

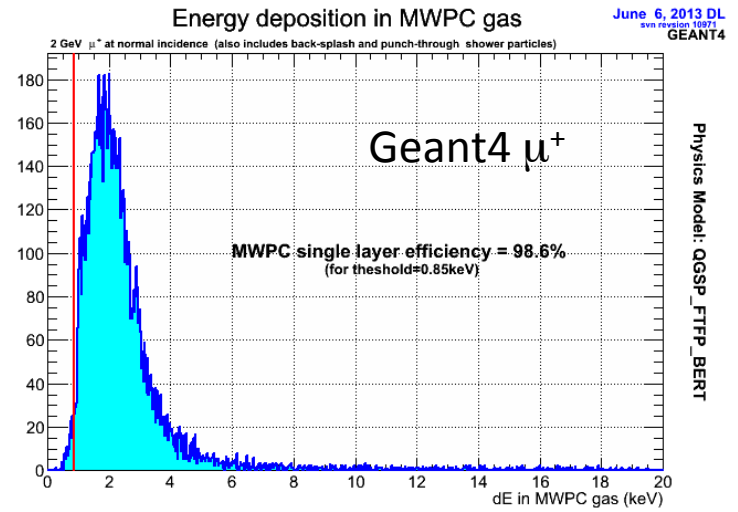
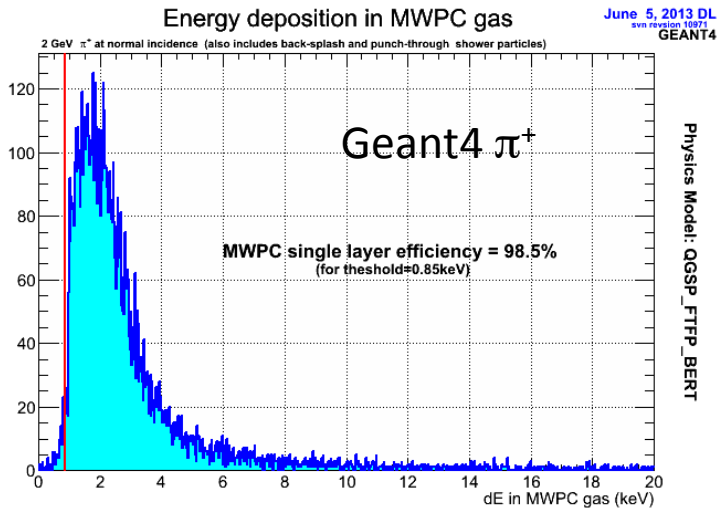
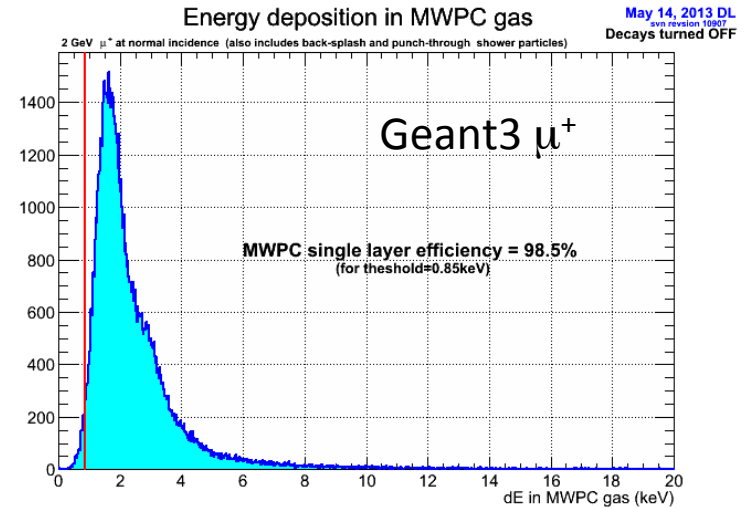
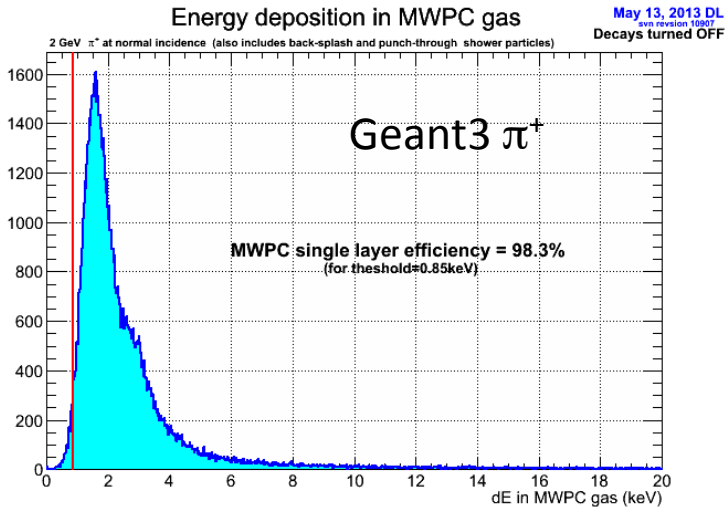
CPP Geant4 Simulations of μ/π detector

David Lawrence JLab

June 13, 2013

GEANT 4 geometry

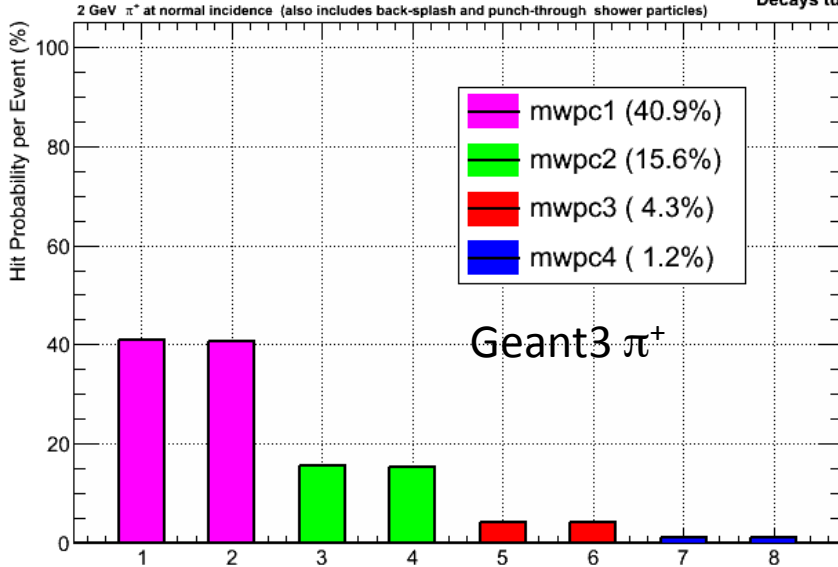
dE/dx comparing G3 vs. G4



Hit Probability G3 vs. G4

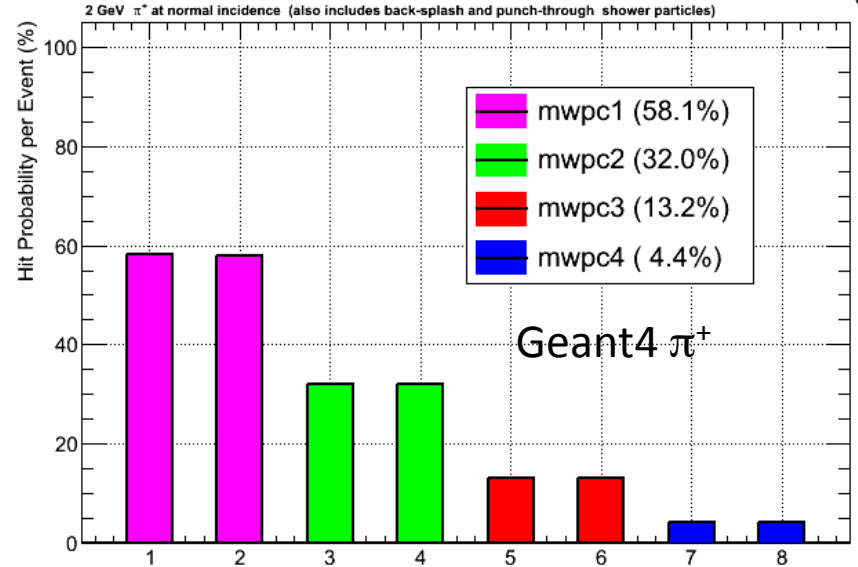
MWPC Hit Probability per Event

May 24, 2013 DL
svn revision 10971
Decays turned OFF



MWPC Hit Probability per Event

June 5, 2013 DL
svn revision 10971
GEANT4



Physics Model: QGSP_FTFP_BERT

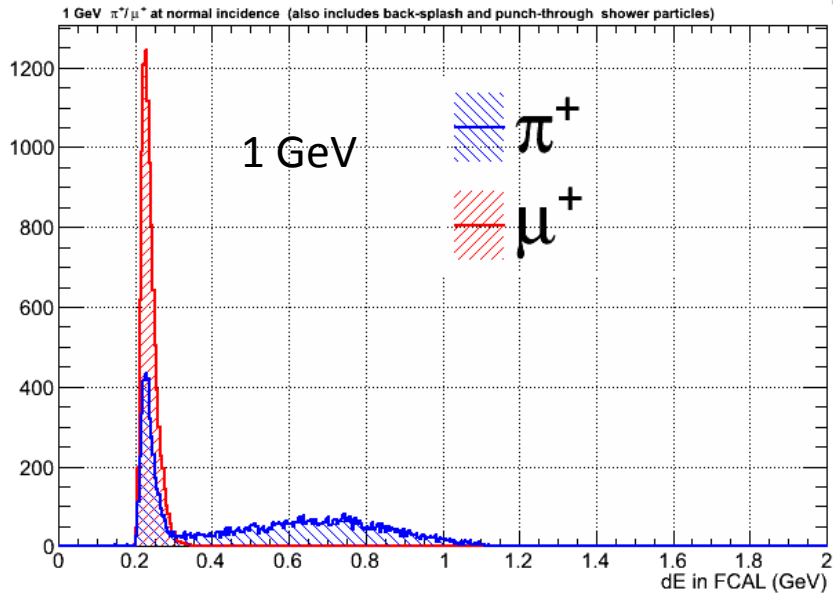
Percentage of time MWPC had one or more hits above threshold

2GeV Pions generated just upstream of FCAL

Energy deposition in FCAL

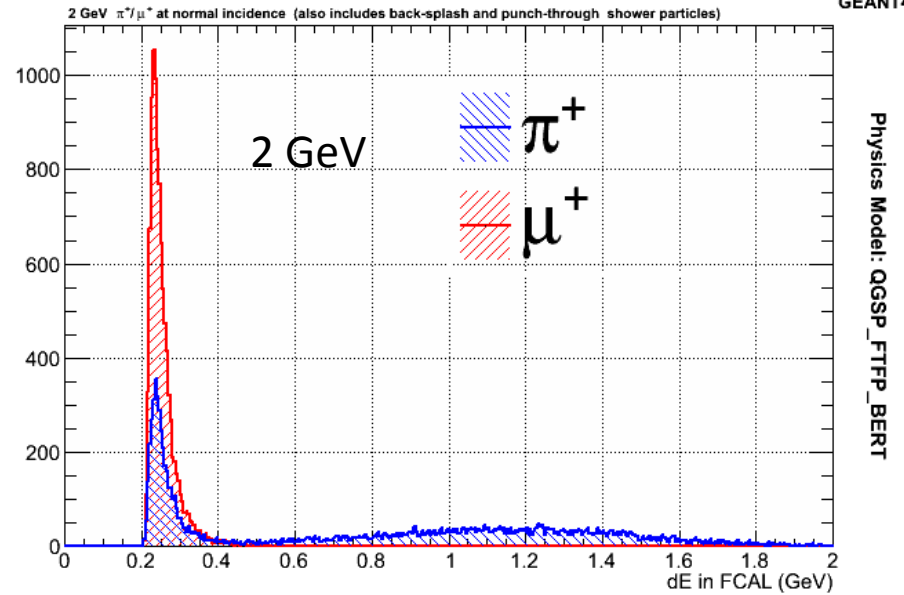
Energy deposition in FCAL

June 12, 2013 DL
svn revision 10971
GEANT4

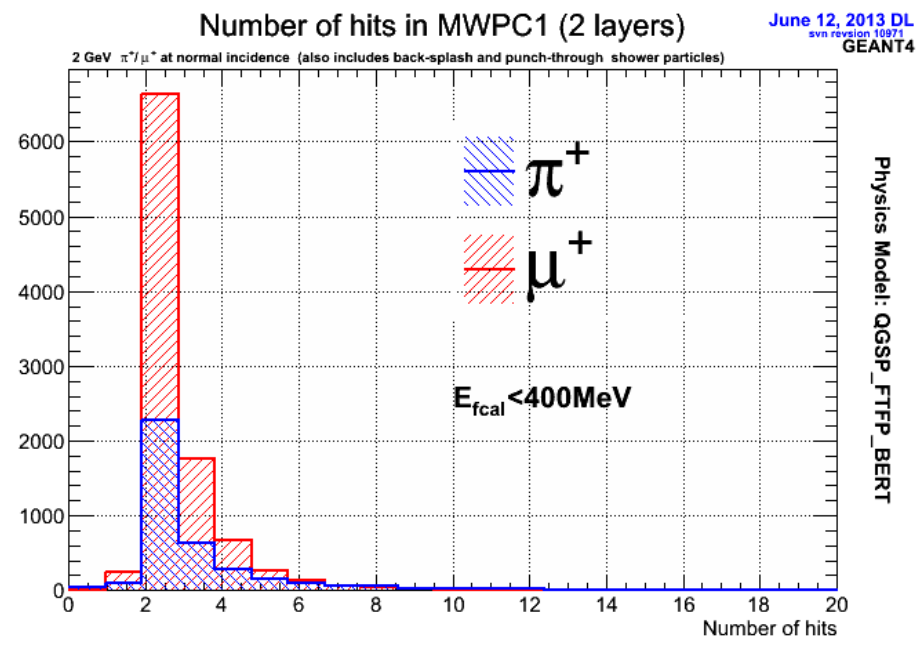
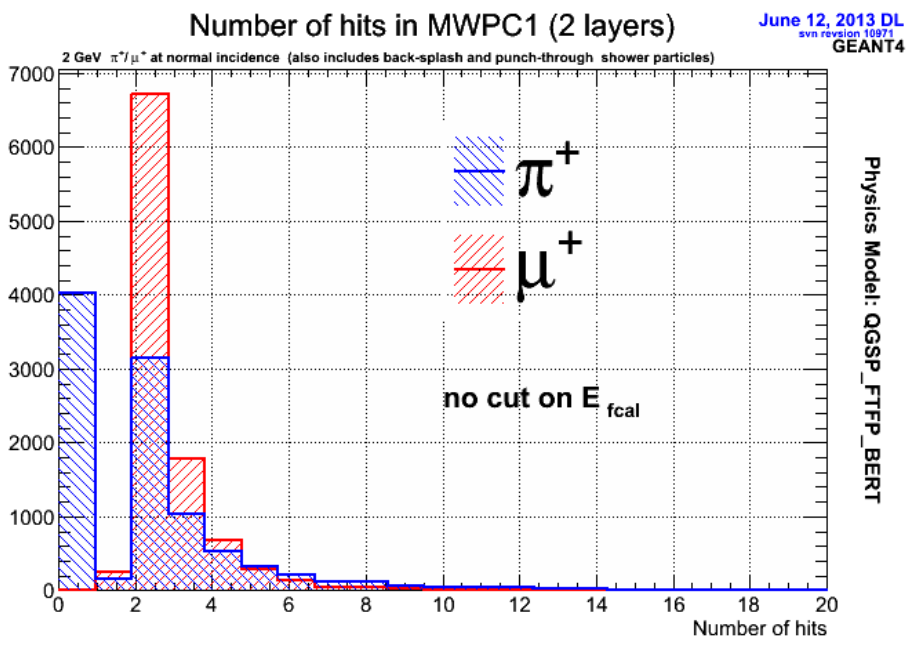


Energy deposition in FCAL

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GEANT4



Number of hits in first MWPC (2 layers)

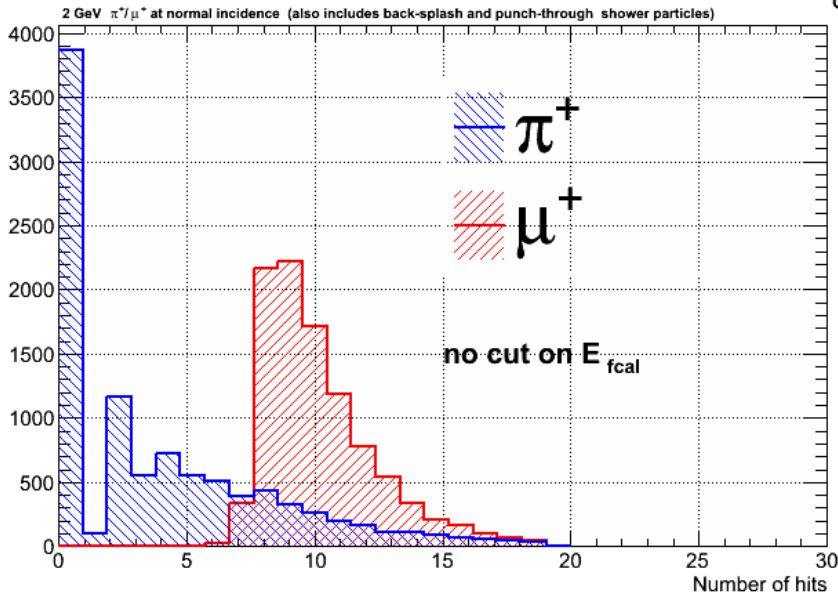


Strong overlap in number of hits due to pions and muons!

Number of hits in all MWPCs (8 layers)

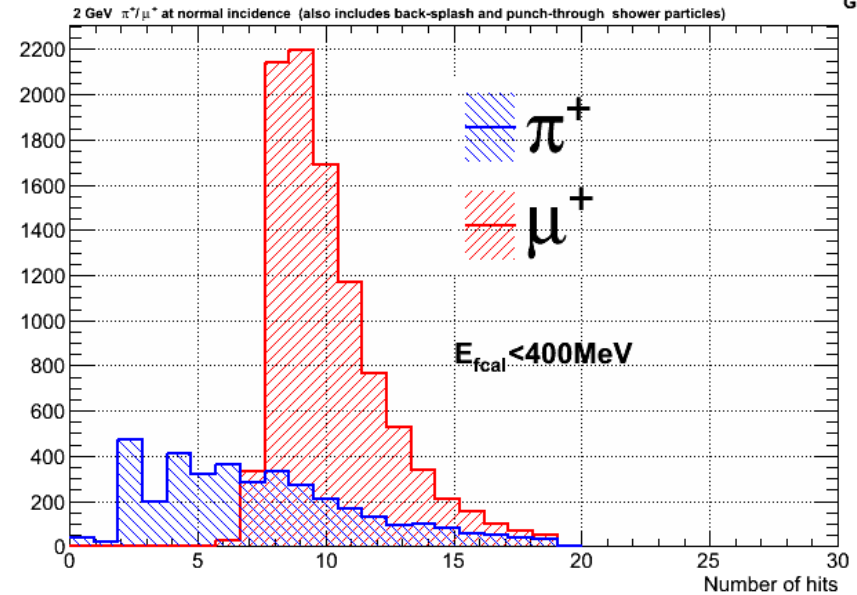
Number of hits in all MWPCs (8 layers)

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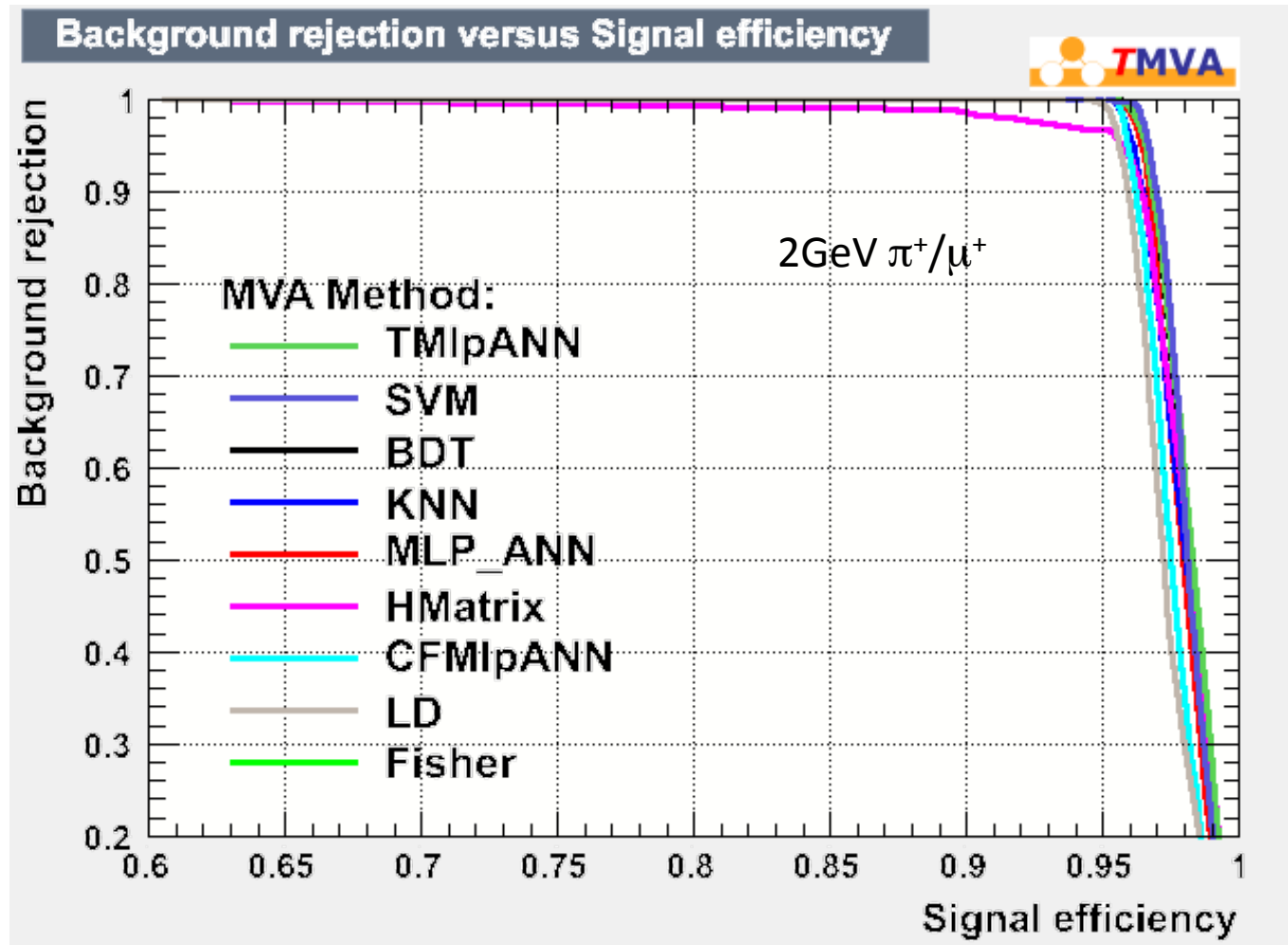
Number of hits in all MWPCs (8 layers)

June 12, 2013 DL
svn revision 10971
GEANT4



Showers in absorbers tend to be absorbed, not necessarily leading to many hits in MWPCs for pions!

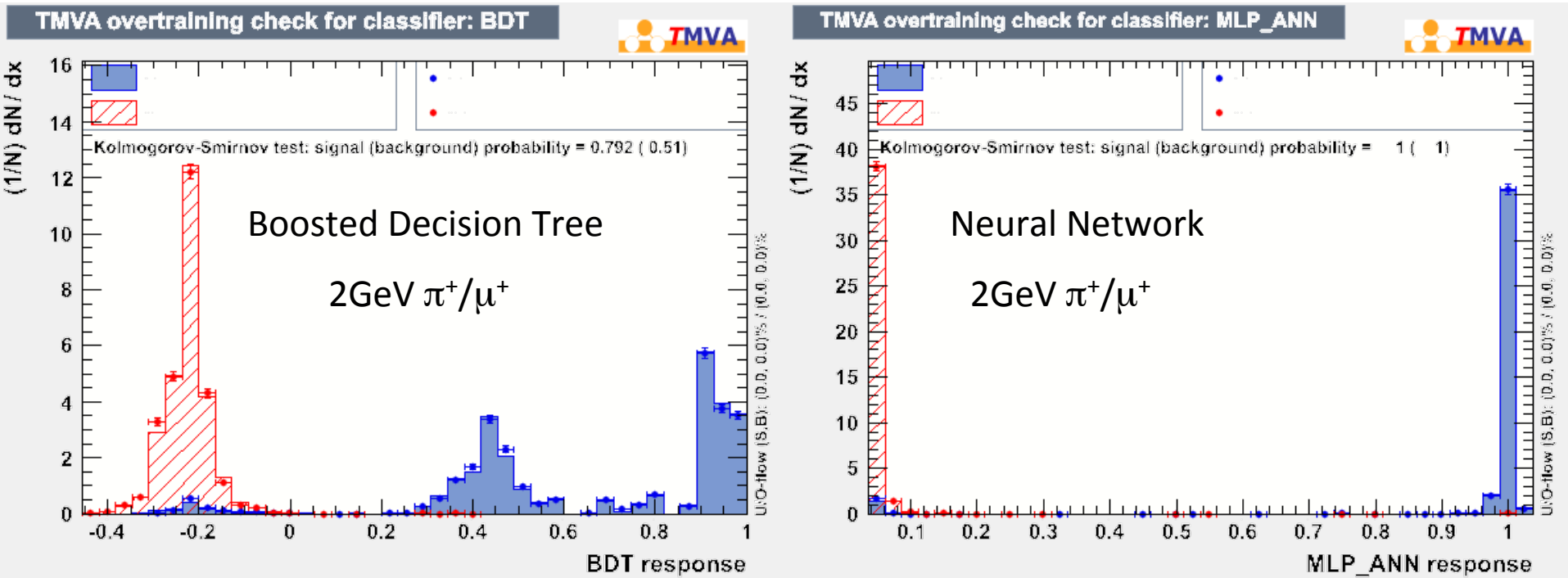
Multi-Variate Analysis (MVA)



ROC Curves (Receiver Operation Characteristics)

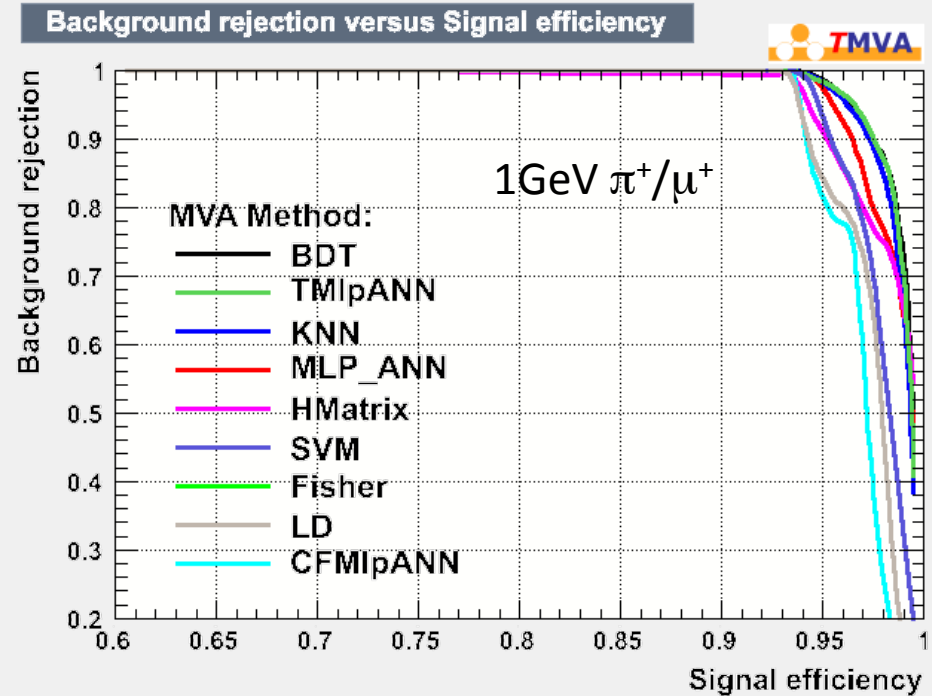
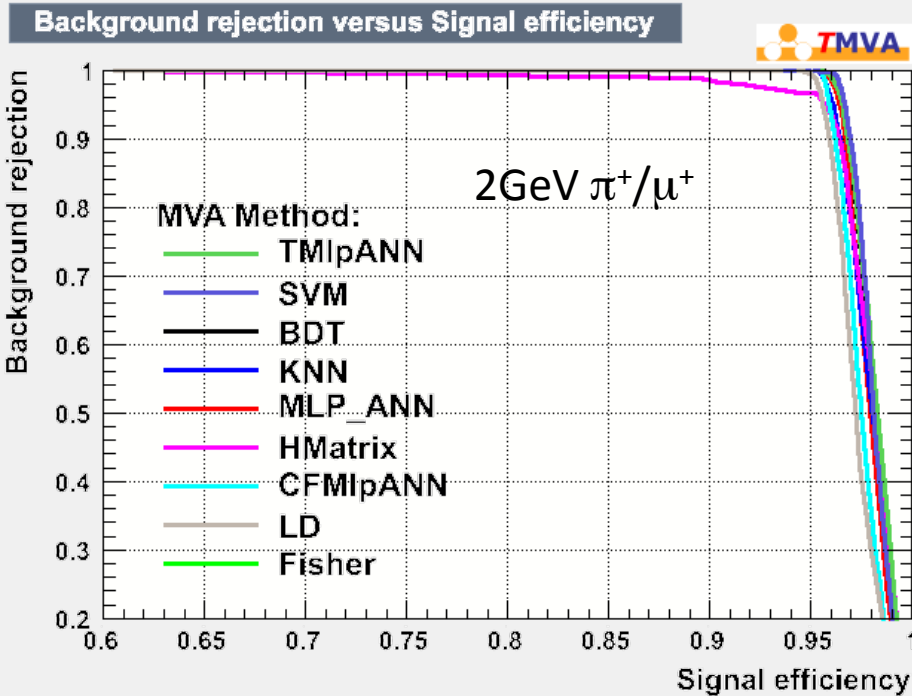
MVA Classification Examples

Blue are π^+ events, red are μ^+ events



Each algorithm works to map the point in N-dimensional space to a probability value that can be used to classify the type of event.

ROC curves for 1GeV and 2GeV



Mono-energetic particles at normal incidence with no beam hole

Realistic momentum Distribution

- *pb_pol70_10days: Primakoff + coherent ρ with 70% polarization*
- *10k events only (5k used for training, 5k used for testing)*

