Event reconstruction in the Baikal experiment



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4-string stage (1996)

AGENDA

- 1. Hit classification criterion.
- 2. Events classification criteria.
- 3. Reconstruction (fitting)
- 4. Quality cuts.
- 5. Post analysis and outlook.

Conditions of reconstruction

- Scattering length(~30-40m) > absorption length (~20m)
- Time response for muon reconstruction is close to single muon.
- Muon track length > geometrical size of array.

Hit classification

$$|\Delta t_{ij}| < r_{ij} / v_c + d$$
 - apply it for each pair in response

 \rightarrow Find channels with the number of violations >1

BUT: Still can be pairs which have wrong causality

$$\cos(\boldsymbol{q}^{\min} + \boldsymbol{h}) < \cos \boldsymbol{q} \frac{\Delta t_{ij}}{z_j - z_i} < \cos(\boldsymbol{q}^{\max} - \boldsymbol{h})$$

For each pair on the same string. If $\bigcap \{q \min q \max\} = 0$ \Rightarrow There is at least 1 channel violating single muon model in time

Event classification

Aim: Find a parameter(s) which are sensitive to muon bundles and showers. Compare MC and experiment over this parameter.







Quality cuts.

- phit*pnonhit + $\sum_{i}^{N_{hit}} P^{hit}_{i}$
- Amplitude correlation $Cor_{amp} = \sum_{i=1}^{N_{hit}} (A_i^{ob} \overline{A^{ob}})(A_i^{rec} \overline{A^{rec}}) / \mathbf{s}^{ob} \mathbf{s}^{rec}$
- Track length in array response
- Amplitude Chi2
- Chi2_sh/Chi2_mu

Neutrino selection cuts:

- Zenith angle > 90
- Time-Z correlation

$$Cor_{tz} = \sum_{i}^{N_{hit}} (Z_i - \overline{Z})(T_i - \overline{T}) / \boldsymbol{s}_z \boldsymbol{s}_T$$

• Nchan >6

RESULTS:

 \mathbf{Y} (median) – for upward going events ~ 3°

Survival rate with respect to trigger 6/3 for neutrino events ~ 20 % at S/N ~ 10 (90% CL)

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NEUTRINO T Test of shower energy reconstruction with laser



Postanalysis and outlook

- Use all pairs to define "allowed" region in ?, f to try to find another track parameters.
- Increase a selectivity of the hit analysis.
- In case of finding hits out of single muon model, use a model with shower(s). $\mu(f,?,x,y,t0)$

