

Analysis of .nustrip Files - 1

Abstract: Summary files (.nustrip) were re-analyzed using current reconstruction software to identify events where there was at least one final track pointing at the target. The primary purpose of this study is to gain a better understanding of systematics and event finding efficiencies. One can also use the results to search for single or di-muon events not confined to the emulsion targets.

1. Introduction

The .nustrip files were created during the “stripping” of the raw data files from 1998 to 2001. The events that passed this strip were then scanned visually by teams of collaborators to find likely neutrino interactions within the emulsion targets. The events from the output of the .nustrip process do not have explicit cuts on longitudinal position of vertices and only weak requirements in the transverse directions. Since the time that these event files were generated, the reconstruction software has had many incremental improvements to tracking and vertex finding. Therefore, a re-analysis of the .nustrip files can be used to estimate event finding efficiency of the visual scanning. Also, since there are few position restrictions, tracks not originating in the emulsion can be extracted to verify the number of events (mainly muons) from SFT, CS and trigger counters.

2. Analysis

There are 93 .nustrip files on fnbblx1 with the path /data3/strip/. The results in this memo are derived only from these files on the local disk, although there are approximately 160 more files on the Enstore system. In this analysis, the standard myanal reconstruction software was used except the explicit selection of the vertex in or near a target was eliminated. Events from the .nustrip files were selected for further inspection iff:

1. a final track projected to $z=90$ cm had $|u|$ OR $|v| < 25$ cm

Events that had a reconstructed vertex without a final track were not analyzed in this study.

3. Results

A summary of the .nustrip files follows.

Total number of files (runs) : 93

Files from Period 1 : 21

Files from Period 2 : 72

Total number of selected events with ≥ 1 final track : 1645

A full list of run numbers is given on page 4.

3.1 Visual Scan

The result of the re-strip was the 1645 events with at least one final track from 34180 events on all 93 files. These events were scanned by eye with `myana1` graphically. A total of 116 events were found with a non-pathological final track connected to the SFT data. Of these, 75 events had a track(s) that most likely originated in an emulsion target. Of these, 72 events had at least one track with a momentum of at least $2 \text{ GeV}/c$.

events in target fiducial	72
events in 959 list	64
events in 870 list	61
events in 515 located list	46
NOT in 959 list	8
NOT in 870 list	11

Table 1. Summary of intersection of both data sets

3.2 Estimate of Scanning Efficiency

If the reconstruction software used for this study were “independent” in choosing good neutrino interactions then the data can be used to get an estimate for the visual scanning efficiency. The events chosen from `.nustrip` files are very concentrated: 1645 events to

scan versus 34000 events that were originally scanned (5%). This is equivalent to scanning less than 5 .nustrip files in the original scan. In view of this, the scanning efficiency for this study will be assumed to be 1.

located AND new scan	50
located ONLY	31
“good” new event ONLY	11

Table 2. Summary of new scan set with respect to located events that passed the same myana1 filter for selecting final track events.

From Table 2 it is clear that located events with a final track(s) were often manipulated by hand to give final tracks or had SFT only tracks. We ignore the located ONLY result and find that the best estimate for the visual scan efficiency is $50/61 = 0.82 \pm 0.16$. This is consistent with previous estimates found by re-scanning a subset of the data.

The error may be reduced by almost a factor of two by analyzing the additional 160 .nustrip files on Enstore.

3.3 New Event Set

Of the 11 events found only in the new scan set, 6 are μ CC events and 3 appear to be e CC events. Although two events might not be in the locatable fiducial volume (one possible Pb, one possible CS), all would have been classified as candidates had they been seen in the original visual scan.

2791	2863	2933
2792	2875	2934
2793	2876	2938
2795	2879	2981
2804	2880	2983
2805	2884	2984
2806	2889	2985
2807	2890	2986
2808	2891	2987
2809	2892	2989
2810	2893	2990
2811	2894	2992
2812	2895	2996
2825	2896	2998
2828	2897	3020
2829	2898	3021
2830	2899	3022
2832	2902	3023
2833	2907	3024
2836	2908	3025
2837	2909	3026
2841	2910	3027
2842	2911	3029
2845	2912	3037
2846	2913	3039
2847	2915	3040
2849	2919	3043
2850	2927	
2851	2928	
2852	2929	
2855	2930	
2856	2931	
2857	2932	