JADE Computer Note 84

Efficiency Corrections due to Online and Offline Event Filtering

H.E. Mills and J. Olsson

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Normally overall detection efficiencies are obtained by generating 4-vector Monte Carlo events of the physics reactions studied, passing these through the JADE detector simulation ("including all known deficiencies of the apparatus") and applying all the cuts of the selection programs that were already used in selecting the data samples from the JADE data tapes, e.g. the REDUC1 tapes. Usually also some effects that are not included in the detector and trigger simulation will be corrected for, e.g. background affecting the rate of TOF counters and veto conditions in some triggers.

The purpose of this note is to point out a potentially important correction that often seems to be forgotten, namely correction for rejection losses in various online and offline filtering algorithms. The real events have gone through a number of filtering algorithms before making it onto a summary tape and all these algorithms of course carry the risk of occasionally rejecting good events, i.e. events arising from e^+e^- collisions. In order of appearance:

Online rejection in the Plessey Miproc–16

The details of the MIPROC–16 rejection can be found in JADE Computer Note 50. Only T2 Accept events are processed. Every 16th event ($\sim$ 6%) of a reject class (either T2ANA rejection or Z-vertex rejection) is kept and written to IBM or tape. The result of the MIPROC–16 analysis is added to the event in the bank MPRS and the Plessey Action word in the HEAD bank (word 25) provides the rejection information: if the event has been classified as reject but is kept as a 16th event, then either bit 12 or bit 13 is set. The reject bit 15 in this word is never set for events that are kept (i.e. written to IBM or tape). See also Supplement 5 to JADE Note 32.

Online rejection in the Nord–50

The details of Nord–50 rejection can be found in JADE Note 78 and its supplement. A large variety of event classes (trigger classes) are subjected to filtering, both T1 Accept and T2 Accept events. The results are also here added into the N50S bank. The Nord–50 action word in the HEAD bank (word 26) has bit 15 set if the event is rejected but kept as a 5% reject event. Note that this is a different convention as compared with the Plessey action word ("historical reasons"..).

Online rejection in the FAMP

At the time of writing this is still in the test phase. As in the case of the MIPROC–16 rejection, only T2 Accept events will be considered for rejection. Details can be found in JADE Notes 110 and 112 and in Supplement 5 to JADE Note 32. The FAMP Action Word in the HEAD bank (word 19) has bit 15 set for events that should be rejected. This bit will not be set for the 5% of rejected events that are to be kept. Bit 12 in the same word indicates that the event is a reject candidate.

Offline rejection in REDUC 1

Offline filtering is first carried out in the REDUC1 program, which also provides calibration of lead glass and chambers, as well as pattern recognition for the jet-chamber. Details can be found in JADE Computer Notes 27 and 38. Since no "5%" events are kept here, the only way to study rejection losses is to subject Monte Carlo events to the REDUC1 program. Although this is in principle easy, some care has to be exercised in order to apply the appropriate version: The REDUC1 program is dependent on trigger bank structure and early data (1979—1981) cannot be passed through the current version for 1982 and subsequent data. Moreover, the JCL of the REDUC1 job is hidden in a C-list, and some editing is needed to produce a version for Monte Carlo data. Note also that some constants used in applying cuts have changed over the years, notably the Z-vertex limit.

Offline rejection in REDUC 2

There are several second reduction step programs in use, either of general application or specialised for particular physics. The program from the TOKYO group (no written description is provided) and the program described in JADE Computer Note 43 are in general use. As in the case of REDUC1, the only way to study possible losses is to pass Monte Carlo events through the programs. A forthcoming supplement to JCN 43 will give details of the various versions and changing rejection criteria for that program.

General remarks

An important thing to note in case one has to consider corrections for rejection in Nord–50 or MIPROC–16 is that the count-down for the 5% or 16th events starts fresh with each new run. In particular for the Nord–50 with its many filtering algorithms, some filtering may be of low statistics, meaning that the 5% event is never reached, since by tradition it is the last 5% that is kept.

Another important thing: If you have found a good event with a reject flag set in one of the above-mentioned action words, **there is no need for panic**. Several of the online rejection algorithms were implemented as test versions and running for quite a while, marking events for rejection but without this particular rejection being enabled. This is true in particular for the Nord–50 filtering. For details, consult Supplement 1 to JADE Note 78 (which contains dates and run numbers for the activation of rejection algorithms), the Log-books, the program author and other online experts.

There exists a model job for selecting MIPROC–16, Nord–50 and FAMP reject event candidates (the 5% that are kept):—

F22HEM.N50RED.S(JBREJ)

This job will also make some plots about rejection statistics. It is well commented and it should be easy to extract the relevant code if one wishes to modify an already existing selection program.