



Continued Discussion of Analysis Plans/Tasks

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Reminder of Goals



- Event location -
 - Continued analysis of Pass1 and Pass 2 data
 - Begin analysis of Pass 3
 - **Locate at least 400 interactions**
- ν_{μ} - ν_e spectrum analysis
 - **Complete analysis of ν_{μ} muon momentum**
 - Complete calibration of EM calorimeter
 - Define sample of ν_e events
 - **Measure the ν_e electron spectrum**
- Candidate event parameter analysis
 - **Extract, analyze and evaluate emulsion data**
 - Determine/estimate daughter momentum
 - Determine all background normalization
- Efficiency studies and calculations

Event Location



- Vertex Predictions to Nagoya
 - BL and VP have this under control
 - Nagoya is scanning ~ 30 events per week
 - I believe this includes generating new scan data for the Pass 1 located events
- Scanned data
 - Nagoya generates [m-files](#), [.ecv](#) files and [.dcy](#) files (for located events)
 - US analysis :
 - Our own searches with m-files (BB, CE)
 - Using Nagoya data (GR)

Definition of “located”



- Unlocated events : **primvtx = 0**
- Pass 1
 - Emulsion vertex & tracks are in `located_all.emu`
 - **rdemvx** finds no .ecv file, calls **io_emulsion**
 - **primvtx = 1**
- Pass 2
 - **rdemvx** finds .ecv file
 - Emulsion `trk_match` 1 or 2 (release)
 - Sets `vproc(n) = 0` if vertex is consistent with SF lines
 - **primvtx = pointer to emvx3, etc.**
 - Individual analysis
- *Eventually*
 - We need to establish a way to verify location and make sure that the emulsion data we use agrees with the data that Nagoya thinks represents the best scanning and analysis of that event.

Spectrum Analysis



- Use events from Period 3 and Period 4, Stations 3 and 4; **candidate** events will be found in four lists in \$E872LISTS :
 - numu_sp_3(4).lis <-- BL
 - nomu_sp_3(4).lis <-- GT, et. al.
 - Includes ν_e , NC and junk...

Event Parameters (1)



**Run
Module**

**Event
Type**

Event Data :

Primary Vertex (cm)			Secondary Vertex (cm)		
<u>U</u>	<u>V</u>	<u>Z</u>	<u>U</u>	<u>V</u>	<u>Z</u>

This is calculated from the vertex position and the distance to the dump.

Neutrino Angle	
<u>Theta U</u>	<u>Theta V</u>

Parent is the track which makes the kink with the daughter (ID=1)

Primary Tracks					
<u>Track No.</u>	<u>Theta U</u>	<u>Theta V</u>	<u>Start Pl</u>	<u>No. Segs</u>	<u>Parent ID</u>

Daughter Track				
<u>Track No.</u>	<u>Theta U</u>	<u>Theta V</u>	<u>Start Pl</u>	<u>No. Segs</u>

Event Parameters (2)



Event Parameters

Angle of Parent (radians)

This is the difference between the incoming neutrino (calculated from primary vertex position and the distance to the beam dump) and the angle of the parent (gotten from the parent's emulsion track).

Delta Phi (radians)

This is calculated by forming the unit vector sum of all primary emulsion tracks, except the one identified as the parent and subtracting that sum from the unit vector of the parent.

Flight Length (mm)

This is calculated by taking the vector difference between the primary and secondary vertex

Daughter Kink Angle (radians)

This is calculated by taking the difference in the emulsion track angles between the parent and the daughter

Daughter Momentum (GeV)

This is determined by different methods, depending on the event :

- 1) linking the daughter emulsion track to a momentum-analyzed spectrometer track or 2) using the emulsion track segments to estimate the momentum from multiple scattering, 3) estimating energy from electron showering in emulsion

Event Parameters (3)



Event Likelihood

tau
charm (missing lepton)
NC Scattering

Raw Prob. Normal. Rel. Prob.

	Raw Prob.	Normal.	Rel. Prob.

Raw probability is determined by comparing the 5 event parameters to the 5-parameter probability functions determined by the Monte Carlo.

The parameters of each candidate event are compared to each of the identified background processes which have been Monte Carlo'd. Presently there are 9 processes which can be evaluated, 3 for charm and 6 for NC scattering.

Event Parameters for 3024_30175



Run 3024 **Event** 30175
Module 1 **Type** ECC

Event Data :

Primary Vertex (cm)			Secondary Vertex (cm)		
U	V	Z	U	V	Z
11.793	43.797	34.893			

Neutrino Angle (radians)

Theta U	Theta V
0.0003	0.001

Still need to calculate

Primary Tracks

Track No.	Theta U	Theta V	Start Pl	No. Segs	Parent ID
4485	-0.0062	-0.0281	12-1	7	1
4657	0.2642	0.2202	12-1	6	
4373	-0.1554	-0.1876	12-1	2	

Daughter Track

Track No.	Theta U	Theta V	Start Pl	No. Segs
4391	-0.0028	-0.1222	09-2	13

Event Parameters

Angle of Parent (radians)
Delta Phi (radians)
Flight Length (mm)
Daughter Kink Angle (radians)
Daughter Momentum (GeV)

0.025
5.3
4.53
0.0934
4.4

← Took from .dcy file
← From Nakamura notes

Event Likelihood

Raw Prob. Normal. Rel. Prob.

tau
charm (e)
charm (m-p)
charm (m-np)
NC (e-nc)
NC (e-cc)
NC (mp-nc)
NC (mp-cc)
NC (mnp-nc)
NC (mnp-cc)

0.061		
0.315		
0.087		
0.27		

From JS program