

# TOP status

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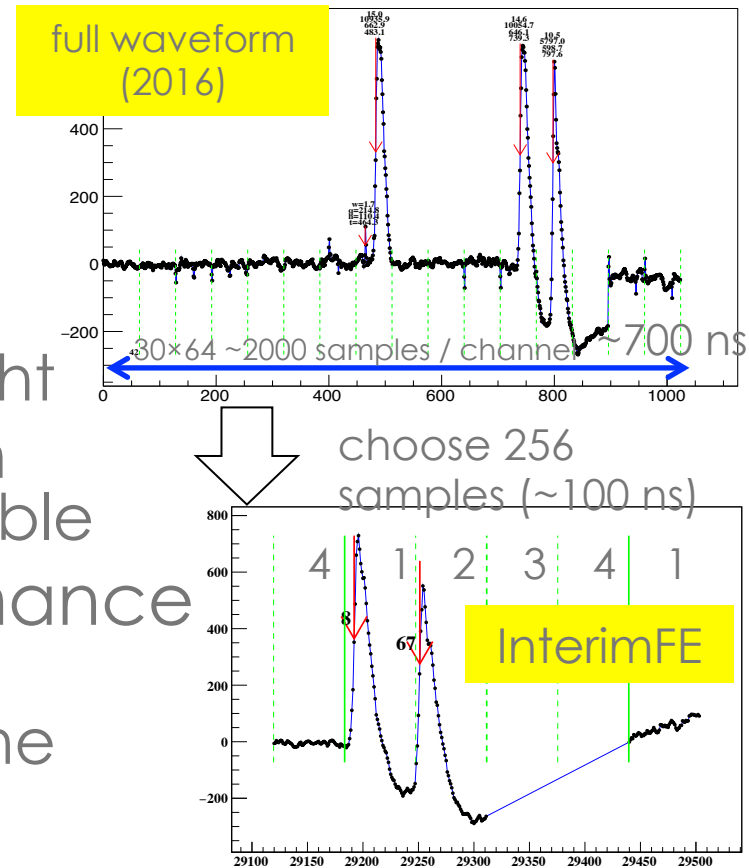
24<sup>th</sup> Aug, 2017

Belle II trigger/DAQ workshop@NTU



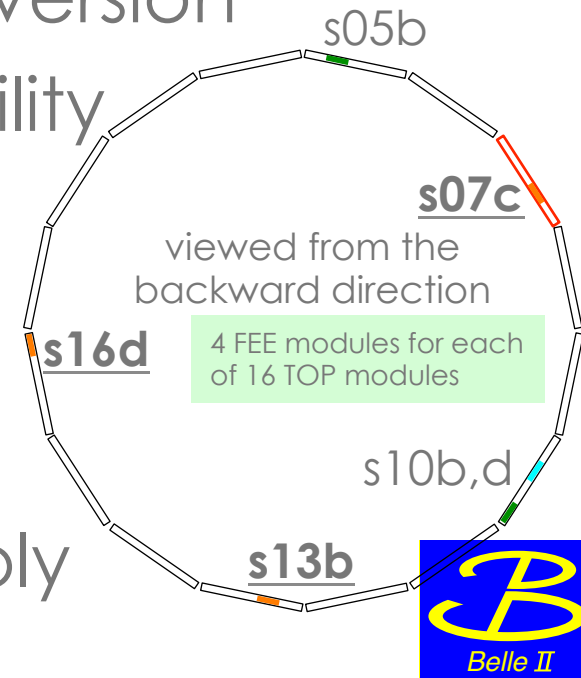
# overview of current TOP DAQ

- readout : “Interim” FE
  - Region Of Interest (ROI) + Feature Extraction (FE)
  - read timing and pulse height
  - record also short waveform for as many events as possible
- limitation / current performance
  - single hit per channel (can be recovered by offline waveform analysis)
  - trigger rate :  $\lesssim 500$  Hz (w/ a single TOP module)
    - min. trigger interval  $> 1.5$  ms
  - huge data size :  $\sim 100$  kB/events (GCR, all the TOP modules)



# operation status of Aug GCR

- updates/issues after GCR in July
  - complete fix of “b2lllost” problem  
→ but still using temporal-fix version
  - data corruption / FEE instability  
→ additional FEE modules to be masked
    - 3 + $\alpha$  modules are unavailable (64 FEE modules in total)
  - basically TOP is working stably



# status of “b2lost” problem

- start to happen when we started study for global cosmic ray data taking
- turned out to be caused by frequent register access
- temporally fixed at the end of July
  - can be used with special HSLB firmware
- completely-fixed version was prepared and tested during the O-bon holidays
  - 😊 can be used with normal HSLB firmware
  - 😊 confirmed that no b2lost are seen
  - 😞 possible problem of data corruption



# data corruption

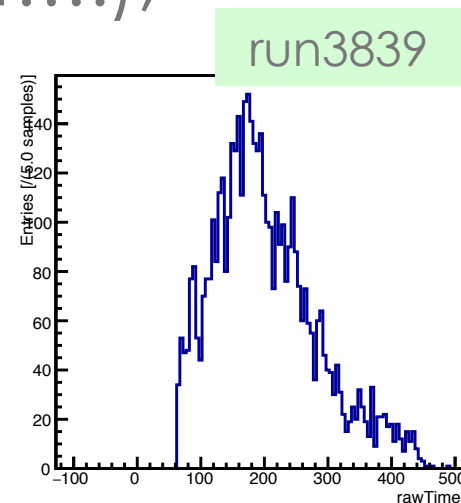
□ simultaneous errors in many FEE modules

□ first (and only once) seen when we started to take cosmic ray data in Aug

□ data looked normal (timing dist....), but huge # of unpacker errors (warnings)

□ might be attributed to the new firmware (not sure at all)  
More investigation is required.

```
[ERROR] TOPUnpacker: Possible frame shift detected. (More than one unique carrier event number in this readout event) { module: TOPUnpacker }
... message repeated 1 times
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 0 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 1 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 2 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 3 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 4 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 5 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 6 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 1 asc: 0 chn: 7 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 0 seen 2 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 1 seen 2 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 2 seen 2 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 3 seen 2 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 4 seen 2 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 5 seen 2 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 6 seen 2 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 45 carrier: 3 asc: 0 chn: 7 seen 2 times instead of once { module: TOPUnpacker }
[ERROR] TOPUnpacker: Possible frame shift detected. (More than one unique carrier event number in this readout event) { module: TOPUnpacker }
[WARNING] ScrodID: 50 carrier: 0 asc: 3 chn: 0 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 50 carrier: 0 asc: 3 chn: 1 seen 0 times instead of once { module: TOPUnpacker }
[WARNING] ScrodID: 50 carrier: 0 asc: 3 chn: 2 seen 0 times instead of once { module: TOPUnpacker }
```

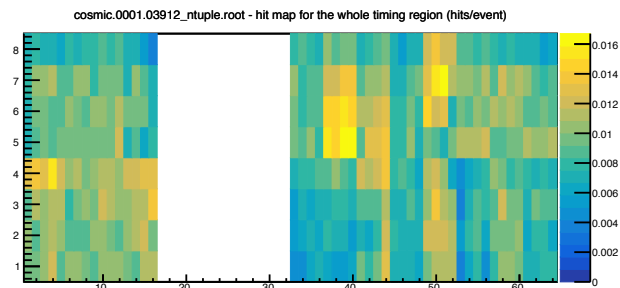


# status of badly behaving FEEs (i)

## □ s05b : data corruption

- no data is available once it happens
- can recover only by power cycling
- seen also in July, but happened only when switching local  $\leftrightarrow$  global modes
- in Aug, happen without doing anything
  - it is fine just after configuration
  - corruption after several hours
- we decided to mask this FEE after data corruption happens
- recently, s10d also start to show the same symptom

```
[ERROR] Different scrodID's in HLSB and FE header: 90 2 word = 0x4090460 { module: TOPUnpacker }
[ERROR] TOPUnpacker: 1176 words of data buffer not used { module: TOPUnpacker }
[ERROR] TOPUnpacker: corrupted data - different scrodID's in HLSB and super short FE header { module: TOPUnpacker }
[ERROR] TOPUnpacker: 1327 words of data buffer not used { module: TOPUnpacker }
[ERROR] TOPUnpacker: corrupted data - different scrodID's in HLSB and super short FE header { module: TOPUnpacker }
[ERROR] TOPUnpacker: 1477 words of data buffer not used { module: TOPUnpacker }
[ERROR] TOPUnpacker: corrupted data - different scrodID's in HLSB and FE header { module: TOPUnpacker }
[ERROR] Different scrodID's in HLSB and FE header: 90 2 word = 0x4280478 { module: TOPUnpacker }
```



## status of badly behaving FEEs (ii)

- s07
  - s07c : everything looks fine before data taking, but can not be included (run immediately crashes)
  - recently, other FEEs start to give issues (ttlost, b2ldown...)
  - now the whole s07 (all the 4 FEEs) is masked
- s10b, s13b, s16d
  - can be configured, but always fails in pedestal data taking
    - s10b is sometimes stable
  - DAQ crashes when they are included as s07c



# status of local run

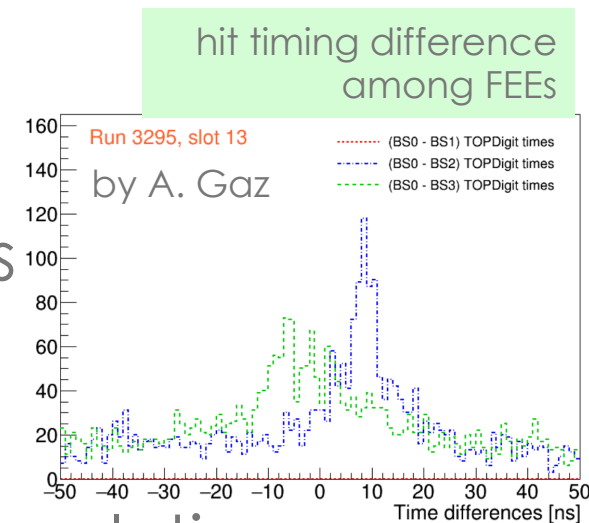
## □ feedback from July run data analysis

□ large FEE module-by-module timing difference was seen ( $\sim O(10 \text{ ns})$ )

□ The timing difference changes every time FEEs are power cycled

□ special laser data with trigger timing synchronized with the revolution clock might be useful

→ take these data every time FEE is power cycled





# slow control

- no big change since July GCR

- HV

- still using tui (text user interface)

- tried to implement Suarabh's GUI, but did not manage to have stable operation yet (no enough time before GCR)

- no big trouble, but sometimes tripped PMTs are seen

- LV

- temporal monitor script is running

ALL	[ON]:[OFF]	HV setting	[0]	[1.5 T]	[+ 0 V]						
HV crate	TOP slot	PMT ID	Switch	Vdemand[V]	VLimit[V]	CLimit[uA]	RampUp[V]	RampDown[V]	State		
01.01.00	01.01	01.01KT0588	OFF	2148	3200	150	50	300	UNKNOWN		
01.01.01	01.02	01.02KT0559	OFF	2332	3200	150	50	300	UNKNOWN		
01.01.02	01.03	01.03KT0573	OFF	2332	3200	150	50	300	UNKNOWN		
01.01.03	01.04	01.04KT0558	OFF	2160	3200	150	50	300	UNKNOWN		
01.01.04	01.05	01.05KT0562	OFF	2135	3200	150	50	300	UNKNOWN		
01.01.05	01.06	01.06KT0538	OFF	2145	3200	150	50	300	UNKNOWN		
01.01.06	01.07	01.07KT0610	OFF	2183	3200	150	50	300	UNKNOWN		
01.01.07	01.08	01.08KT0587	OFF	1934	3200	150	50	300	UNKNOWN		
01.01.08	01.09	01.09KT0637	OFF	2132	3200	150	50	300	UNKNOWN		
01.01.09	01.10	01.10KT0589	OFF	2848	3200	150	50	300	UNKNOWN		
01.01.10	01.11	01.11KT0600	OFF	1916	3200	150	50	300	UNKNOWN		
01.01.11	01.12	01.12KT0566	OFF	2229	3200	150	50	300	UNKNOWN		
01.01.12	01.13	01.13KT0618	OFF	2290	3200	150	50	300	UNKNOWN		
01.01.13	01.14	01.14KT0612	OFF	2667	3200	150	50	300	UNKNOWN		
01.01.14	01.15	01.15KT0580	OFF	2152	3200	150	50	300	UNKNOWN		
01.01.15	01.16	01.16KT0628	OFF	2123	3200	150	20	300	UNKNOWN		
01.01.16	01.17	01.17KT0613	OFF	2117	3200	150	50	300	UNKNOWN		
01.01.17	01.18	01.18KT0591	OFF	2687	3200	150	50	300	UNKNOWN		
01.01.18	01.19	01.19KT0598	OFF	1959	3200	150	50	300	UNKNOWN		
01.01.19	01.20	01.20KT0592	OFF	2625	3200	150	50	300	UNKNOWN		
01.01.20	01.21	01.21KT0575	OFF	2367	3200	150	50	300	UNKNOWN		
01.01.21	01.22	01.22KT0590	OFF	2107	3200	150	50	300	UNKNOWN		
01.01.22	01.23	01.23KT0620	OFF	2221	3200	150	50	300	UNKNOWN		
01.01.23	01.24	01.24KT0611	OFF	2889	3200	150	50	300	UNKNOWN		
01.02.00	01.25	01.25KT0601	OFF	2624	3200	150	50	300	UNKNOWN		
01.02.01	01.26	01.26KT0603	OFF	2609	3200	150	50	300	UNKNOWN		
01.02.02	01.27	01.27KT0594	OFF	2116	3200	150	50	300	UNKNOWN		
01.02.03	01.28	01.28KT0596	OFF	2623	3200	150	50	300	UNKNOWN		

# summary of operation status

- ❑ TOP is stably running in GCR, but there are some issues.
  - ❑ b2lllost problem is now fully understood in firmware side
    - ❑ more tests are needed for stable operation
  - ❑ several FEE modules are unavailable in data taking and masked
    - ❑ behaviors are different module-by-module
    - ❑ trying to understand reasons to fix them
- ❑ slow control GUI is soon available

