

本周工作汇报

Done: 绘制 Data/MC 图

Ongoing: 学习 ABCD 方法

To Do: 完成 quality correlation 和 Cutcount

沈羽 2022.8.7

Merge root 文件

合并 root 文件

- /afs/ihep.ac.cn/users/s/sheny/
Publicfs/test/test-7.25/root
- hadd Mergedfilename.root
filename*.root

```
sheny@lxslc711:test/test-7.25/root
ls
C1C1_Stau_100p0_0p0.root  Data.root  MultiBoson.root  SingleTopT.root  ttHiggs.root  ttX_M.root  VBFHiggs.root  Z.root
C1C1_Stau_300p0_150p0.root  ggHiggs.root  SingleTop.root  SingleTopWt.root  tt.root  ttX_X.root  VHiggs.root
C1C1_Stau_700p0_400p0.root  Higgs.root  SingleTopS.root  ttbar.root  ttV.root  ttX_Z.root  W.root
```

- Merge.cxx

编写 draw.C

生成直方图

- [/afs/ihep.ac.cn/users/s/sheny/Publicfs/test/test-7.25/plot/Data-MC](https://afs.ihep.ac.cn/users/s/sheny/Publicfs/test/test-7.25/plot/Data-MC)



include 文件

MiniAnalysis

```
#Additional C,C++ include/lib path
export C_INCLUDE_PATH=/publicfs/atlas/atlasnew/SUSY/users/yuanjiarong/framework/MiniAnalysis/include:/publicfs/atlas/atlasnew/SUSY/users/yuanjiarong/framework/MiniAnalysis/src:$C_INCLUDE_PATH
export CPLUS_INCLUDE_PATH=/afs/ihep.ac.cn/users/y/yuanjiarong/codes/include:/publicfs/atlas/atlasnew/SUSY/users/yuanjiarong/framework/MiniAnalysis/include:/publicfs/atlas/atlasnew/SUSY/users/yuanjiarong/framework/MiniAnalysis/src:$CPLUS_INCLUDE_PATH
export LD_LIBRARY_PATH=/publicfs/atlas/atlasnew/SUSY/users/yuanjiarong/framework/MiniAnalysis/lib:$LD_LIBRARY_PATH
export LIBRARY_PATH=/publicfs/atlas/atlasnew/SUSY/users/yuanjiarong/framework/MiniAnalysis/lib:$LIBRARY_PATH
```

```
sheny@lxs1c709:yuanjiarong/framework/MiniAnalysis InternalWeight x 27d4h
ls
build CMakeLists.txt config Dockerfile include licenses MiniAnasrc python README.md src userInclude userSrc
```

```
#include "Plotter/AtlasStyle.C"
#include "Plotter/AtlasUtils.C"
#include "Plotter/Plotter.h"

#include <fstream>
#include <iostream>
#include <math.h>
#include <string>
#include <vector>
```

```
sheny@lxs1c709:~/Publicfs/MiniAnalysis master x
```


设置颜色

设置相关颜色

```
//颜色设置
enum
{
    //QCDColor = 46,

    dataColor=kBlack,
    HiggsColor=kViolet-8,
    sig1Color=9,
    sig2Color=6,
    sig3Color=2,
    WColor=41,
    ZColor=38,

    arrowColor=2,
    //箭头颜色

    MultiBosonColor=30,
    SingleTopColor=46,
    ttColor=48,
};
```

```
### 颜色设置
- 1 Blue
- 2 Green
- 3 Aqua
- 4 Red
- 5 Purple
- 6 Yellow
- 7 White
- 8 Gray
- 9 Light Blue
- 0 Black
- A Light Green
- B Light Aqua
- C Light Red
- D Light Purple
- E Light Yellow
- F Bright White
```

获取并添加文件

通过设定位置获得 root 文件

```
### 画布设置
- ONE_PAD
- USE_ZN_PAD //ZN图
- USE_COM_PAD //DATa-MC图
- BINNED_ZN
- FLIP_DIC
- NOM_DIC
- STANDARD_COM
- NORMALIZE_COM
- INTEGRAL_COM
- USE_LOG_Y/NO_LOG_Y //Y轴是否取对数
```

```
void draw(const std::string name)
{
    std::string folder = "../../root/";

    SetAtlasStyle();

    Plotter* mPlotter = new Plotter(Plotter::USE_COM_PAD, Plotter::USE_LOG_Y);

    //画直方图
    TH1F* histMultiBoson = (TH1F*)Plotter::getHist(folder + "MultiBoson.root", name, Plotter::Block, MultiBosonColor);
    TH1F* histsig = (TH1F*)Plotter::getHist(folder + "C1C1_Stau_300p0_150p0.root" , name, Plotter::Dash, sig1Color);
    TH1F* histsig2 = (TH1F*)Plotter::getHist(folder + "C1C1_Stau_700p0_400p0.root" , name, Plotter::Dash, sig2Color);
    TH1F* histsig3 = (TH1F*)Plotter::getHist(folder + "C1C1_Stau_1000p0_0p0.root" , name, Plotter::Dash, sig3Color);
    TH1F* histSingleTop = (TH1F*)Plotter::getHist(folder + "SingleTop.root", name, Plotter::Block, SingleTopColor);
    TH1F* histtt = (TH1F*)Plotter::getHist(folder + "tt.root", name, Plotter::Block, ttColor);
    TH1F* histZ = (TH1F*)Plotter::getHist(folder + "Z.root", name, Plotter::Block, ZColor);
    TH1F* histHiggs = (TH1F*)Plotter::getHist(folder + "Higgs.root" , name, Plotter::Block, HiggsColor);
    TH1F* histData = (TH1F*)Plotter::getHist(folder + "Data.root", name, Plotter::Block, dataColor);
    TH1F* histW = (TH1F*)Plotter::getHist(folder + "W.root" , name, Plotter::Block, WColor);

    mPlotter->addBkgHist(histHiggs);
    mPlotter->addBkgHist(histMultiBoson);
    mPlotter->addBkgHist(histSingleTop);
    mPlotter->addBkgHist(histtt);
    mPlotter->addBkgHist(histW);
    mPlotter->addBkgHist(histZ);
    mPlotter->addSigHist(histsig);
    mPlotter->addSigHist(histsig2);
    mPlotter->addSigHist(histsig3);
    mPlotter->setDataHist(histData);
}
```

画图

设置图头、坐标、尺寸、图例等

```
mPlotter->setCompareHist(histData,mPlotter->getBkgHist());

mPlotter->addUpperText(0.17,0.76+0.05,"#sqrt{s} = 13 TeV, 139 fb^{-1}" , 0.04);

mPlotter->addATLASText(0.17, 0.86+0.05, 0.04);

mPlotter->addUpperText(0.17+0.10,0.86+0.05,"Internal", 0.04);

TLegend *legendMC = mPlotter->addUpperLegend(0.55,0.75,0.92,0.97);

legendMC->AddEntry(histData, "Data","pl");
legendMC->AddEntry(mPlotter->getBkgHist(), "Total SM","f");
legendMC->AddEntry(histHiggs, "Higgs","f");
legendMC->AddEntry(histMultiBoson, "MultiBoson","f");
legendMC->AddEntry(histSingleTop, "SingleTop","f");
legendMC->AddEntry(histtt, "tt","f");
legendMC->AddEntry(histW, "W", "f");
legendMC->AddEntry(histZ, "Z","f");
legendMC->SetNColumns(2);

TLegend *legendsig = mPlotter->addUpperLegend(0.4,0.63,0.92,0.75);

legendsig->AddEntry("", "m_{#tilde{#chi}_{2}^{0}}/#tilde{#chi}_{1}^{#pm}}, m_{#tilde{#chi}_{1}^{0}} =", "");
legendsig->AddEntry(histsig, "(300,150) GeV","pl");
legendsig->AddEntry(histsig2, "(700,400) GeV","pl");
legendsig->AddEntry(histsig3, "(1000, 0) GeV","pl");
legendsig->SetNColumns(2);
```


设置特殊 bin 及坐标轴

设置坐标轴标题

```
int rebinNum = 1;
if( name.find("_N_1") != string::npos || name.find("Mtt") != string::npos ){
    rebinNum = 2;
} else if( name.find("MET") != string::npos ){
    rebinNum = 3;
} else{
    rebinNum = 5;
}

//Zn
std::string xaxis = name;
string yTitile = "Events";
mPlotter->autosetUpperYTitle();
```


绘图及命名

绘图命名各文件

```
if(name.find("tau1pt") != string::npos || name.find("tau1Pt") != string::npos){
    xaxis = "p_{T#tau} [GeV]";
} else if (name.find("tau2pt") != string::npos || name.find("tau2Pt") != string::npos){
    xaxis = "p_{T#tau2} [GeV]";
} else if (name.find("mu1Pt") != string::npos){
    xaxis = "p_{T#mu} [GeV]";
} else if (name.find("Mtt_high_N_1") != string::npos){
    mPlotter->setZnProperty(Plotter::FLIP_DIC,0.3);
    xaxis = "M_{#tau#tau} [GeV]";
} else if (name.find("Mtt") != string::npos){
    xaxis = "M_{#tau#tau} [GeV]";
} else if (name.find("Evt_MET") != string::npos){
    xaxis = "E_{T}^{miss} [GeV]";
} else if (name.find("Rtt") != string::npos){
    xaxis = "#Delta R_{#tau#tau}";
    mPlotter->autosetUpperYTitle(" ");
    mPlotter->setZnProperty(Plotter::FLIP_DIC,0.3);
} else if (name.find("topTagger") != string::npos){
    mPlotter->setZnProperty(Plotter::FLIP_DIC,0.3);
} else if (name.find("bTag_N_1") != string::npos){
    mPlotter->setZnProperty(Plotter::FLIP_DIC,0.3);
} else if (name.find("Njet") != string::npos){
    mPlotter->setZnProperty(Plotter::FLIP_DIC,0.3);
} else if (name.find("Ht_Jet") != string::npos){
    mPlotter->setZnProperty(Plotter::FLIP_DIC,0.3);
} else if (name.find("Phitt") != string::npos){
    xaxis = "#Delta #phi_{#tau#tau}";
    mPlotter->autosetUpperYTitle(" ");
    mPlotter->setZnProperty(Plotter::FLIP_DIC,0.3);
} else if (name.find("dRtm") != string::npos){
    xaxis = "#Delta R_{#tau#mu}";
```

```

} else if (name.find("Mll") != string::npos){
    xaxis = "M_{#tau#mu} [GeV]";
} else if (name.find("MT12") != string::npos){
    xaxis = "m_{T#tau}+m_{T#mu} [GeV]";
} else if (name.find("mT2") != string::npos){
    xaxis = "m_{T2} [GeV]";
} else if (name.find("met_sig_tj") != string::npos){
    xaxis = "E_{T}^{miss} Sig_{taujet} [#sqrt{GeV}]";
} else if (name.find("dPhitm") != string::npos){
    xaxis = "#Delta #phi_{#tau#mu}";
} else if (name.find("meff") != string::npos){
    xaxis = "M_{eff} [GeV]";
} else if (name.find("muMt") != string::npos || name.find("mu1Mt") != string::npos){
    xaxis = "M_{T#mu} [GeV]";
} else if (name.find("tau1Mt") != string::npos){
    xaxis = "M_{T#tau1} [GeV]";
} else if (name.find("tau2Mt") != string::npos){
    xaxis = "M_{T#tau2} [GeV]";
} else if (name.find("lepMt") != std::string::npos){
    xaxis = "M_{TL} [GeV]";
} else if (name.find("lepPt") != std::string::npos){
    xaxis = "p_{TL} [GeV]";
} else if (name.find("MET") != std::string::npos){
    xaxis = "E_{T}^{miss} [GeV]";
    mPlotter->setXRange(0,300);
} else if (name.find("MTsum") != std::string::npos){
    xaxis = "m_{Tsum} [GeV]";
}
```

坐标设置

设置坐标

```
mPlotter->Rebin(rebinNum);

mPlotter->setLowerRange(0,2);
mPlotter->setUpperRange(0.008,100000000000);

mPlotter->setXTitle(xaxis);

mPlotter->setLowerYTitle("Data/MC");

mPlotter->Draw(name);

}
```

编写 run.sh 文件

编写运行绘图脚本

- /afs/ihep.ac.cn/users/s/sheny/
Publicfs/test/test-7.25/plot/
Data-MC
- root: .ls
- source run.sh

```
KEY: TH1F      bTag;1  bTag
KEY: TH1F      bTag_N_1;1  bTag_N_1
KEY: TH1F      dPhitt;1  dPhitt
KEY: TH1F      dPhitt_N_1;1  dPhitt_N_1
KEY: TH1F      MET;1  MET
KEY: TH1F      MET_N_1;1  MET_N_1
KEY: TH1F      MT2;1  MT2
KEY: TH1F      MT2_N_1;1  MT2_N_1
KEY: TH1F      MET_low;1  MET_low
KEY: TH1F      MT2_low;1  MT2_low
KEY: TH1F      tau1Pt_low;1  tau1Pt_low
KEY: TH1F      tau2Pt_low;1  tau2Pt_low
KEY: TH1F      tau1Mt_low;1  tau1Mt_low
KEY: TH1F      tau2Mt_low;1  tau2Mt_low
KEY: TH1F      dPhitt_low;1  dPhitt_low
KEY: TH1F      dRtt_low;1  dRtt_low
KEY: TH1F      Mtt_12_low;1  Mtt_12_low
```

```
1 root -l -b -q 'draw-7.28.C("dPhitt")' &
2 root -l -b -q 'draw-7.28.C("dPhitt_N_1")' &
3 root -l -b -q 'draw-7.28.C("MET")' &
4 root -l -b -q 'draw-7.28.C("MET_N_1")' &
5 root -l -b -q 'draw-7.28.C("MT2")' &
6 root -l -b -q 'draw-7.28.C("MT2_N_1")' &
7
8 root -l -b -q 'draw-7.28.C("dPhitt_low")' &
9 root -l -b -q 'draw-7.28.C("dRtt_low")' &
10 root -l -b -q 'draw-7.28.C("MET_low")' &
11 root -l -b -q 'draw-7.28.C("MT2_low")' &
12 root -l -b -q 'draw-7.28.C("Mtt_12_low")' &
13 root -l -b -q 'draw-7.28.C("tau1Mt_low")' &
14 root -l -b -q 'draw-7.28.C("tau1Pt_low")' &
15 root -l -b -q 'draw-7.28.C("tau2Mt_low")' &
16 root -l -b -q 'draw-7.28.C("tau2Pt_low")' &
17
18 root -l -b -q 'draw-7.28.C("bTag")' &
19 root -l -b -q 'draw-7.28.C("bTag_N_1")' &
20
21
22
23
24
25
26
27
28
29
30 /*
31
32
33
34
35
36
37 */
```


Data/MC图简单分析

ANA-SUSY-2019-17-INT1

SR-C1C1-LM

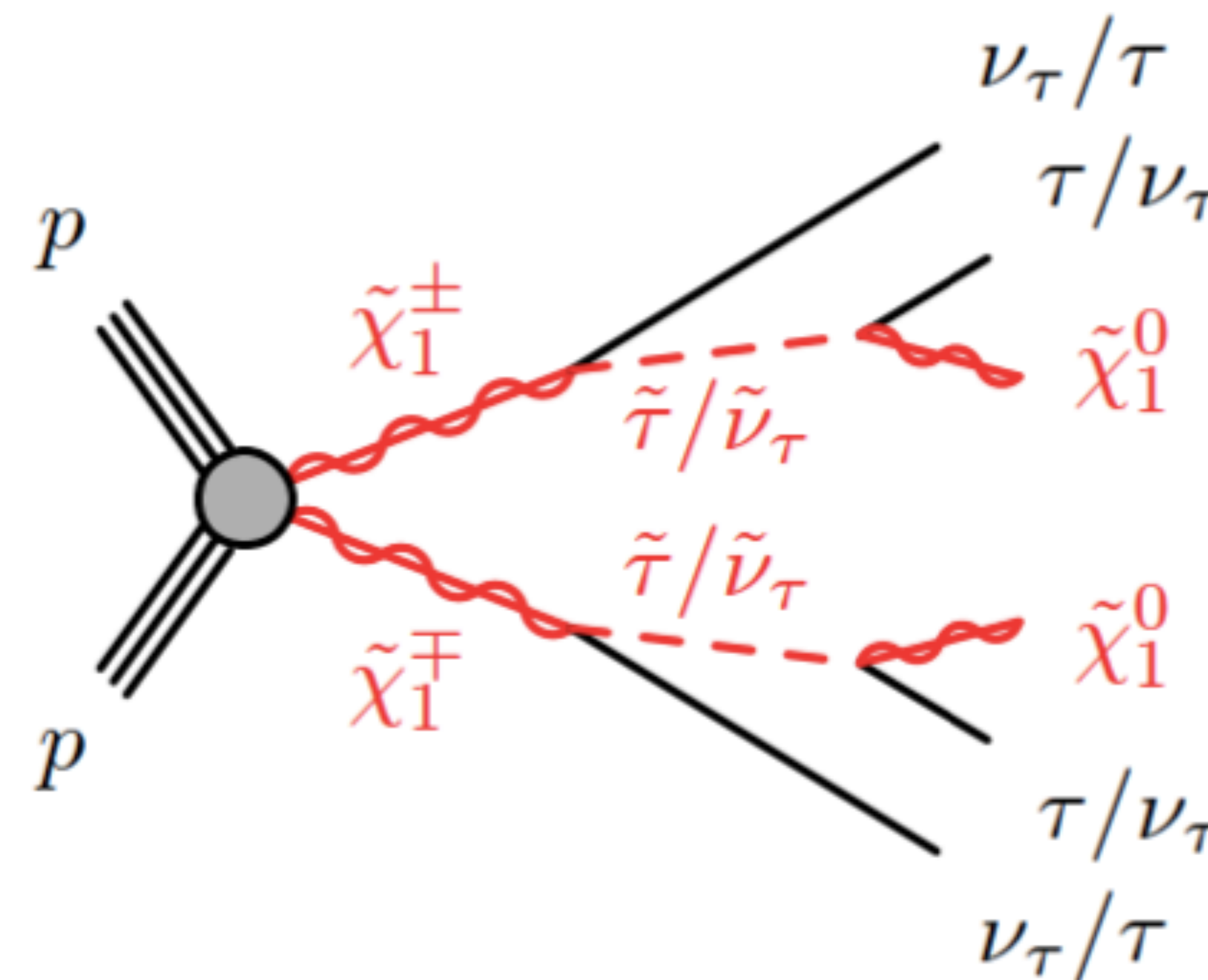
Preselection

沈羽 2022.8.7

研究背景

简化模型

- 一对质子与质子对撞生成两个C1
- C1衰变为stau，放出一个轻子
- Stau衰变成一个LSP和一个轻子
- 末态为2个tau、2个LSP、2个中微子



SR-C1C1-LM

Preselection

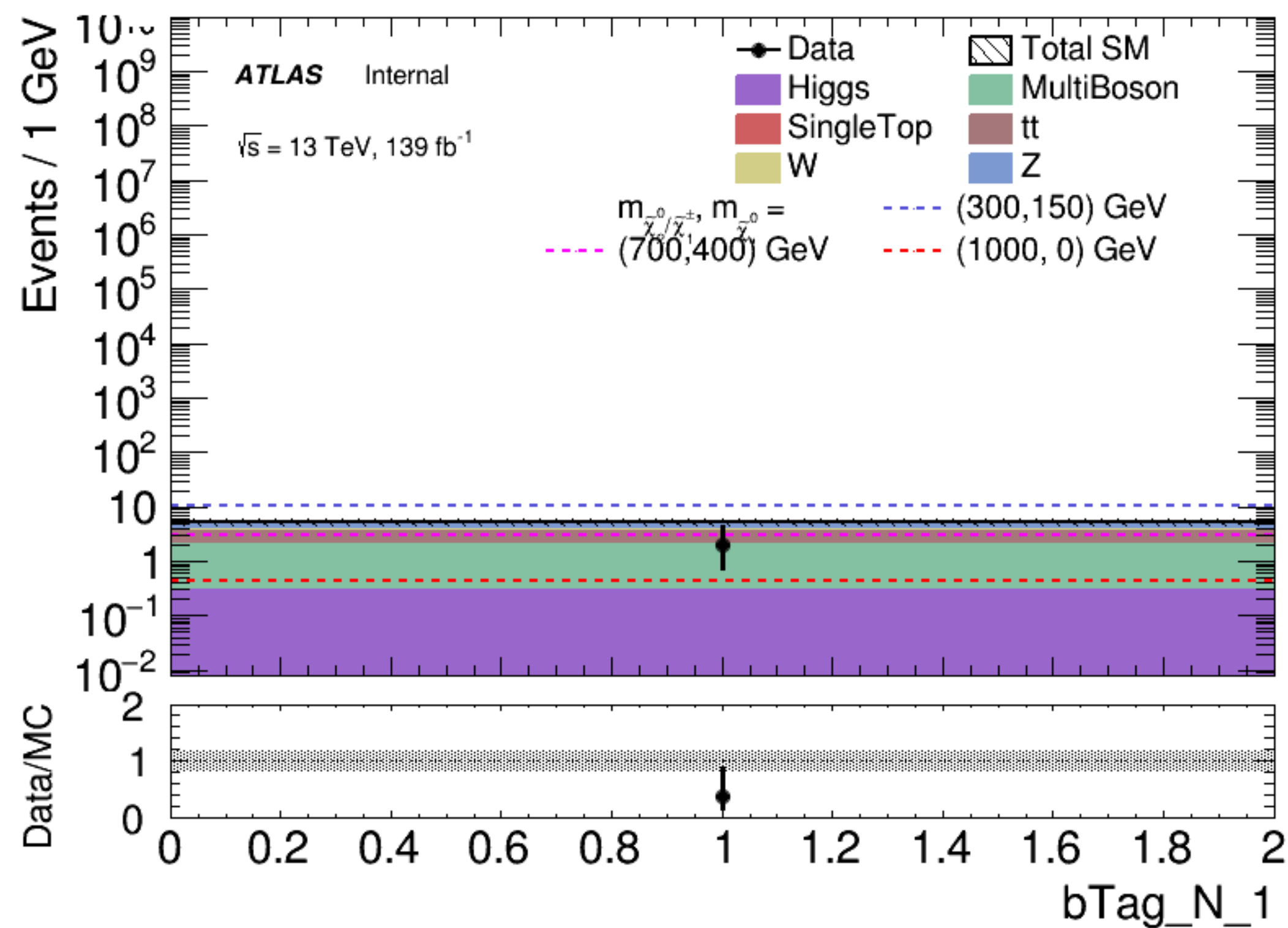
- == 2 medium taus (OS)
- >= 1 tight tau
- B-jet veto
- Z/H veto ($m(\text{tau1}, \text{tau2}) > 120 \text{ GeV}$)
- $d\text{Phitt} > 1.6$
- $60 \text{ GeV} < \text{MET} < 150 \text{ GeV}$

SR-C1C1-LM	SR-C1N2OS-LM	SR-C1C1-HM	SR-C1N2OS-HM
== 2 medium taus (OS)	>= 2 medium taus (OS)	== 2 medium taus (OS)	>= 2 medium taus (OS)
>= 1 tight tau		-	
<i>b</i> -jet veto			
Z/H veto ($m(\tau_1, \tau_2) > 120$ GeV)			
$ \Delta\phi(\tau_1, \tau_2) > 1.6$	$N_{jets} < 3$	-	
$E_T^{\text{miss}} > 60$ GeV		$m_{Tsum} > 400$ GeV	
$m_{T2} > 80$ GeV	$m_{T2}^{\text{max}} > 70$ GeV	$m_{T2} > 85$ GeV	$m_{T2}^{\text{max}} > 85$ GeV
asymmetry di-tau Trigger		di-tau + E_T^{miss} Trigger	
$E_T^{\text{miss}} < 150$ GeV		$E_T^{\text{miss}} > 150$ GeV	
τ_1 and τ_2 p_T requirements described in Table 8 in Section 4.3			

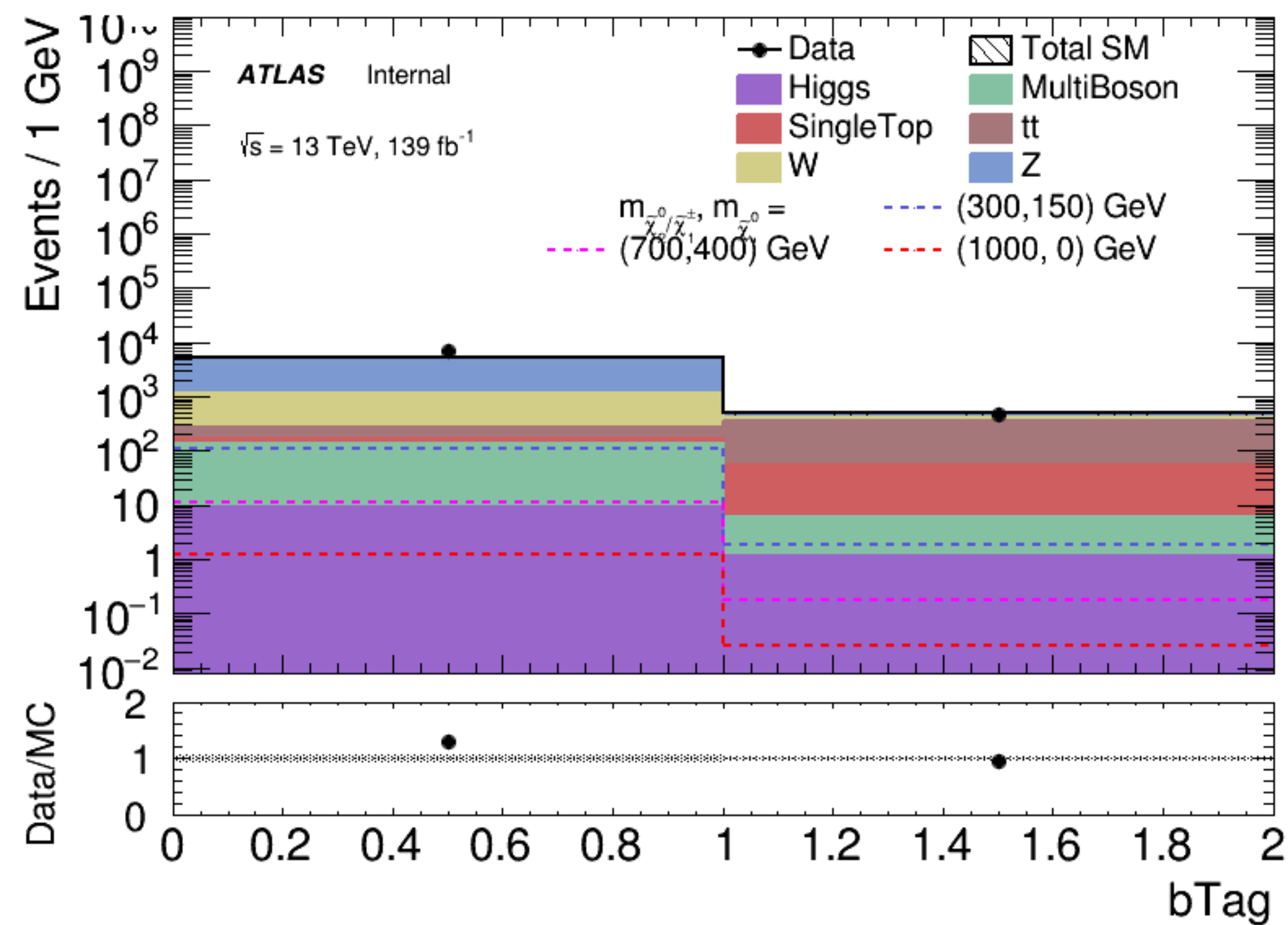
```
auto mCutflow_low = addCutflow();
mCutflow_low->setWeight([&]{return Var["totalWeight"]});
mCutflow_low->setFillTree(oTree);
mCutflow_low->registerCut("baseline", [&]{return fabs(Var["totalWeight"]) < 1000; }); //统计没有经过任何cut时的事例数
mCutflow_low->registerCut("==2 tau", [&]{return n_BaseTau == 2; });
mCutflow_low->registerCut(">= 2 medium tau", [&]{return nTaus >= 2 && nTightTau >=1; });
mCutflow_low->registerCut("OS", [&]{return (OS2Tau); });
mCutflow_low->registerCut("MET<150 GeV", [&]{return Var["MET"] < 150; });
mCutflow_low->registerCut("z/hVeto(120GeV)", [&]{return Var["Mtt_12"] > 120; });
mCutflow_low->registerCut("bVeto", [&]{return Var["bVeto"]});, "bTag", 2, 0, 2, [&]{return Var["bNumber"]});
mCutflow_low->registerCut("dPhitt>1.6", [&]{return Var["dPhitt"] > 1.6; }, "dPhitt", 15, 0, 3, [&]{return Var["dPhitt"]});, Hist::USE_OVERFLOW);
mCutflow_low->registerCut("MET>60 GeV", [&]{return Var["MET"] > 60 && Var["MET"] < 150; }, "MET", 15, 0, 150, [&]{return Var["MET"]});, Hist::USE_OVERFLOW);
mCutflow_low->registerCut("MT2>80 GeV", [&]{return Var["MT2"] > 80; }, "MT2", 12, 30, 150, [&]{return Var["MT2"]});, Hist::USE_OVERFLOW);
```

bTag

bTag_N_1

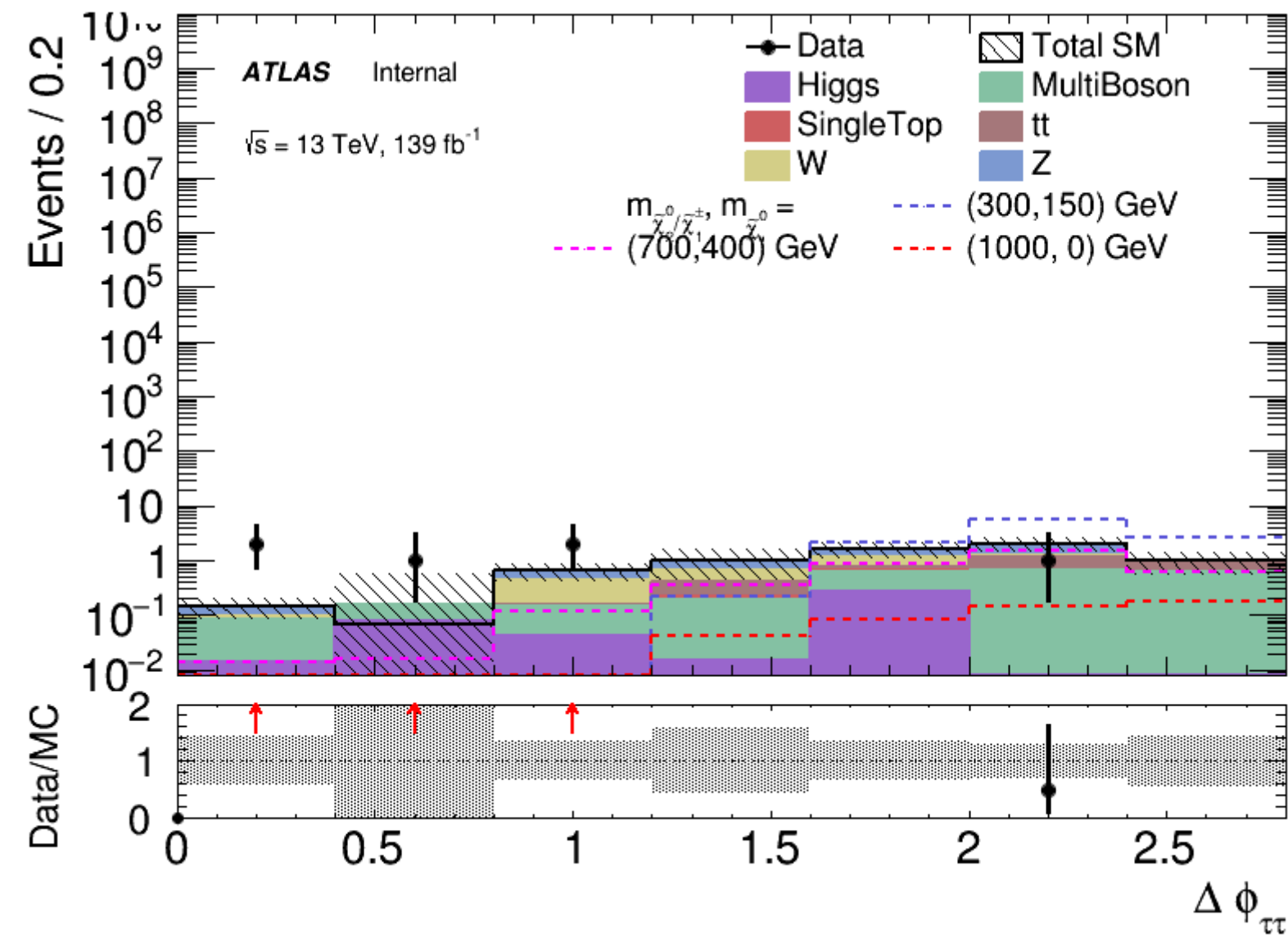


bTag

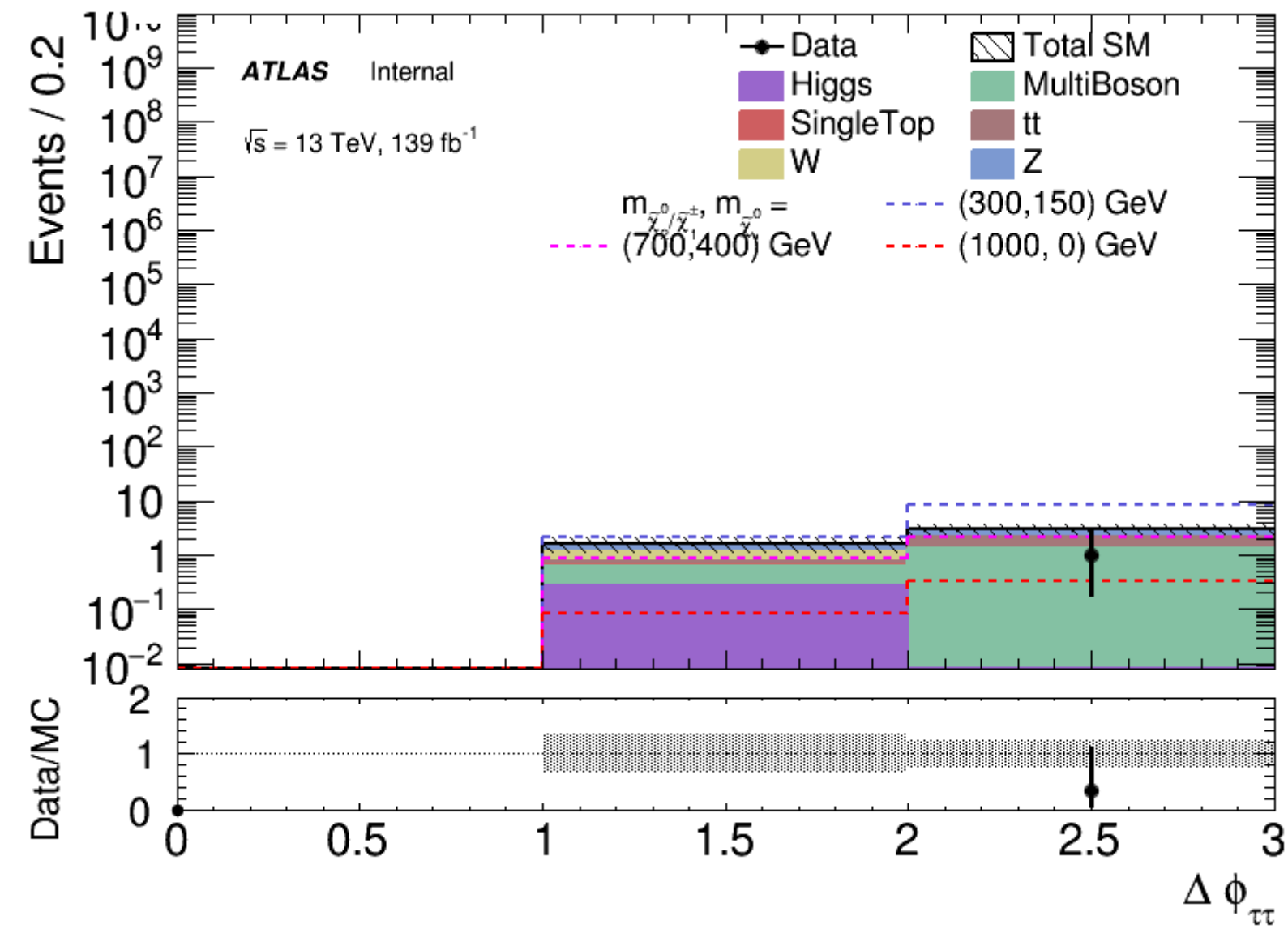


dPhitt

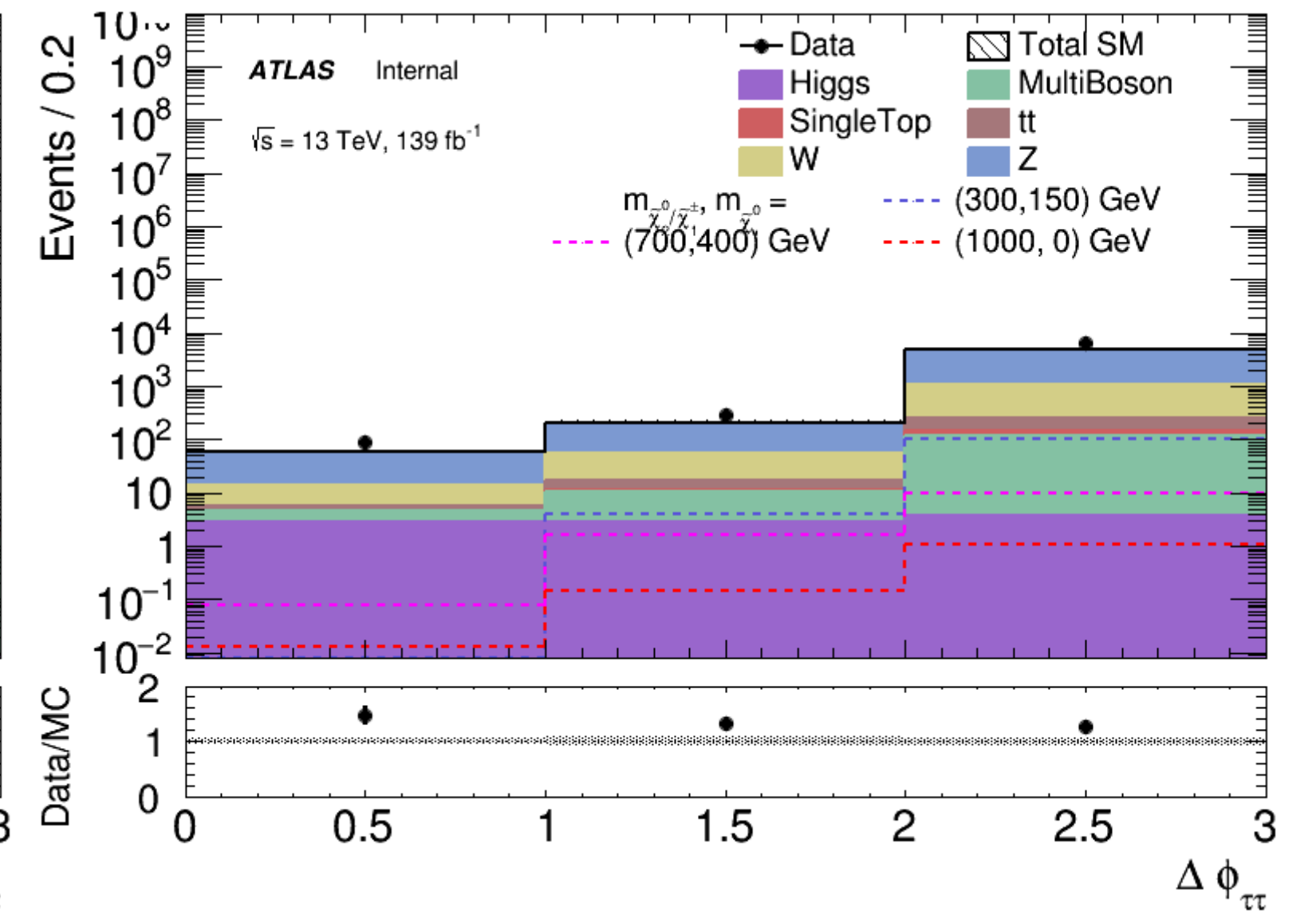
dPhitt_N_1



dPhitt

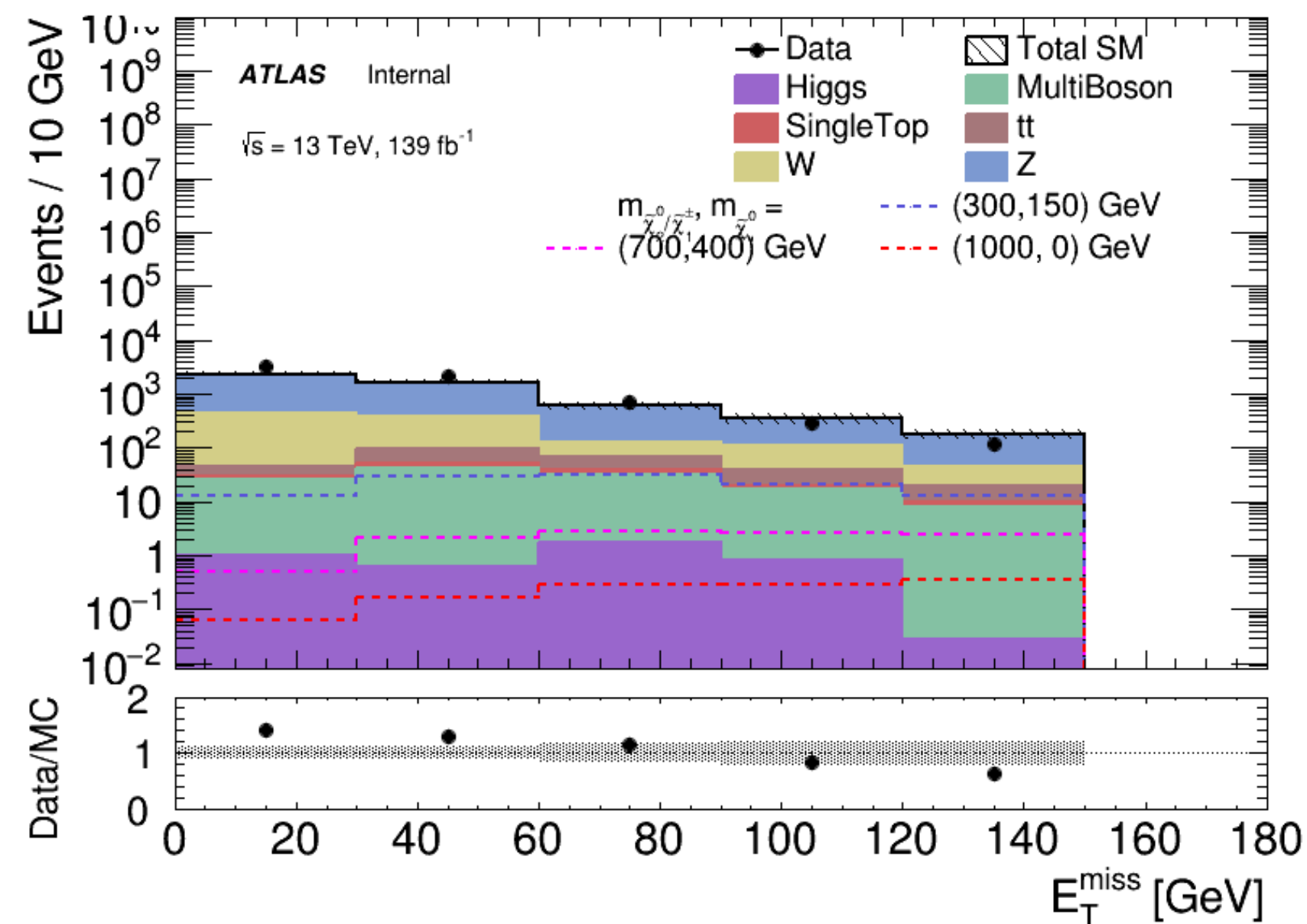


dPhitt_low

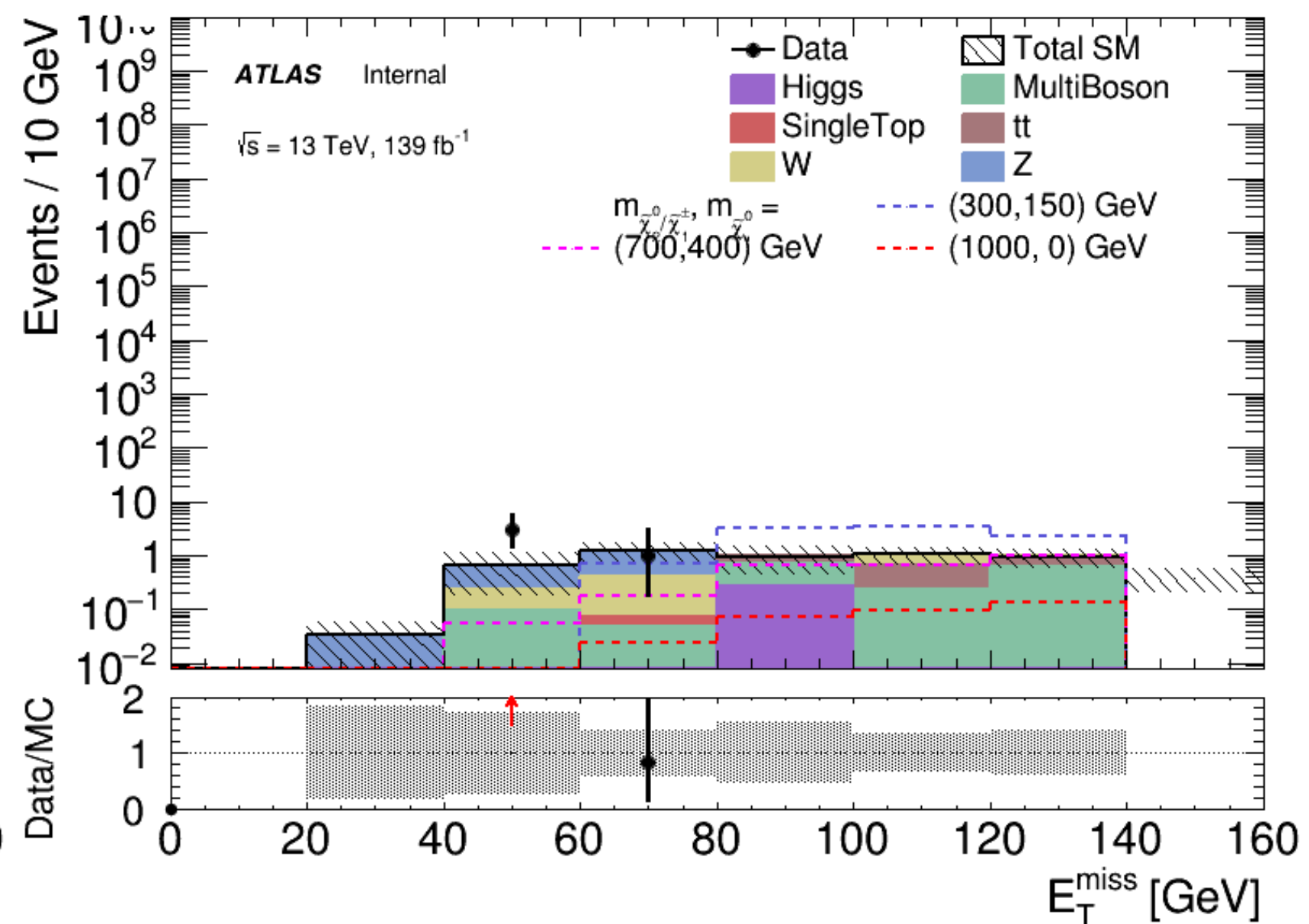


MET

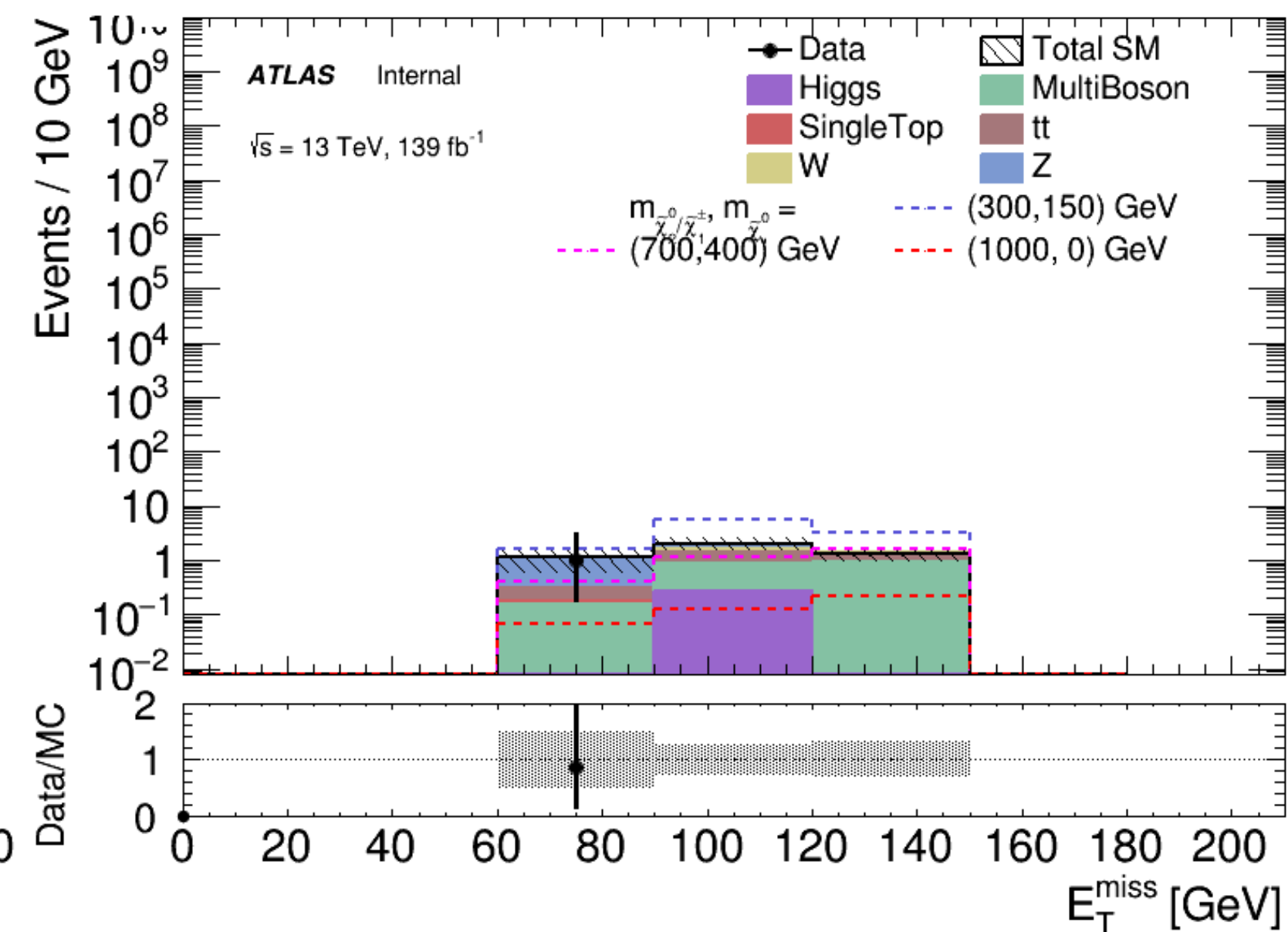
MET



MET_N_1

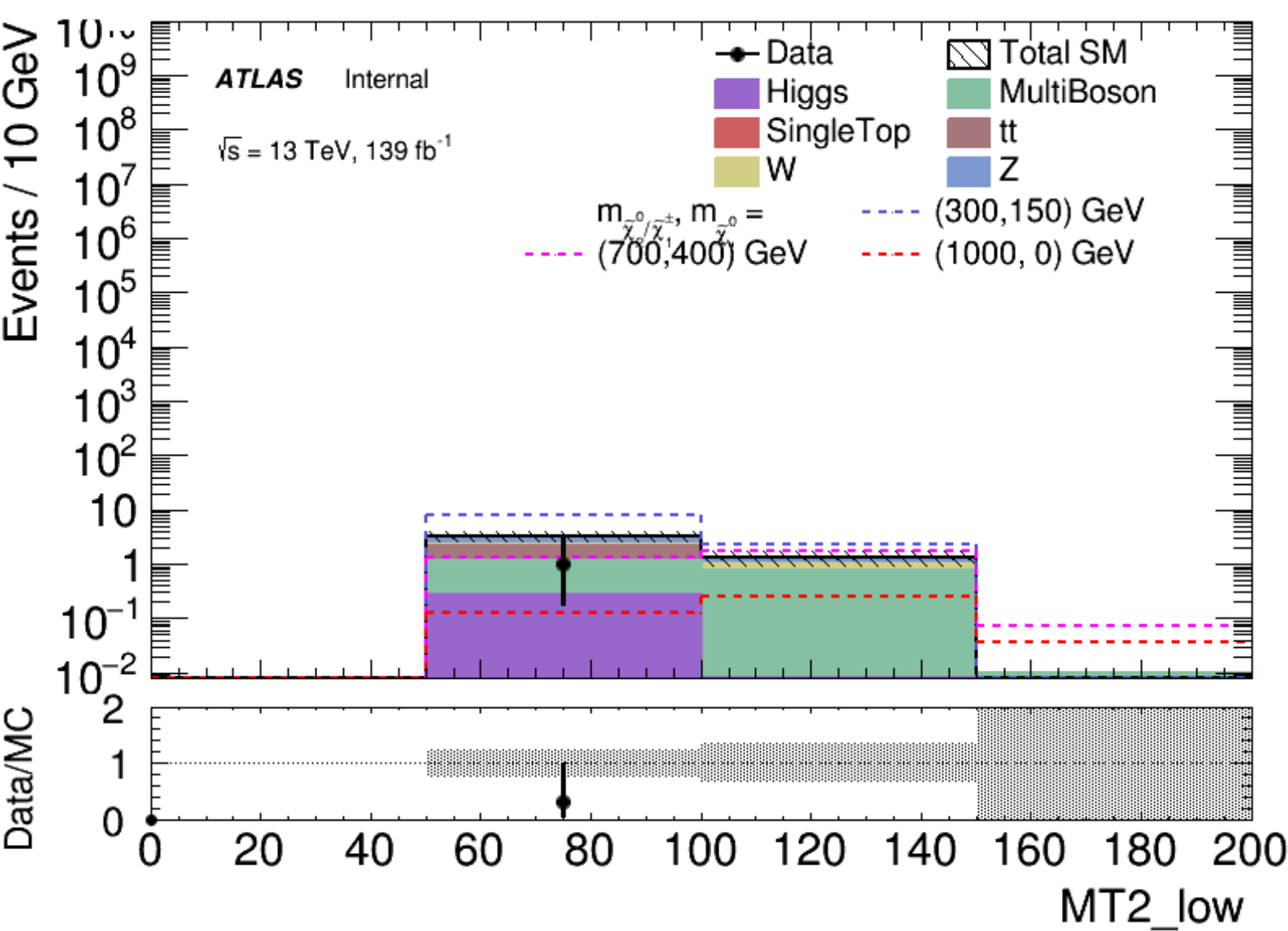


MET_low

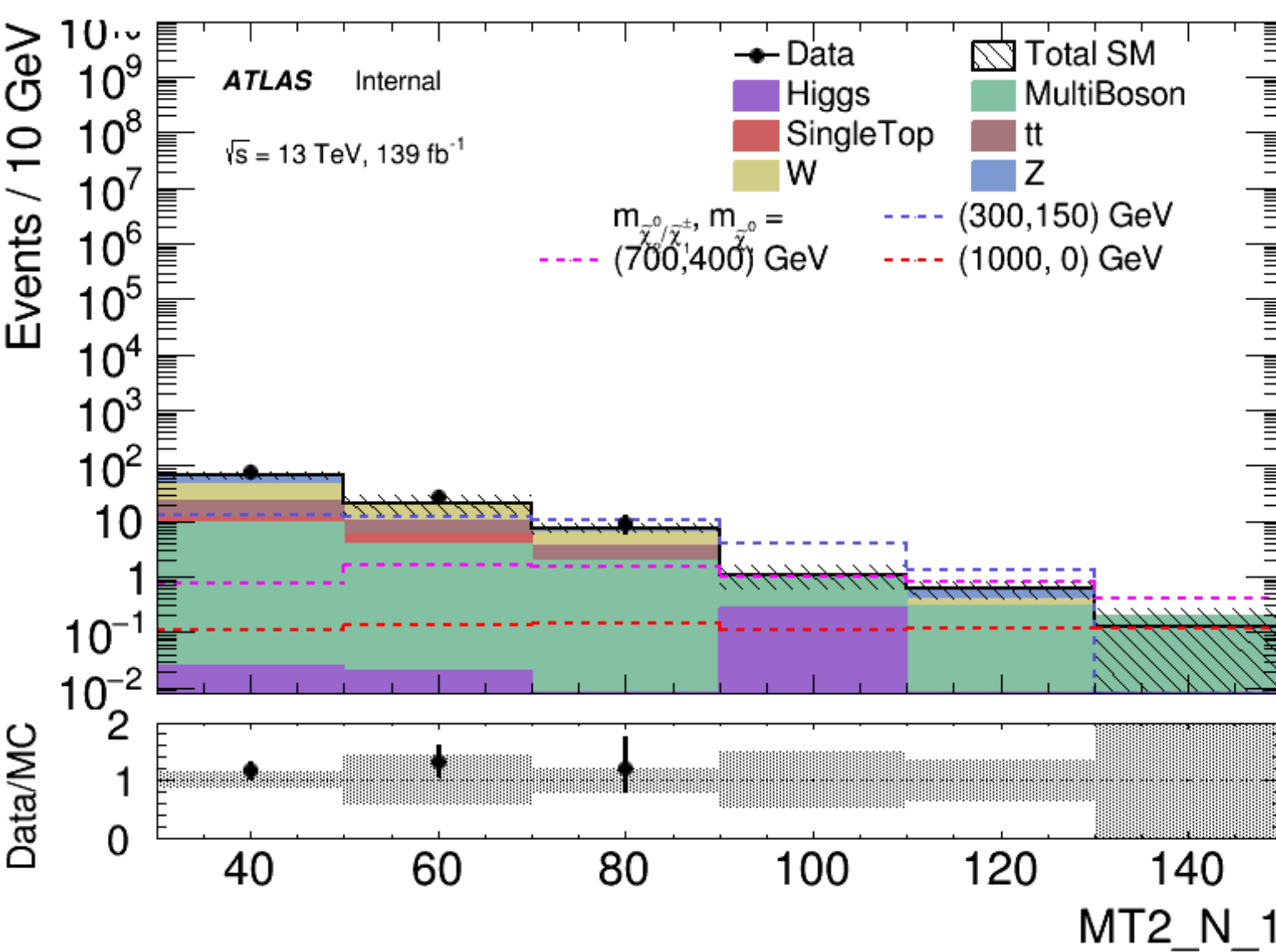


MT2

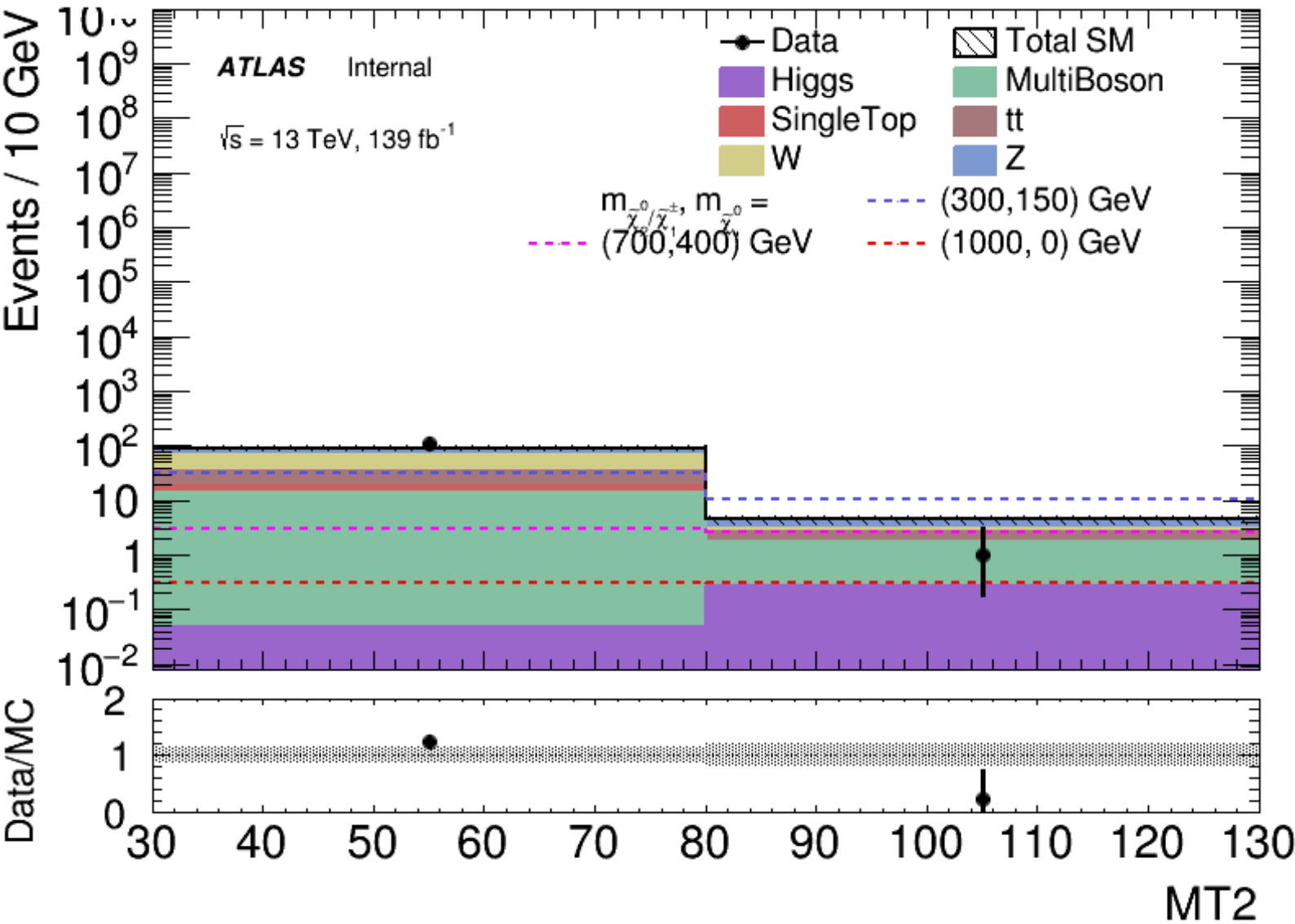
MT2_low



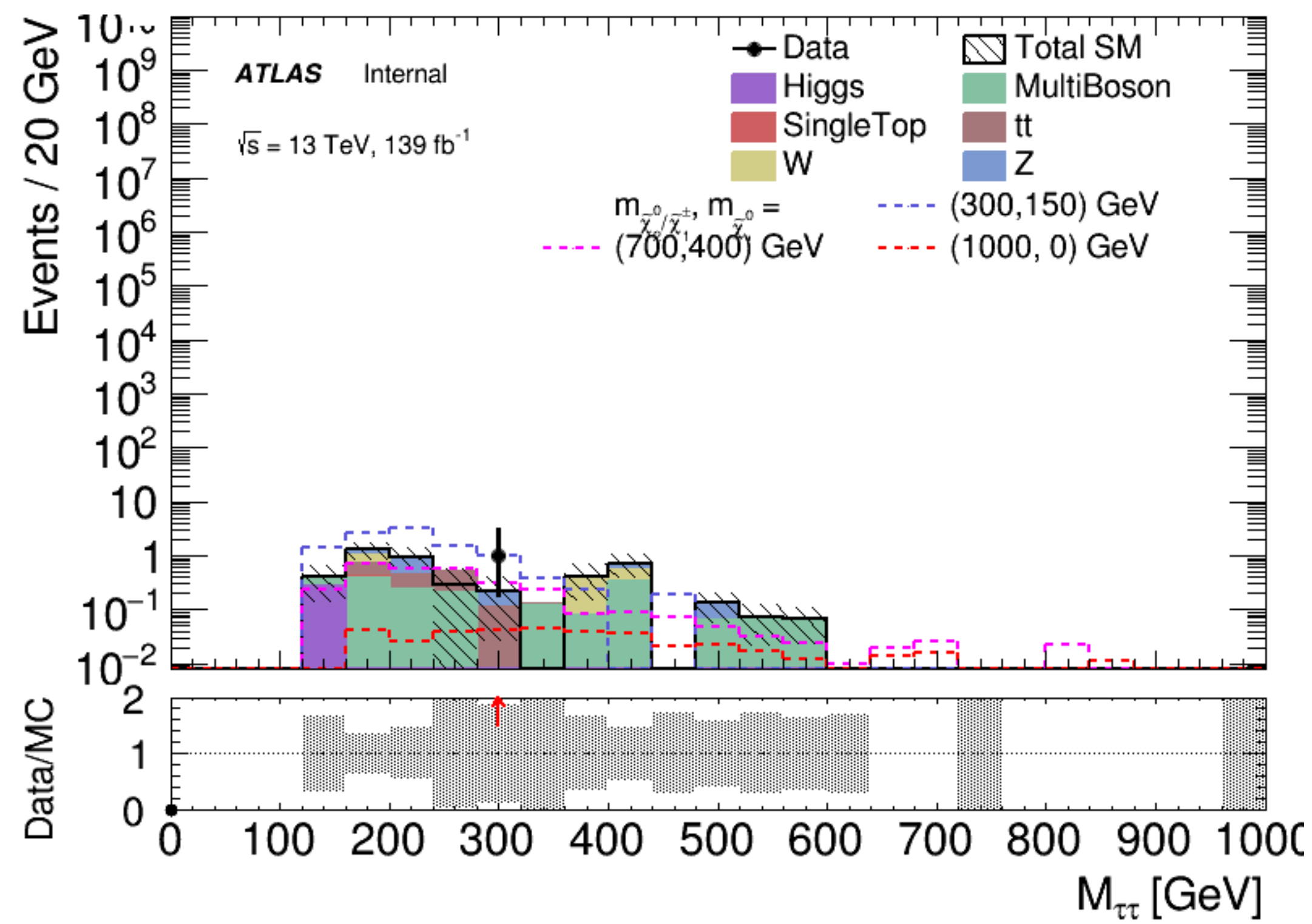
MT2_N_1



MT2



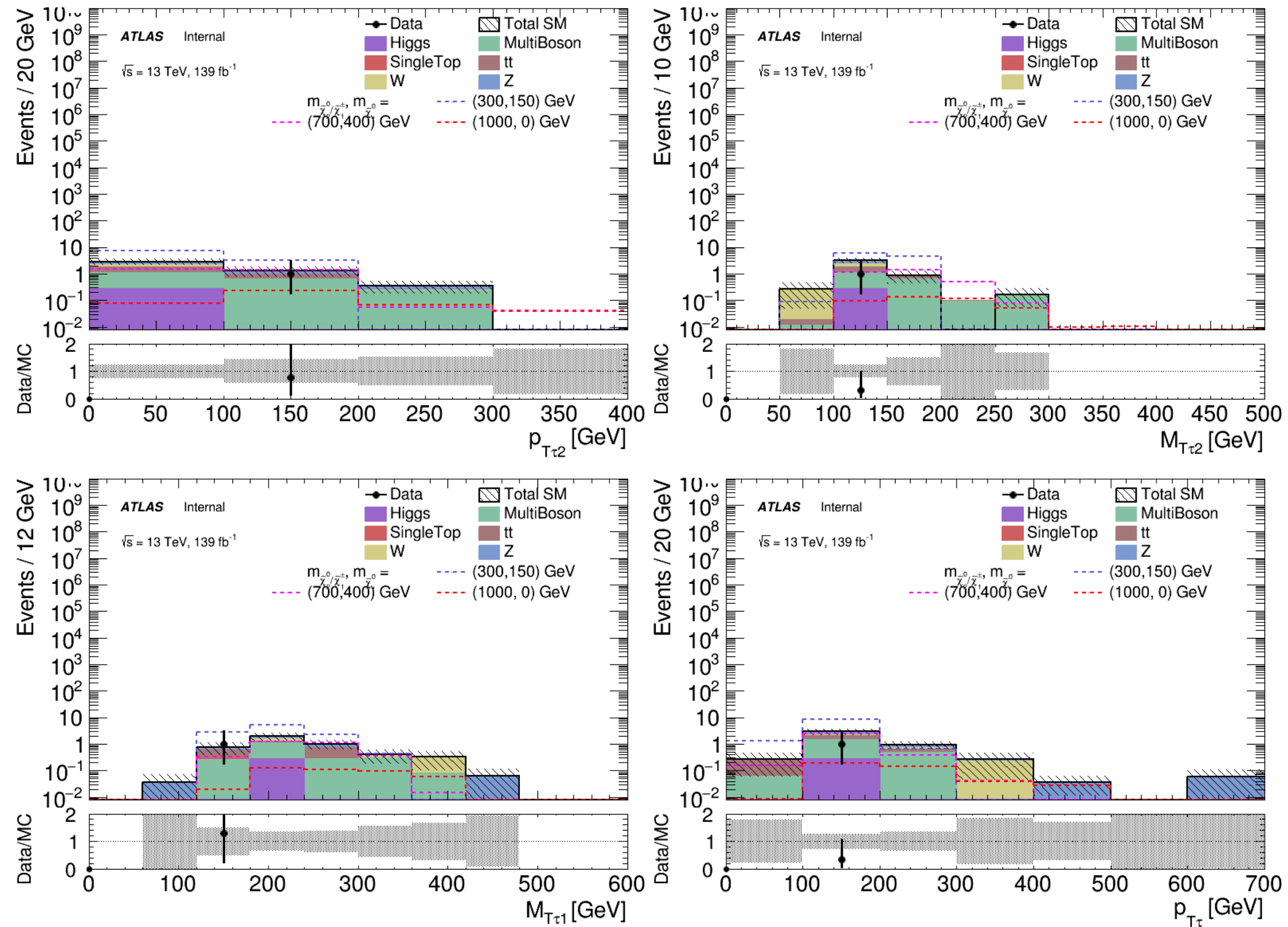
Matt_12_low



Tau

tau2Pt_low
tau1Mt_low

tau2Mt_low
tau1Pt_low



下周工作安排

2022.8.7-2022.8.14

1. 阅读文献
2. 学习 ABCD 方法
3. 计算quality correlation 和 Cutcount

Question?

谢谢！