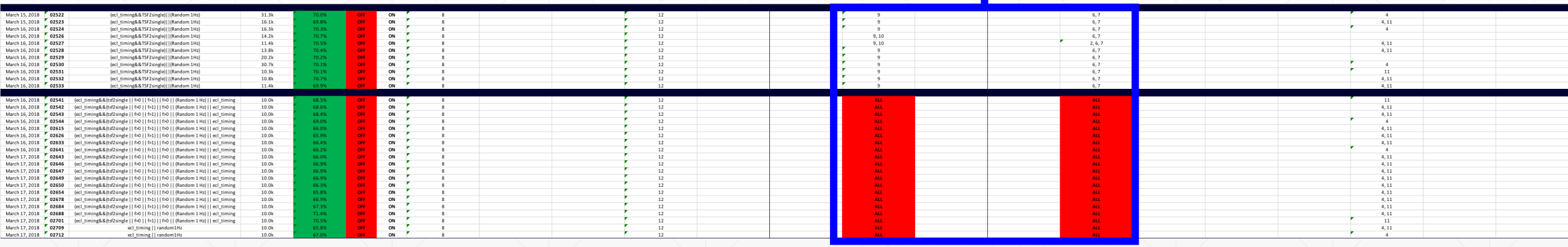
The higher trigger rate lead to a decrease in the track rate.

Decrease in Track Rate

- The decrease in track rate between runs 2541 & 2712 can be attributed to problems with sectors BB6 & BF1.

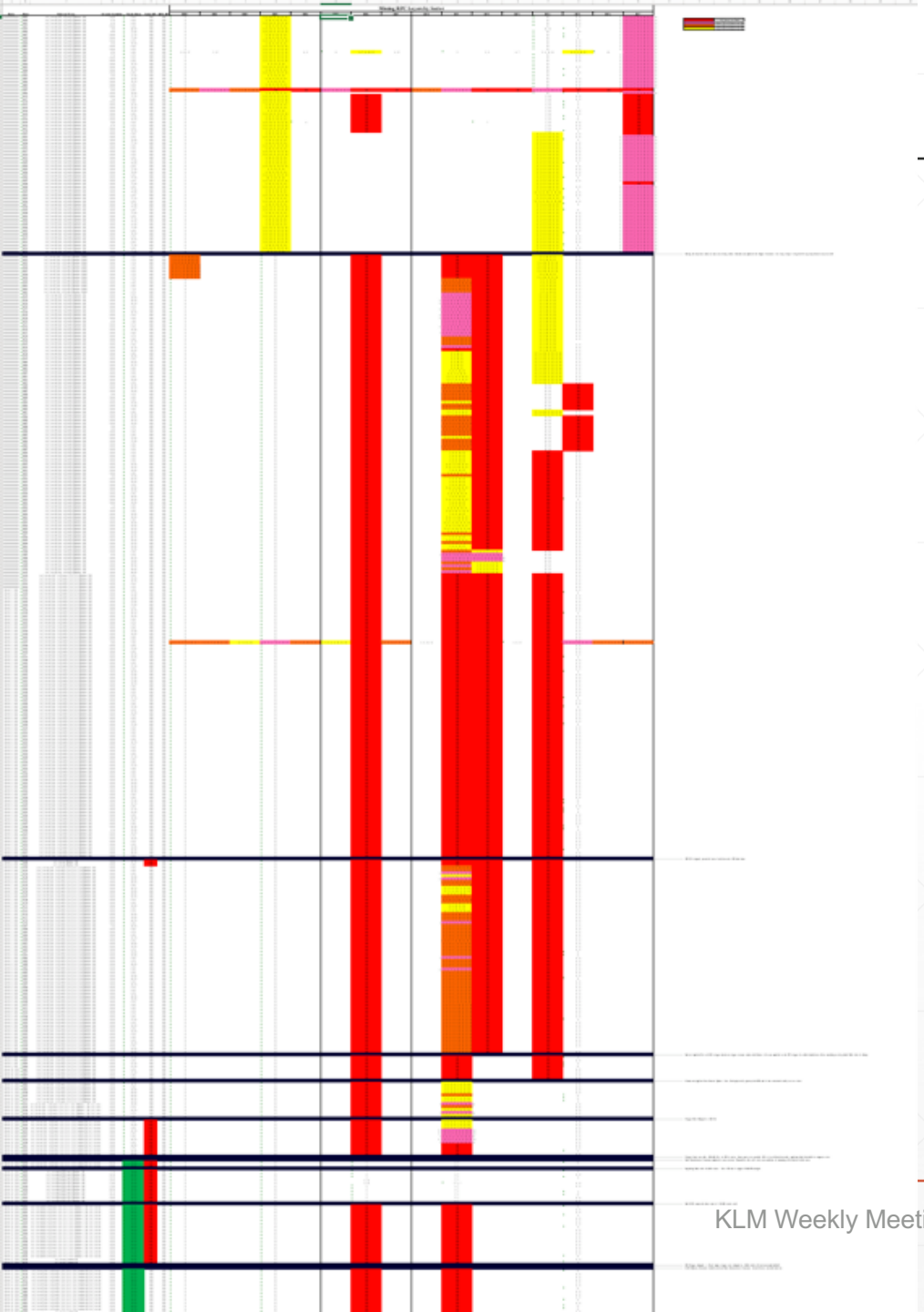
Run	Track Rate	BB6	BB7	BF0	BF1
02522	70.0%	9			6, 7
02523	69.8%	9			6, 7
02524	70.3%	9			6, 7
02526	70.7%	9, 10			6, 7
02527	70.5%	9, 10			2, 6, 7
02528	70.4%	9			6, 7
02529	70.2%	9			6, 7
02530	70.1%	9			6, 7
02531	70.1%	9			6, 7
02532	70.7%	9			6, 7
02533	69.9%	9			6, 7
02541	68.5%	ALL			ALL
02542	68.6%	ALL			ALL
02543	68.4%	ALL			ALL
02544	69.0%	ALL			ALL
02615	66.0%	ALL			ALL
02626	65.9%	ALL			ALL
02633	66.4%	ALL			ALL
02641	66.2%	ALL			ALL
02643	66.0%	ALL			ALL
02646	66.9%	ALL			ALL
02647	66.9%	ALL			ALL
02649	66.9%	ALL			ALL
02650	66.3%	ALL			ALL
02654	65.8%	ALL			ALL
02678	66.9%	ALL			ALL
02684	67.3%	ALL			ALL
02688	71.4%	ALL			ALL
02701	70.5%	ALL			ALL
02709	65.8%	ALL			ALL
02712	67.0%	ALL			ALL

The runs between the blue lines are the specially requested short runs I requested to test the new firmware with the new DC firmware



SEGWAY →→→ Sector Health Assessment

- Investigation of the track rate, in terms of stability and value led to the development of these spreadsheets.
- I have developed scripts to make spreadsheets that display various characteristics of each run. The information is read directly from the root file. Nothing is input directly by hand.
- Quantities included in Spreadsheet:
  - Date, Run Number, Trigger Logic, HV status ← The only quantities predefined by user
  - Events Sampled & Track Rate ← calculated form the root file
  - ”Dead” RPC Layers ← determined by reading sector hitmaps via root
    - **NOTE:** A **DEAD RPC LAYER** is defined as a layer with 0 hits.
- This code package will soon be released on confluence for all expert shifters to use. Documentation will also be made available.
- This tool enables us to assess the health of sectors over the course of many runs.



Sector Health Spreadsheet

- Spreadsheet is just too big ~450+ lines long…
- I will highlight gross features in the next couple of slides.
- I've also uploaded the spreadsheet of the global runs to the indico page for you to peruse at your leisure.

Origin of Problematic Sectors

VIRGINIA TECH

	All Layers are Dead
	At Least 75% of Layers are Dead
	At least 50% of Layers are Dead
	At least 25% of Layers are Dead

Issue predates COPPER firmware update

Seems to have begun after the COPPER firmware update.

BF4

BB6

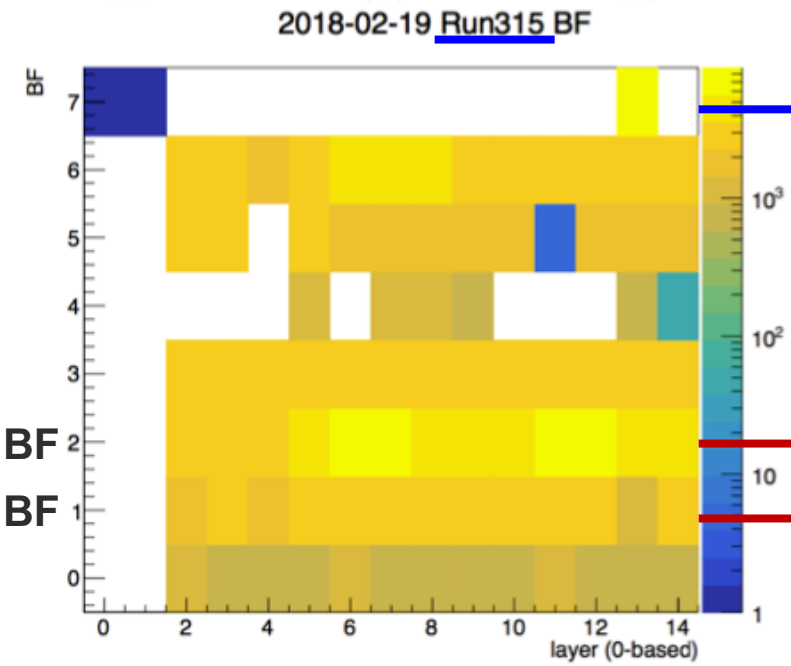
BF1 BF2

Copper Firmware Update on Feb. 19th

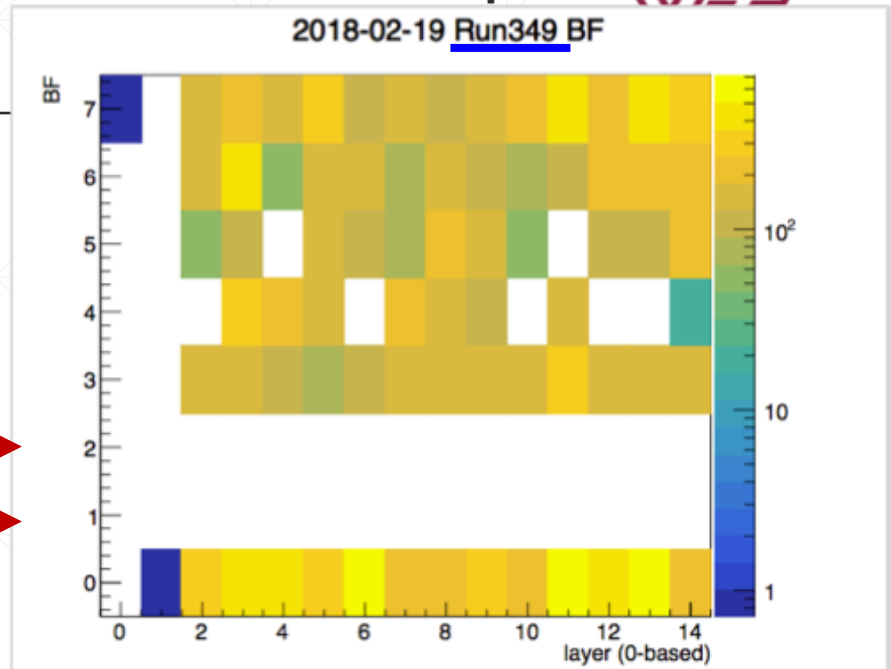
Date	Run	Trigger Type	Events Sampled	Track Rate	Scint HV	RPC HV	BB0	BB1	BB2	BB3	BB4	BB5	BB6	BB7	BF0	BF1	BF2	BF3	BF4	BF5	BF6	BF7
February 1, 2018	00304	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	77.5%	ON	ON	8			9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00305	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	77.6%	ON	ON	8			9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00306	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	77.8%	ON	ON	8			8, 9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00307	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.6%	ON	ON	8			8, 9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00309	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	78.3%	ON	ON	8			8, 9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00310	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			8, 9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00311	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	78.2%	ON	ON	8			8, 9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00312	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.6%	ON	ON	8			8, 9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00313	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	77.5%	ON	ON	8			9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00314	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			8, 9, 10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4, 11		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 1, 2018	00315	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	77.0%	ON	ON	8			10, 11, 12, 13, 14									2, 3, 4, 6, 10, 11, 12	4		2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14
February 19, 2018	00349	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	0.4%	ON	ON	2, 4, 5, 6, 8, 10, 12, 13			12			ALL			ALL	ALL		2, 6, 10, 12, 13	4, 11		
February 19, 2018	00351	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	5.3%	ON	ON	2, 4, 5, 6, 8, 10, 12, 13			12			ALL			ALL	ALL		2, 6, 10, 12, 13	4, 11		
February 20, 2018	00353	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	5.1%	ON	ON	2, 4, 5, 6, 8, 10, 12, 13			12			ALL			ALL	ALL		2, 6, 10, 12, 13, 14	4, 11		
February 20, 2018	00354	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	5.3%	ON	ON	2, 4, 5, 6, 7, 8, 10, 12, 13, 14			12			ALL			ALL	ALL		2, 6, 10, 12, 13, 14	4, 11		
February 20, 2018	00355	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	0.4%	ON	ON	2, 4, 5, 6, 7, 8, 10, 12, 13, 14			12			ALL			ALL	ALL		2, 6, 10, 12, 13, 14	4, 11		
February 20, 2018	00357	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	0.5%	ON	ON	2, 4, 5, 6, 7, 8, 10, 12, 13, 14			12			ALL			ALL	ALL		2, 6, 10, 12, 13, 14	4, 11		
February 20, 2018	00358	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	5.3%	ON	ON	2, 4, 5, 6, 7, 8, 10, 12, 13, 14			12			ALL			ALL	ALL		2, 6, 10, 12, 13	4, 11		
February 20, 2018	00359	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	5.7%	ON	ON	2, 4, 5, 6, 7, 8, 10, 12, 13, 14			12			ALL			ALL	ALL		2, 6, 10, 12, 13, 14	4, 11		
February 20, 2018	00438	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	7.5%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 9, 10, 12, 13, 14	ALL		2, 3, 6, 10, 12	4, 11		
February 20, 2018	00439	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		2, 3, 6, 10, 12	4, 11		
February 20, 2018	00441	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 9, 10, 12, 13, 14	ALL		2, 3, 6, 10, 12	4, 11		
February 20, 2018	00443	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	7.1%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 9, 10, 12, 13, 14	ALL		2, 3, 6, 10, 12	4, 11		
February 21, 2018	00451	(ecl_timing && tsf2single)||(Random 500Hz)	10.0k	6.7%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 10, 11, 12, 13, 14	ALL		2, 3, 6, 10, 12	4, 11		
February 22, 2018	00709	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			12			ALL			2, 3, 4, 6, 7, 8, 9, 10, 11, 12	ALL		2, 3, 10, 11, 12	4, 11		
February 22, 2018	00719	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	58.9%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13	ALL		2, 3, 10, 11, 12	4, 11		
February 22, 2018	00720	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	58.5%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14	ALL		2, 3, 10, 11, 12	4, 11		
February 22, 2018	00724	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	59.1%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14	ALL		2, 3, 10, 11, 12	4, 11		
February 22, 2018	00725	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.3%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13	ALL		2, 3, 10, 11, 12	4, 11		
February 23, 2018	00727	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14	ALL		2, 3, 10, 11, 12	4, 11		
February 23, 2018	00728	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	58.7%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13	ALL		2, 3, 10, 11, 12	4, 11		
February 23, 2018	00729	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14	ALL		2, 3, 10, 11, 12	4, 11		
February 23, 2018	00730	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.6%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14	ALL		2, 3, 10, 11, 12	4, 11		
February 23, 2018	00732	(ecl_timing && tsf2single)||(Random 1Hz)	6.5k	1.4%	ON	ON	8			12			ALL			2, 3, 4, 6, 8, 9, 10, 11, 12, 13	ALL		2, 3, 10, 11, 12	4, 11		

Pre-COPPER Firmware Update

Post-COPPER Firmware Update



Improved!

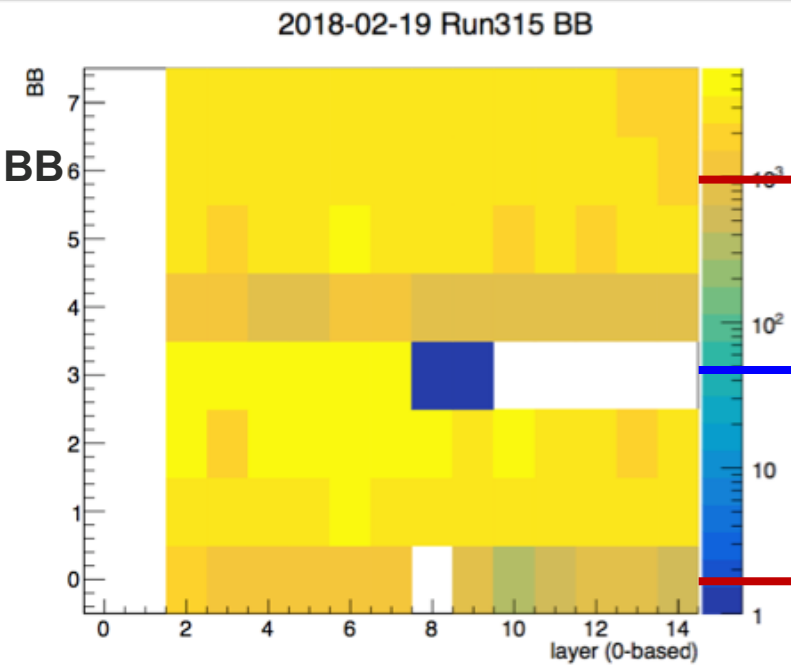


BF

BF

Dead!

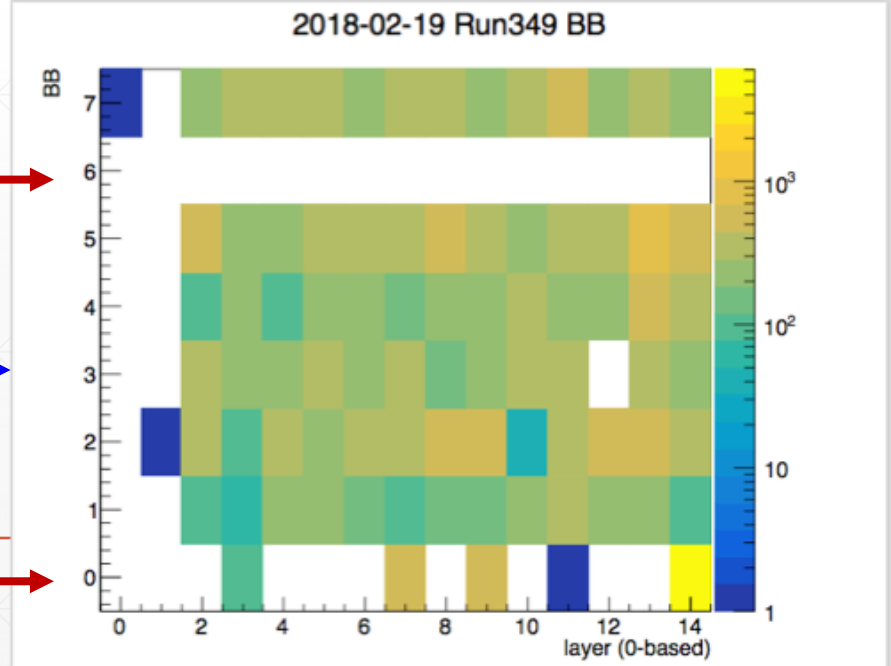
Dead!



Dead!

Improved!

Worse



BF4 Died on Feb. 24th and was Resurrected on Mar. 9th

Date	Run	Trigger Type	Events Sampled	Track Rate	Scint HV	RPC HV	BB0	BB1	BB2	BB3	BB4	BB5	BB6	BB7	BF0	BF1	BF2	BF3	BF4
February 24, 2018	00891	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 9, 10, 12, 13, 14	ALL		10, 14
February 24, 2018	00892	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	57.4%	ON	ON	8			12			ALL			2, 4, 6, 8, 10, 12, 13, 14	ALL		10, 14
February 25, 2018	00894	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	57.4%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		10, 14
February 25, 2018	00895	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		10, 14
February 25, 2018	00896	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 9, 10, 12, 13, 14	ALL		10, 14
February 25, 2018	00897	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			12			ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		10, 14
February 25, 2018	00905	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00906	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00919	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00920	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00923	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	59.2%	ON	ON	8			12			ALL			2, 4, 5, 8, 10, 12, 13	ALL		ALL
February 25, 2018	00929	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	59.5%	ON	ON	8			12			ALL			2, 4, 5, 8, 10, 12, 13	ALL		ALL
February 25, 2018	00931	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	59.4%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00932	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 8, 10, 12, 13	ALL		ALL
February 25, 2018	00933	(ecl_timing && tsf2single)||(Random 1Hz)	3.0k	59.2%	ON	ON	8			12			ALL			2, 4, 5, 8, 10, 11, 12, 13	ALL		ALL
February 25, 2018	00934	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	60.3%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00935	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	59.9%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00936	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.5%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00938	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	59.2%	ON	ON	8			12			ALL			2, 4, 5, 8, 10, 12, 13	ALL		ALL
February 25, 2018	00939	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	59.6%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL
February 25, 2018	00940	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	0.4%	ON	ON	8			12			ALL			2, 4, 8, 10, 12, 13	ALL		ALL
February 25, 2018	00941	(ecl_timing && tsf2single)||(Random 1Hz)	10.0k	60.0%	ON	ON	8			12			ALL			2, 4, 8, 10, 12	ALL		ALL

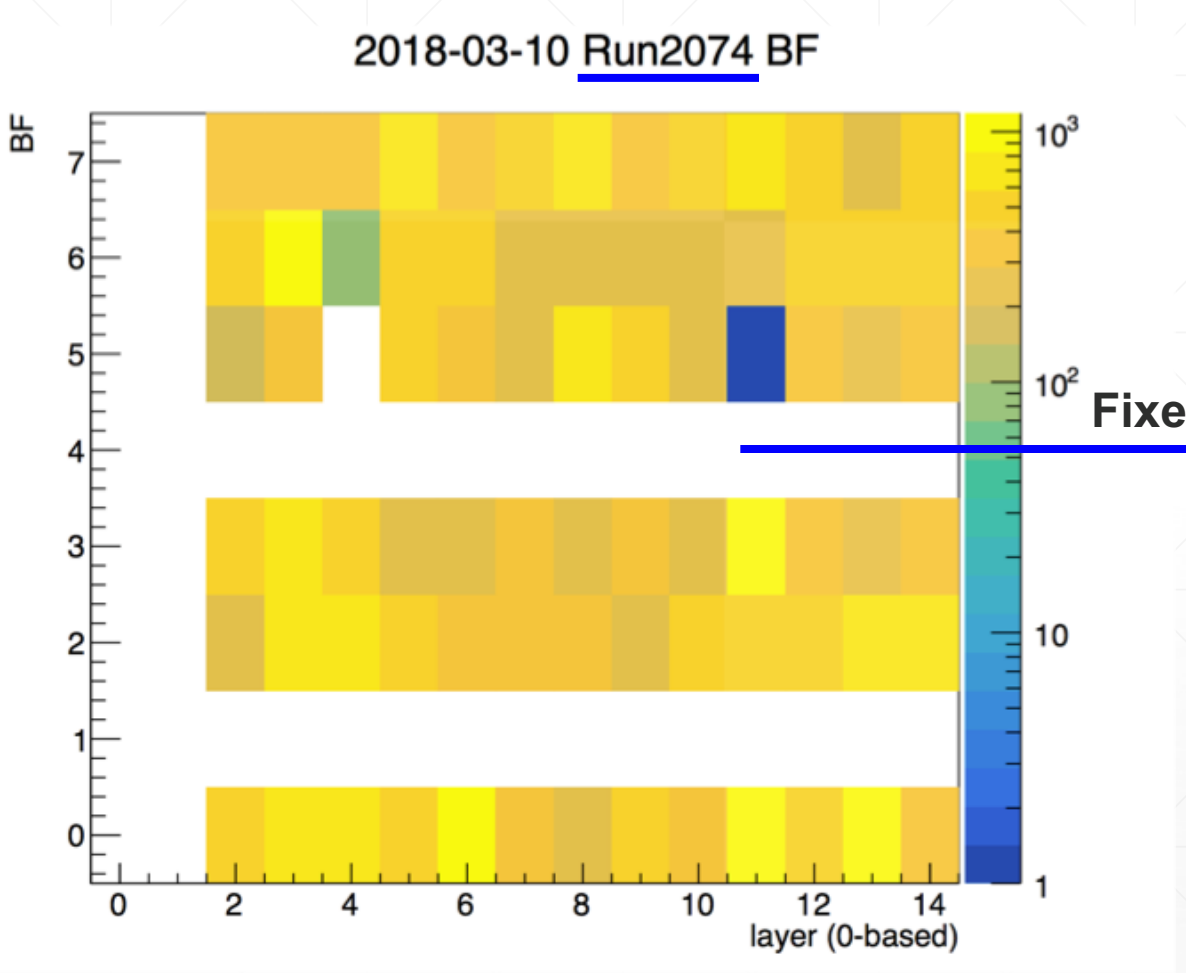
- Attempted Fix→ Manual Power Cycle. Ultimately this was ineffective (died again after ~10 runs)
- Remained dead until March 9th. **I power cycled BF4 manually on Mar. 9th and it has been on ever since.**
- Nobody has a clue why this is now working.
- We asked Sumisawa-san to take a look at the BF4 power supply back in Feb., but received no response.

Date	Run	BB6	BB7	BF0	BF1	BF2	BF3	BF4
March 9, 2018	01994	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	01995	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	01996	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	01997	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	02062	ALL			ALL			ALL
March 9, 2018	02063	ALL			ALL			ALL
March 9, 2018	02064	ALL			ALL			ALL
March 9, 2018	02066	ALL			ALL			ALL
March 10, 2018	02067	ALL			ALL			ALL
March 10, 2018	02072	ALL			ALL			ALL
March 10, 2018	02073	ALL			ALL			ALL
March 10, 2018	02074	ALL			ALL			ALL
March 11, 2018	02091	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02092	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02094	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02100	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02101	ALL			2, 3, 5, 6, 7, 11, 12, 13, 14			
March 12, 2018	02116	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 12, 2018	02117	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 12, 2018	02161	ALL			2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14			

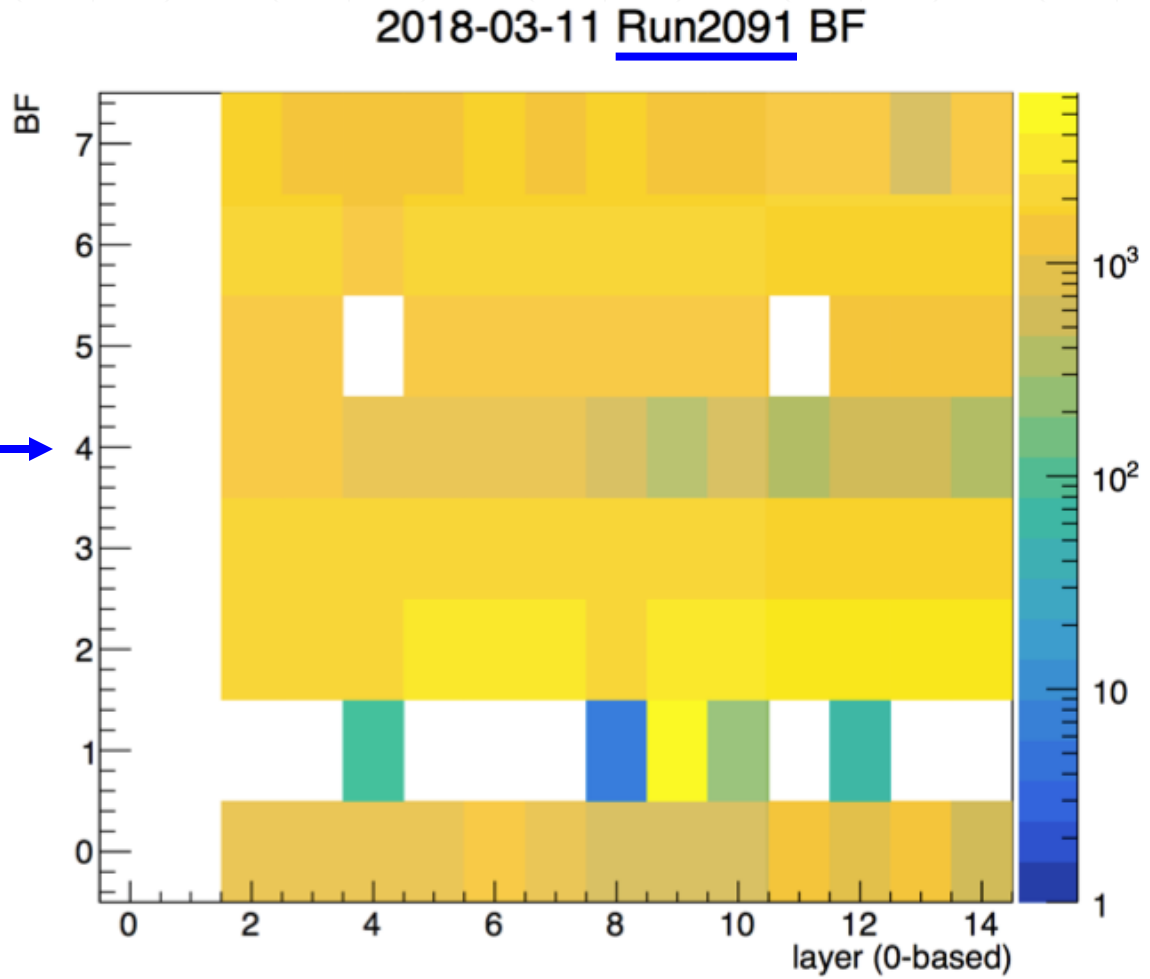
Manual Power Cycle on Mar. 9th

Anomalous Resurrection of BF2

The Resurrection of BF4



Fixed!



Remaining Problematic Sectors

Date	Run	BB6	BB7	BF0	BF1	BF2	BF3	BF4
March 9, 2018	01994	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	01995	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	01996	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	01997	ALL			2, 4, 5, 6, 8, 10, 12, 13, 14	ALL		ALL
March 9, 2018	02062	ALL			ALL			ALL
March 9, 2018	02063	ALL			ALL			ALL
March 9, 2018	02064	ALL			ALL			ALL
March 9, 2018	02066	ALL			ALL			ALL
March 10, 2018	02067	ALL			ALL			ALL
March 10, 2018	02072	ALL			ALL			ALL
March 10, 2018	02073	ALL			ALL			ALL
March 10, 2018	02074	ALL			ALL			ALL
March 11, 2018	02091	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02092	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02094	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02100	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 11, 2018	02101	ALL			2, 3, 5, 6, 7, 11, 12, 13, 14			
March 12, 2018	02116	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 12, 2018	02117	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 12, 2018	02161	ALL			2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14			
March 12, 2018	02162	ALL			2, 3, 5, 6, 7, 8, 11, 12, 13, 14			
March 12, 2018	02168	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 12, 2018	02169	ALL			2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14			
March 12, 2018	02170	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 13, 2018	02178	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 13, 2018	02181	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 13, 2018	02196	ALL			2, 3, 5, 6, 7, 11, 13, 14			
March 13, 2018	02275	ALL			2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14			
March 13, 2018	02276	ALL			2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14			
March 13, 2018	02277	ALL			2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14			
March 13, 2018	02278	ALL			2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14			
March 14, 2018	02280	ALL			2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14			
March 15, 2018	02411	ALL			ALL			
March 15, 2018	02414	ALL			ALL			
March 15, 2018	02415	ALL			ALL			
March 15, 2018	02416	ALL			ALL			
March 15, 2018	02518	9			6, 7			
March 15, 2018	02519	9			6, 7			
March 15, 2018	02522	9			6, 7			
March 15, 2018	02523	9			6, 7			
March 16, 2018	02524	9			6, 7			
March 16, 2018	02526	9, 10			6, 7			
March 16, 2018	02527	9, 10			2, 6, 7			
March 16, 2018	02528	9			6, 7			
March 16, 2018	02529	9			6, 7			
March 16, 2018	02530	9			6, 7			
March 16, 2018	02531	9			6, 7			
March 16, 2018	02532	9			6, 7			
March 16, 2018	02533	9			6, 7			
March 16, 2018	02541	ALL			ALL			
March 16, 2018	02542	ALL			ALL			
March 16, 2018	02543	ALL			ALL			
March 16, 2018	02544	ALL			ALL			
March 16, 2018	02615	ALL			ALL			
March 16, 2018	02626	ALL			ALL			
March 16, 2018	02633	ALL			ALL			

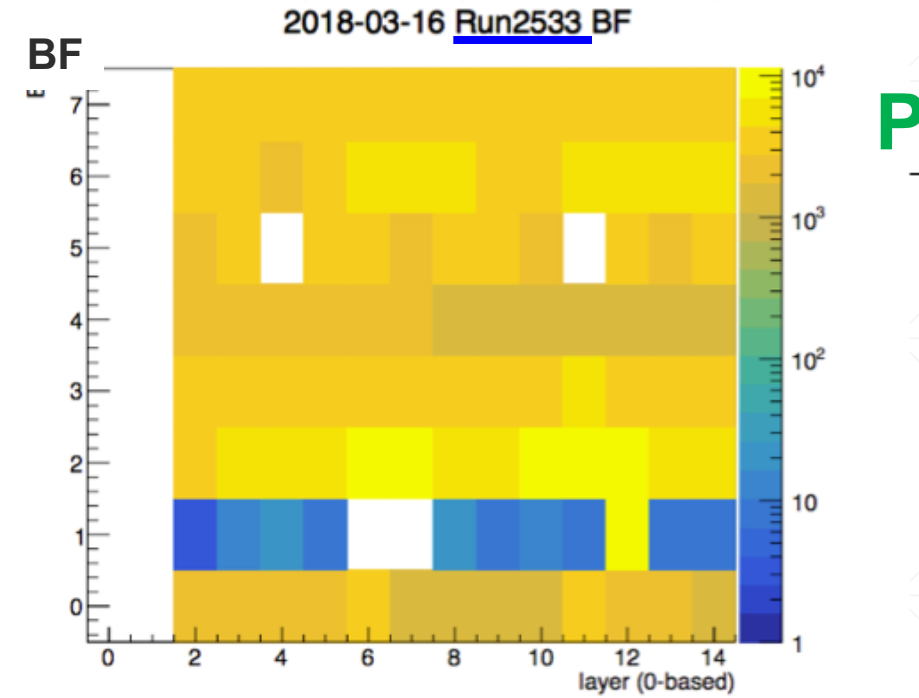
VIRGINIA TECH

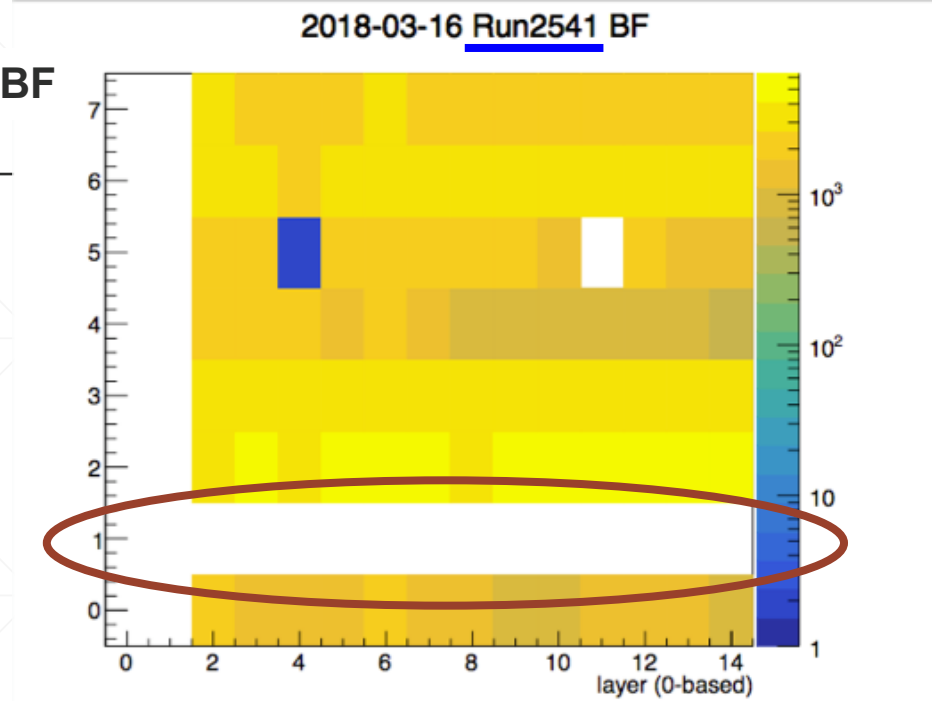
BB6 & BF1
Remain Problematic

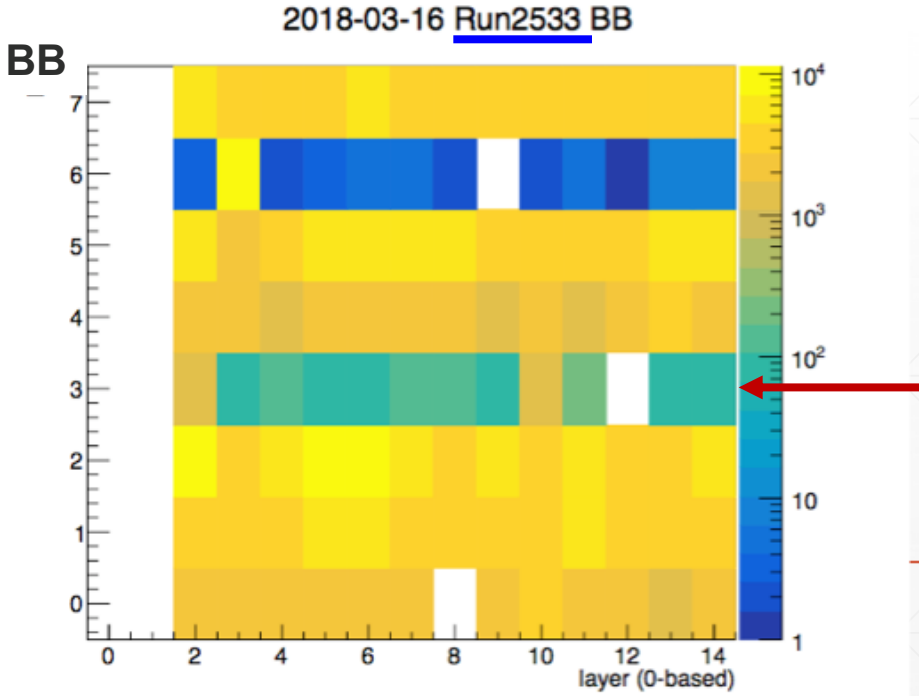
Closer examination of the hitmaps indicates that BF3 is also unhealthy….

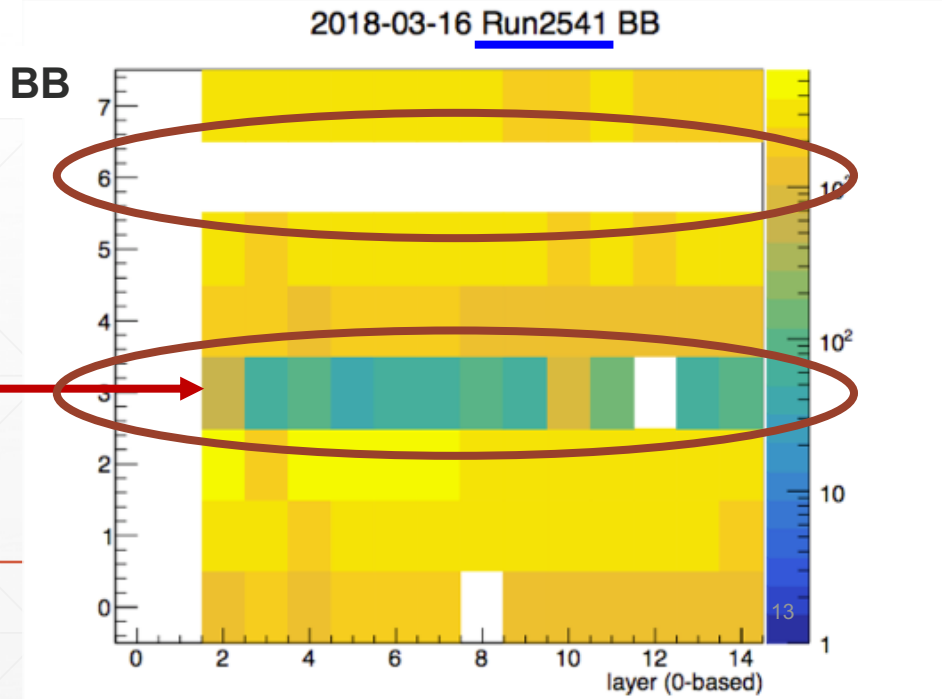
Problematic Sectors

BB6 & BF1
Remain Problematic









Closer examination of the hitmaps indicates that BB3 is also unhealthy….

Q&A: Single Random Hit in Each Event

- There was some confusion about the random hit injected in each event.
- We have been told that the purpose behind this is to prevent the data concentrator from hanging up.
- Could someone please clarify which hit is the injected one?
  - Is it always in the same place or is it in a random channel?
  - Is it injected into the run even when the HV is off?
  - When is it injected? At the very beginning of the run or at the end?

Hot channels have hits even when HV is OFF

Benjamin noticed this behavior during his expert shift this week.

Are these the random hits that are being injected?