

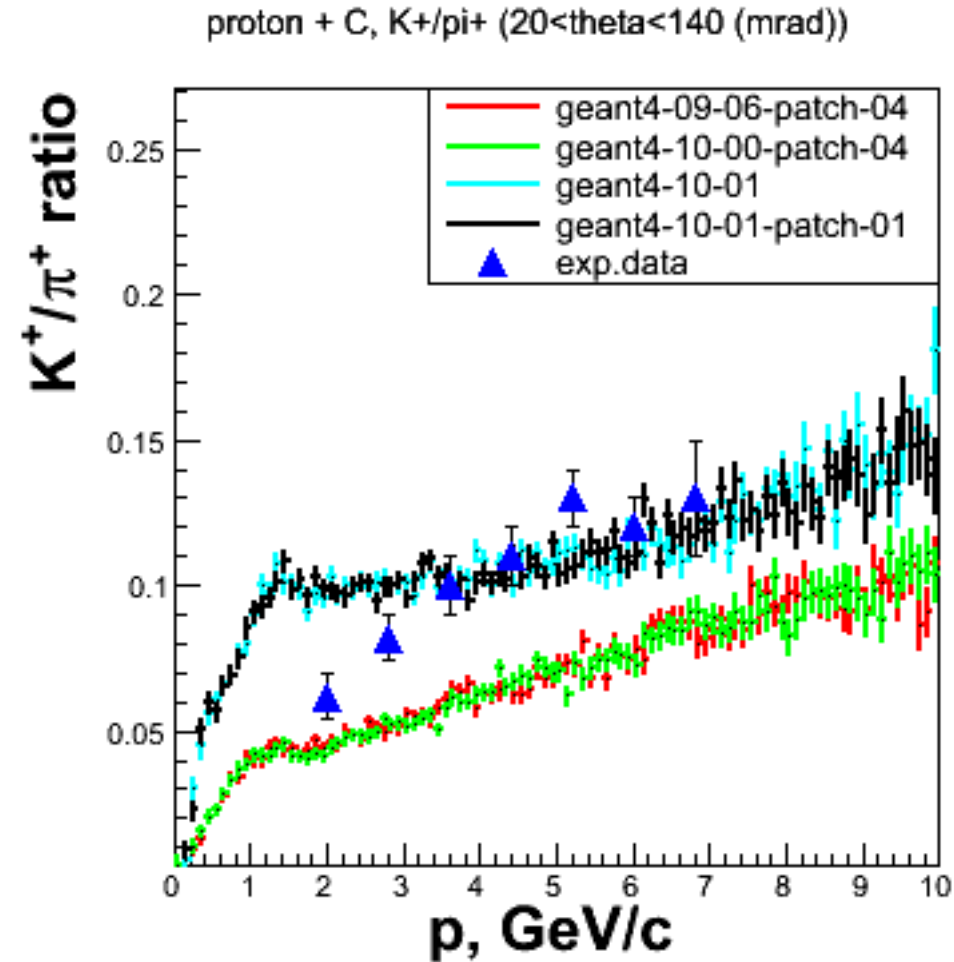
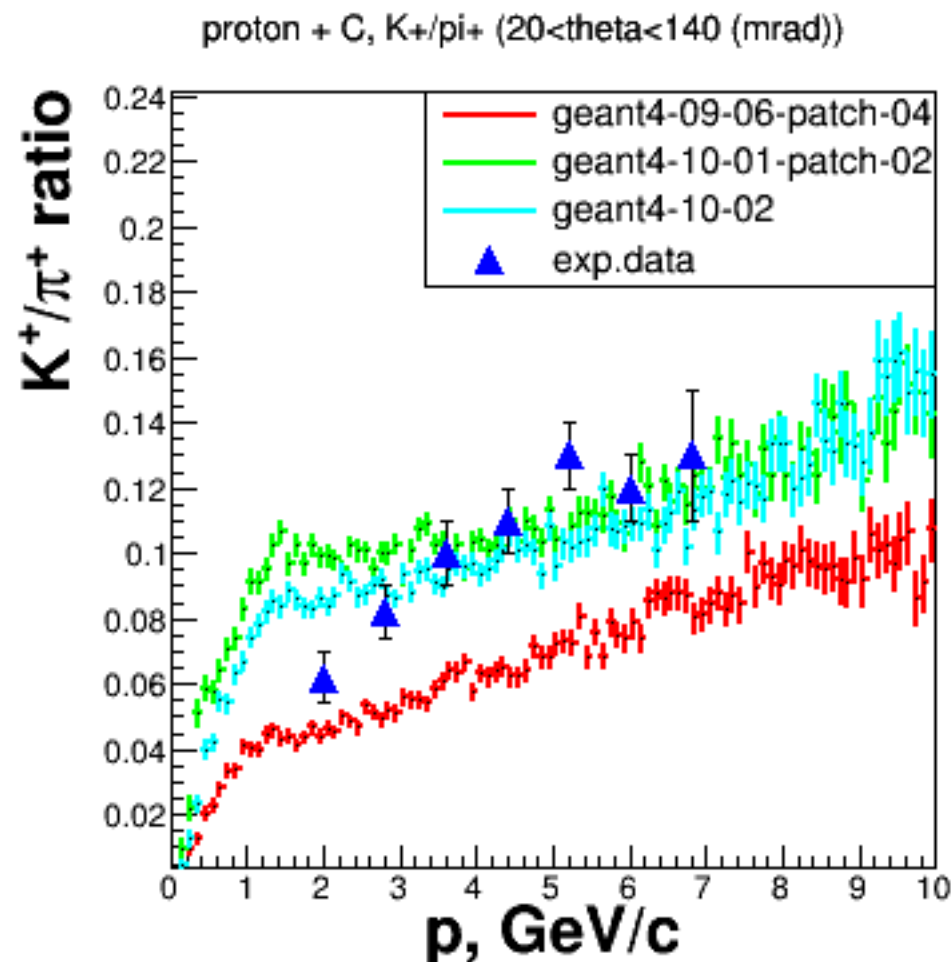
# Geant 4.10 vs Geant 4.9 and Kaons

# Introduction

- LArSoft has moved to Geant 4.10.1 with release v05\_04\_00.
- A comparison has been made between previously discussed simulations of Muon-induced Kaons in the far detector and new simulations using the new release.
- Charge Kaon production has approximately doubled and this is likely to be a more accurate prediction.

# Changes in Geant4 Physics

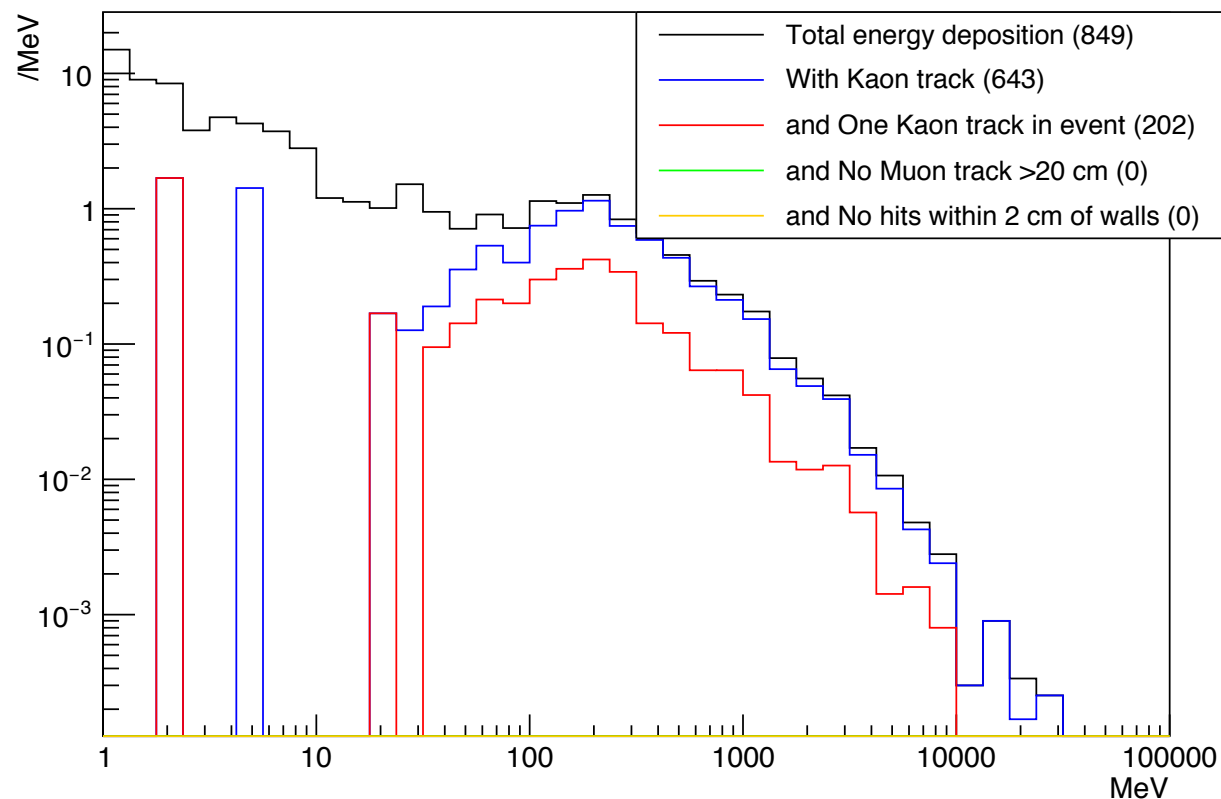
- As discussed here: <https://cdcvcs.fnal.gov/redmine/issues/11153>; the Geant4 developers have implemented an update for v10 which brings the pion/kaon production ratio into better agreement with experimental data



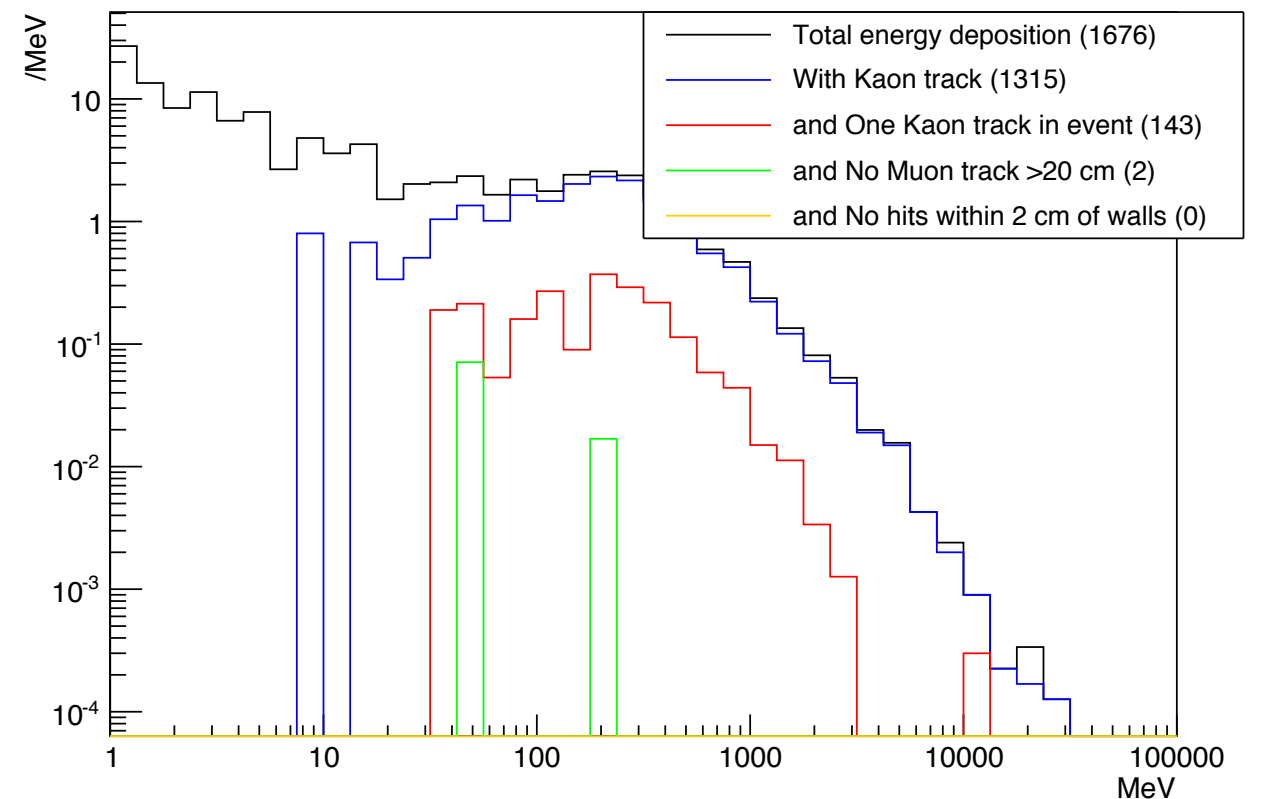
# New simulation results

- Simulation run of  $10^6$  muons without filtering performed to compare with previous similar (v4) simulations

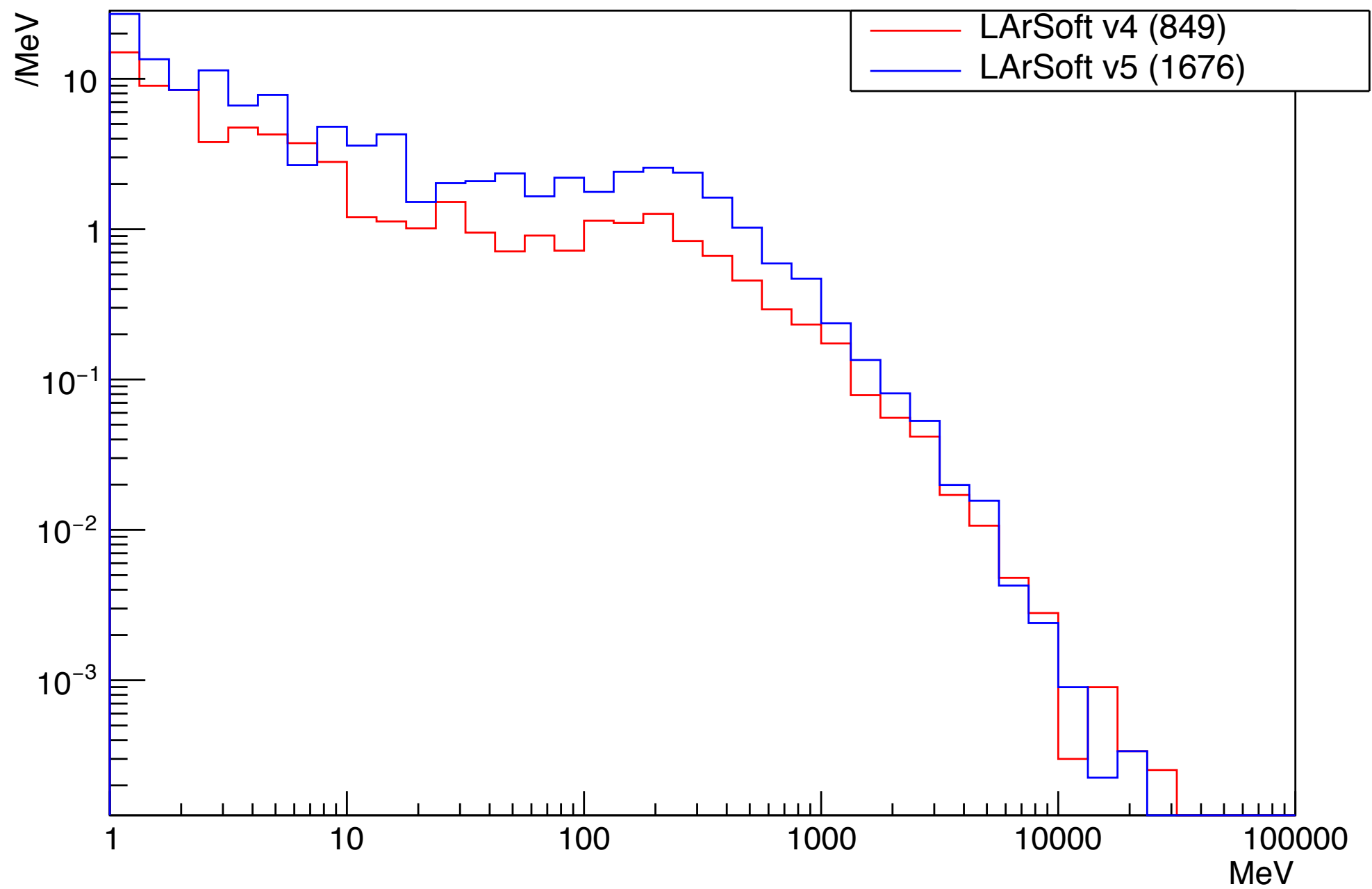
Charged Kaon Spectrum,  $10^6$  unfiltered muons



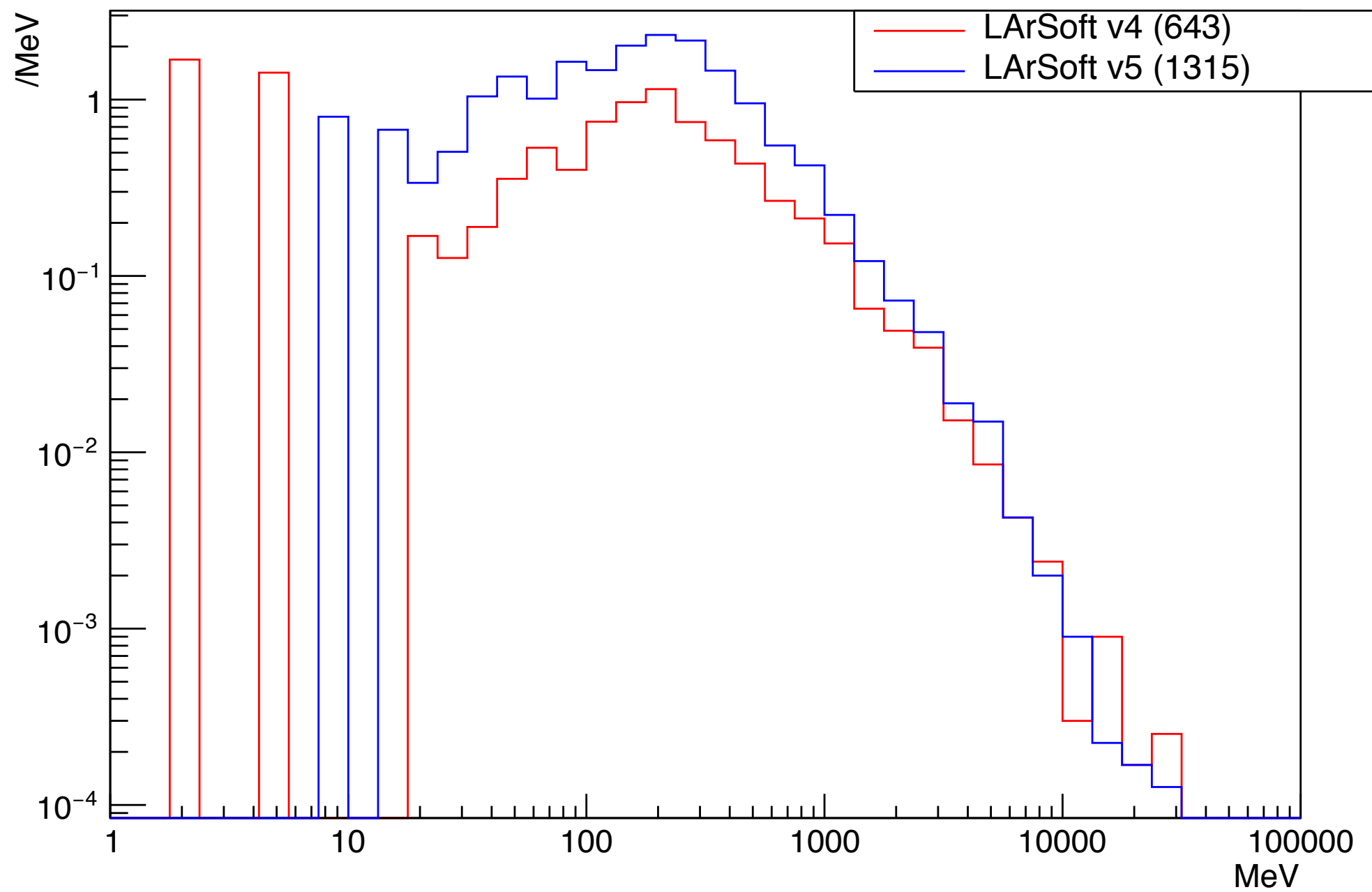
Charged Kaon Spectrum,  $10^6$  unfiltered muons



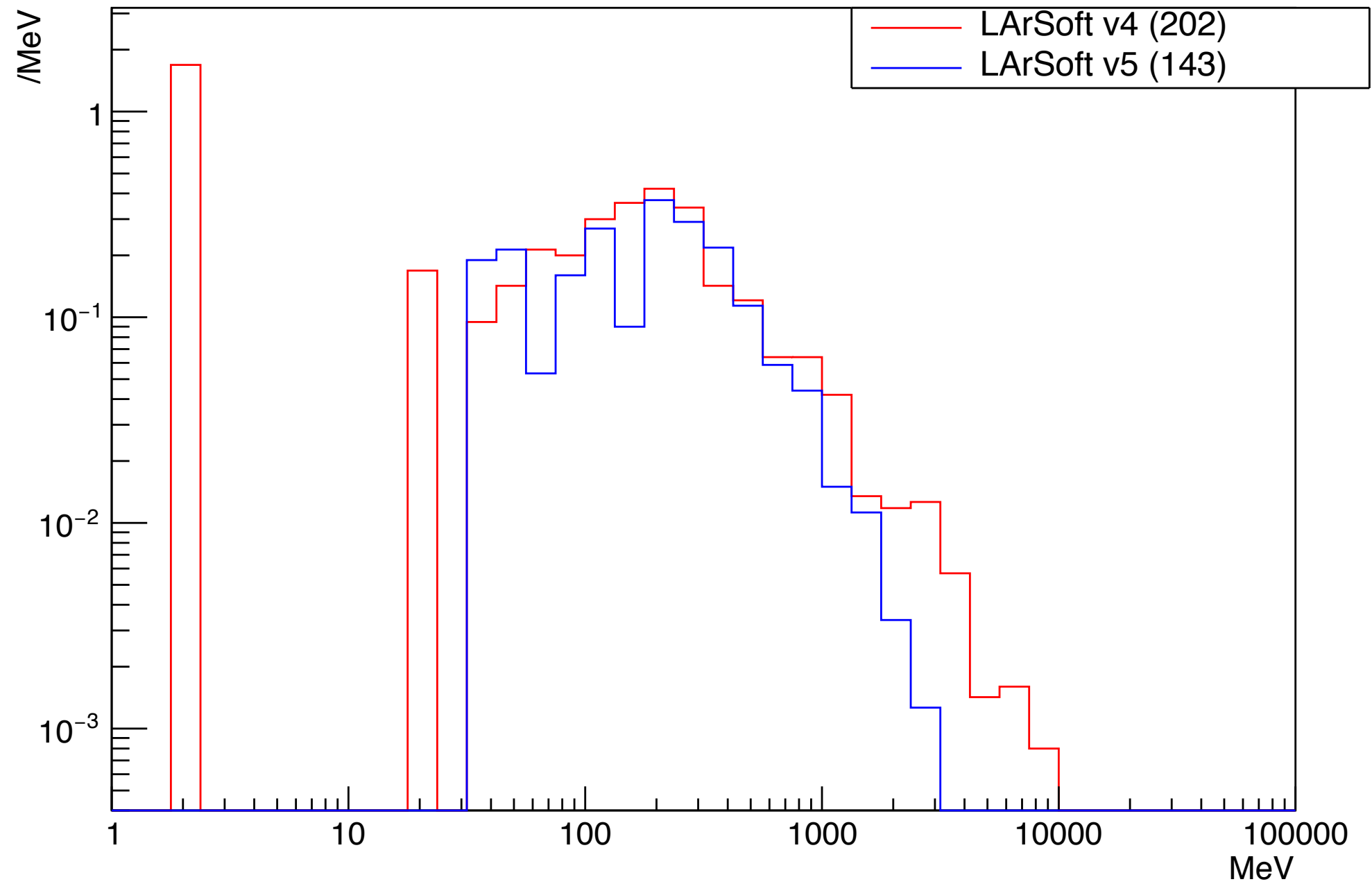
# All Kaons, $10^6$ unfiltered muons



# Kaon Seen in Detector, $10^6$ unfiltered muons



Only one Kaon in Detector,  $10^6$  unfiltered muons



# Conclusions and Plans

- New version of LArSoft (v05\_04\_00) implementing newer version of Geant4 increases charged Kaon production by about a factor of 2.
- Difference is too large to neglect and very likely an improvement in the accuracy of the simulations.
- Old data should not be trusted.
- Re-running  $10^8$  with new version (should be done in about 1 week).