Constraining the ν_e flux from $\bar{\nu}_\mu$ measurements

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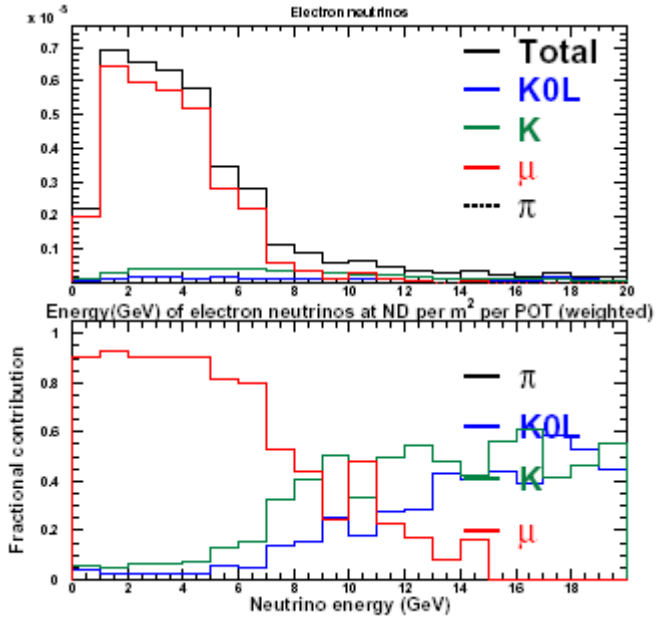
Primary source of low energy beam ν_e is $\mu^+ \rightarrow e^+ + \nu_e + \bar{\nu}_\mu$

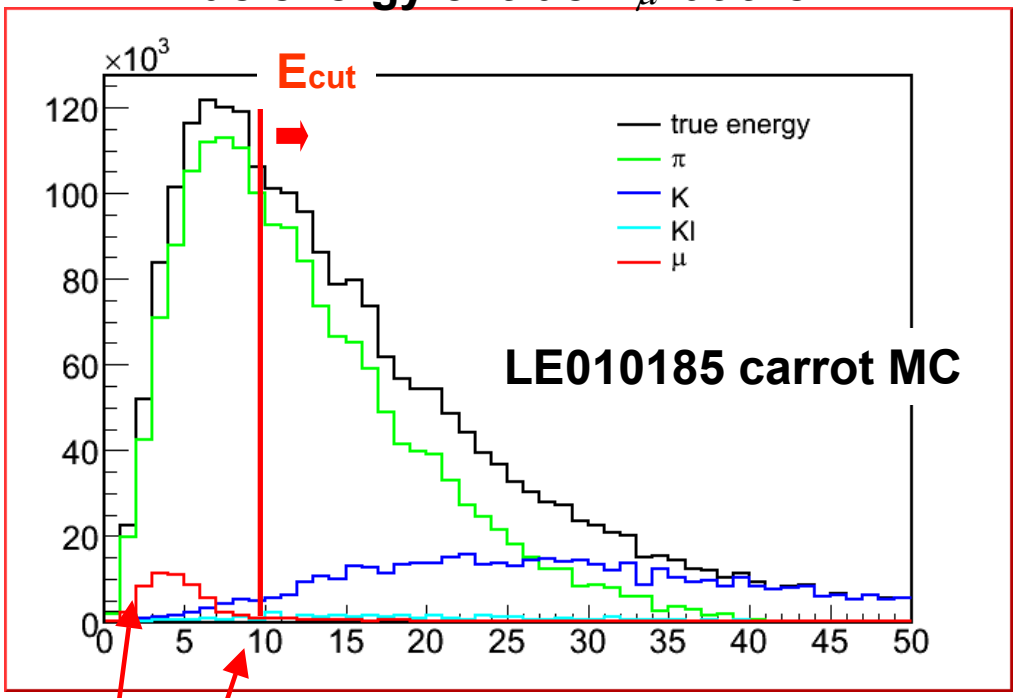
a measurement of low energy $\bar{\nu}_\mu$ can be used to constrain the ν_e flux

True energy of true ν_e at the ND



The majority of beam ν_e background in the energy region we are interested in is from μ^+ decay

True energy of true $\bar{\nu}_\mu$ at the ND



No $\bar{\nu}_\mu$ from μ+ above this energy (E_{cut})

This is what we are trying to measure

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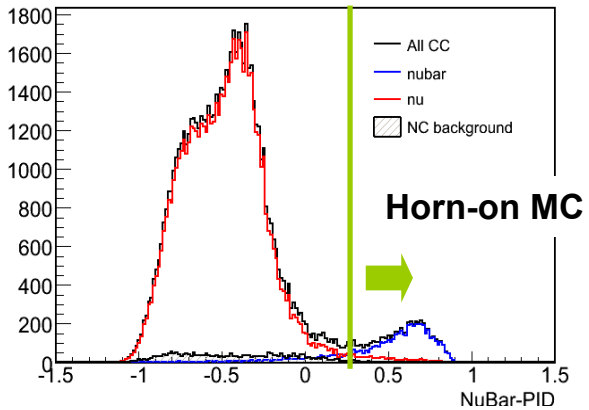
$$N_{\bar{\nu}} = L_\mu - L_{NC}^{MC} - L_\nu^{MC} - C \times L_{\bar{\nu}}^{MC}(\pi, K)$$

$\bar{\nu}_\mu$ from μ^+ decay — NC&ν bg. from MC — $\bar{\nu}_\mu$ from π & K decay

measured "μ^+" — corr. for diff. beween data/mc

1. anti-neutrinos are not perfectly modeled in the current MC. It's crucial to correct for the difference between data and MC.
2. It's very important to identify low energy $\bar{\nu}_\mu$ efficiently.

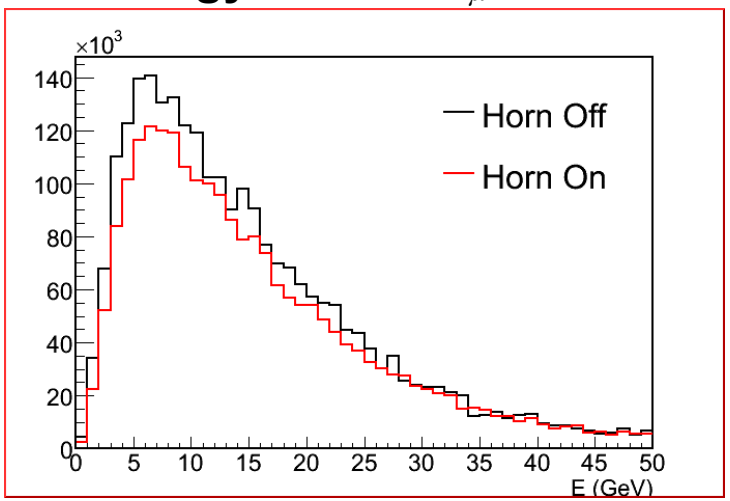
likelihood pid to select $\bar{\nu}_\mu$



Variables used:

- **(q/p)/(σq/p)**
- **Event length (planes)**
- **reco y**
- **cos(θz)**

True energy of true $\bar{\nu}_\mu$ at the ND



$\bar{\nu}_\mu$ from μ^+ decay is depleted in the horn off sample

Horn off sample can be used to take out differences between data/MC.