Saclay, september 13th 1999 - JM

EP Trigger

We have equiped the trigger for e-p measurement (march 1999) with two remote Matrix Logic Units (MLU Lecroy 2365). So now we are able to work with the 7 following triggers without turning off any high voltage ($\bullet$ *means AND*). Therefore, we have :

0 - (DOWN = $S1_B \bullet S2_B \bullet S3_H \bullet C_H$) .OR. (UP = $S1_H \bullet S2_H \bullet S3_B \bullet C_B$)
Main trigger (by default).

1 - (DOWN = $S1_B \bullet S2_B \bullet S3_H$) .OR. (UP = $S1_H \bullet S2_H \bullet S3_B$)
Trigger without Cerenkov.

2 - (DOWN = $S1_B \bullet S2_B \bullet C_H$) .OR. (UP = $S1_H \bullet S2_H \bullet C_B$)
Trigger without electron scintillators (S3).

3 - (DOWN = $S1_B \bullet S3_H \bullet C_H$) .OR. (UP = $S1_H \bullet S3_B \bullet C_B$)
Trigger without one of the proton scintillators (S2).

4 - (DOWN = $S2_B \bullet S3_H \bullet C_H$) .OR. (UP = $S2_H \bullet S3_B \bullet C_B$)
Trigger without one of the proton scintillators (S1).

5 - (DOWN = $S1_B \bullet S2_B$) .OR. (UP = $S1_H \bullet S2_H$)
Proton trigger.

6 - (DOWN = $S3_H \bullet C_H$) .OR. (UP = $S3_B \bullet C_B$)
Electron trigger.

The notations are defined as follow :

UP and **DOWN** define the **Trigger**.
H (as **H**igh; **H***aut*) and **B** (as **B**ottom; **B***as*) are **geometrical positions**.

Main trigger **UP** means proton scintillators **H** (**H**igh) and Cerenkov **B** (**B**ottom) and scintillator S3 $_{\mathbf{B}}$:
Trigger **UP** = $\mathbf{S1}_H \bullet \mathbf{S2}_H \bullet \mathbf{S3}_B \bullet \mathbf{C}_B$

Main trigger **DOWN** means proton scintillators **B** (**B**ottom) and Cerenkov **H** (**H**igh) and scintillator S3 $_{\mathbf{H}}$:
Trigger **DOWN** = $\mathbf{S1}_B \bullet \mathbf{S2}_B \bullet \mathbf{S3}_H \bullet \mathbf{C}_H$

Rq : the timing is given by $S1_B$ or $S1_H$ which are delayed by 25 ns relative to S2, S3 and C for diode runs and electron runs for all energies. With electron beam, timings are ajusted by a remote control delay unit.

Remote Control Discriminator **CCF8200** :

8 inputs for 8 A outputs and 8 B outputs. Only 2 widths can be set, one for A outputs and one for B outputs. This is set as follow :

F17; A=0; W_A : to adjust the width (=W_A in DAC unit) of A outputs

F17; A=1; W_B : to adjust the width (=W_B in DAC unit) of B outputs

The width is given by the formula : W(ns) $\simeq$ 0.0013·DAC^2 - 1.13·DAC + 220.

And, the DAC is calculated as follow : DAC = (1.13 - $\sqrt{1.277 - 0.0052(220. - W(ns))}$)/0.0026

with : 0$\leq$DAC$\leq$255

The threshold on each 8 inputs should be different and are set as follow :

F16; A=0,1..,7; DAC_i : to adjust each threshold at the value $Thres_i$

The formula is :

Thres $\leq$ 100 mV $\rightarrow$ DAC = 0.19·Thres(mV) - 1.7

Thres $\geq$ 100 mV $\rightarrow$ DAC = 0.21·Thres(mV) - 5

There is a VETO input on this module. It has to be fed by a NIM signal but **only** B outputs could be vetoed. This is not the case for the A outputs!

We have set 7 PM and scintillators for $S3_B$, and 7 for $S3_H$. Each of them corresponds to a given micro-strip. With the first MLU (Camac 10) only one or two of them are selected by using the fortran program "trigger.f". To use it, just type trigger and answer the questions. Below, are two tables, one for each arm, giving some information for the cabling of S3.

The scintillators are numbered from 1 to 7; 1 are the scintillators at the smallest angle with respect to the beam and 7 is the farthest!

Table for **$S3_H$** :

$S3_H$	**HT**	**Splitter** NIM **1**	**Discri** Lecroy 423B NIM **2**	**OR** Lecroy 428F NIM **6**	**NIM/ECL$_5$** NIM **5**	**MLU$_{10}$** Lecroy 2365 Camac **10**	
						In	Out
$S3_H$-1	3.0	1	1	1-1	1	0	
$S3_H$-2	3.1	2	2	1-2	2	1	**A0→Delay 6**
$S3_H$-3	3.2	3	3	1-3	3	2	A1→ECL/NIM$_9$-13
$S3_H$-4	3.3	4	4	1-4	4	3	A2→ECL/NIM$_{10}$-7
$S3_H$-5	3.4	5	5	2-1	5	4	
$S3_H$-6	3.5	6	6	2-2	6	5	
$S3_H$-7	3.6	7	7	2-3	7	6	

Table for $\mathbf{S3_B}$:

$\mathbf{S3}_B$	**HT**	**Splitter** NIM **3**	**Discri** Lecroy 423B NIM **4**	**OR** Lecroy 428F NIM **6**	**NIM/ECL$_5$** NIM **5**	**MLU$_{10}$** Lecroy 2365 Camac **10**	
						In	Out
$S3_B$-1	3.7	1	1	3-1	9	8	
$S3_B$-2	3.8	2	2	3-2	10	9	
$S3_B$-3	3.9	3	3	3-3	11	10	
$S3_B$-4	3.10	4	4	3-4	12	11	**B5→Delay 5**
$S3_B$-5	3.11	5	5	4-1	13	12	B6→Scaler 9
$S3_B$-6	1.8	6	6	4-2	14	13	B7→NIM/ECL$_9$-14
$S3_B$-7	1.9	7	7	4-3	15	14	

The two other tables help to follow cables on the trigger. Refer to the drawings for more information on the crate layout and the electronic trigger diagram.

Scint.	**HT**	**Splitter** NIM **12**	**Discri**† Ortec Camac **13**	**Delay** L 4418 Camac **16**	**MLU$_{20}$** Lecroy 2365 Camac **20**	
					In	Out
C_H	2.0	1	1		(A1)* → 0	A0 → ECL/NIM$_9$-1 = **DOWN**
$S1_B$	1.2	2	2	1	(B2)* → 1	A1 → MLU$_{20}$-7 = **DOWN**
$S2_B$	1.3	3	3	3	(A3)* → 2	
$S3_H$				6	Delay 6 → 3	
UP					A0=**DOWN** → 7	A3 = **UP+DOWN**
DOWN					B7=**UP** → 8	
					In	Out
C_B	2.1	4	1		(A4)* → 12	B6 → ECL/NIM$_9$-2 = **UP**
$S1_H$	1.4	5	2	2	(B5)* → 13	B7 → MLU$_{20}$-8 = **UP**
$S2_H$	1.5	6	3	4	(A6)* → 14	
$S3_B$				5	Delay 5 → 15	

† : Outputs A for C, S2, S3 and output B for S1 are used to make the trigger (MLU$_{20}$). Outputs B for C, S2, S3 and outputs A for S1 are used for scalers, TDC.

* : (A) or (B) means here that inputs come from the A or B outputs of the Ortec discriminator (but not directly) which have different widths.

Rq : A or B without parenthesis are the outputs of the Matrix Logic Unit (MLU) Lecroy 2365.

Trigger	**ECL/NIM$_9$** Lecroy 4616 NIM **9**		**NIM/ECL$_{10}$** Lecroy 4616 NIM **10**	**Scaler**	**TDC**	**ADC**
	In	Out				
C$_H$	(B1)	4	ECL/NIM$_9$-4 $\rightarrow$ 1		0	0
			$\rightarrow$ 9	0		
S1$_B$	(A2)	10	ECL/NIM$_9$-10 $\rightarrow$ 2		1	1
			$\rightarrow$ 10	1		
S2$_B$	(B3)	11	ECL/NIM$_9$-11 $\rightarrow$ 3		2	2
			$\rightarrow$ 11	2		
S3$_H$			MLU$_{10}$-A2 $\rightarrow$ 7		6	6
	MLU$_{10}$-A1	13	ECL/NIM$_9$-13 $\rightarrow$ 15	6		
C$_B$	(B4)	5	ECL/NIM$_9$-5 $\rightarrow$ 4		3	3
			$\rightarrow$ 12	3		
S1$_H$	(A5)	7	ECL/NIM$_9$-7 $\rightarrow$ 5		4	4
			$\rightarrow$ 13	4		
S2$_H$	(B6)	8	ECL/NIM$_9$-8 $\rightarrow$ 6		5	5
			$\rightarrow$ 14	5		
S3$_B$	MLU$_{10}$-B7	14	ECL/NIM$_9$-14 $\rightarrow$ 8		7	7
			MLU$_{10}$-B6	9		
DOWN		8	16	7		
UP		9		8		
UP+DOWN		6		10		