# More on the left-right monitor

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## Outline

- Motivation
- New configurations and partially contained events
- Conclusions

# Motivation

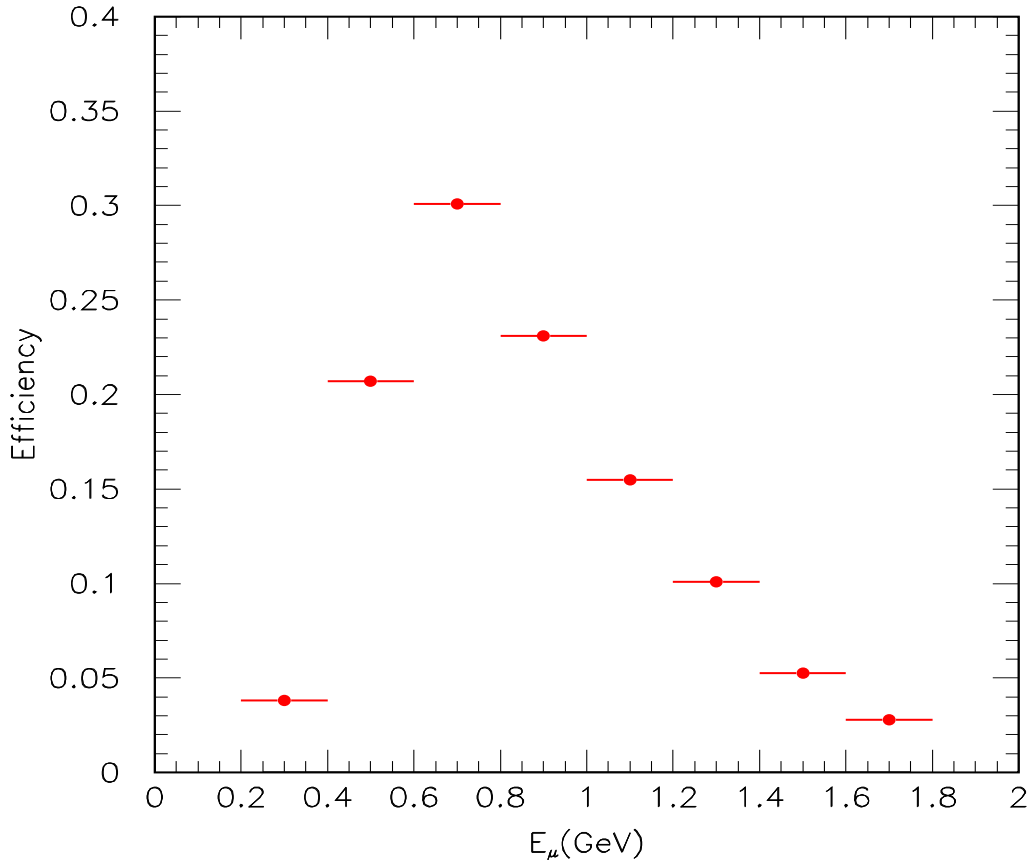
The main parameters of the left-right monitor detector are as follows:

MD1 Longitudinal structure:
10cm * 4 plates + 5cm * 10 plates + 2.5cm * 12 plates

Mass of the FV $M_{FV}$=8.414 t, total thickness of the MD1 $X_{tot}$= 975.8 g/cm$^2$, thickness of four thin plates (2.5 cm * 4 plates) is 83.7 g/cm$^2$ that corresponds to threshold muon momentum $p_{th} \sim$ 265 MeV/c or to the threshold total muon energy $E_{th} \sim$ 285 MeV

Range of muon with energy E = 305MeV (kinetic energy 200MeV) is R$\sim$110 g/cm$^2$ and corresponds to the thickness of five thin (2.5 cm thick) plates or four plates at the direction $\cos\theta$=0.76

# Efficiency of the MD1 as a function of total muon energy




In the energy bin (0.2 - 0.4) GeV the efficiency is only 4% and the expected number of events is $\sim$ 8300 per year

# New configurations and partially contained events

Can we find the better efficiency to the low energy events at the fixed size, the number of plates and total weight of the MD less than 10 tonnes?

The follows configurations of the monitor detector were regarded

MD2 Longitudinal structure:
10cm * 4 plates + 5cm * 10 plates + 2.5cm * 8 plates + 1.25cm * 4 plates

Mass of the FV $M_{FV}$=8.414 t, total thickness of the MD2 $X_{tot}$= 936.7 g/cm$^2$, thickness of four thin plates (1.25 cm * 4 plates) is 44.45 g/cm$^2$ that corresponds to the threshold muon momentum $p_{th} \sim$ 176 MeV/c or to the threshold total muon energy $E_{th} \sim$ 206 MeV

Muon with total energy E=305MeV penetrates through the nine thin ( 1.25 cm) planes and through four plates at the angle $cos(\theta)$=0.4

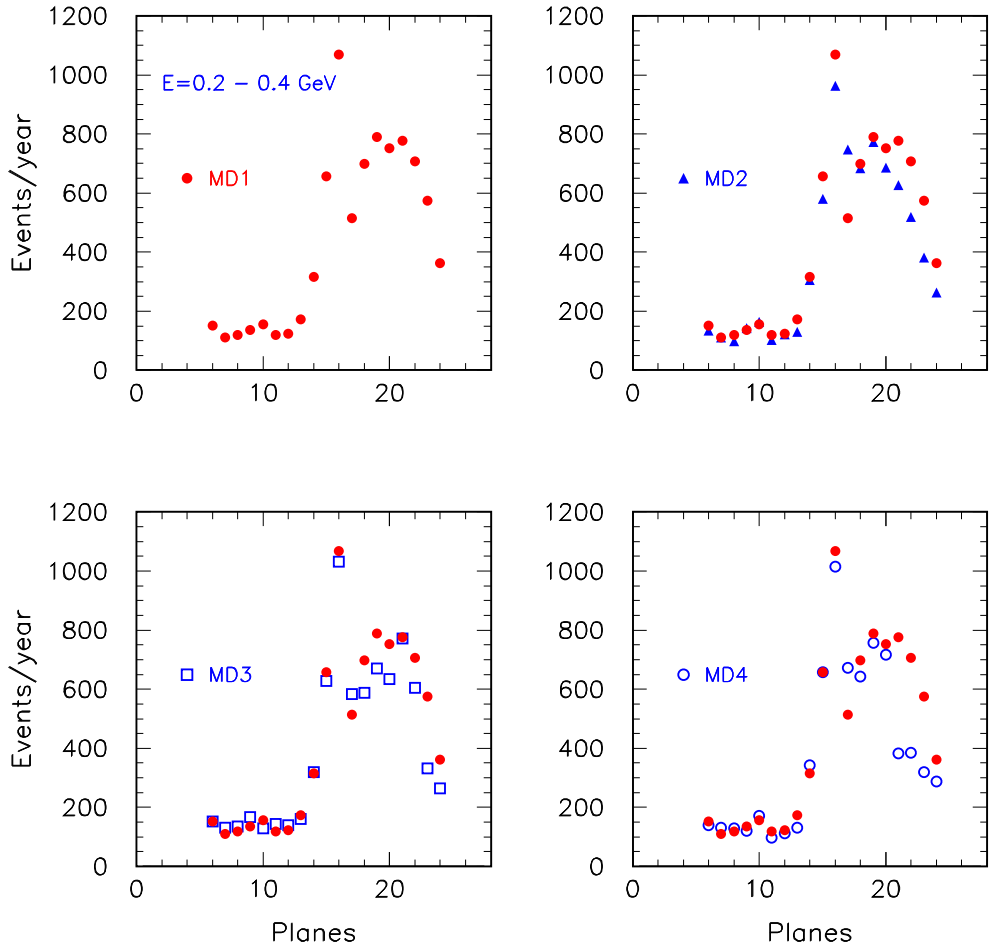
MD3 Longitudinal structure:
10cm * 4 plates + 5cm * 10 plates + 2.5cm * 6 plates + 1.25cm * 6 plates

Mass of the FV $M_{FV}$=8.114 t, total thickness of the MD3 $X_{tot}$= 917.5 g/cm$^2$.

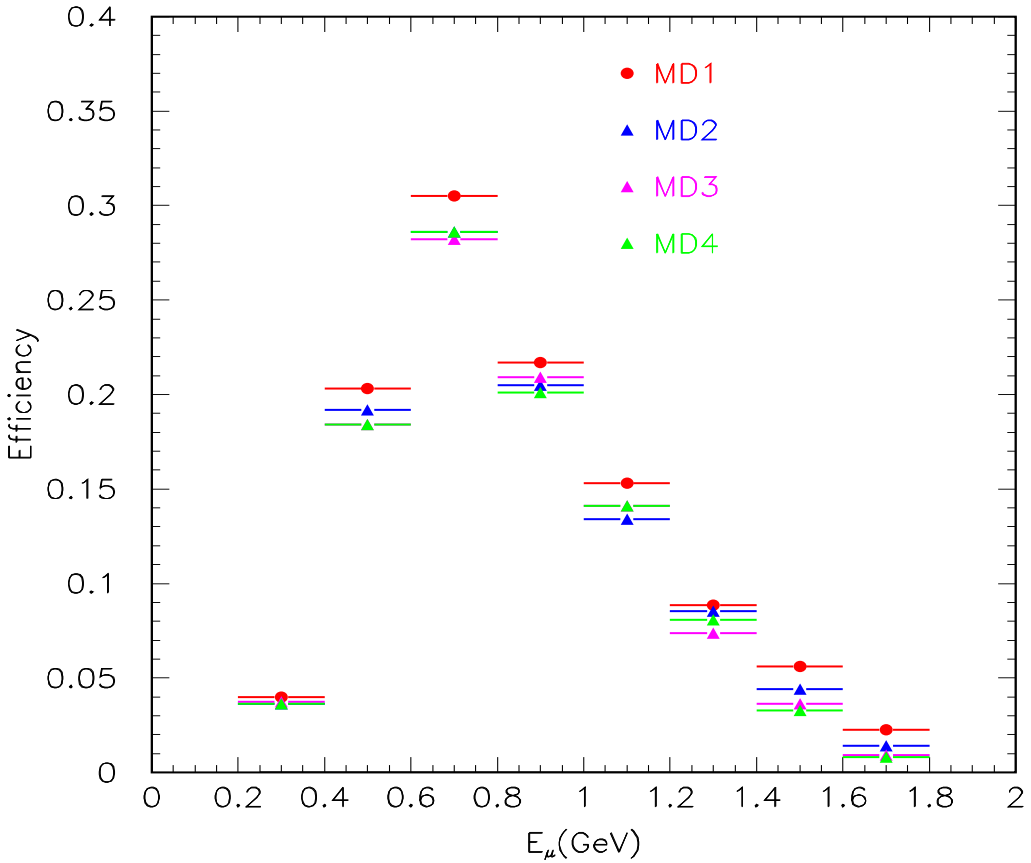
MD4 Longitudinal structure:
10cm * 4 plates + 5cm * 10 plates + 2.5cm * 4 plates + 1.25cm * 8 plates

Mass of the FV $M_{FV}$=7.763 t, total thickness of the MD4 $X_{tot}$= 897.5 g/cm$^2$.

# Distributions of the detected muon vertex positions along the detector with total muon energy E=0.2÷ 0.4 GeV

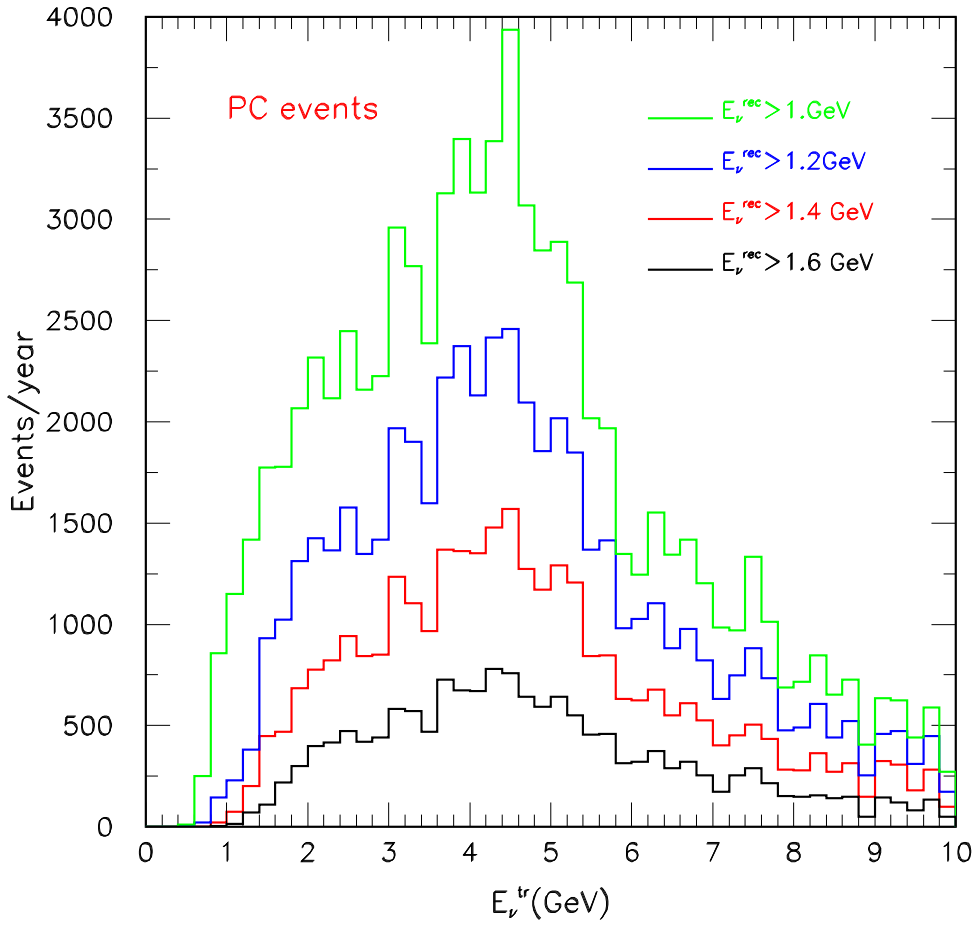


# Efficiency of the MDs configurations as functions of total muon energy




In the energy bin 0.2÷0.4 GeV the efficiency is about 4% for all configurations. At high energy 1.4÷1.6 GeV the efficiency is reduced up to 3% for the MD4

PC events distributions in the MD1 set up as functions of true neutrino energy $E_\nu^{tr}$ for reconstructed neutrino energies $E_\nu^{rec}$ more than 1, 1.2, 1.4 and 1.6 GeV.



Statistic:

79700 PC events/year with $E_\nu^{rec} \geq 1$ GeV
52500 PC events/year with $E_\nu^{rec} \geq 1.2$ GeV
31400 PC events/year with $E_\nu^{rec} \geq 1.4$ GeV
15500 PC events/year with $E_\nu^{rec} \geq 1.6$ GeV

## Conclusion

Efficiency of the MD1 set up at the fixed size, number of readout channels and total weight of the MD is larger than efficiency of the set ups with more thin plates.

We can monitor the left-right integral asymmetry for the high-energy tail using PC events with $E_\nu^{rec} \geq 1$, 1.2, 1.4, and 1.6 GeV with the statistical error of less than 1%.