GL1 matching study

Jaein Hwang

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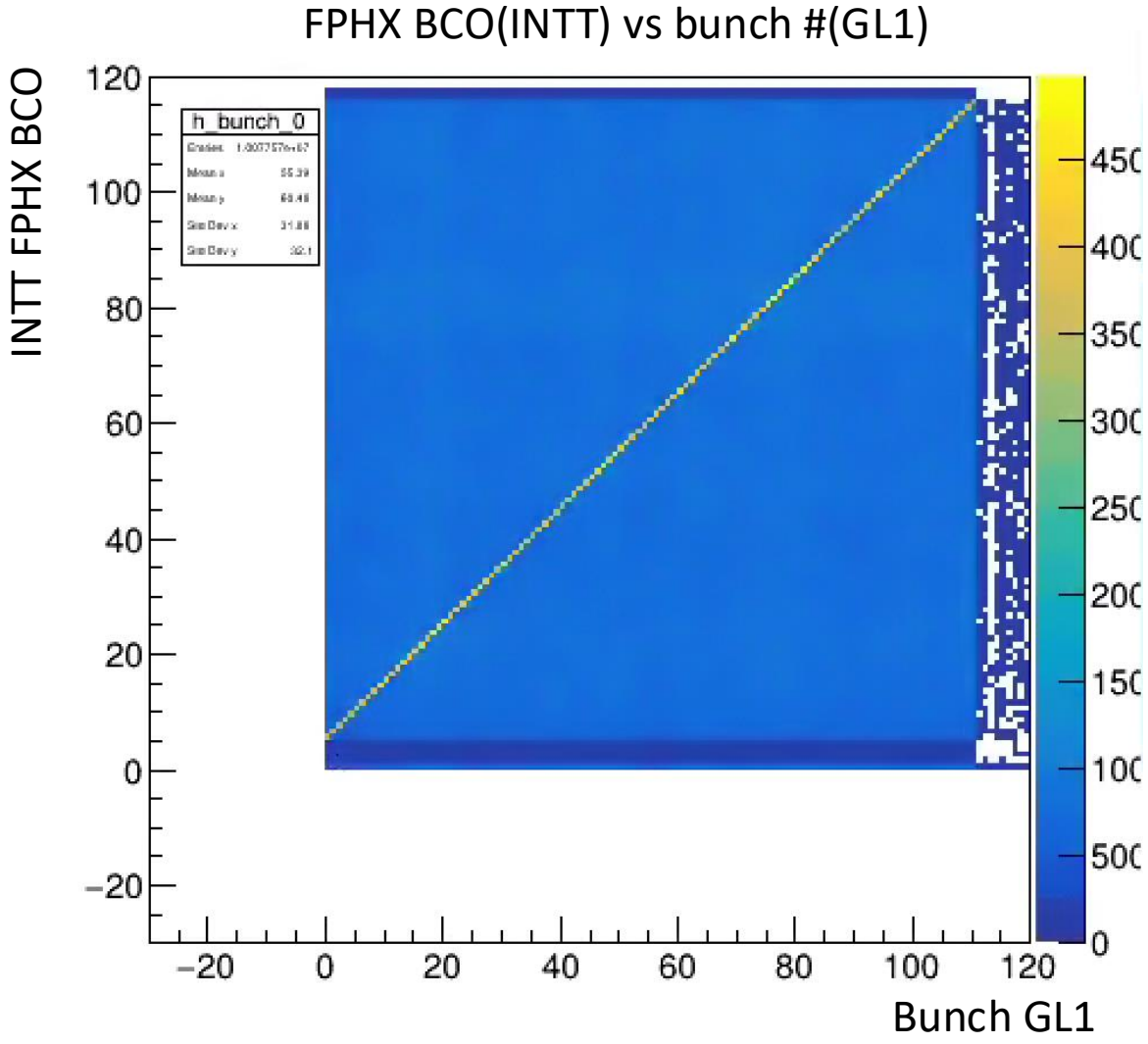
Motivation Review

- GL1 finding(matching) study was made by Takashi and Genki

- Most recent study made by Genki
  https://indico.bnl.gov/event/24711/contributions/96287/attachments/57049/97903/20240904_streaming_timing.pdf

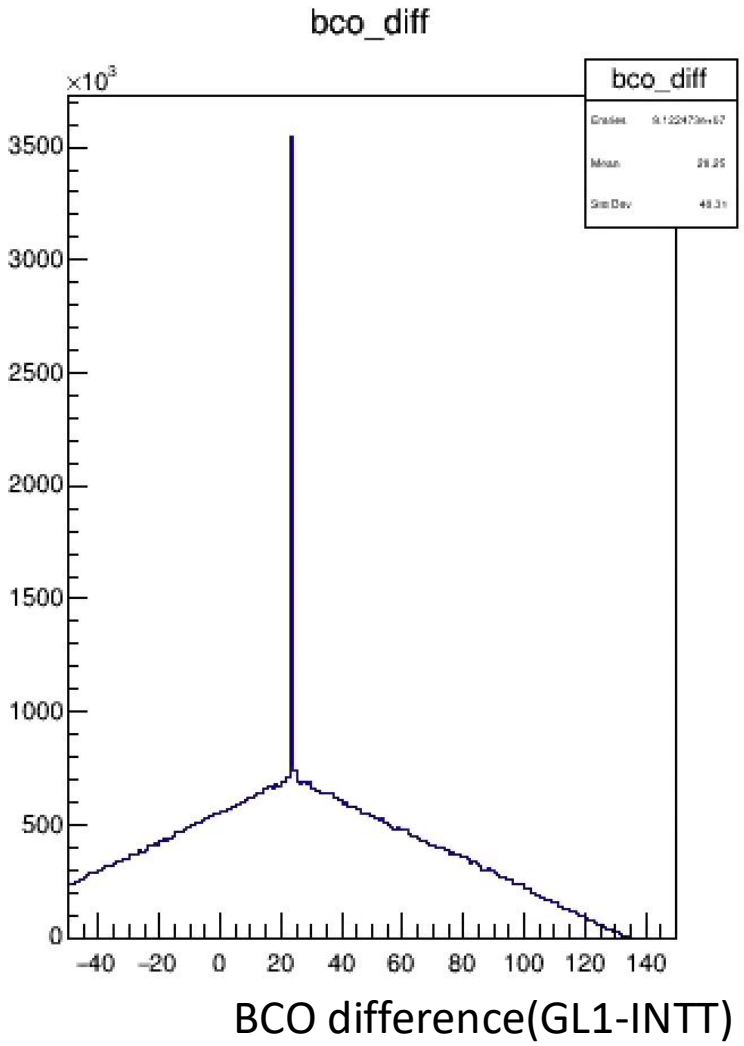
- Try to reproduce the result and want to do cross-check

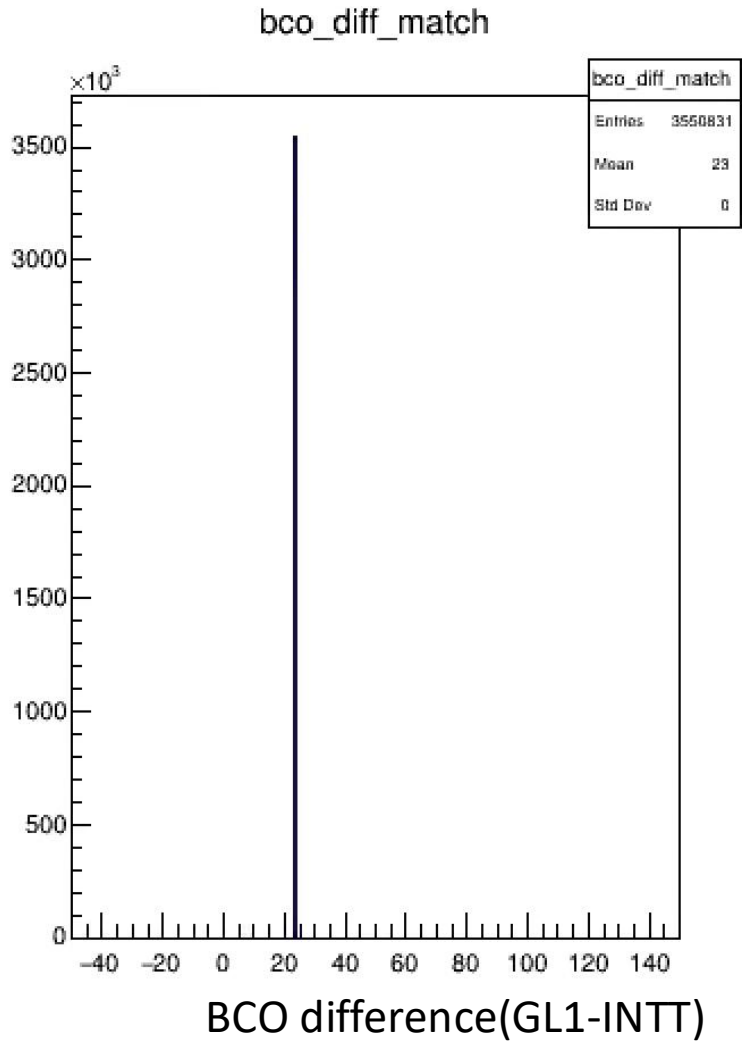
Some QA before GL1 matching ratio calculation



- Run 50889
- INTT 0 used
- 50,000 events used
- Hot channel rejected
- We can see clear correlation btw INTT and GL1

Some QA before GL1 matching ratio calculation





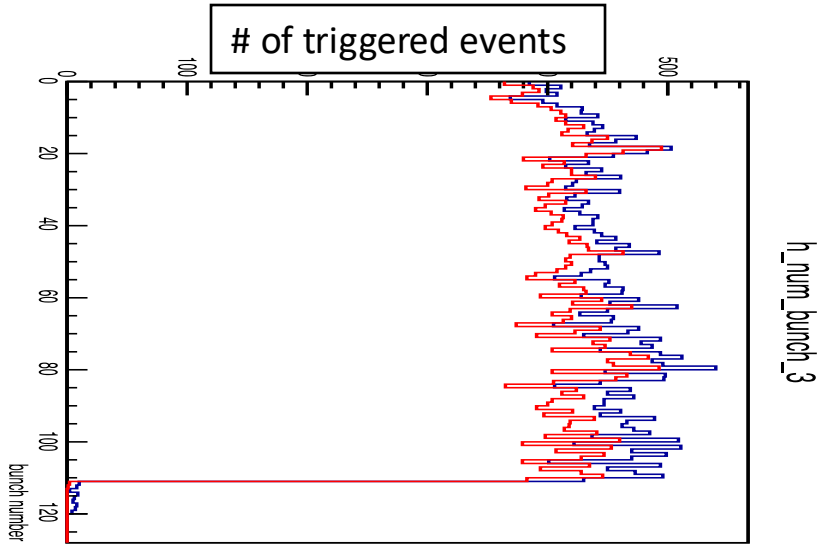
- Run 50889
- 50,000 events used
- Hot channel rejected

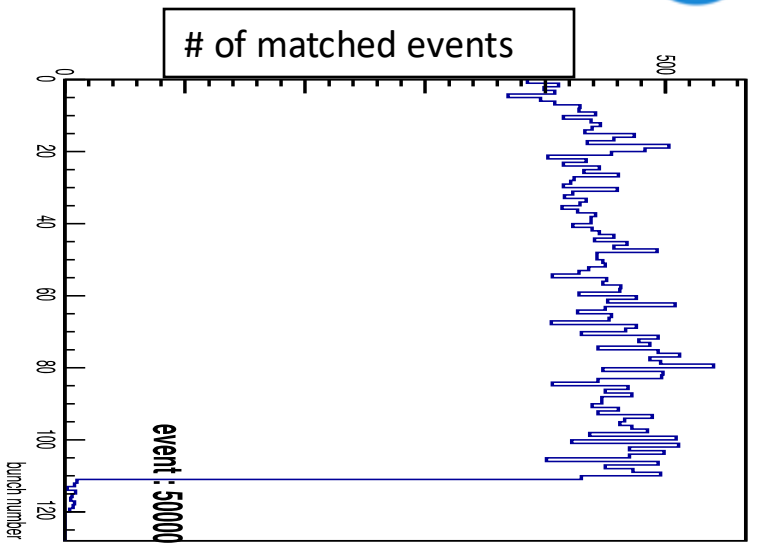
Hit from bco_diff match hit were used to count matched events

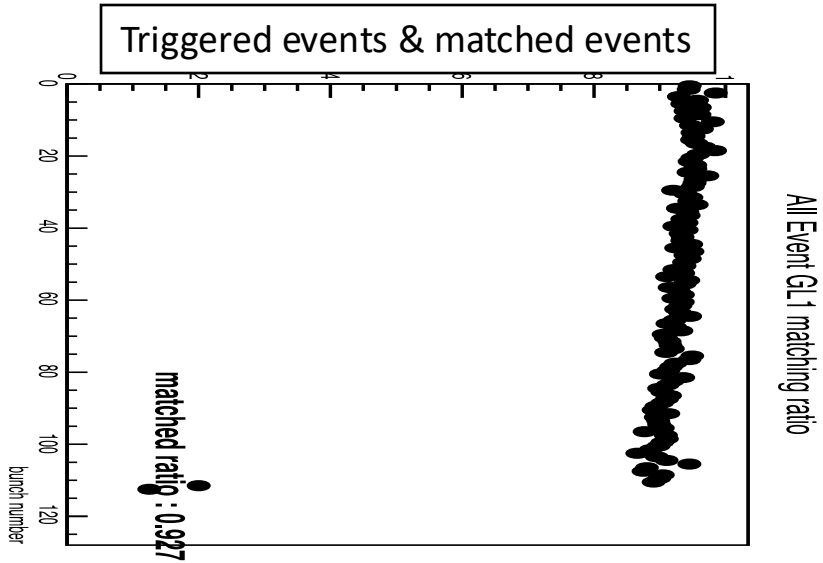
Result(Run 50889 / All trigger used)

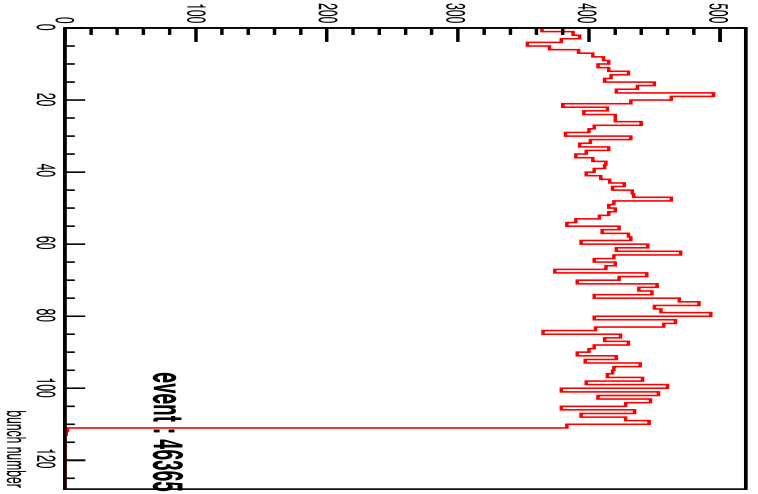
- Hot channel rejected.
- InttRawhit used(before TrkrHit)
- 50,000 events used.

- # of GL1 triggered events : 749
- # of matched event : 289
- Ratio : 46,365/50,000
  ~ 0.927.. = 92.7%





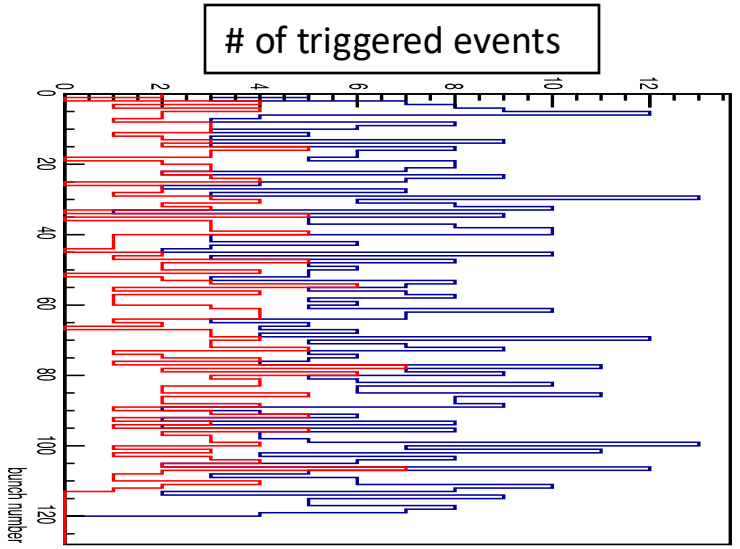


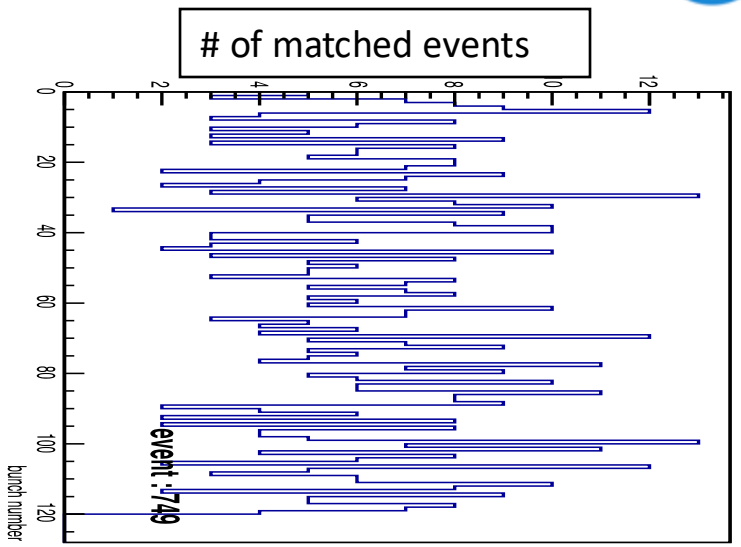


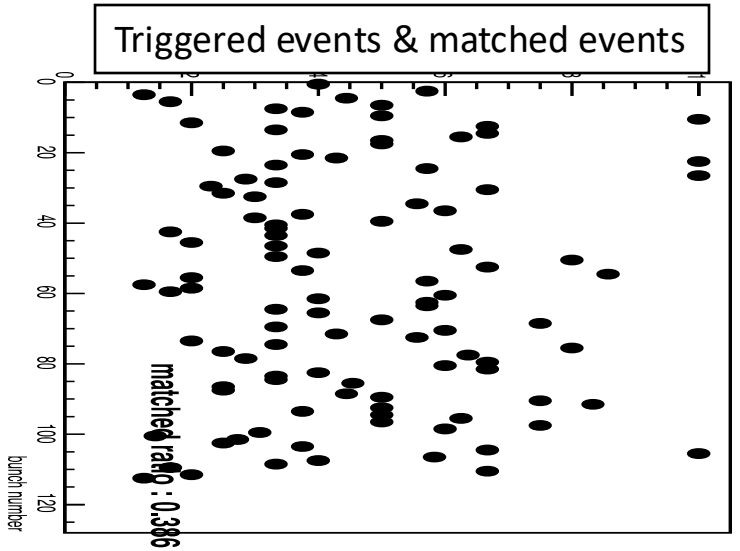
Result(Run 50889 / Clock trigger selected)

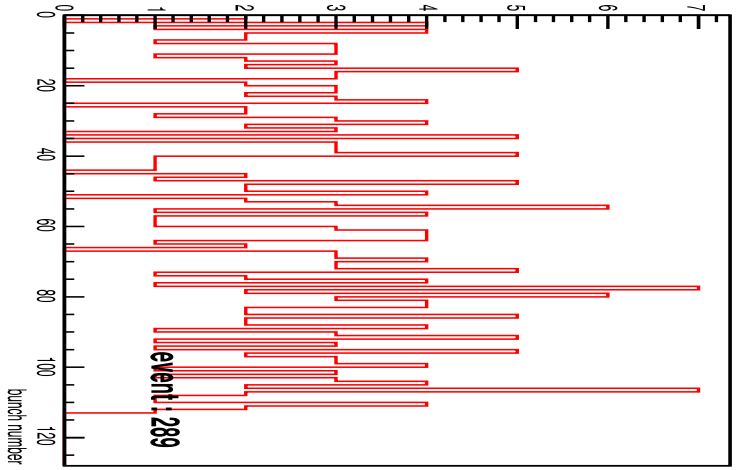
- Hot channel rejected.
- InttRawhit used(before TrkrHit)
- 50,000 events used.

- # of GL1 triggered events : 749
- # of matched event : 289
- Ratio : 289/749
  ~ 0.386 = 38.6%





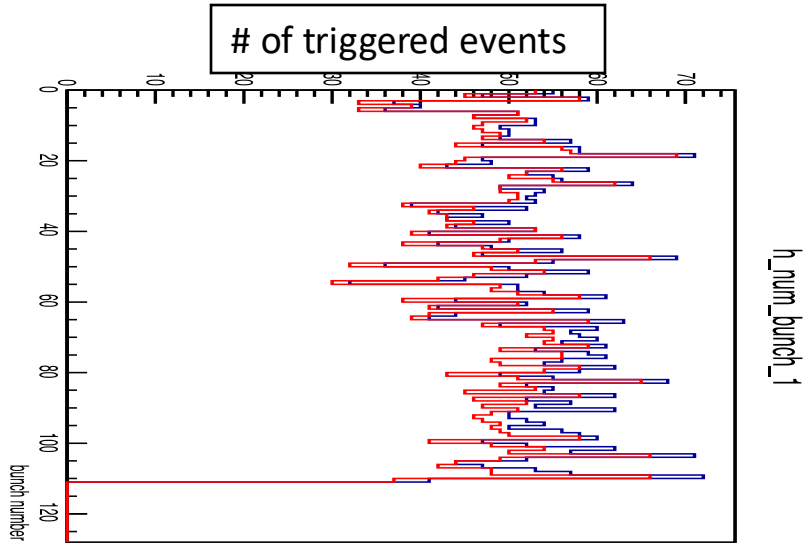


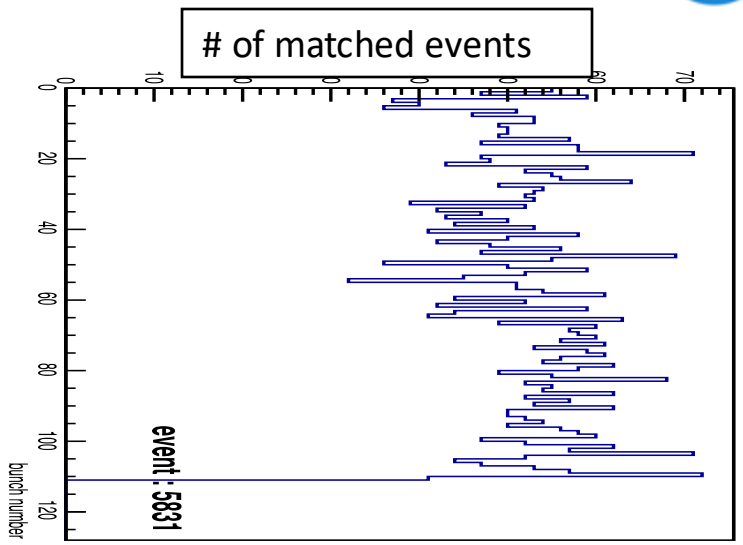


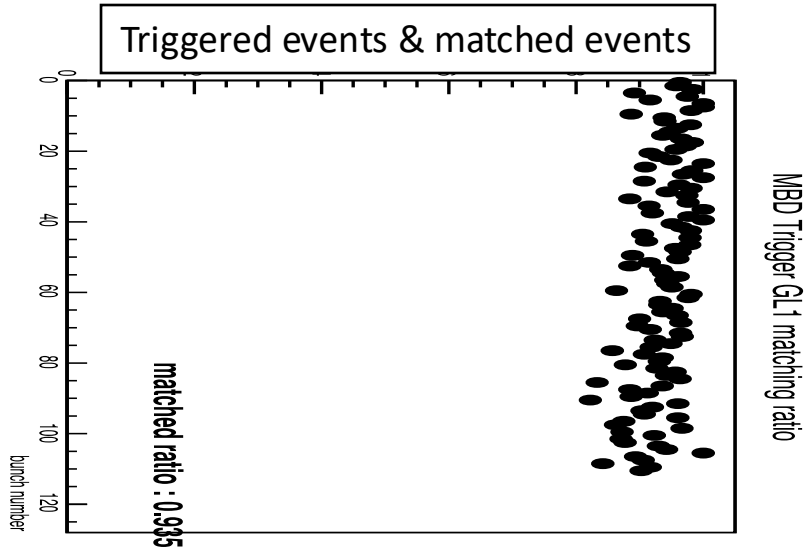
Result(Run 50889 / MBD N&S trigger selected)

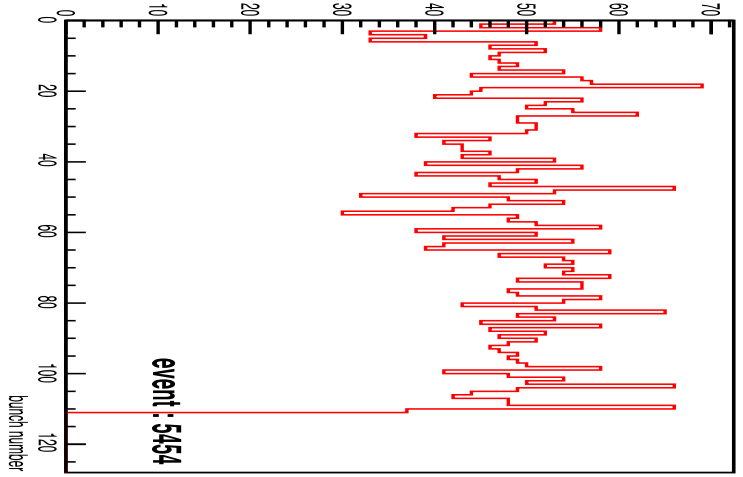
- Hot channel rejected.
- InttRawhit used(before TrkrHit)
- 50,000 events used.

- # of GL1 triggered events : 5454
- # of matched event : 5831
- Ratio : 5454/5831
- ~ 0.935 = 93.5%





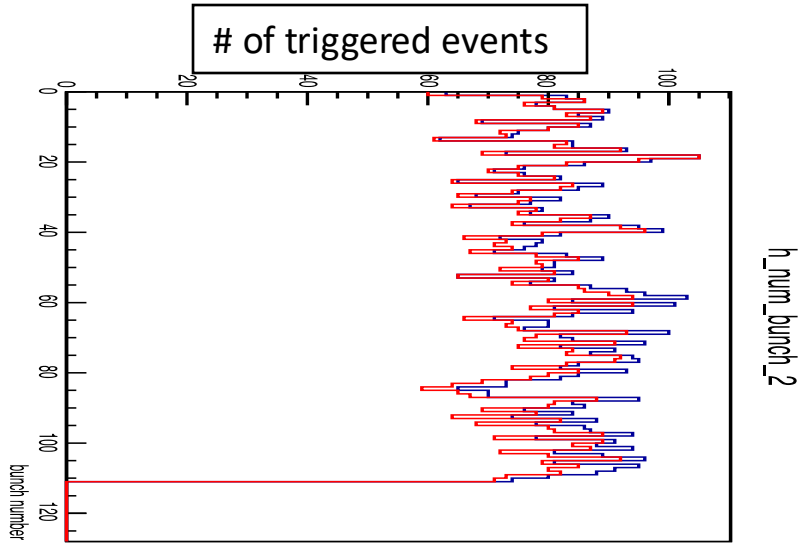


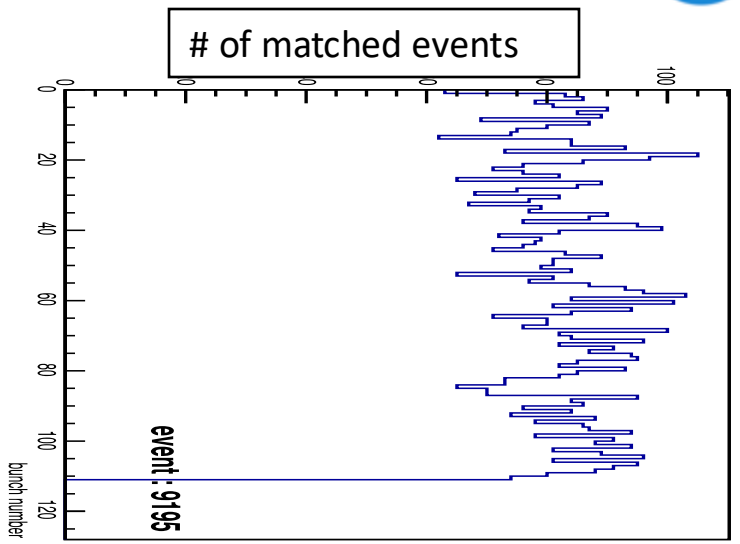


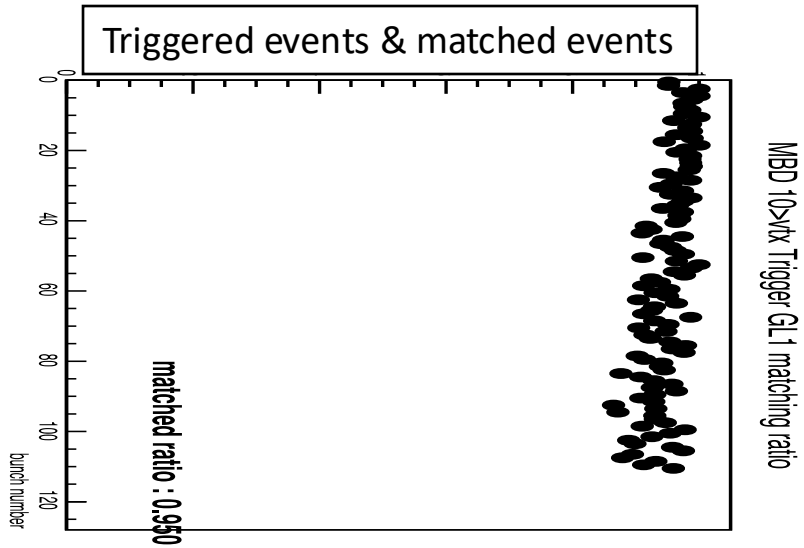
Result(Run 50889 / MBD N&S 10>vtx trigger selected)

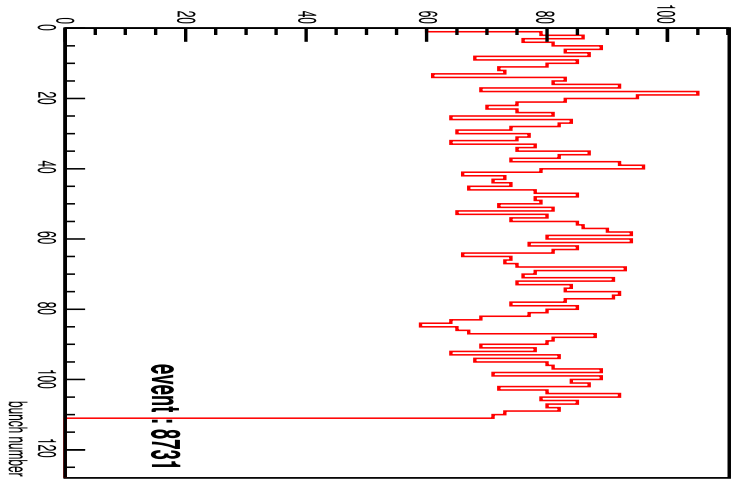
- Hot channel rejected.
- InttRawhit used(before TrkrHit)
- 50,000 events used.

- # of GL1 triggered events : 9355
- # of matched event : 8886
- Ratio : 8731/9195
- ~ 0.950 = 95.0%









Summary Table(Run 50889 / 50889 events InttRawHit used)

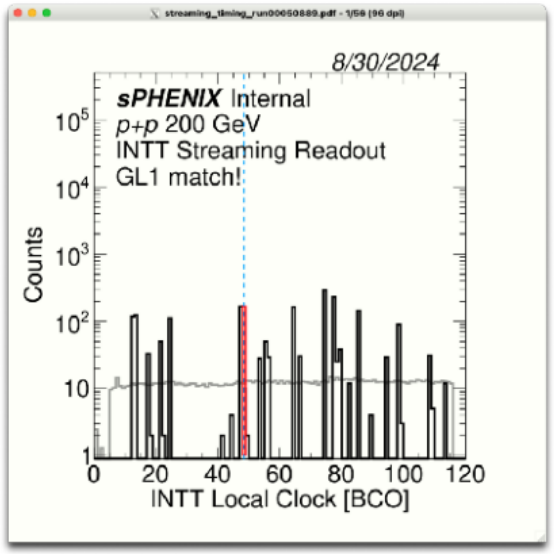
Trigger type	Total event	Matched event	Ratio(%)
All	50000	46365	92.7%
Clock	749	289	38.6%
MBD N&S	5454	5831	93.5%
MBD N&S 10>vtx	9195	8731	95.0%

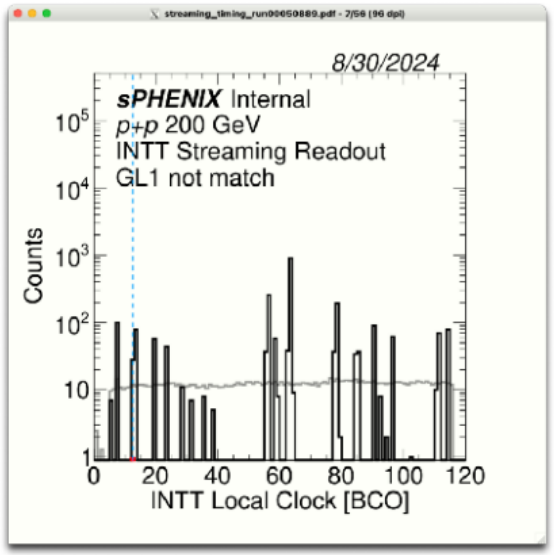
- I can see the matching ratio dependency on Trigger type
- Ratio result is relatively higher than previous result
- Why do we have discrepancy?
  How much ratio is supposed to be?

backup

What about GL1 matching?

@Genki's slide





Trigger type?:

The trigger type (clock, MBD N&1 >= 1, etc.) should affect to the GL1 matching ratio.
Thanks to Jaein, I could get information like:

```
153 std::vector < int > InttStreamingTiming::GetTriggerBits()
154 {
155
156   uint64_t trigger_vector = gl1_->getScaledVector();
157
158   vector < int > rtn;
159   while( trigger_vector != 0 )
160     {
161       int this_bit = 0 ;
162       this_bit = trigger_vector & 1;
163       // cout << std::bitset<32>(trigger_vector) << "  "
164       //           << this_bit << "\t";
165
166       trigger_vector = trigger_vector >> 1;
167
168       //cout << std::bitset<32>(trigger_vector) << endl;
169
170       rtn.push_back( this_bit );
171     }
```

~~I don't see trigger dependence.~~

The matching ratio is always too low.
I think I'm wrong.

1	ZDC South	0	0	
2	ZDC North	6	14	0.43
3	ZDC N&S	24	43	0.56
4	HCAL Single	24	43	0.56
5	HCAL Coincidence	24	43	0.56
6		24	43	0.56
7		0	0	
8	MBD S>=1	16	31	0.52
9	MBD N>=1	4	7	0.57
10	MBD N&S>=1	100	130	0.77
11	MBD N&S>=2	26	34	0.76
12	MBD N&S>=1 vtx<10cm	216	265	0.82
13	MBD N&S>=1 vtx<30cm	57	73	0.78
14	MBD N&S>=1 vtx<60cm	190	244	0.78
15	HCAL, Singles+MBD NS>=1	32	41	0.78
16	Jet 6GeV+MBD NS>=1	177	224	0.79
17	Jet 8GeV+MBD NS>=1	141	168	0.84
18	Jet 10GeV+MBD NS>=1	242	300	0.81
19	Jet 12GeV+MBD NS>=1	12	21	0.57
20	Jet 6GeV	224	280	0.80
21	Jet 8GeV	320	390	0.82
22	Jet 10GeV	281	347	0.81
23	Jet 12GeV	215	259	0.83
24	Photon 2GeV+MBD NS>=1	52	73	0.71
25	Photon 2GeV+MBD NS>=2	75	98	0.77
26	Photon 2GeV+MBD NS>=3	310	381	0.81
27	Photon 2GeV+MBD NS>=4	82	91	0.90
28	Photon 2GeV	246	309	0.80
29	Photon 3GeV	134	163	0.82
30	Photon 4GeV	584	709	0.82
31	Photon 5GeV	213	254	0.84
all	all	638	778	0.82

Only 1k events were analyzed for each trigger.