Trigger Configuration Study

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1 Trigger Configuration

There were two sets of thresholds for the `EC` labeled *photon* and *electron*. These labels did not mean photon or electron specifically, but were considered a first-order approximation. The actual particle identification was done much later in

Table 1: Trigger counts for runs on the boundaries of the trigger configuration changes.

		bit					
run	file index	1	2	3	4	5	6
56363	A10	244469	244665	224567	254681	262007	245170
56476	A10	177814	177315	161772	139244	146748	143215
56593	A10	105475	95745	87343	98412	99869	94848
56605	A10	3590	238013	242955	9422	20643	23819
56609	A10	104433	94992	86810	97407	98769	93449
56646	A10	105037	94857	87169	97929	99173	94415
56653	A10	1982	249545	255596	6948	29240	37454
56747	A10	147948	149234	135214	150374	157856	150478
57061	A10	150126	151766	136500	152346	160142	153160
57317	A10	10492	241707	230612	240886	55866	34503
		bit					
run	file index	7	8	9	10	11	12
56363	A10	0	0	0	432	0	0
56476	A10	0	0	0	414	0	0
56593	A10	3853	0	0	174	263036	158649
56605	A10	12339	0	0	199	385	136250
56609	A10	4016	0	0	145	260120	148671
56646	A10	3948	0	0	167	261495	153052
56653	A10	18886	0	0	314	782	112301
56747	A10	0	0	0	174	0	0
57061	A10	0	0	0	185	0	0
57317	A10	15642	0	10492	210	693	107908

Table 2: Trigger configuration for *g12* runs from 56363 to 56594 and 56608 to 56647. $(\texttt{ST}\times\texttt{TOF})_i$ indicates a single *prong* which is a trigger-level track defined as a coincidence between a start counter and time-of-flight hit in the i^{th} sector or any sector if the subscript index, i, is not specified. An added $\times 2$ or $\times 3$ indicates the coincidence of multiple *prongs* which are not in the same sector. MORA and MORB represent coincidences with tagger hits within a certain energy range as specified in Table 5.

g12 runs 56363–56594, 56608–56647			
bit	definition	L2 multiplicity	prescale
1	$\texttt{MORA}\cdot(\texttt{ST}\times\texttt{TOF})_1\cdot(\texttt{ST}\times\texttt{TOF})$	–	1
2	$\texttt{MORA}\cdot(\texttt{ST}\times\texttt{TOF})_2\cdot(\texttt{ST}\times\texttt{TOF})$	–	1
3	$\texttt{MORA}\cdot(\texttt{ST}\times\texttt{TOF})_3\cdot(\texttt{ST}\times\texttt{TOF})$	–	1
4	$\texttt{MORA}\cdot(\texttt{ST}\times\texttt{TOF})_4\cdot(\texttt{ST}\times\texttt{TOF})$	–	1
5	$\texttt{MORA}\cdot(\texttt{ST}\times\texttt{TOF})_5\cdot(\texttt{ST}\times\texttt{TOF})$	–	1
6	$\texttt{MORA}\cdot(\texttt{ST}\times\texttt{TOF})_6\cdot(\texttt{ST}\times\texttt{TOF})$	–	1
7	$\texttt{ST}\times\texttt{TOF}$	–	1
8	$\texttt{MORA}\cdot(\texttt{ST}\times\texttt{TOF})\times 2$	–	1
11[a]	$\texttt{MORB}\cdot(\texttt{ST}\times\texttt{TOF})\times 2$	–	1
12	$(\texttt{ST}\times\texttt{TOF})\times 3$	–	1

[a] bit 11 and MORB were included in the trigger starting with run 56519.

the analysis of the reconstructed data. The thresholds for the CC and EC during the *g12* running period are shown in Table 6.

Table 3: Trigger configuration for *g12* runs from 56595 to 56607 and 56648 to 57323. (EC×CC) represents a coincidence between the electromagnetic calorimeter and the Čerenkov subsystems within a single sector using the thresholds as described in Table 6. ECP represents the *photon* threshold trigger from the EC as detailed in Fig. **??**. See Table 2 for other explanatory details.

g12 runs 56595–56607, 56648–57323			
bit	definition	L2 multiplicity[a]	prescale
1	MORA·(ST×TOF)	1	1000/300[b]
2	MORA·(ST×TOF)×2	2/–[c]	1
3	MORB·(ST×TOF)×2	2	1
4	ST×TOF	1	1000/300
5	(ST×TOF)·ECP×2	1	1
6	(ST×TOF)·(EC×CC)	2	1
7	MORA·(ST×TOF)·(EC×CC)	–	1
8	MORA·(ST×TOF)×2	–	1
11	(EC×CC)×2	–	1
12	(ST×TOF)×3	–	1

[a]Level 2 triggering was turned off on all bits for runs 56605, 56607 and 56647.

[b]Prescaling for bits 1 and 4 were 1000 for runs prior to 56668 at which point they both were changed to 300.

[c]Level 2 triggering of bit 2 was set to 2 for runs prior to 56665 at which point it was turned off.

Table 4: Trigger configuration for the single-sector runs of *g12*. Trigger bits 7–12 were not used for these runs. See Table 2 for explanatory details.

bit	definition	L2 multiplicity	prescale
1	MORA·$(\text{ST}\times\text{TOF})_1$	sector 1	1
2	MORA·$(\text{ST}\times\text{TOF})_2$	sector 2	1
3	MORA·$(\text{ST}\times\text{TOF})_3$	sector 3	1
4	MORA·$(\text{ST}\times\text{TOF})_4$	sector 4	1
5	MORA·$(\text{ST}\times\text{TOF})_5$	sector 5	1
6	MORA·$(\text{ST}\times\text{TOF})_6$	sector 6	1

Table 5: Master-OR definitions for *g12*. The TDC counters were used in the trigger and since each of these corresponds to several energy paddles, the energies given here are approximate. T-counter number 1 corresponds to the highest energy photon of approximately 5.4 GeV. Both MORA and MORB are referenced in terms of the trigger logic in Tables 2, 3 and 4. The *single-sector* runs are listed in Table **??**.

	MORA		MORB	
run range	T-counters	energy (GeV)	T-counters	energy (GeV)
56363–56400	1–47	1.7–5.4	–	–
56401–56518	1–25	3.6–5.4	–	–
56519–57323	1–19	4.4–5.4	20–25	3.6–4.4
single-sector	1–31	3.0–5.4	–	–

Table 6: Threshold values for the electromagnetic calorimeter (EC) and Čerenkov counter (CC) during the *g12* running period. EC thresholds are shown as *inner*/*total*, and CC thresholds are shown as *left*/*right*.

EC		CC
photon	*electron*	
50/100 mV	60/80 mV	20/20 mV
150/300 MeV	180/240 MeV	∼0.4 photo-electrons