# Magnetic Monopole Simulation in STAR Experiment

Vasily Dzhordzhadze

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**Direct Search for Dirac Magnetic Monopoles in $p\bar{p}$ Collisions at $\sqrt{s} = 1.96$ TeV**

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# Simulating magnetic monopoles by extending GEANT

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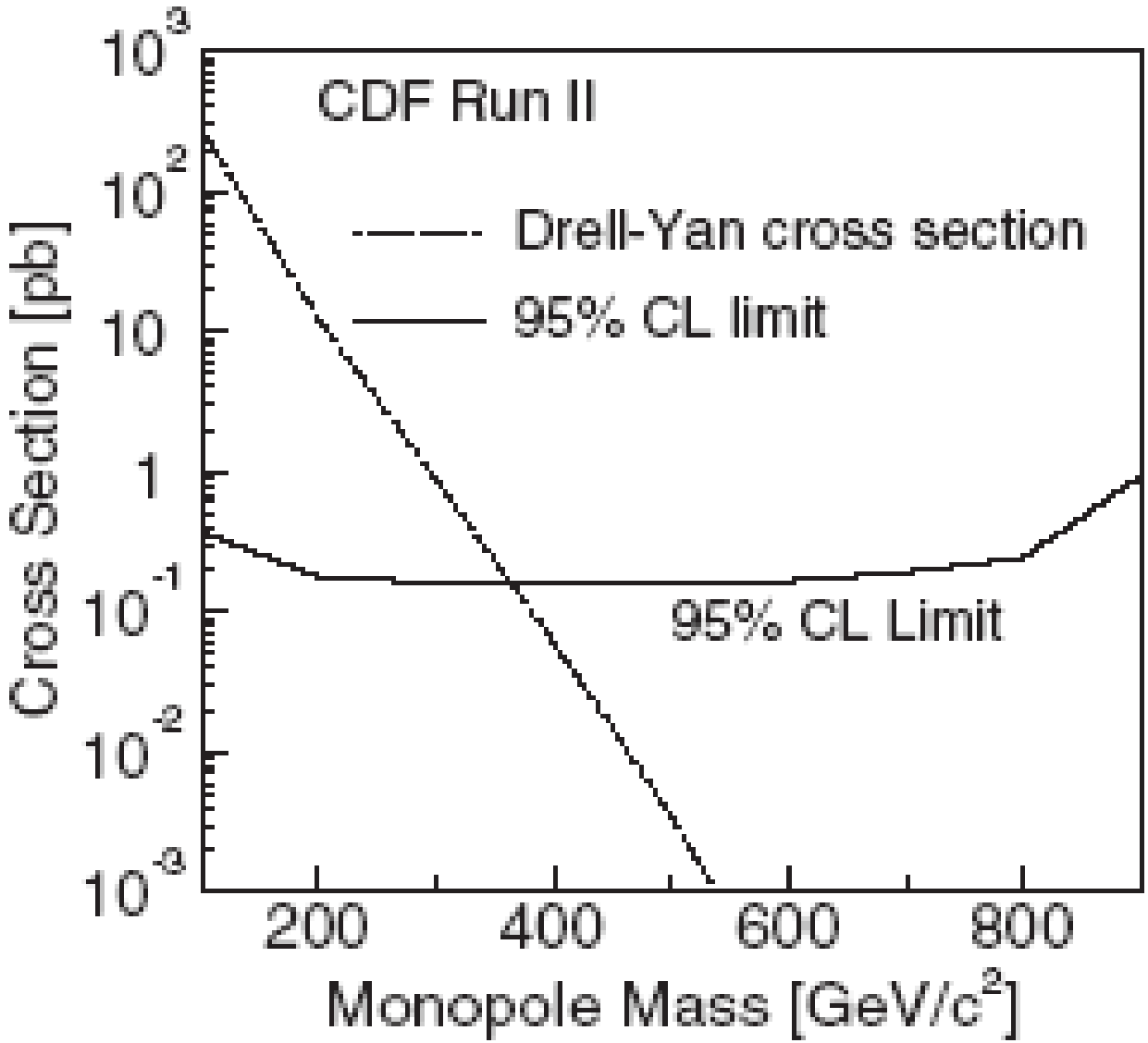
# FNAL CDF Monopole Search experiment, 2006



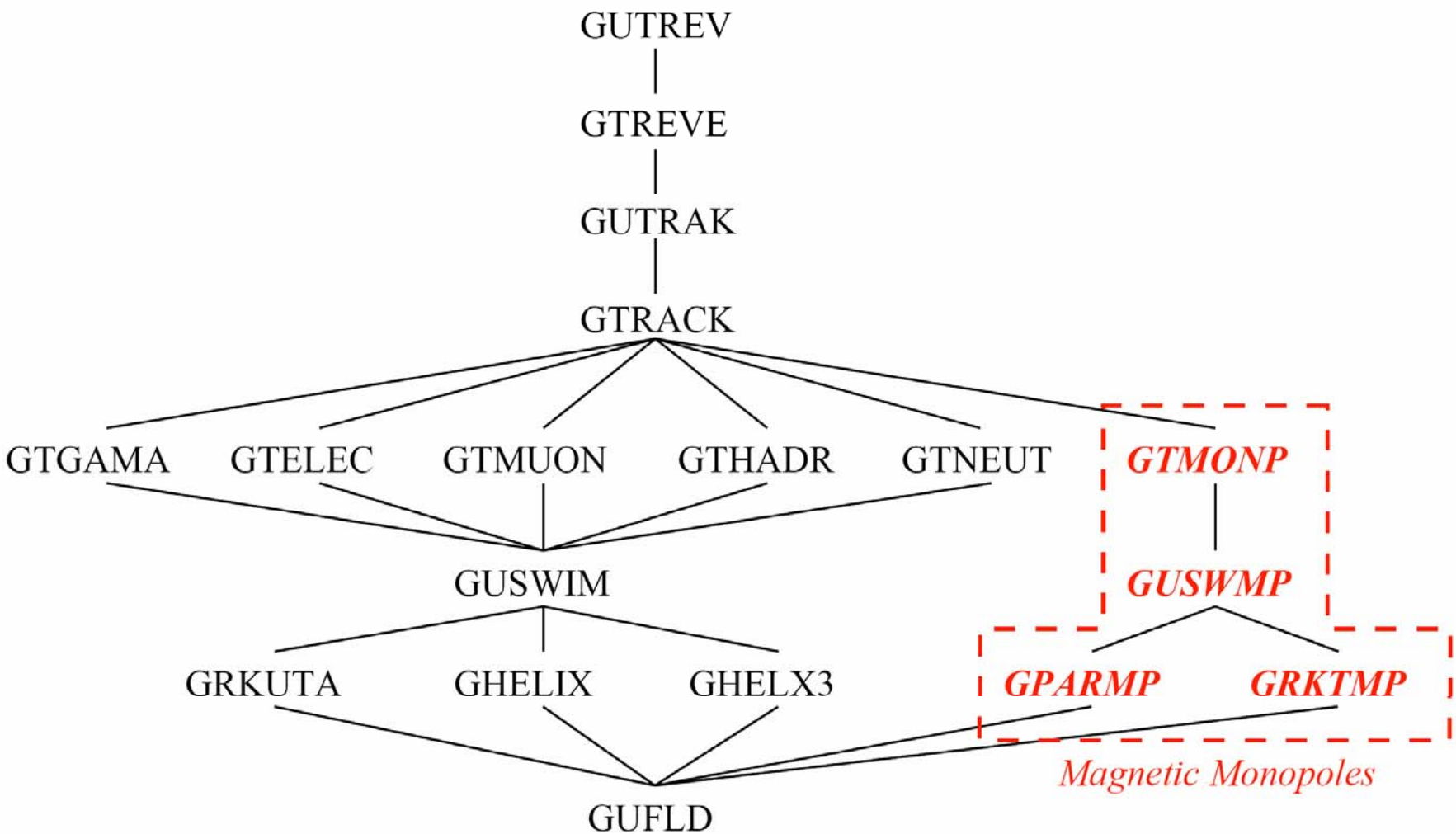



Fig. 1. The structure of the GEANT tracking package.

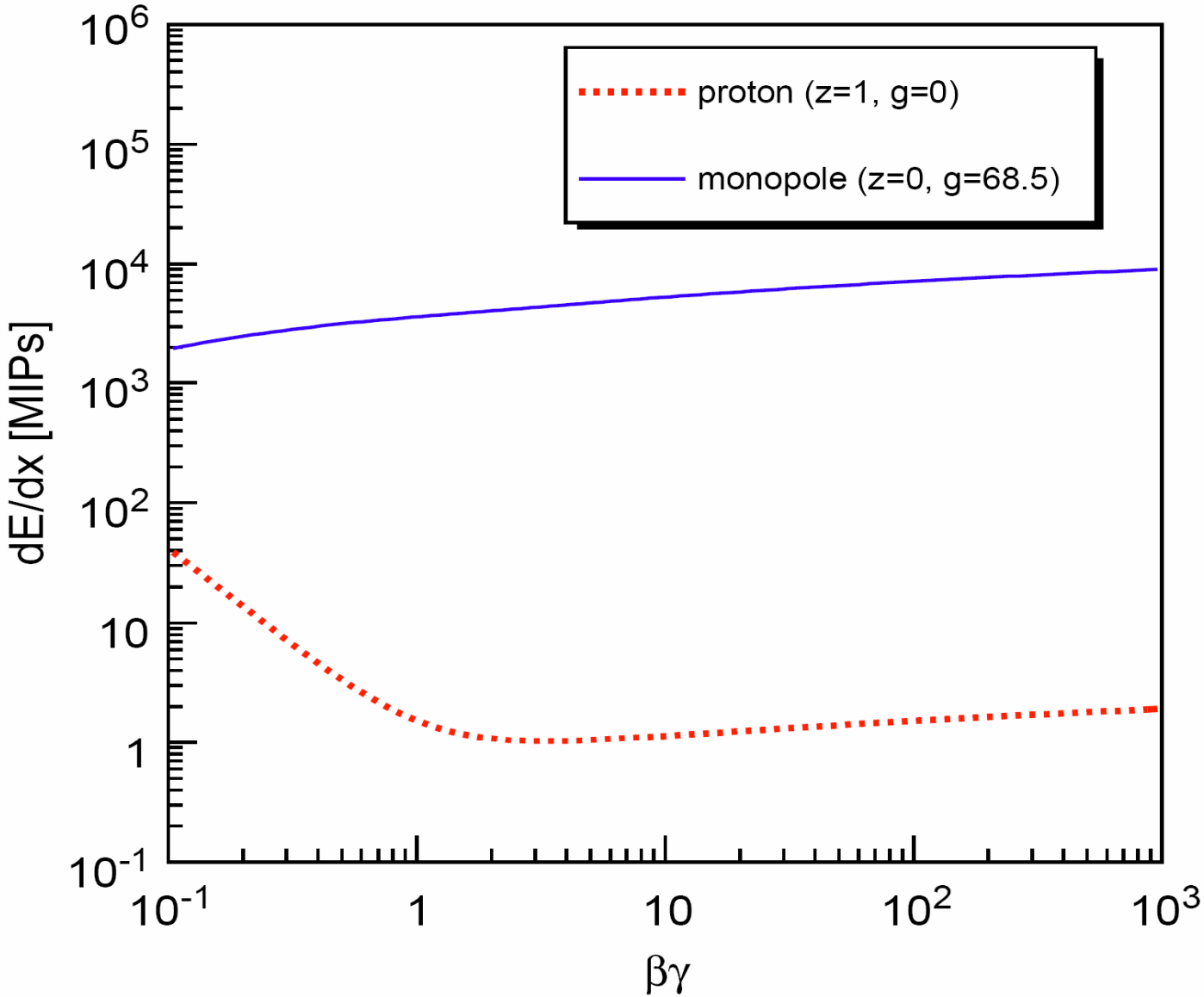



Fig. 3. The energy loss of electric and magnetic charges in air.

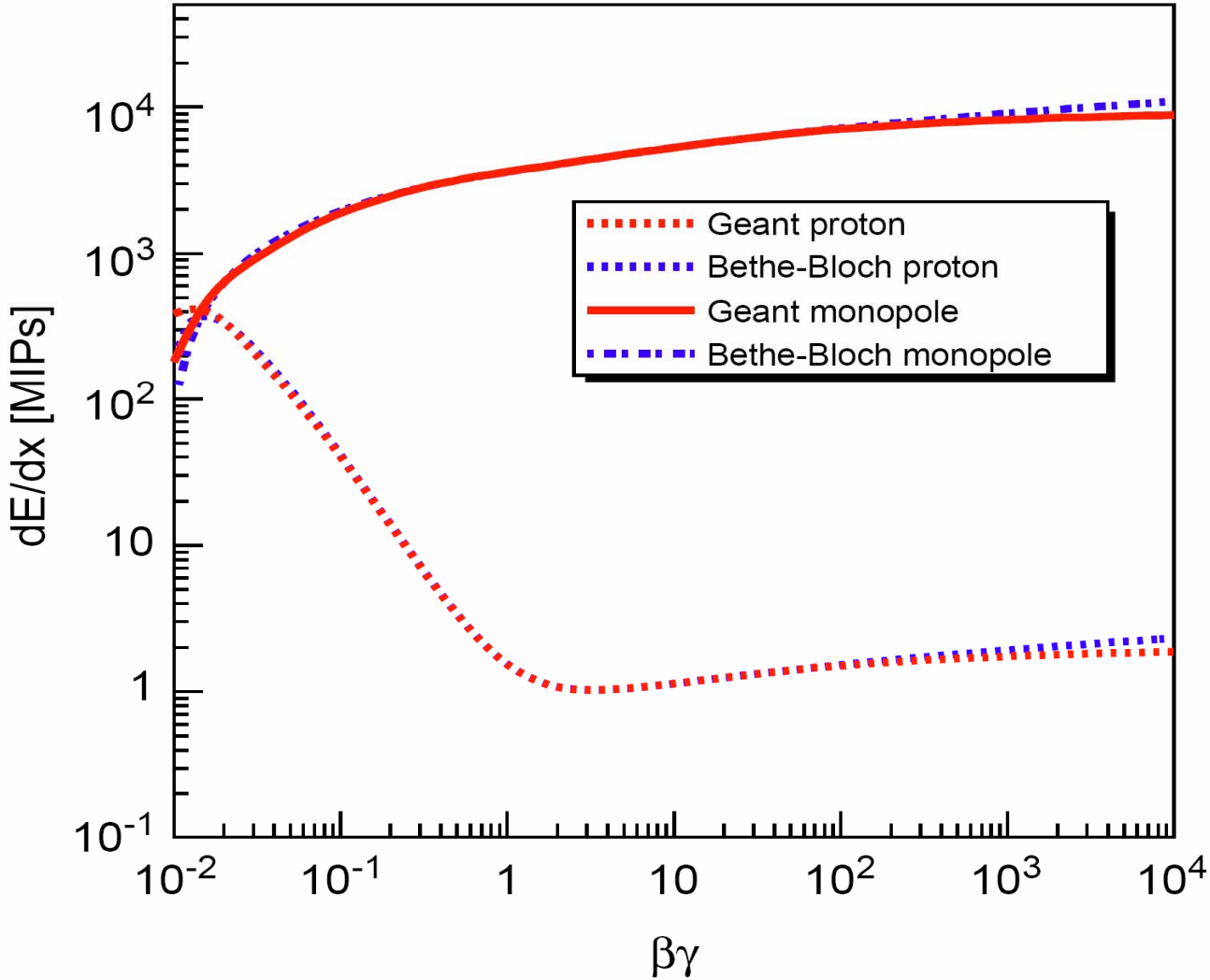
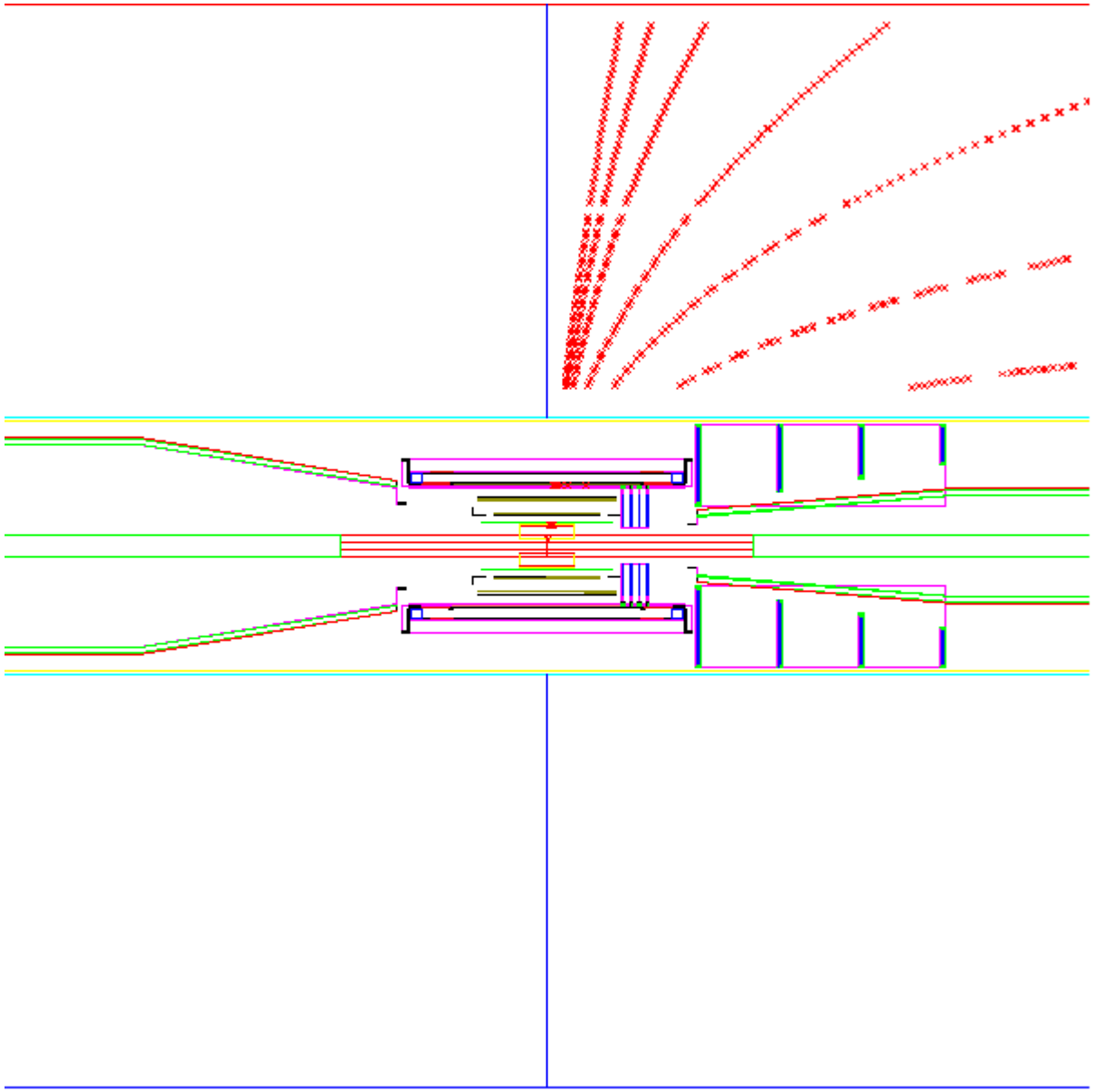
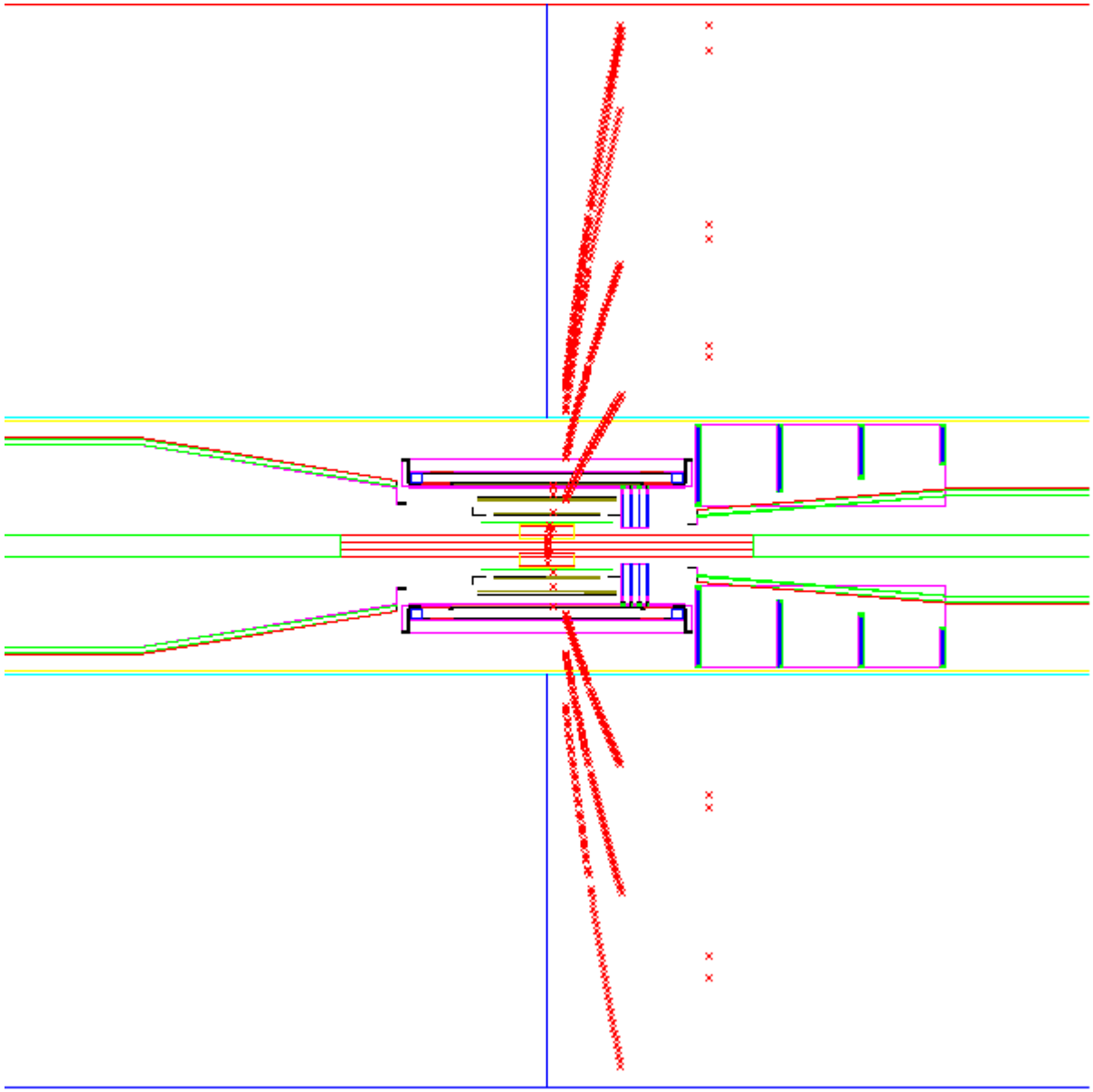



Fig. 4. A comparison of the Bethe–Bloch formula with GEANT tables for the energy loss of monopoles and protons in air.

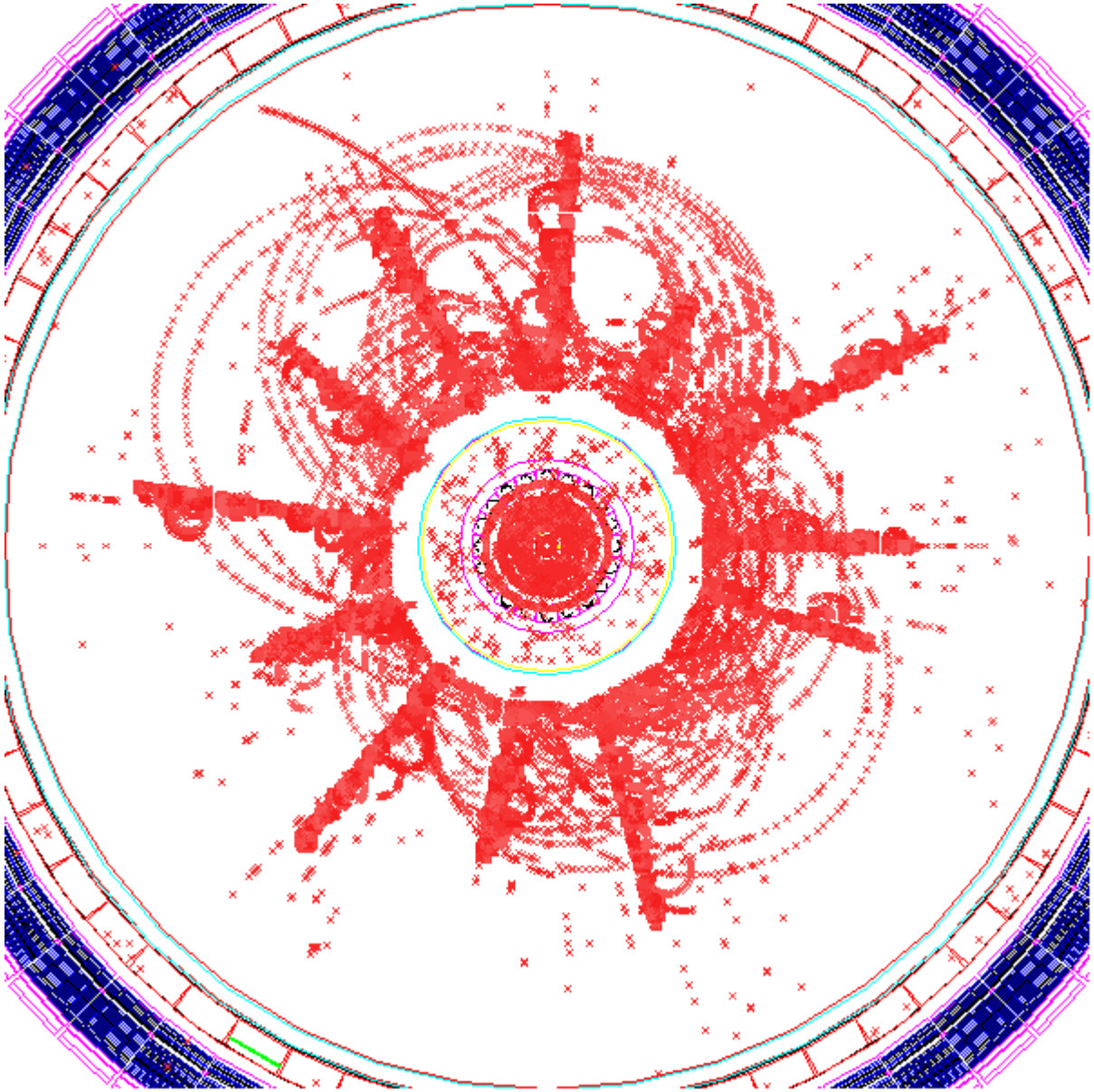
# MMs in STAR r-z projec., p=12,...,30 GeV/c



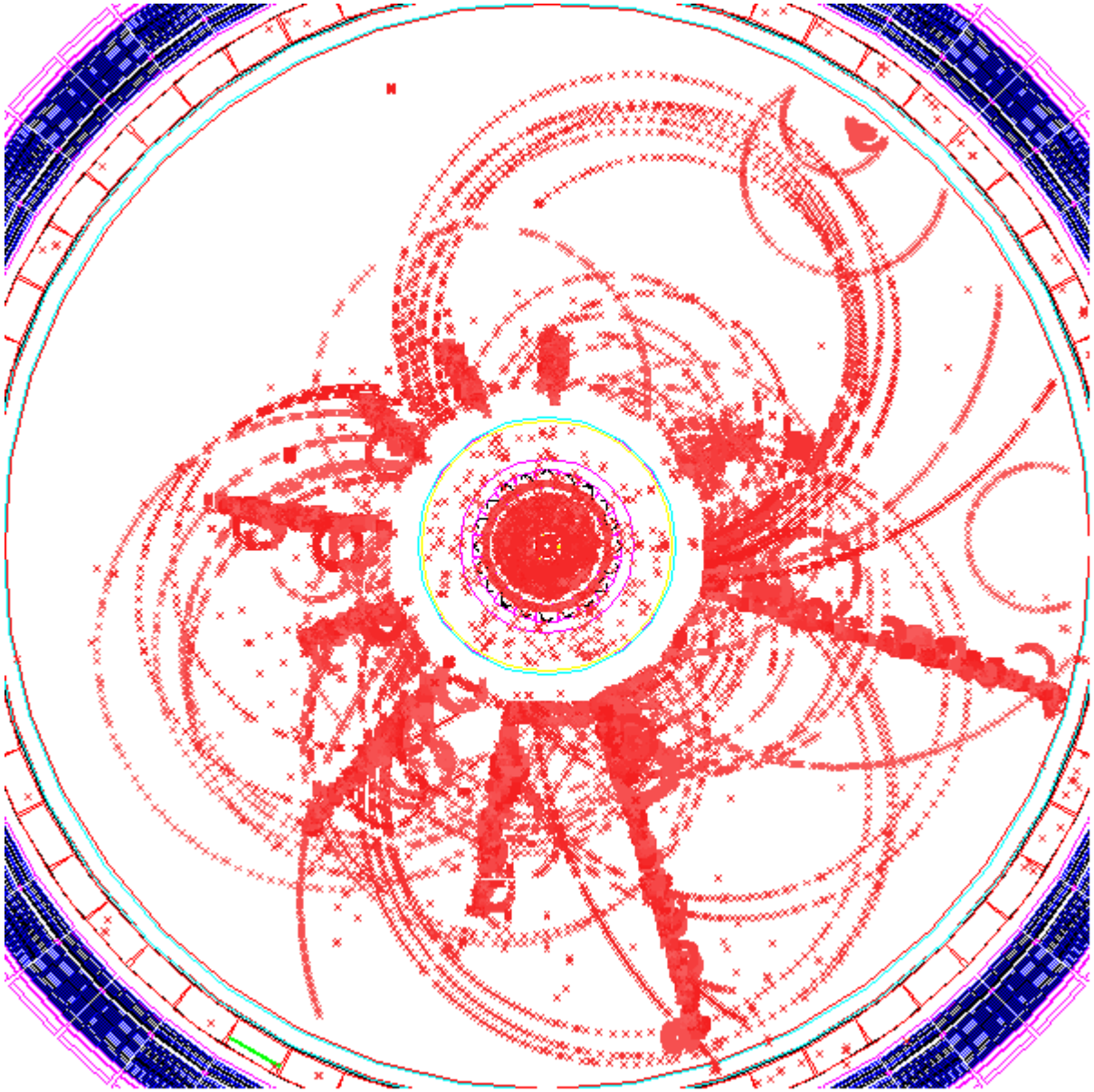
# MMs in STAR r-z projec., p=12,...,30 GeV/c, diff $\phi$



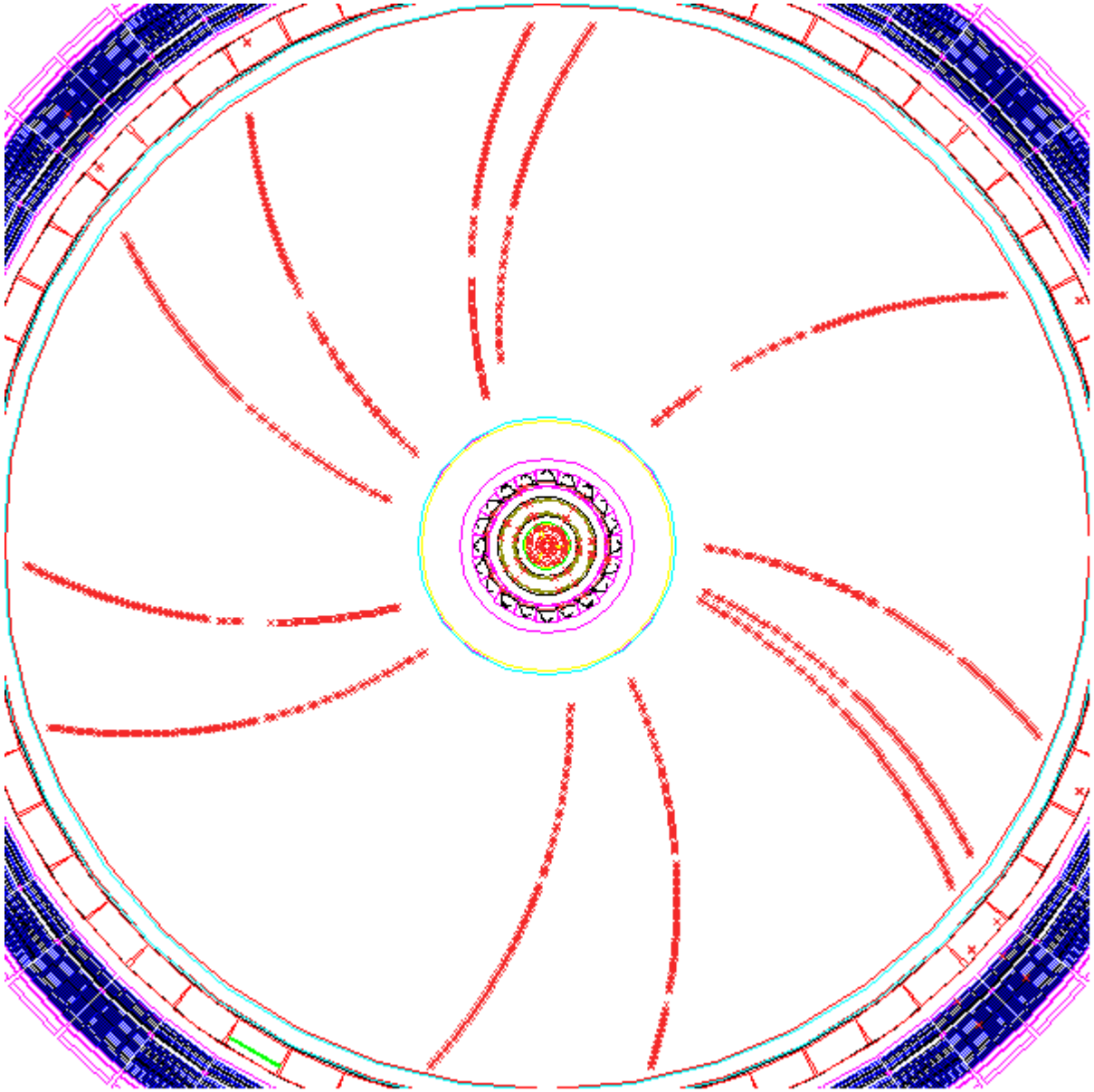
# 12 MMs in STAR r-$\phi$ proj., p=20 GeV/c, diff $\phi$



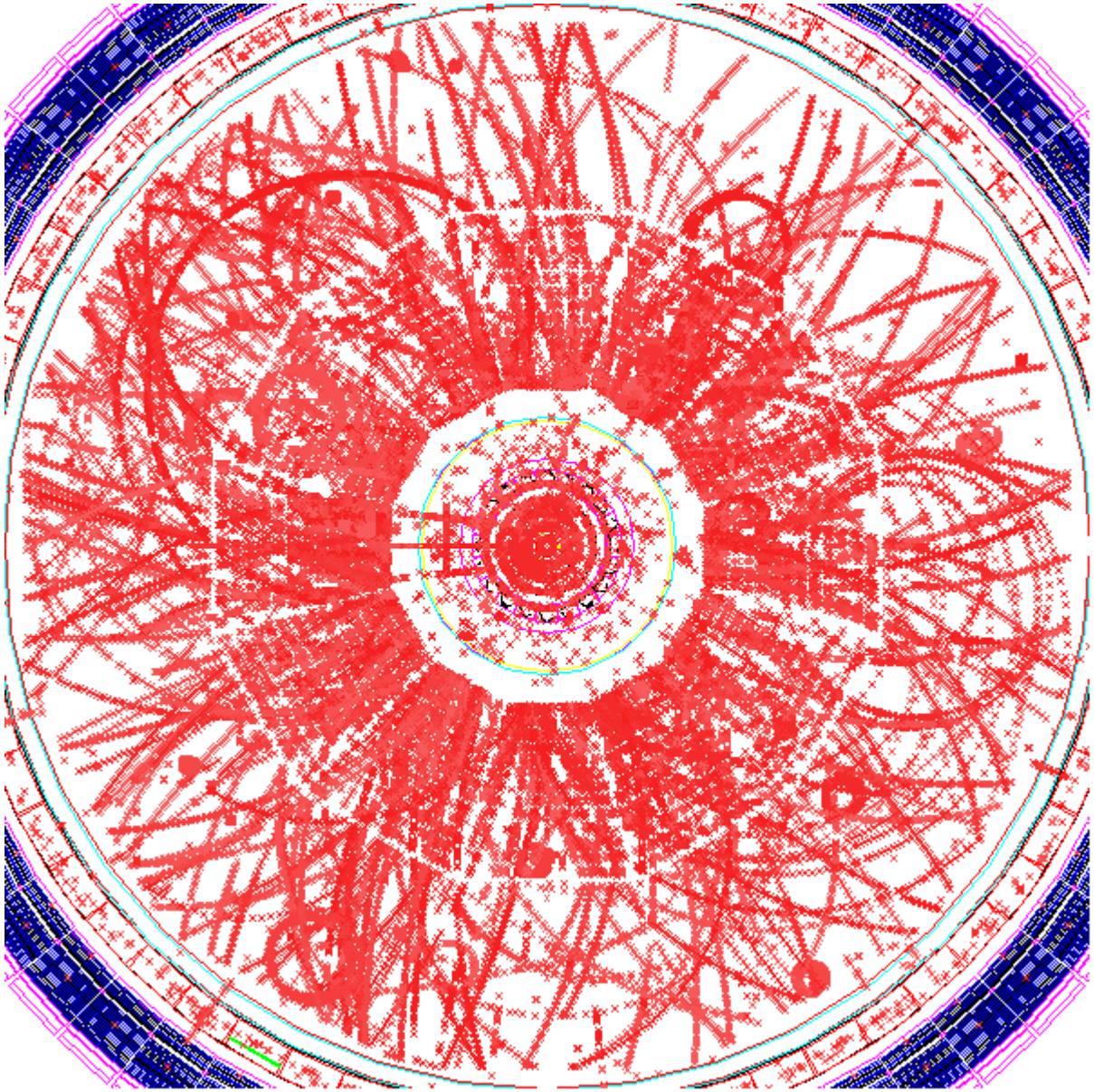
# 12 MMs in STAR r-$\phi$ proj., p=12,..., 30 GeV/c, diff $\phi$



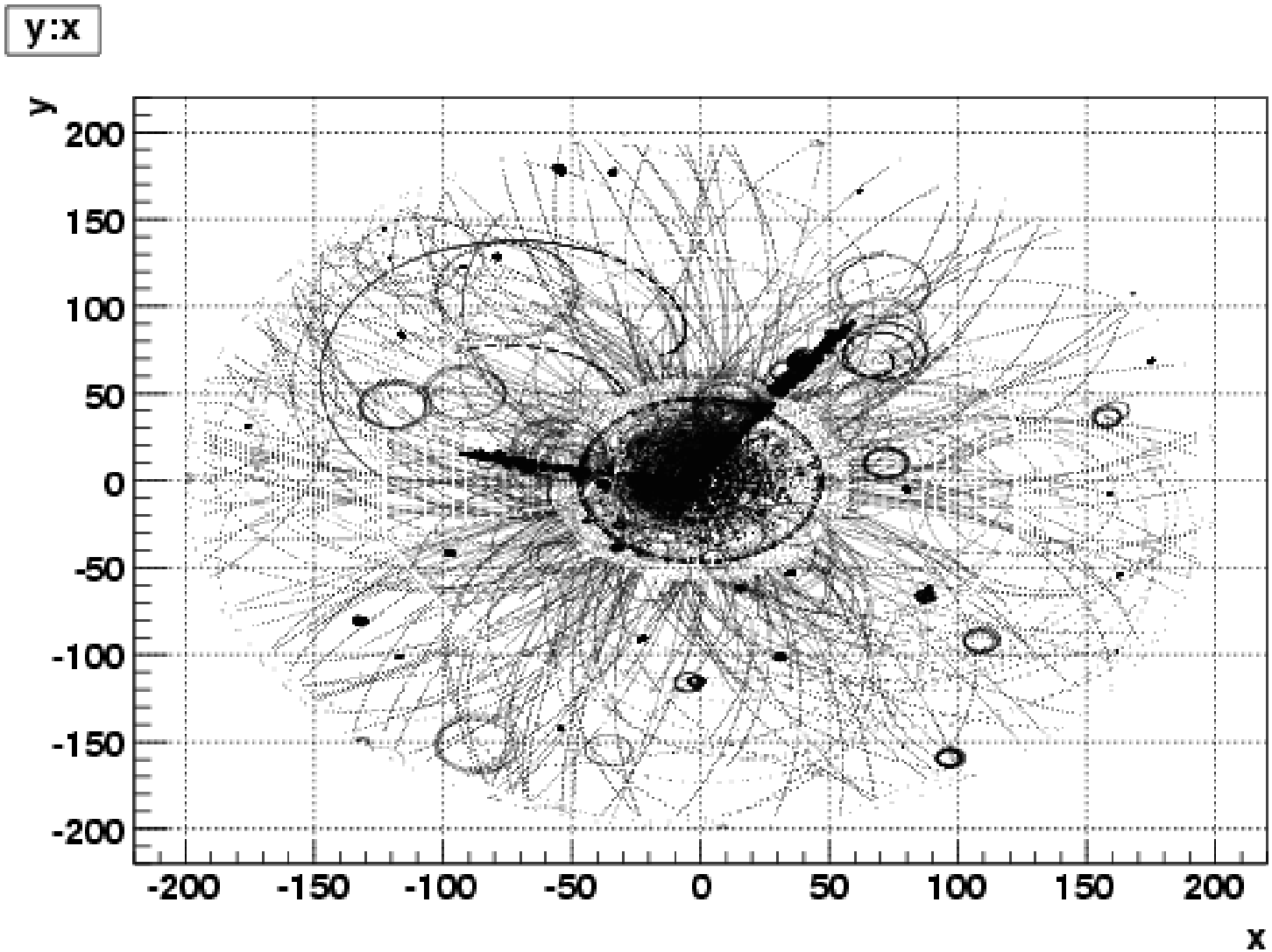
# 12 muons in STAR r-$\phi$ proj., MIP, diff $\phi$



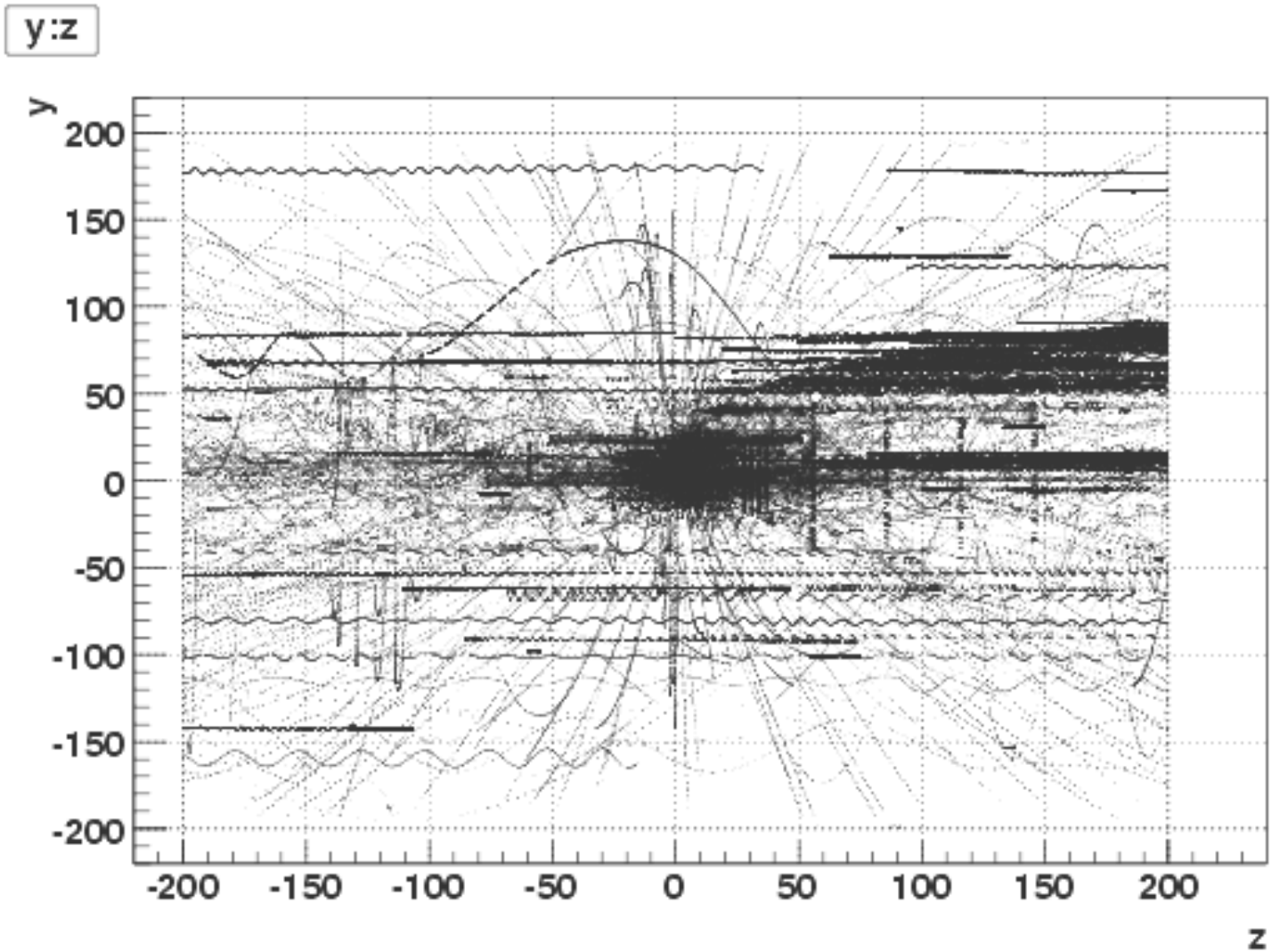
# Minbias + 2 MMs, 15 and 20 GeV/c, geant



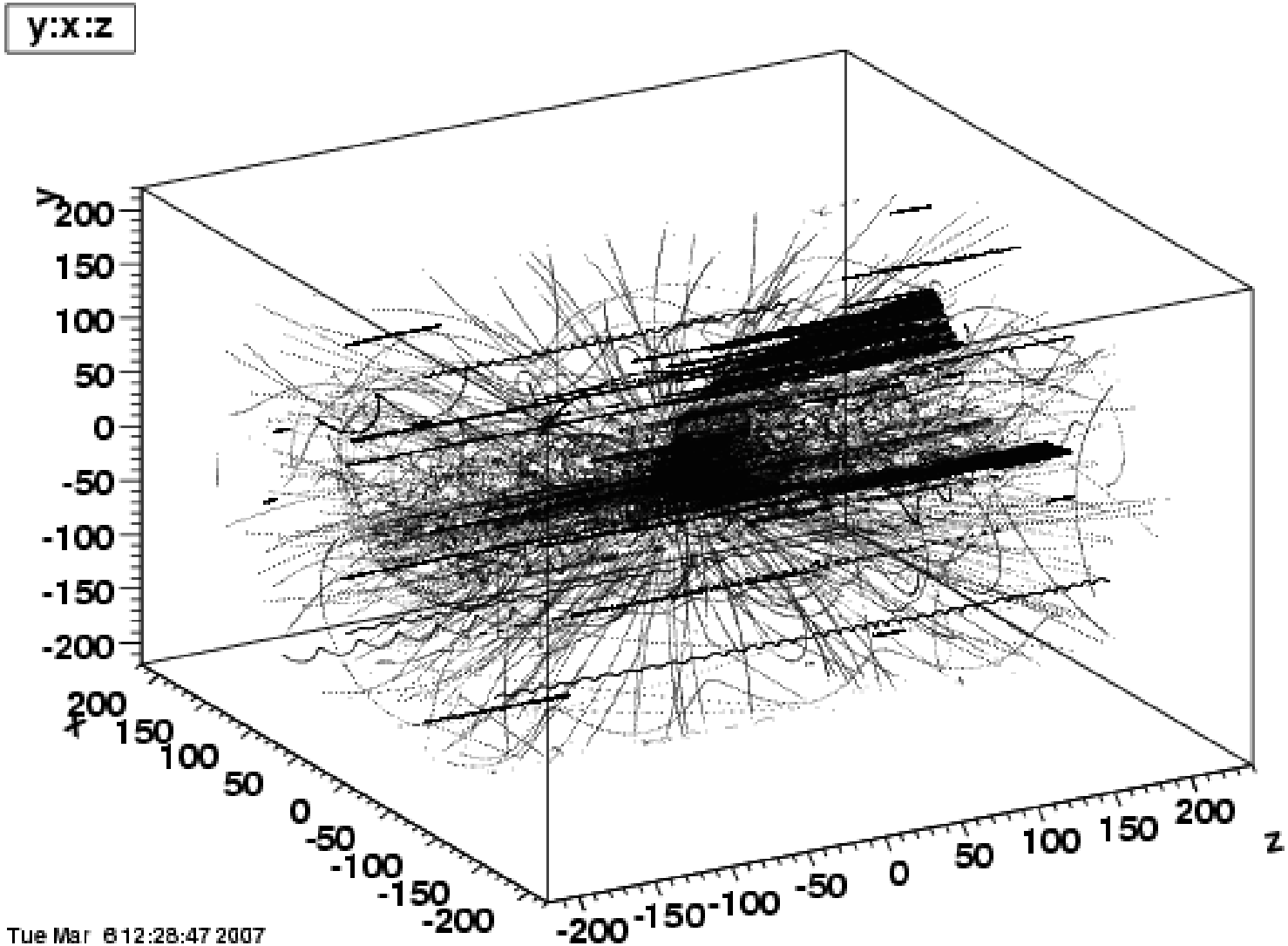
# Minbias + 2 MMs, 15 and 20 GeV/c; root



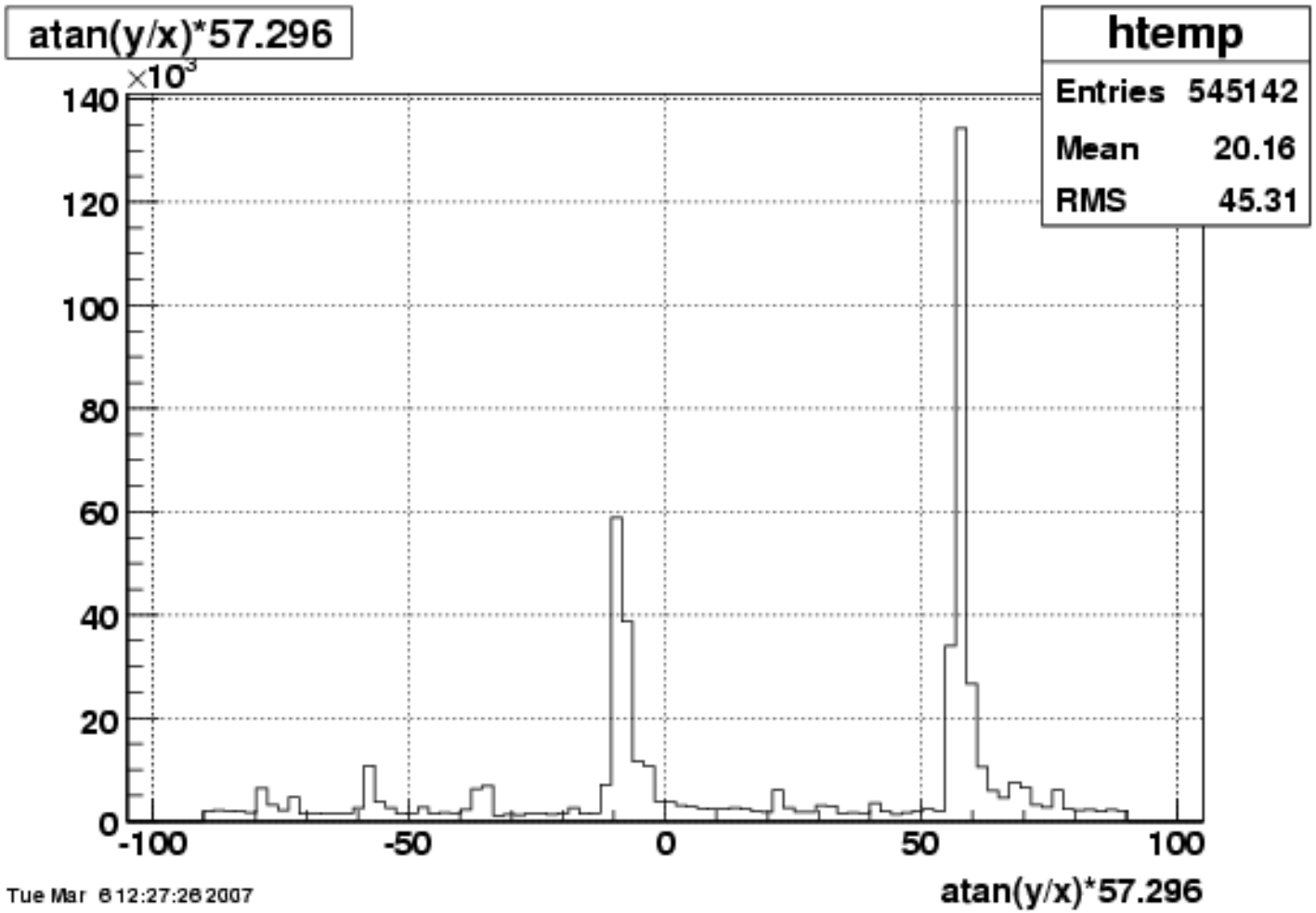
# Minbias + 2 MMs, 15 and 20 GeV/c; root



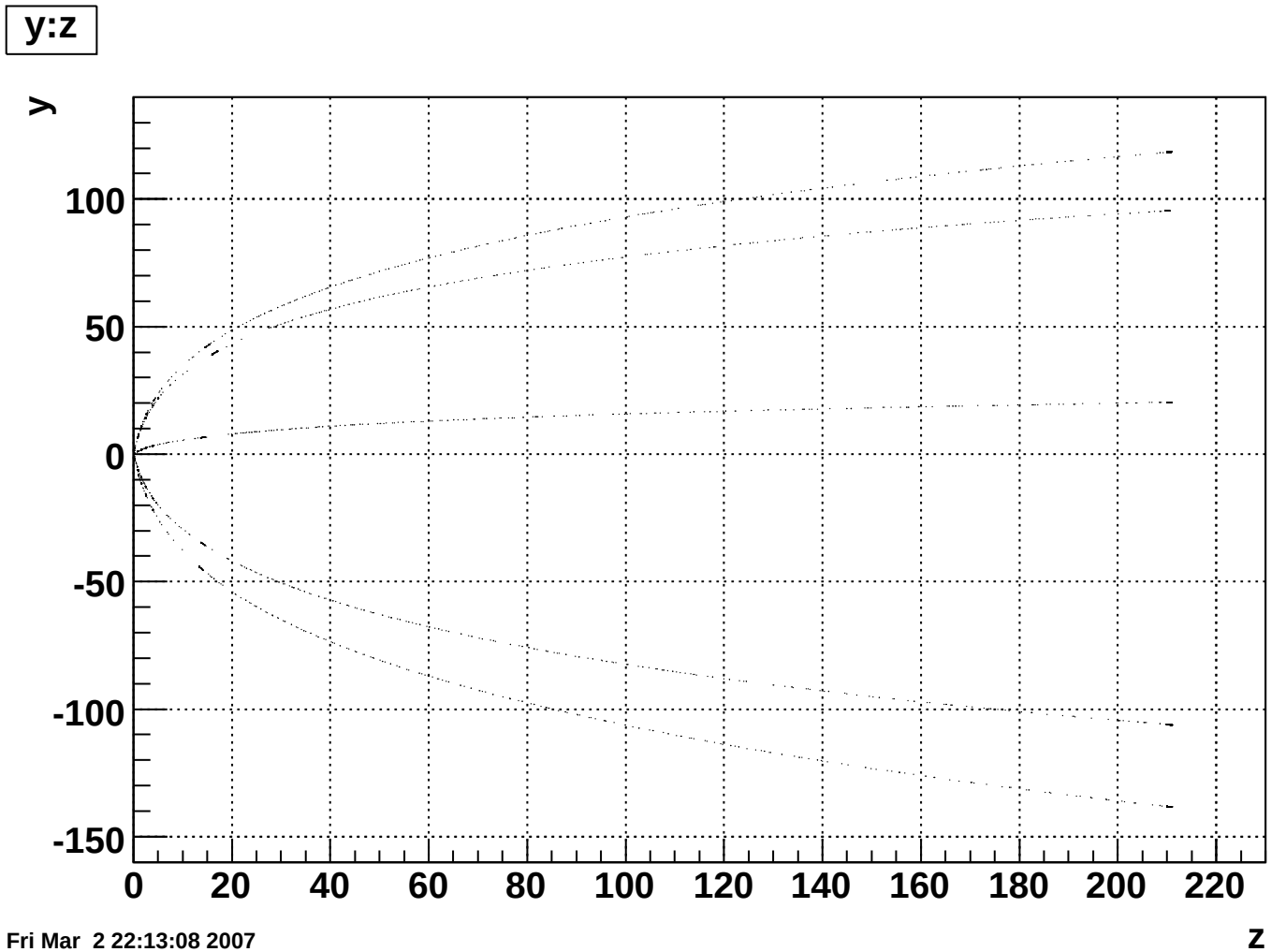
# Minbias + 2 MMs, 15 and 20 GeV/c; root



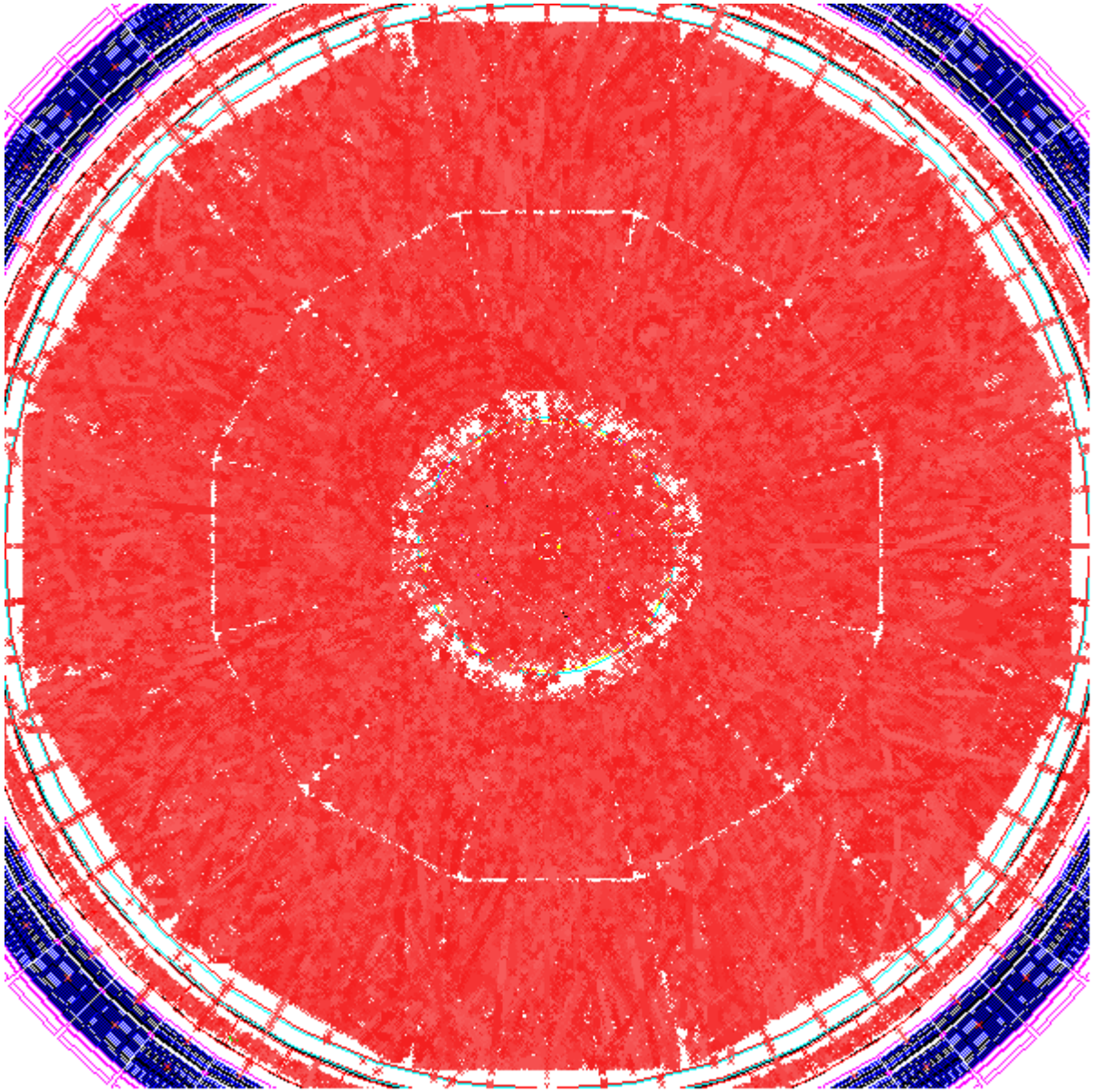
# Minbias + 2 MMs, 15 and 20 GeV/c; root



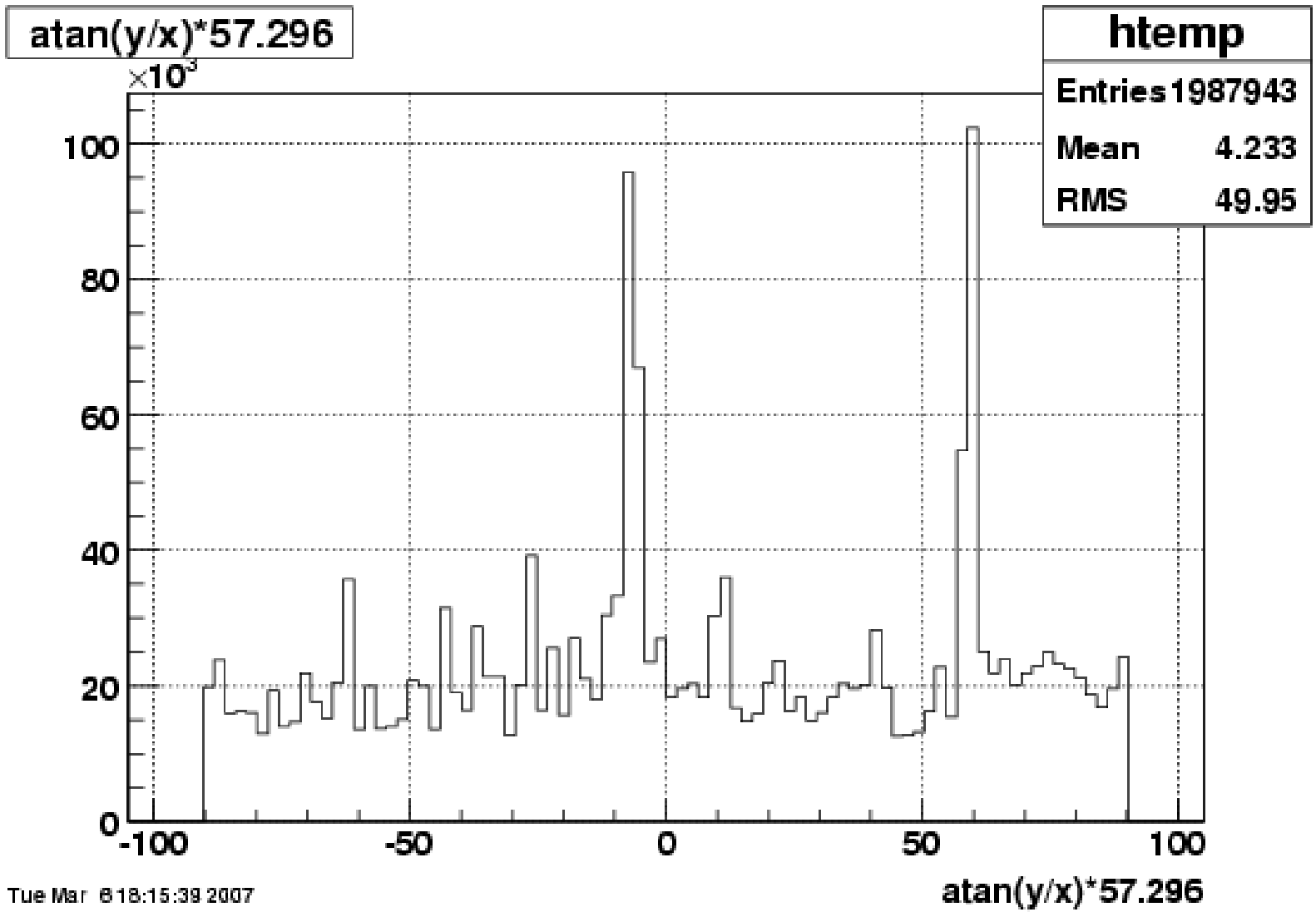
# 5 MMs, 20 GeV/c; root



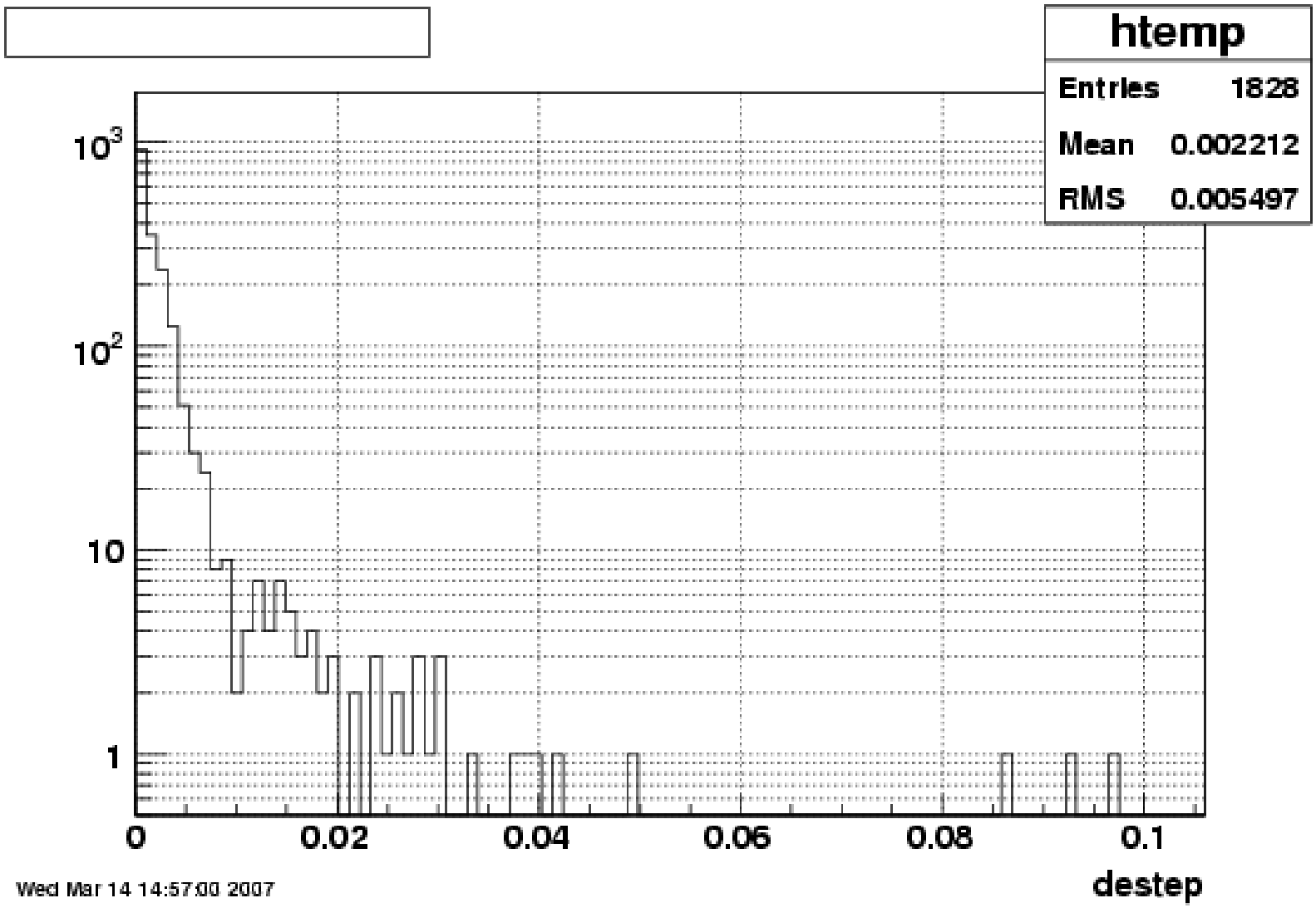
# central + 2 MMs, 15 and 20 GeV/c; geant



# central + 2 MMs, 15 and 20 GeV/c; geant

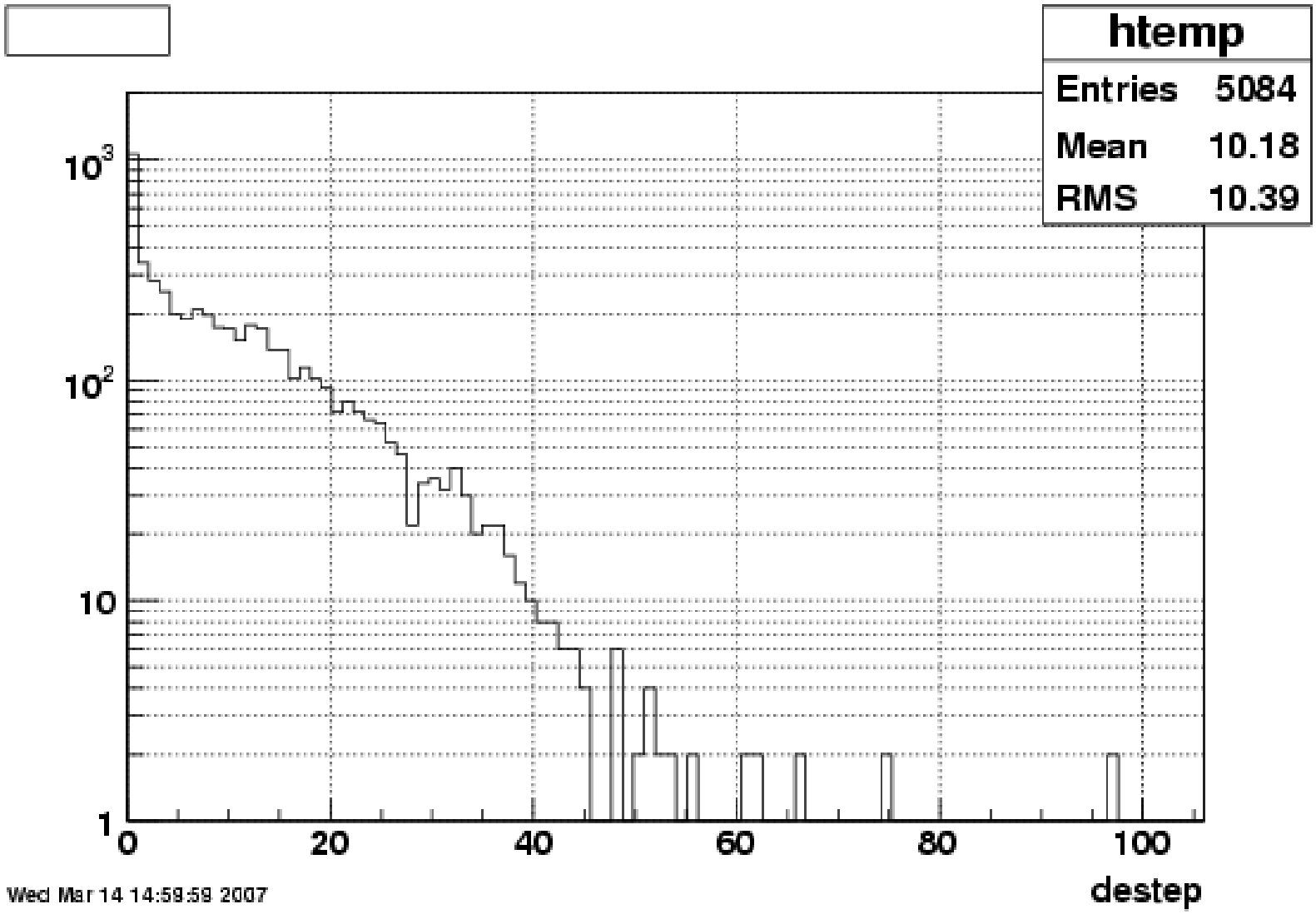


# MIP Muons de/dx



# MMs 20 GeV, de/dx

## 10.18/0.022~4627; $(g/e)^2=68.5^2=4692$



# Summary

- A GEANT 3.21 MC simulation program for magnetic monopoles has been implemented into the STAR experiment software
- Simulation shows expected tracking for MMs in the STAR detector
- MM track patterns allows to set a logic for searching MMs in the STAR data