ν_e analysis status and prospectives
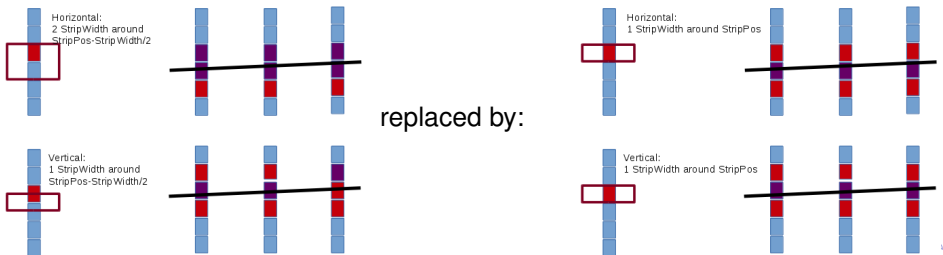
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OPERA CM, 26 October, 2016

Correction of the CS-TT matching algorithm

At Nagoya Meeting we (Svetlana and Giuliana) have the difference in the location step at CS level.

At CS level there are 3 criteria of the event selection for the rather analysis:

- search for vertex (2 or more CS tracks)
- search for μ candidate
- search for for CS-TT matching (when only 1 CS track found, the idea of the CS-TT matching implementation was a reproduction of manual selection of penetrating track)

replaced by:

Location efficiency cross check: ν_μ CC 1μ and 0μ (Svetlana and Giuliana)

Cross check was done on the slightly different fractions, with the old CS-TT matching algorithm, the results with corrected CS-TT matching is in the brackets, now is used for location efficiency evaluation

ν_μ CC 1μ	Giuliana:	eff(%)	Svetlana:	eff(%)
total	42068	100 ± 0	42079	100 ± 0
ED Trigger	42068	100 ± 0	42079	100 ± 0
Classification	40053	95.21 ± 0.10	40050	95.18 ± 0.10
OpCarac	39063	92.86 ± 0.13	39059	92.82 ± 0.13
BF	24214	57.56 ± 0.24	24390	57.96 ± 0.24
CS	21122	50.21 ± 0.24	21286(20174)	$50.58 \pm 0.24(47.94 \pm 0.24)$
SB	20035	47.63 ± 0.24	20196(19215)	$48.00 \pm 0.24(45.75 \pm 0.24)$
LOC	18873	44.86 ± 0.24	19038(18137)	$45.24 \pm 0.24(43.10 \pm 0.24)$

ν_μ CC 0μ	Giuliana:	eff(%)	Svetlana:	eff(%)
total	42068	100 ± 0	42079	100 ± 0
ED Trigger	42068	$100 \pm 0.$	42079	100 ± 0
Classification	2015	4.79 ± 0.10	2029	4.82 ± 0.10
OpCarac	1917	4.56 ± 0.10	1930	4.58 ± 0.14
BF	1648	3.92 ± 0.09	1475	3.51 ± 0.09
CS	1428	3.39 ± 0.09	1439(1321)	$3.42 \pm 0.09(3.14 \pm 0.09)$
SB	1281	3.05 ± 0.08	1291(1182)	$3.07 \pm 0.08(2.81 \pm 0.08)$
LOC	1209	2.87 ± 0.08	1217(1120)	$2.89 \pm 0.08(2.66 \pm 0.08)$

# Location efficiency cross check: ν_μ NC 1μ and 0μ (Svetlana and Giuliana)

Cross check was done on the slightly different fractions, with the old CS-TT matching algorithm, the results with corrected CS-TT matching is in the brackets, now is used for location efficiency evaluation

ν_μ NC 1μ	Giuliana:	eff(%)	Svetlana:	eff(%)
total	10809	100 ± 0	10812	100 ± 0
ED Trigger	10791	99.83 ± 0.04	10794	99.83 ± 0.04
Classification	2240	20.72 ± 0.39	2226	20.59 ± 0.48
OpCarac	2148	19.87 ± 0.38	2135	19.75 ± 0.38
BF	1804	16.69 ± 0.36	1794	16.59 ± 0.36
CS	1604	14.84 ± 0.34	1596(1446)	$14.76 \pm 0.34(13.37 \pm 0.33)$
SB	1511	13.98 ± 0.34	1502(1376)	$13.89 \pm 0.34 \ (12.73 \pm 0.32)$
LOC	1426	13.19 ± 0.33	1418(1301)	$13.11 \pm 0.33 \ (12.03 \pm 0.31)$

| ν_μ NC 0μ	Giuliana:	eff(%)	Svetlana:	eff(%)
total	10809	100 ± 0	10812	100 ± 0
ED Trigger	10791	99.83 ± 0.04	10794	99.82 ± 0.04
Classification	8551	79.11 ± 0.39	8568	79.25 ± 0.39
OpCarac	7954	73.59 ± 0.42	7970	73.71 ± 0.42
BF	6122	56.64 ± 0.48	6136	56.75 ± 0.48
CS	4038	37.36 ± 0.47	4049(3626)	$37.45 \pm 0.47(33.53 \pm 0.45)$
SB	3412	31.57 ± 0.45	3423(3055)	$31.66 \pm 0.45(28.26 \pm 0.43)$
LOC	3211	29.71 ± 0.45	3218(2879)	$29.76 \pm 0.44(26.63 \pm 0.43)$

Location efficiency ν_e CC 0μ and 1μ

ν_e CC	Svetlana 0μ :	eff(%)	Svetlana 1μ :	eff(%)	ν_e data
total	4418	100 ± 0	4418	100 ± 0	53
ED Trigger	4417	99.98 ± 0.023	4417	99.98 ± 0.023	53
Classification	3052	60.08 ± 0.70	1365	30.90 ± 0.70	43 (-10)
OpCarac	2876	65.10 ± 0.72	1293	29.27 ± 0.69	40 (-3)
BF	2507	56.75 ± 0.75	1159	26.23 ± 0.66	40
CS	2207	49.95 ± 0.75	1105	25.01 ± 0.65	40
SB	2010	45.50 ± 0.75	1043	23.61 ± 0.64	40
LOC	1923	43.53 ± 0.75	989	22.39 ± 0.63	40
CShint	1492	33.77 ± 0.71	740	16.75 ± 0.56	34 (-6)
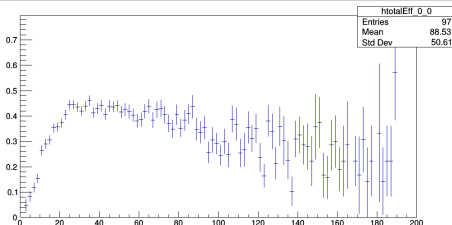
Plots and tables prepared for summer conferences

Background from $\tau \to e$ and γ was evaluated (Giuliana, Svetlana), plots and values for the summer conferences were done (normalized on the number of located events in the DB at 06/06/2016)

2008-2012 preliminary distribution
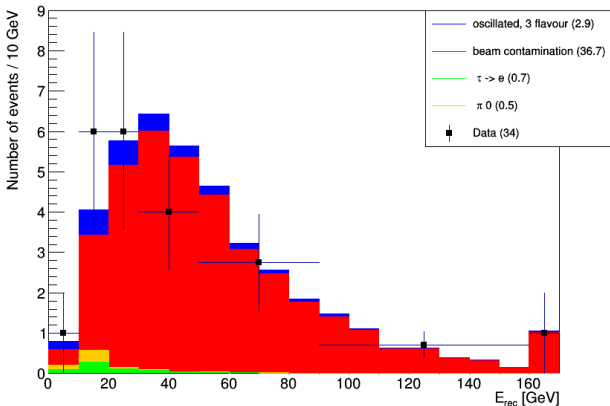
Plots and tables were prepared for summer conferences

Ecut, GeV	10	20	30	40	50	all
pi0	0.11	0.41	0.45	0.46	0.48	0.50
Tau->e	0.10	0.37	0.50	0.57	0.61	0.70
Beam cont	0.40	3.25	8.26	14.18	19.49	36.72
Bg to 3 flavour	0.61	4.03	9.21	15.21	20.58	37.92
osc	0.20	0.82	1.42	1.84	2.12	2.86
Osc/Bg to 3 flavour	0.328	0.203	0.154	0.121	0.103	0.075
Bg to non-stand	0.81	4.85	10.63	17.05	20.70	40.78
Data	1	7	13	19	21	34

Normalization on the number of located events in the DB at 06/06/2016

Plan of the 2nd $\nu_\mu \to \nu_e$ draft

Search for $\nu_\mu \to \nu_e$ oscillations in appearance
mode in the OPERA experiment

OPERA Collaboration

Draft Version 1.0

October 26, 2016

Abstract

The result of the search for $\nu_\mu \to \nu_e$ oscillations in the full data sample of the OPERA experiment and its interpretation are presented. Experiment was located in the Gran Sasso underground laboratory and was convenient for the detection and identification of ν_e interactions in the quasi pure ν_μ CNGS beam. The data was collected during 2008-2012 runs. The results are compatible with non-oscillation hypothesis in the three-flavour mixing model. The data was used for study of the non-standard oscillation parameters θ_{new} and Δm^2_{new} in the regions suggested by LSND and MiniBooNE experiments. In this approach, the result is interpreted as an upper limit on $sin^2(2\theta_{new})$ which reaches the value X(7.2×10^{-3} in the 1st article) for large Δm^2_{new} values ($> 0.1\ eV^2$) at the 90% OPERA C.L. based on a Bayesian statistical method.

Contents

Summary and prospectives

Done:

- Location efficiency cross check was done (Svetlana and Giuliana)
- Algorithm used for CS-TT matching was corrected (affects on the number of expected ν_e events)
- The values and the energy spectra of BG from γ and $\tau \to e$ were evaluated
- The plan of the 2nd ν_e article was accepted, part of the draft was written

To do:

- to do cross check of the expected beam contamination with Matteo - in progress
- to fix the number of located events
- to complete the 2nd ν_e draft (Matteo needs about 1 month for the calculation after the number of located events are fixed)