GDL

TRG/DAQ workshop
Yonsei University
20190828
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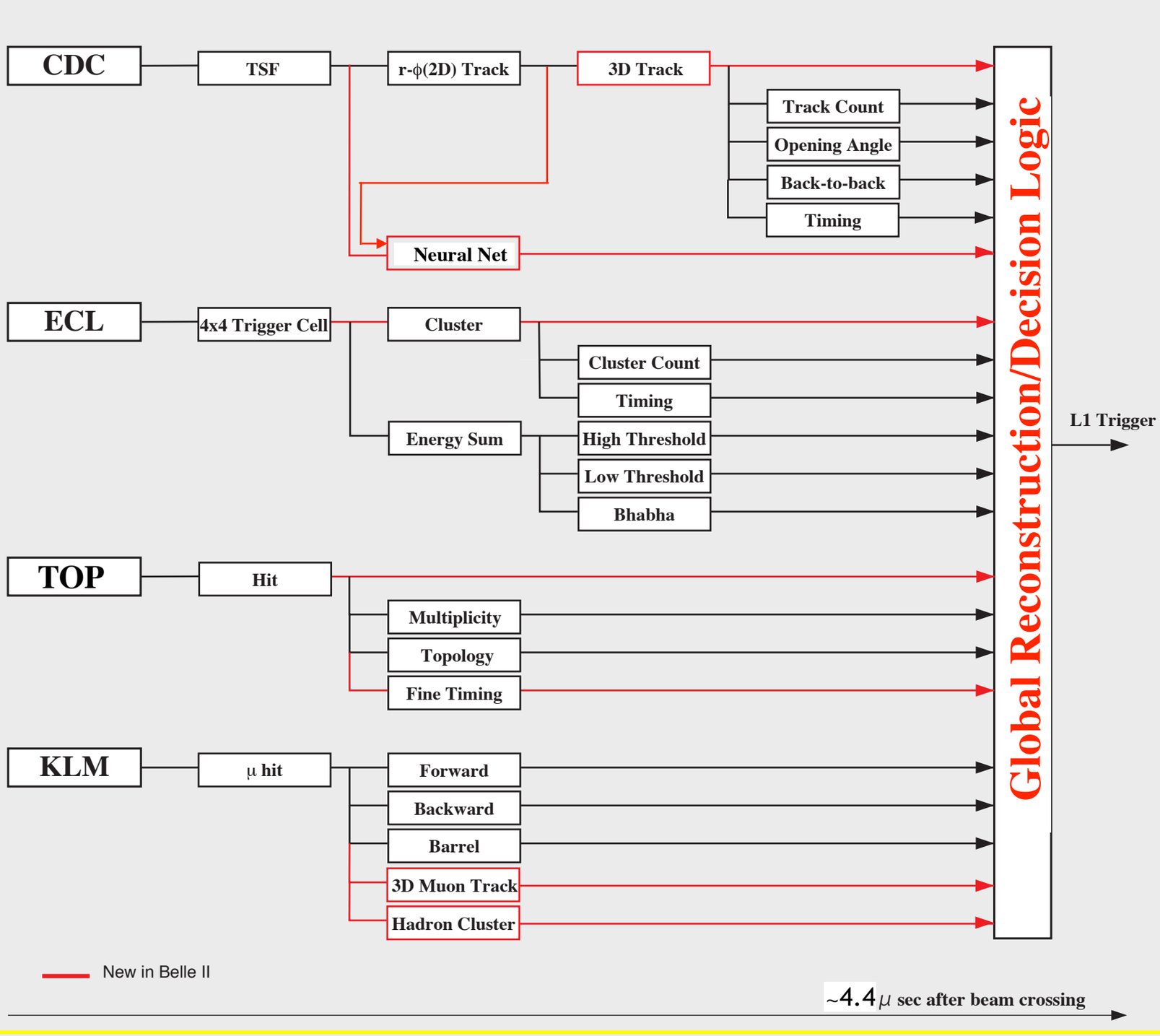
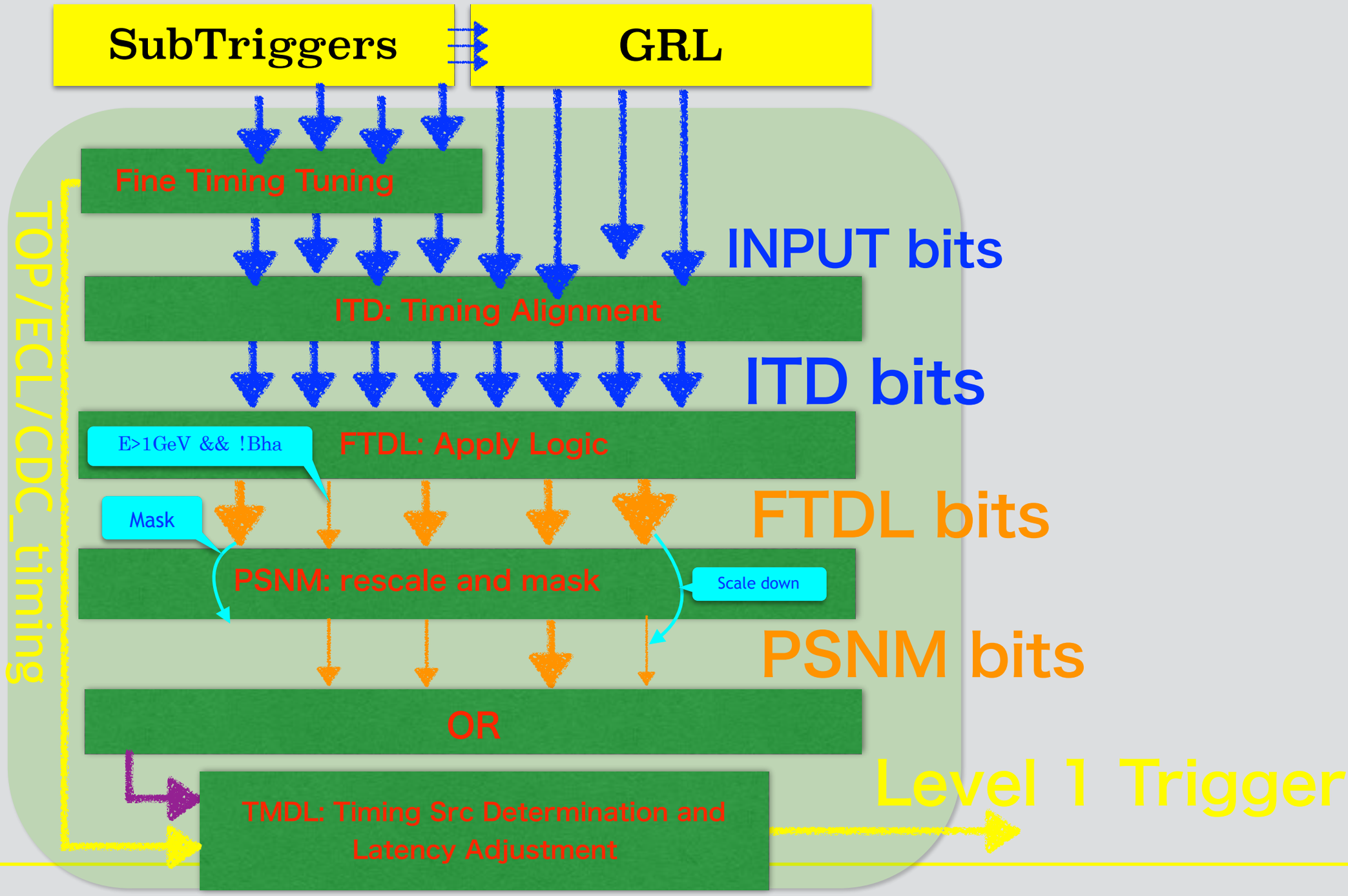
L1 trigger Overview



GDL (Global Decision Logic)

- Implemented on UT3 in Ehut, accessible with vmetrg18



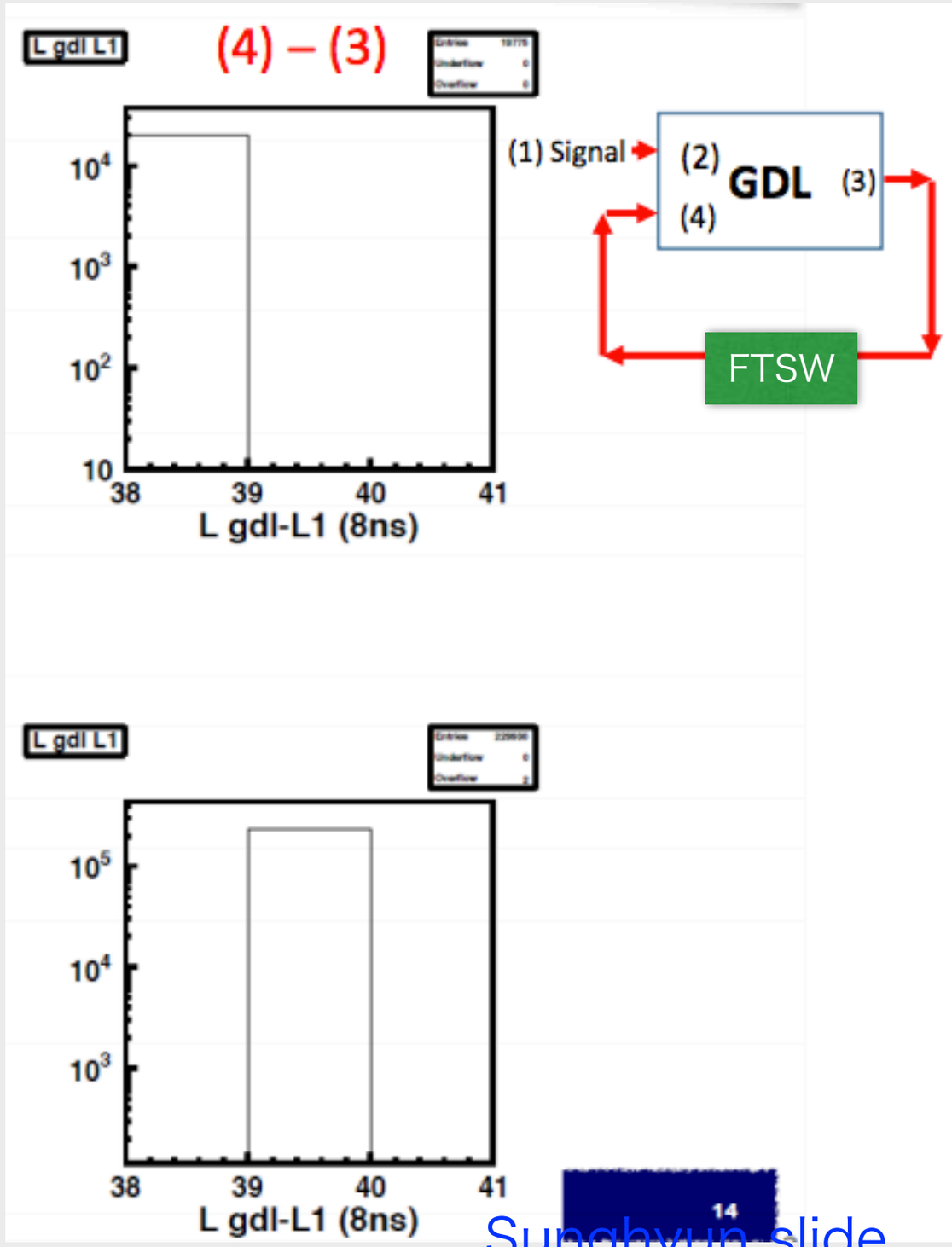
GDL development schedule

- **Short term (within Phase3)**
  - GDL-ETM link ✅
  - Rate check of ffy (three-track with at least one neuro-z)
- **Middle term (during summer)**
  - Common L1 timing shift (GDL->FTSW) ✅
  - B2L data shift (not only GDL but all UT3 except for ETM)
  - Full readout of GDL data
  - VME I/F update
  - Scaler update
  - Edge sensitive ITD ✅
  - Delayed Bhabha logic ✅
  - Large deadtime with 10 kHz read-out
- **Long term**
  - UT3 -> UT4

Iwasaki-san @ June TB

Shift of gdlL1-comL1 latency

- Shift by 1 clock (8ns)
- GDL -> FTDW -> GDL takes 38 clocks or 39 clocks



Sunghyun slide

```
gdl trigger type is synchronized 110b0000 1f000000
```

Sync

- Latency = commonL1 - gdlL1
- Sync: Timing adjustment

RUN	Sync	Latency	
378	0	38	
390	1	Nodata	
551	2	38	After break
676	2	38	
770	0	39	After break
849	0	39	
1001	1	38	After break
1005	1	38	
1006	2	39	GDL no reboot
1007	2	39	
1008	1	38	GDL no reboot
1027	1	38	
1029	3	39	Not synchronized
1030	2	39	
1036	1	38	GDL no reboot
1037	2	39	GDL no reboot
1038	1	38	Inj params DL
1040	0	39	GDL rebooted
1168	0	39	
1170	2	38	GDL rebooted
1175	2	38	
1200	0	39	After break
1207	0	39	
1208	2	38	GDL rebooted
1274	2	38	
1275	1	38	GDL rebooted
1278	1	38	
1279	0	38	GDL rebooted
1286	0	38	
1287	0	39	GDL rebooted
1336	0	39	
1413	1	38	After break
1433	1	38	
1506	0	38	After break
1519	0	38	
1520	1	Nodata	GDL rebooted
1524	1	38	
1525	2	38	GDL rebooted
1556	2	38	
1684	0	38	After break
1739	0	38	
1767	1	38	After break
1917	2	38	After break
1925	0	38	GDL rebooted
1961	0	38	GDL rebooted
1962	0	39	GDL not rebooted
2165	0	39	
2168	2	38	GDL rebooted

Shift of gdlL1-comL1 latency

- Two possibilities
  - CDX on GDL, system clock vs b2tt clock
    - Clock unified to system clock but still the shift seen.
  - On FTSW side, timing phase
    is adjusted run by run in unit of 2 nsec
    - Nakao-san guesses this is due to scanning failure, but no idea how to solve it.
  - Can be corrected on GDL once the run starts.

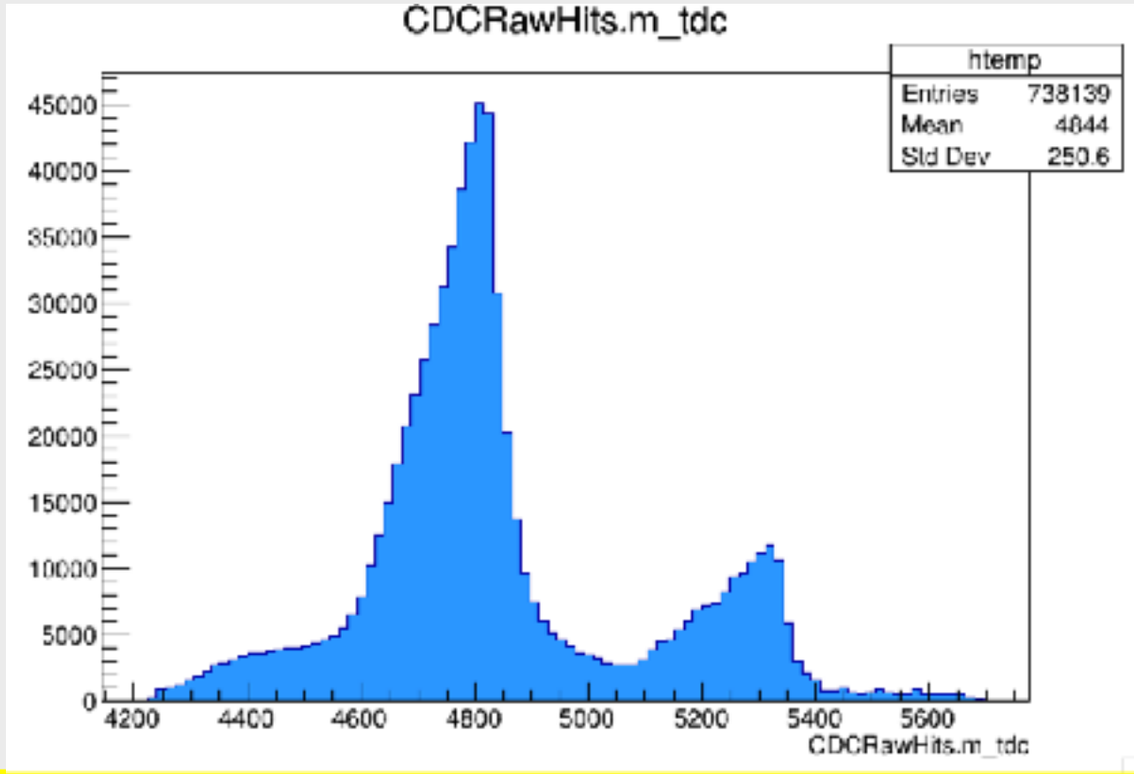
Delayed Bhabha logic

- Data for background overlay to MC data to reproduce background situation.
- Bhabha, high purity, proportional rate to physics.
  - ~400Hz@8e35,PS=100
- To avoid abort gap, take data with same bunch crossing (same timestamp) with Bhabha after one (?) beam cycle.
- Design
  - If Bhabha bit (PSNM) is fired, timestamp and revolution counter for corresponding L1 signal is stored in FIFO
    - FIFO size is 5
  - Inject bha_delay (=logic input) bit and timing source (=dph_timing) before fixed (changeable) latency to L1
- Test OK. More realistic, high rate test will be done.

Timing tuning for cdc_timing

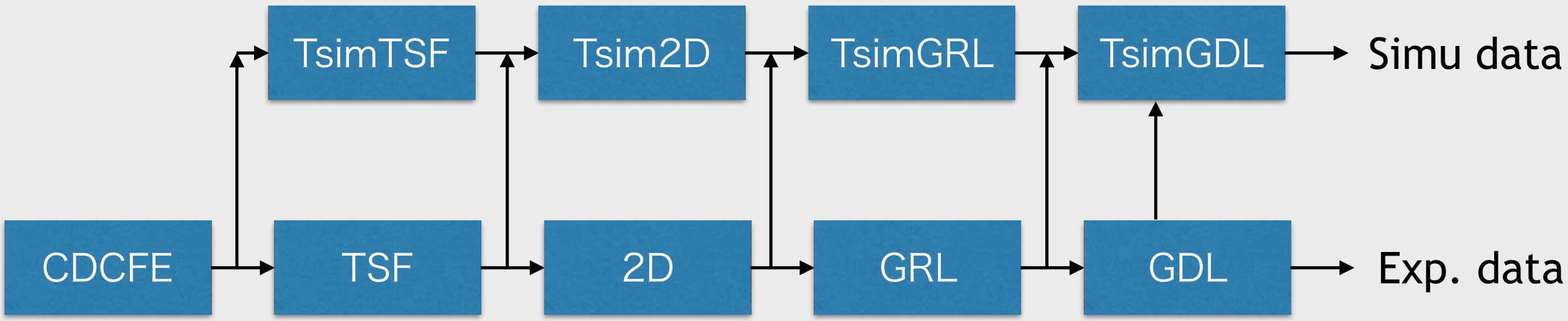
- In case of ECL signals
  - Data clock is 8 MHz, all signal delivered at the same clock
  - Timing is tuned to correct this effect using ecl_timing value
- No correction for cdc_timing.
  - Timing window of cdc_timing was fluctuated.
  - Modified so that cdc_timing signal is given to TMDL (timing decision logic) at fixed latency before L1 signal

Cosmic data taken with cdc_timing

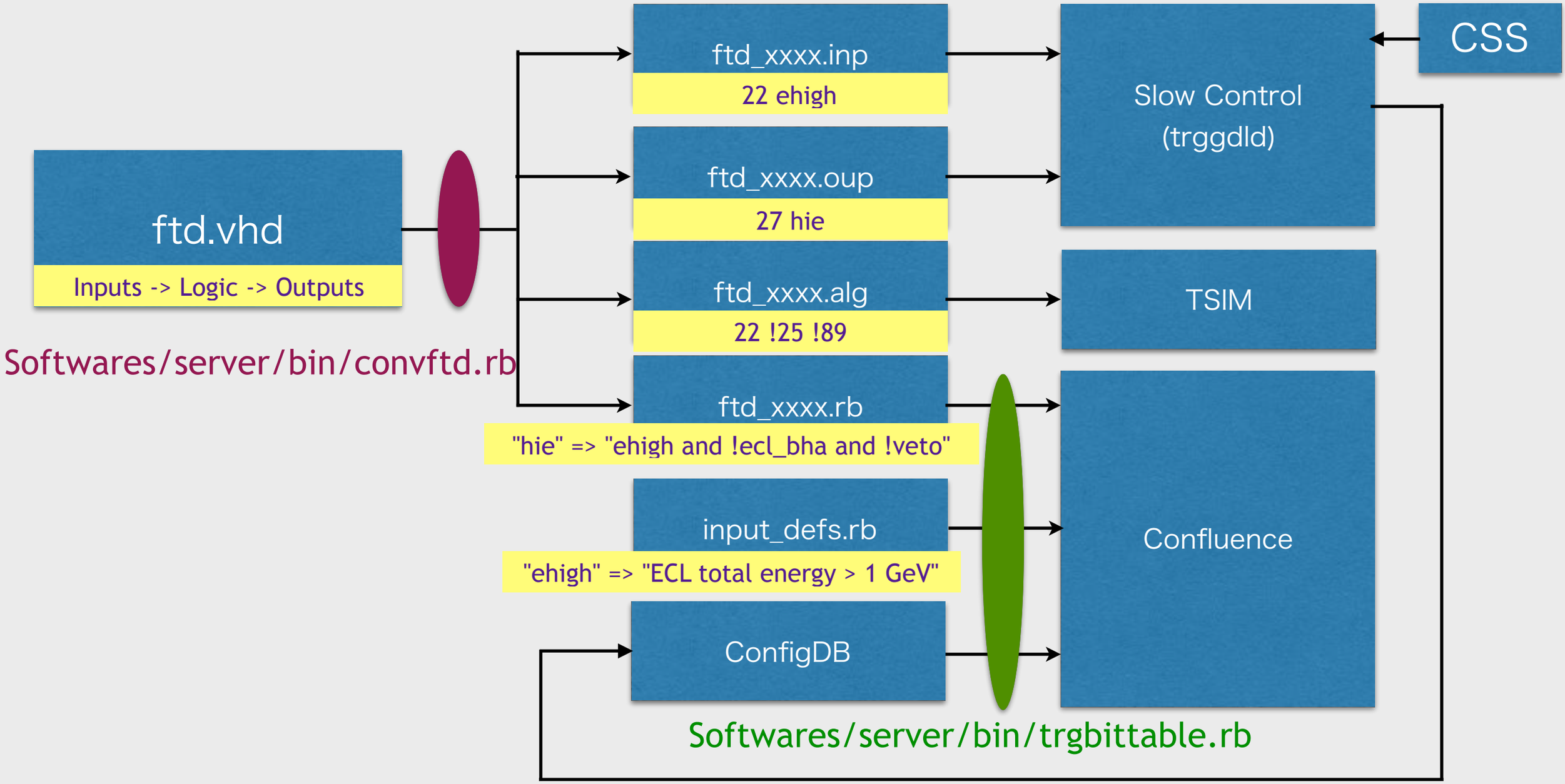


Tsim GDL

- 3 types
  - Firmware simulation
    - Clock-by-clock. Converted from FW code. For detailed systematic study
    - Development not started
  - Fast simulation
    - For Physics analysis
    - Ready. Considering how to test it.
  - Data simulation
    - For algorithm validation. Main part is common with fast simulation.
    - Apply algorithm to exp. input data and compare the output with exp. output bits.
    - Ready and validation ongoing.
- Local DB is used for algorithm data. Need to embed it to global DB.
- Pull request made but not ready for release 4.



Exporting Trigger Bit Map and PS values



- ftd.vhd and input_defs.rb are needed to be modified by hand.
- Bit map, PS value, Logics are recorded in DB run by run.

GDL full readout

- For debugging
- At present, integrated (127MHz -> 32MHz) data.
  Logic consistency partially lost.
- Suppress mode?
- Readout through dedicated UT3 (GDL->one readout UT3-> 4*B2L)
  - Koga-san started FW implementation
- Copper and hslb15003a,3b,4a,4b ready by Yamada-san
  - Can login from trg01
  - trg03 is there. PS=4 if only trg03.
  - Negotiation on FTSW, takes a few months to be delivered.
  - SC

Data truncation

- Data truncation
  - 1st several bytes (sometimes a few words) missing
  - Happend events <0.3%
- Bug found and fixed.
- Dummy 30 kHz with 2 usec event separation
- GDL + skeleton 3Ds
- Will test with other modules when ready
  - Large dead time at 10 kHz solved?

	hdr ok	data ok	hdr bad	data bad	bad#wd	dd shift	ccdisodr	cc ok
2D0	0	0	0	0	0	0	0	0
2D1	0	0	0	0	0	0	0	0
2D2	0	0	0	0	0	0	0	0
2D3	0	0	0	0	0	0	0	0
3D0	221082	3505	0	0	0	0	0	3505
3D1	221082	3505	0	0	0	0	0	3505
3D2	221082	3505	0	0	0	0	0	3505
3D3	221082	3505	0	0	0	0	0	3505
NN0	0	0	0	0	0	0	0	0
NN1	0	0	0	0	0	0	0	0
NN2	0	0	0	0	0	0	0	0
NN3	0	0	0	0	0	0	0	0
SL0	0	0	0	0	0	0	0	0
SL1	0	0	0	0	0	0	0	0
SL2	0	0	0	0	0	0	0	0
SL3	0	0	0	0	0	0	0	0
SL4	0	0	0	0	0	0	0	0
SL5	0	0	0	0	0	0	0	0
SL6	0	0	0	0	0	0	0	0
GDL	0	224587	0	0	0	0	0	224587
ETF	0	0	0	0	0	0	0	0

242,1 末尾

Others

- GDL-ETM link
  - Optical Link: GTX->GTH on both side
  - Will test it at B2 testbench though not realistic.
- Veto signals, ecl_bst, bha_veto
  - bha_veto via NIM to reduce latency.
  - ecl_bst should be prepared anyway.
  - ecl_bst should be through NIM.
    - Dedicated delay module to widen it to 2 usec
- Edge sensitive input signals, done.
- VME component update
  - To avoid access to VME parameter values in top.vhd.
  - CDX free.
  - Iwasaki-san has new VME component.
  - Need to develop scaler part?
- Compile with alive count scaler
  - Omitted at present for easy compiling. No plan.
- Logic and usage of TOP and KLM signals.

```
j: input average rates, J: input total counts
f: ftd   instant rates, F: ftd   instant counts
e: ftd   average rates, E: ftd   total counts
p: psn   instant rates, P: psn   instant counts
o: psn   average rates, O: psn   total counts
g; general info
interval   9.0 sec
RUNNING
```

0	fff	1,	1608.4,	0.0	49	sp		0,	0.0,	0.0	98	cdctop2		0,	0.0,	0.0
1	ffs	0,	0.0,	0.0	50	zp		0,	0.0,	0.0	99	cdctop3		0,	0.0,	0.0
2	fss	0,	0.0,	0.0	51	yp		0,	0.0,	0.0	100	cdctop4		0,	0.0,	0.0
3	sss	0,	0.0,	0.0	52	d_5		0,	0.0,	0.0	101	c1hie		1,	210.7,	0.0
4	ffz	0,	0.0,	0.0	53	shem		40,	26.8,	0.0	102	c1lume		1,	110.6,	0.0
5	fzz	0,	0.0,	0.0	54	ohem		40,	32.5,	0.0	103	n1hie		1,	180.4,	0.0
6	zzz	0,	0.0,	0.0	55	toptiming		0,	0.0,	0.0	104	n1lume		1,	100.6,	0.0
7	ffy	0,	0.0,	0.0	56	ecltiming		0,	0.0,	0.0	105	c3hie		1,	31.4,	0.0
8	fyy	0,	0.0,	0.0	57	cdctiming		0,	0.0,	0.0	106	c3lume		1,	12.4,	0.0
9	yyy	0,	0.0,	0.0	58	cdcbb		1,	502.3,	0.0	107	n3hie		1,	15.4,	0.0
10	ff	20,	270.0,	0.0	59	mu_pair		0,	0.0,	0.0	108	n3lume		1,	1.3,	0.0
11	fs	0,	0.0,	0.0	60	mu_b2b		0,	0.0,	0.0	109	lm10		1,	316.8,	0.0
12	ss	0,	0.0,	0.0	61	klmhit		0,	0.0,	0.0	110	lm11		1,	72.9,	0.0
13	fz	0,	0.0,	0.0	62	revolution	R	1,	0.9,	0.0	111	lm12		1,	46.1,	0.0
14	zz	0,	0.0,	0.0	63	random	R	1,	0.7,	0.0	112	lm13		1,	96.6,	0.0
15	fy	0,	0.0,	0.0	64	bg		0,	0.0,	0.0	113	lm14		1,	150.4,	0.0
16	yy	0,	0.0,	0.0	65	pls		0,	0.0,	0.0	114	lm15		1,	83.3,	0.0
17	ffo	1,	816.3,	0.0	66	poisson		0,	0.0,	0.0	115	lm16		1,	63.4,	0.0
18	fso	0,	0.0,	0.0	67	f		2000,	12.5,	0.0	116	lm17		1,	45.7,	0.0
19	sso	0,	0.0,	0.0	68	s		0,	0.0,	0.0	117	lm18		1,	28.3,	0.0
20	fzo	0,	0.0,	0.0	69	z		0,	0.0,	0.0	118	lm19		1,	112.7,	0.0
21	fyo	0,	0.0,	0.0	70	y		0,	0.0,	0.0	119	lm110		1,	139.4,	0.0
22	ffb	1,	377.7,	0.0	71	nim0		0,	0.0,	0.0	120	lm111		0,	0.0,	0.0
23	fsb	0,	0.0,	0.0	72	nima03		0,	0.0,	0.0	121	zzzv		0,	0.0,	0.0
24	ssb	0,	0.0,	0.0	73	nimo03		0,	0.0,	0.0	122	yyyv		0,	0.0,	0.0
25	fzb	0,	0.0,	0.0	74	eclnima03		0,	0.0,	0.0	123	fffv		0,	0.0,	0.0
26	fyb	0,	0.0,	0.0	75	eclnimo03		0,	0.0,	0.0	124	zzv		0,	0.0,	0.0
27	hie	1,	230.7,	0.0	76	n1gev0		0,	0.0,	0.0	125	yyv		0,	0.0,	0.0
28	lowe	0,	0.0,	0.0	77	n1gev1		0,	0.0,	0.0	126	ffov		0,	0.0,	0.0
29	lume	0,	0.0,	0.0	78	n1gev2		0,	0.0,	0.0	127	hiev		0,	0.0,	0.0
30	c2	150,	17.1,	0.0	79	n1gev3		0,	0.0,	0.0	128	lumev		0,	0.0,	0.0
31	c3	50,	5.7,	0.0	80	n1gev4		0,	0.0,	0.0	129	c4v		0,	0.0,	0.0
32	c4	1,	63.0,	0.0	81	n2gev1		0,	0.0,	0.0	130	bhabhav		0,	0.0,	0.0
33	c5	0,	0.0,	0.0	82	n2gev2		0,	0.0,	0.0	131	bhapurv		0,	0.0,	0.0
34	bha3d	1,	158.8,	0.0	83	n2gev3		0,	0.0,	0.0	132	mu_pairv		0,	0.0,	0.0
35	bhabha	1,	174.5,	0.0	84	n2gev4		0,	0.0,	0.0	133	bha3dv		0,	0.0,	0.0
36	bhabha_trk	1,	35.7,	0.0	85	c2gev1		1,	13.0,	0.0	134	sl0b2b		0,	0.0,	0.0
37	bhabha_brl	1,	42.2,	0.0	86	c2gev2		1,	4.7,	0.0	135	mu_epair		0,	0.0,	0.0
38	bhabha_ecp	1,	132.3,	0.0	87	c2gev3		0,	0.0,	0.0	136	mu_eb2b		0,	0.0,	0.0
39	bhapur	1,	187.1,	0.0	88	c2gev4		0,	0.0,	0.0	137	eklmhit		0,	0.0,	0.0
40	eclmumu	1,	109.1,	0.0	89	cdcecl1		3000,	1.9,	0.0	138	fffc		0,	0.0,	0.0
41	bhauni	1,	187.1,	0.0	90	cdcecl2		150,	2.0,	0.0	139	fffc2		0,	0.0,	0.0
42	ecloflo	1,	16.8,	0.0	91	cdcecl3		1,	16.8,	0.0	140	ffoc		0,	0.0,	0.0
43	g_high	20,	12.5,	0.0	92	cdcecl4		1,	4.8,	0.0	141	ffoc2		0,	0.0,	0.0
44	g_c1	1500,	21.7,	0.0	93	cdcklm1		0,	0.0,	0.0	142	fffo		1,	399.8,	0.0
45	gg	150,	10.5,	0.0	94	cdcklm2		0,	0.0,	0.0	143	fffov		0,	0.0,	0.0
46	eed	1,	30.8,	0.0	95	cdcklm3		0,	0.0,	0.0	144	sl1b2b		0,	0.0,	0.0
47	fed	1,	64.8,	0.0	96	cdcklm4		0,	0.0,	0.0	145	sl2b2b		0,	0.0,	0.0
48	fp	1,	176.6,	0.0	97	cdctop1		0,	0.0,	0.0	146	sl12b2b		0,	0.0,	0.0

```
j: input average rates, J: input total counts
f: ftd   instant rates, F: ftd   instant counts
e: ftd   average rates, E: ftd   total counts
p: psn   instant rates, P: psn   instant counts
o: psn   average rates, O: psn   total counts
g; general info
interval   9.0 sec
RUNNING
```

0	fff	1,	1369.3,	0.0	49	sp	0,	88.4,	0.0	98	cdctop2	0,	14.9,	0.0
1	ffs	0,	850.5,	0.0	50	zp	0,	134.6,	0.0	99	cdctop3	0,	7.4,	0.0
2	fss	0,	432.8,	0.0	51	yp	0,	171.7,	0.0	100	cdctop4	0,	15.1,	0.0
3	sss	0,	114.1,	0.0	52	d_5	0,	364.6,	0.0	101	c1hie	1,	228.5,	0.0
4	ffz	0,	2165.0,	0.0	53	shem	40,	1056.8,	0.0	102	c1lume	1,	123.5,	0.0
5	fzz	0,	1596.0,	0.0	54	ohem	40,	1282.1,	0.0	103	n1hie	1,	197.1,	0.0
6	zzz	0,	8939.5,	0.0	55	toptiming	0,	204272.1,	0.0	104	n1lume	1,	111.8,	0.0
7	ffy	0,	1368.9,	0.0	56	ecltiming	0,	58652.2,	0.0	105	c3hie	1,	29.5,	0.0
8	fyy	0,	1360.2,	0.0	57	cdctiming	0,	56334.6,	0.0	106	c3lume	1,	12.9,	0.0
9	yyy	0,	1164.3,	0.0	58	cdcbb	1,	341.2,	0.0	107	n3hie	1,	12.9,	0.0
10	ff	20,	5131.2,	0.0	59	mu_pair	0,	0.0,	0.0	108	n3lume	1,	0.9,	0.0
11	fs	0,	3856.2,	0.0	60	mu_b2b	0,	0.0,	0.0	109	lml0	1,	325.7,	0.0
12	ss	0,	1283.3,	0.0	61	klmhit	0,	0.0,	0.0	110	lml1	1,	78.3,	0.0
13	fz	0,	5745.1,	0.0	62	revolution	1,	1.0,	0.0	111	lml2	1,	48.5,	0.0
14	zz	0,	17939.1,	0.0	63	random	1,	0.7,	0.0	112	lml3	1,	107.8,	0.0
15	fy	0,	5130.4,	0.0	64	bg	0,	238.9,	0.0	113	lml4	1,	153.1,	0.0
16	yy	0,	4622.3,	0.0	65	pls	0,	1.0,	0.0	114	lml5	1,	89.5,	0.0
17	ffo	1,	689.6,	0.0	66	poisson	0,	0.4,	0.0	115	lml6	1,	68.2,	0.0
18	fso	0,	269.7,	0.0	67	f	2000,	24525.3,	0.0	116	lml7	1,	46.6,	0.0
19	sso	0,	64.0,	0.0	68	s	0,	12649.1,	0.0	117	lml8	1,	30.8,	0.0
20	fzo	0,	692.7,	0.0	69	z	0,	33135.1,	0.0	118	lml9	1,	104.9,	0.0
21	fyo	0,	689.3,	0.0	70	y	0,	24566.0,	0.0	119	lml10	1,	135.8,	0.0
22	ffb	1,	264.0,	0.0	71	nim0	0,	3218208.8,	0.0	120	lml11	0,	58268.2,	0.0
23	fsb	0,	98.8,	0.0	72	nima03	0,	0.0,	0.0	121	zzzv	0,	9211.0,	0.0
24	ssb	0,	27.4,	0.0	73	nimo03	0,	6074096.5,	0.0	122	yyyv	0,	1280.9,	0.0
25	fzb	0,	253.2,	0.0	74	eclnima03	0,	0.0,	0.0	123	fffv	0,	1495.7,	0.0
26	fyb	0,	263.8,	0.0	75	eclnimo03	0,	47726.0,	0.0	124	zzv	0,	18313.7,	0.0
27	hie	1,	239.2,	0.0	76	n1gev0	0,	1079.0,	0.0	125	yyv	0,	4777.8,	0.0
28	lowe	0,	1260.4,	0.0	77	n1gev1	0,	72.0,	0.0	126	ffov	0,	773.8,	0.0
29	lume	0,	57.0,	0.0	78	n1gev2	0,	8.5,	0.0	127	hiev	0,	289.4,	0.0
30	c2	150,	2628.8,	0.0	79	n1gev3	0,	0.3,	0.0	128	lumev	0,	94.6,	0.0
31	c3	50,	295.1,	0.0	80	n1gev4	0,	0.1,	0.0	129	c4v	0,	126.0,	0.0
32	c4	1,	67.3,	0.0	81	n2gev1	0,	23.1,	0.0	130	bhabhav	0,	201.4,	0.0
33	c5	0,	28.3,	0.0	82	n2gev2	0,	5.9,	0.0	131	bhapurv	0,	200.6,	0.0
34	bha3d	1,	172.2,	0.0	83	n2gev3	0,	0.1,	0.0	132	mu_pairv	0,	0.0,	0.0
35	bhabha	1,	189.3,	0.0	84	n2gev4	0,	0.0,	0.0	133	bha3dv	0,	172.9,	0.0
36	bhabha_trk	1,	39.3,	0.0	85	c2gev1	1,	12.8,	0.0	134	sl0b2b	0,	182420.8,	0.0
37	bhabha_brl	1,	45.2,	0.0	86	c2gev2	1,	4.1,	0.0	135	mu_epair	0,	998.0,	0.0
38	bhabha_ecp	1,	144.0,	0.0	87	c2gev3	0,	0.2,	0.0	136	mu_eb2b	0,	184.3,	0.0
39	bhapur	1,	199.7,	0.0	88	c2gev4	0,	0.0,	0.0	137	eklmhit	0,	7228.9,	0.0
40	eclmumu	1,	108.0,	0.0	89	cdcecl1	3000,	5863.2,	0.0	138	fffc	0,	334.8,	0.0
41	bhauni	1,	199.7,	0.0	90	cdcecl2	150,	310.5,	0.0	139	fffc2	0,	106.2,	0.0
42	ecloflo	1,	17.3,	0.0	91	cdcecl3	1,	17.7,	0.0	140	ffoc	0,	351.7,	0.0
43	g_high	20,	266.7,	0.0	92	cdcecl4	1,	6.3,	0.0	141	ffoc2	0,	160.5,	0.0
44	g_c1	1500,	32960.6,	0.0	93	cdcklm1	0,	99.6,	0.0	142	fffo	1,	279.9,	0.0
45	gg	150,	1620.3,	0.0	94	cdcklm2	0,	5.3,	0.0	143	fffov	0,	357.6,	0.0
46	eed	1,	30.3,	0.0	95	cdcklm3	0,	0.0,	0.0	144	sl1b2b	0,	328470.2,	0.0
47	fed	1,	64.9,	0.0	96	cdcklm4	0,	0.0,	0.0	145	sl2b2b	0,	452253.6,	0.0
48	fp	1,	176.6,	0.0	97	cdctop1	0,	1045.1,	0.0	146	sl12b2b	0,	24247.6,	0.0

```
i: input instant rates, I: input instant counts
j: input average rates, J: input total counts
f: ftd   instant rates, F: ftd   instant counts
e: ftd   average rates, E: ftd   total counts
p: psn   instant rates, P: psn   instant counts
o: psn   average rates, O: psn   total counts
g: general info

RUNNING
interval   5.1 sec

```

0	t3_0	0	0,	19808.5,	0.0	48	ecl_active	19	16,	60320.1,	0.0	96	n1gev_3	23	24,	0.0,	0.0
1	t3_1	0	0,	12125.2,	0.0	49	ecl_timing_fwd	19	16,	3721.3,	0.0	97	n2gev_0	23	16,	21.4,	0.0
2	t3_2	0	0,	7006.9,	0.0	50	ecl_timing_brl	19	16,	38147.8,	0.0	98	n2gev_1	23	16,	4.6,	0.0
3	t3_3	0	0,	5105.7,	0.0	51	ecl_timing_bwd	19	16,	18451.0,	0.0	99	n2gev_2	23	16,	0.0,	0.0
4	ty_0	47	31,	20377.4,	0.0	52	ecl_phys	19	16,	608.9,	0.0	100	n2gev_3	23	16,	0.0,	0.0
5	ty_1	47	31,	3705.9,	0.0	53	ecl_oflo	19	16,	523.2,	0.0	101	c2gev_0	23	16,	29.3,	0.0
6	ty_2	47	31,	864.1,	0.0	54	ecl_3dbha	19	16,	161.8,	0.0	102	c2gev_1	23	16,	44.5,	0.0
7	ty_3	47	31,	1273.7,	0.0	55	ecl_lml_0	19	16,	905.2,	0.0	103	c2gev_2	23	16,	5.4,	0.0
8	t2_0	47	31,	19830.6,	0.0	56	ecl_lml_1	19	16,	119.0,	0.0	104	c2gev_3	23	16,	23.6,	0.0
9	t2_1	47	31,	3995.5,	0.0	57	ecl_lml_2	19	16,	61.4,	0.0	105	cdcecl_0	23	16,	6139.3,	0.0
10	t2_2	43	31,	993.0,	0.0	58	ecl_lml_3	19	16,	97.7,	0.0	106	cdcecl_1	23	16,	401.0,	0.0
11	t2_3	43	31,	1366.2,	0.0	59	ecl_lml_4	19	16,	180.0,	0.0	107	cdcecl_2	23	16,	61.9,	0.0
12	ts_0	19	31,	11872.4,	0.0	60	ecl_lml_5	19	16,	84.9,	0.0	108	cdcecl_3	23	16,	221.2,	0.0
13	ts_1	19	31,	1442.0,	0.0	61	ecl_lml_6	19	16,	72.2,	0.0	109	cdcklm_0	0	16,	94.2,	0.0
14	ts_2	19	31,	237.6,	0.0	62	ecl_lml_7	19	16,	42.4,	0.0	110	cdcklm_1	0	16,	6.2,	0.0
15	ts_3	19	31,	129.7,	0.0	63	ecl_lml_8	19	16,	101.8,	0.0	111	cdcklm_2	0	16,	0.0,	0.0
16	cdc_open90	47	31,	1678.7,	0.0	64	ecl_lml_9	19	16,	244.5,	0.0	112	cdcklm_3	0	16,	0.0,	0.0
17	cdc_active	183	31,	54918.5,	0.0	65	ecl_lml_10	19	16,	166.8,	0.0	113	cdctop_0	0	16,	1651.7,	0.0
18	cdc_b2b3	47	31,	694.4,	0.0	66	ecl_lml_11	19	16,	59874.0,	0.0	114	cdctop_1	0	16,	321.2,	0.0
19	cdc_b2b5	47	31,	867.3,	0.0	67	ecl_bhauni	19	16,	191.5,	0.0	115	cdctop_2	0	16,	228.6,	0.0
20	cdc_b2b7	47	31,	1000.9,	0.0	68	ecl_mumu	19	16,	126.5,	0.0	116	cdctop_3	0	16,	497.1,	0.0
21	cdc_b2b9	47	31,	1130.4,	0.0	69	ecl_bhapur	19	16,	191.5,	0.0	117	d3	23	16,	375.7,	0.0
22	ehigh	19	16,	746.3,	0.0	70	top_0	0	0,	0.0,	0.0	118	d5	23	16,	554.3,	0.0
23	elow	19	16,	1824.4,	0.0	71	top_1	0	0,	0.0,	0.0	119	d7	23	16,	709.7,	0.0
24	elum	19	16,	485.2,	0.0	72	top_2	0	0,	0.0,	0.0	120	d9	23	16,	863.8,	0.0
25	ecl_bha	19	16,	251.9,	0.0	73	top_bb	0	0,	0.0,	0.0	121	p3	23	16,	917.9,	0.0
26	bha_veto	0	63,	251.9,	0.0	74	top_active	26	0,	208891.2,	0.0	122	p5	23	16,	1184.1,	0.0
27	bha_type_0	19	16,	153.0,	0.0	75	klm_hit	42	31,	0.0,	0.0	123	p7	23	16,	1420.1,	0.0
28	bha_type_1	19	16,	12.4,	0.0	76	klm_0	42	0,	0.0,	0.0	124	p9	23	16,	1634.1,	0.0
29	bha_type_2	19	16,	24.9,	0.0	77	klm_1	42	0,	0.0,	0.0	125	track	36	63,	35152.1,	0.0
30	bha_type_3	19	16,	35.5,	0.0	78	klm_2	42	0,	0.0,	0.0	126	trkflt	0	63,	35152.1,	0.0
31	bha_type_4	19	16,	44.4,	0.0	79	klm_3	42	0,	0.0,	0.0	127	nimin0	0	0,	3254872.0,	0.0
32	bha_type_5	19	16,	43.0,	0.0	80	klmb2b_0	42	0,	0.0,	0.0	128	nimin1	0	0,	3254872.0,	0.0
33	bha_type_6	19	16,	38.3,	0.0	81	klmb2b_1	42	0,	0.0,	0.0	129	nimin2	0	0,	0.0,	0.0
34	bha_type_7	19	16,	62.6,	0.0	82	klmb2b_2	42	0,	0.0,	0.0	130	nimin3	0	0,	51670.3,	0.0
35	bha_type_8	19	16,	58.6,	0.0	83	revo	0	0,	1.0,	0.0	131	tsf0b2b	0	0,	190266.7,	0.0
36	bha_type_9	19	16,	81.1,	0.0	84	her_kick	0	0,	0.0,	0.0	132	eklm_hit	0	0,	7531.1,	0.0
37	bha_type_10	19	16,	79.1,	0.0	85	ler_kick	0	0,	6.3,	0.0	133	eklm_0	0	0,	531.6,	0.0
38	bha_type_11	19	16,	102.0,	0.0	86	bha_delay	0	0,	232.3,	0.0	134	eklm_1	0	0,	520.2,	0.0
39	bha_type_12	19	16,	102.6,	0.0	87	pseud_rand	0	0,	0.6,	0.0	135	eklm_2	0	0,	30.7,	0.0
40	bha_type_13	19	16,	134.6,	0.0	88	plsin	0	0,	1.0,	0.0	136	eklm_3	0	0,	2.8,	0.0
41	clst_0	19	16,	39161.5,	0.0	89	poissonin	0	0,	0.2,	0.0	137	eklmb2b_0	0	0,	172.3,	0.0
42	clst_1	19	16,	2943.9,	0.0	90	veto	0	0,	6316.1,	0.0	138	eklmb2b_1	0	0,	29.5,	0.0
43	clst_2	19	16,	328.2,	0.0	91	samhem	31	16,	1335.1,	0.0	139	eklmb2b_2	0	0,	11.4,	0.0
44	clst_3	19	16,	239.0,	0.0	92	opohem	31	16,	1507.8,	0.0	140	tsf1b2b	0	0,	341322.2,	0.0
45	ecl_bg_0	19	16,	5.3,	0.0	93	n1gev_0	23	24,	64.7,	0.0	141	tsf2b2b	0	0,	469221.9,	0.0
46	ecl_bg_1	19	16,	3635.7,	0.0	94	n1gev_1	23	24,	7.7,	0.0						
47	ecl_bg_2	19	16,	39693.0,	0.0	95	n1gev_2	23	24,	0.4,	0.0						

```
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o: psn   average rates, O: psn   total counts
g; general info



RUNNING
exp(8),run(2630),subrun(0)
gdl0070t.mcs
GDL0072i_non fmt=(2,31,21),(2,20,16),(3,31,28).(non,col,cos,std)
timsrc(6,14,10):random(on),psn(off),top(off),ecl(on),cdc(off)
required(1,30,24):grl(on),top(off),ecl(on),etf(off),klm(on),kle(off),t3d(off)
sublinkstat(rdy):GRL ECL KLM
delayed_bha cycle=0
top_inp_dly(16,26,18)=160
ecl_inp_dly(16,17,9)=19
cdc_inp_dly(16, 8, 0)=160
top_rvc_offset(8,29,20)=569
ecl_rvc_offset(8,19,10)=350
cdc_rvc_offset(8, 9, 0)=560
top_rvc_diff=0
ecl_rvc_diff=5     <- should be 4 to 6
cdc_rvc_diff=0

TOP:lane(up), txdst(up), txsrc(up), rxsrc(up), rdreq(up), fifoemp(down)
ETM:link(up), txdst(up), txsrc(up), rxsrc(up), rdreq(up), fifoemp(down)
tmdl_busy_length(12,23,0)=0,b2l_buffer_delay(6,9,1)=5

                  raw count,      raw rate alive count,    alive rate tot raw cnt,  ave raw rate tot alv cnt,  ave alv rate
0   commonL1          12180,        1819.7           0,           0.0    22320303,        1833.2           0,           0.0
1   gdlL1             12299,        1837.5           0,           0.0    22604005,        1856.5           0,           0.0
2   top_timing            0,           0.0           0,           0.0           0,           0.0           0,           0.0
3   ecl_timing        12282,        1834.9           0,           0.0    22580181,        1854.6           0,           0.0
4   cdc_timing            0,           0.0           0,           0.0           0,           0.0           0,           0.0
5   psn_timing            0,           0.0           0,           0.0           0,           0.0           0,           0.0
6   rnd_timing           17,           2.5           0,           0.0       23824,           2.0           0,           0.0
7   dph_timing            0,           0.0           0,           0.0           0,           0.0           0,           0.0
8   ika                   0,           0.0           0,           0.0           0,           0.0           0,           0.0
9   tako                  0,           0.0           0,           0.0           0,           0.0           0,           0.0
10  interval            6.7
11  duration        12175.5
```
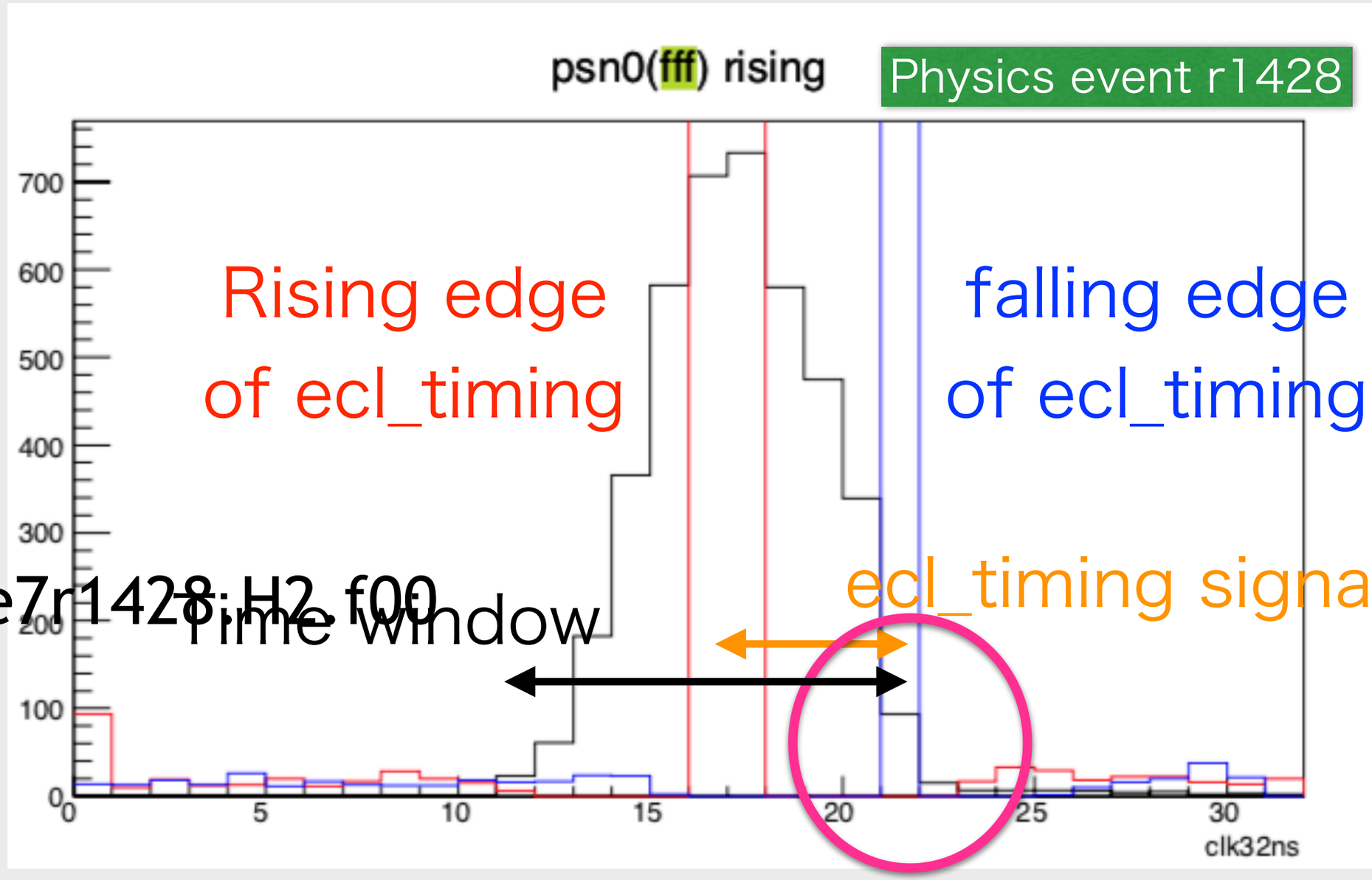
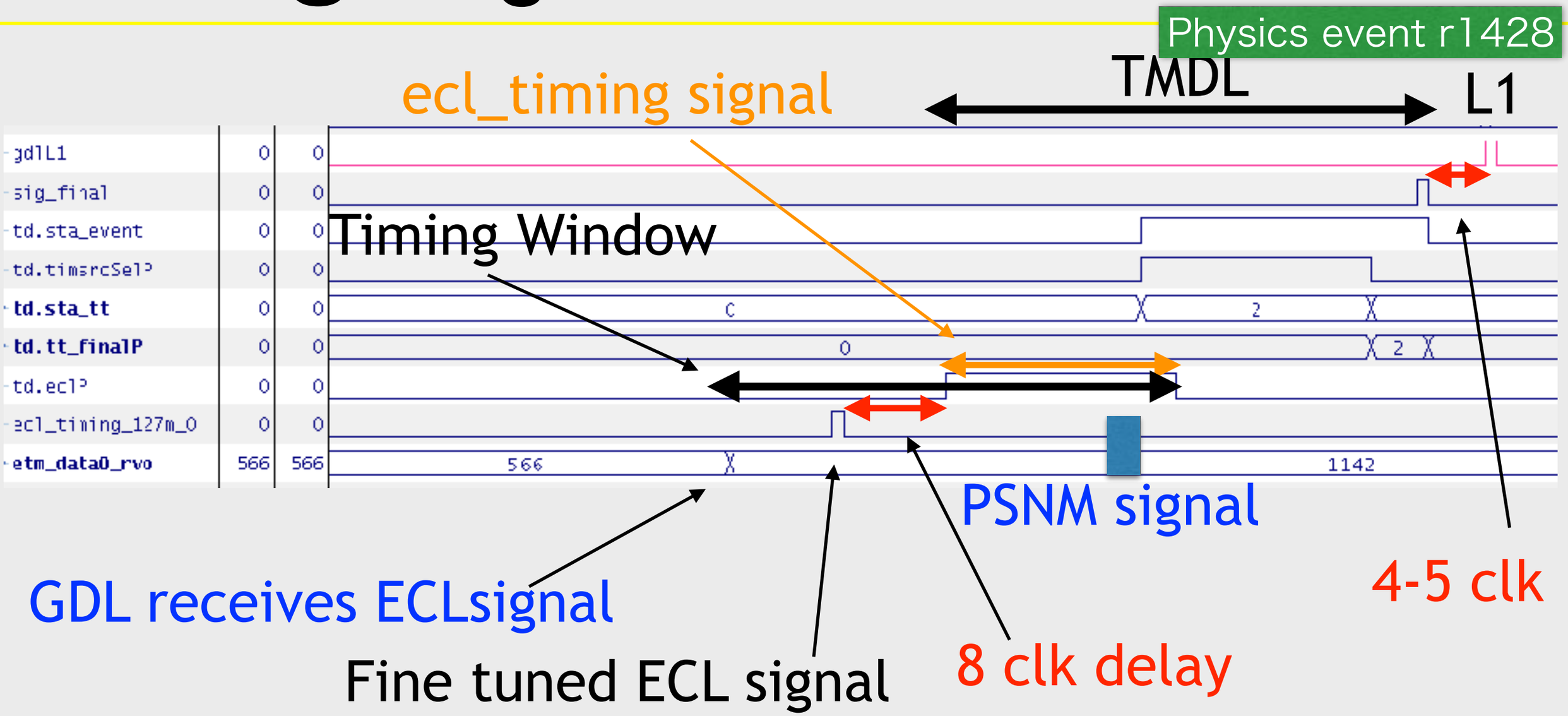

PSNM vs Timing signal



- e7r1428:H2 f00

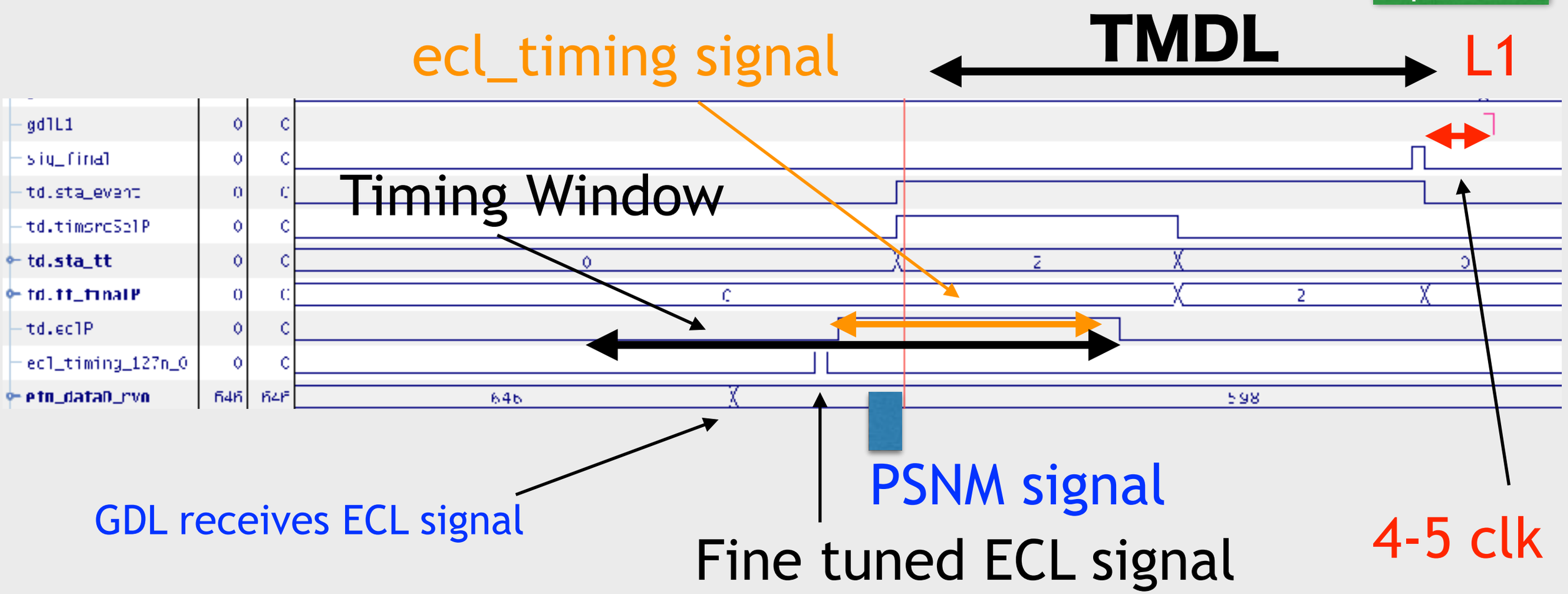
Timing Adjustment in TMDL



- No room to extend timing window to future direction
- No room to shift PSNM(fff) signal to past direction because delay of corresponding input bits t2(n) were 0.
- t2(n): GRL->GDL via GTH. Use LVDS instead of GTH.

Timing Adjustment in TMDL

Updated



- Using LVDS, latency reduced by 61 clocks.
  - fff distribution will be check when physics.
- Timing window is extended to past direction.
- Sunghyun can reduce ecl_timing latency by ~10 clocks.

Trigger Bits

- Input 141 bits, output 146 bits
- Exp 7
  https://confluence.desy.de/display/BI/Trigger+Bit+Table+for+Exp+7
- Exp 8
  https://confluence.desy.de/display/BI/TriggerBitTable