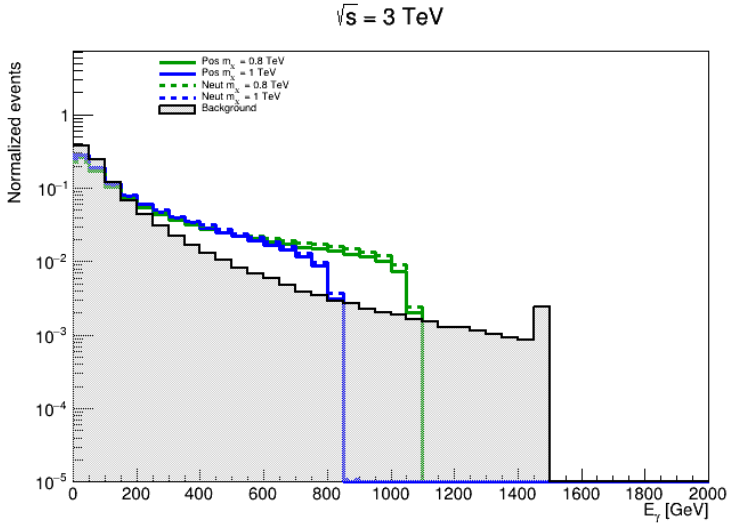
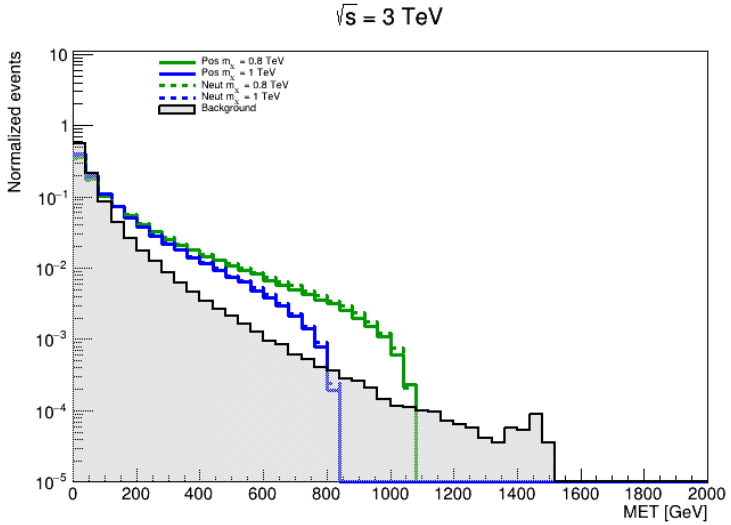
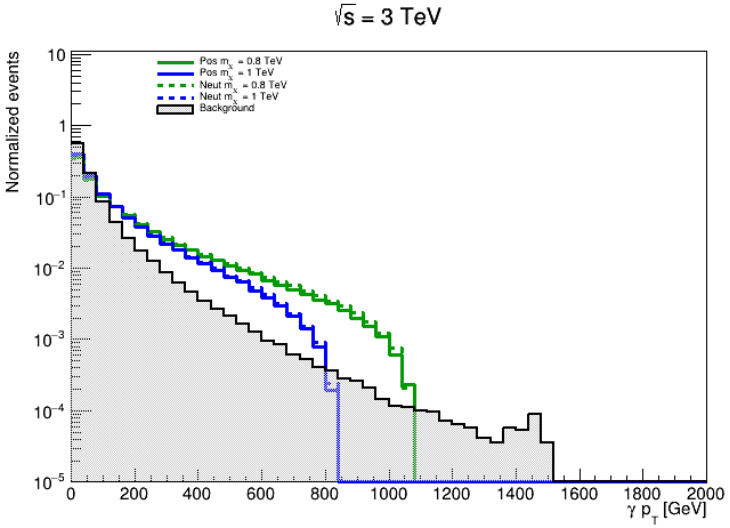
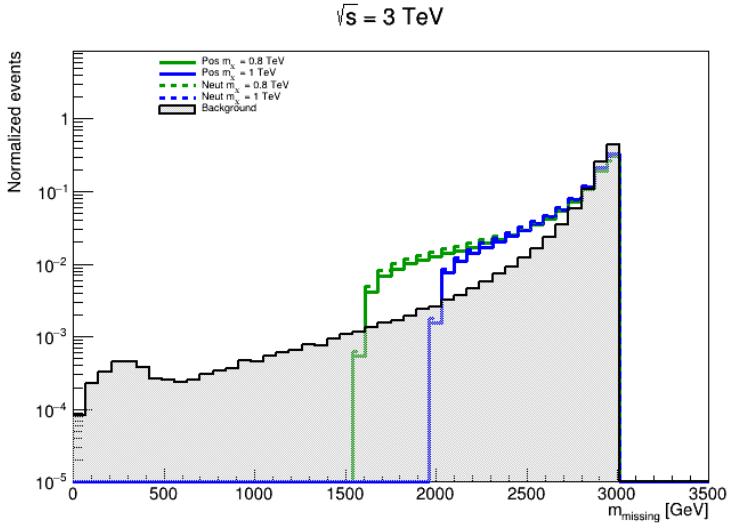
COMBINED ANALYSIS OF POSITIVE AND NEUTRAL DM PARTICLES

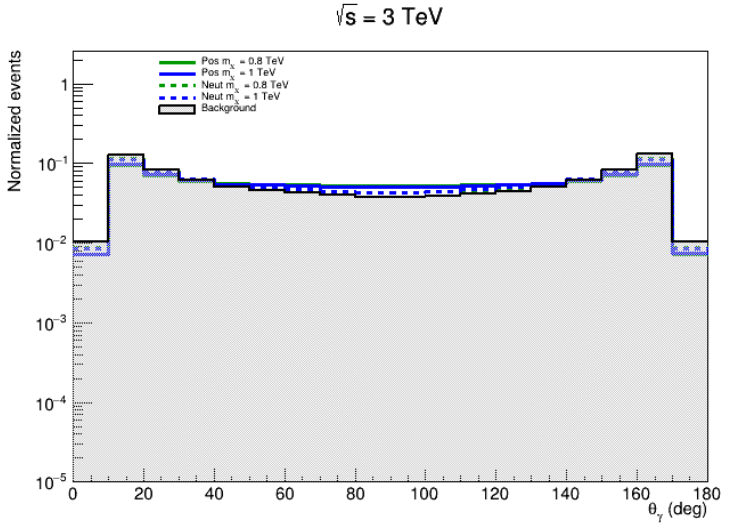
COM = 3 TeV

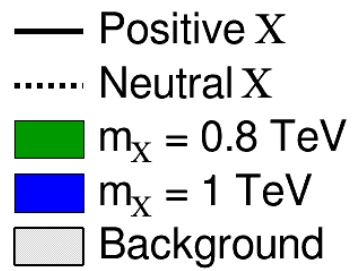

√s = 3 TeV
Pos m_X = 0.8 TeV
Pos m_X = 1 TeV
Neut m_X = 0.8 TeV
Neut m_X = 1 TeV
Background
Normalized events
E_γ [GeV]


√s = 3 TeV
Pos m_X = 0.8 TeV
Pos m_X = 1 TeV
Neut m_X = 0.8 TeV
Neut m_X = 1 TeV
Background
Normalized events
MET [GeV]

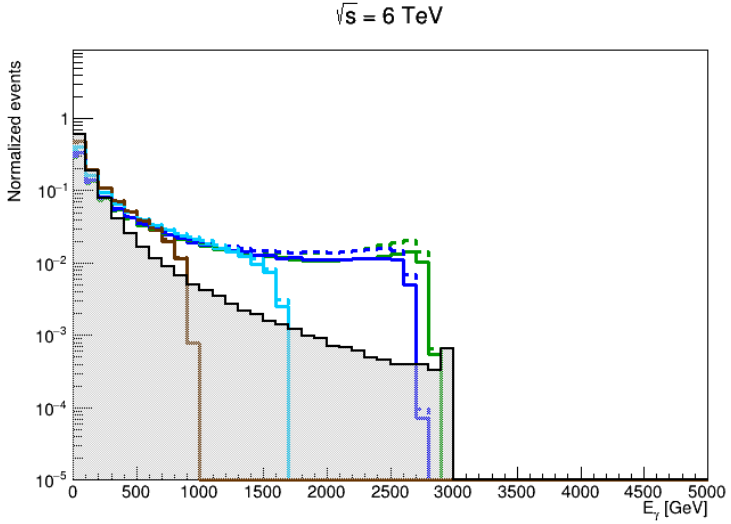

√s = 3 TeV
Pos m_X = 0.8 TeV
Pos m_X = 1 TeV
Neut m_X = 0.8 TeV
Neut m_X = 1 TeV
Background
Normalized events
γ p_T [GeV]

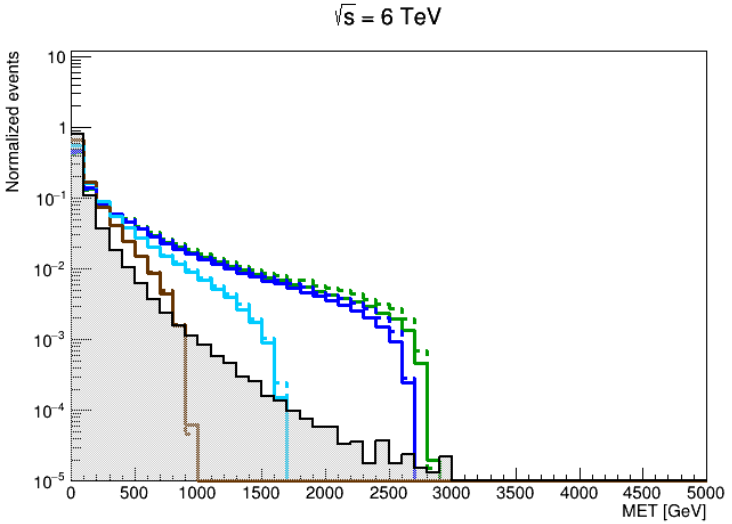

√s = 3 TeV
Pos m_X = 0.8 TeV
Pos m_X = 1 TeV
Neut m_X = 0.8 TeV
Neut m_X = 1 TeV
Background
Normalized events
m_missing [GeV]

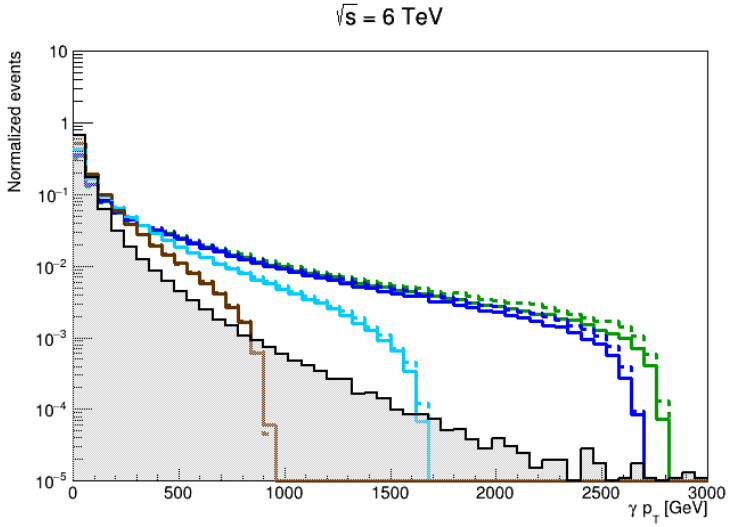

√s = 3 TeV
Pos m_X = 0.8 TeV
Pos m_X = 1 TeV
Neut m_X = 0.8 TeV
Neut m_X = 1 TeV
Background
Normalized events
θ_γ (deg)

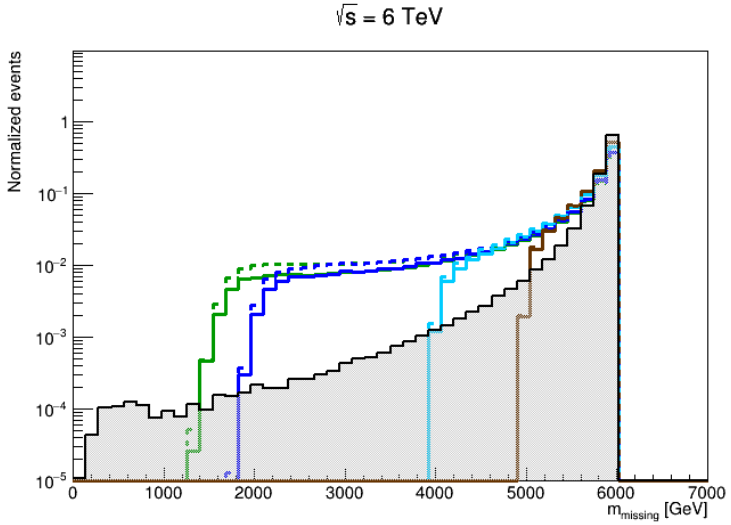

Positive X
Neutral X
m_X = 0.8 TeV
m_X = 1 TeV
Background

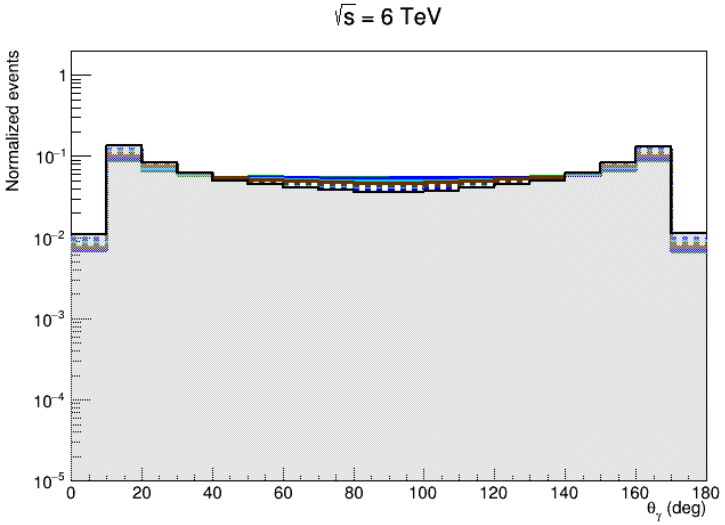
COM = 6 TeV

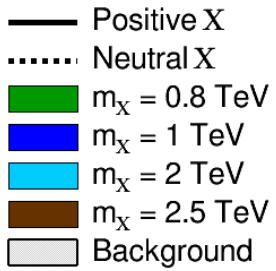

√s = 6 TeV
Normalized events
E_γ [GeV]


√s = 6 TeV
Normalized events
MET [GeV]

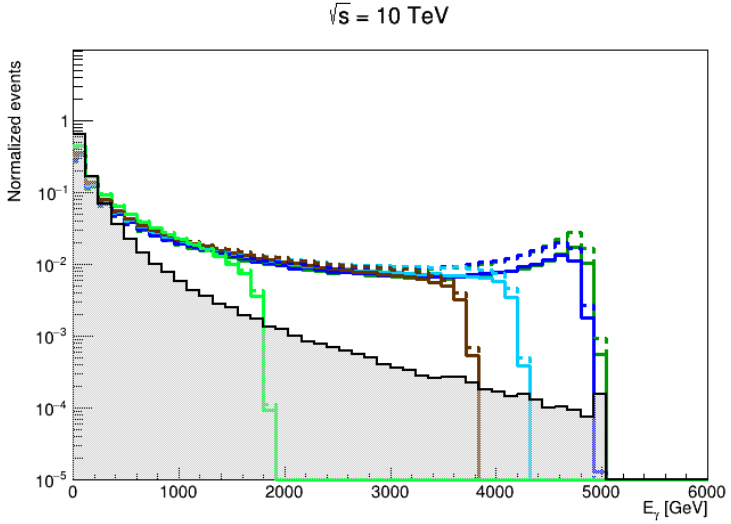

√s = 6 TeV
Normalized events
γ p_T [GeV]

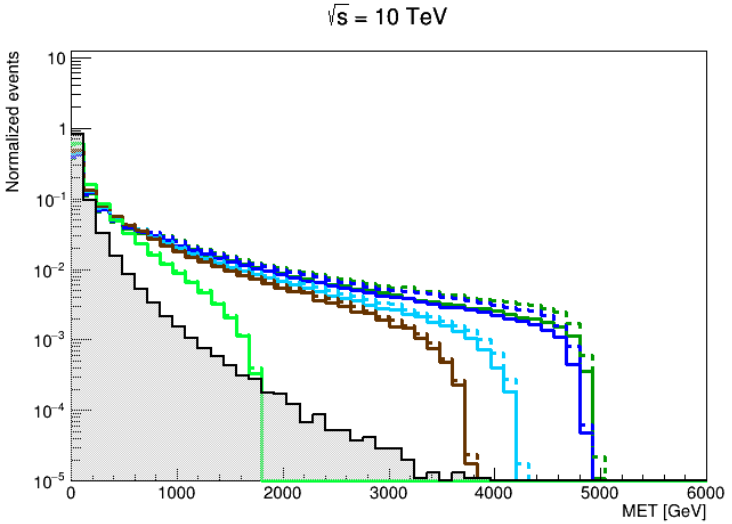

√s = 6 TeV
Normalized events
m_missing [GeV]

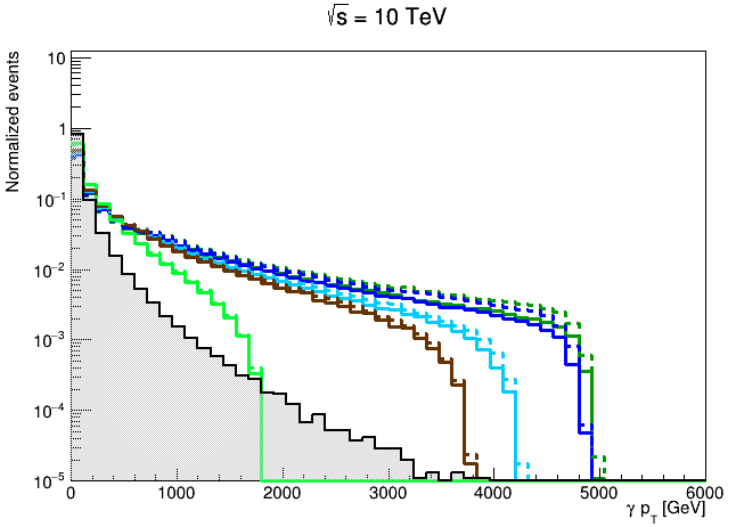

√s = 6 TeV
Normalized events
θ_γ (deg)

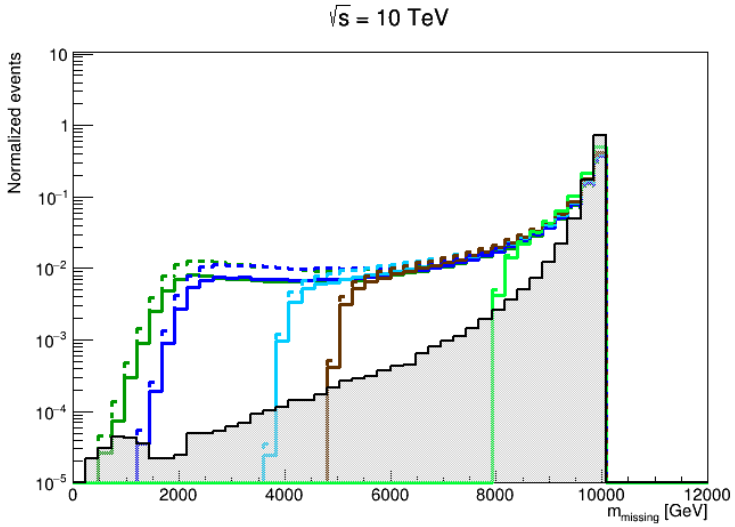

Positive X
Neutral X
m_X = 0.8 TeV
m_X = 1 TeV
m_X = 2 TeV
m_X = 2.5 TeV
Background

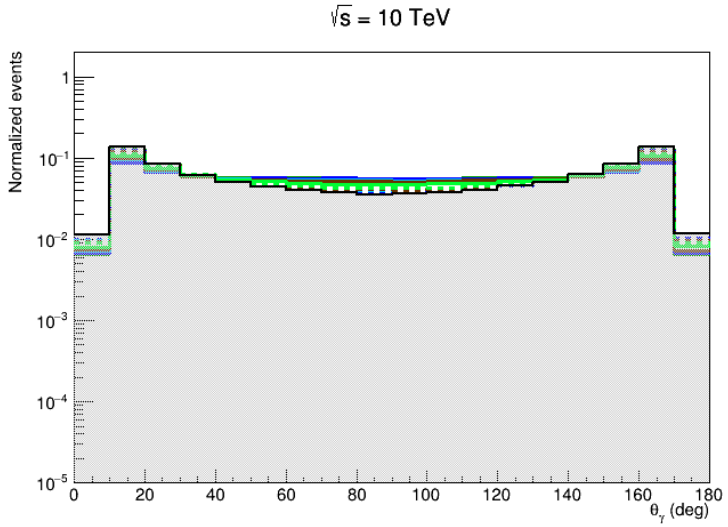
COM = 10 TeV

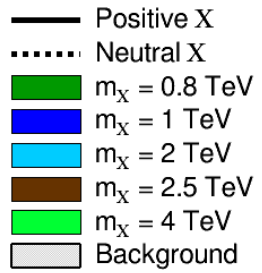

√s = 10 TeV
Normalized events
E_γ [GeV]


√s = 10 TeV
Normalized events
MET [GeV]

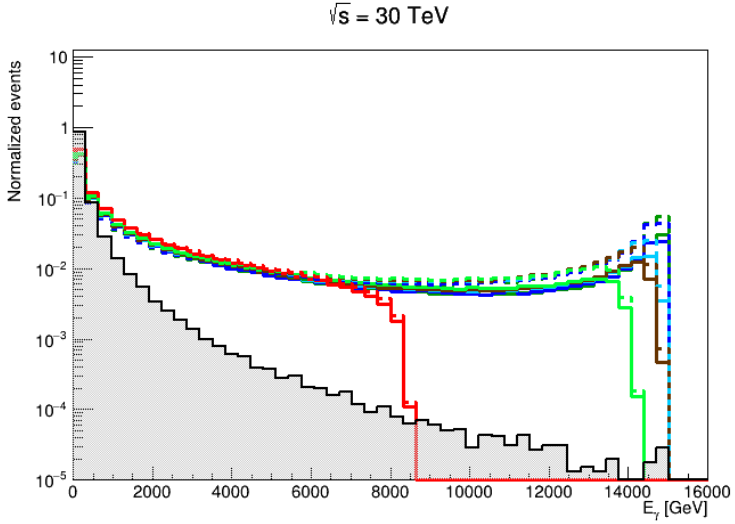

√s = 10 TeV
Normalized events
γ p_T [GeV]

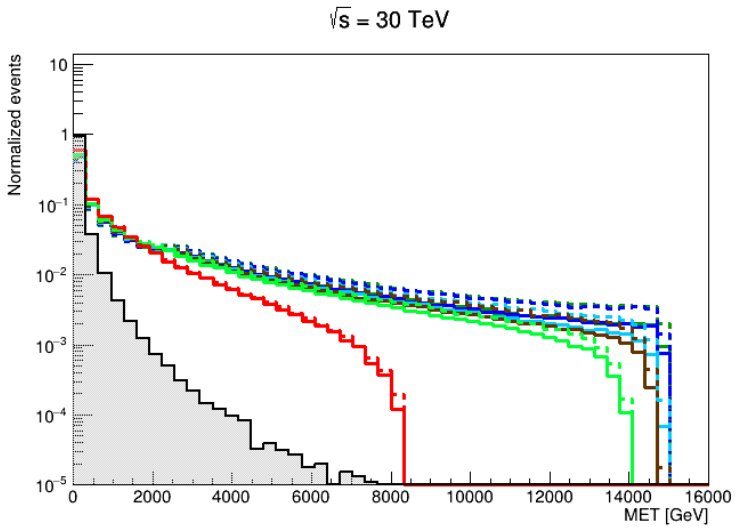

√s = 10 TeV
Normalized events
m_missing [GeV]

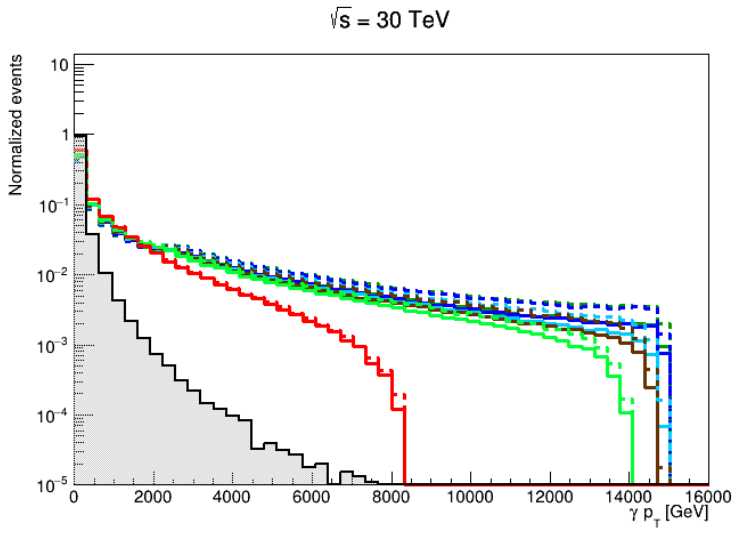

√s = 10 TeV
Normalized events
θ_γ (deg)

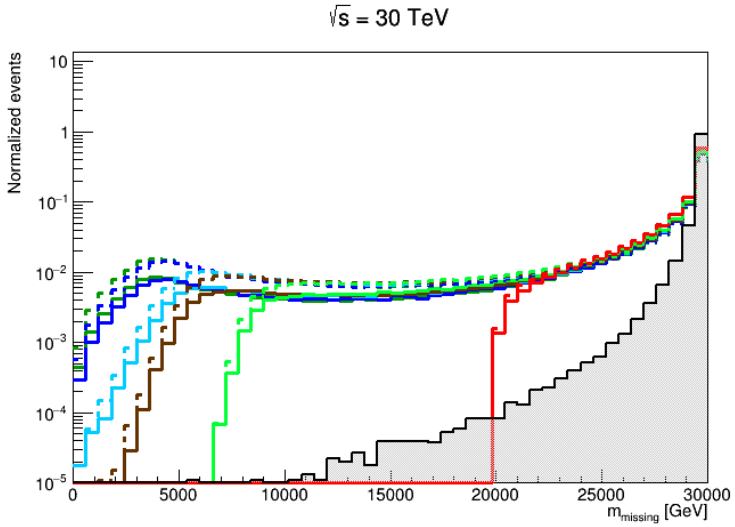

Positive X
Neutral X
m_X = 0.8 TeV
m_X = 1 TeV
m_X = 2 TeV
m_X = 2.5 TeV
m_X = 4 TeV
Background

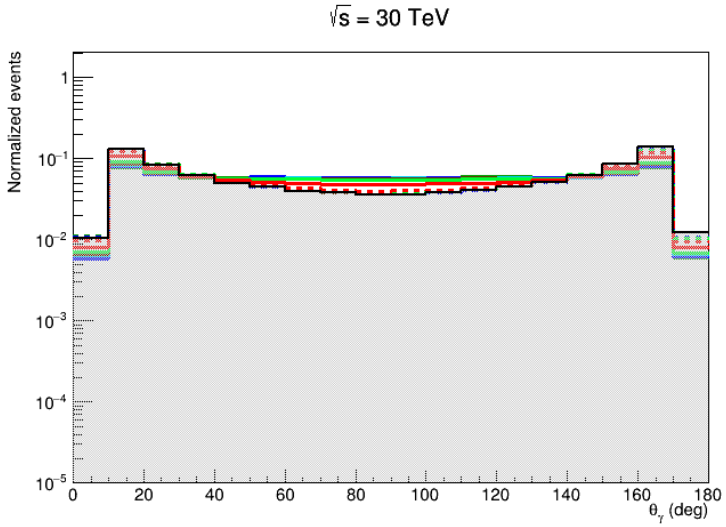
COM = 30 TeV

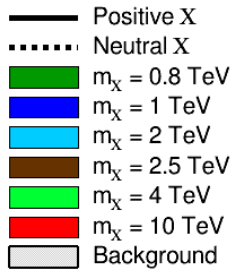

√s = 30 TeV
Normalized events
E_γ [GeV]


√s = 30 TeV
Normalized events
MET [GeV]


√s = 30 TeV
Normalized events
γ p_T [GeV]


√s = 30 TeV
Normalized events
m_missing [GeV]


√s = 30 TeV
Normalized events
θ_γ (deg)


Positive X
Neutral X
m_X = 0.8 TeV
m_X = 1 TeV
m_X = 2 TeV
m_X = 2.5 TeV
m_X = 4 TeV
m_X = 10 TeV
Background

Applied the following selections based on the plots (selections same as the ones applied in the MuCol DM paper) and calculated the combined FOM as follows:

$$FOM = \frac{s_1 + s_2}{\sqrt{b}}$$

Where s_1 is the number of normalized events for positive DM particle
s_2 is the number of normalized events for neutral DM particle
b is the number of normalized background events

Selections Applied

$\sqrt{s}$ ($\int d\mathcal{L}$) / Discrminating Variables	θ_γ	E_γ	MET	γ_{pT}
3 TeV (1 ab^{-1})	$> 30°, < 150°$	> 150 GeV	> 75 GeV	> 75 GeV
6 TeV (4 ab^{-1})	$> 40°, < 140°$	> 200 GeV	> 100 GeV	> 100 GeV
10 TeV (10 ab^{-1})	$> 40°, < 140°$	> 200 GeV	> 100 GeV	> 100 GeV
30 TeV (10 ab^{-1})	$> 40°, < 140°$	> 500 GeV	> 500 GeV	> 500 GeV

Combined FOM

M_χ / $\sqrt{s}$ ($\int d\mathcal{L}$)	3 TeV (1 ab^{-1})	6 TeV (4 ab^{-1})	10 TeV (10 ab^{-1})	30 TeV (10 ab^{-1})
0.8 TeV	1.02	1.01	0.81	0.23
1.0 TeV	0.72	0.91	0.75	0.22
2.0 TeV	n/a	0.47	0.55	0.18
2.5 TeV	n/a	0.22	0.47	0.17
4.0 TeV	n/a	n/a	0.21	0.15
10.0 TeV	n/a	n/a	n/a	0.07