NA49 Vs Geant4 Comparison NOvA Collaboration meeting 1/09/2014

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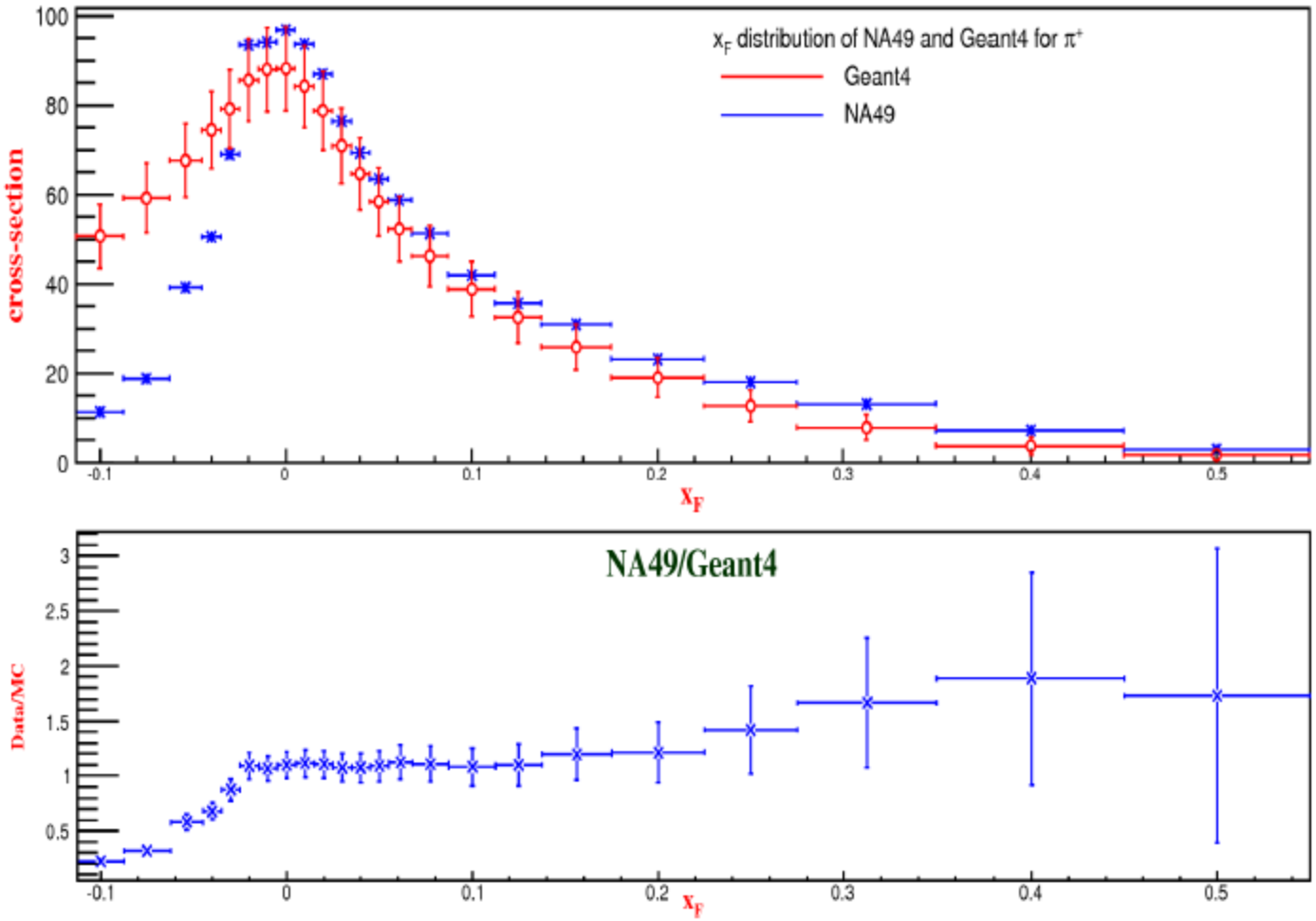
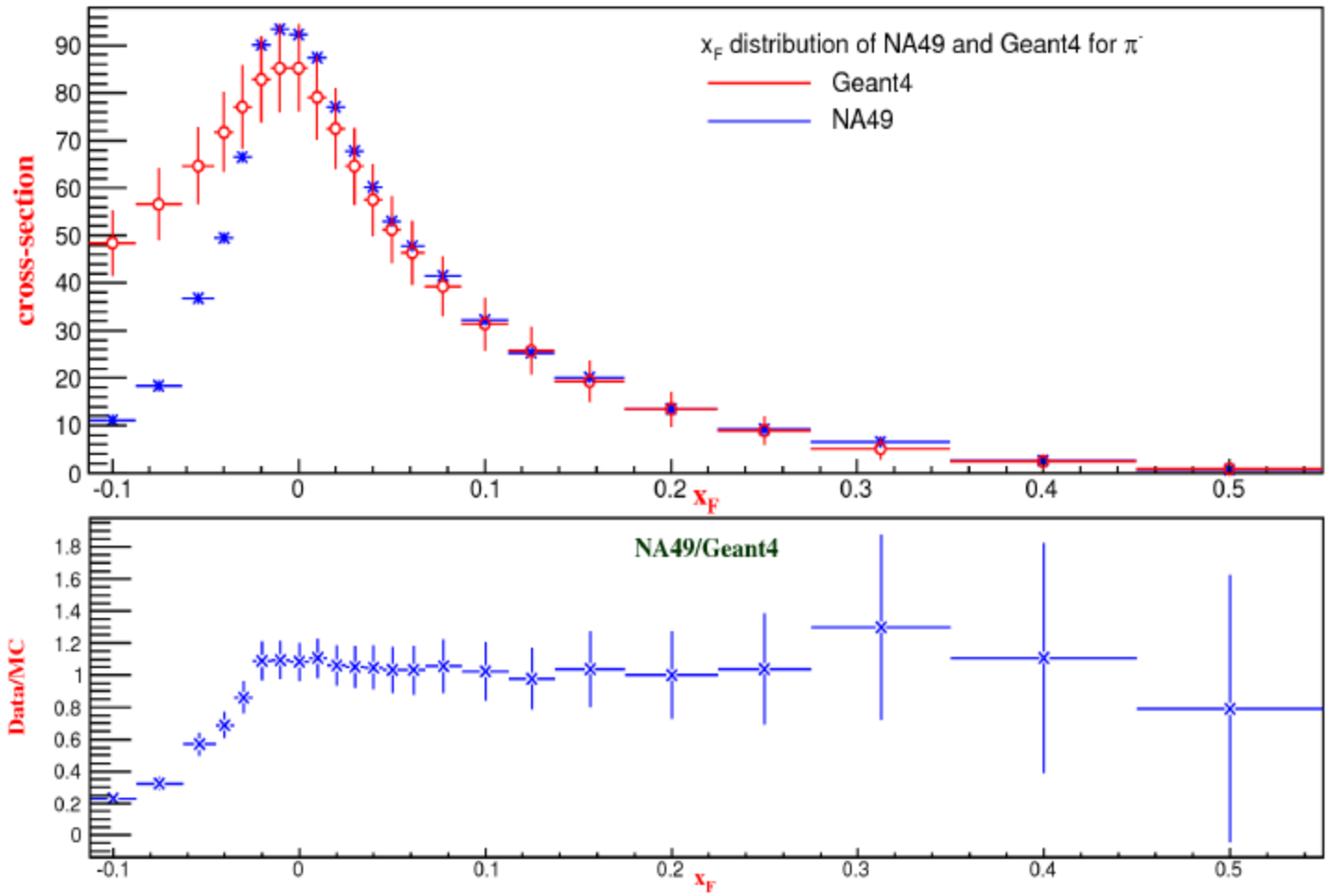
Introduction

- Run Geant4 using FTFP_BERT and mimicking NA49.
- 158 GeV protons
- 1.83 g/cm^3 carbon for $\pi^{+/-}$
- .0708 g/cm^3 hydrogen for $K^{+/-}$
- Much thinner carbon target (1 mm) than NA49 to prevent secondary interactions, 18.6cm hydrogen target.
- Calculate the weight from NA49/Geant4 both for $\pi^{+/-}$ and $K^{+/-}$ in x_F and p_T.
- NDOS ν spectrum using G4NuMI(FTFP) both for $\pi^{+/-}$ and $K^{+/-}$ (4 E_ν bins .25-.8, .8-1.4, 1.4 -2, 2- 3.2)
- NDOS ν spectrum using G4NuMI(FTFP π^+) after weighting the FTFP(Pi+) production using the NA49 data.

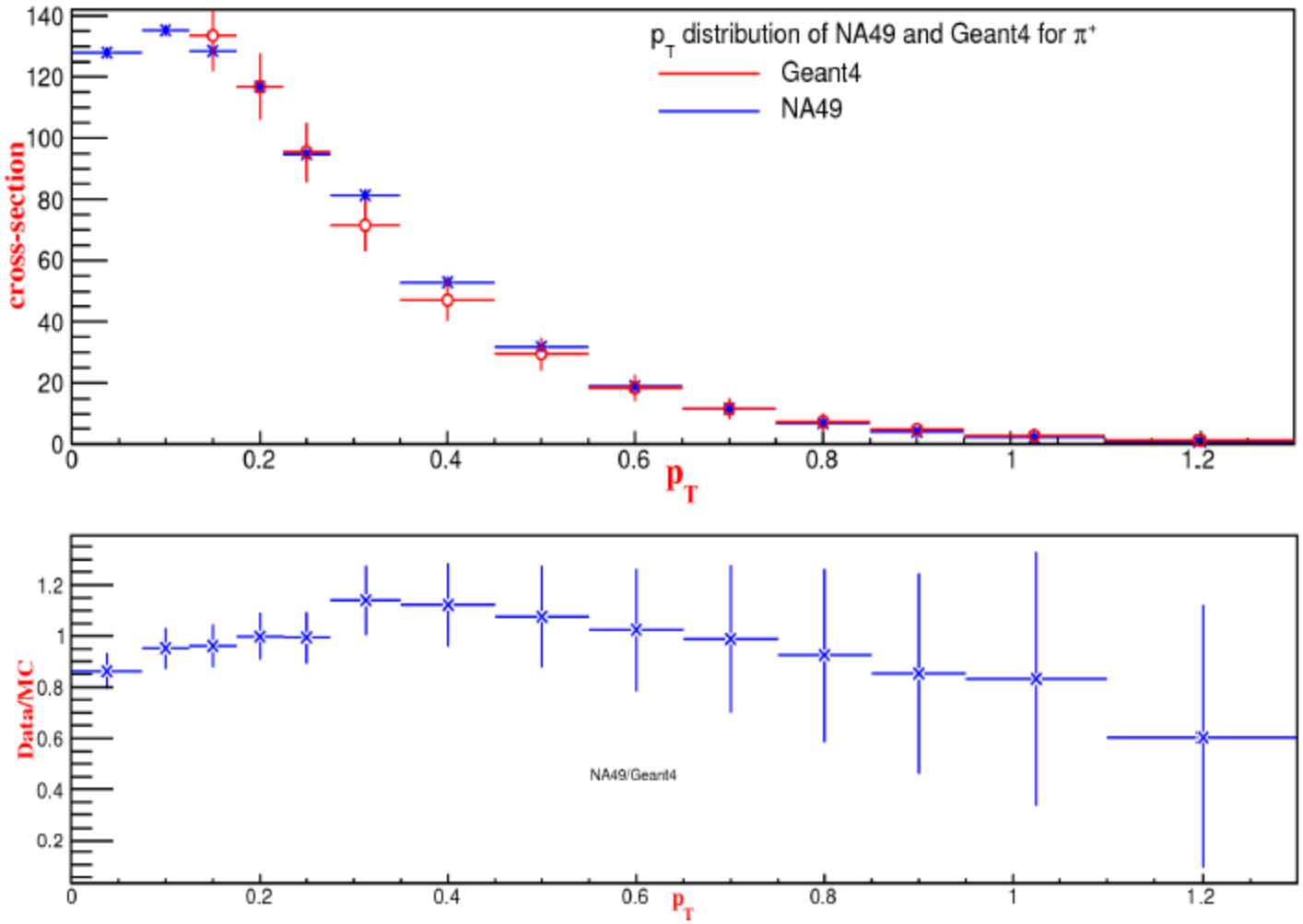
x_F distribution comparison of NA49 and Geant4 for π^+



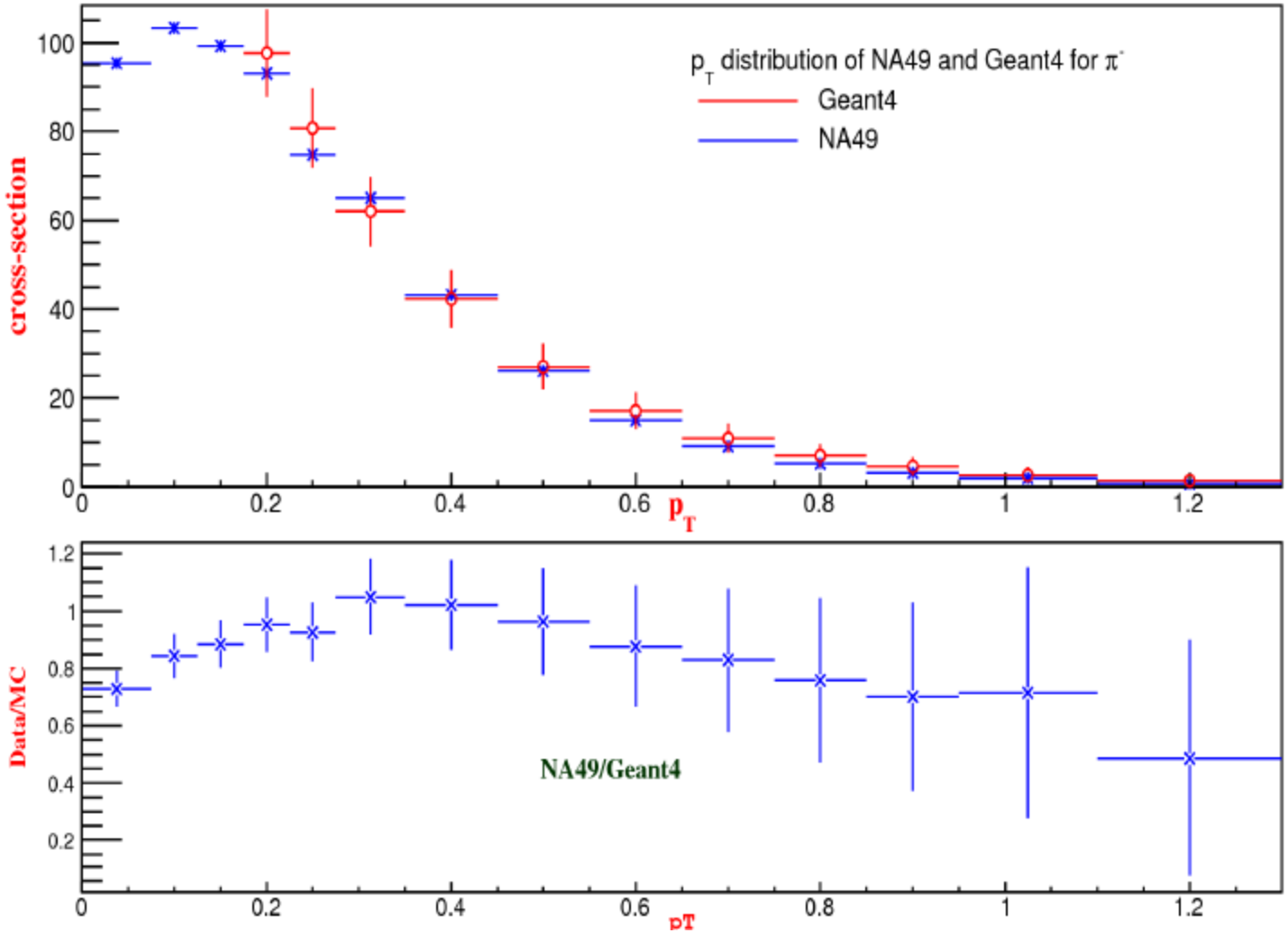
x_F distribution comparison of NA49 and Geant4 for π^-



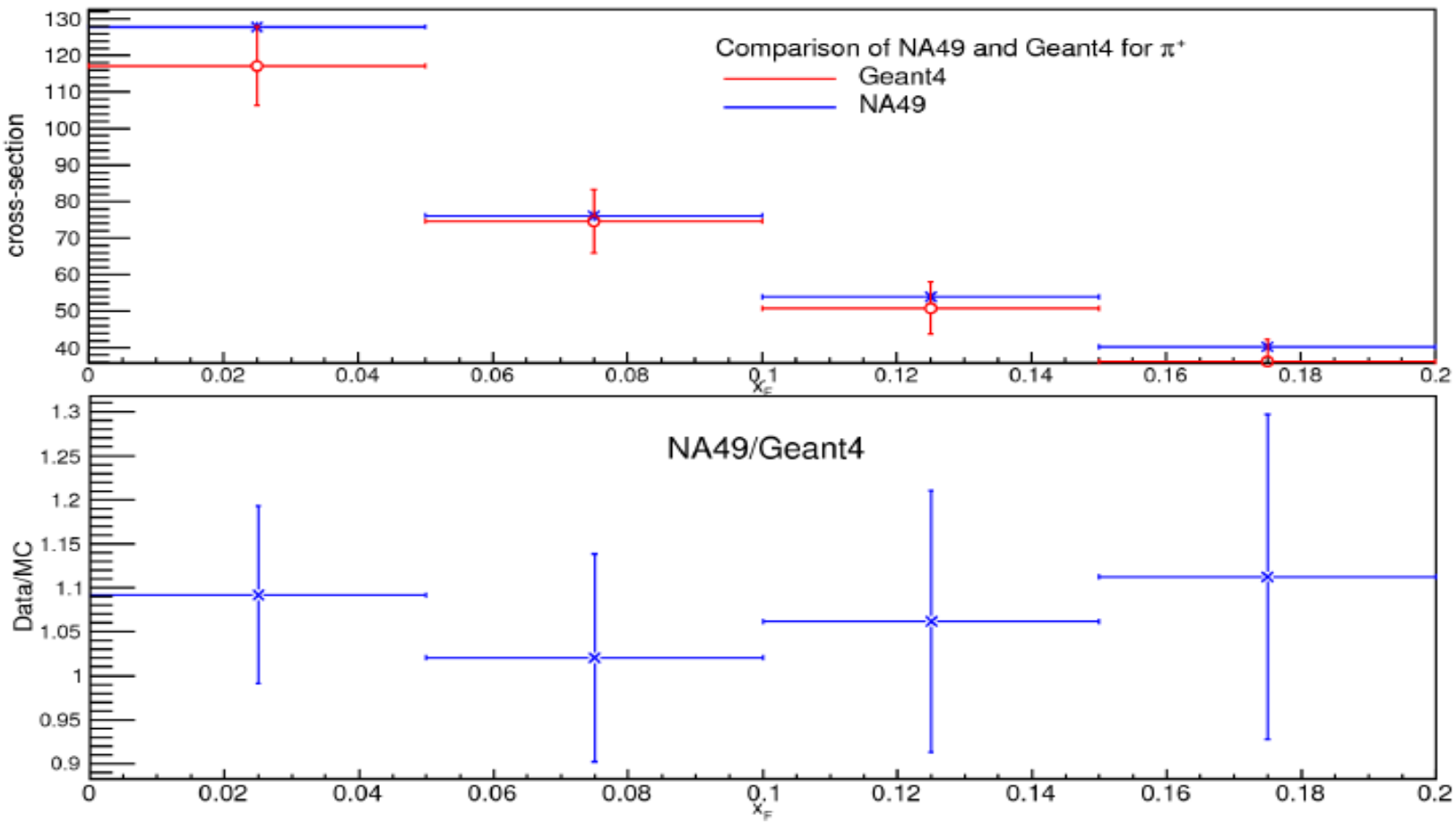
p_T distribution comparison of NA49 and Geant4 for π^+



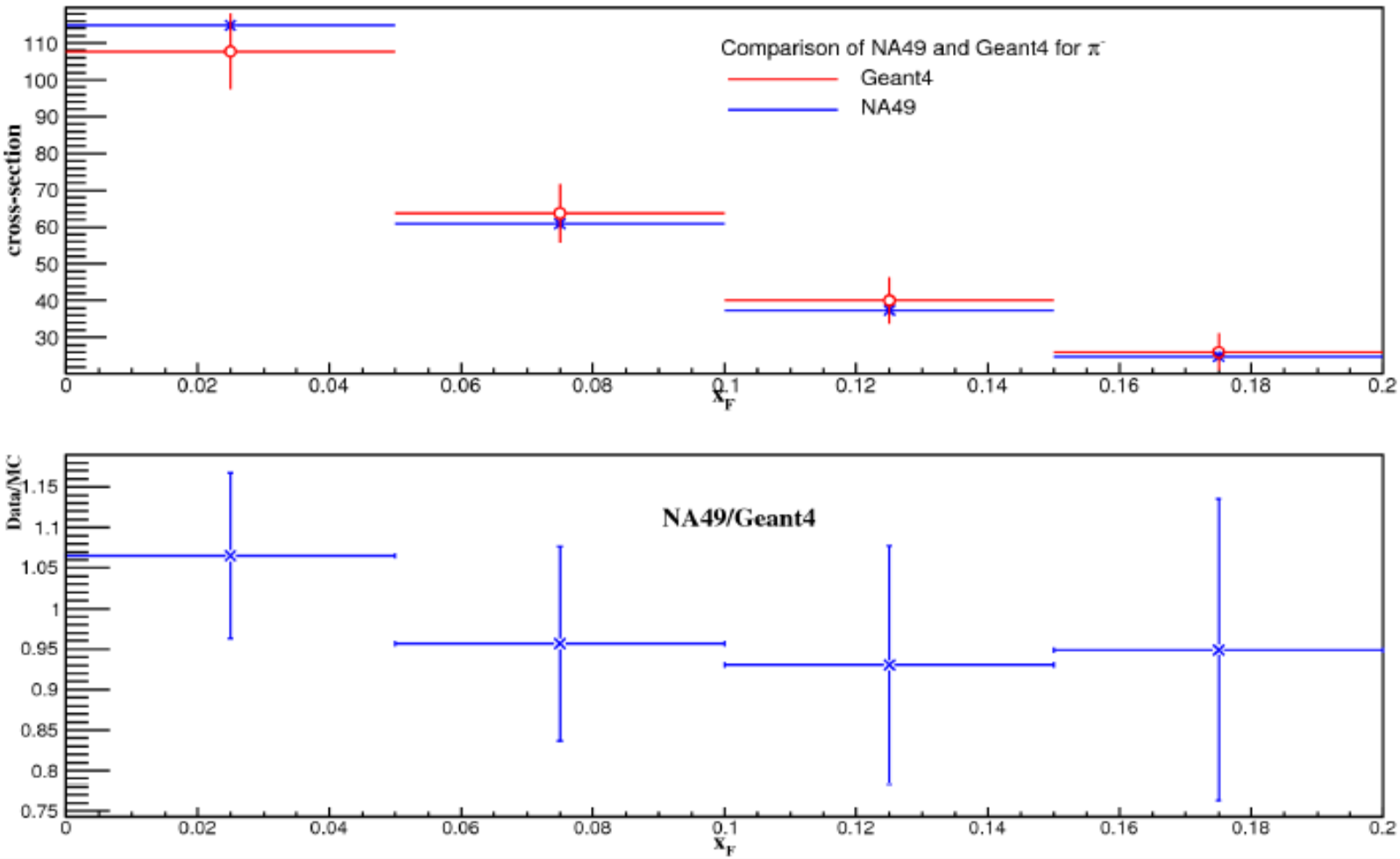
p_T distribution comparison of NA49 and Geant4 for π^-



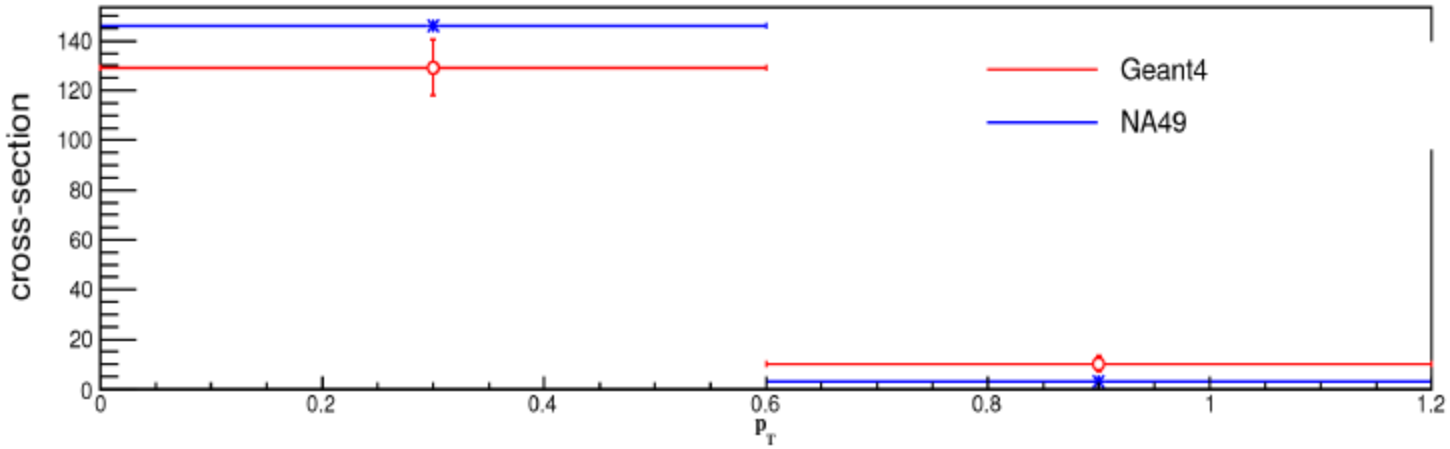
x_F distribution of π^+ with NA49 and Geant4 in four sensitive bins of NDOS

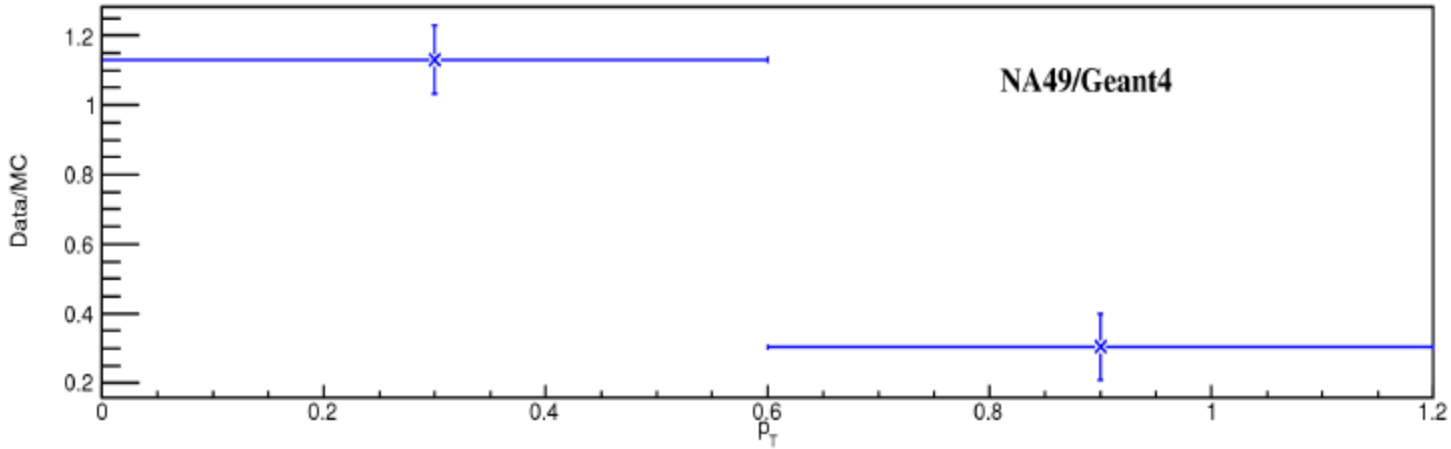


x_F distribution of π^- with NA49 and Geant4 in four sensitive bins of NDOS

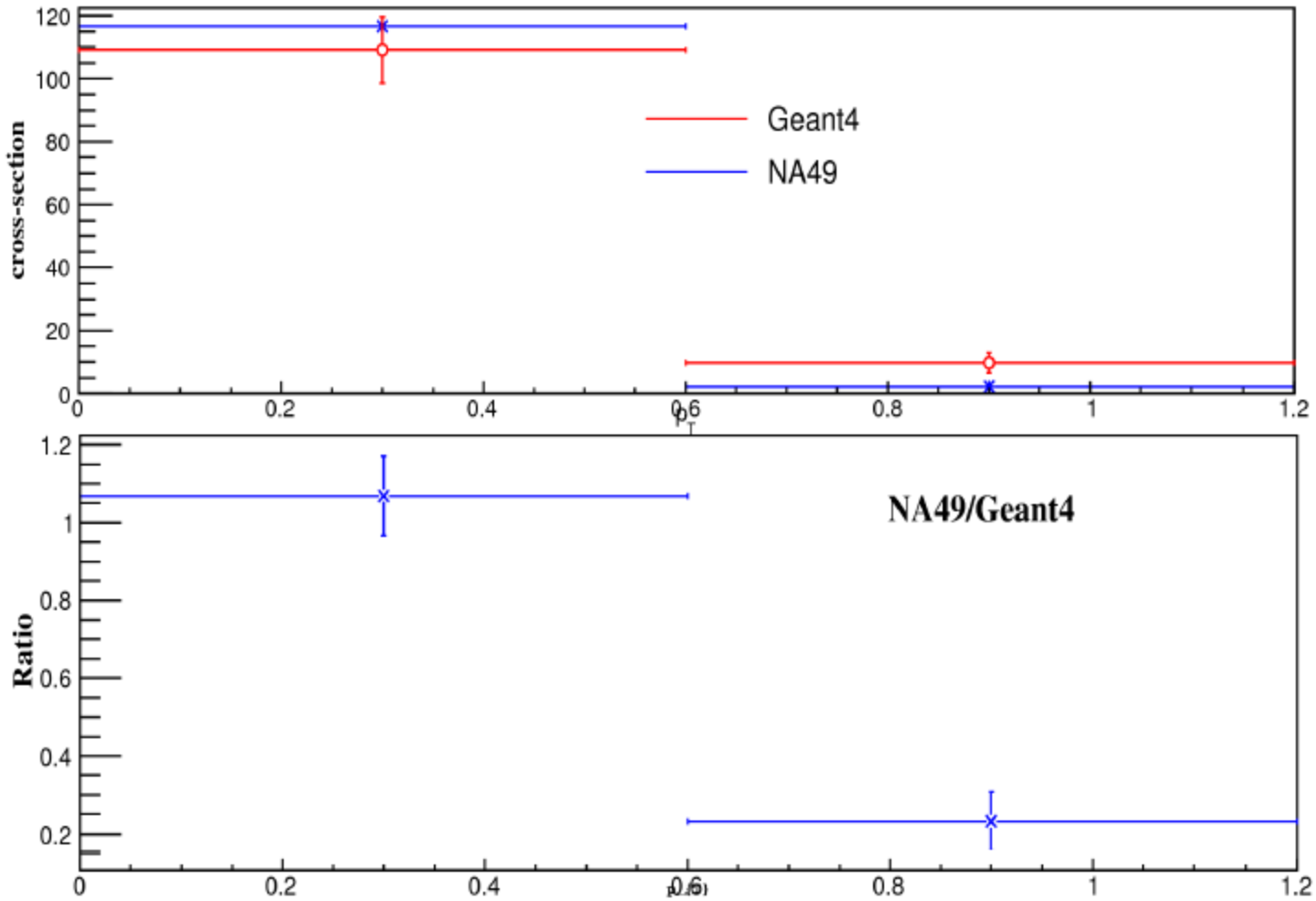


p_T distribution of π^+ with NA49 and Geant4 in two sensitive bins of NDOS

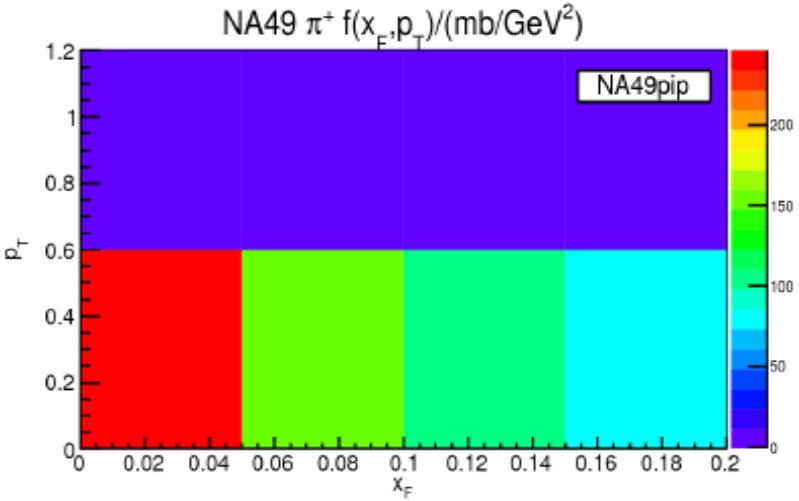


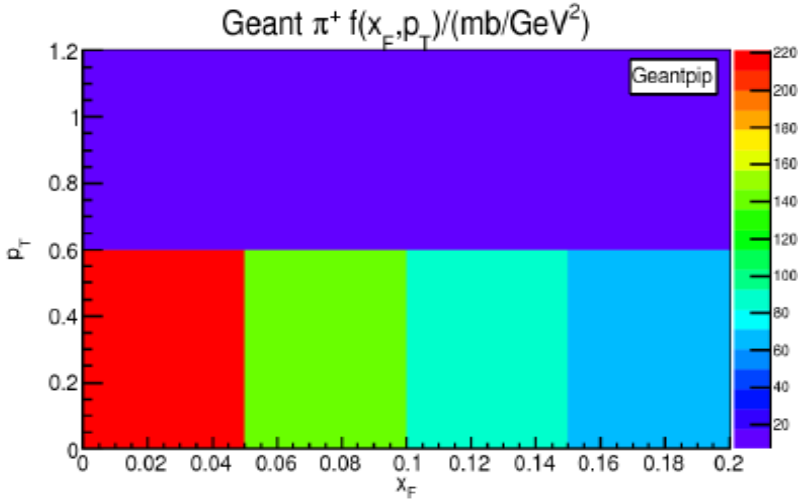


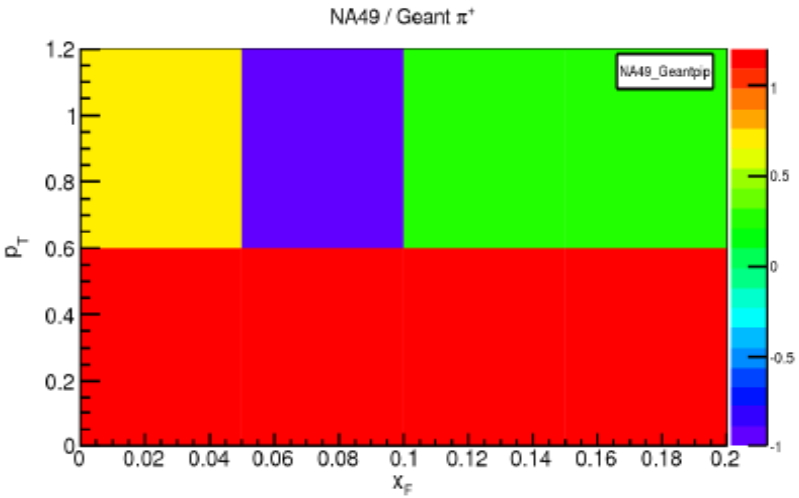
p_T distribution of π^- with NA49 and Geant4 in two sensitive bins of NDOS



XF, pT distribution of π^+ NA49 and Geant4 in 4 x_F and 2 p_T sensitive bins for NDOS



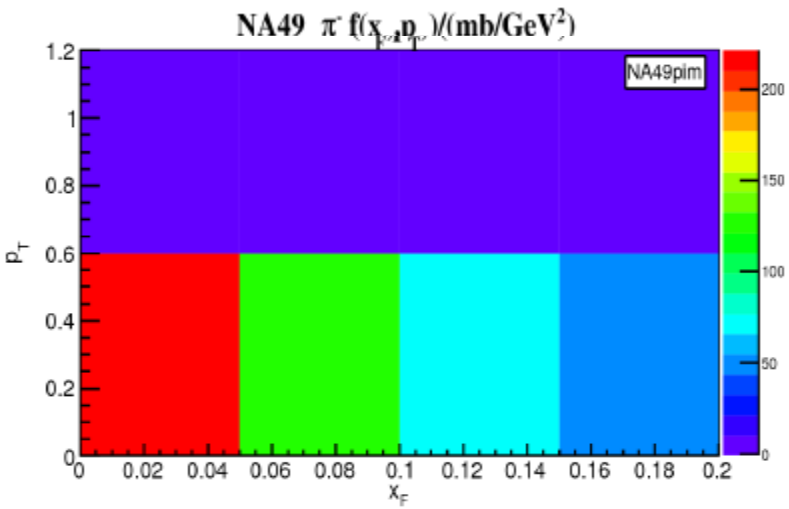


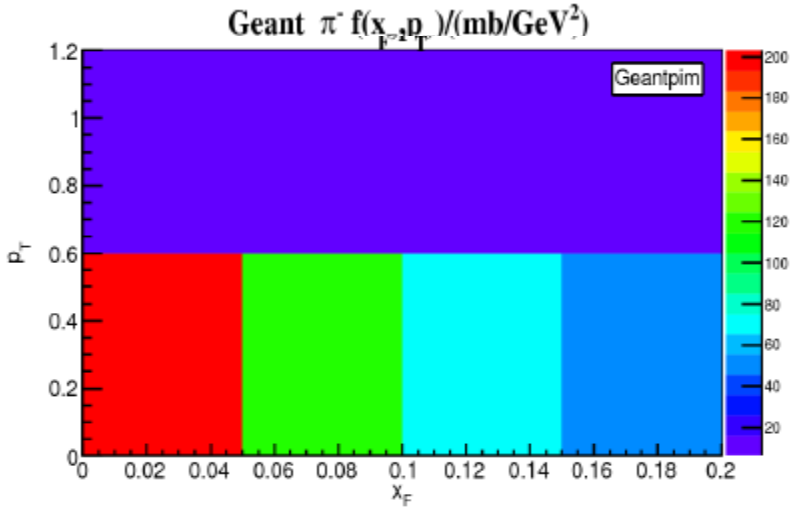


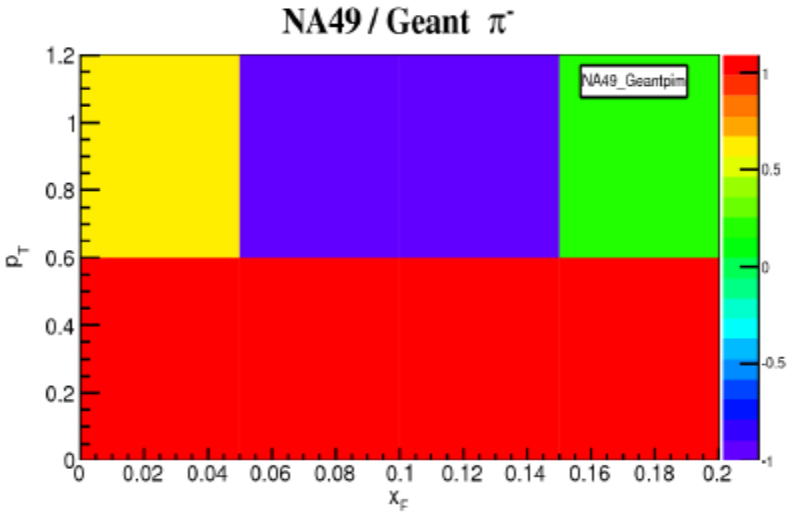
pT/xF	0-.05	.05-.1	.1-.15	.15-.2
0-.6	1.11	1.11	1.14	1.2
.6-1.2	.72	-1	.24	.26

Bin by bin x_F and p_T weight from NA49/Geant4

XF, pT distribution of π^- NA49 and Geant4 in 4 x_F and 2 p_T sensitive bins for NDOS





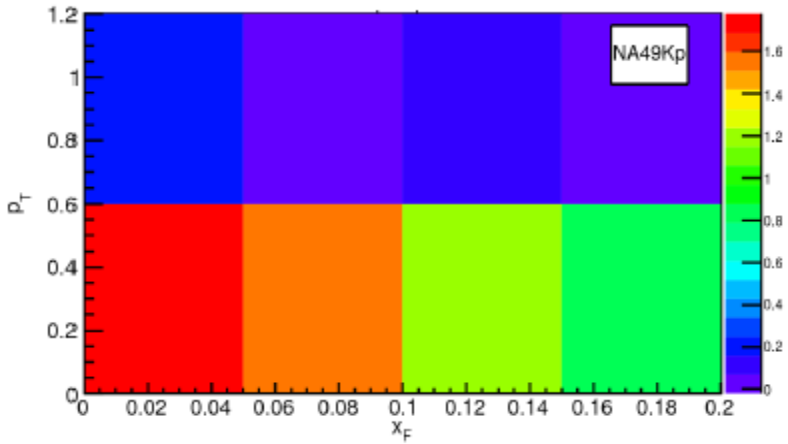


pT/xF	0-.05	.05-.1	.1-.15	.15-.2
0-.6	1.09	1.06	1.04	1.05
.6-1.2	.66	-1	-1	.241

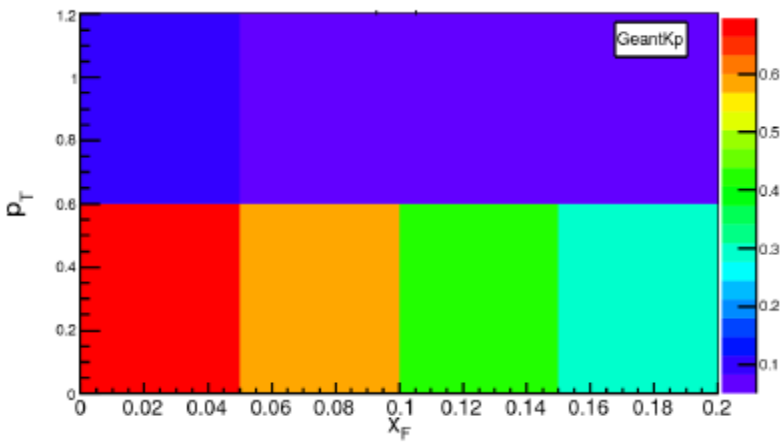
Bin by bin x_F and p_T weight from NA49/Geant4

XF, pT distribution of K^+ NA49 and Geant4 in 4 x_F and 2 p_T sensitive bins for NDOS

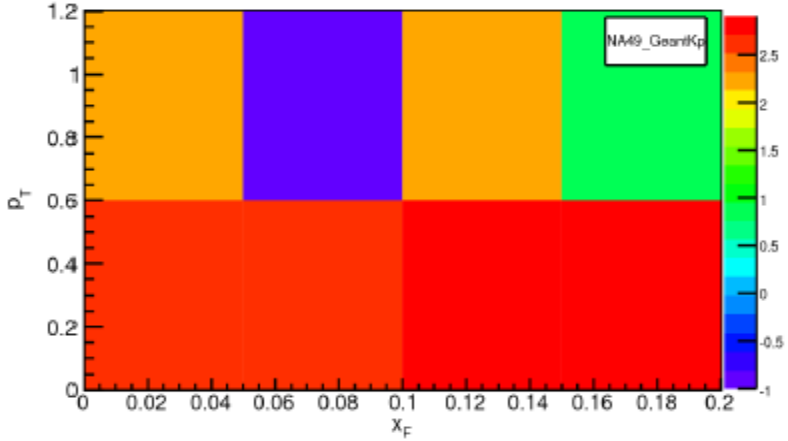
NA49 K+



Geant4 K+



NA49/Geant4 K+

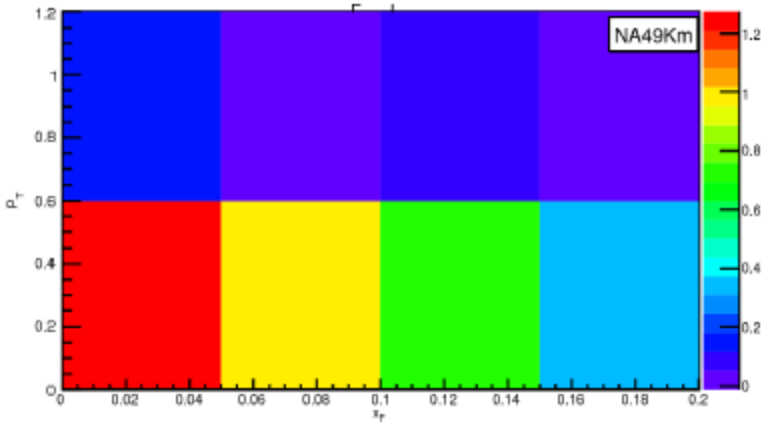


pT/xF	0-.05	.05-.1	.1-.15	.15-.2
0-.6	2.55	2.64	2.91	2.77
.6-1.2	2.19	-1	2.25	.78

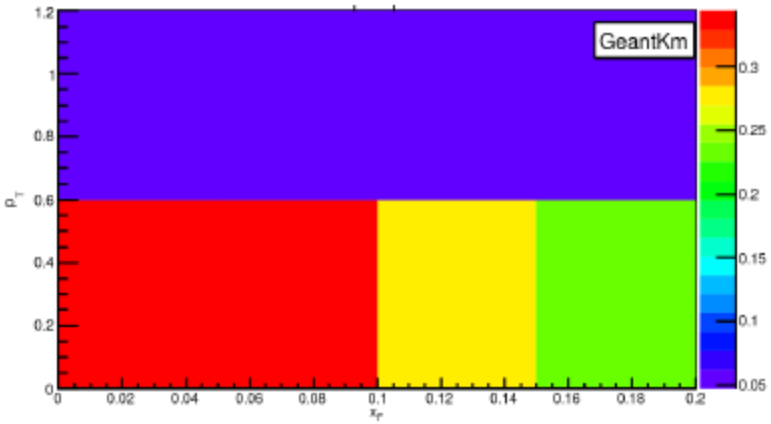
Bin by bin x_F and p_T weight from NA49/Geant4

XF, pT distribution of K^- NA49 and Geant4 in 4 x_F and 2 p_T sensitive bins for NDOS

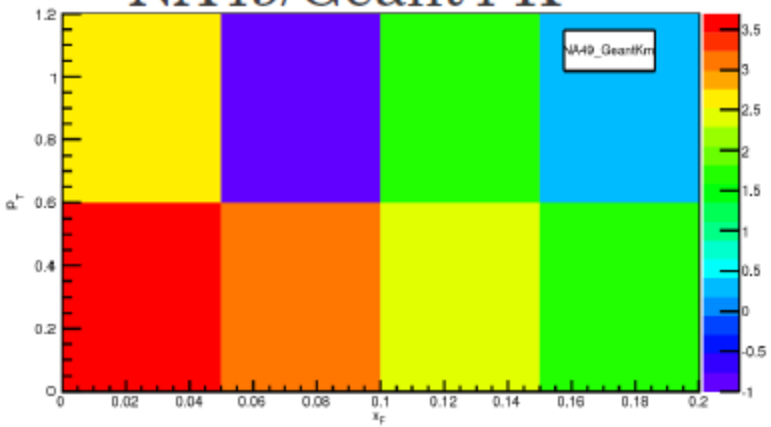
NA49 K-



Geant4 K-



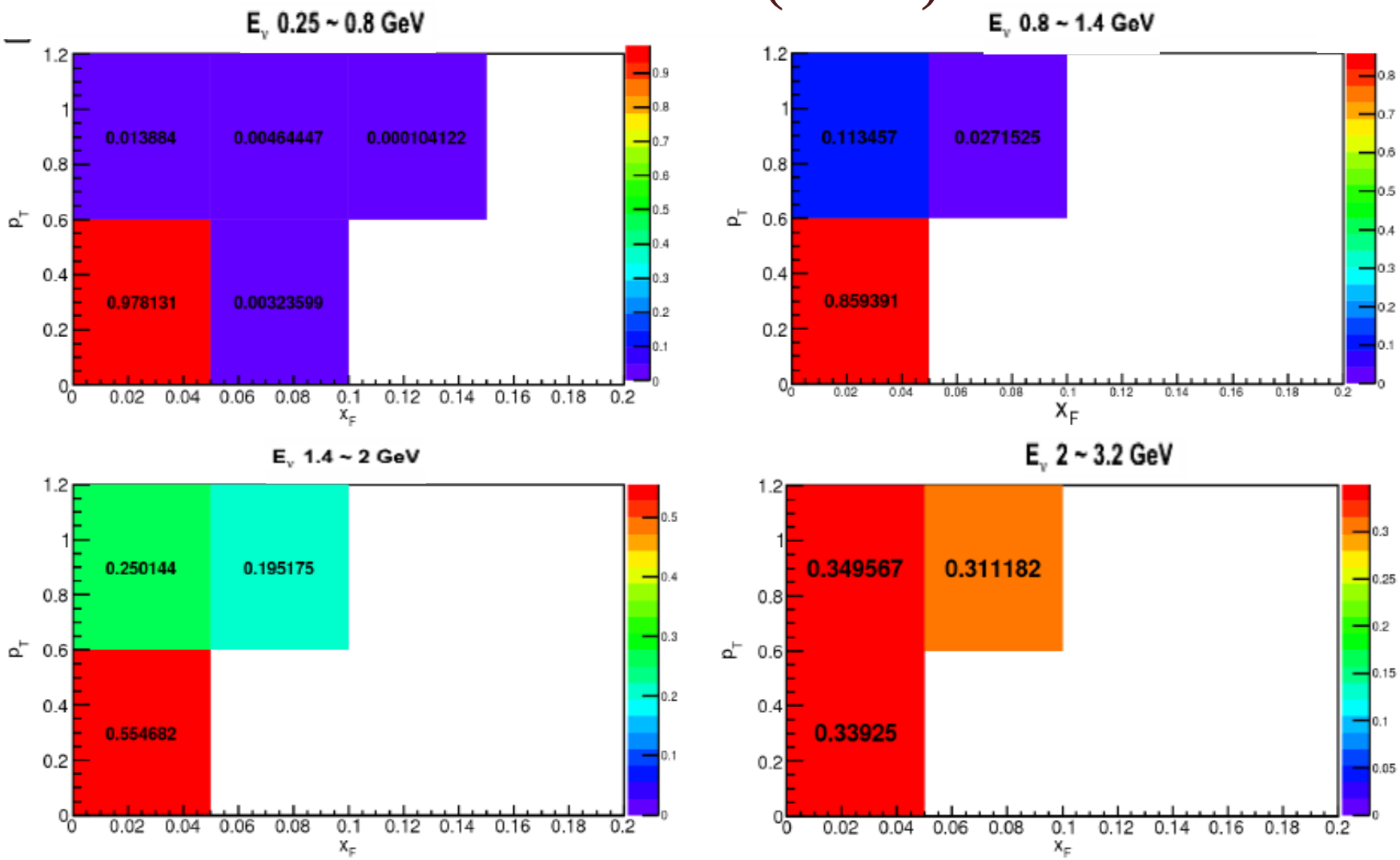
NA49/Geant4 K-



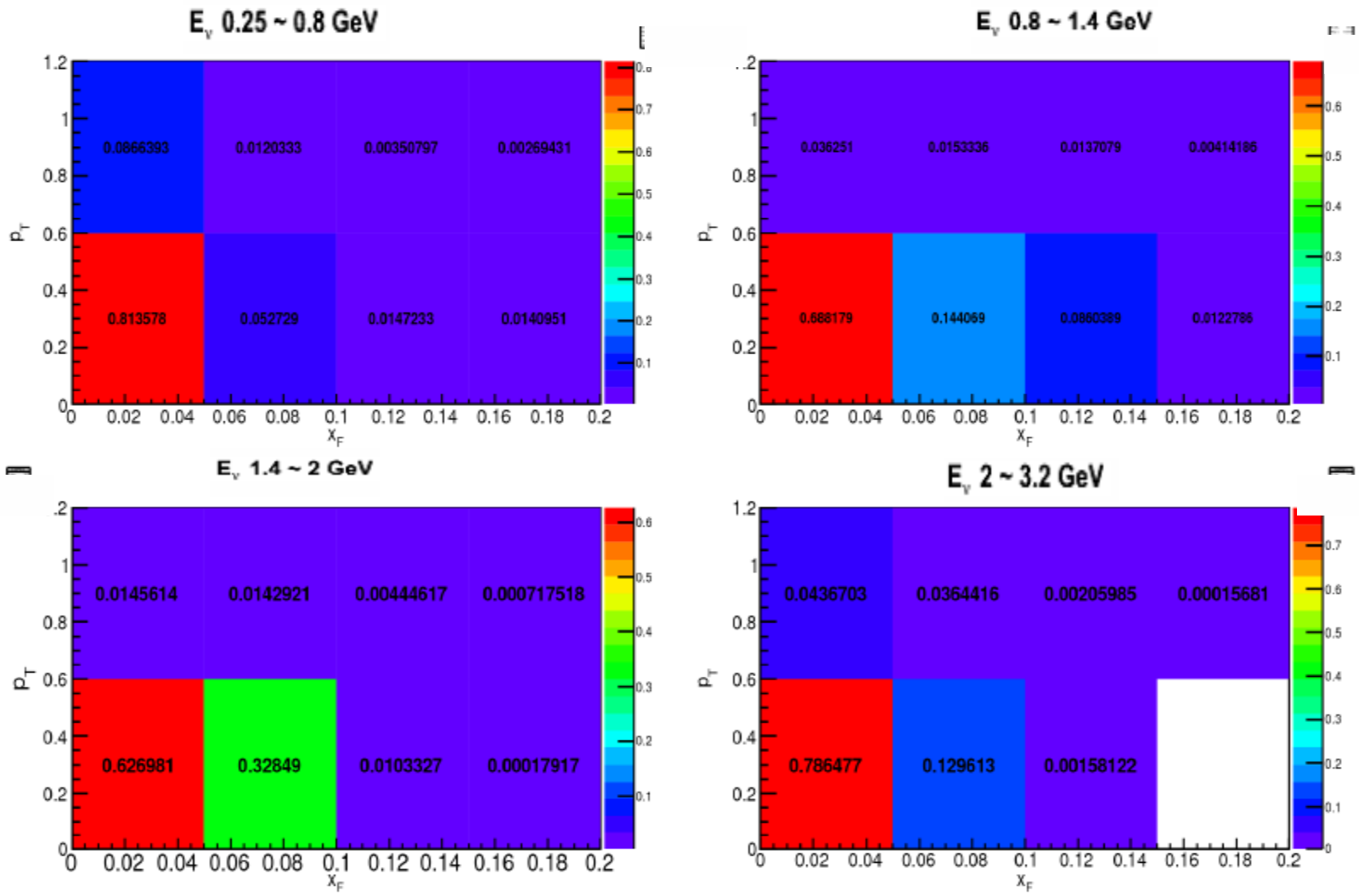
pT/xF	0-.05	.05-.1	.1-.15	.15-.2
0-.6	3.7	3.02	2.45	1.58
.6-1.2	2.64	-1	1.59	.38

Bin by bin x_F and p_T weight from NA49/Geant4

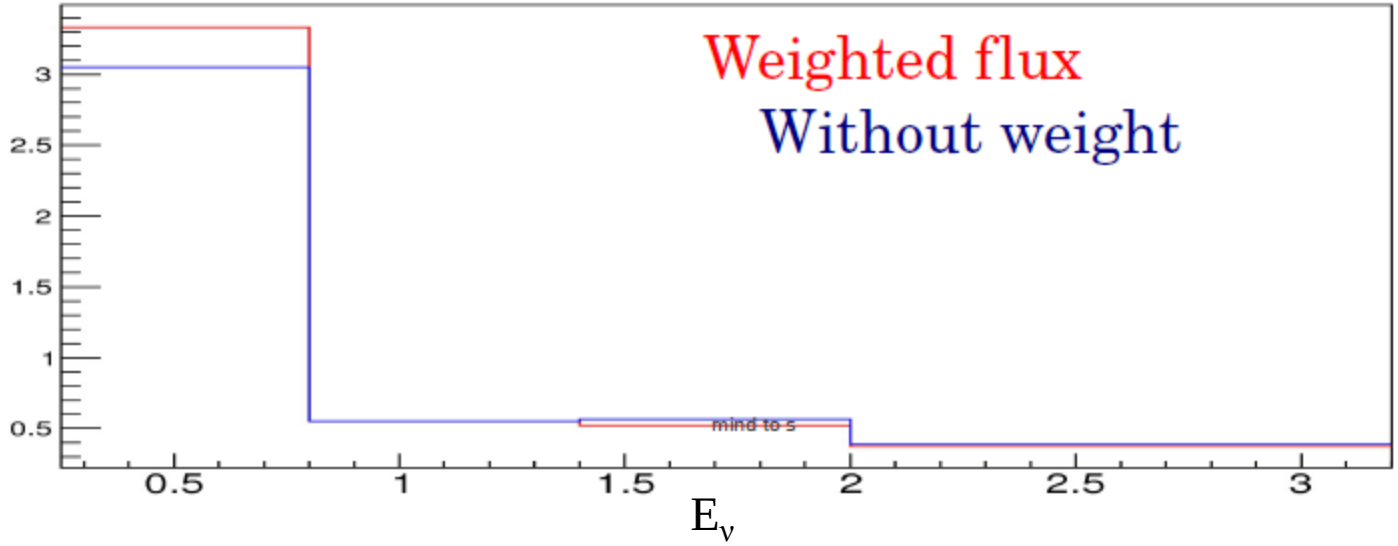
XF, pT distribution 4 xF, 2pT sensitive bins for NDOS for π^+ G4NuMI(FTFP)

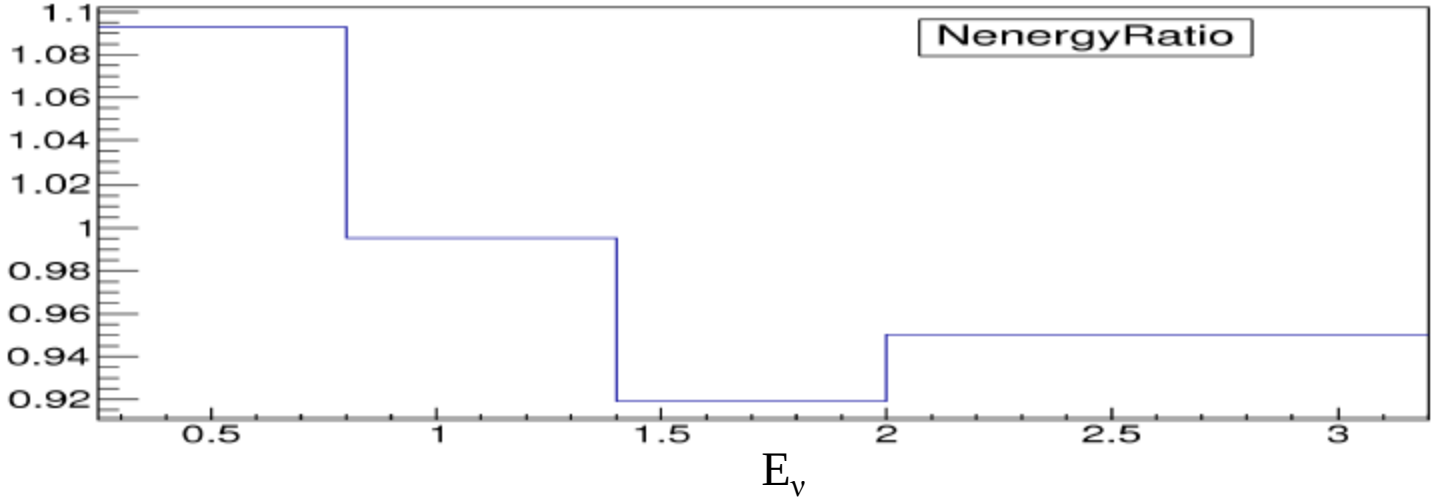


XF, pT distribution 4 xF, 2pT sensitive bins for NDOS for K^+ G4NuMI(FTFP)



Weighted and unweighted E_ν flux at NDOS after using x_F and p_T bin by bin weight from NA49/Geant4





Outlook…

In the coming weeks, obtain:

1. Geant4 (FTFP) comparison with NA49 is almost done. The Geant4(FTFP) NDOS-flux is ~10--15% different from NA49-weighted-Geant4 flux at NDOS.

2. We are in contact with Pedro. We will work with him on Fluka -vs- NA49 comparison and difference in the NDOS flux with Fluka-alone and NA49-weighted-Fluka.

3. We will draft a memo summarizing this work.

4. Move to the task of empirical constraint of the NOvA-flux at ND, FD, FD/ND using the NOvA-ND data and the Hadroproduction data (where available).

Thank you…