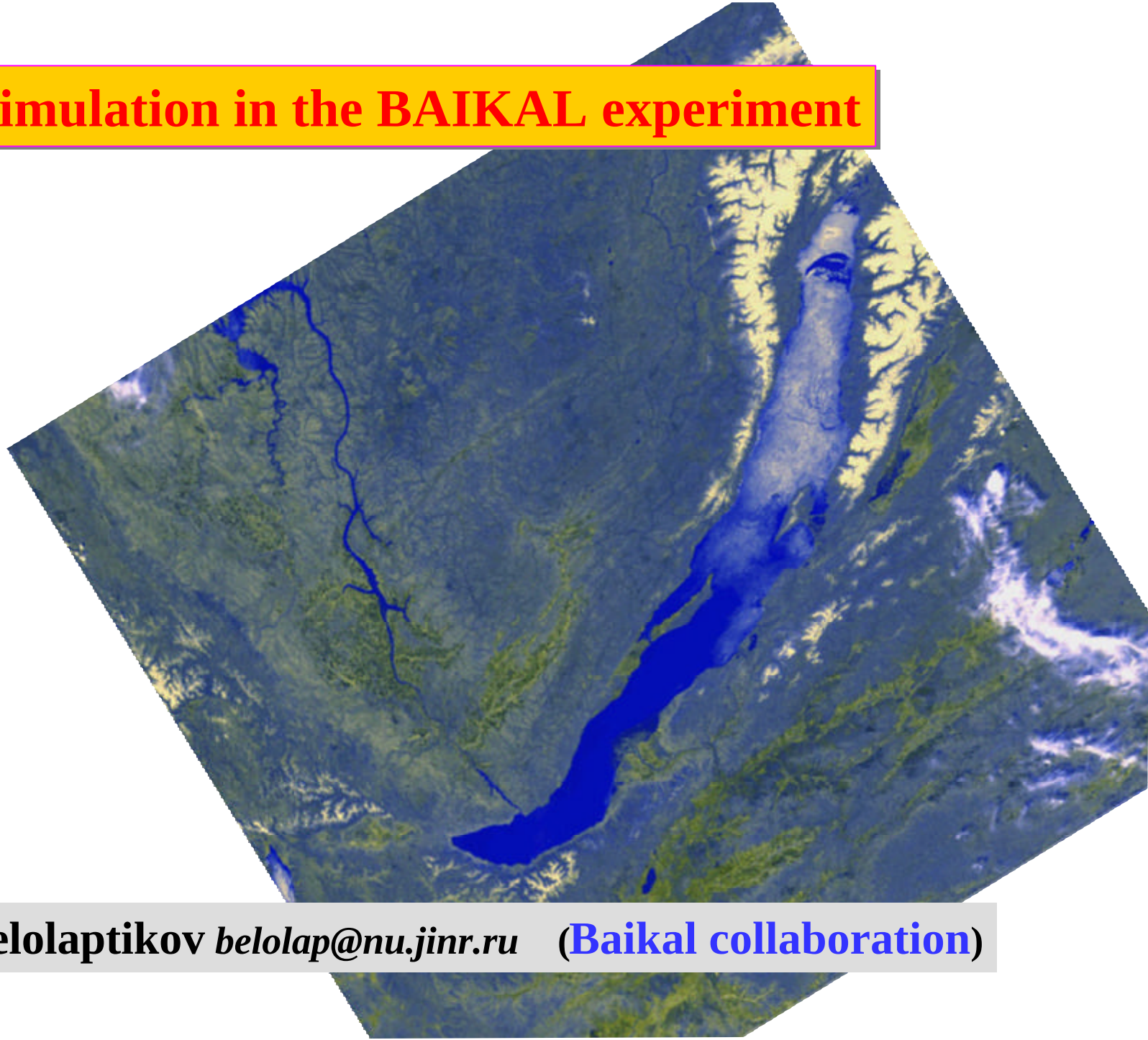
Simulation in the BAIKAL experiment



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Simulation tool

1. Light propagation :

L_{sc} » 30-50m; L_{abs} @ 20m Þ for showers with energy up to ~10 TeV and muons up to ~50 TeV scattering of light in medium can be ignored.

For higher energies scattering is taken into account on the base of long term measurements of parameters of scattering.

2. Accurate simulation of time response of a channel on fact of registration is provided.

3. Atmospheric muons:

CORSIKA with QGSJET.

4. Muons from atm. neutrino:

- cross-sections - CTEQ4M (PDFLIB)
- Bartol atm. neutrino flux

5. Angular distribution for hadronic showers is the same as for el.-m. showers.

4. **Lepton transport** in media and in the array is done by MUM.

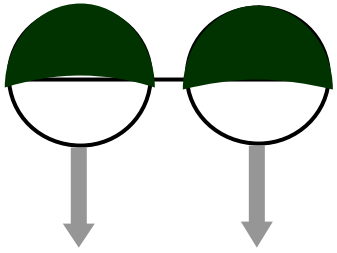
   Showers with energy > 20 MeV are considered as catastrophic losses.

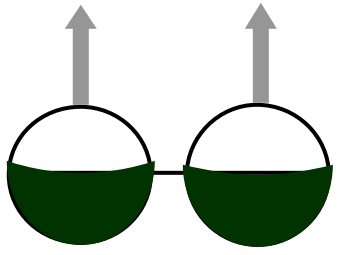
5. **Dead time and random** hits of measuring channels are included in code.

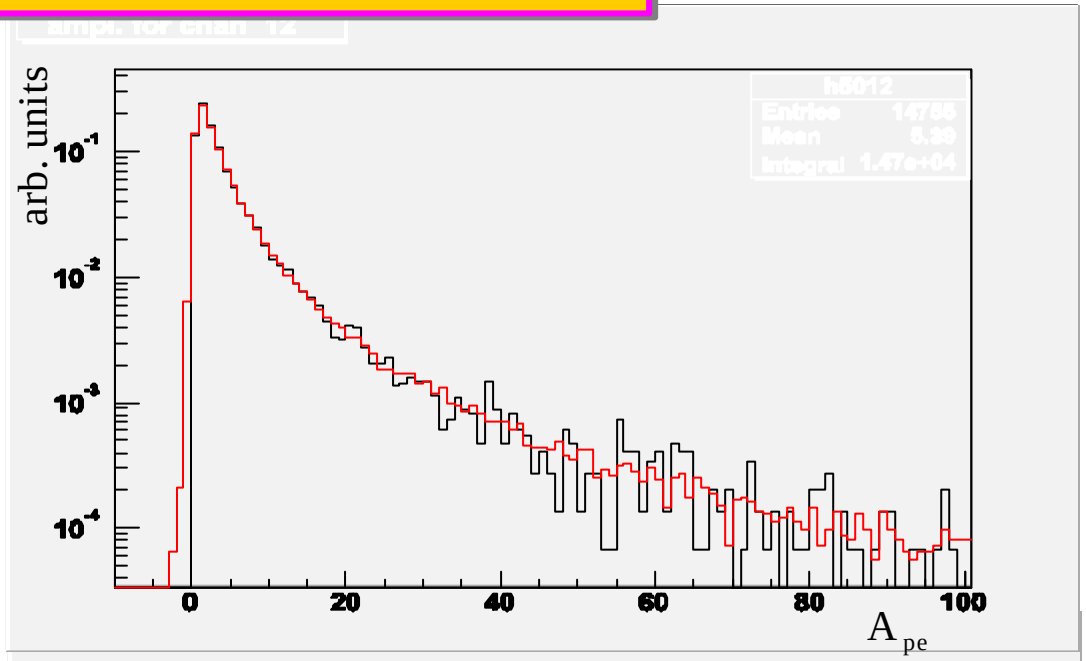
   Efficiencies of channels are measured experimentally in situ.

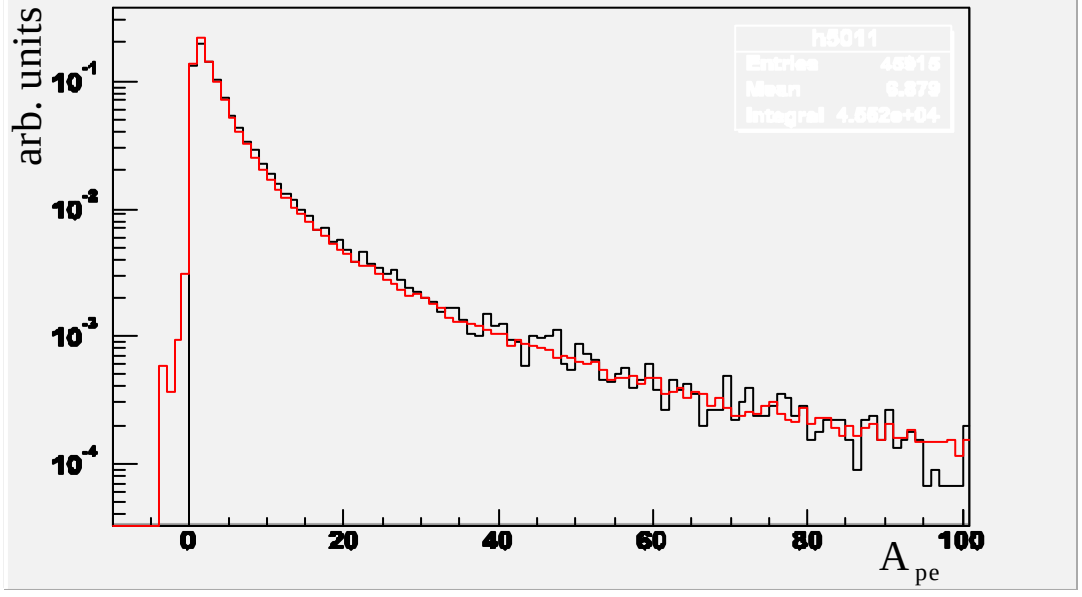
6. For simulation of **high energy neutrinos** we are going to use ANIS code.

Characteristics per channel









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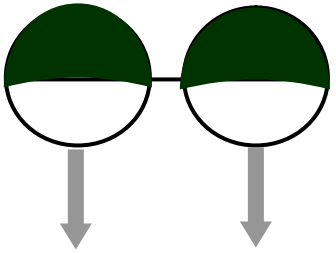

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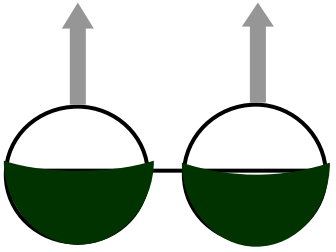

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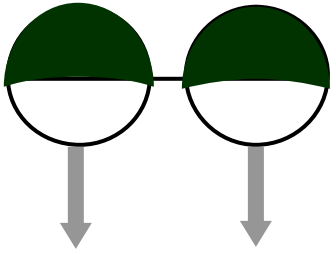
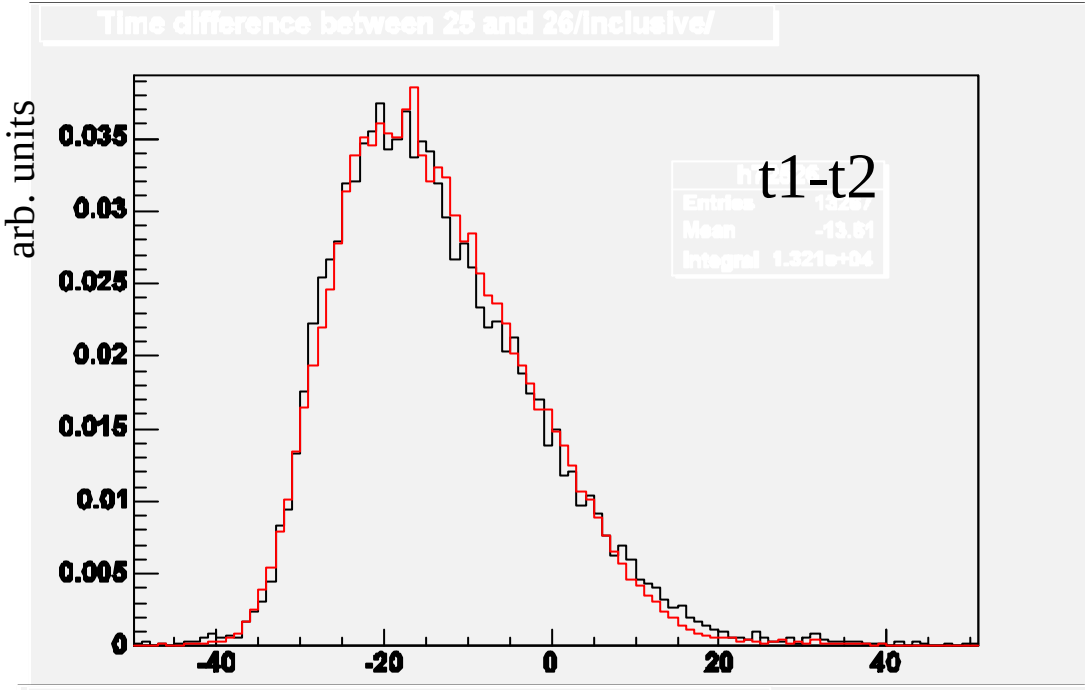
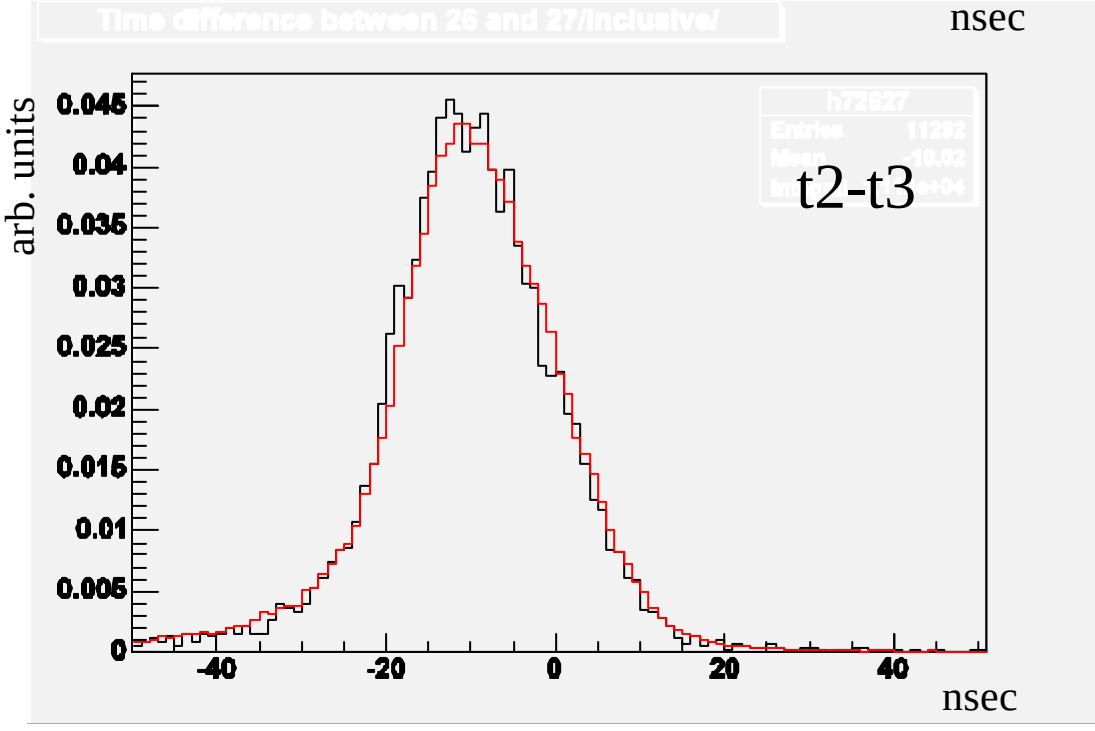



Time difference between 25 and 26/inclusive/
arb. units
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-40
-20
0
20
40
t1-t2
nsec


Time difference between 26 and 27/inclusive/
arb. units
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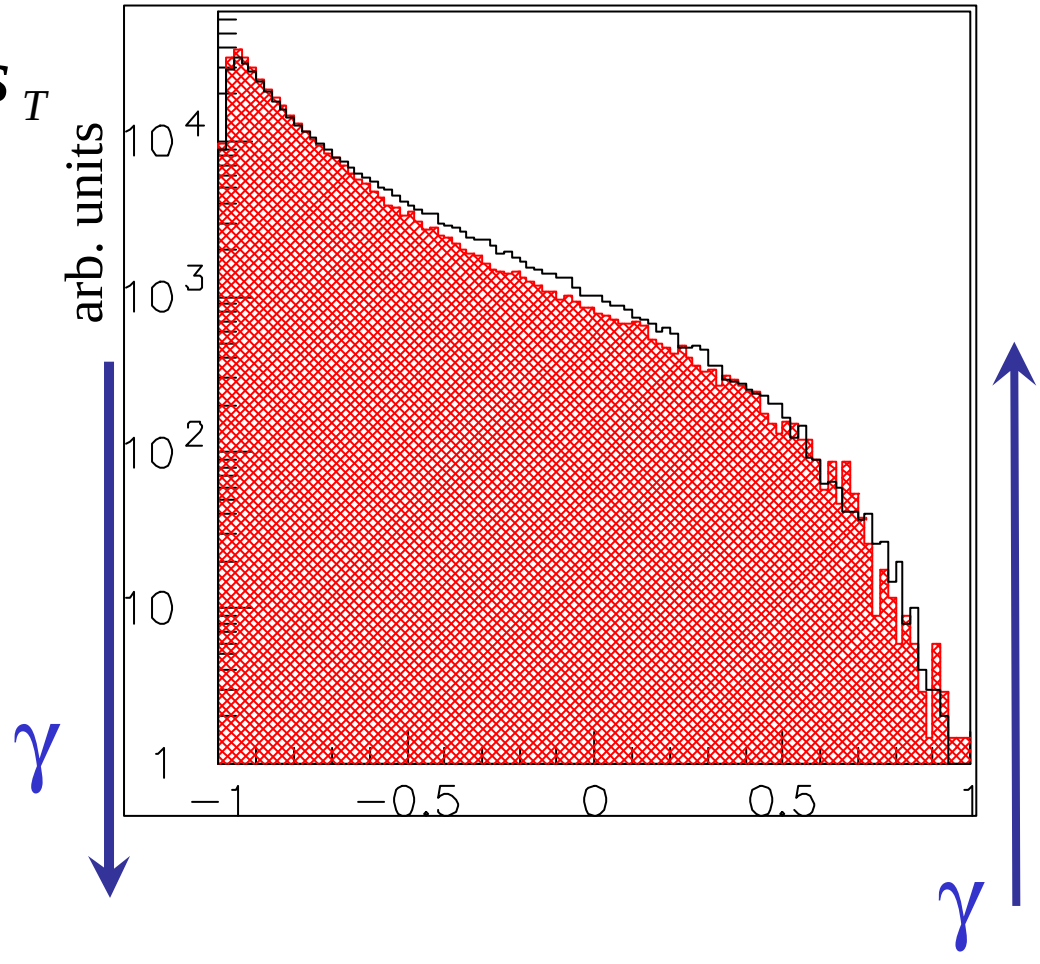
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
-40
-20
0
20
40
t2-t3
nsec

Array response characteristics

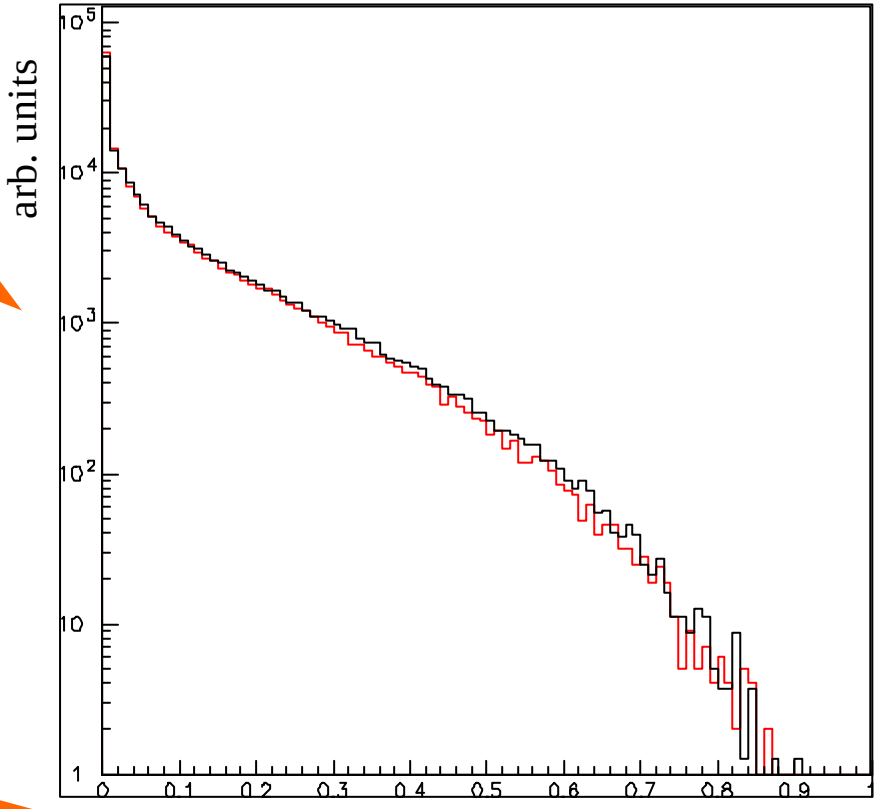
$$Cor_{TZ} = \sum_{i}^{N_{hit}} (Z_i - \overline{Z})(T_i - \overline{T}) / s_z s_T$$

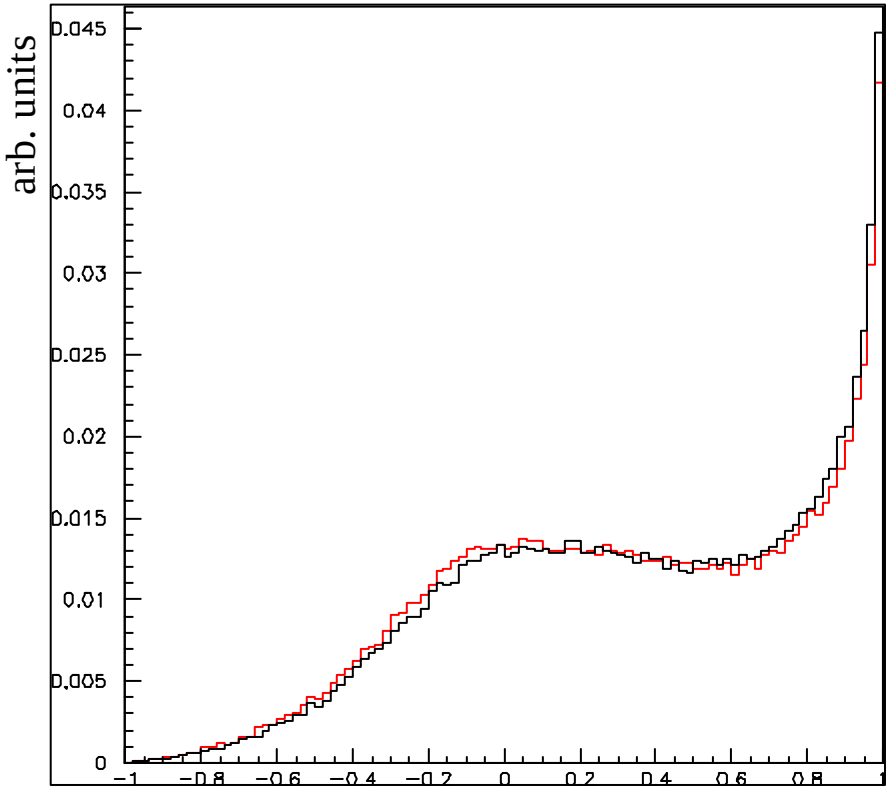
Time-Z correlation for > 20 hits for experiment and normal chemical composition of primaries.



Reconstructed events in array

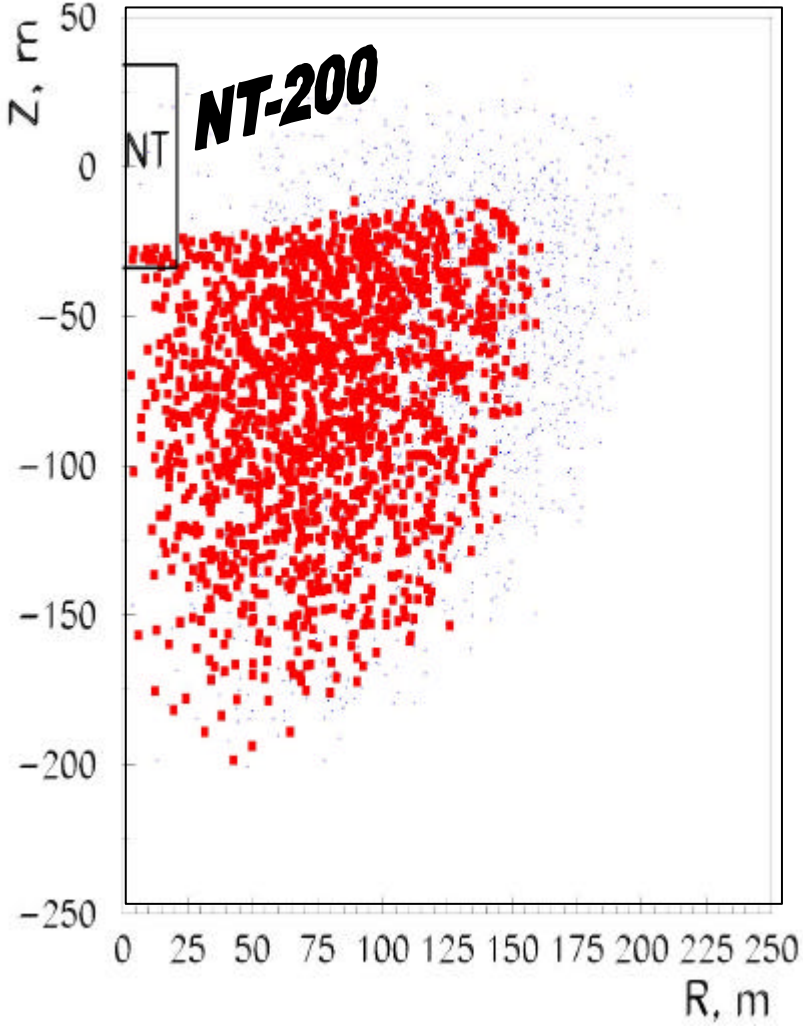
$$N_{hit}\sqrt{\prod_{i}^{N_{hit}} P_i^{hit}} \times N_{non}\sqrt{\prod_{j}^{N_{non}} P_j^{non}}$$

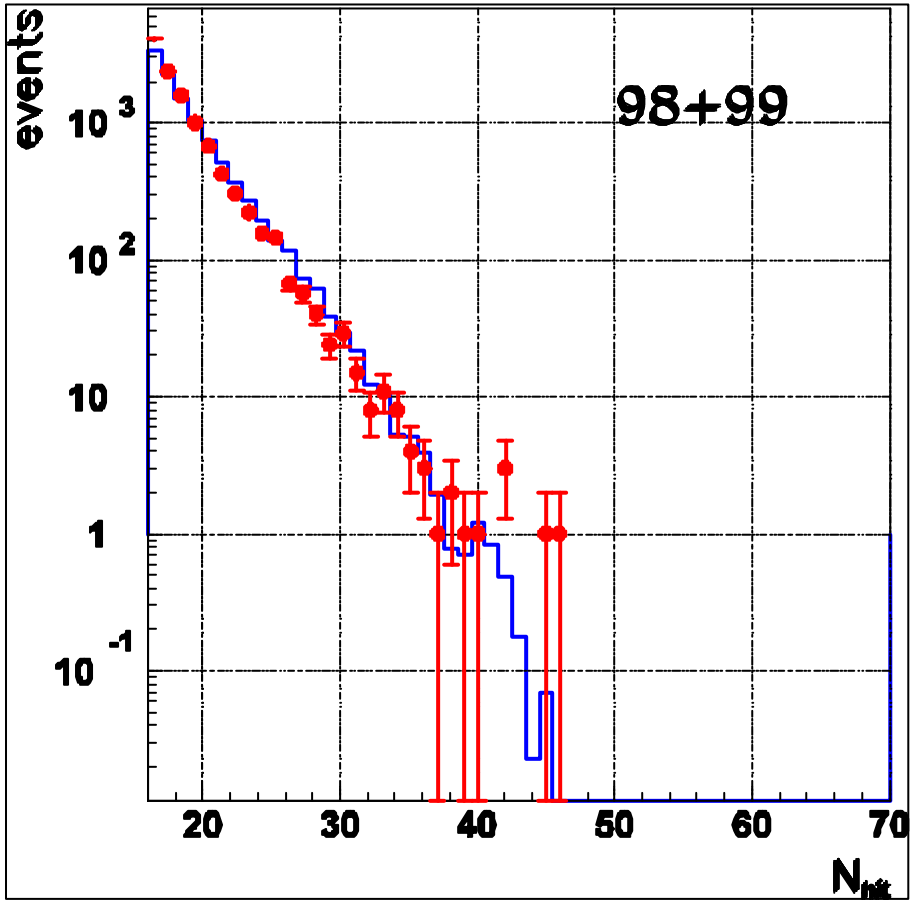




$$Cor_{amp} = \sum_{i}^{N_{hit}} (A_i^{ob} - \overline{A^{ob}})(A_i^{rec} - \overline{A^{rec}}) / s^{ob} s^{rec}$$

Seldom events





Conclusion

- We understand:
  1) response of our PMTs-channels
  2) response of our array as whole structure on a complex events like muon bundles;

- We can:
  1) describe array response on events with light front upward going.

- What to do:
  1) hadronic shower;
  2) LPM effect;

- NT200+ will give us new opportunity to check (or may be correct) our MC