CLOSURE TEST
per i nuovi casi di spin
$\mathbf{2^-_h}$ e $\mathbf{2^-_h(f_{qq}=100\%)}$

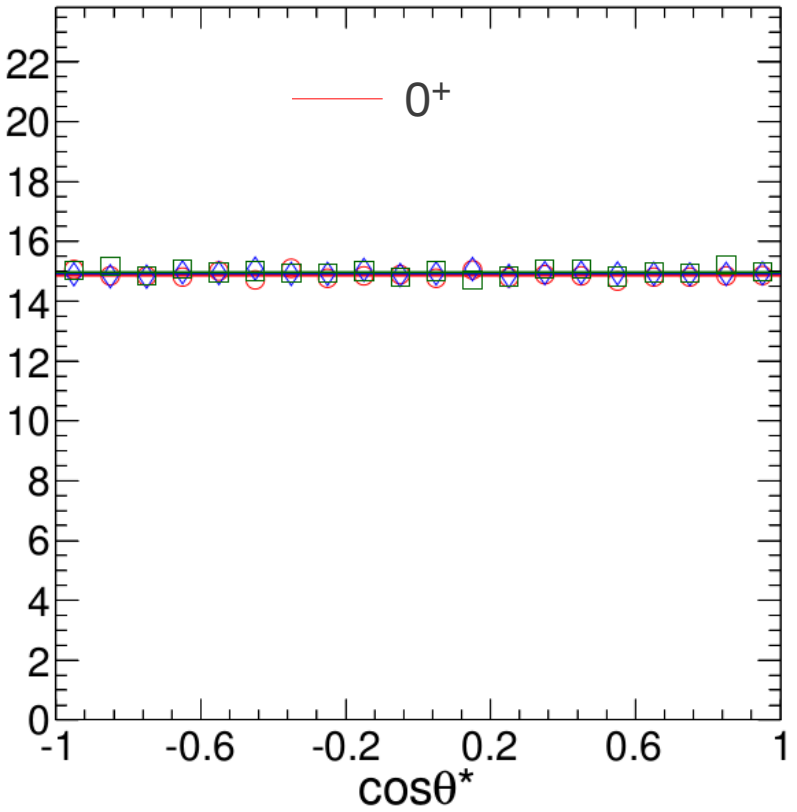
Procedo con la **produzione dei closure test** per i nuovi casi di spin per le distribuzioni **truth**, confrontandoli con le distribuzioni **truth da PAPER** (arXiv:1208.4018) e con le distribuzioni **JHU_mc12_truth**.

Le ntuple per creare le distribuzioni JHU_mc12_truth sono definite in *./file/data_locations/* (contengono ntuples_v41, le più recenti). I tagli effettuati sono semplici tagli truth (presenti anche in *produce_acceptances_2013.C*)

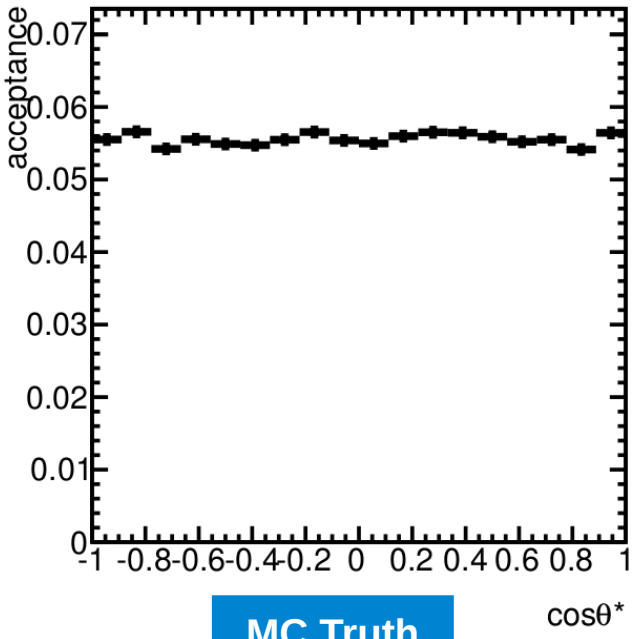
SELEZIONI truth:

“last>=0 && (Z1_m/1000.>=50 && Z1_m/1000.<=106) && (Z2_m/1000.>=17.5 && Z2_m/1000.<=115) && (H_m>115000 && H_m<130000)” + JHU_wTruth

0p cth

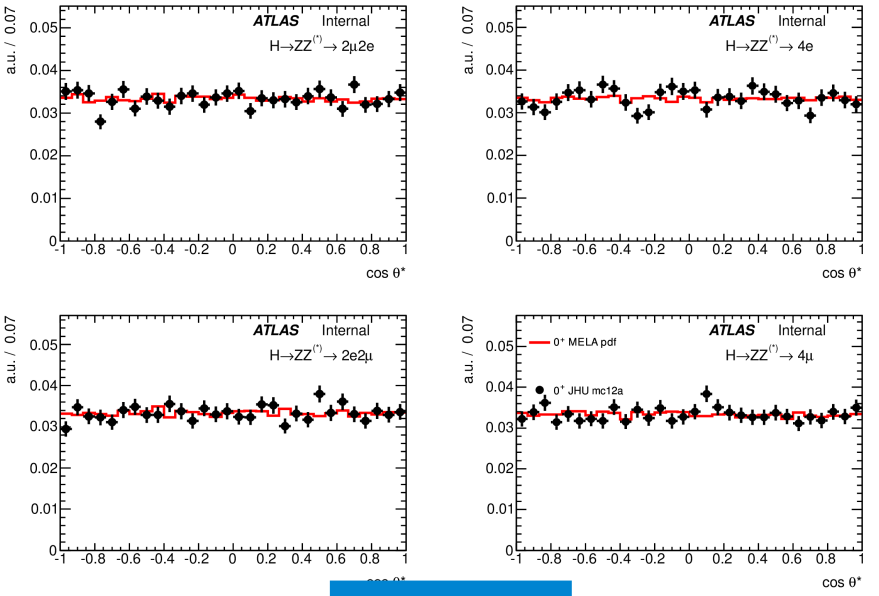


JHU paper



MC Truth

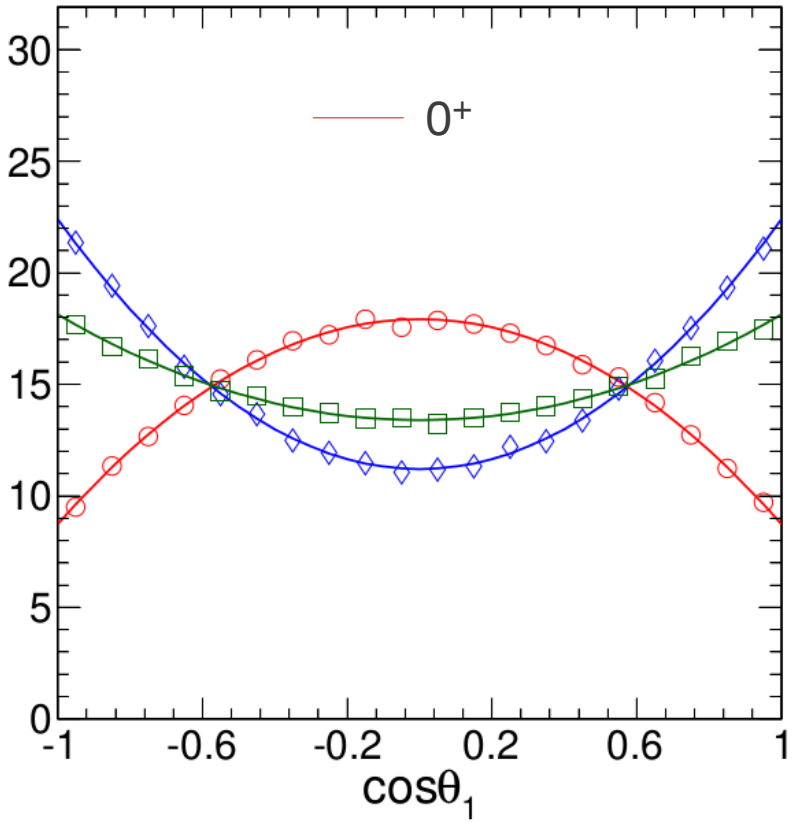
truth



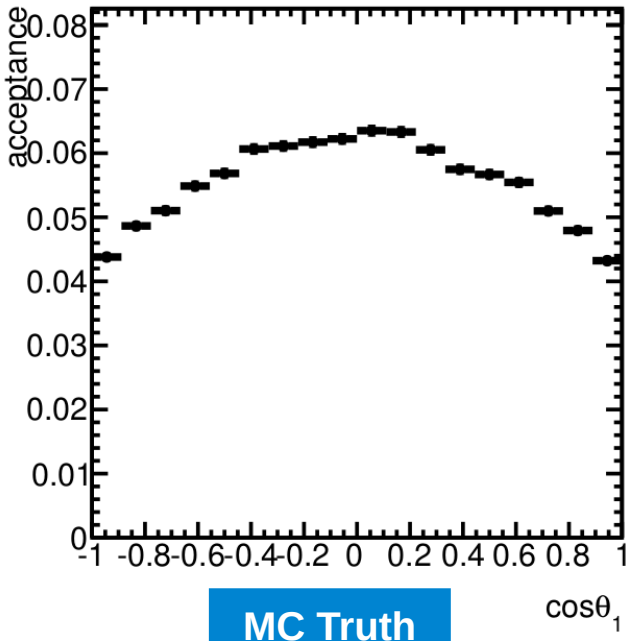
Toys vs MC

0p

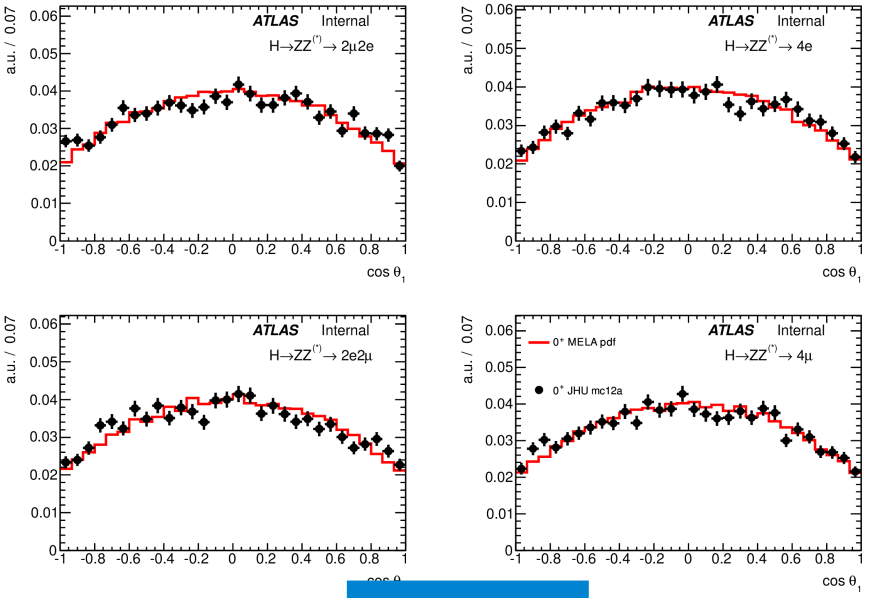
cth1



JHU paper



MC Truth

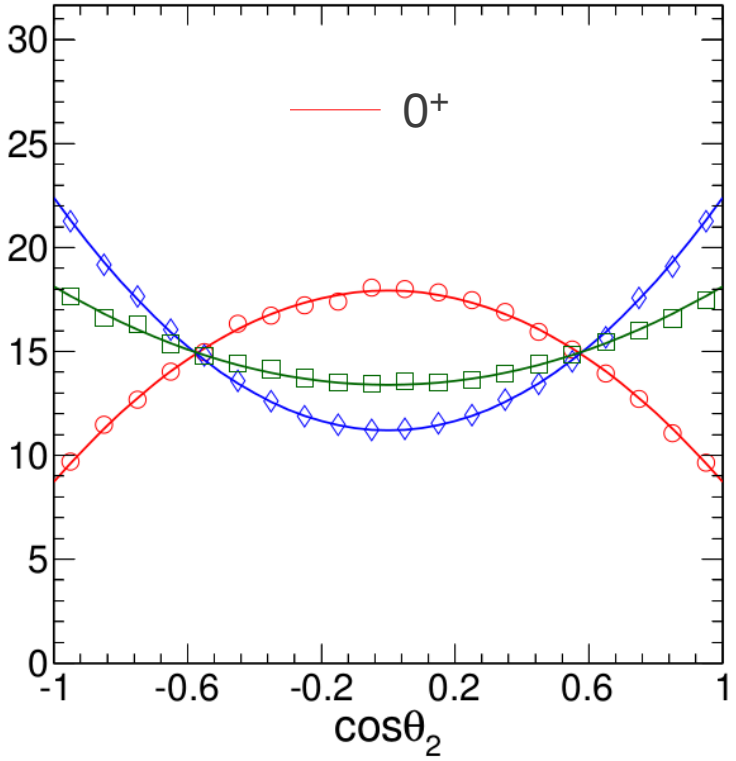


Toys vs MC

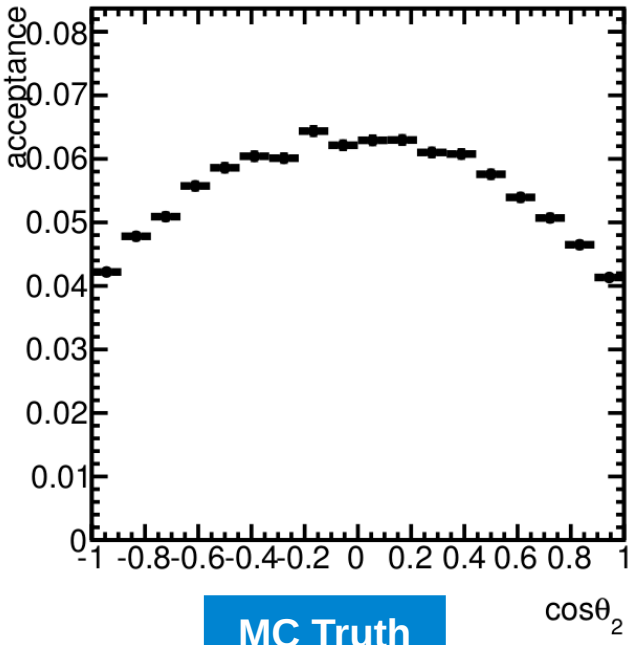
truth

0p

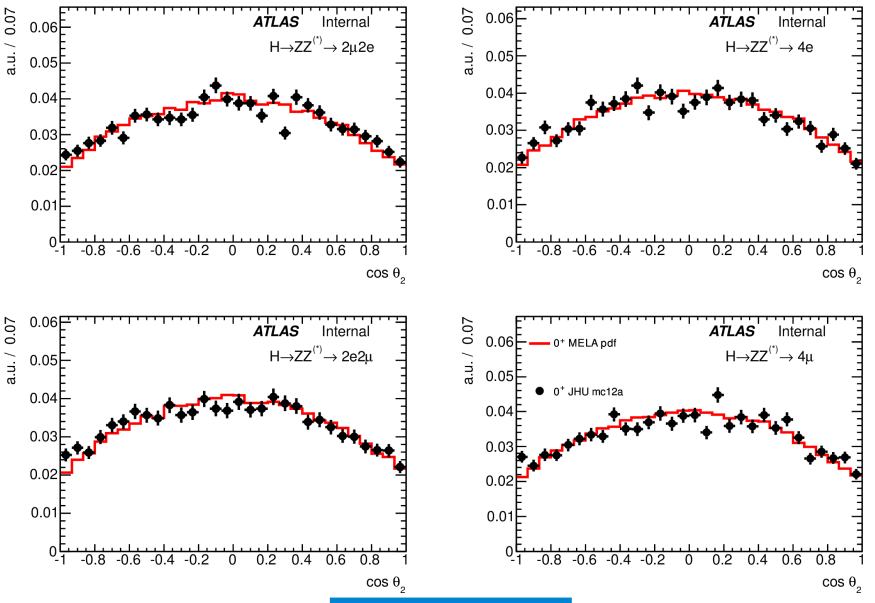
cth2



JHU paper



MC Truth

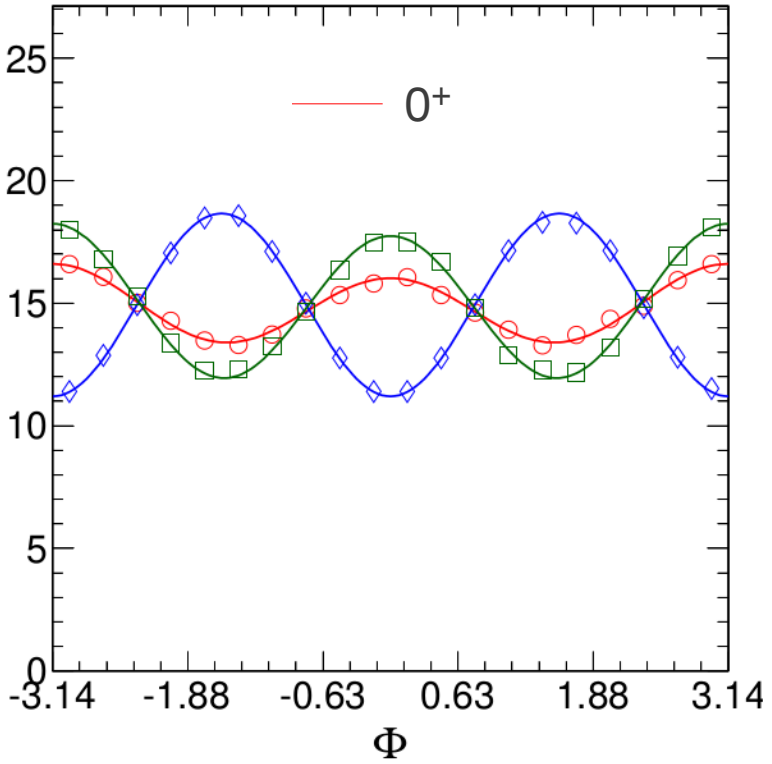


Toys vs MC

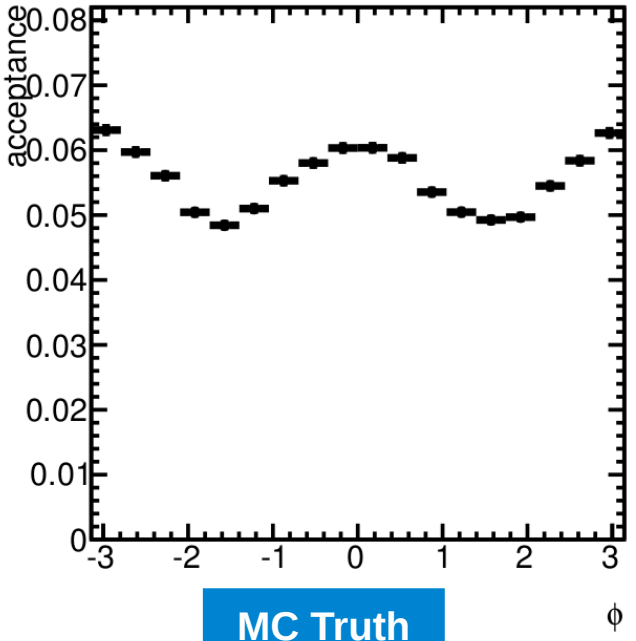
truth

0p

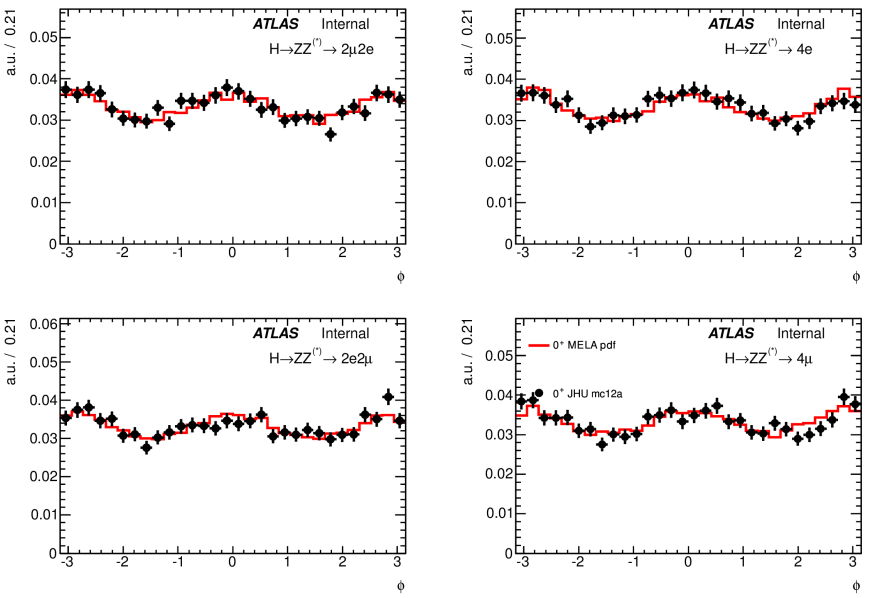
phi



JHU paper



MC Truth

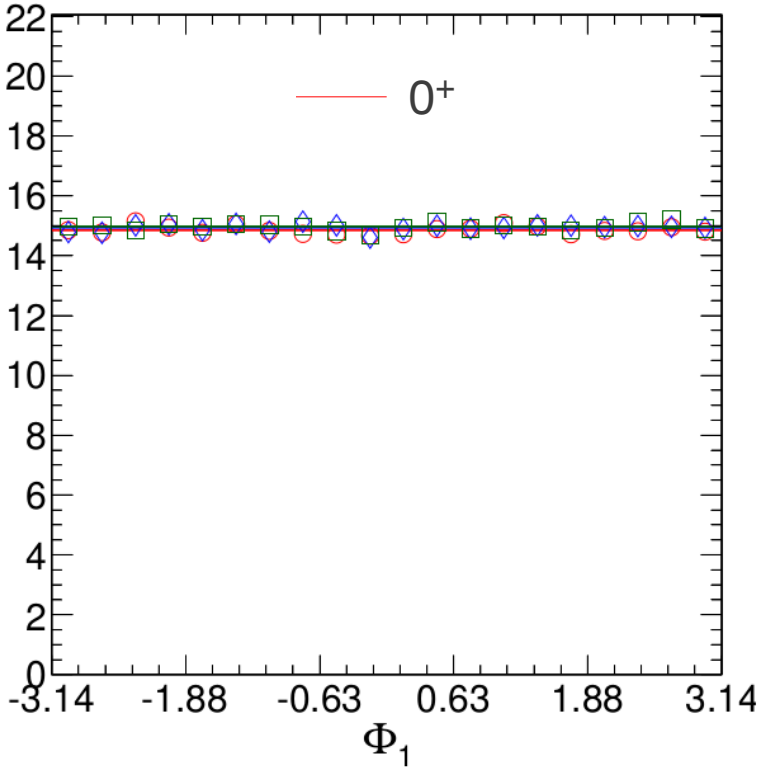


Toys vs MC

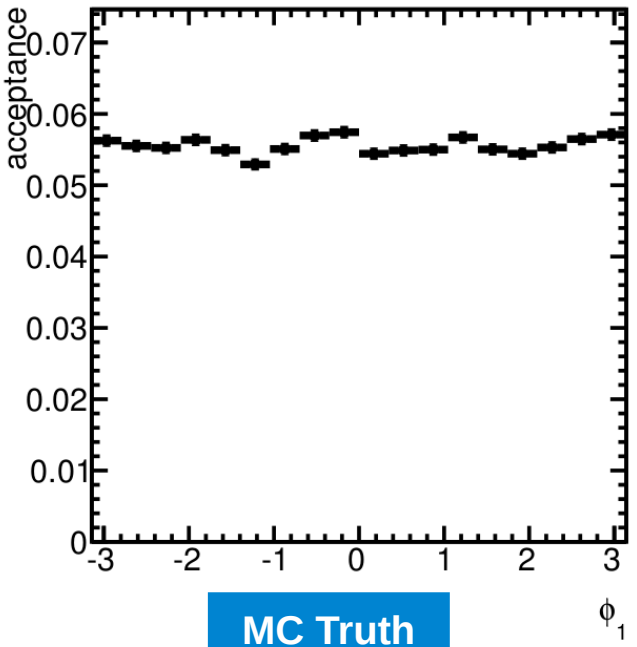
truth

0p

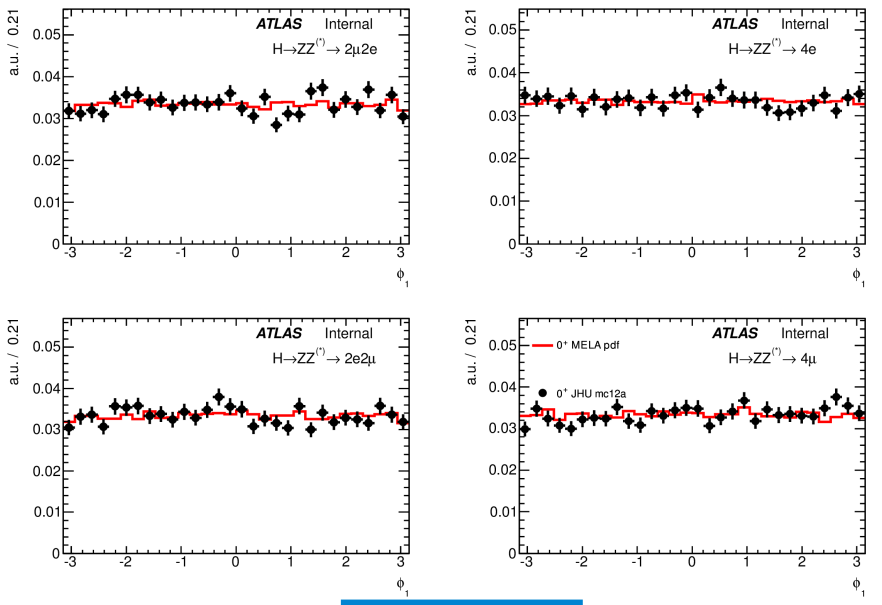
phi1



JHU paper



MC Truth

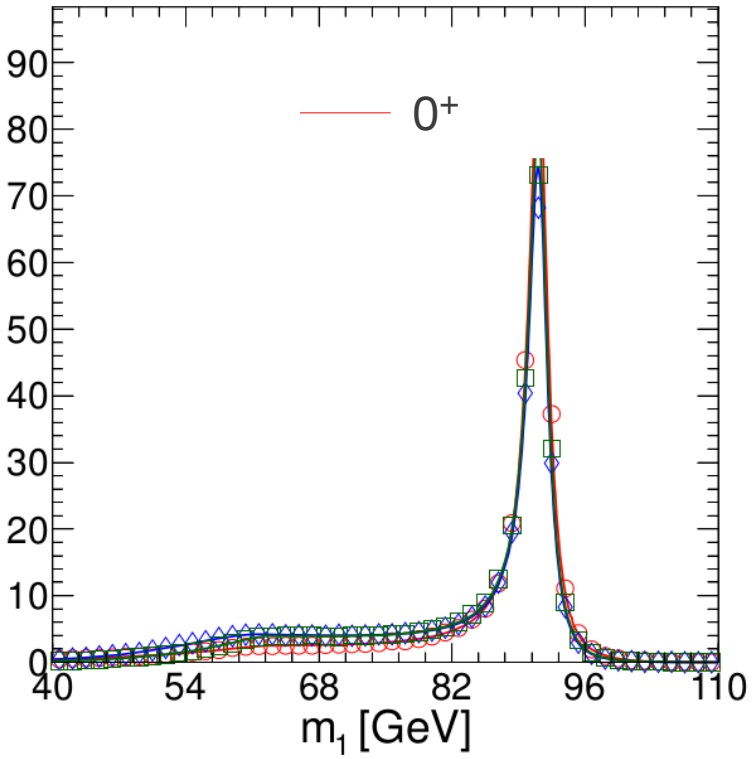


Toys vs MC

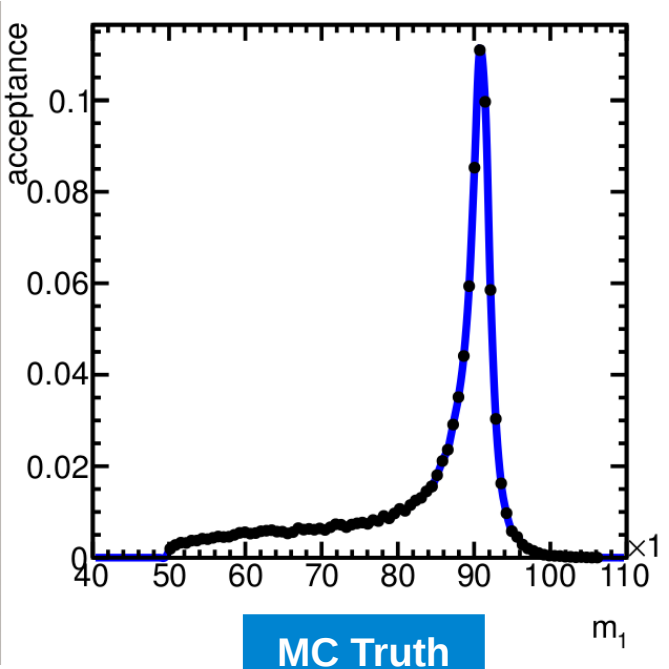
truth

0p

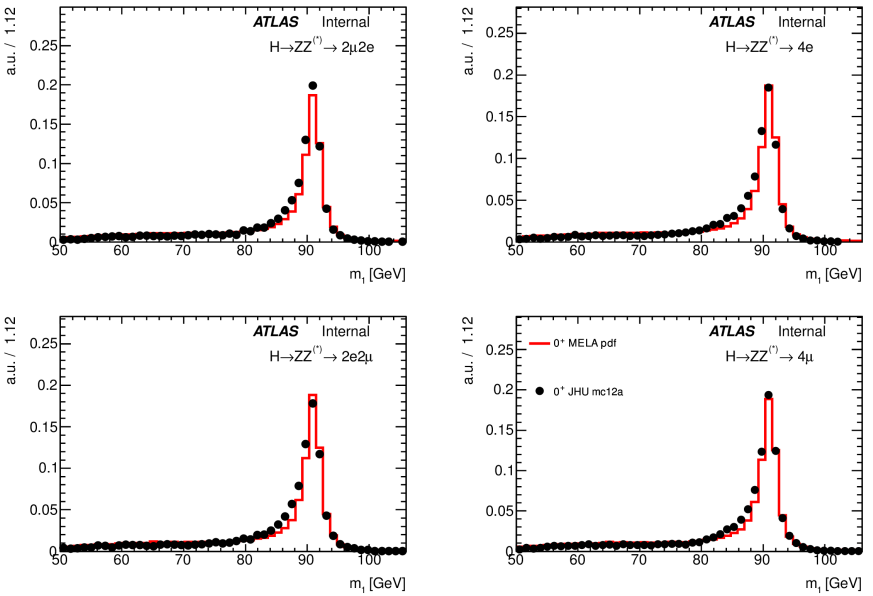
m1



JHU paper



MC Truth

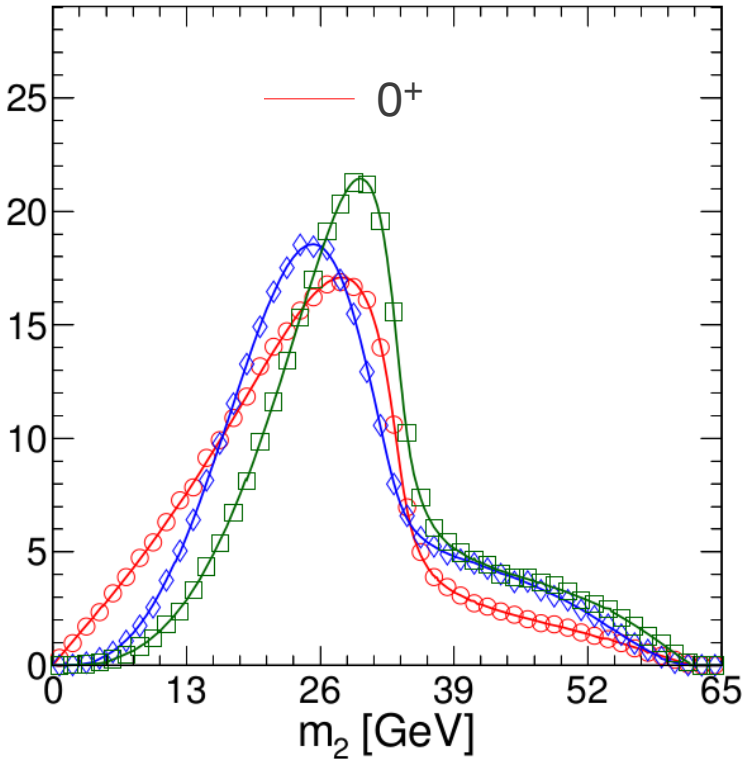


Toys vs MC

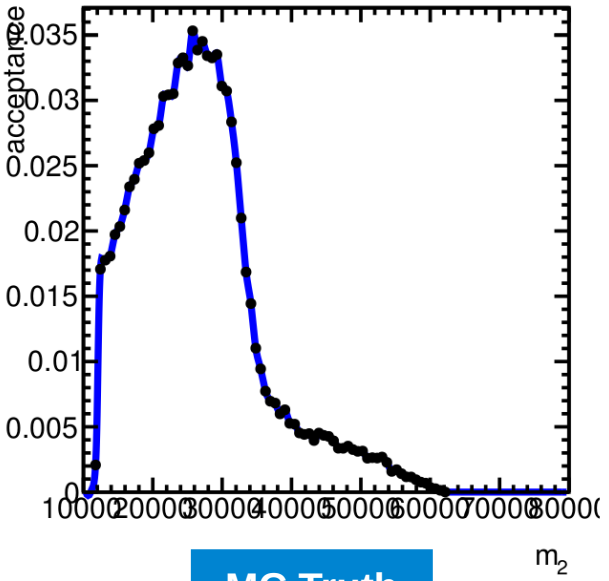
truth

0p

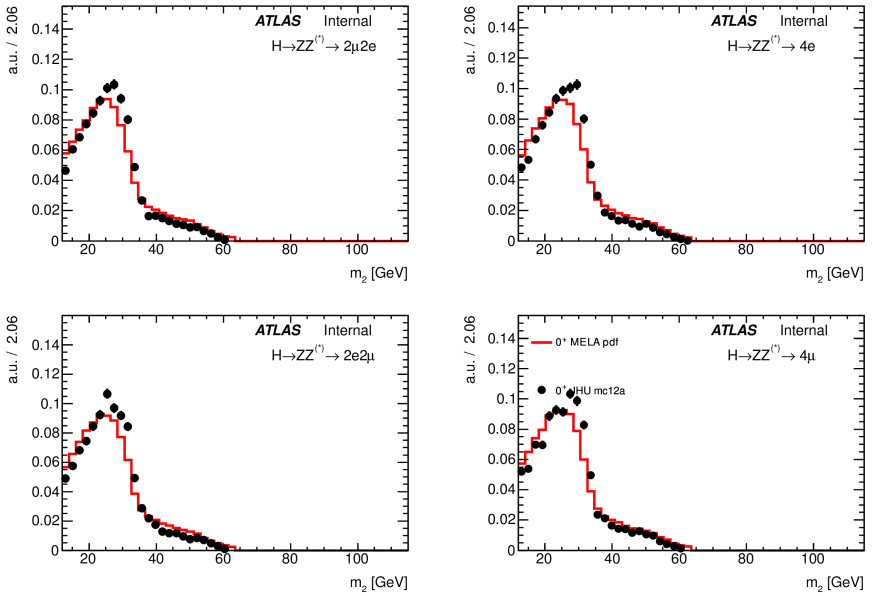
m2



JHU paper



MC Truth

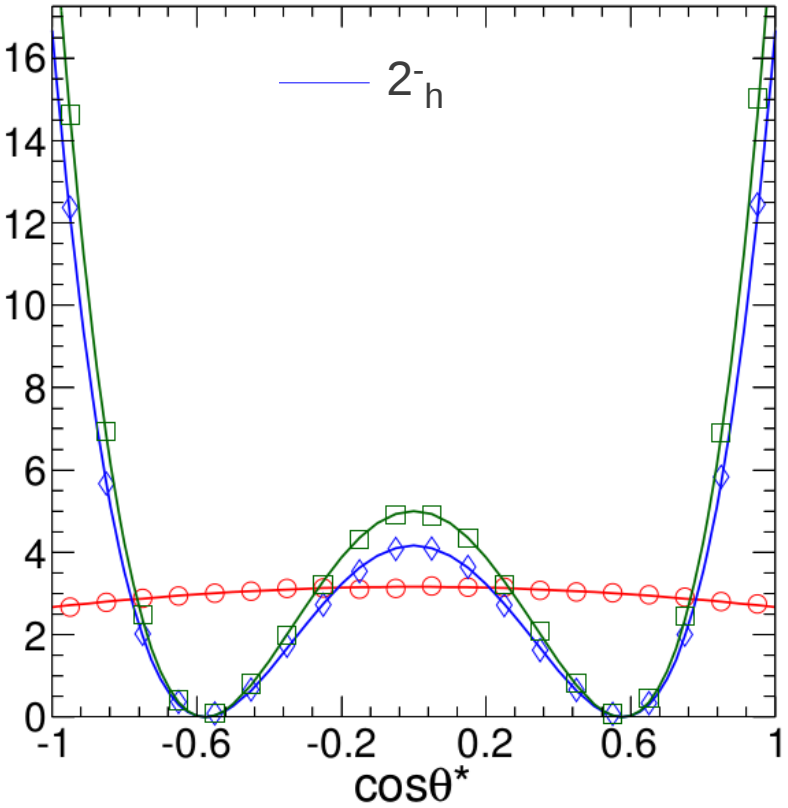


Toys vs MC

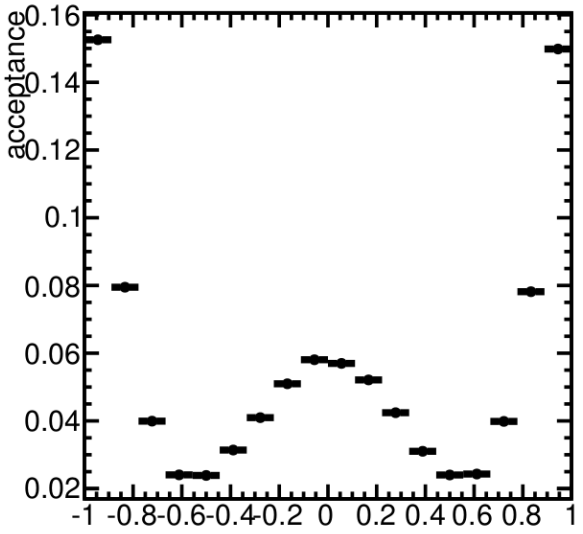
truth

2mh

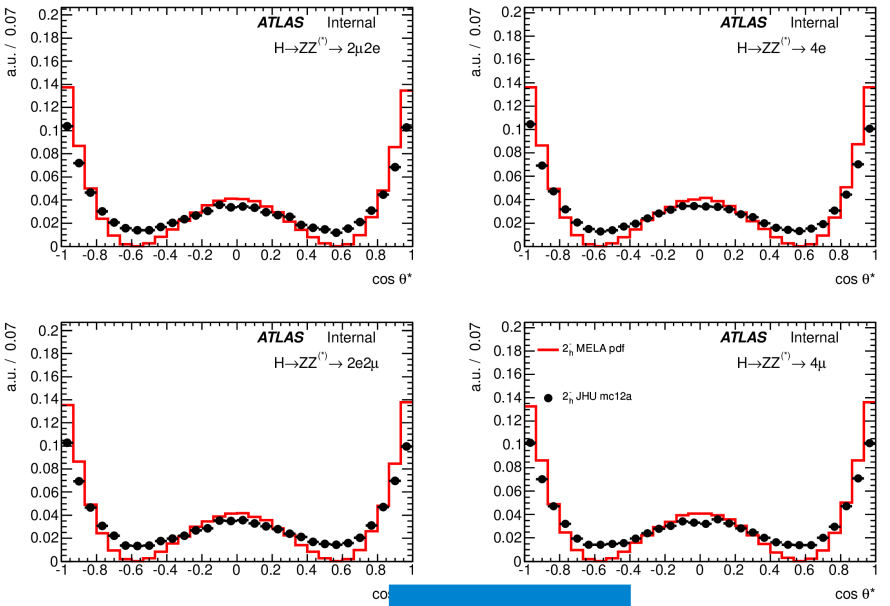
cth



JHU paper



MC Truth

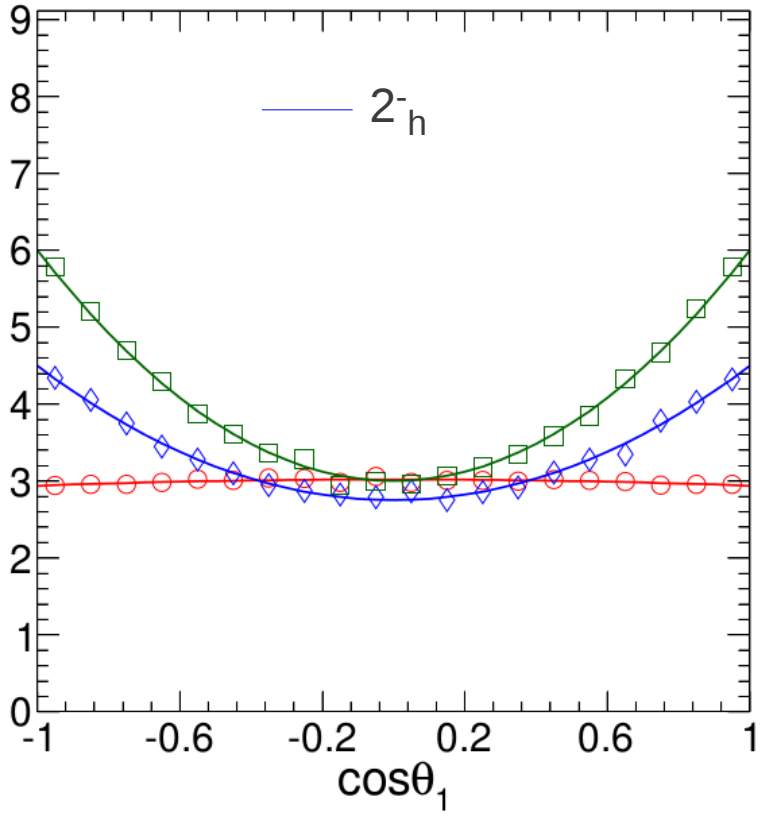


Toys vs MC

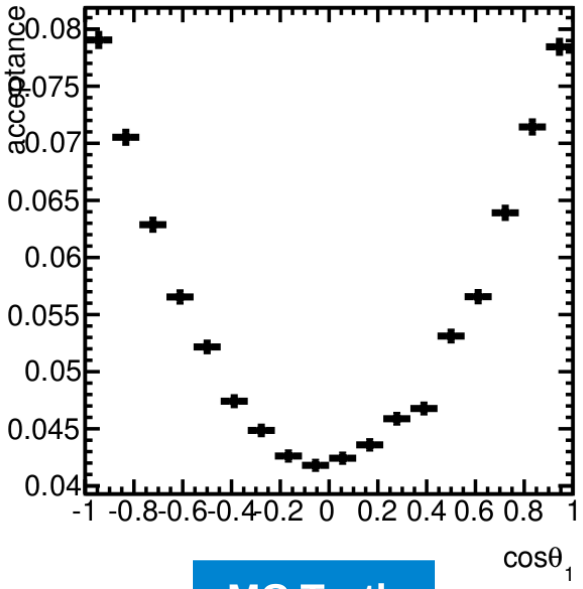
truth

2mh

cth1

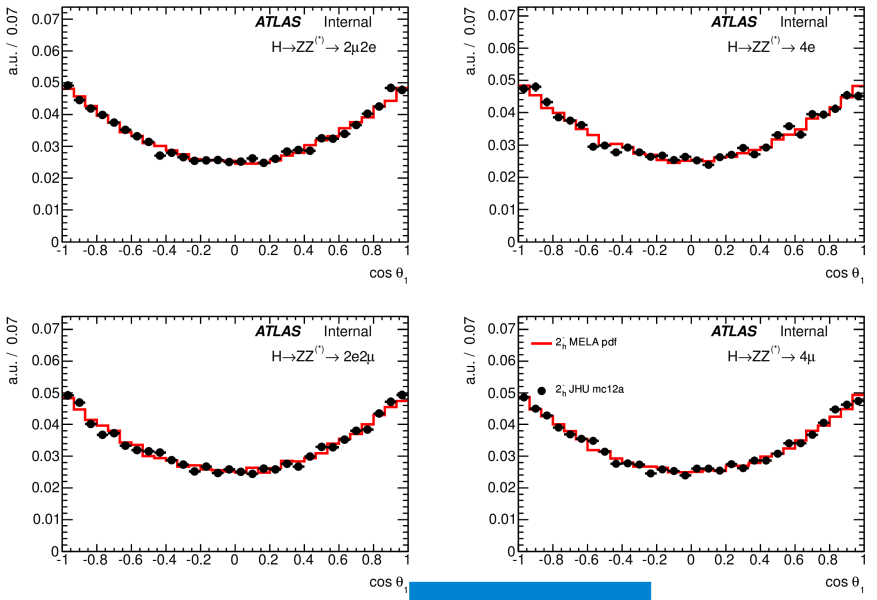


JHU paper



MC Truth

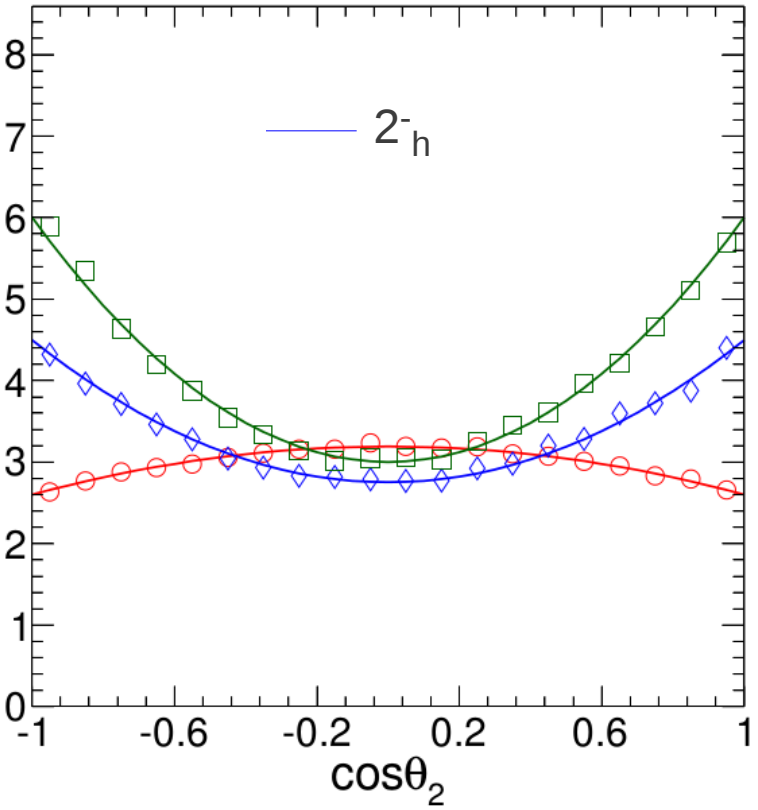
truth



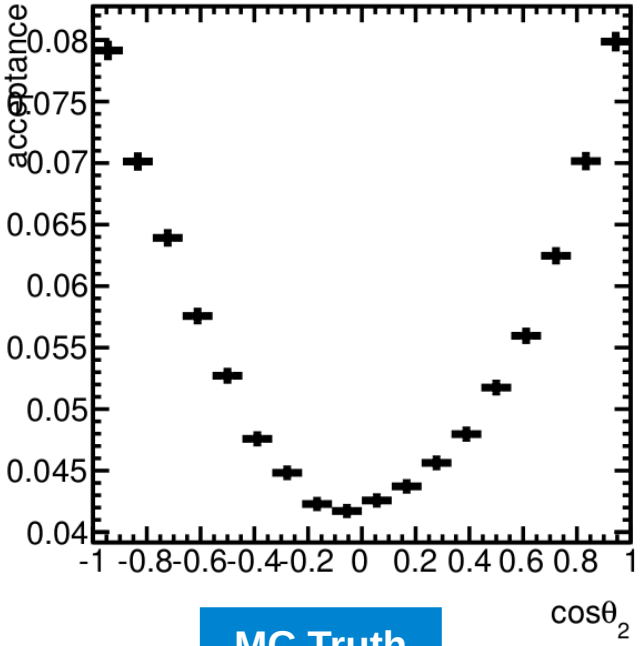
Toys vs MC

2mh

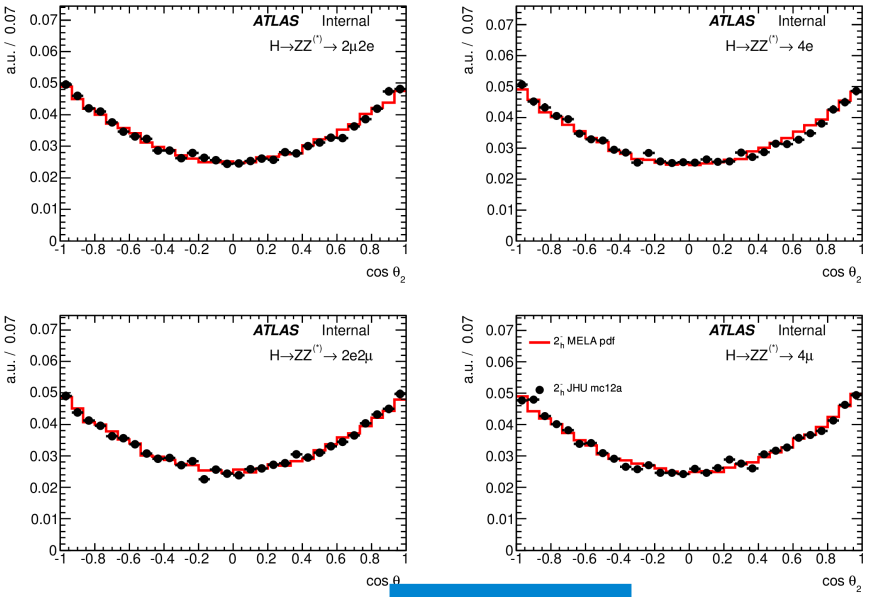
cth2



JHU paper



MC Truth



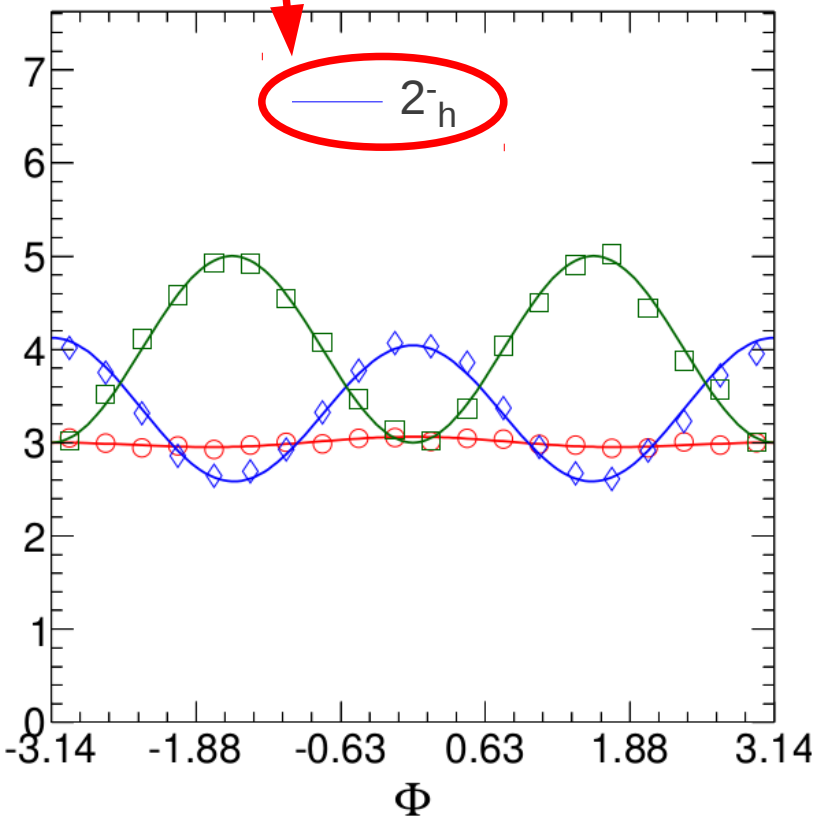
Toys vs MC

truth

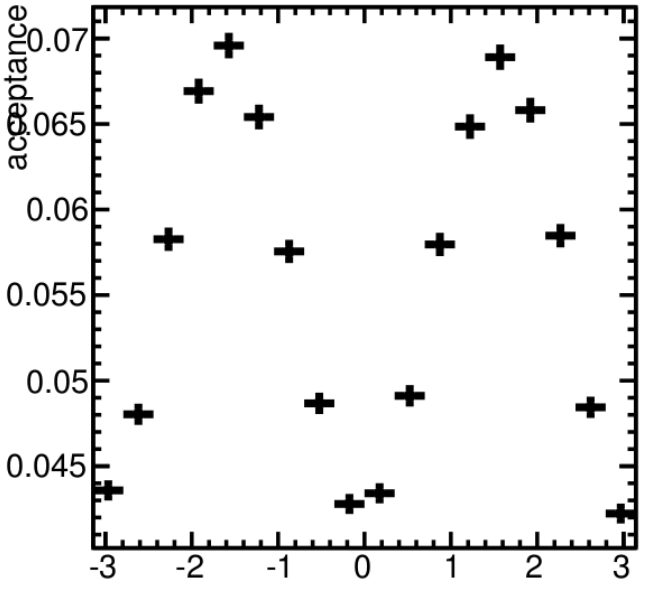
2mh

phi

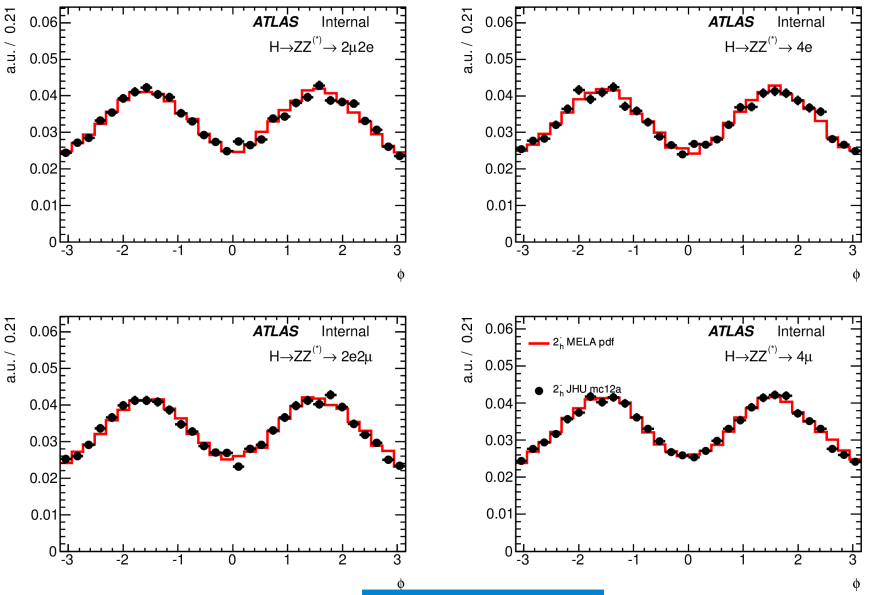
Errore del PAPER!
La distribuzione in phi per il caso 2mh è la curva **verde**



JHU paper



MC Truth

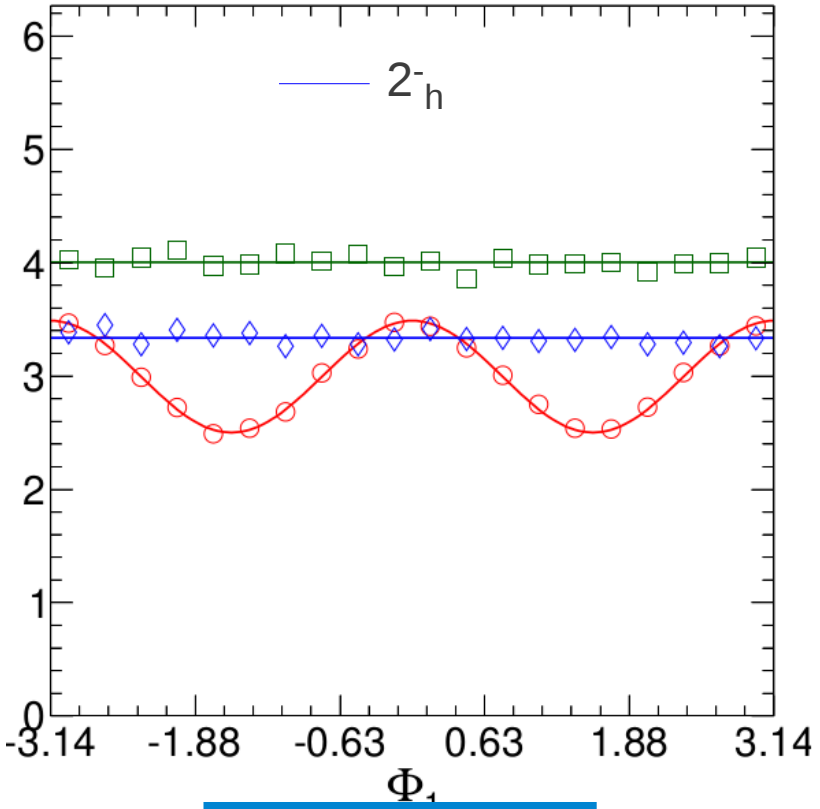


Toys vs MC

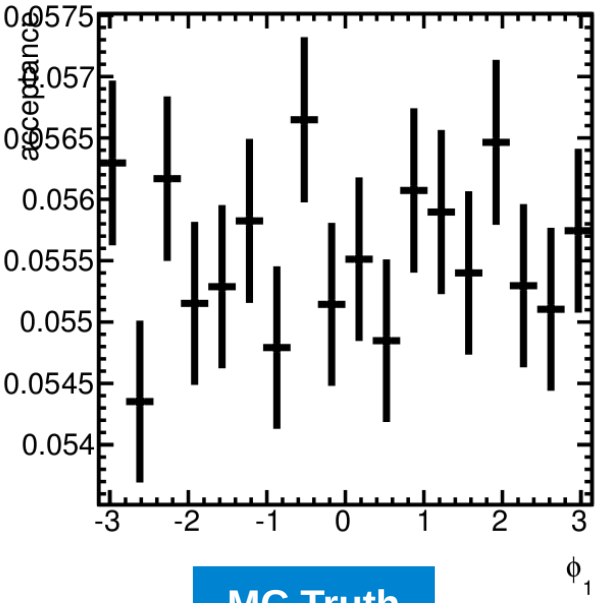
truth

2mh

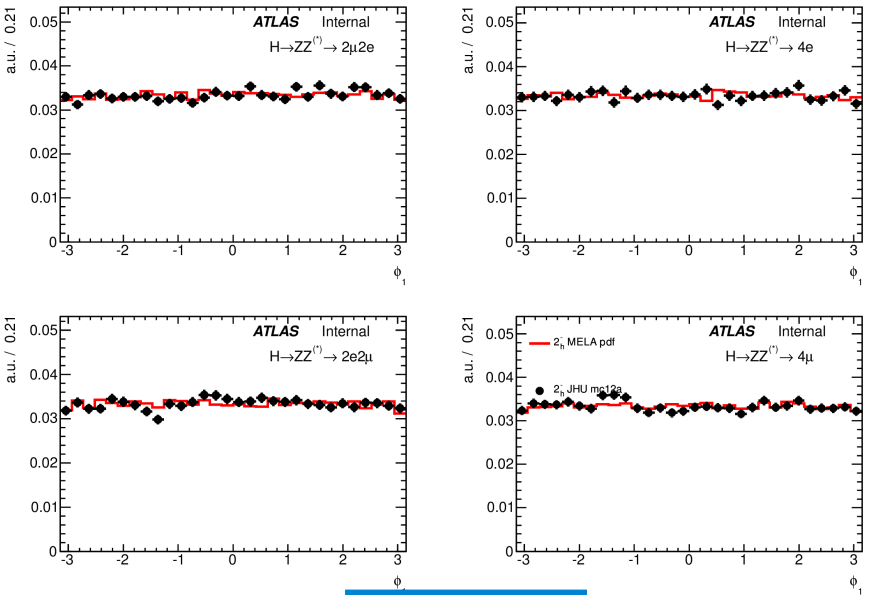
phi1



JHU paper



MC Truth

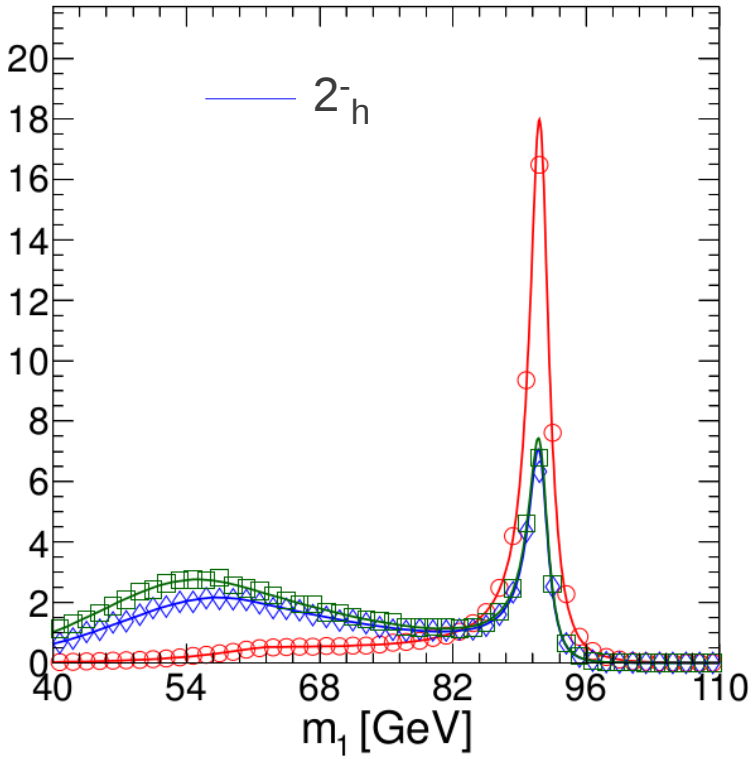


Toys vs MC

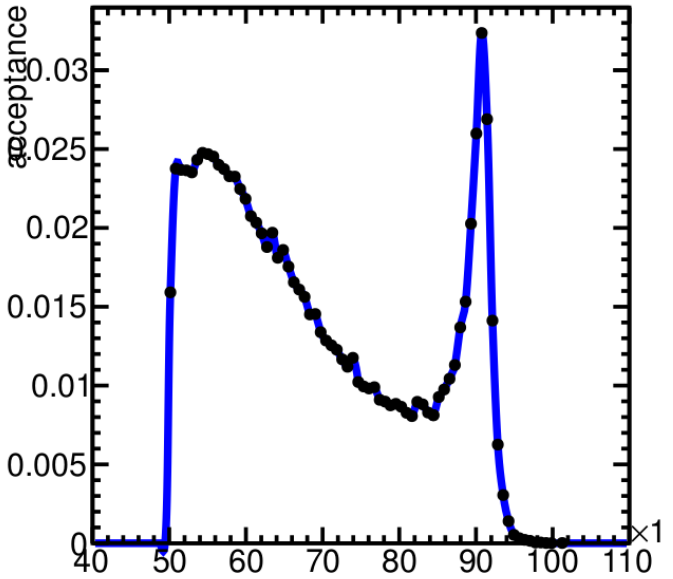
truth

2mh

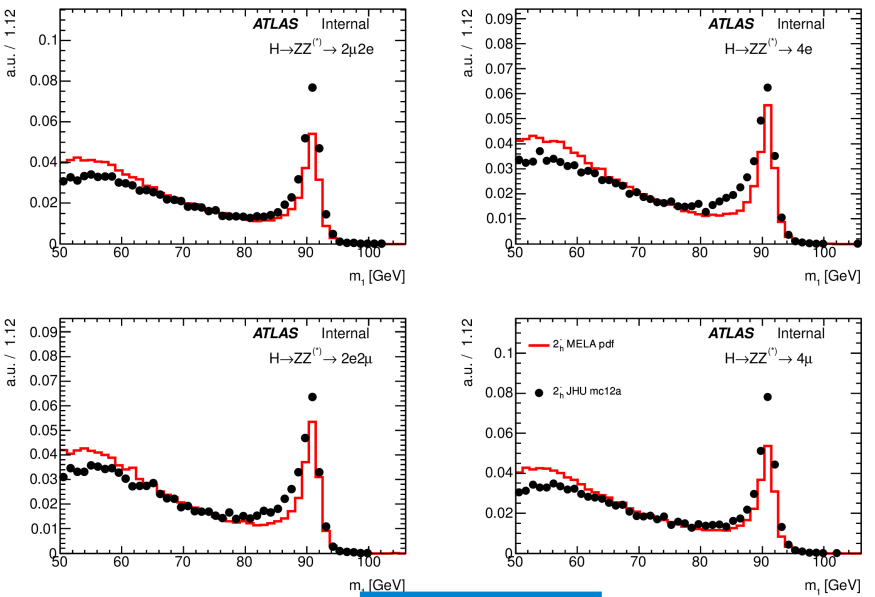
m1



JHU paper



MC Truth

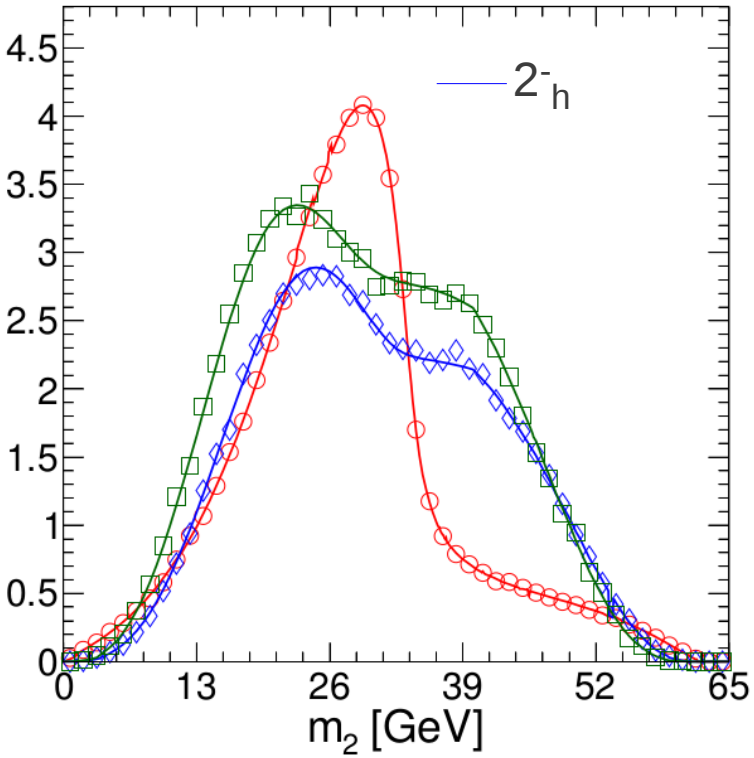


Toys vs MC

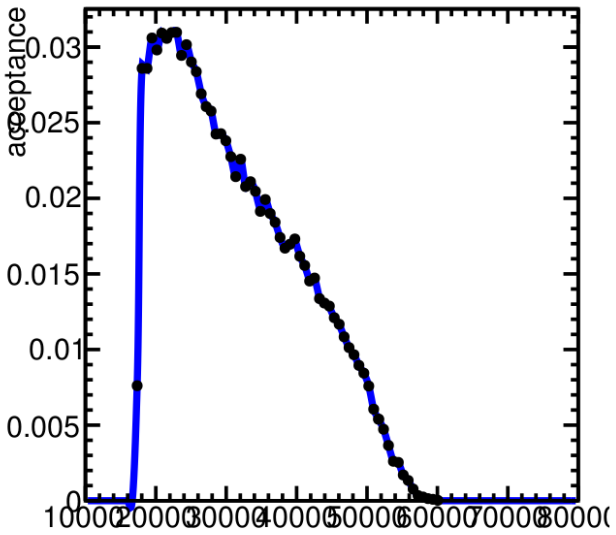
truth

2mh

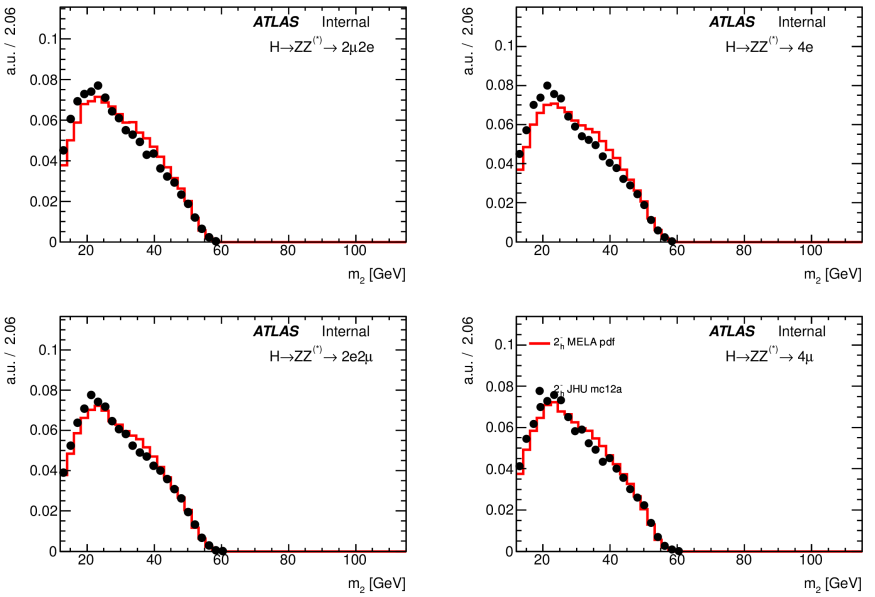
m2



JHU paper



MC Truth

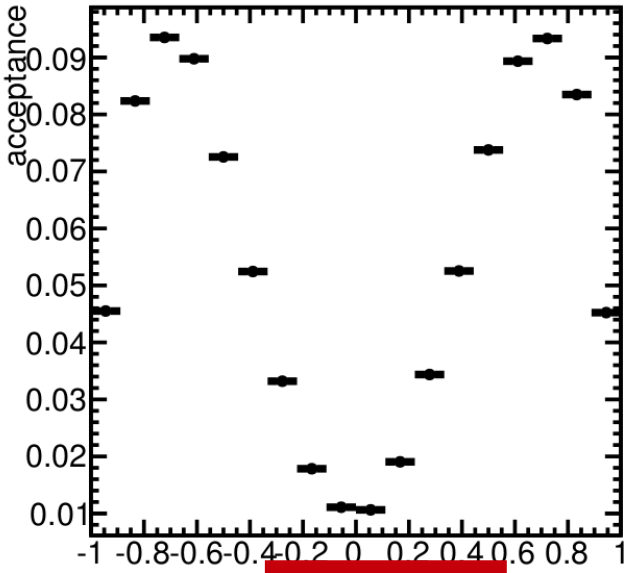


Toys vs MC

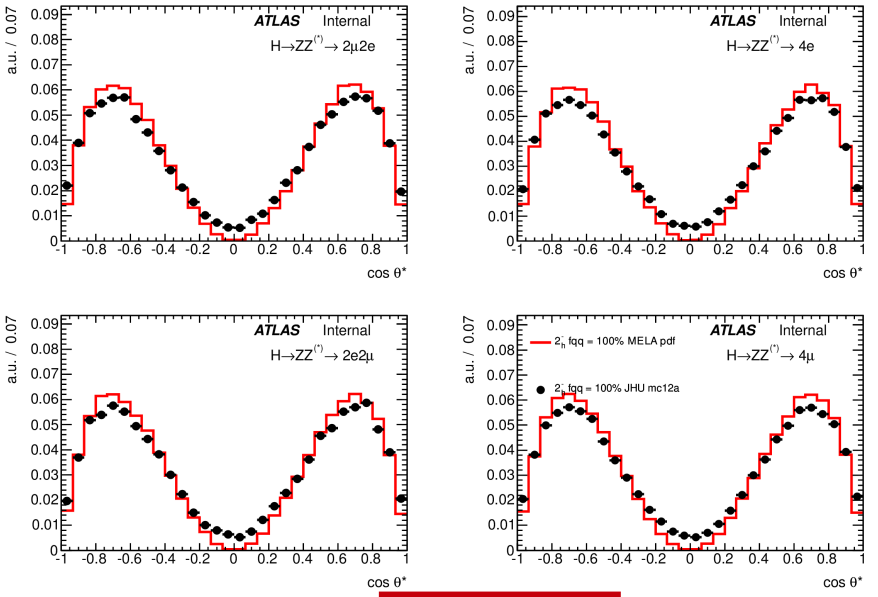
truth

2mh_fqq100

cth



MC Truth

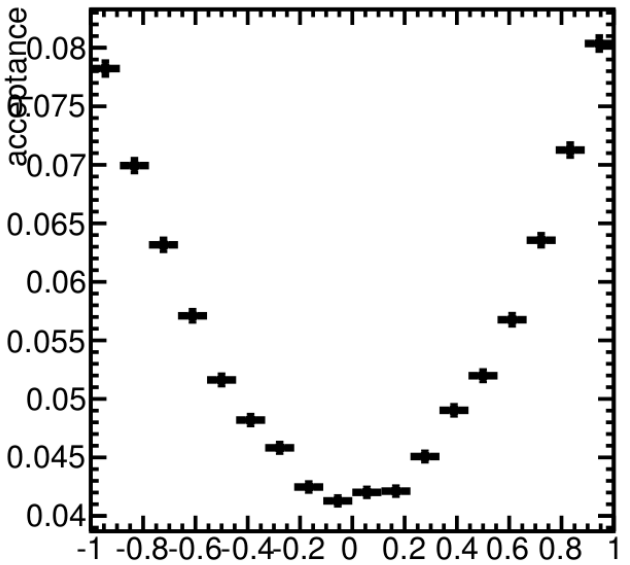


Toys vs MC

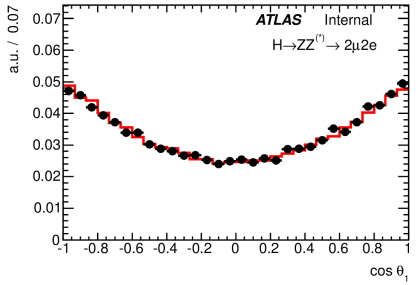
truth

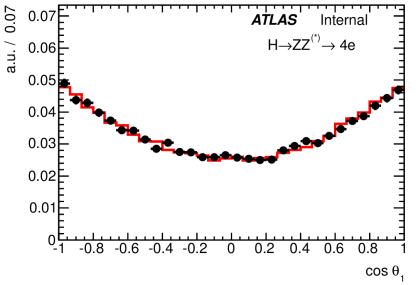
2mh_fqq100

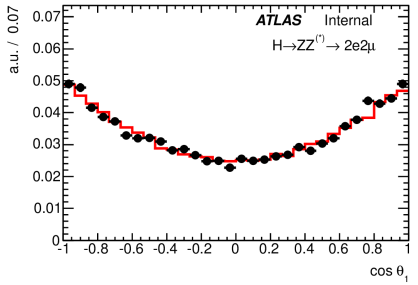
cth1

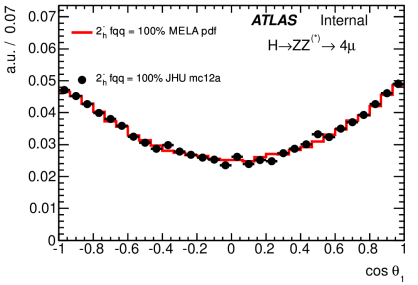


MC Truth







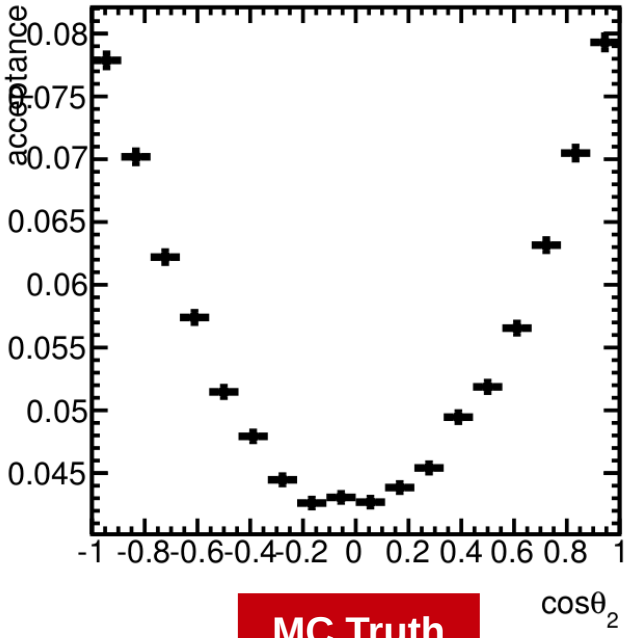


Toys vs MC

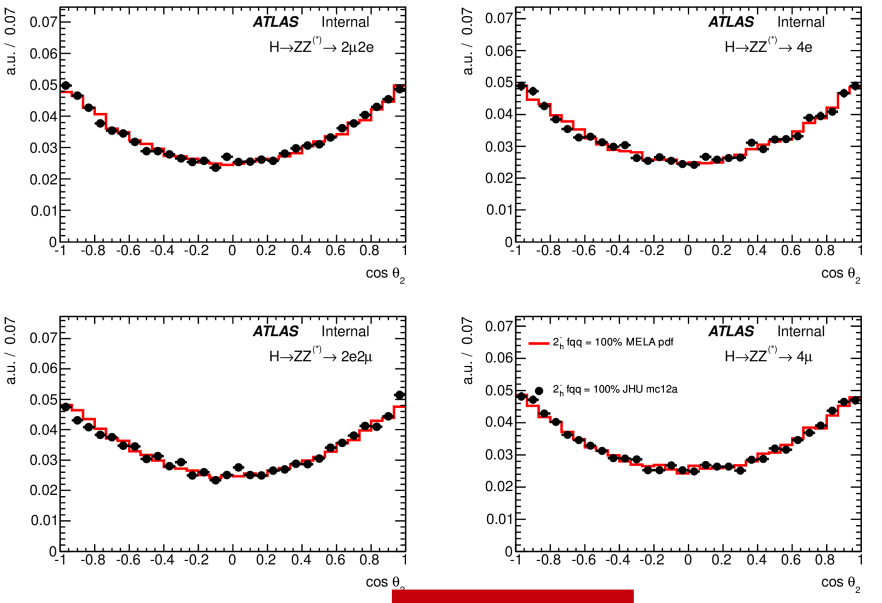
truth

2mh_fqq100

cth2



MC Truth

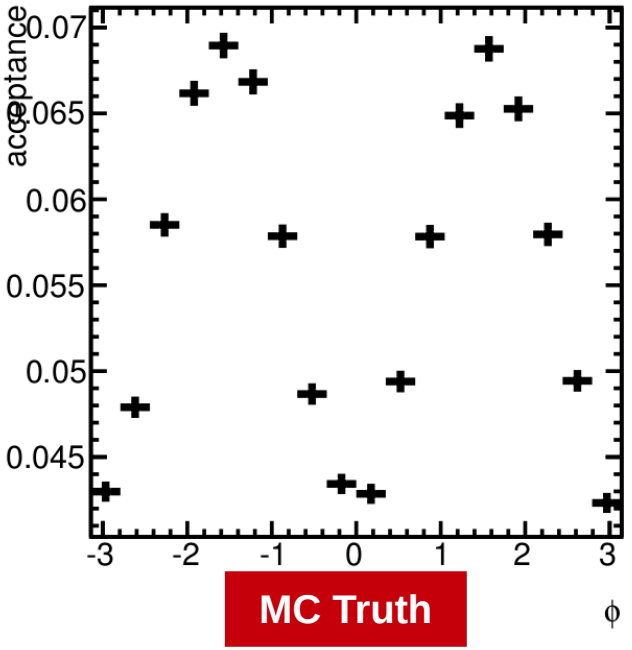


Toys vs MC

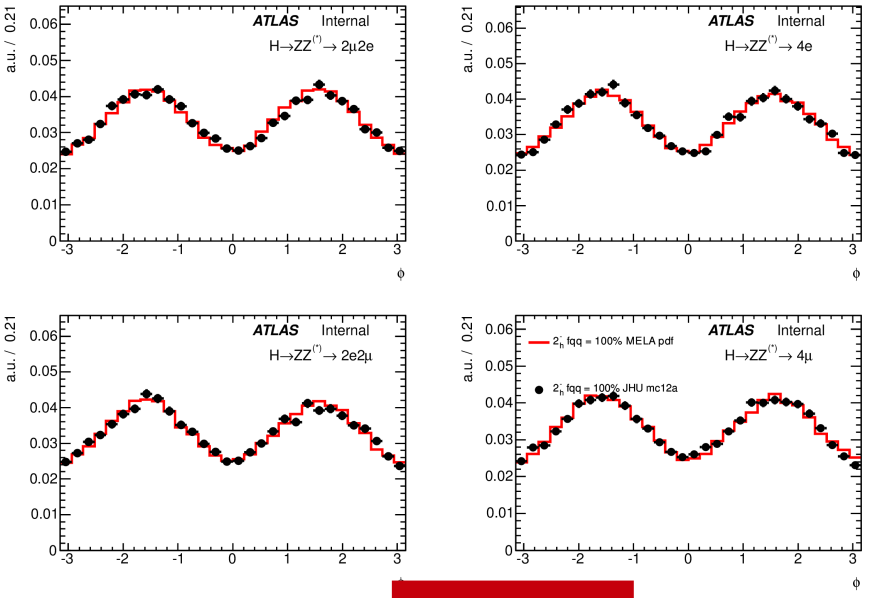
truth

2mh_fqq100

phi



MC Truth

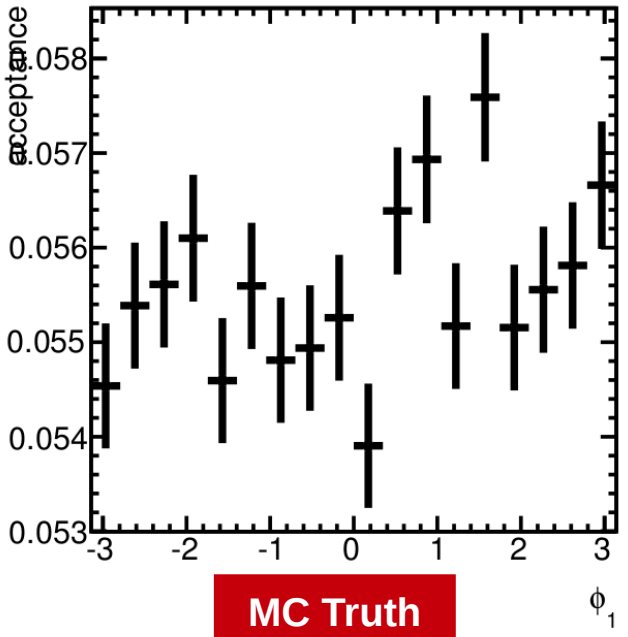


Toys vs MC

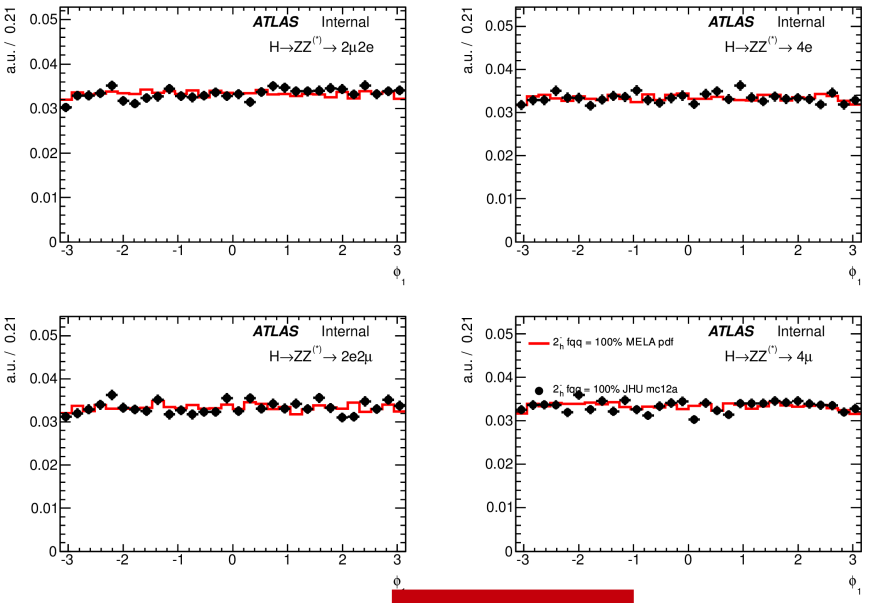
truth

2mh_fqq100

phi1



MC Truth

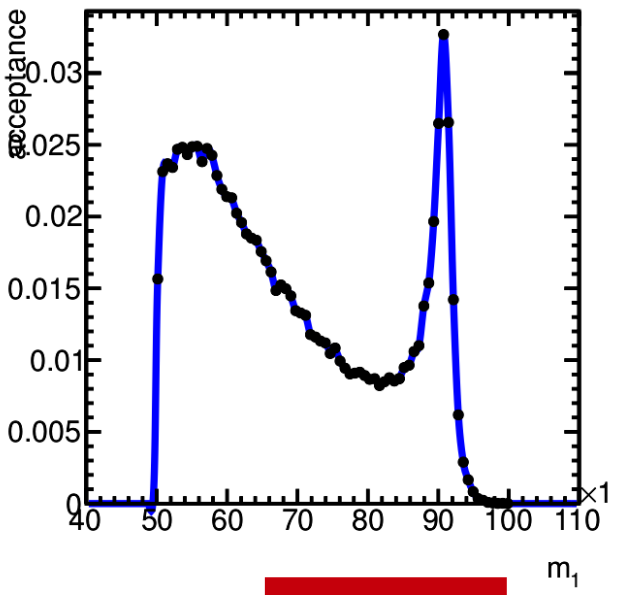


Toys vs MC

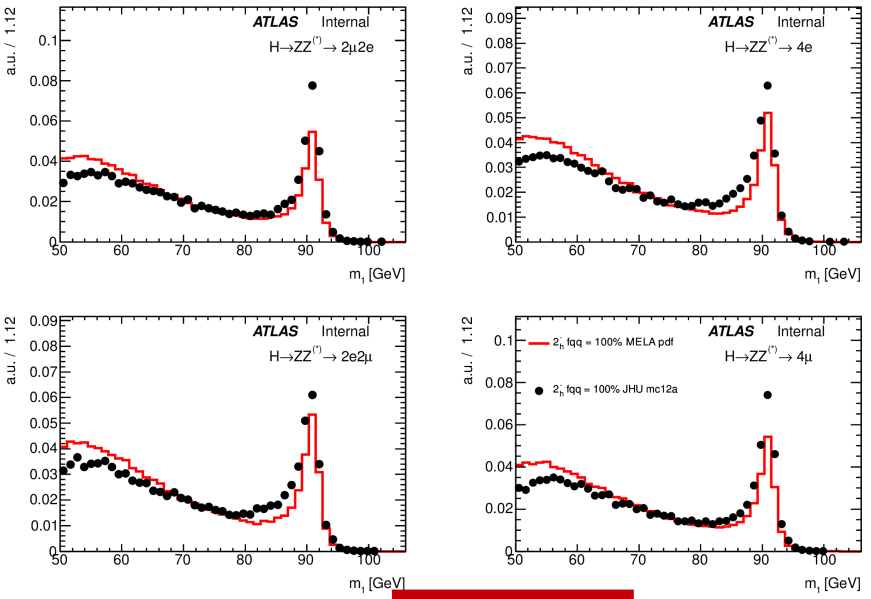
truth

2mh_fqq100

m1



MC Truth

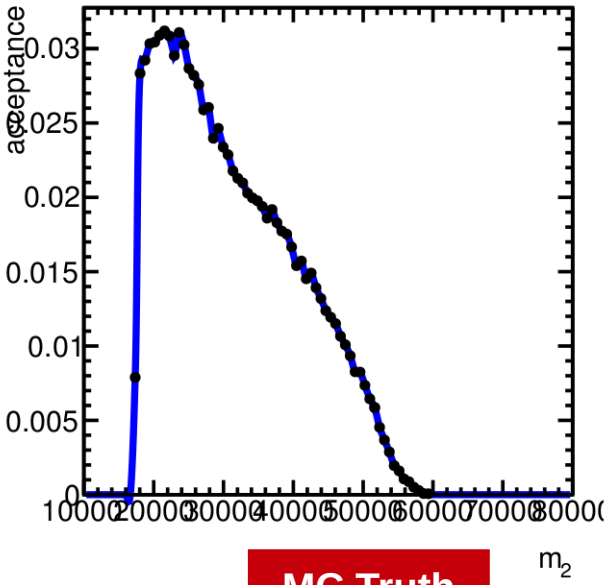


truth

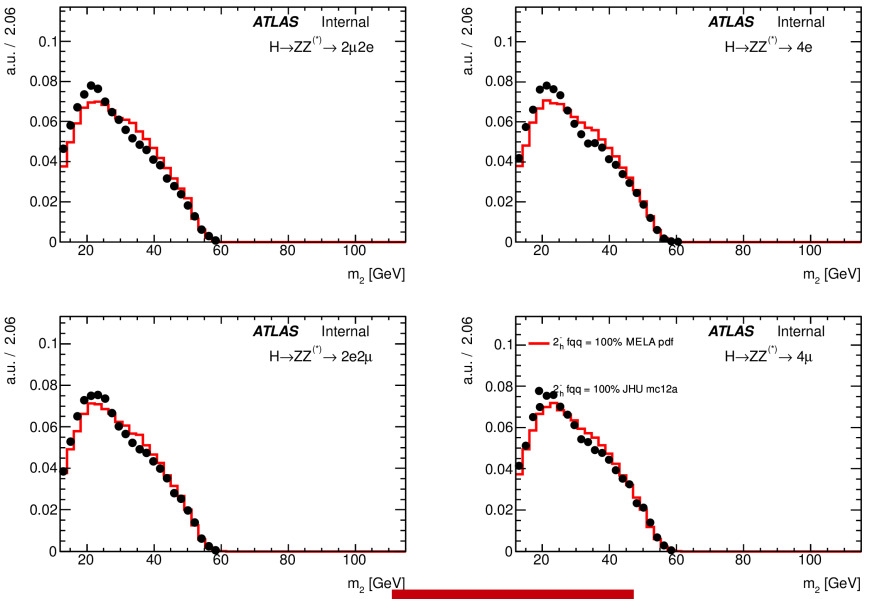
Toys vs MC

2mh_fqq100

m2



MC Truth



Toys vs MC

truth

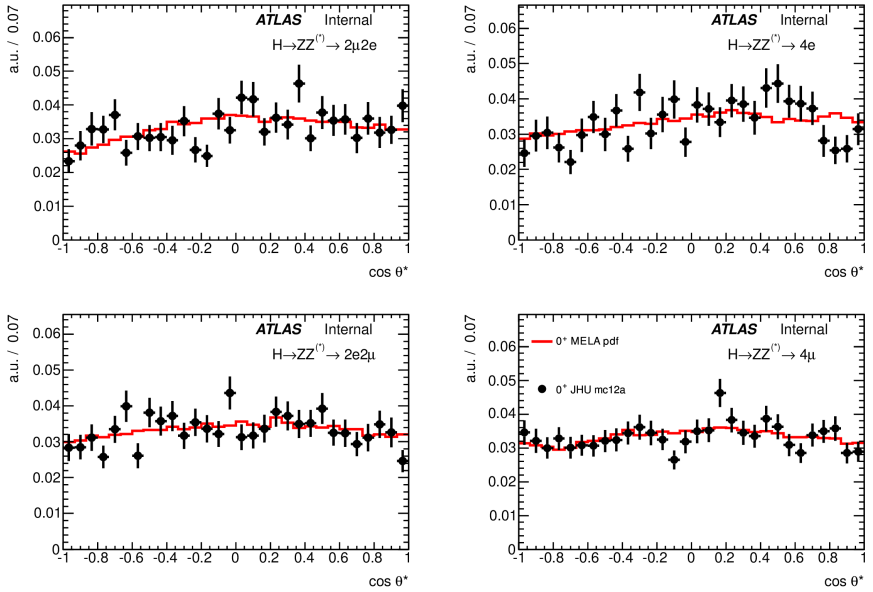
Nei closure truth si nota il **disaccordo** tra **nominal_mc_12_truth** (punti neri) e **nominal_toys_truth** (curva rossa) nelle distribuzioni:
cos(θ*), m1 e **m2**.

Procedo con la **produzione dei closure test** per i nuovi casi di spin per le distribuzioni **reco**.

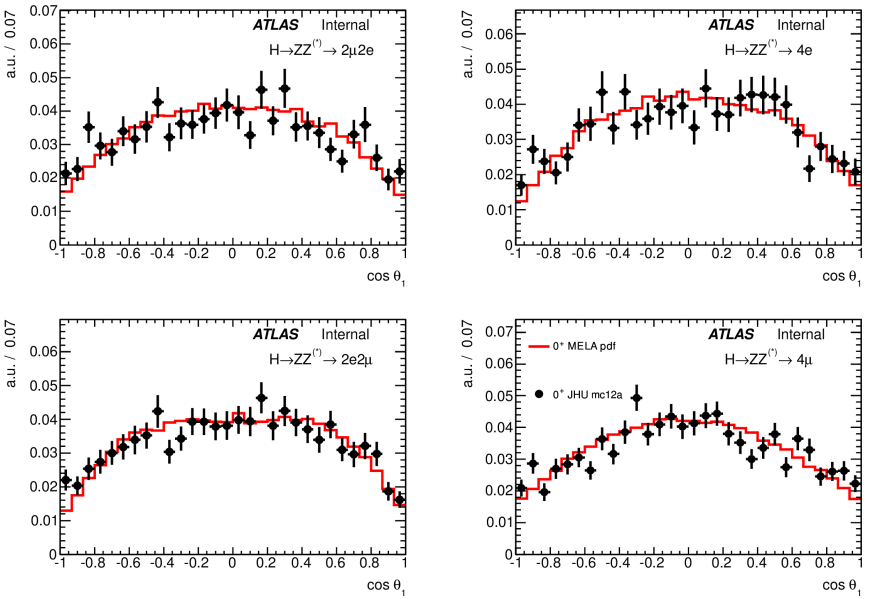
SELEZIONI reco:
distribuzioni costruite sull'**intera statistica**
“selected==1 && (H_m_fsr_constrained>115000 && H_m_fsr_constrained<130000)” + JHU_w

0p

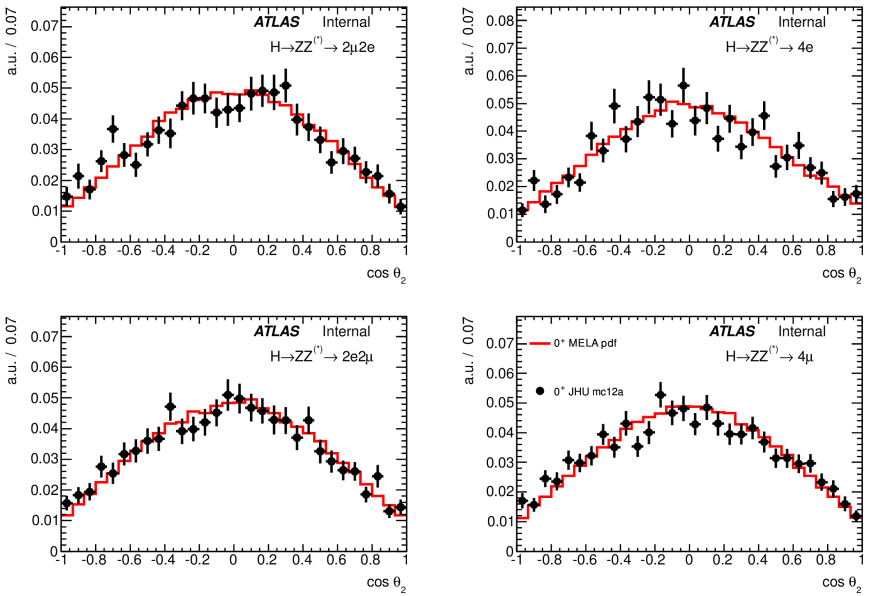
cth



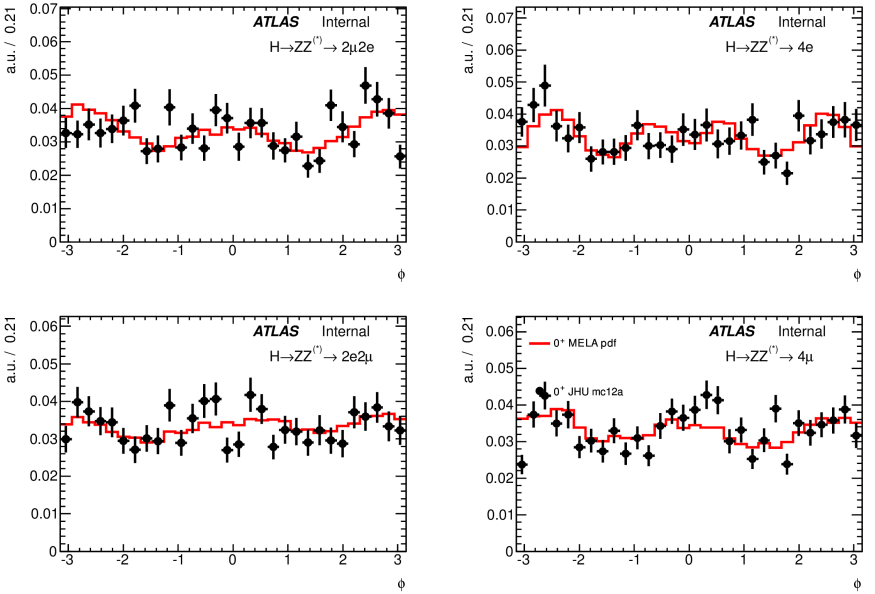
cth1



cth2



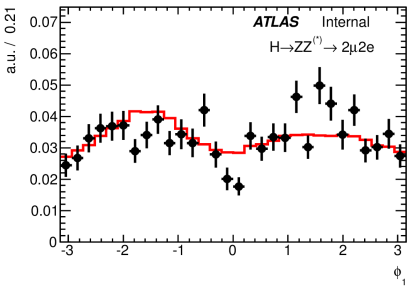
phi

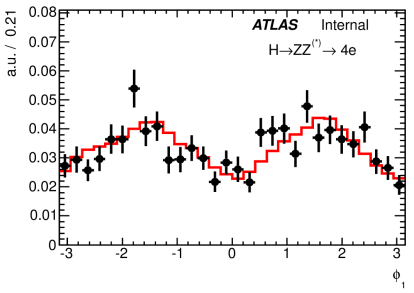


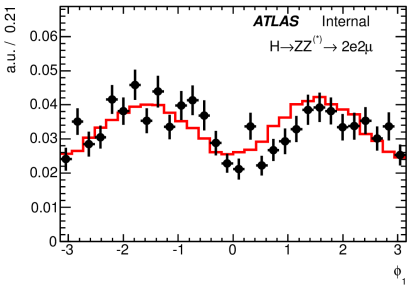
reco: Toys vs MC

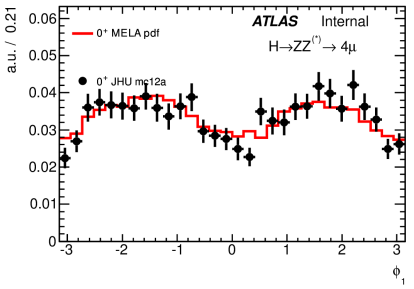
0p

phi1

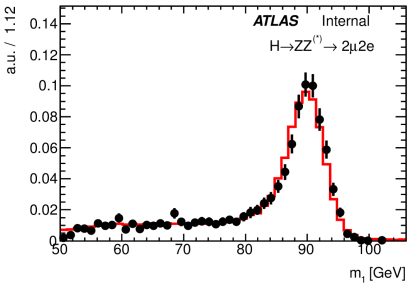


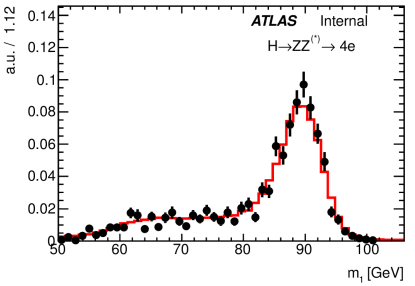


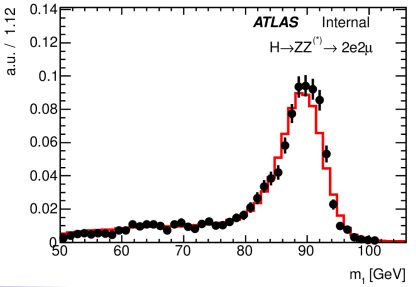


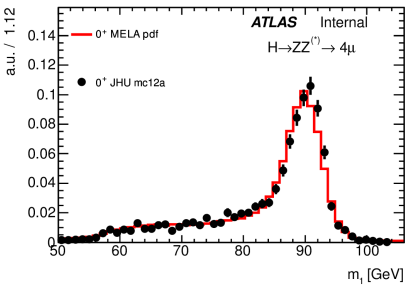


m1

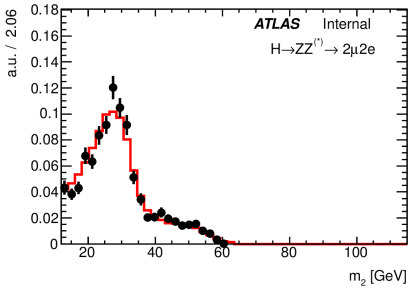


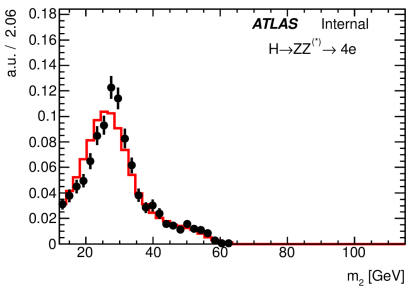


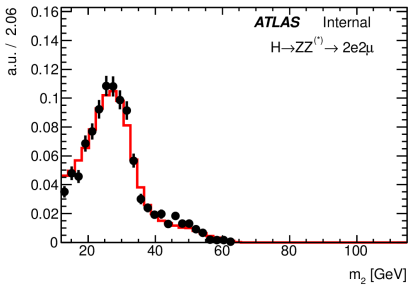


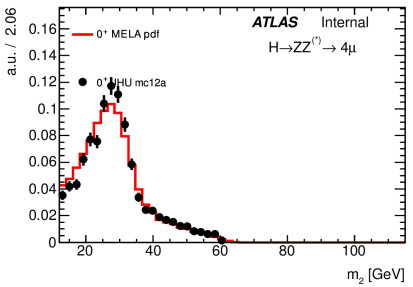


m2

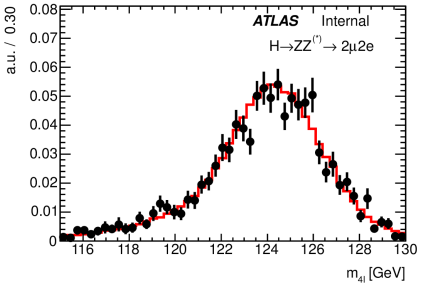


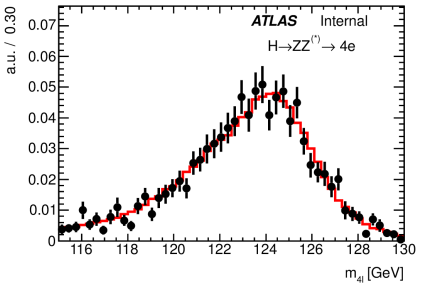


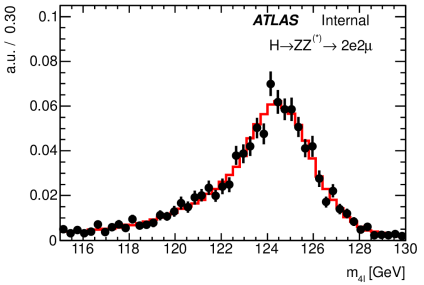


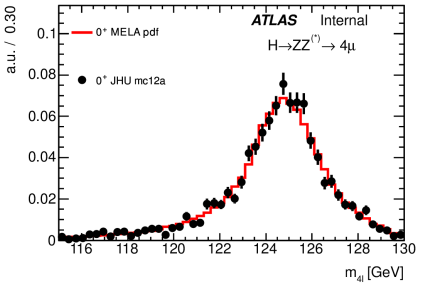


m4l





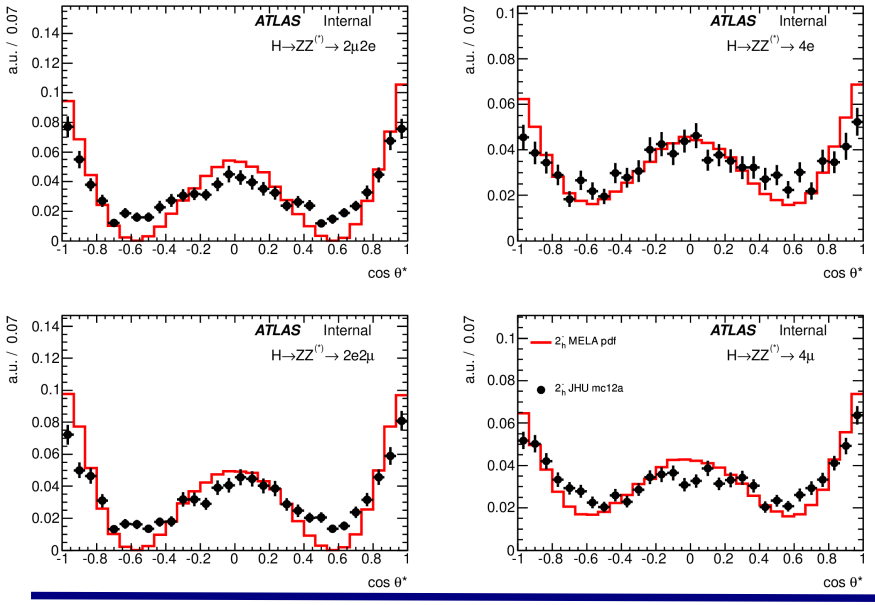




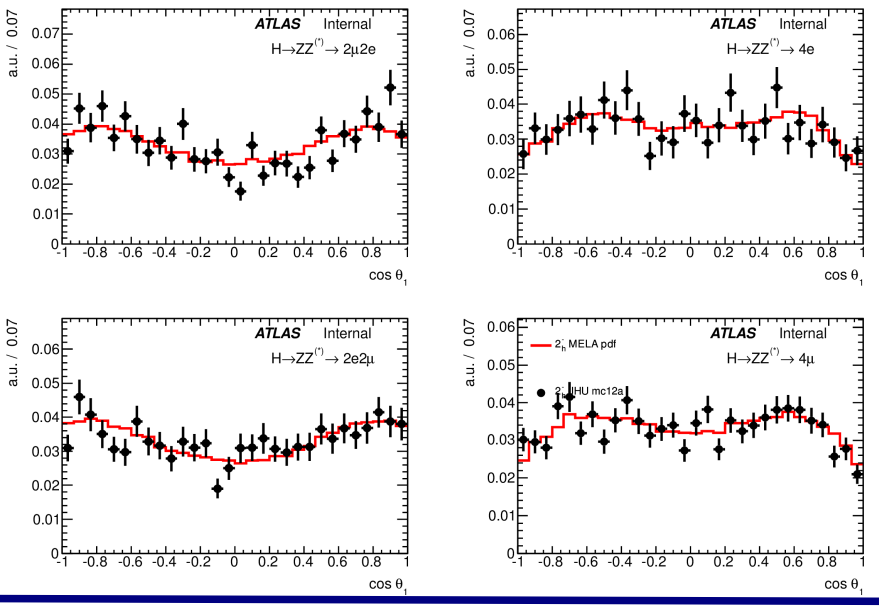
reco: Toys vs MC

2mh

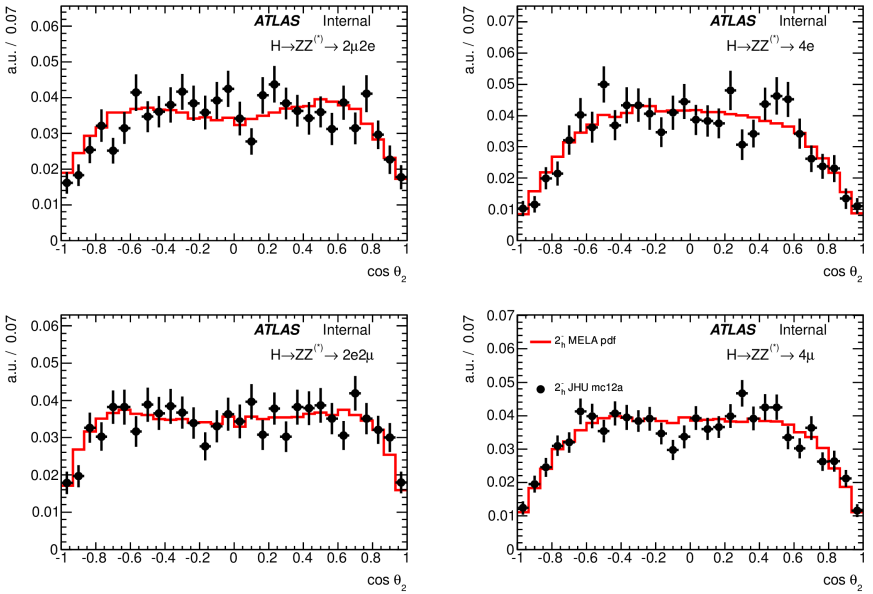
cth



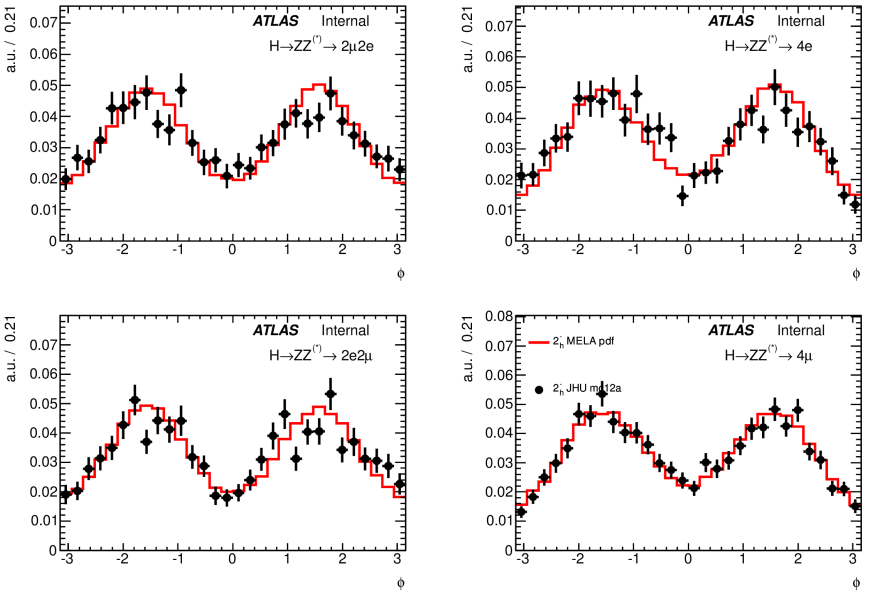
cth1



cth2



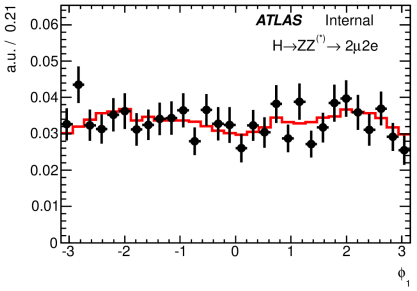
phi

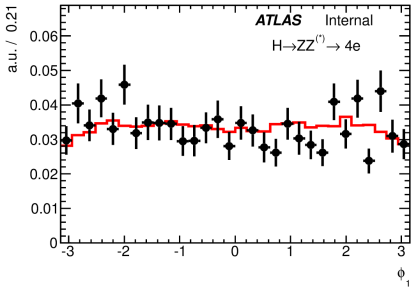


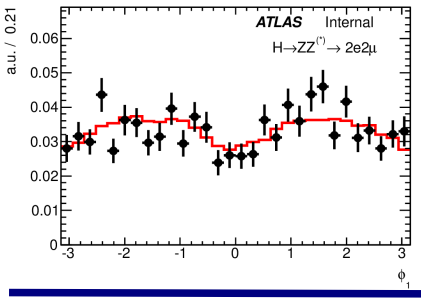
reco: Toys vs MC

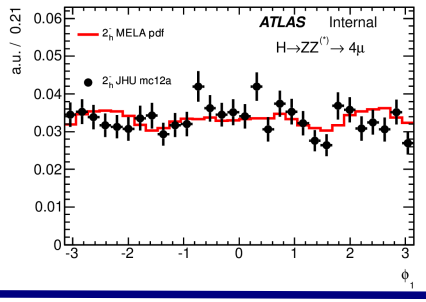
2mh

phi1

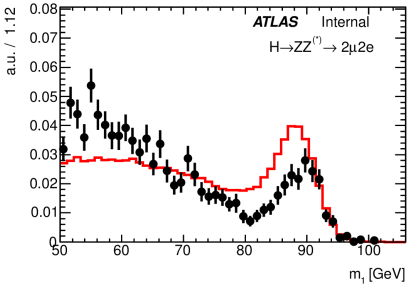


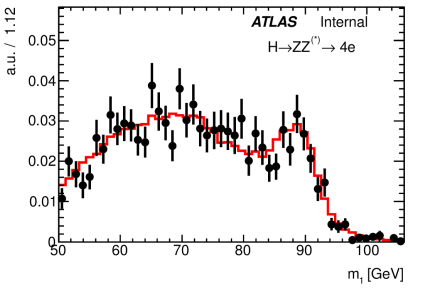


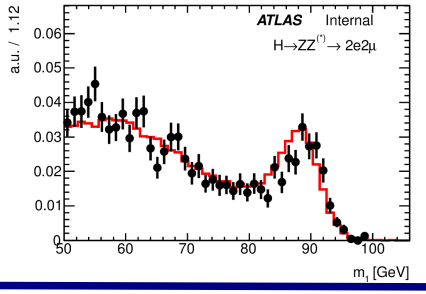


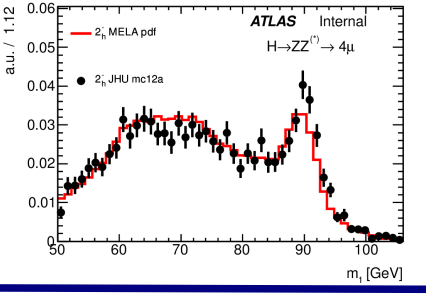


m1

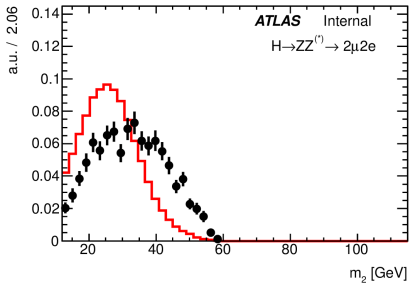


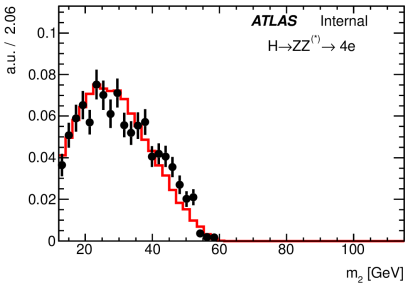


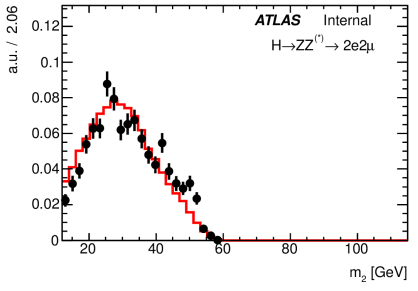


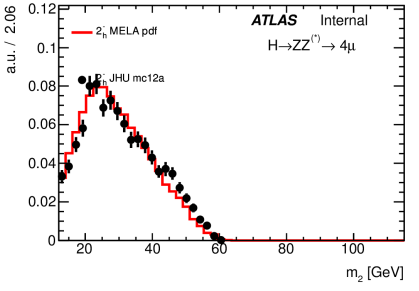


m2

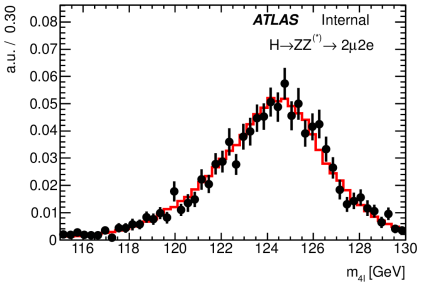


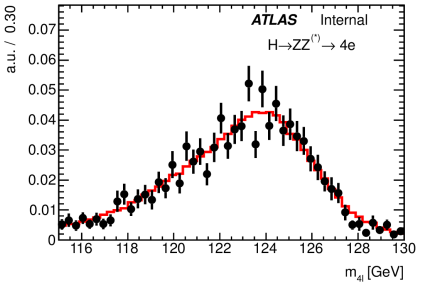


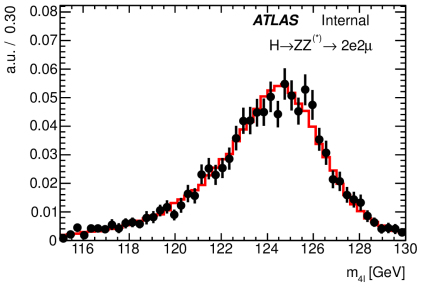


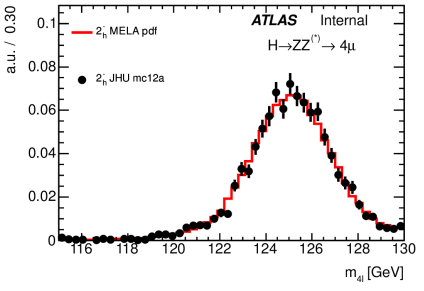


m4l





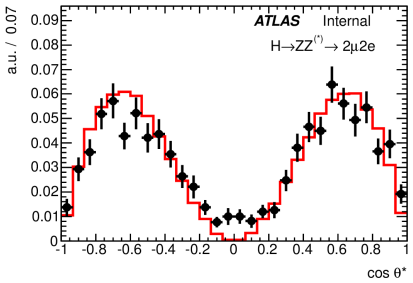


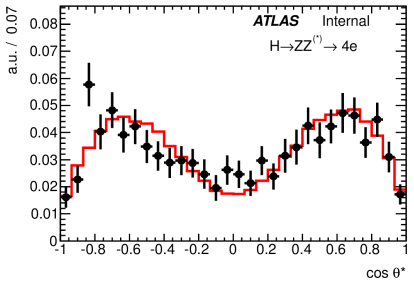


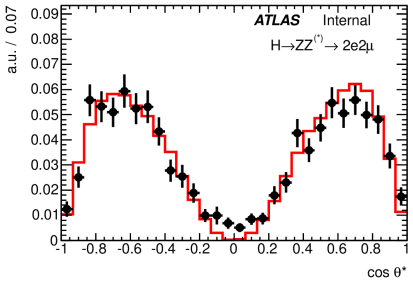
reco: Toys vs MC

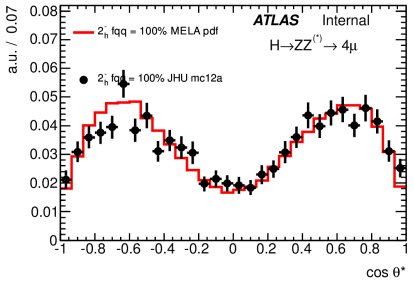
2mh_fqq100

cth

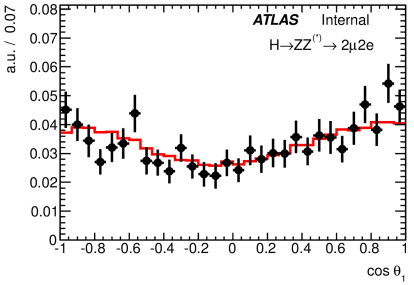


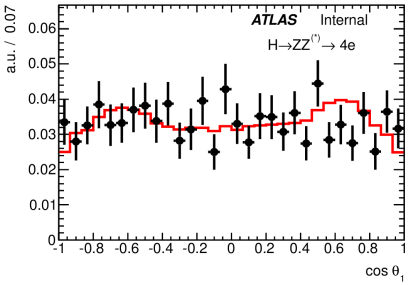


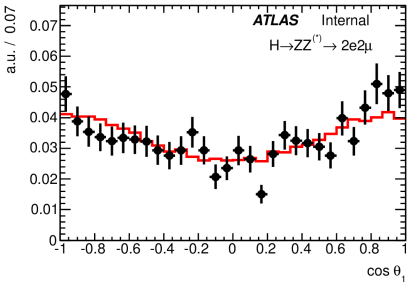


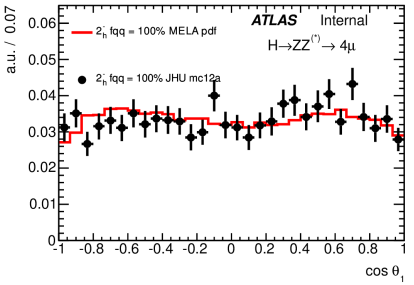


cth1

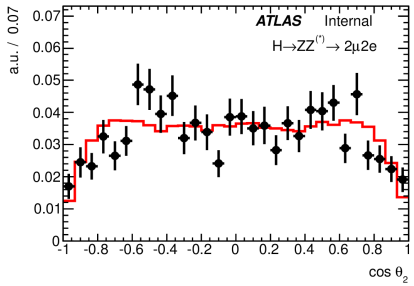


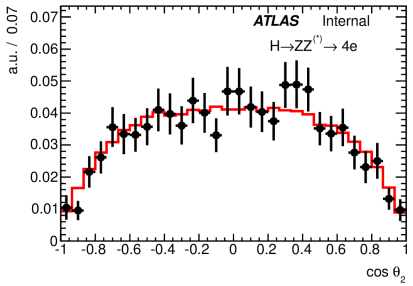


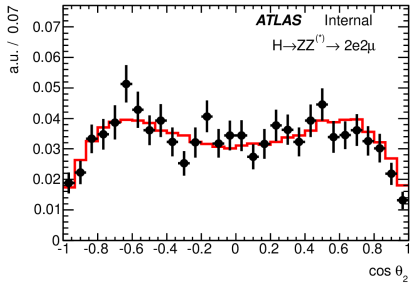


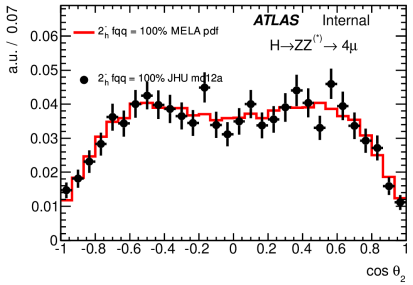


cth2

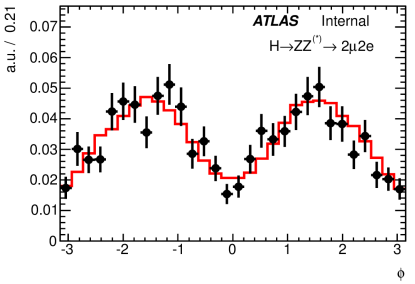


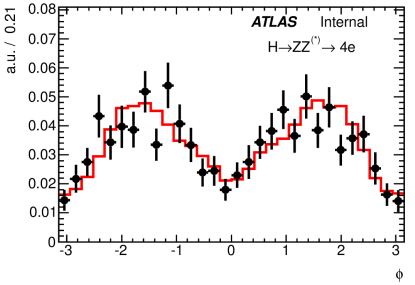


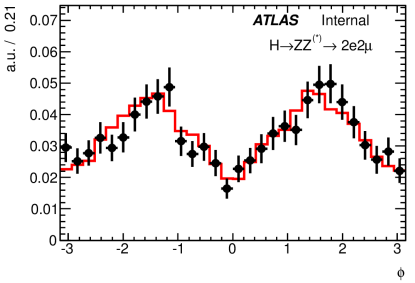


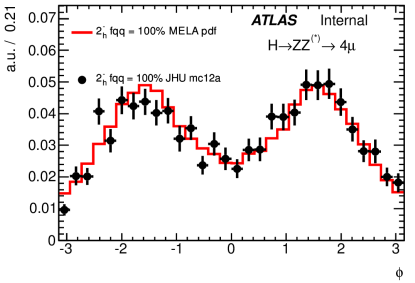


phi





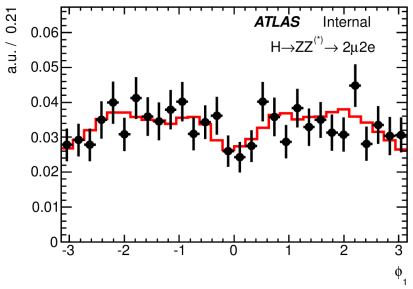


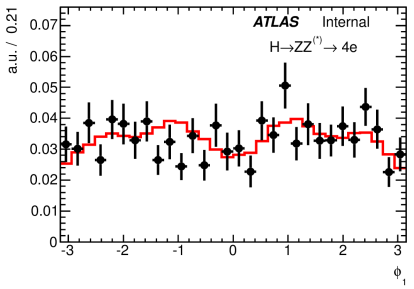


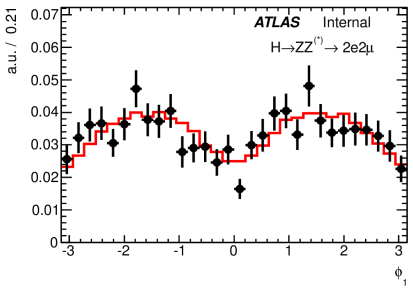
reco: Toys vs MC

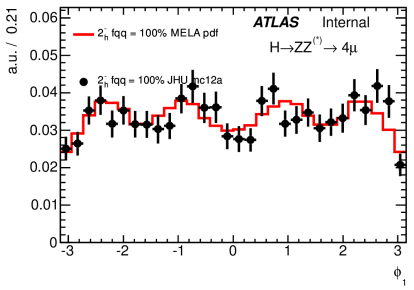
2mh_fqq100

phi1

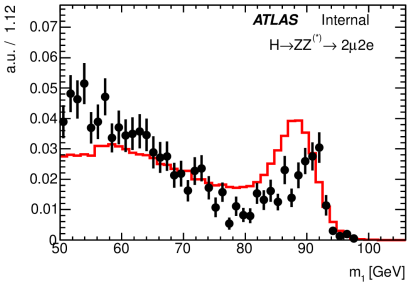


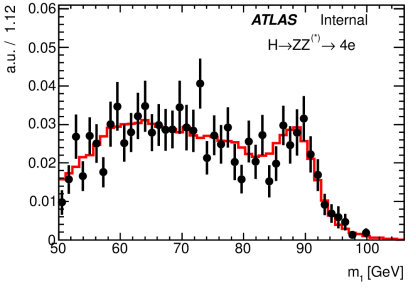


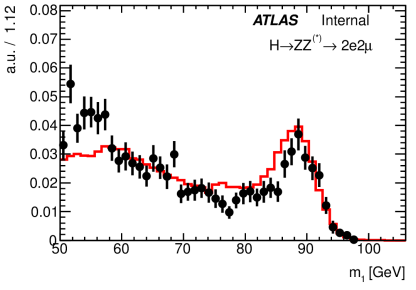


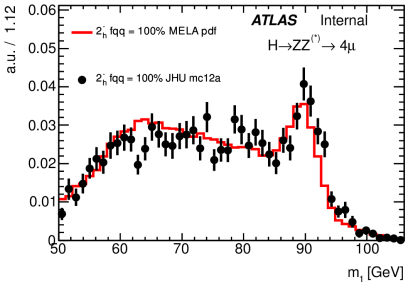


m1









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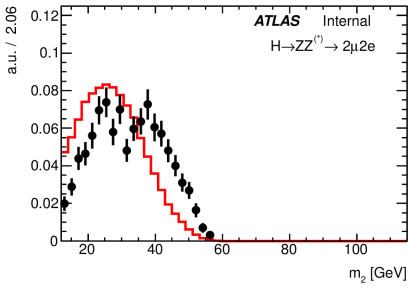
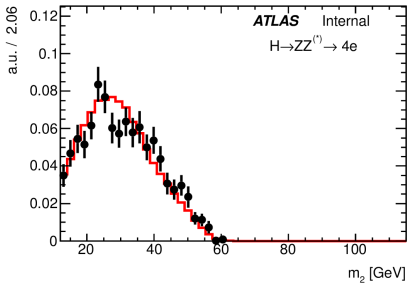
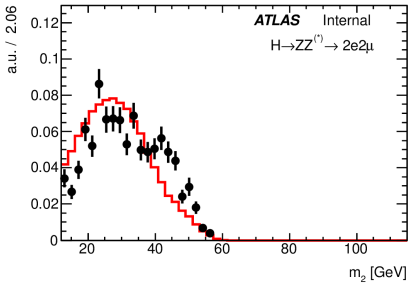
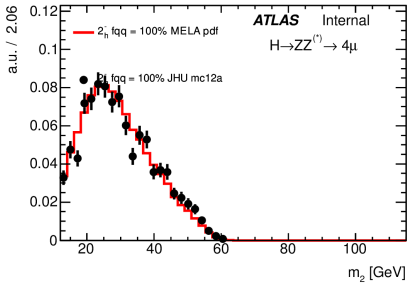
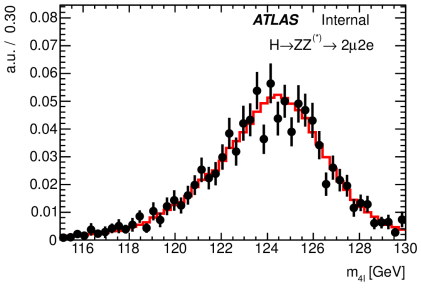


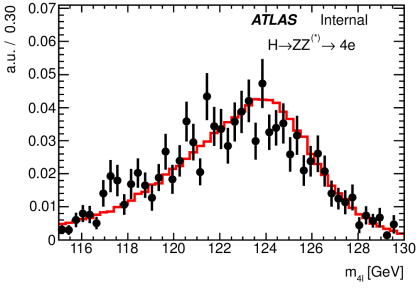


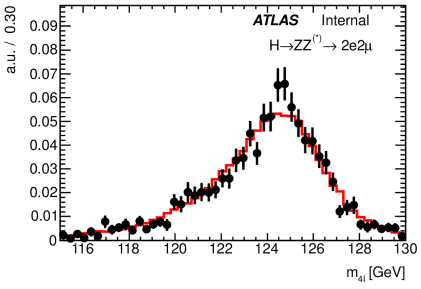


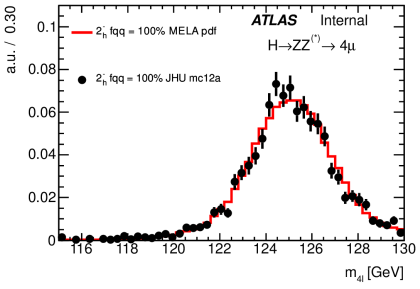


m4l









reco: Toys vs MC

Anche nei closure reco si nota il **disaccordo** tra **nominal_mc_12** (punti neri) e **nominal_toys_nominal** (curva rossa) nelle distribuzioni:
cos(θ*), m_1 e **m_2**.

Decido allora di confrontare i toys già creati con le distribuzioni JHU_mc12, sia reco che truth, per vari range di p_T dell'Higgs.

NOTA: solo i JHU_mc12 hanno la selezione sul p_T!

Le ntuple per creare le distribuzioni sono definite in *./file/data_locations/*
(e.g. *./files/data_locations/input.mc12a.ggH125.0p.txt*)
E contengono le ntuple di Valerio (ntuples_v41, le più recenti)

Procedura:

1. Plotto le distribuzioni in **pT dell'Higgs** per i casi di spin d'interesse, reco e truth, **senza alcuna selezione**

2. Determino gli intervalli in pT (**4 intervalli**)

3. Creo le distribuzioni in **cos(θ*), m1** e **m2** sia **reco** che **truth** con le stesse selezioni di *produce_acceptances_2013.C* **per i 4 intervalli in pT**.

SELEZIONI reco:
distribuzioni costruite sull'**intera statistica**
"selected==1 && (H_m_fsr_constrained>115000
&& H_m_fsr_constrained<130000)" + JHU_w

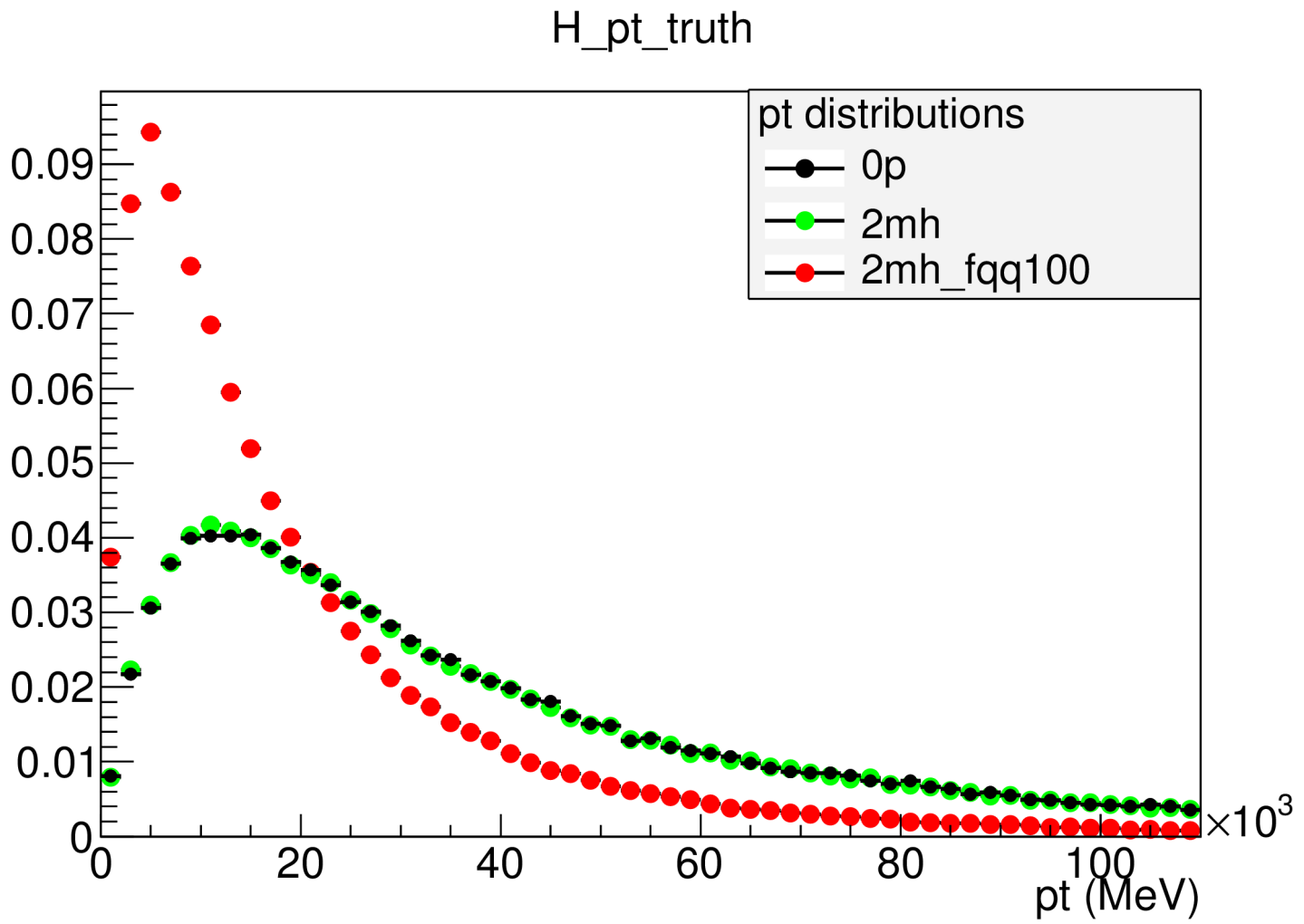
SELEZIONI truth:
distribuzioni costruite sull'**intera statistica**
"last>=0 && (Z1_m/1000.>=50
&& Z1_m/1000.<=106) && (Z2_m/1000.>=**12**
&& Z2_m/1000.<=115) && (H_m>115000
&& H_m<130000)" + JHU_wTruth

17.5 GeV

4. Plotto la distribuzione **toys truth** (generati in precedenza e presenti nelle cartella *./file/pmela_trees*, e.g. *./file/pmela_trees/input_workspace_4mu_nominal_toys_truth.root*) e la confronto con le distribuzioni truth del punto 3.
Analogamente faccio per i reco (toys del tipo *input_workspace_4mu_nominal_toys_nominal.root*).

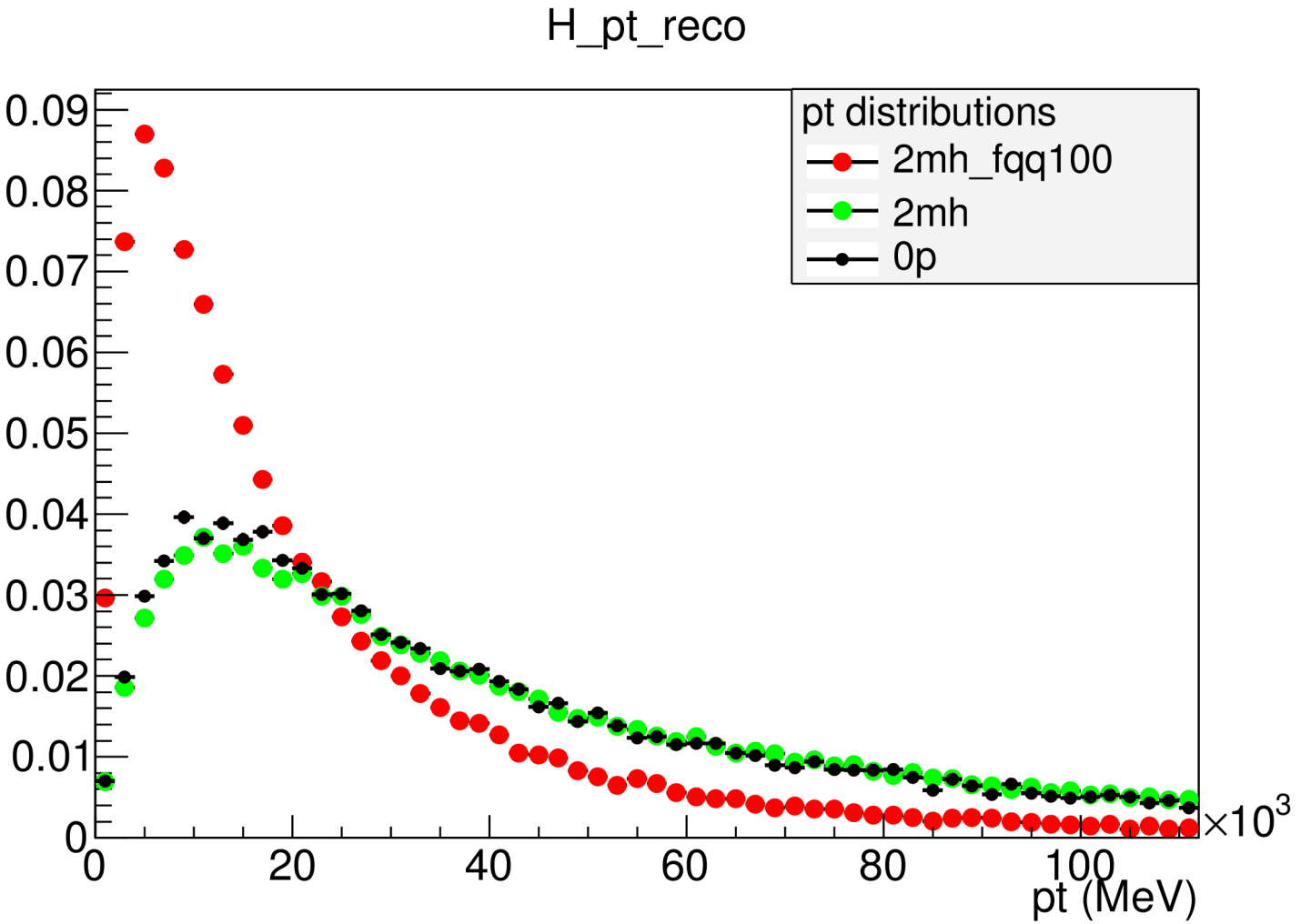
NOTA: solo i JHU_mc12 hanno la selezione sul p_T!

pT distributions truth



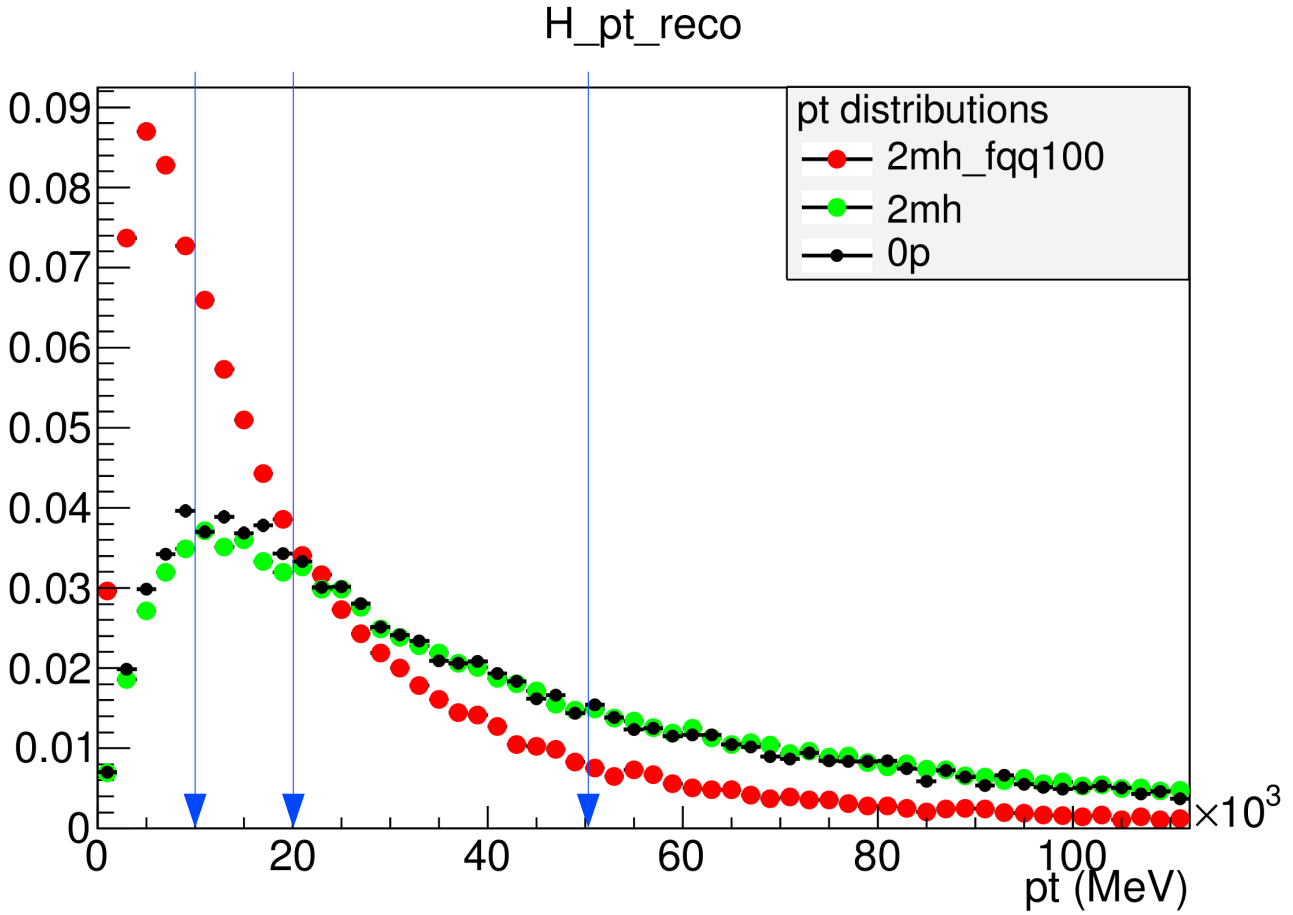
Intera statistica, nessuna selezione

pT distributions reco



Intera statistica, nessuna selezione

Scelta intervalli

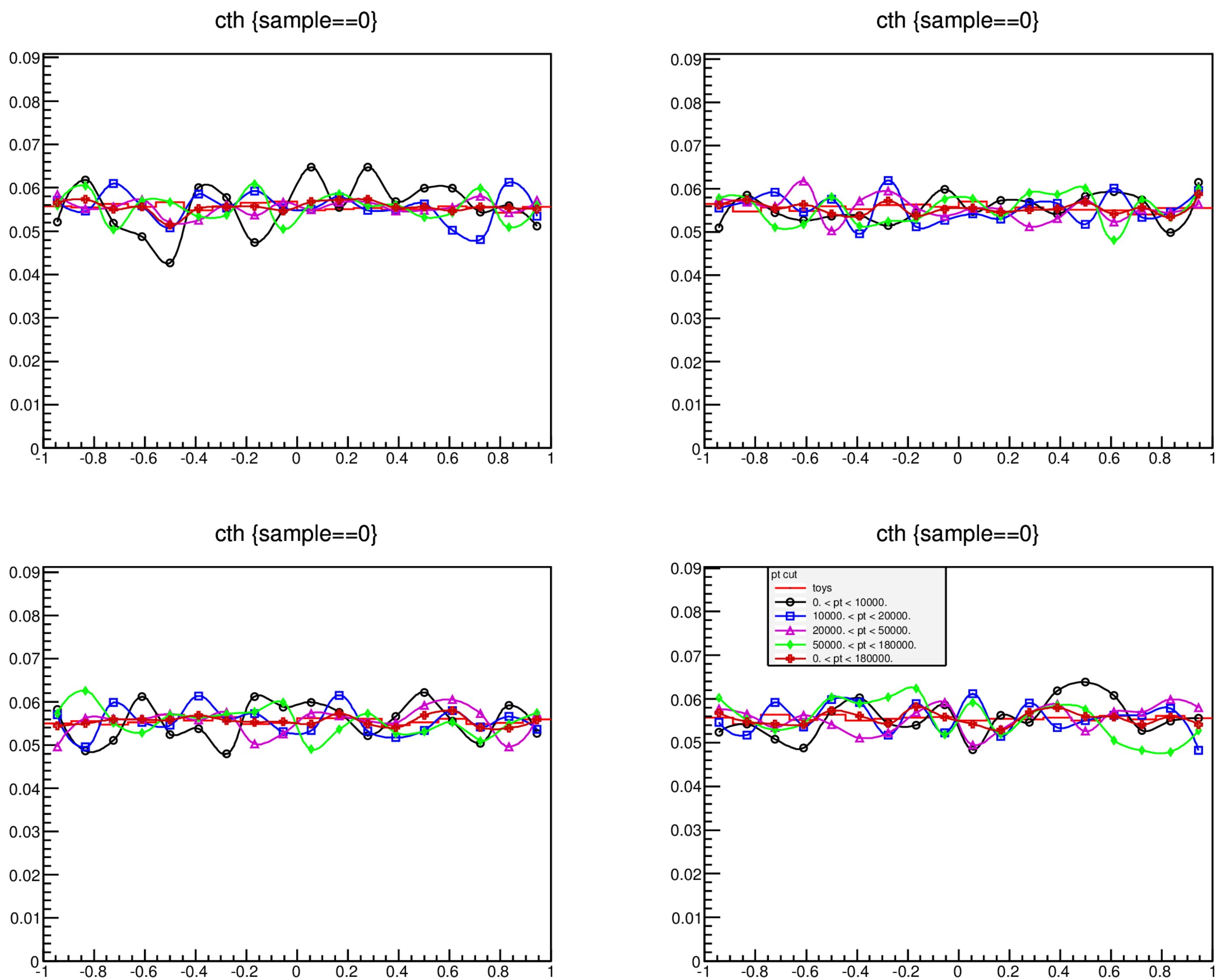


Scelta dei 4 intervalli (sia reco che truth)
[0.,10] GeV
[10,20] GeV
[20,50] GeV
[50,180] GeV

Spin 0^+

0p

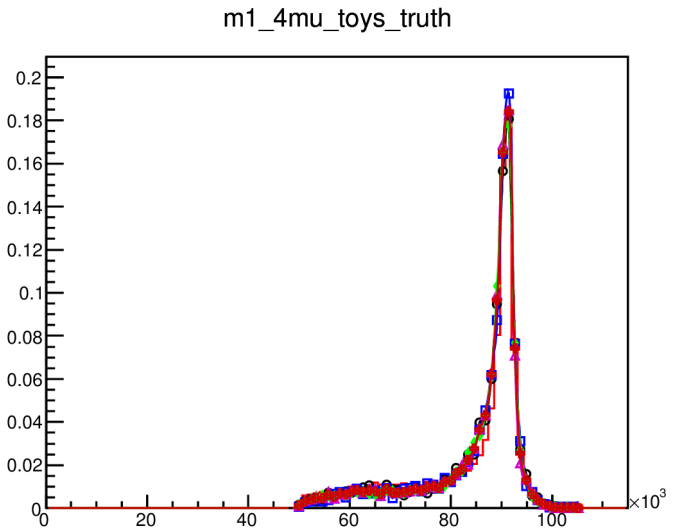
cth

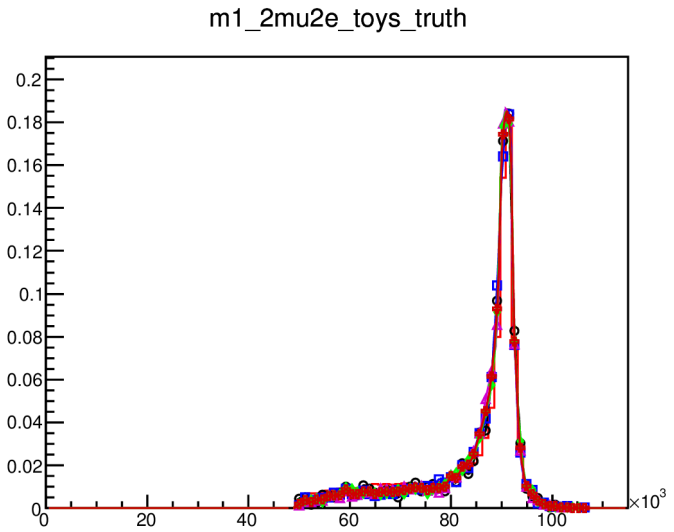


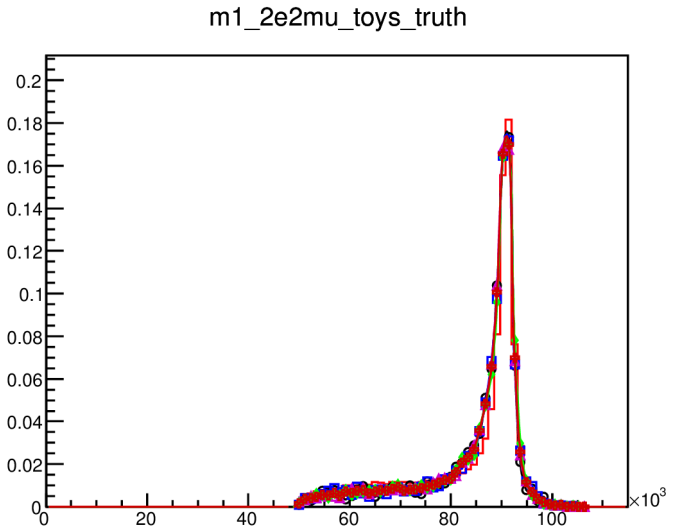
Confronto truth

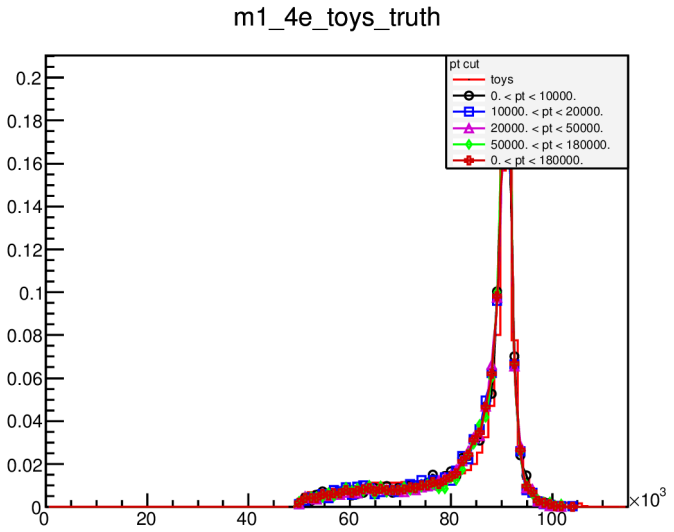
0p

m1





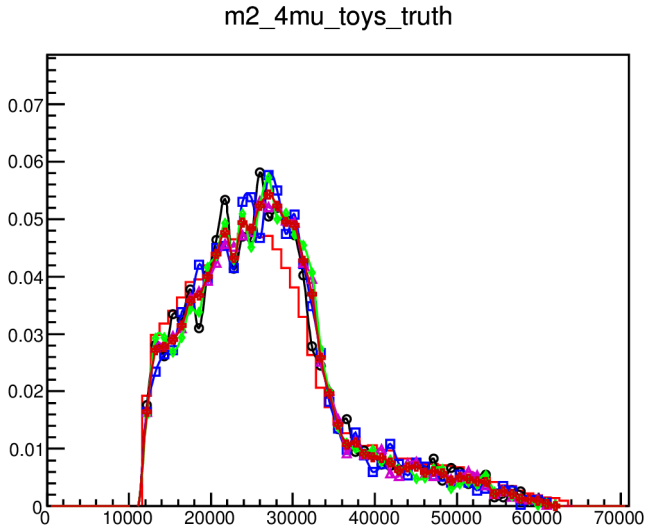


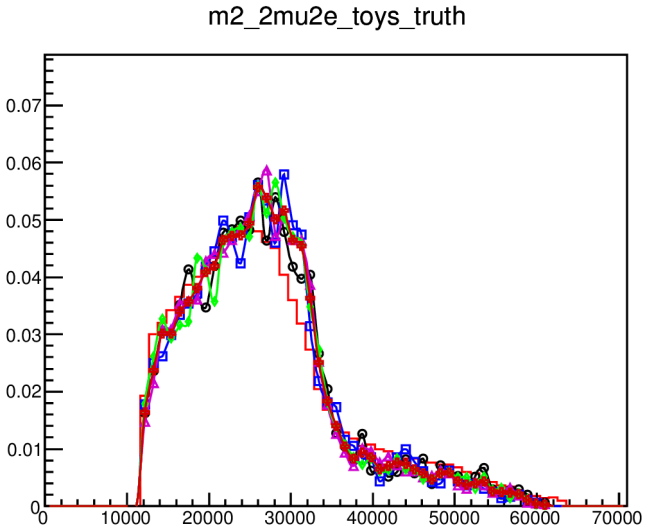


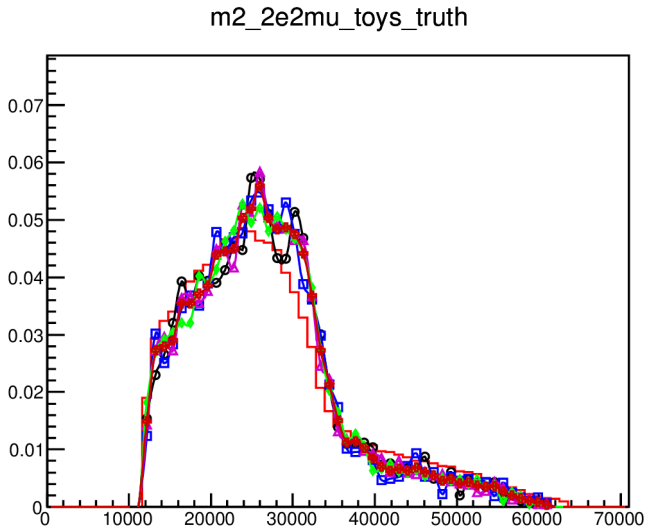
Confronto truth

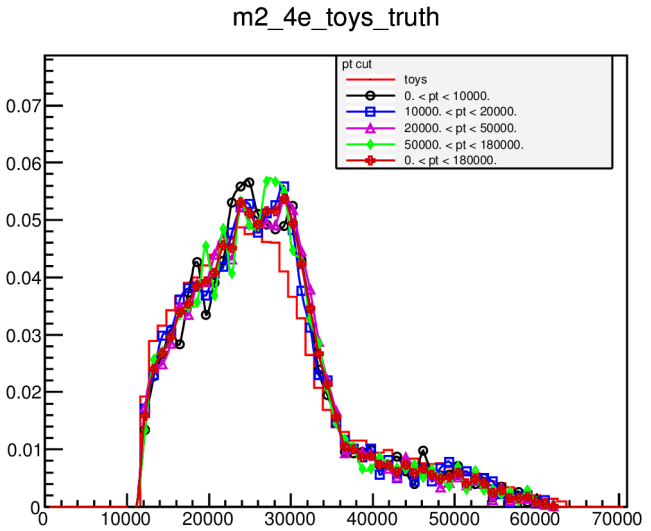
0p

m2





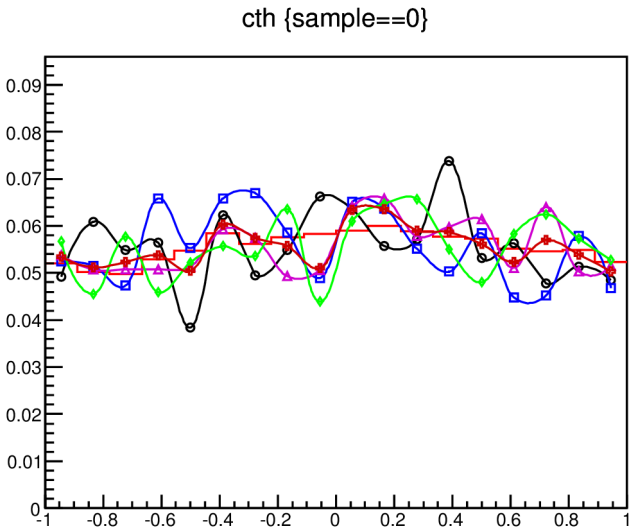


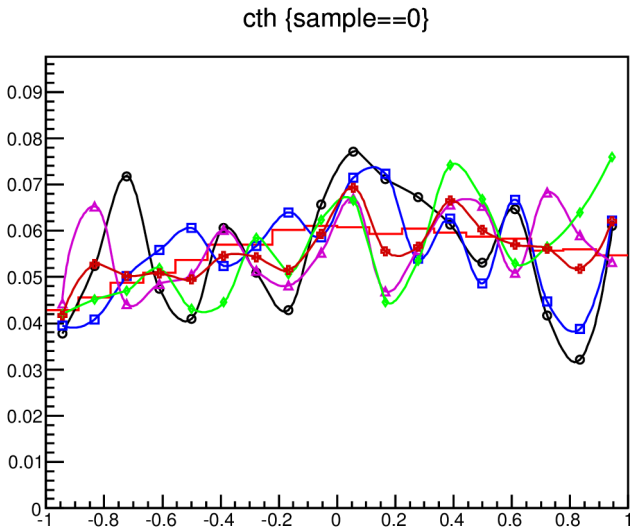


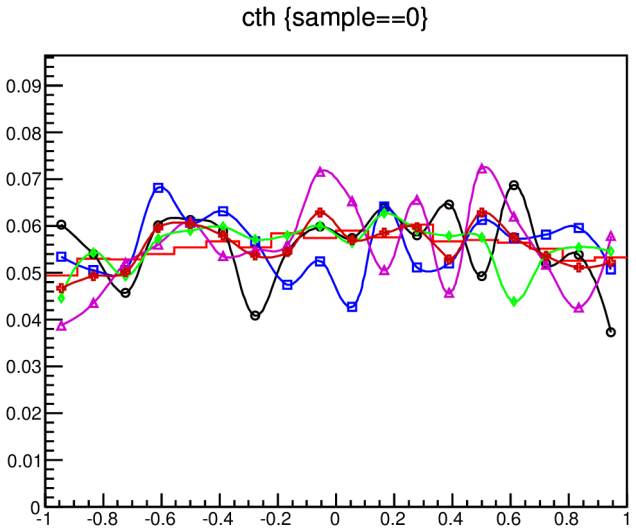
Confronto truth

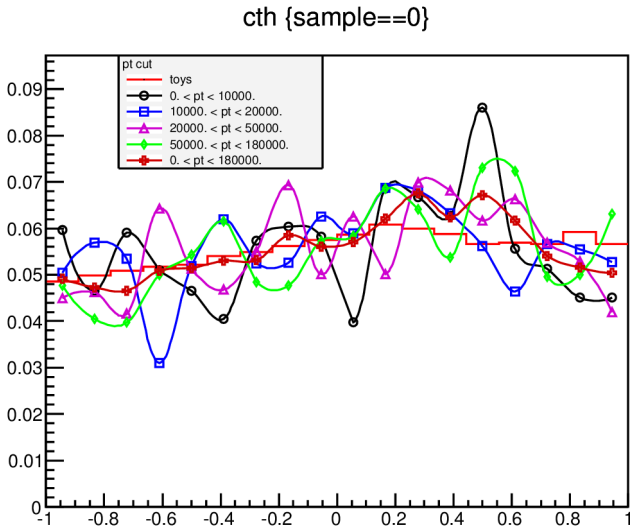
0p

cth





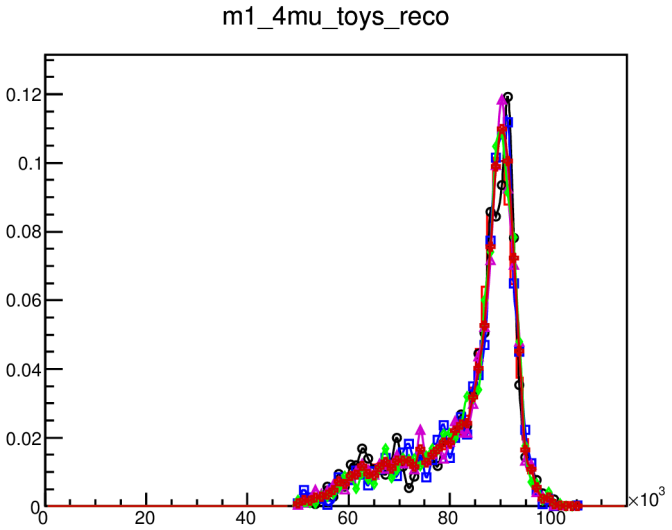


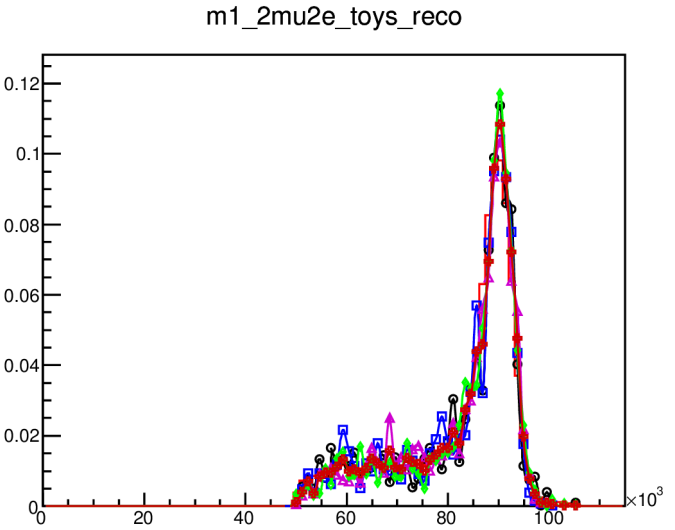


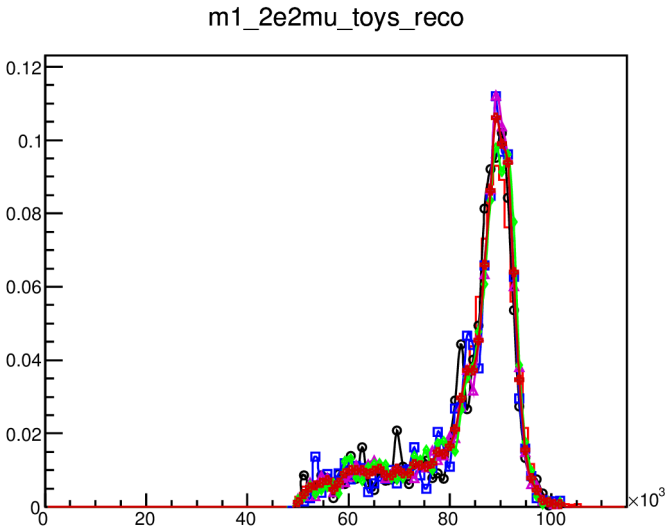
Confronto reco

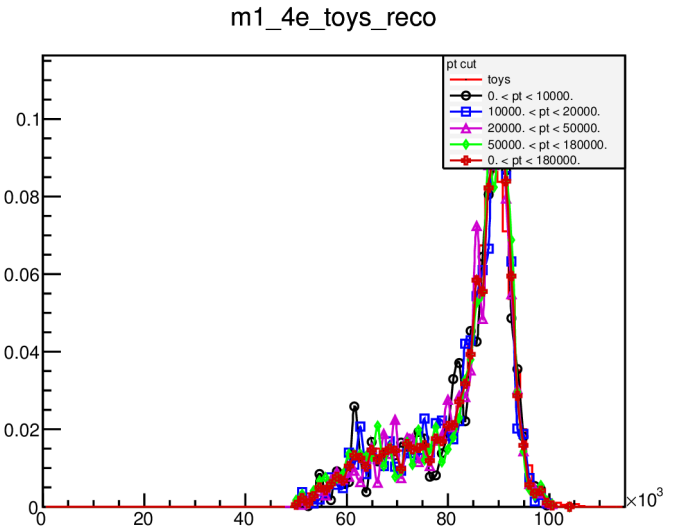
0p

m1





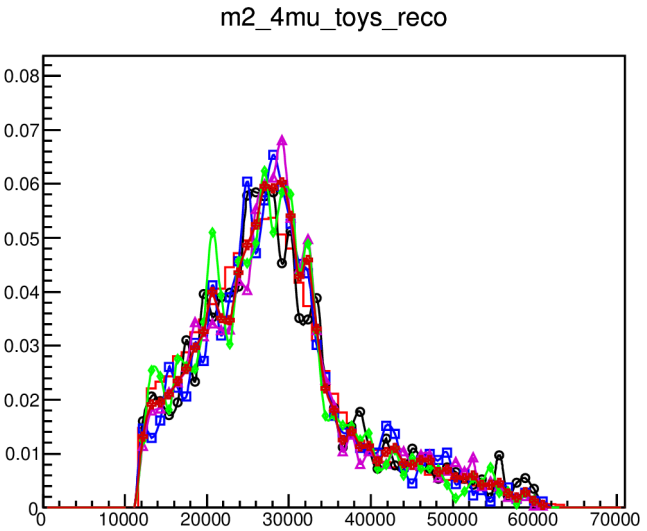


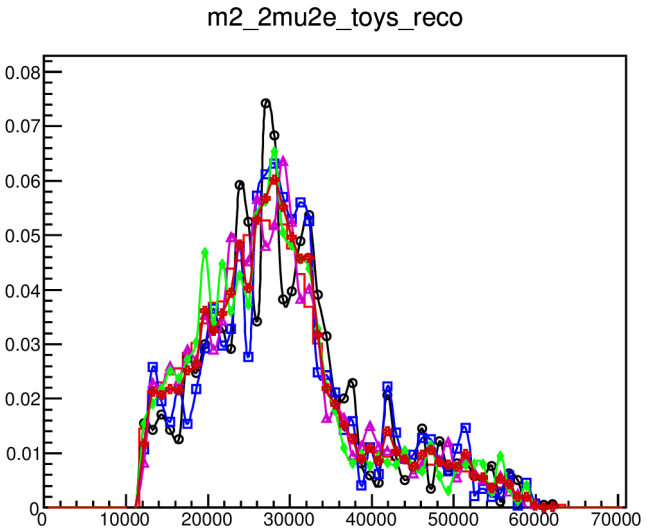


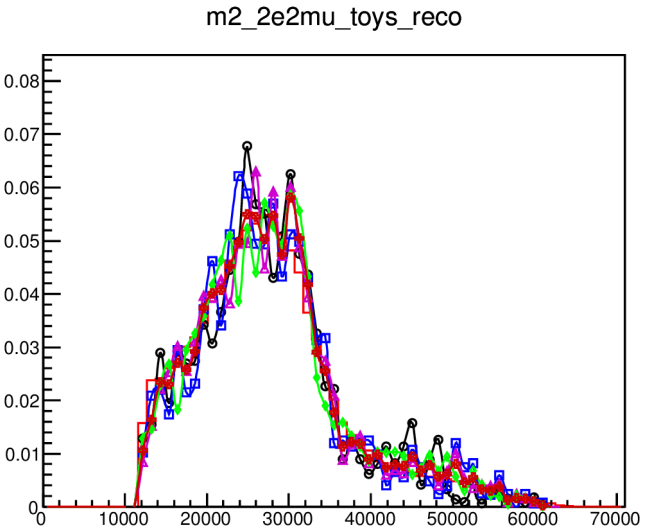
Confronto reco

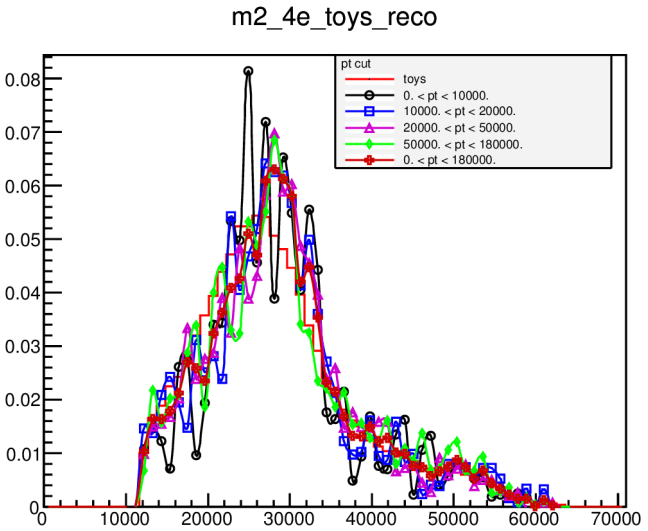
0p

m2







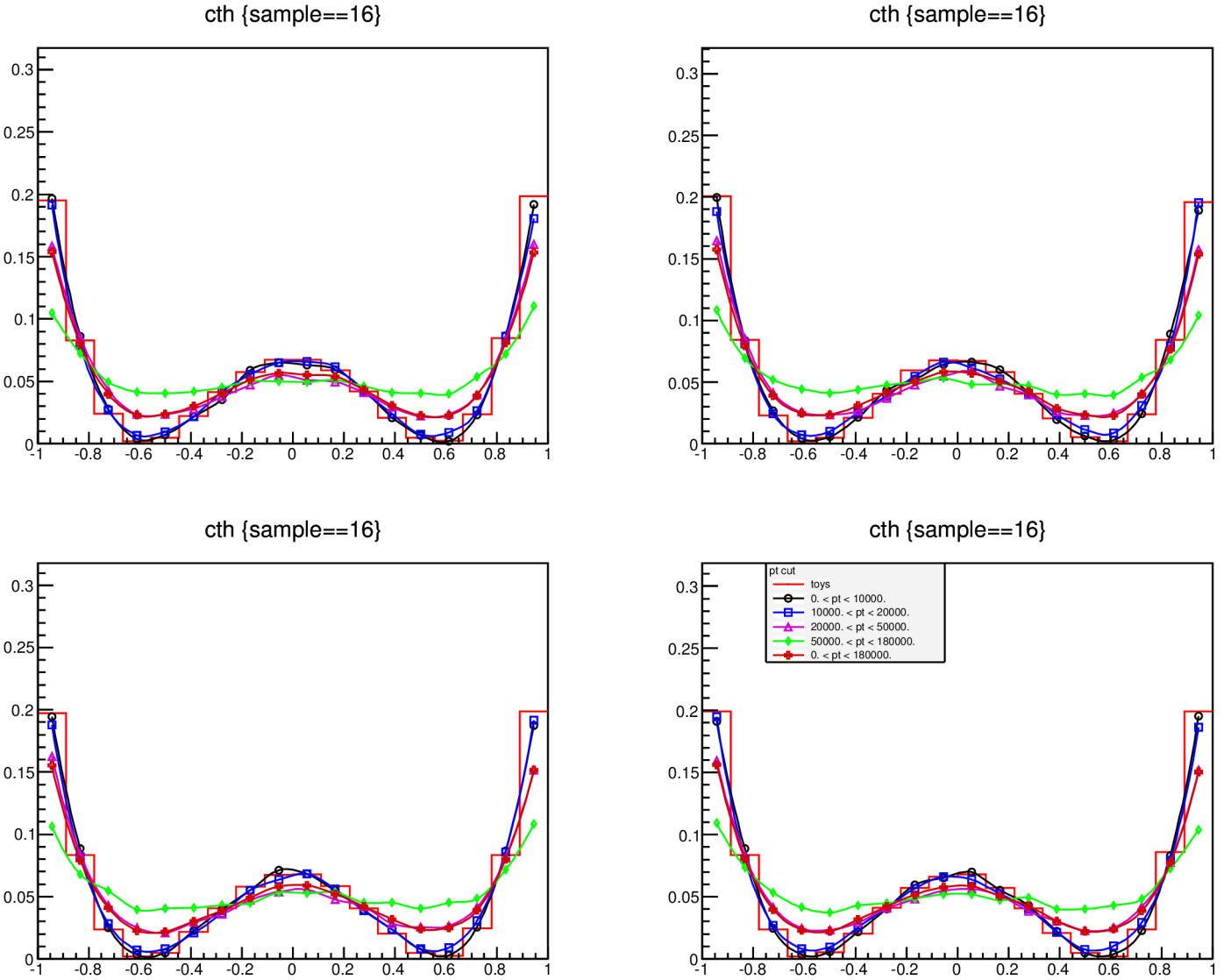


Confronto reco

Spin 2^-_h

2mh

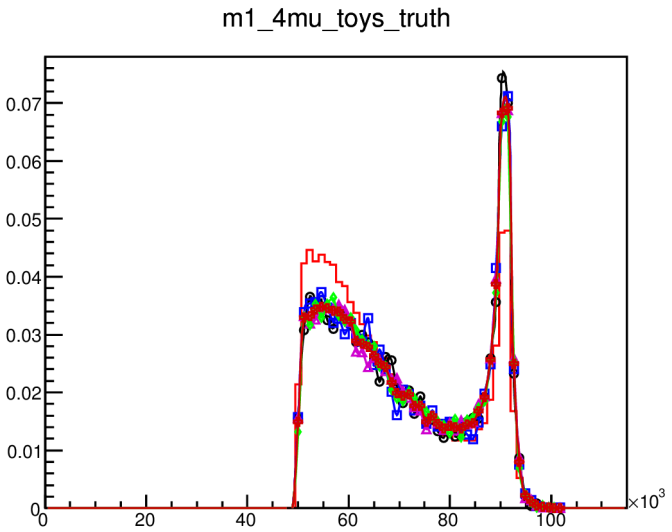
cth

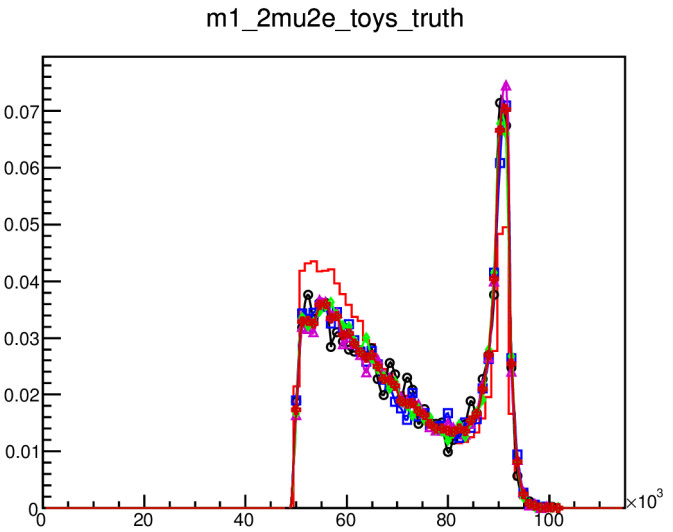


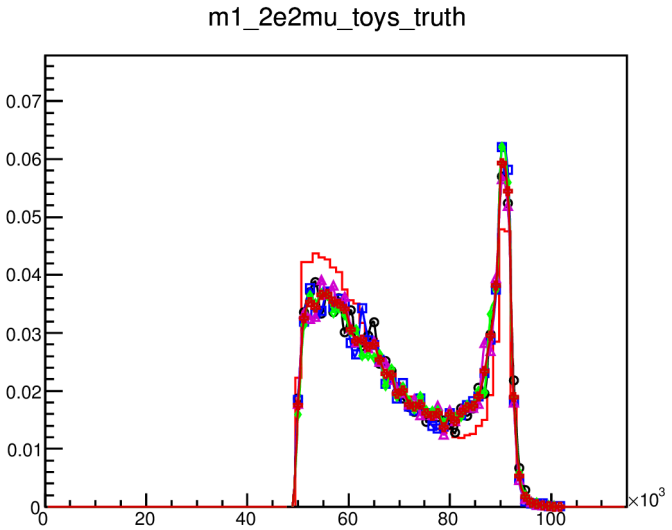
Confronto truth

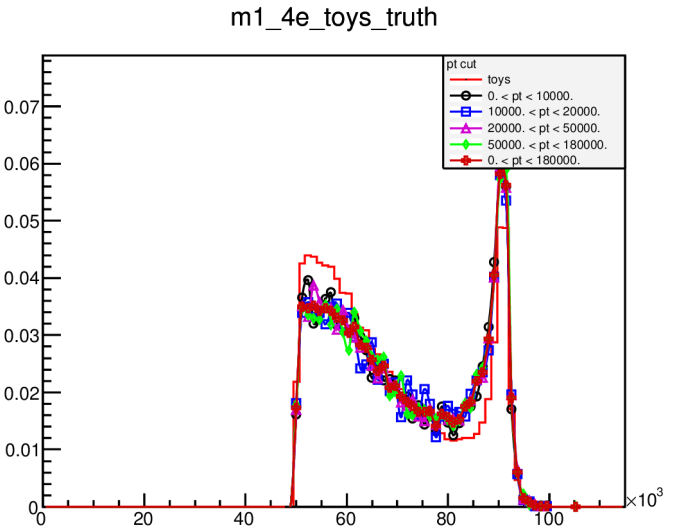
2mh

m1





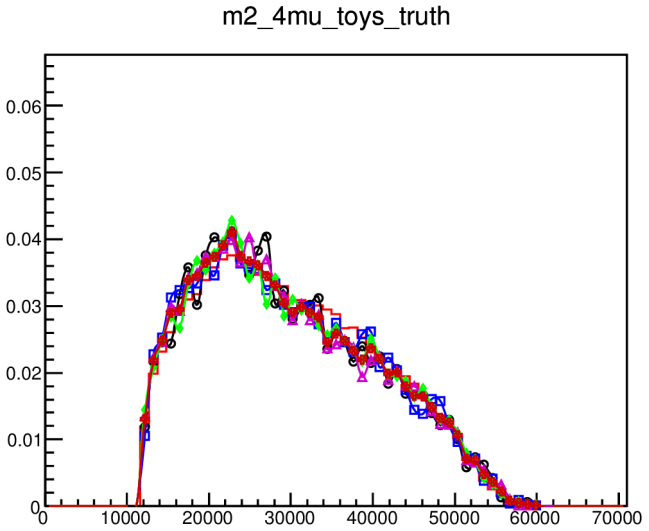


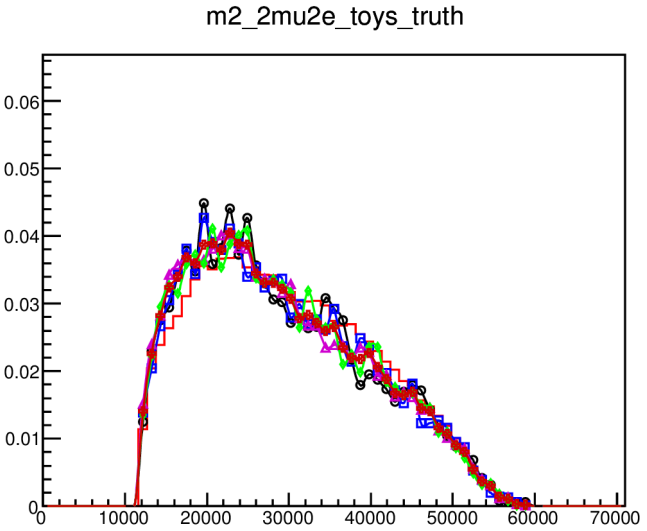


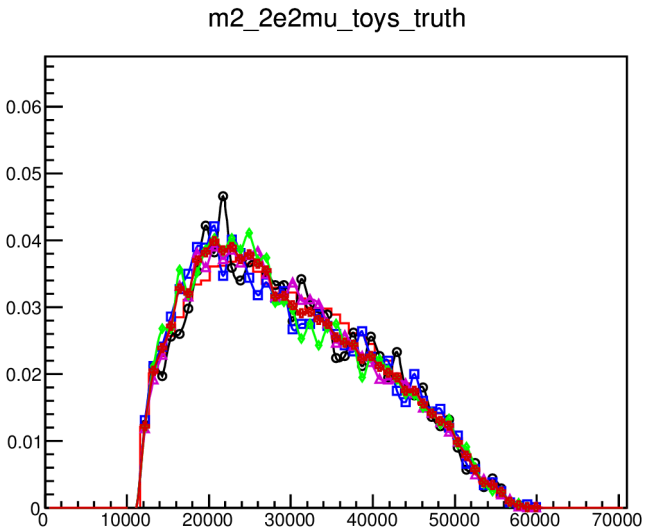
Confronto truth

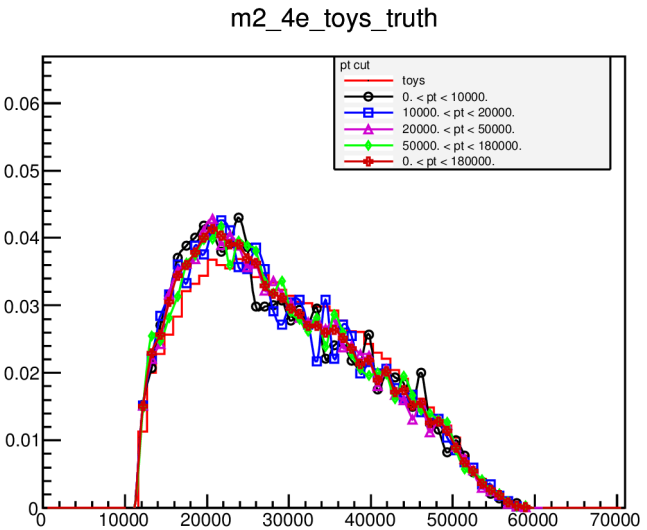
2mh

m2





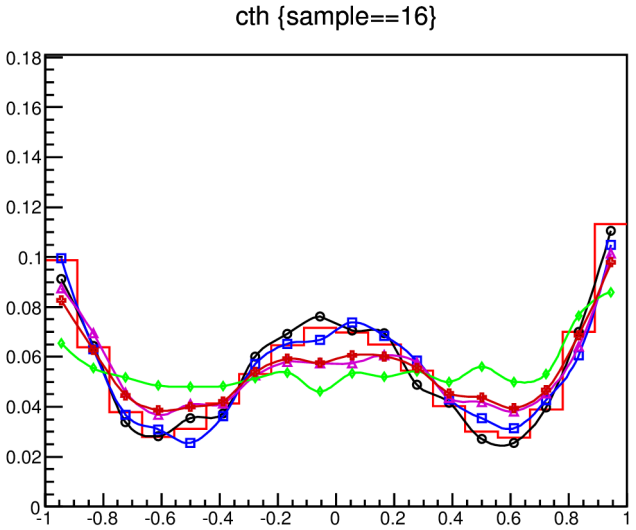


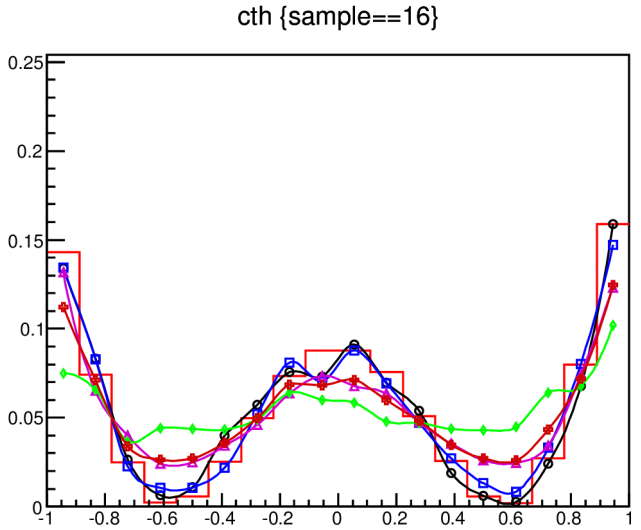


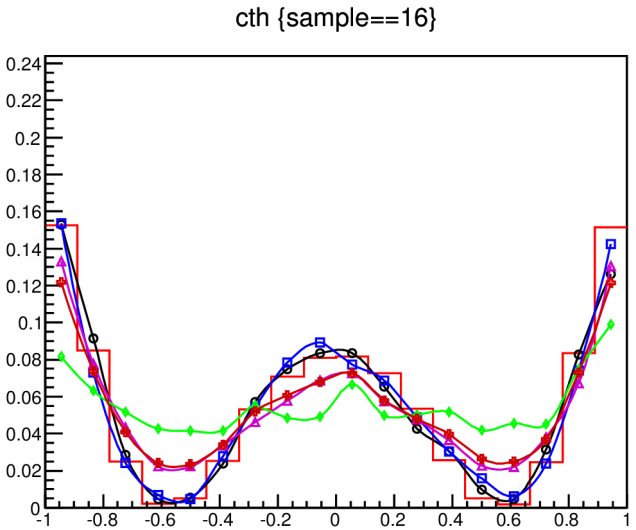
Confronto truth

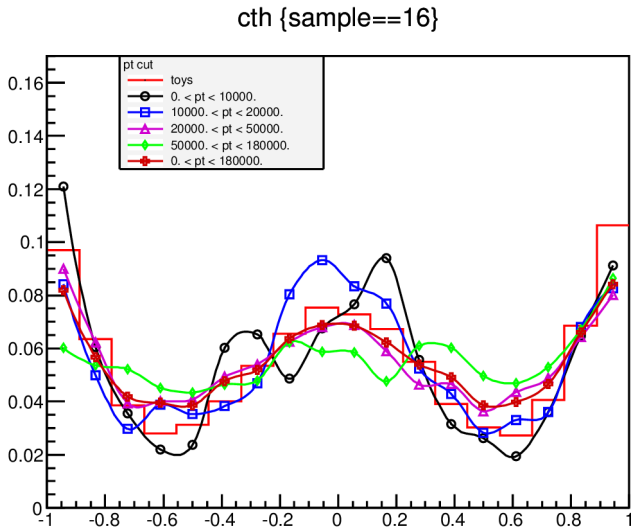
2mh

cth





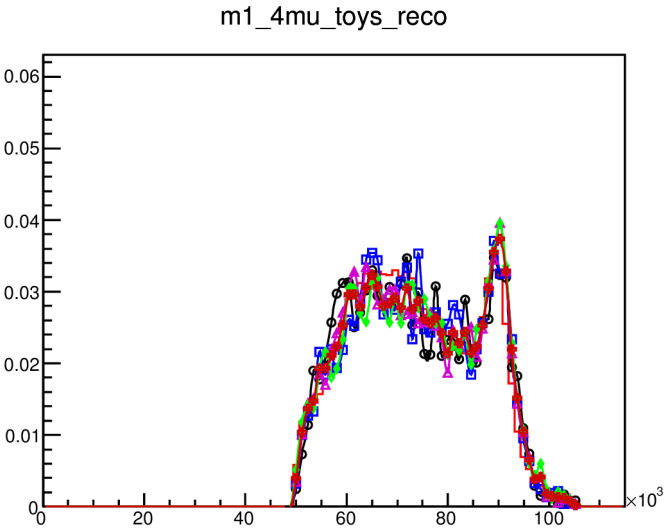


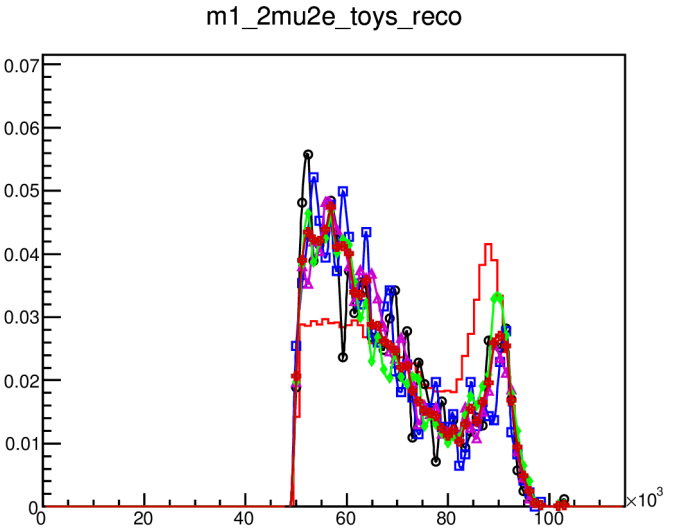


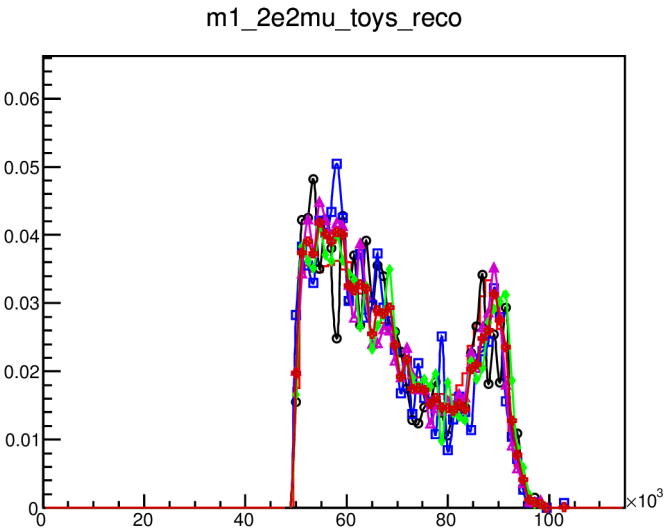
Confronto reco

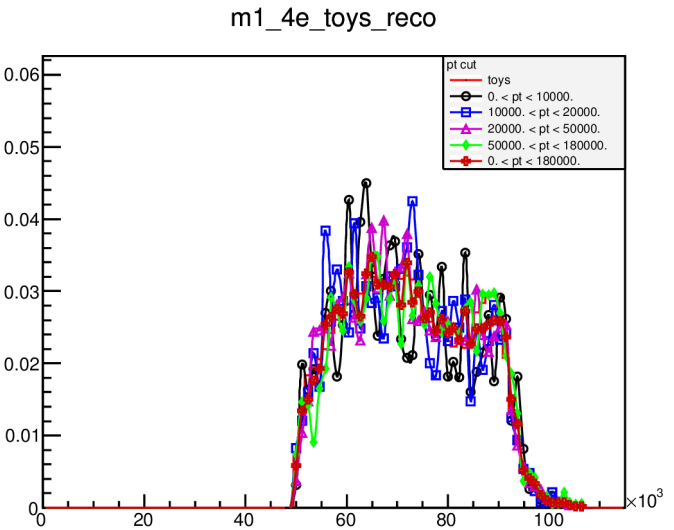
2mh

m1





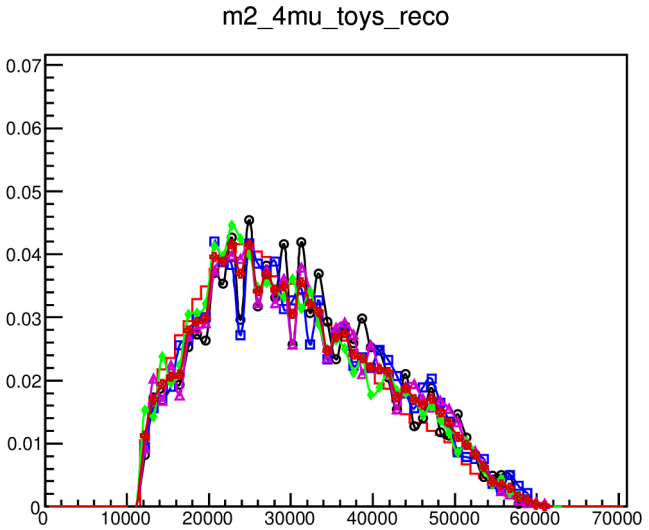


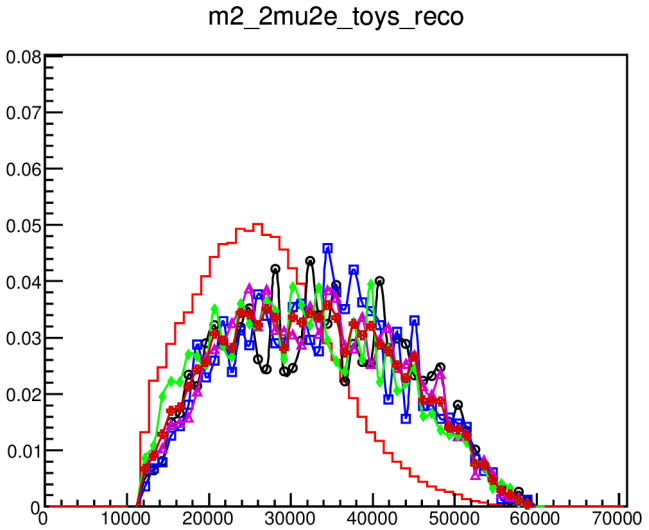


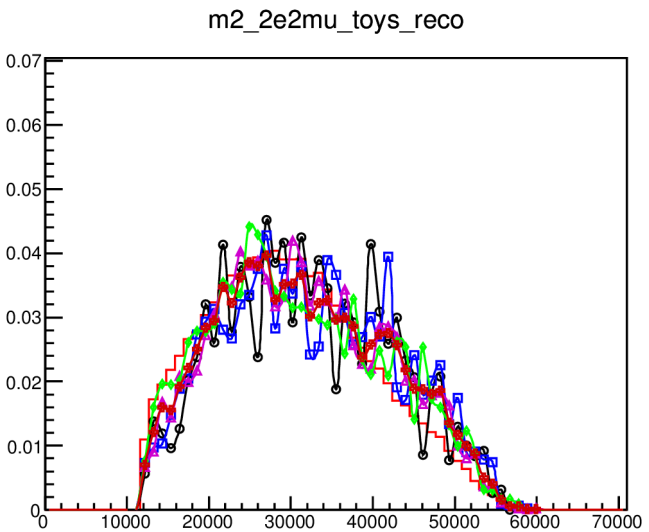
Confronto reco

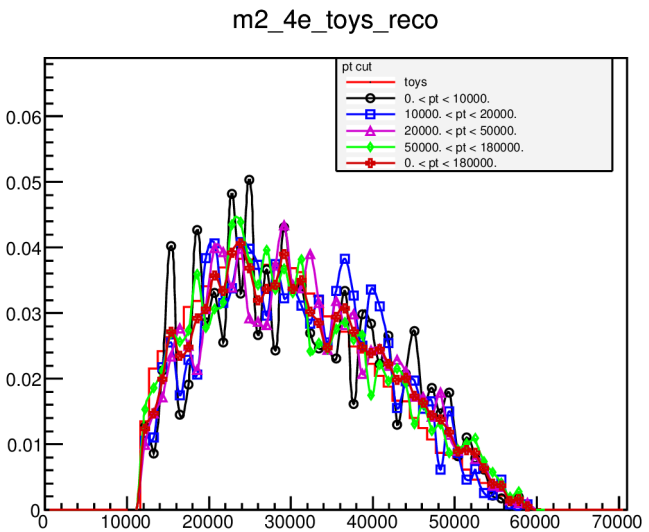
2mh

m2







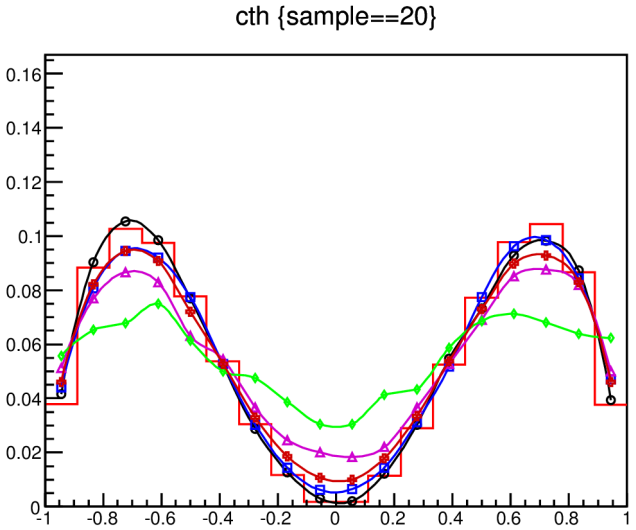


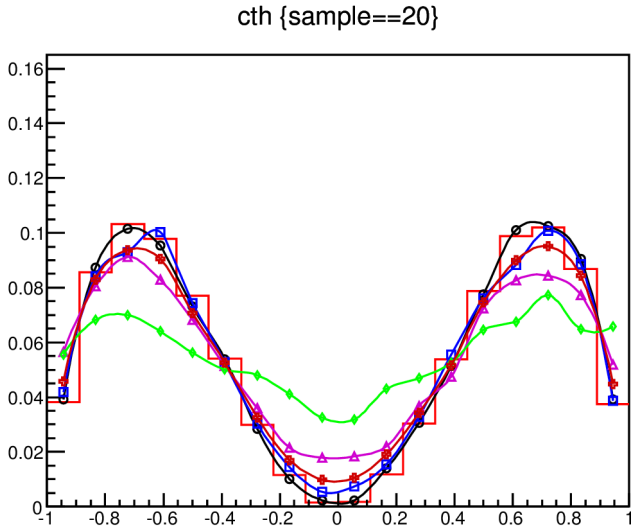
Confronto reco

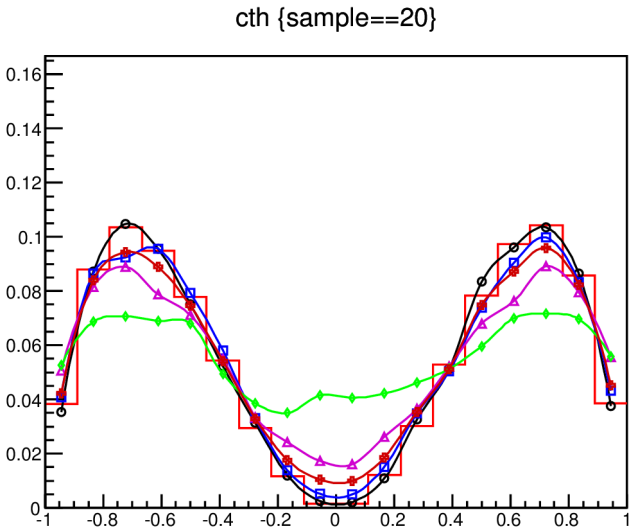
Spin 2^-_h (f_{qq}=100)

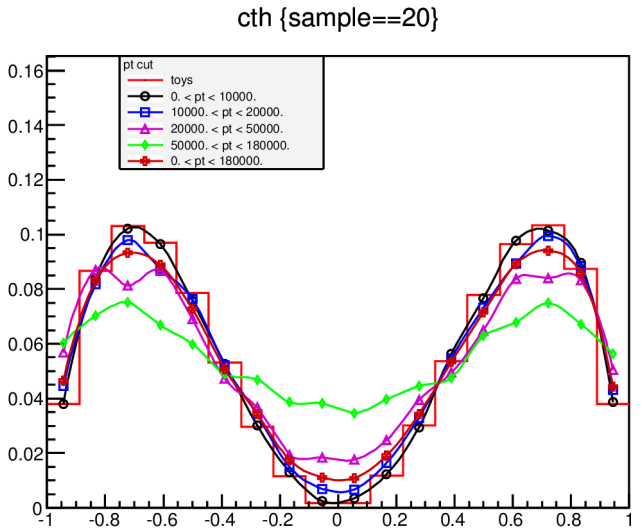
2mh_fqq100

cth





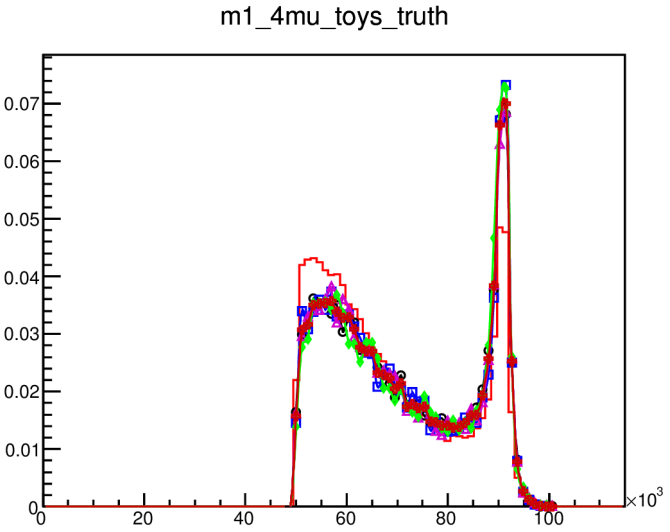


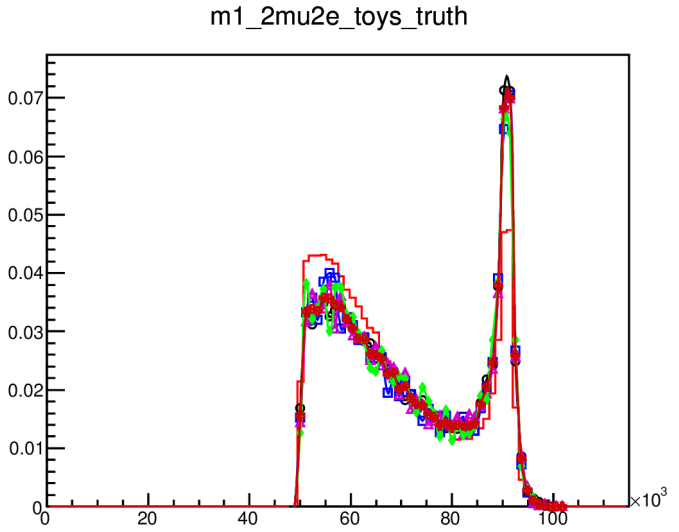


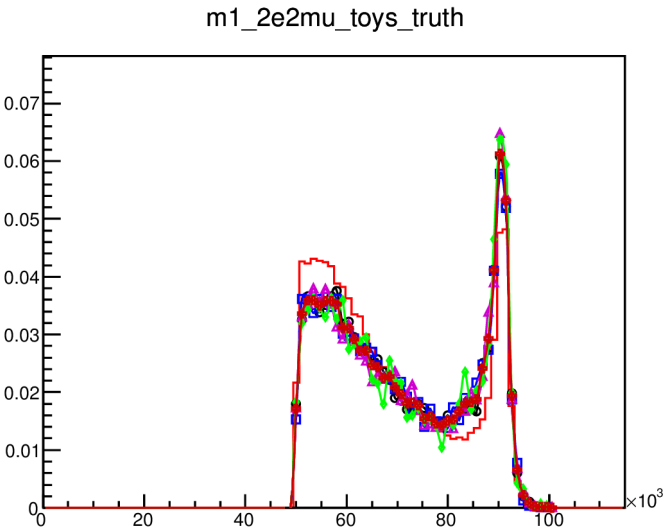
Confronto truth

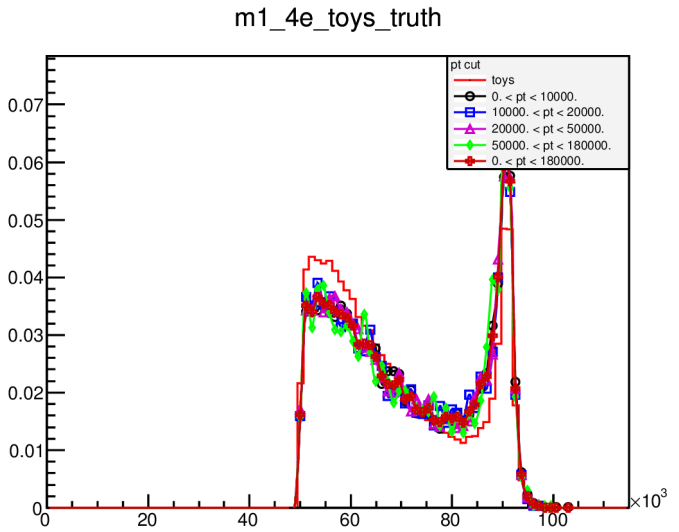
2mh_fqq100

m1





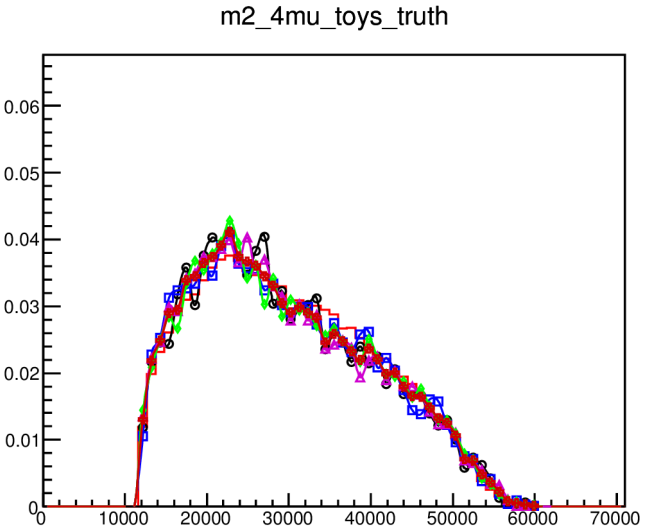


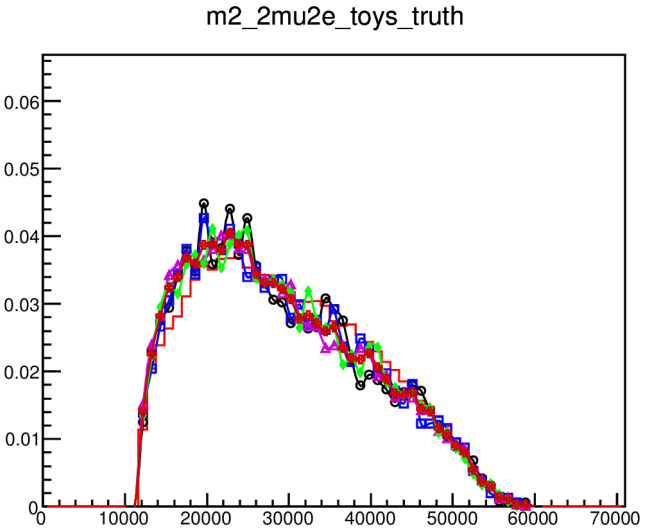


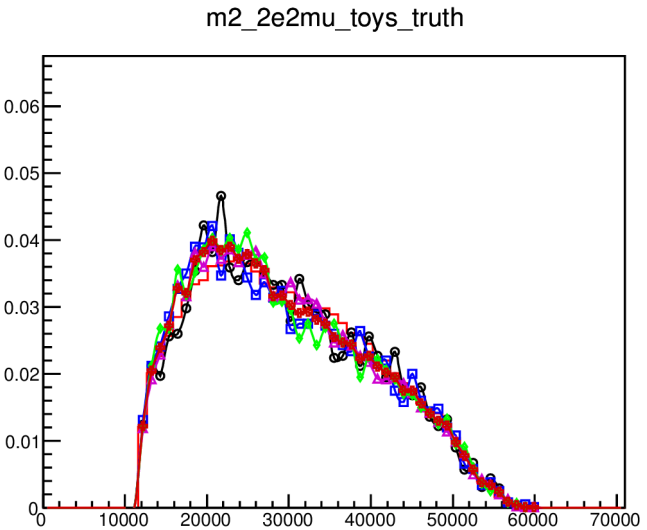
Confronto truth

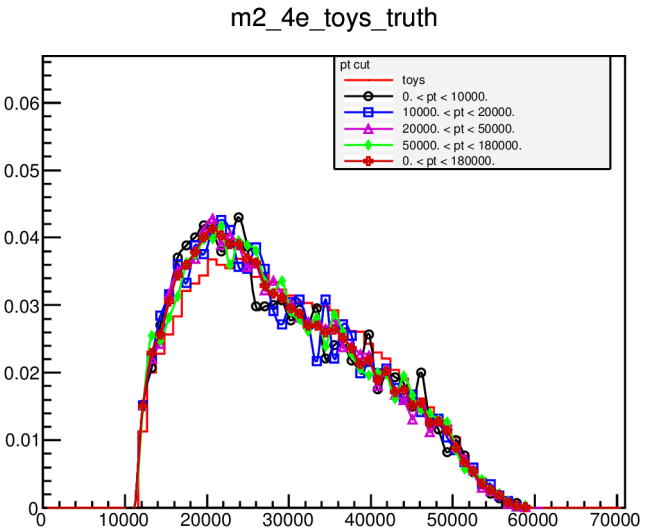
2mh_fqq100

m2





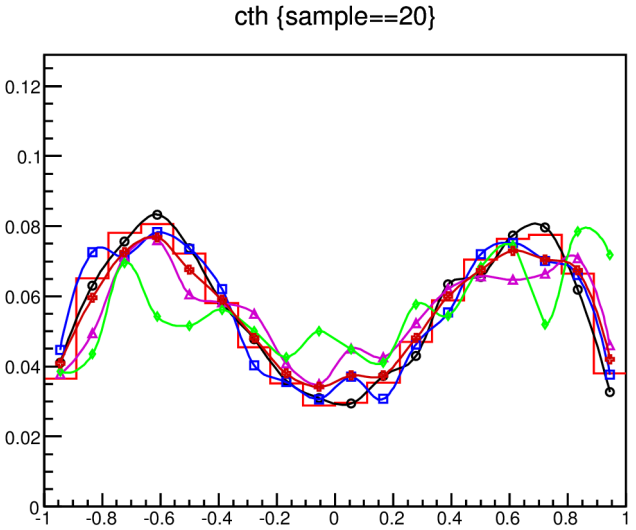


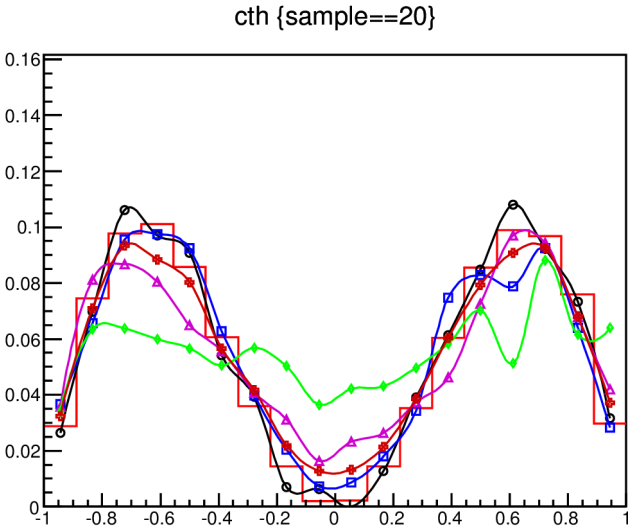


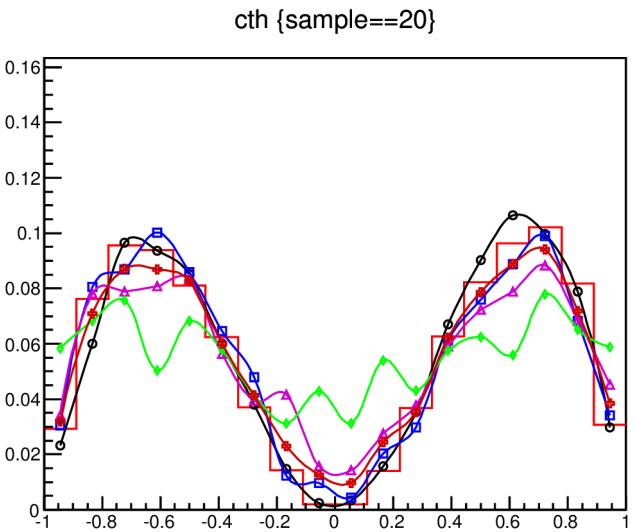
Confronto truth

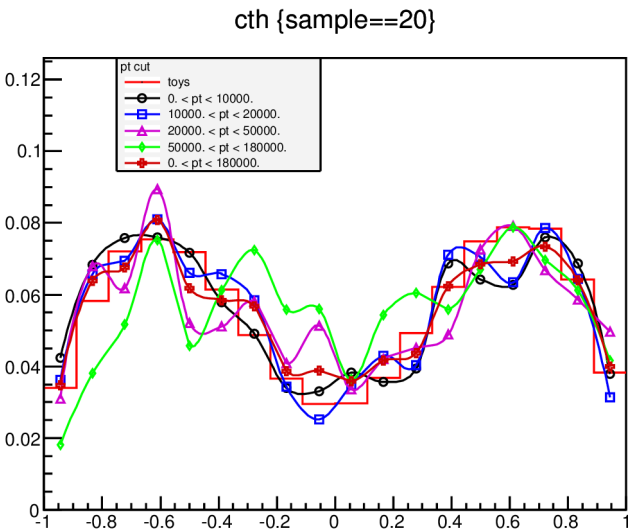
2mh_fqq100

cth





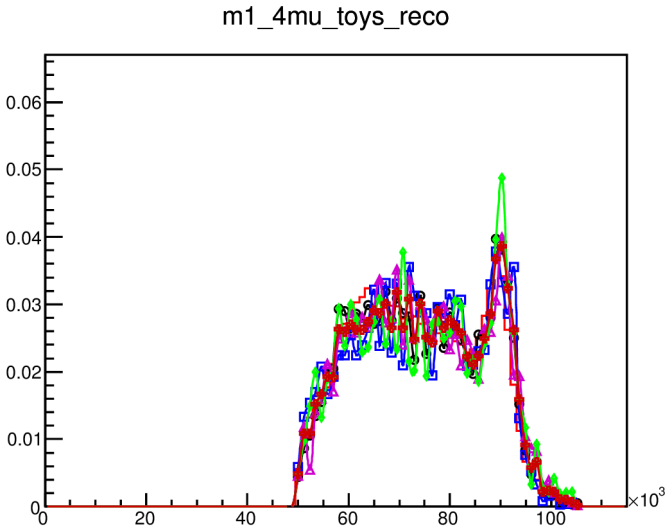


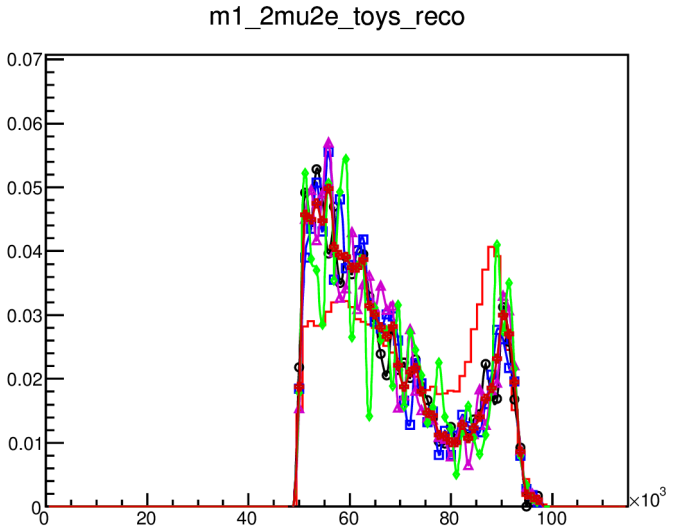


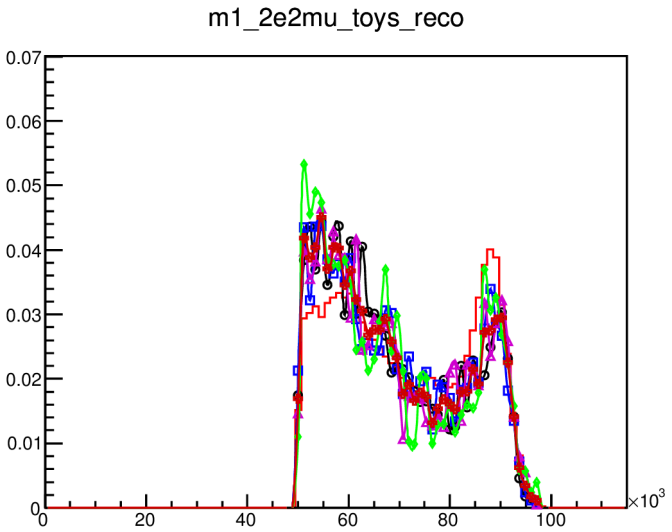
Confronto reco

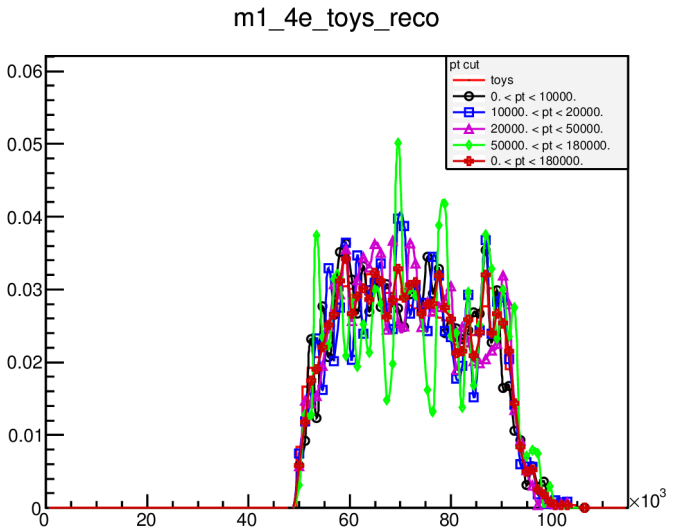
2mh_fqq100

m1





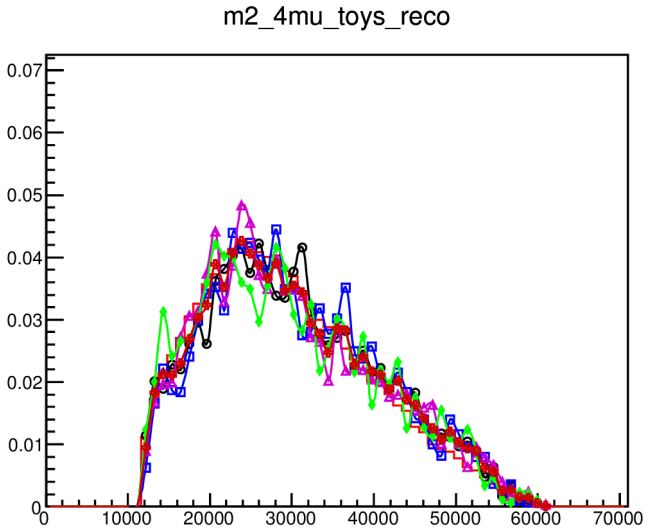


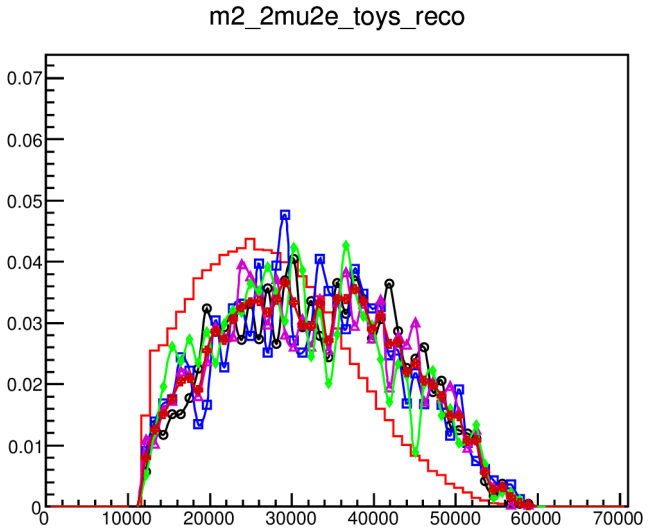


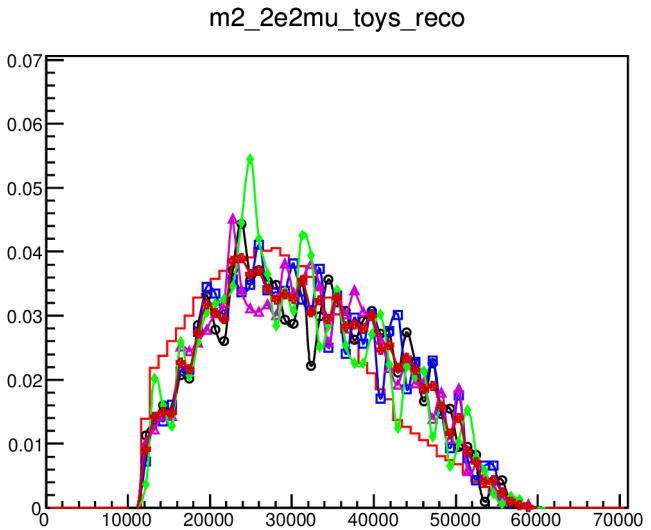
Confronto reco

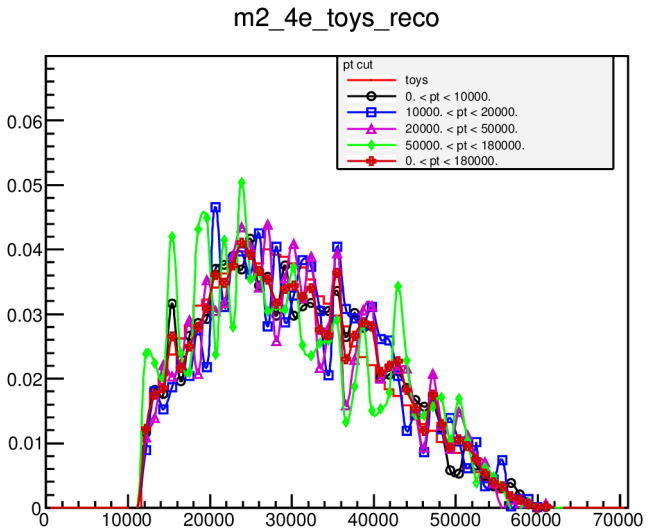
2mh_fqq100

m2









Confronto reco

In conclusione:

- per p_T bassi si nota un accordo tra JHU_mc12 e toys, sia per i reco che truth, nella distribuzione in cos(θ*)
- le distribuzioni in massa restano invariate
- modificando il taglio in massa alla JHU_mc12_truth m2 da 17.5 GeV a 12 GeV https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/HiggsZZllllSummer2013#Secondary_Di_Lepton_Mass_Cut
  il closure torna (?)
- vanno fatti i fit d'accettanza alle masse

Suggerimenti