

# Measurement of the left-right neutrino flux asymmetry at neutrino energies $\geq 1.6$ GeV

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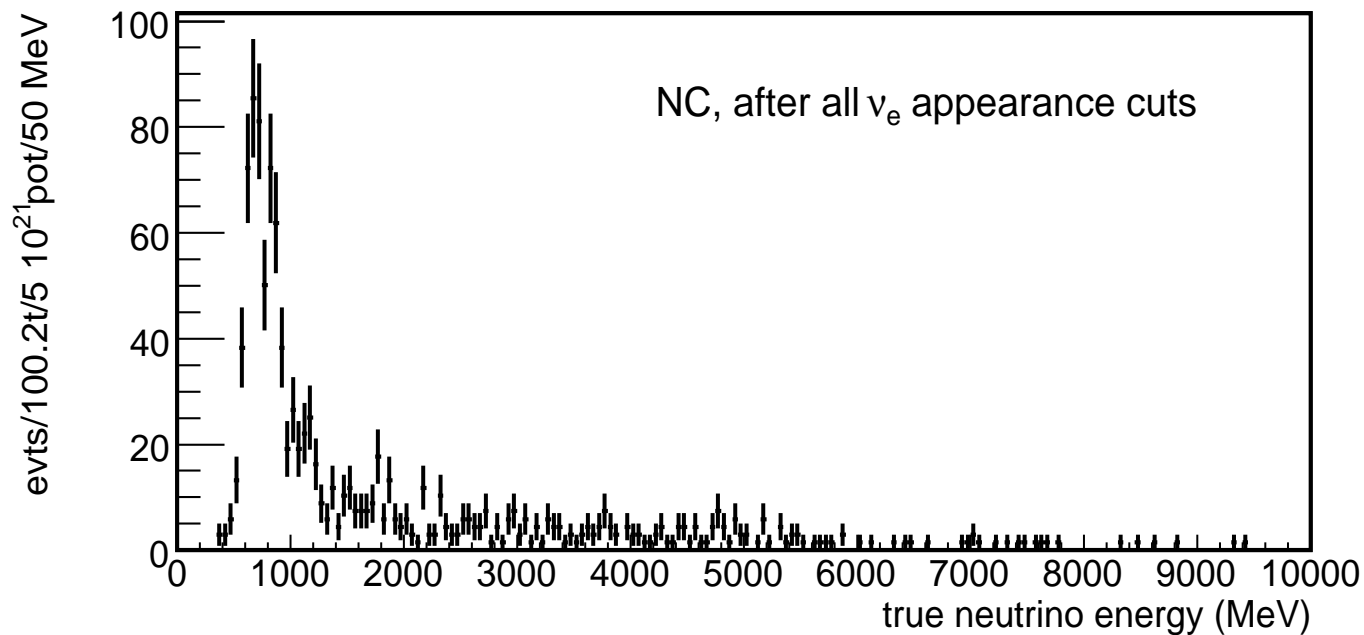
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## Outline

- Motivation
- Partially contained events
- Conclusions

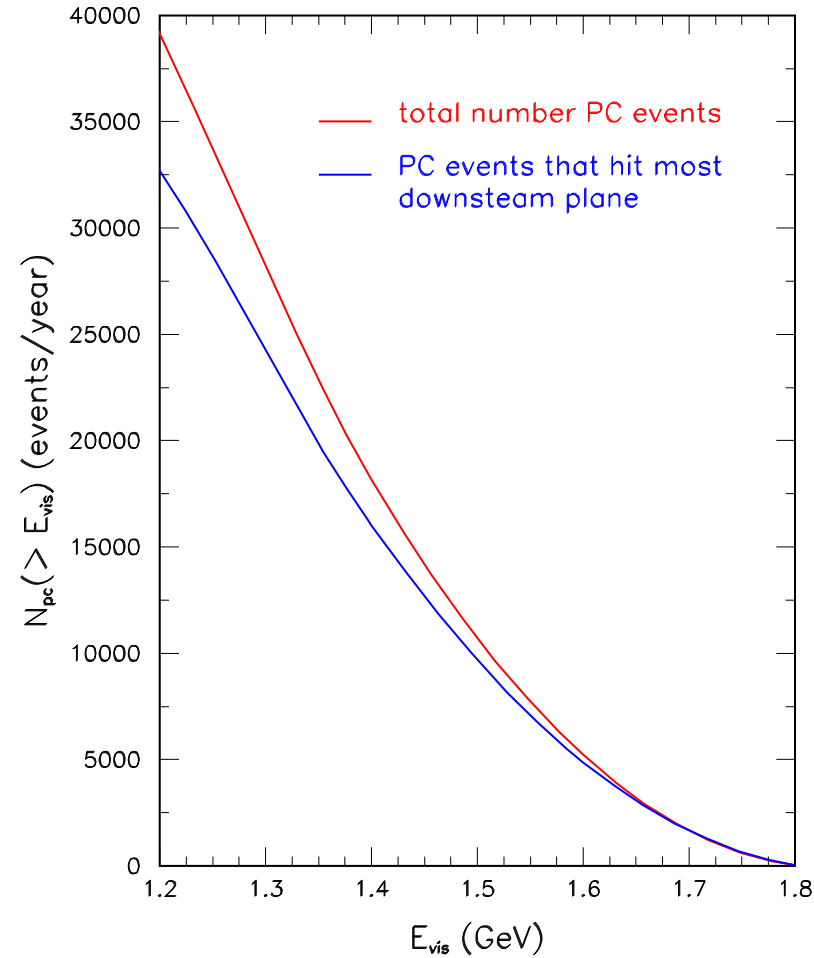
## Motivation

Muon energy distribution can be measured by the monitor detector (MD) up to energy  $\sim 1.6$  GeV. As follows from Maxim's evaluations of the electron appearance BG events due to NC  $\nu_\mu$  interactions the left-right flux asymmetry should be measured up to energy  $\sim 8$  GeV.



## Partially contained events

Using track lengths of PC events visible muon energy  $E_{vis}$  and integral muon energy spectrum can be reconstructed.



High energy muons escape from the MD mainly through the most downstream plane.

**Statistic:**  $\sim 5200$  PC events/year with  $E_\mu \geq 1.6$  GeV

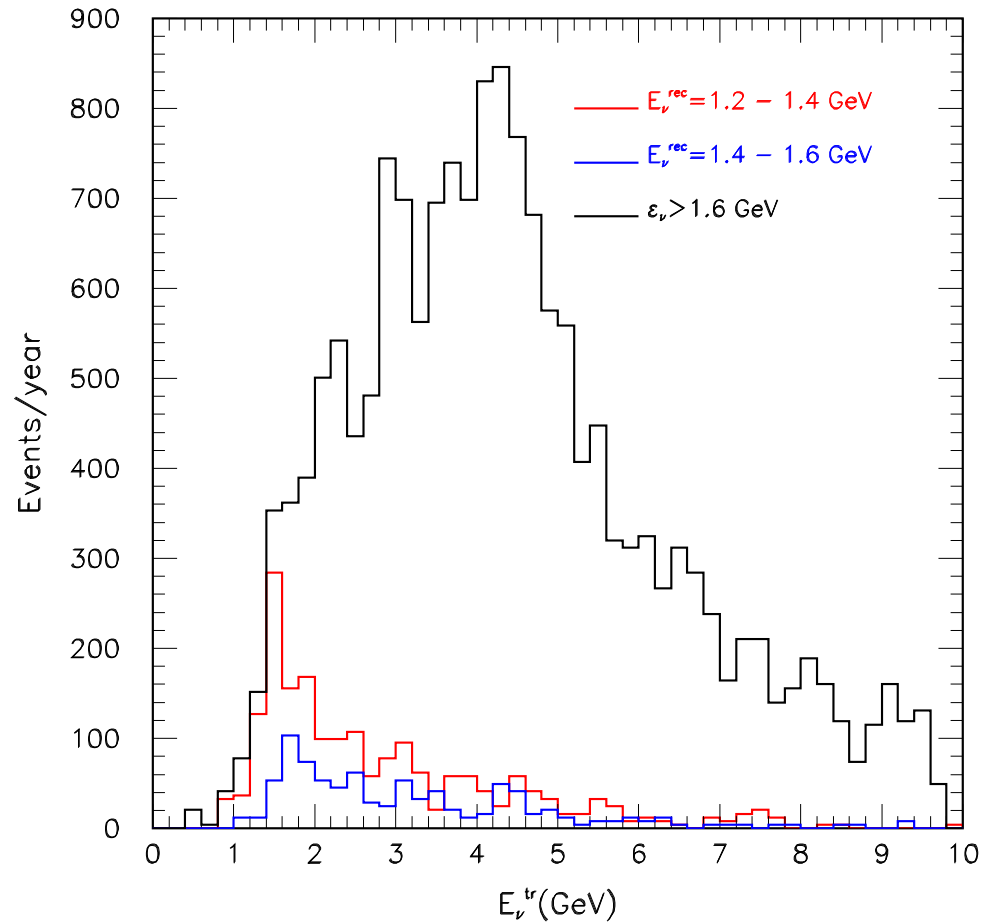
**Neutrino energy of PC event is larger than reconstructed visible neutrino energy**

$$\varepsilon_\nu = \frac{(M - \epsilon_b)E_{vis} + (2M\epsilon_b - m_\mu^2 - \epsilon_b^2)/2}{(M - \epsilon_b) - E_{vis} + k_{vis} \cos \theta},$$

where  $\epsilon_b$  is binding energy of nucleon in nucleus (35.5 MeV for Iron) and  $k_{vis}$  is visible muon momentum.

What true neutrino energies are responsible for FC + PC events with  $\varepsilon_\nu \geq 1.6$  GeV?

PC+FC events distribution as a function of true neutrino energy  $E_\nu^{tr}$  for  $\varepsilon_\nu \geq 1.6$  GeV.



FC events distributions for reconstructed neutrino energy ranges  $1.2 \div 1.4$  GeV and  $1.4 \div 1.6$  GeV are shown also.

## Result

- **Statistic:** 16620 FC+PC events/year with  $\varepsilon_\nu \geq 1.6$  GeV.
- Neutrino energy range  $2 \div 6$  GeV gives the main contribution (74%) to the FC+PC events with  $\varepsilon_\nu \geq 1.6$  GeV.

## Conclusion

We can monitor the left-right integral ( $1.6 \leq E_\nu \leq 8$  GeV) asymmetry for the high-energy tail using FC+PC events with  $\varepsilon_\nu \geq 1.6$  GeV with the statistical error of about 1%.