Status of MIPP Trigger

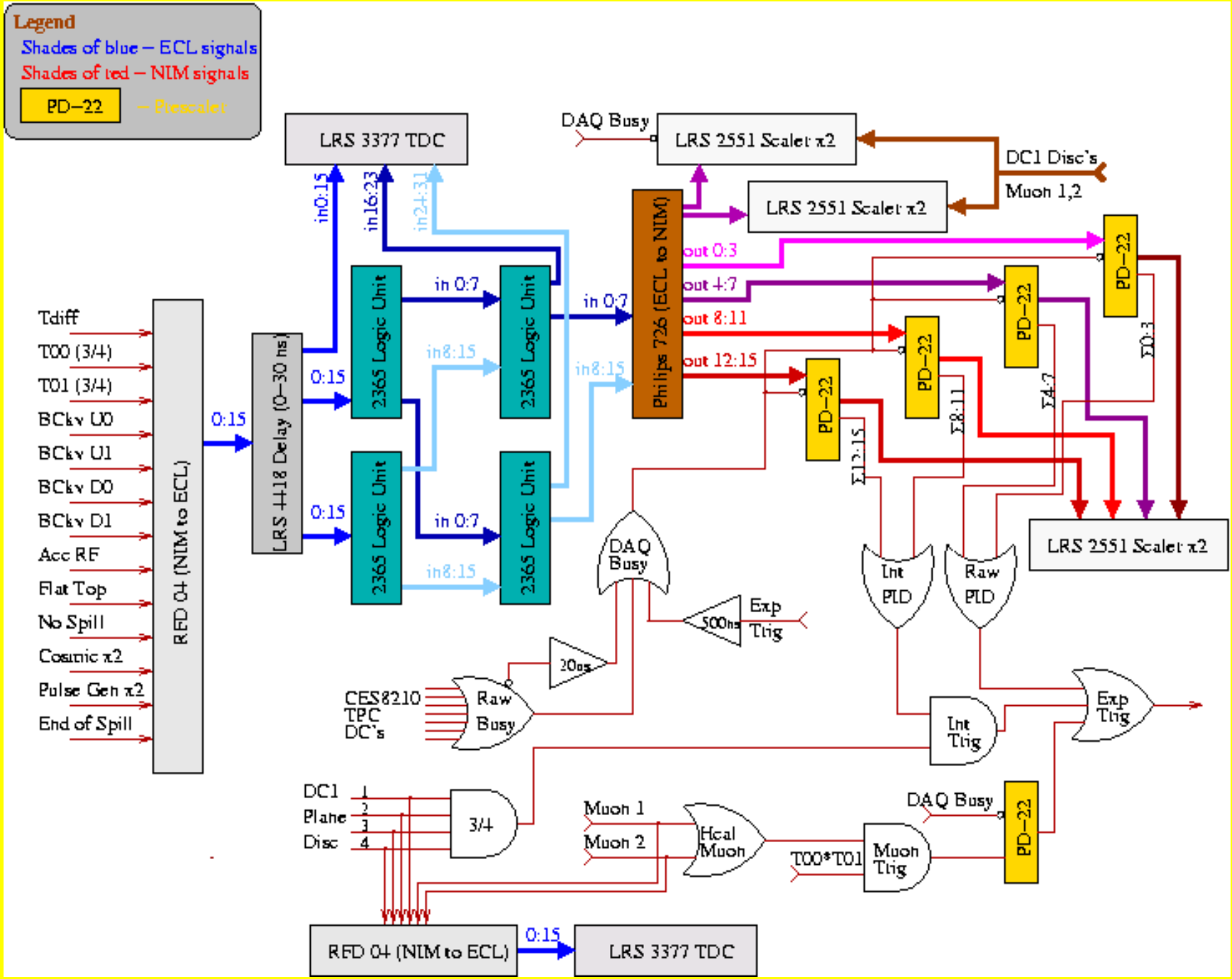
Trigger Group
February 14, 2004

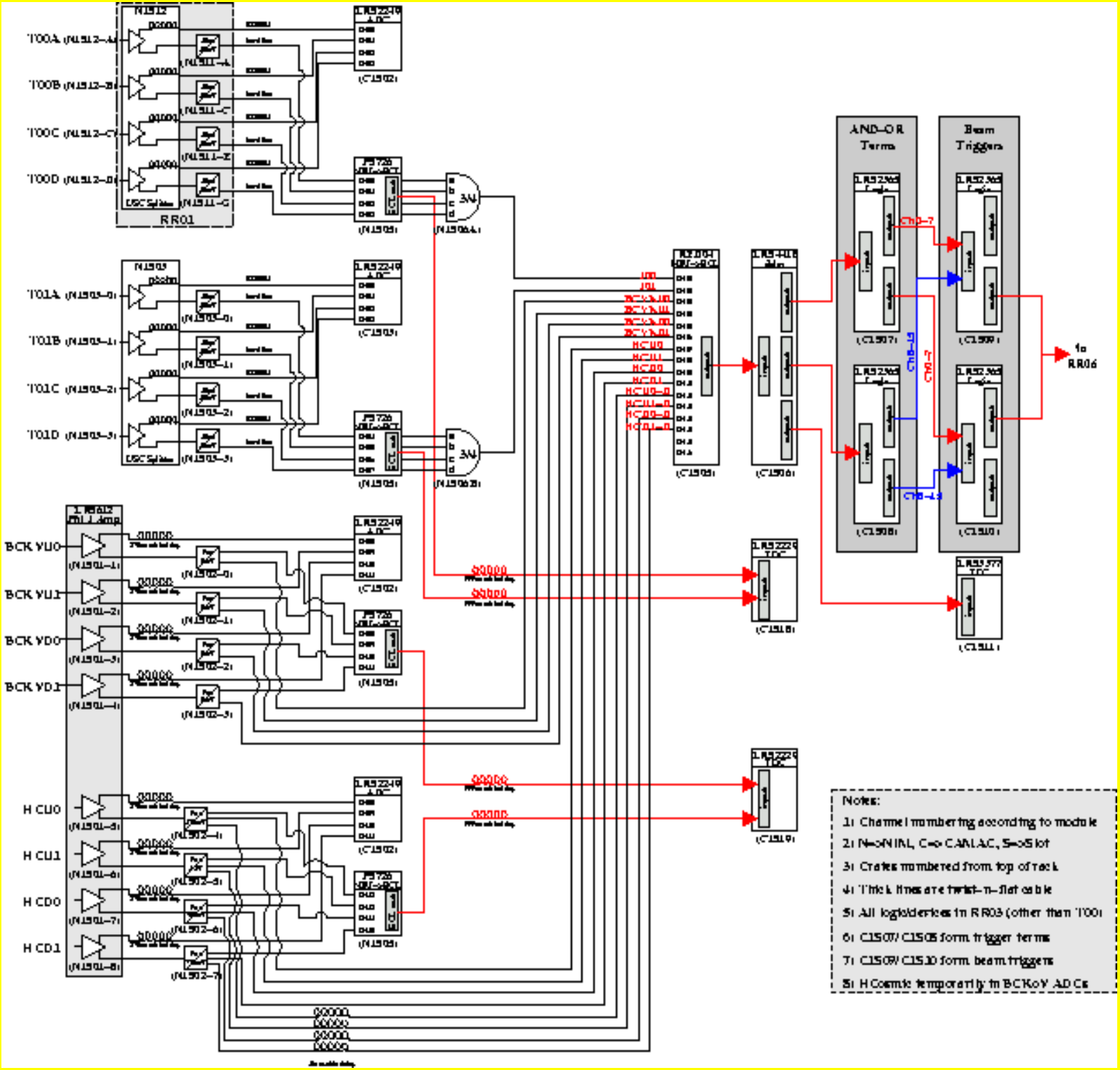
Design Goals

- Beam PID capability should be maximized
- Beam and Interaction trigger
- Ability to prescale individual triggers, both Beam and Interaction
- Speed – minimize decision time
- Programmable remotely
- Cosmics trigger
- Calibration triggers
- Trigger during Spill Gate

Customer Wishes

- TOF/T0 counters: “ Anything you can do is too long”
- Hadronic calorimeter – muon trigger
- Beam Chamber 1 – 150 feet away
- Make use of RF


Legend
Shades of blue – ECL signals
Shades of red – NIM signals
PD–22 – Prescaler
LRS 3377 TDC
DAQ Busy
LRS 2551 Scaler x2
DC1 Disc's
Muon 1,2
LRS 2551 Scaler x2
in0:15
in16:23
in24:31
out 0:3
out 4:7
out 8:11
out 12:15
PD–22
PD–22
PD–22
PD–22
PD–22
Σ0:3
Σ4:7
Σ8:11
Σ12:15
Tdiff
T00 (3/4)
T01 (3/4)
BCkv U0
BCkv U1
BCkv D0
BCkv D1
Acc RF
Flat Top
No Spill
Cosmic x2
Pulse Gen x2
End of Spill
RFD 04 (NIM to ECL)
0:15
LRS 4418 Delay (0–30 ns)
0:15
0:15
2365 Logic Unit
2365 Logic Unit
2365 Logic Unit
2365 Logic Unit
in 0:7
in 0:7
in 0:7
in 0:7
in8:15
in8:15
in8:15
in8:15
Philips 726 (ECL to NIM)
DAQ Busy
500ns
Exp Trig
20ns
CES8210 TPC DC's
Raw Busy
Int PID
Raw PID
LRS 2551 Scaler x2
Int Trig
Exp Trig
DC1 Plane Disc
1
2
3
4
3/4
Muon 1
Muon 2
Heal Muon
T00*T01
Muon Trig
DAQ Busy
PD–22
RFD 04 (NIM to ECL)
0:15
LRS 3377 TDC


T00A
T00B
T00C
T00D
RR01
T01A
T01B
T01C
T01D
BCK VU0
BCK VU1
BCK VD0
BCK VD1
H CU0
H CU1
H CD0
H CD1
AND-OR Terms
Beam Triggers
to RR06
Notes:
1) Channel numbering according to module
2) N=>NIM, C=> CAMAC, S=>Slot
3) Crates numbered from top of rack
4) Thick lines are twist-n-flat cable
5) All logic devices in RR03 (other than T00)
6) C1507/C1508 form trigger terms
7) C1509/C1510 form beam triggers
8) H Cosmic temporarily in BCKoV ADCs

Timing of Detectors

Element	Pos-m	RR-m	Bm-ns	Δt-Det	Δt-Cbl	t-Sig	t-ready	Δt-back	Latency	Diff
Primary Tgt	-95.9		-320							
Collimator	-62.2		-207							
T00	-59.9	-4.0	-200	50	226	76	200	21	150	5
BC1	-40.4	-39.8	-135	110	31	6	200	170	512	148
BC2	-16.0	-16.0	-53	110	28	84	200	71	512	326
BCK1adc	-16.0	-4.0	-53	50	94	91	200	21	375	245
BC3	-3.3	-4.0	-11	110	32	131	200	21	512	422
BCK2adc	-3.3	-4.0	-11	50	32	71	200	21	375	225
T01	-3.0	-4.0	-10	50	22	62	200	21	150	-9
Target/M	0.0	-4	0	0			200			
TPC	0.9		3				200		1000	
DC1	2.3	3	8	110	32	149	200	50	512	411
CKOVtdc	2.9	2.9	10	60	28	97	200	50	200	48
CKOVadc	2.9	2.9	10	60	300	370	200	50	-10	110
DC2	3.9	6	13	110	39	162	200	63	512	412
DC3	5.2	6	17	110	32	160	200	63	512	409
TOFtdc	5.5	6	18	60	31	109	200	63	150	-4
TOFadc	5.5	6	18	60	31	109	200	63	250	96
DC4	7.1	10	24	110	44	178	200	79	512	410
PWC5	8.8	10	29	110	34	174	200	79	400	295
RICH -enter	10.5	12	35	100	36	171	200	88	4000	3884
PWC6	21.4	13	71	110	74	256	200	92	400	364
ECAL	21.8	23	73	50			200	133		
HCAL	23.4	23	78	50	300	428	200	133	-10	85
T0,BCKV,TOF,CKOVadc all need ~180 ns of minimal delay										

Cables	Beta	m/ns		Racks			
Beam	1	0.3		RR01	-39.8		
FastHard	0.918	0.28		RR02	-16		
SlowHard	0.81	0.24		RR03	-4		
Slow	0.6	0.18					
Element	Pos-m	Bm-ns	Δt-Det	Δt-Cbl	Δt-Dsc	Δt-Cbl	t-trig
T00	-59.9	-200	40	89	10	128	67
BCK1	-16.0	-53	40	30	10	44	70
BCK2	-3.3	-11	40	30	10	3	72
T01	-3.0	-10	40	18	10	4	61
Target/M	0.0	0					
DC1	2.3	8	40	30	50	23	151
TOF	5.5	18	50	30	10	34	143
DC4	7.1	24	40	30	50	40	183
HCAL-muon	23.4	78	40	30	10	98	256
Base Trig	Logic		Modules*		Δt-Mod		t-ready
BeamPID	T00*T01*BCK		full system		120		192
INTdc1	DC1-thresh		LRS4532		50		201
INTdc4	DC4-bullseye		LRS2365		50		233
mu-cal	MU1*MU2		LRS429		20		276

Summary

- Decision time: 110 ns (from the last input)
  - Timing of interaction trigger is to be determined
- Muon trigger will be late
  - At least TOF, T0, BC1 will not make it
- Bull's eye may be difficult to provide in time
- Documentation is in progress
- Ready for beam
  - Need beam in order to fine-tune timing