PROPOSAL FOR THE USE OF THE "EXPLICIT NO" IN TRIGGER CONDITIONS

(Proposal approved by the ALICE Technical Board on 26 November 2002.)

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September 19th 2002

SUMMARY

In view of the desirability of making the trigger configuration as compact as possible, it is proposed that the number of classes equipped with veto capability be reduced from 50 (as specified in the URD) to six. It is argued that the proposed functions of the veto could still be implemented in this way.

In the approved User Requirement Document for the Central Trigger Processor it is stated that for each trigger condition there can be three states requested: condition required, anti-condition required, or "don't care". The projected trigger classes are given in table 1 below. It may be seen that none of the proposed trigger classes actually use a veto condition. Instead, the veto condition was originally proposed to facilitate setting up. In previous experiments (WA97, NA57) it has been found useful systematically to veto the inputs in a given physics trigger condition as a kind of consistency check, to verify that the backgrounds are behaving in the way one expects. This type of check cannot be done later, offline, as events not triggered on are not available for offline analysis.

Table 1: Proposed list of trigger classes for ALICE Pb-Pb running. (Part 1)

No.	Description	Condition
1	MB	[T0.V0MB.TRDpre]L0[ZDC1]L1
2	SC	[T0.V0SC.TRDpre]L0[ZDC2]L1
3	CE	[T0.V0CE.TRDpre]L0[ZDC3]L1
4	DMunlike high pT.TPC.MB	[T0.V0MB.DMunlike high pT.TRDpre]L0[ZDC1]L1
5	DMunlike high pT.TPC.SC	[T0.V0SC.DMunlike high pT.TRDpre]L0[ZDC2]L1
6	DMunlike high pT.no TPC.MB	[T0.V0MB.DMunlike high pT]L0[ZDC1]L1
7	DMunlike low pt.no TPC.MB	[T0.V0MB.DMunlike low pT]L0[ZDC1]L1
8	DMunlike low pT.no TPC.SC	[T0.V0SC.DMunlike low pT]L0[ZDC2]L1
9	DMlike high pT.TPC.MB	[T0.V0MB.DMlike high pT.TRDpre]L0[ZDC1]L2
10	DMlike high pT.TPC.SC	[T0.V0SC.DMlike high pT.TRDpre]L0[ZDC2]L1
11	DMlike high pT.no TPC.MB	[T0.V0MB.DMlike high pT]L0[ZDC1]L1
12	DMlike low pT.no TPC.MB	[T0.V0MB.DMlike low pT]L0[ZDC1]L1
13	DMlike low pT.no TPC.SC	[T0.V0SC.Dmlike low pT]L0[ZDC2]L1
14	DMsingle.TRDe.MB	[T0.V0MB.Dmsi.TRDpre]L0[TRDe.ZDC1]L1
15	DMsingle.TRDe.SC	[T0.V0SC.Dmsi.TRDpre]L0[TRDe.ZDC2]L1
16	TRDe.MB	[T0.V0MB.TRDpre]L0[TRDe.ZDC1]L1
17	TRDlow pT.MB	[T0.V0MB.TRDpre]L0[TRDlow pT.ZDC1]L1
18	TRDhigh pT.MB	[T0.V0MB.TRDpre]L0[TRDhigh pT.ZDC1]L1

In view of the increasing complexity of the trigger, it is questioned whether it is really necessary to equip each class in hardware with the capability to perform the "explicit veto" function. In the extreme case, if this facility were abandoned completely, it would imply a saving of 2500 programmable bits in the trigger setup (there are 24 L0 + 20 L1 + 6 L2 inputs, making 50 in all; 50 inputs × 50 classes gives 2500 bits).

Table 1: Proposed list of trigger classes for ALICE Pb-Pb running. (Part 2)

No.	Description	Condition
19	TRDunlike high pT.MB	[T0.V0MB.TRDpre]L0[TRDunlike high pT.ZDC1]L1
20	TRDunlike high pT.SC	[T0.V0SC.TRDpre]L0[TRDunlike high pT.ZDC2]L1
21	TRDlike high pT.MB	[T0.V0MB.TRDpre]L0[TRDlike high pT.ZDC1]L1
22	TRDlike high pT.SC	[T0.V0SC.TRDpre]L0[TRDlike high pT.ZDC2]L1
23	TRDjet high pT.SC	[T0.V0SC.TRDpre]L0[TRDjet high pT.ZDC1]L1
24	TRDjet low pT.MB	[T0.V0MB.TRDpre]L0[TRDjet low pT.ZDC1]L1
25	TRDjet low PT.SC	[T0.V0SC.TRDpre]L0[TRDjet low pT.ZDC2]L1
26	PHOShigh pT.MB	[T0.V0MB.PHOShigh pT.TRDpre]L0[ZDC1]L1
27	PHOSlow pT.MB	[T0.V0MB.PHOSlow pT.TRDpre]L0[ZDC1]L1
28	PHOSlow pT.SC	[T0.V0SC.PHOSlow pT.TRDpre]L0[ZDC2]L1
29	PHOS standalone	[T0.V0MB.PHOSMB]L0[ZDC1]L1
30	EMCALjet high pT.MB	[T0.V0MB.EMCALjet high pT]L0[ZDC1]L1
31	EMCALjet med pT.MB	[T0.V0MB.EMCALjet med pT]L0[ZDC1]L1
32	EMCALjet low pT.MB	[T0.V0MB.EMCALjet low pT]L0[ZDC1]L1
33	EMCALjet low pT.SC	[T0.V0SC.EMCALjet low pT]L0[ZDC2]L1
34	ZDCdiss	[BX]L0[ZDCspe]L1
35	cosmic	[BX.cosmic_telescope]L0
36	beam gas	[T0beamgas]L0

The trigger classes can be grouped into a number of families, depending on which detector is principally used (*e.g.* dimuon, TRD, PHOS, etc.) where the largest number of classes in a family is that for the TRD (10 classes) and none of the trigger classes has more than six inputs. However the TRD classes can be grouped into two functions: dielectrons and jets. The dielectron group is the larger of the two, with six classes. It is therefore proposed that the number of classes equipped with capacity to veto inputs should be limited to six. This allows two types of checks to be made:

1. For a given trigger class, every input can be vetoed in turn, in order to check the consistency of the rates (and histograms) as each input is vetoed. This was a standard practice during setting up in NA57.

2. For a given "family" of trigger classes, the whole family can be copied into the set of trigger classes hardware enabled to do veto functions. In this way, the relative rates for each class in the family can be studied with veto conditions inserted at will. At the end of the study, the family would then have to be copied out and a new family brought in to continue the study.

As indicated above, equipping six classes to be veto-enabled would allow a full range of setting-up options. The use of more than one class concurrently is needed in order to compare relative rates, as otherwise more complicated and indirect relative normalizations would have to be employed. The number of bits "saved" by doing this is $44 \times 50 = 2200$ bits.

A corollary of the above hardware requirement is that the CTP configuration software would also have to be capable of following swaps of trigger classes, applying all the trigger class parameters (trigger conditions, trigger cluster requirements, past-future protection requirements) transparently when the trigger class number (*i.e.* hardware location) assigned to a given trigger class is swapped. Additionally, detector software would also have to be capable of following changes in the ordering of trigger classes in a transparent way.