

Numu→nue expected numbers & Electromagnetic showers energy estimation

LAPP – Annecy
Florian Brunet
Supervisor : Amina Zghiche

Reunion de groupe OPERA 13/09/2012

Outline

- Numu → nue expected numbers
- Energy estimation on MC sample : electron nue & taue

Numu → nue expected numbers

Species	Oscillated ν_e	Prompt ν_e	$\tau \rightarrow e$	ν_μ NC	ν_μ CC → ν_μ NC	Charm → e
Mis-id mu eff.					0,0436666667	0,043666666
Rate (yr/kt)	3,2	26,4	3,2	1084,8	3615,2	6,1765692
Expected 2008-2009	4,7111111111	38,8666666667	4,7111111111	1597,0666666667	232,410496314	0,3970732723
Location eff. 1Brk	0,448	0,453453453	0,45452418	0,3731593	0,6384615029	0,45452418
Location eff. 2Brk	0,591503646	0,593145	0,5868209027	0,4940744066	0,7633920186	0,5868209027
Expected	2,7866393989	23,053569	2,7645784749	789,0697657058	177,4203179276	0,2330108961
ElectronID eff.	0,6907563025	0,8151862464	0,6490777658	0,3194444444	0,3194444444	0,6490777658
CS hint eff. (Umut)	0,305	0,541	0,305	0,1	0,1	0,305
CS to Vtx shower (Umut)	0,721			0,144	0,144	
Expected	0,8499250167	12,471980829	0,8431964349	78,9069765706	17,7420317928	0,0710683233
Kin. sel. (MC t E only)	0,9245742092	0,2530755712	0,8148818855	0,5063938619	0,5063938619	0,8148818855
Expected (MC t E only)	0,7858187502	3,156353672	0,6871055006	39,9580085959	8,9844559974	0,0579122893
Significance	0,5	0,1993364739	0,5335092757	0,0192868172	0,0804295448	0,9313616703
Kinematical sel. (MC t)	0,5109489051	0,1142355009	0,251995917	0,0204603581	0,0204603581	0,251995917
Expected	0,4342682567	1,424742977	0,2124820588	1,6144649938	0,3630083231	0,0179089273
Significance	0,5	0,2336017388	0,6714619943	0,2119691554	0,5446895942	0,960394005
Kin. sel. (MC t + lowE)	0,4841849148	0,1089630931	0,2497758011	0,0051150895	0,0051150895	0,2497758011
Expected	0,4115208718	1,3589856088	0,210610065	0,4036162484	0,0907520808	0,0177511474
Significance	0,5	0,2324311582	0,6614698731	0,5048486464	0,8193172053	0,9586482543
S (Komatsu)	0,5	0,2913385827	0,6218487395	0,5873015873	0,880952381	

Electron ID Efficiency

Done :

- Statistics has been increased τ_{e} and n_{e} (1k $\rightarrow$ 3k)
- Re-evaluation of the event rates for each channel with up-to-date informations : pb with osc. N_{e} , NC event rate

To do :

- Implement CS hint efficiency, SB hint efficiency and CS2Vertex efficiency
 - $\rightarrow$ Matteo gave me a list of events
- Evaluate efficiencies properly for $\text{numucc} \rightarrow \text{numunc}$ & $\text{charm} \rightarrow \text{e}$

Multivariate analysis 2012

Done :

- Input variables : E_{TT} (visible) for Enu, reco'd electron energy (debugged), missing pt at 1ry vertex and phi angle (Hadron Pt $\rightarrow$ « electron ») by applying « Pablo & Dominique » MCS parametrisation

To do :

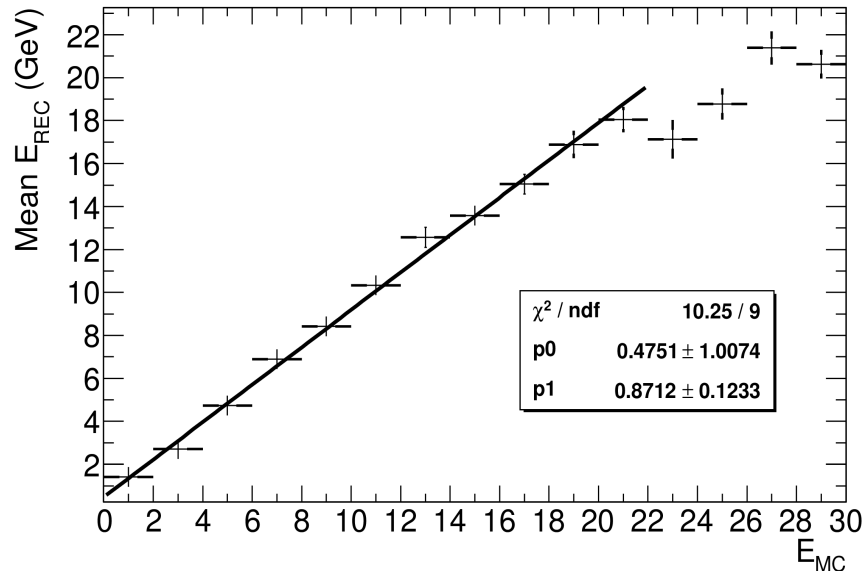
- Normalisation from the re-evaluation of the event rates
- Rerun this analysis

Reminder : physics performance of current tool to estimate shower energy

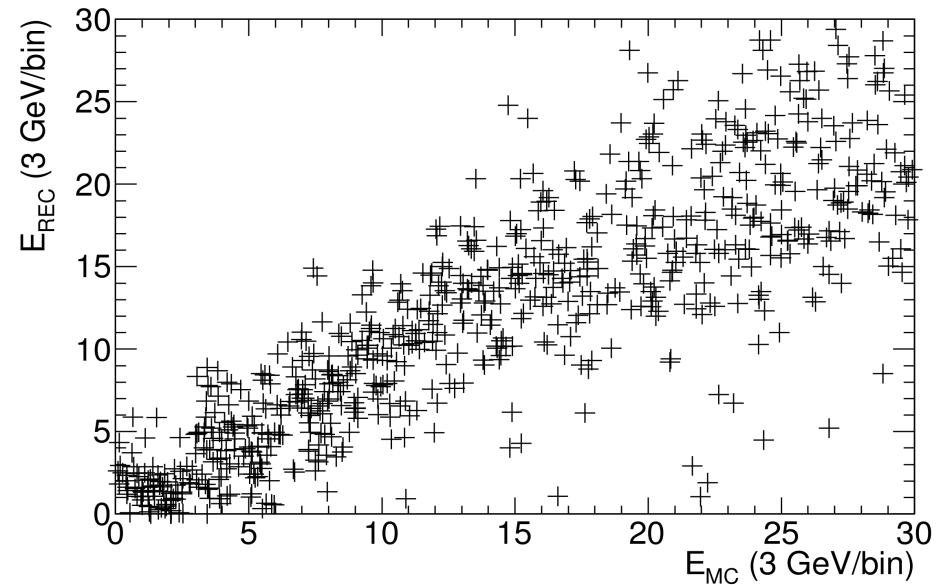
- New electron MC sample (10k)
 - Define a good sample for energy estimation
 - Contained showers (cf. past presentation) + incoming angle < 0.1 rd
 - Bugs have been corrected

MC electron 1k : rec energy «control sample »

Profile of reco'd energy wrt MC true energy [Single electrons FullBrick (Contained + $\theta < 0.1$ rd)]



Reco'd energy vs MC true energy [Single electrons FullBrick (Contained + $\theta < 0.1$ rd)]



- Good parametrisation up to 20 GeV
- BUT errors on the profile are not the energy resolution (mean error by default)

Outlook

1/ Write my thesis : a first complete version by the end of september

2/ Electron Energy estimation
 Compute the energy resolution

3/ Redo the numu-nue oscillation analysis and compute the sensitivity to θ_{13}