E835 Memo #
January 16, 1998

E835 Neutral DST Format and Production Streaming

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1. INTRODUCTION

We have decided upon a list of detector information which should be included in the E835 Neutral DST's (hereafter NDST) for production which should start on the FNAL farms by March. Outlined below is a short introduction to the NDST's for the non-initiate, the proposed NDST format, and a preliminary timetable for production. We hope that all interested parties will examine this format carefully by the time we meet in Torino on Feb 6, and be ready to discuss it there (and subsequently, at FNAL the next week for those not going to the Torino meeting). We wish to have all questions settled by Februrary 27 at the latest.

We have written the NDST packing and unpacking code, which should remain untouched, except for minor format changes. Either of us can answer questions about this code itself before the Torino meeting. The filter code has also been written, and is in the process of being tested so that we can evaluate our needs at the Farm more precisely. It is expected that this code might change somewhat more substantially.

2. PRODUCTION STREAMING

The goal of the NDST production apparatus is to select neutral events of various topologies from the GK and GN tapes for streaming to 15 different data sets, which will then be spooled to tape for distribution. These 15 sets are specified in the trim_run shell file used to run the code, and will be as follows:

1. KPRID 040 Autopass for Neutral PBG1 trigger
2. KPRID 050 Autopass for Neutral ETOT trigger
3. KPRID 070 Autopass for Neutral ETOT-hi (80%), No FCH Veto
4. KPRID 080 Autopass for Neutral ETOT-lo (70%)
5. KPRID 090 Autopass for the laser hardware trigger.

6. KPRID 120 Autopass for the Min Bias trigger
7. KPRID 130 Autopass for the Random gate
8. 2 neutral in-time or undetermined (i.o.u.) clusters
9. 3 neutral i.o.u. clusters
10. 4 neutral i.o.u. clusters
11. 5 neutral i.o.u. clusters
12. 6 neutral i.o.u. clusters
13. 7 neutral i.o.u. clusters
14. 8 neutral i.o.u. clusters
15. 9 neutral i.o.u. clusters

For the Autopass prescale values for the KPRID's mentioned above, see the WWW page for PRUDE. (http://www-e835.fnal.gov/~gollwitz/prude_trigs.html) The Autopass streams above will be written in the usual raw data format, i.e. they will not be packed in the manner described below for the NDSTs.

At present, it is envisioned that the NDST packing process will be run on each GK and GN tape, producing $15 + 8$ data sets for each run. Autopass events have been written by the DAQ onto the GK tapes only, so the GN tapes will produce only the i.o.u. cluster streams. These sets will follow a simple naming scheme: GKXXXX_YYY.dat, GKXXXX_ZZZ.dat or GNXXXX_ZZZ.dat where XXXX is the run number, and YYY is the 3 digit KPRID from above, and ZZZ is 002, 003, ..., 009, denoting the number of i.o.u. clusters.

3. INFORMATION INCLUDED IN THE NDSTS

Each NDST record will include the following information from the detectors. Some questions have been anticipated regarding the information we have chosen to include, and will be addressed below.

1. Gateway buffer number
2. Run number
3. Processor number (0-3)
4. Event number

   Items 2-4 above identify an event uniquely
5. KPRID
6. Trigger words
7. Event time (from processor clock)

8. Total Number of CCAL clusters
9. Total Number of FCAL clusters
10. Total Number of i.o.u. CCAL clusters
11. Total Number of intime CCAL clusters
12. Total Number of CCAL clusters w/ $E \geq 75$ MeV
13. Total Number of CCAL clusters over $E \geq 100$ MeV
14. For each CCAL cluster:
    (a) Cluster energy, corrected for cracks
    (b) Cluster center of gravity in ring units
    (c) Cluster center of gravity in wedge units
    (d) Cluster mass
    (e) Flag which tells us whether the cluster arises from a previously split cluster, an isolated cluster, or a cluster which shared energy with another
    (f) Cluster Time, as determined by the offline intime.f routine
    (g) Cluster Timing flag (in, out or undetermined)
    (h) Ratio of Uncorrected to Corrected Energy
    (i) Hit map for 8 blocks surrounding the cluster c.o.g. (not ADC counts, but a simple flag for each block which registers above pedestal)
15. Total energy in the CCAL (of all i.o.u. clusters)
16. Total x-component of the momentum sum for all i.o.u. clusters (P_x)
17. Total y-component of the momentum sum for all i.o.u. clusters (P_y)
18. Total z-component of the momentum sum for all i.o.u. clusters (P_z)
19. TDC hit map for H1
20. TDC hit map for H2$'$
21. TDC hit map for H2
22. TDC hit map for Čerenkov
23. For each FCAL cluster:
    (a) Corrected cluster energy
    (b) Cluster center of gravity in block units (x)
    (c) Cluster center of gravity in block units (y)
24. Total energy in the FCAL (of all clusters regardless of time)

Since we began considering this format, it has been mentioned to us by various people that having an ADC hit map of the entire CCAL for each event would be preferable. We agree, if we had sufficient processing time and disk space. However, such a map would vastly increase the size of the NDSTs, making them rather unwieldy. Furthermore, such a map is not really needed. If necessary, in principle, one may reconstruct the ADC hit maps for each cluster, given the Corrected and Uncorrected energy, c.o.g. in block units, cluster hit map, the calibration constants used in the NDST filtering, and the clusterizer code. Since this procedure is available to those who desire it, we see no real reason to record the ADC value for each hit block in each event.

We have decided, also in order to conserve space, not to include information from the Scintillating Fibers. Consideration can be given to adding a bundle hit-map, but we can't afford to add much more than that. Another alternative is to include the c.o.g. in fiber units for all SciFi clusters.

We should carefully consider in discussion whether or not items 15-18 (The CCAL total energy and momentum component sums) in the above list should include ALL CCAL clusters or as we have proposed, just the i.o.u CCAL clusters; the timing window used to determine intime status should also be considered.

Finally, it should be noted that we have not included the timing information for the FCAL clusters after the implementation of FCAL-II. We can include this if there is sufficient interest in doing so.

4. THE FILTERING CODE

The filtering code consists simply of two parts - USER_FILT1 and USER_EVENT. We have decided to cluster at 25/50 (seed/cluster) thresholds, and place the coalescing pi0 cluster mass cut at 100 MeV.

USER_FILT1: The streaming of all 7 autopass streams from the GK tapes is done here. For the other streams, a cut is made here on those events which for which PRUDE indicates > 10 CCAL clusters, in order to reduce the number of events being fed to the clusterizer.

USER_EVENT: Analysis of each event is performed only up to run level 10. For each cluster, the time (using the usual offline intime.f routine) is calculated, as are each cluster's momentum components P_x, P_y and P_z. Then the number of i.o.u. clusters is determined and the appropriate stream then identified. The other cluster counters (clusters above 75 MeV, 100 MeV, etc) are incremented. Finally the following cuts are made:

- Events with number of i.o.u. clusters < 2 or > 9.
- Events with $|P_z - P_{\bar{p}}| \geq 0.15$.
- Events with $P_\perp \equiv \sqrt{P_x^2 + P_y^2} \geq 350\text{MeV}$.

5. TENTATIVE SCHEDULE FOR THE FUTURE

Jan 30

Testing code, estimation of FNAL farm resources required.

Feb 6

Meeting at Torino: discussion of format as presented here, suggestions for changes can be made, and discussed.

Feb 13

Meeting at FNAL: same as above.

Feb 27

NDST packing, filtering code and the offline should be frozen by this point.

mid-Februrary to March

Migration of code to FNAL farms and begin NDST production.