JADE - Computer Note No. 23a

6.6.79

M. Helm

B. Naroska

IBM TRIGGER BANKS

According to the CAMAC readout from different branches and the performance of the trigger in subsequent steps T1, T2, T3 there are three banks 'TRIG' (Pointer: IDATA(55)) distinguished by bank numbers 1,2,3. In these banks the event dependent information of the trigger sources is stored. The scheme of the banks is as follows:

TRIG	TRIG	TRIG	
1 (T1)	2 (T2)	3 (T3)	I * 4
Pointer to T2	Pointer to T3	0	
LENG	LENG	LENG	
descriptor	descriptor	descriptor	
0	0	0	
T1 word 1	T2 word 1	T3 word 1	I * 2
⋮	⋮	⋮	
T1 word 8*	T2 word 24	T3 word 36	

*may later on be extended

T1 bank (name 'TRIG', number 1)

The length actually is 8 I * 2 words but may change in future.

word	bits	content
1	0 - 3	multiplicity* of beam-pipe-counters
	4 - 7	" of TOF counters
	8 - 11	" of BP counters through BP · TOF matrix
	12 - 15	" of TOF counters through BP · TOF matrix
2	0 - 6	TOF counters through matrix 1 - 7
	8 - 14	" " " " 8 - 14
3	0 - 6	" " " " 15 - 21
	8 - 14	" " " " 22 - 28
4	0 - 6	" " " " 29 - 35
	8 - 14	" " " " 36 - 42
5	0 - 15	PB counters " " 1 - 16
6	0 - 7	" " " " 17 - 24
7	0 - 7	output of the 8 coincidences of the final T1 AND/OR for ACCEPT
	8 - 15	as above for POSTPONE
8		free

* Coding of multiplicities (modified BCD) (numbers greater than 7 are set to 7)

Bit	content
0	0
1	2^0
2	2^1
3	2^2

T2 bank (name 'TRIG', number 2)

The length is fixed to 26 I * 2 words.

word	bits	content			
1		BANK DESCRIPTOR		1	
2				0	
3	0 - 15	HIT CELL/WALL	R3	1 - 16	
4	0 - 7	" " "	R2	1 - 8	
	8 - 15	" " "	R1	1 - 8	$0^\circ < \phi < 60^\circ$
5	0 - 15	ALL TRACKS		1 - 16	
6	0 - 15	FAST TRACKS		1 - 16	
7	0 - 15	HIT CELL/WALL	R3	17 - 32	
8	0 - 7	" " "	R2	9 - 16	
	8 - 15	" " "	R1	9 - 16	$60^\circ < \phi < 120^\circ$
9	0 - 15	ALL TRACKS		17 - 32	
10	0 - 15	FAST TRACKS		17 - 32	
11 - 14	dito	dito			$120^\circ < \phi < 180^\circ$
15 - 18	"	"			$180^\circ < \phi < 240^\circ$
19 - 22	"	"			$240^\circ < \phi < 300^\circ$
23 - 26	"	"			$300^\circ < \phi < 360^\circ$

HIT CELL and HIT WALL define inner detector track elements which are linked through rings R1, R2 and R3 to give ALL or FAST TRACKS with momentum cutoff of 200 MeV/c or 1 GeV/c, respectively. The numbering starts at $\phi = 0^\circ$ and increases with ϕ. For more details see Jade Note No. 31.

T3 bank (name 'TRIG', number 3)

The length is fixed to 36 I * 2 words of unique format for all streets.

word	bits	content	
1	0,1	unused inputs	street 1
	2	T2 input	" "
	3	group 5	" "
	4	" 4	" "
	5	" 3	" "
	6	" 2	" "
	7	" 1	" "
	8	subtrigger 1	" "
	9	" 2	" "
	10	" 3	" "
	11	" 4	" "
	12 - 15	free	
2 - 36	dito	dito	street 2 - 36

The five groups G1 to G5 form a street through the muon detector which broadens to the outside. Within a group several muon chambers are OR'ed. Beside the edges there is a rough correspondence between group number and layer number of chambers, G1 being the innermost. Form the five group signals within one street a set of four subtriggers is defined corresponding to momentum cutoff values of about 0.55, 0.8, 1.05 and 1.2 GeV/c.

A more detailed description of the muon trigger T3 is given in JADE Note No. 28.

outdated

T2 bank (name 'TRIG', number 2)

The length is fixed to 24 I * 2 words.

word	bits	content			
1	0 - 15	HIT CELL/WALL	R3	1 - 16	
2	0 - 7	" " "	R1	1 - 8	
	8 - 15	" " "	R2	1 - 8	$0^o < \phi < 60^o$
3	0 - 15	ALL TRACKS		1 - 16	
4	0 - 15	FAST TRACKS		1 - 16	
5	0 - 15	HIT CELL/WALL	R3	17 - 32	
6	0 - 7	" " "	R1	9 - 16	
	8 - 15	" " "	R2	9 - 16	$60^o < \phi < 120^o$
7	0 - 15	ALL TRACKS		17 - 32	
8	0 - 15	FAST TRACKS		17 - 32	
9 - 12	dito	dito			$120^o < \phi < 180^o$
13 - 16	"	"			$180^o < \phi < 240^o$
17 - 20	"	"			$240^o < \phi < 300^o$
21 - 24	"	"			$300^o < \phi < 360$

HIT CELL and HIT WALL define inner detector track elements which are linked through rings R1, R2 and R3 to give ALL or FAST TRACKS with momentum cutoff of 200 MeV/c or 1 GeV/c, respectively. The numbering starts at $\phi = 0^o$ and increases with ϕ. For more details see Jade Note No. 31.

Trigger output in the bank 'HEAD'

There are three words of general trigger information in the event header bank.

word (I * 2)	content
20	trigger action override and accept command word
21	trigger source and NIM-AND-OR command word
22	trigger action and logics condition of last accepted event

The words 20 and 21 are set by the person on shift and in general do not change within a run, while word 22 is event dependent. The bit content is the following:

TRIGGER ACTION OVERRIDE and ACCEPT COMMAND WORD (20)

BIT	CONTENT
0	T1 forced accept
1	" " postpone
2	" " reject
3	T2 forced accept
4	" " postpone
5	" " reject
6	T3 forced accept
7	" " reject
8	NO DL8 start & clear (Dead time is reduced)
9, 10	HANDLE EVENT (2 bit binary no.): 00 LAM; 01 NIM-PULSE; 10 Auto-reset; 11 Sit'n wait
11	All this is camac controlled (doesn't work)

TRIGGER SOURCE and NIM-AND-OR COMMAND WORD (21)

BITS	CONTENT	
0 - 3	TRIGGER SOURCE (BCD)	
4	CAMAC CONTROL	
5	EMPTY	
6 - 7	Setting of NIM-AND-OR (2 bit binary number)	00 AND 01 ONLY 2 10 ONLY 1 11 OR

TRIGGER ACTION and LOGICS CONDITION OF LAST ACCEPTED EVENT (22)

Bits	Content	
0 1 2	ACTUAL ACCEPT BY	T1 T2 T3
3 4	T1 LOGICS CONDITION	ACCEPT POSTPONE
5 6	T2 LOGICS CONDITION	ACCEPT POSTPONE
7	T3 LOGICS CONDITION	ACCEPT

For more details there exists a private note from H. Krehbiel: "Programming the master trigger box via CAMAC".

Trigger-Parameters

It seems to be necessary to have a complete list on tape with all the trigger parameters which may be changed by an operator either via CAMAC commands or manual switches.

There are important numbers to be recorded which define the final T1, T2, T3 accept or postpone (AND/OR) conditions, such as multiplicity of TOF counters, total lead glass energy threshold, number of tracks in the inner and the muon detector etc. This trigger status information should only change before starting a new run. An extra run start bank will be created which will contain all the relevant information for the trigger in some 20 words. Its format will be described in a subsequent note.