

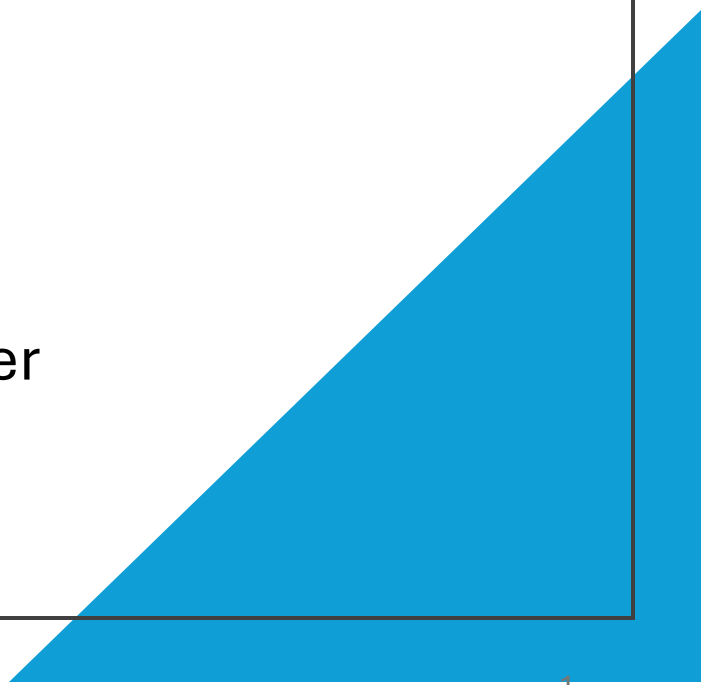
A Bi-Adjoint Model from the W -Gluon Portal

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PHENO, May 12th 2026

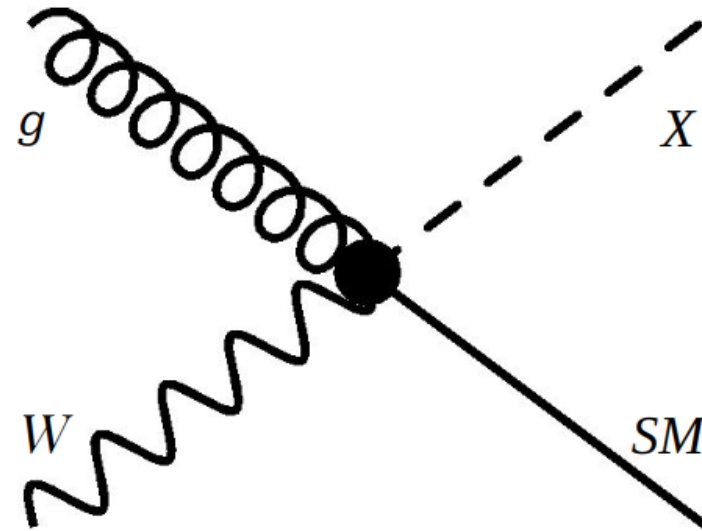
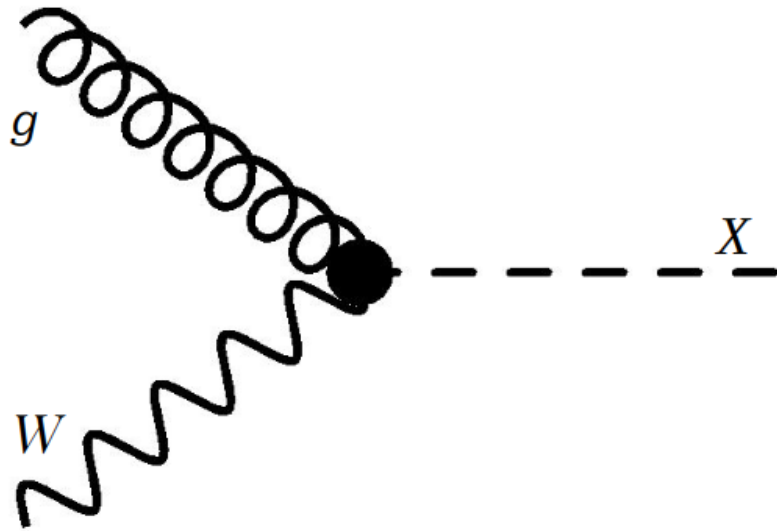


In collaboration with Linda M. Carpenter



W-Gluon Portal

- Exploring the potential of BSM states with unusual SM charges
 - Includes scalars, pseudoscalars, and fermions
- Effective operators up to dimension six



- Can access up to a 15-plet of SU(3)
 - Doublets of SU(2)

$$G_B^{\mu\nu A} D^\mu \bar{\psi}_{AC}^i \gamma^\nu Q_{Li}^C$$

- Or quadruplets of SU(2)
 - Octets of SU(3)

$$G_a^{\mu\nu} W_{\mu\nu}^{ij} \phi_{ijk}^a H^{\dagger k}$$

The Bi-Adjoint Model

- Dimension 5 operator
- $\phi \rightarrow$ real scalar
(8,3,0) representation
- Also include mass and kinetic terms

$$\phi = \begin{pmatrix} \phi^0/\sqrt{2} & \phi^+ \\ \phi^- & -\phi^0/\sqrt{2} \end{pmatrix}$$

$$\frac{1}{\Lambda} \phi W^{\mu\nu} G_{\mu\nu}$$

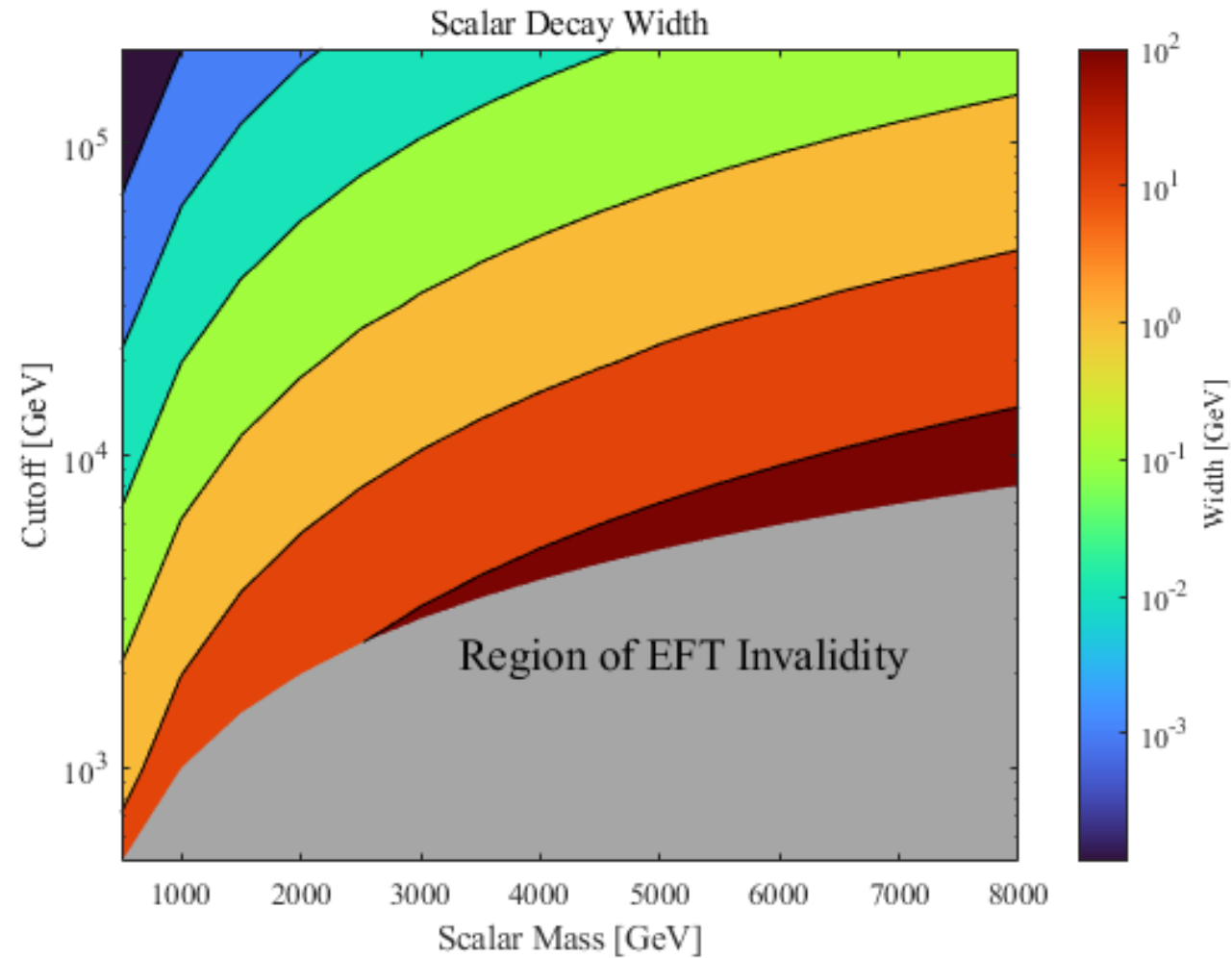
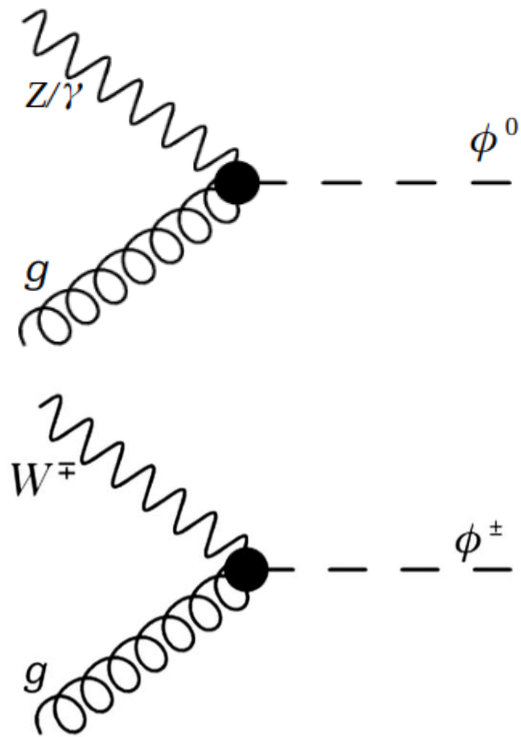
Why this operator?

- No renormalizable interactions with quarks
- Di-gluon interactions only appear at dimension seven
- Relatively simple charges

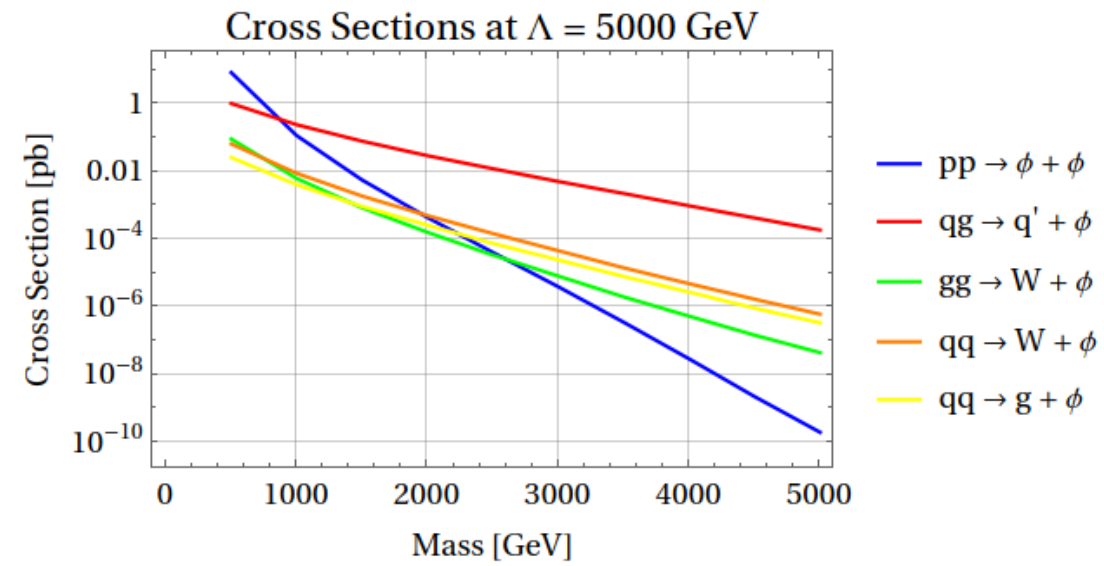
$$\frac{1}{\Lambda} \phi W^{\mu\nu} G_{\mu\nu}$$

Relevant Interactions

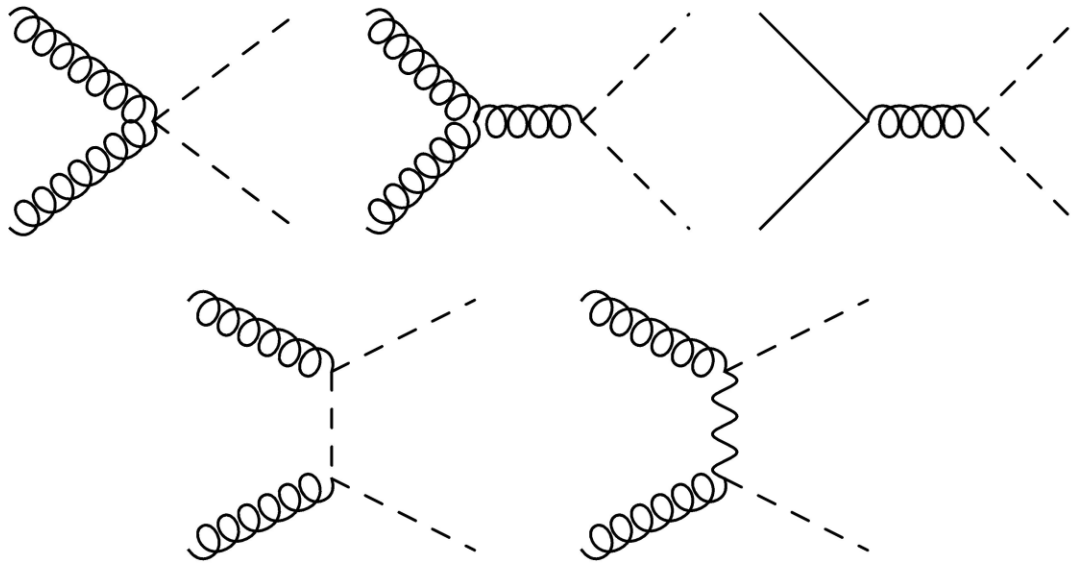
- Allows three, four, or five-particle interactions



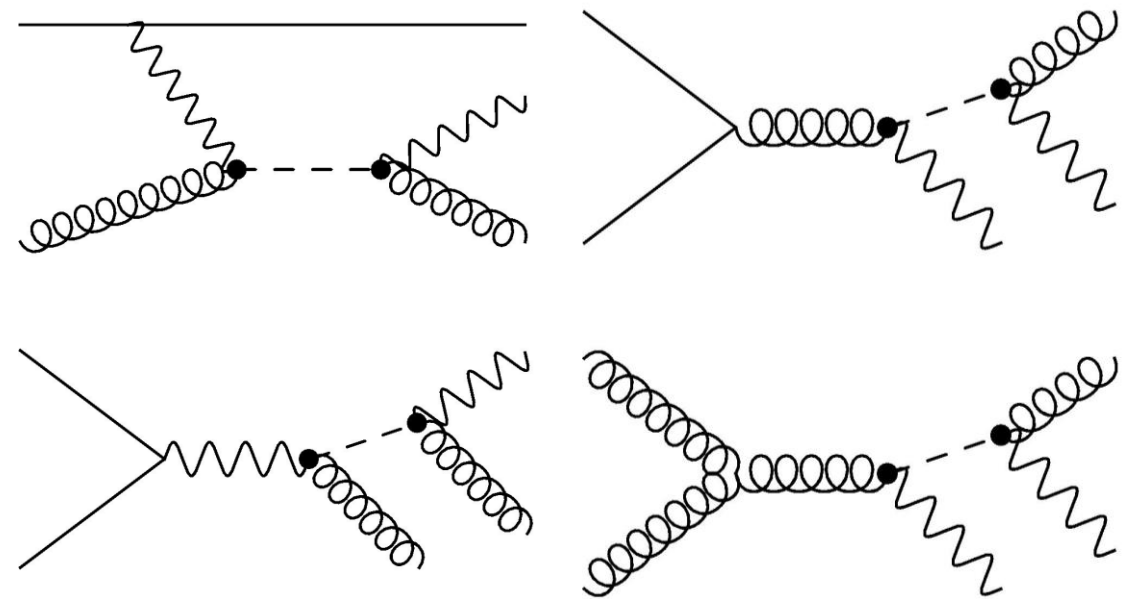
Potential LHC Processes



Pair Production

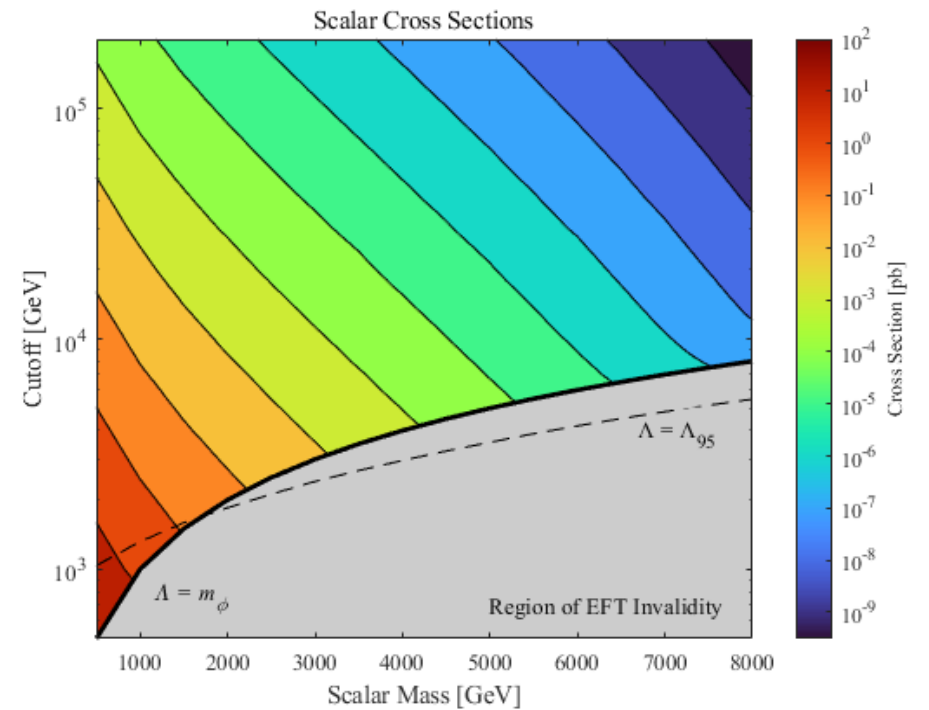
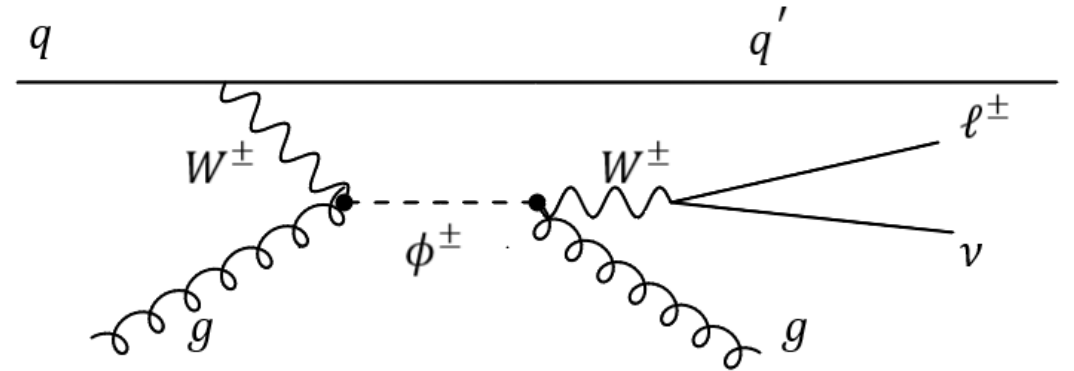


Single Production

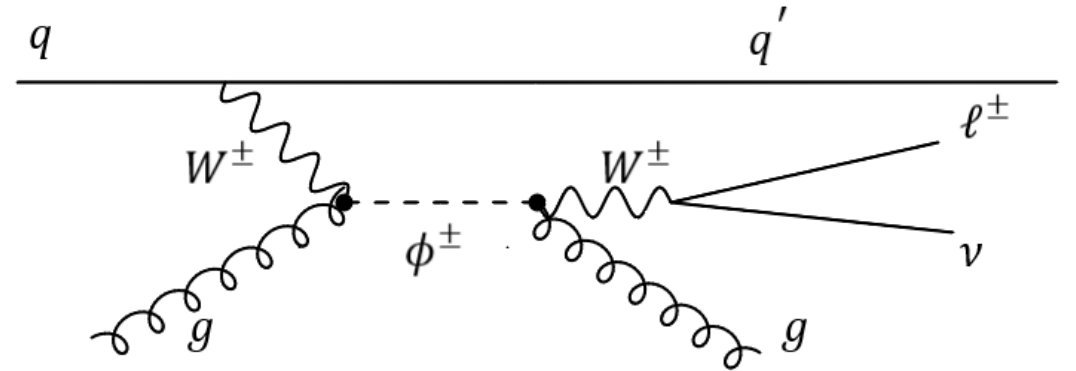


Crafting an LHC Search

- Model files generated by FeynRules
- Simulations run in MadGraph5
- Analysis performed in MadAnalysis



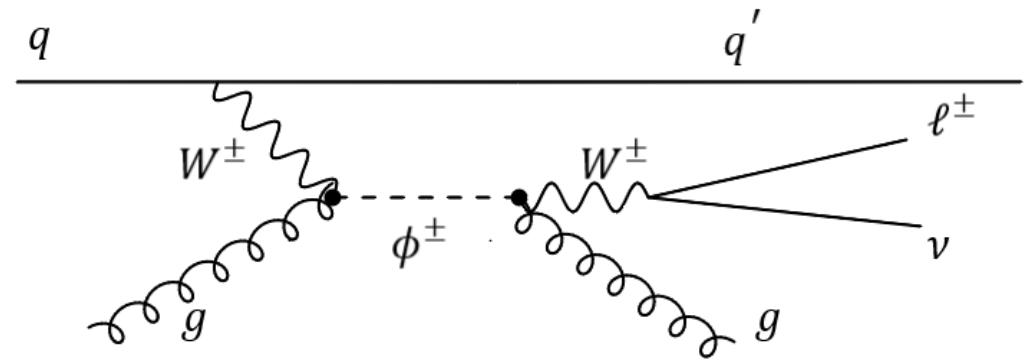
Background Processes



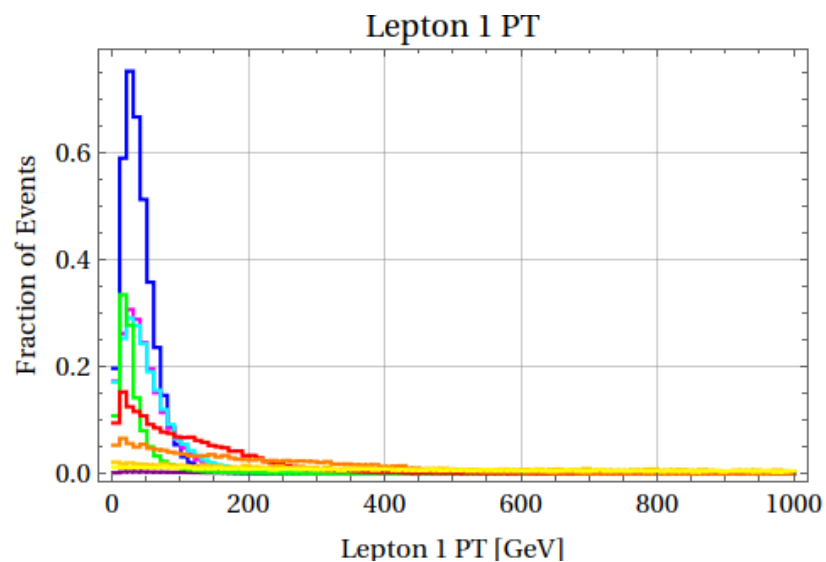
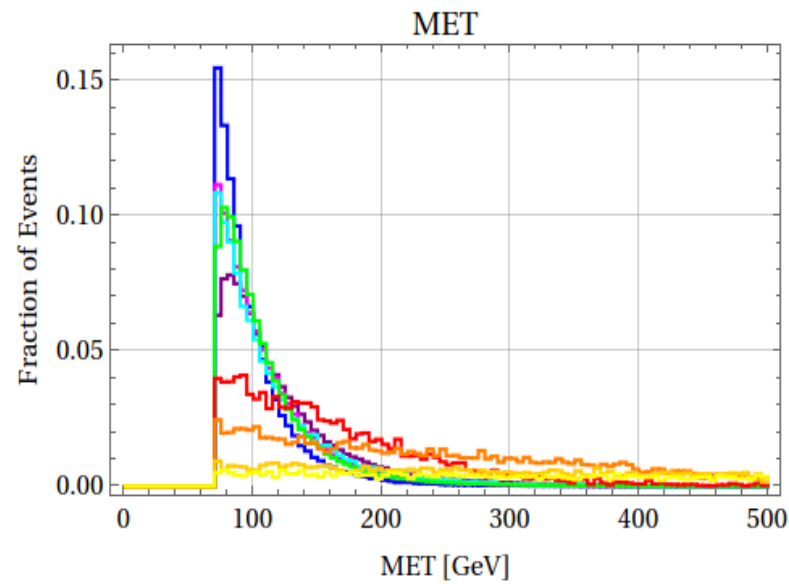
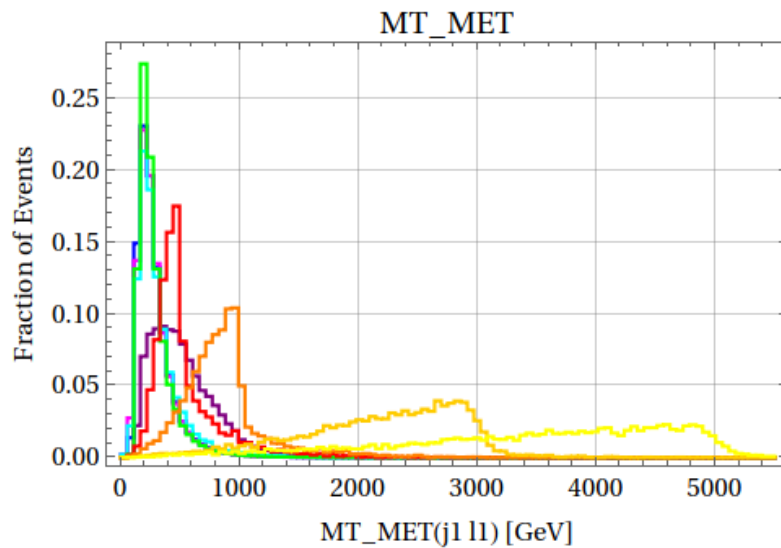
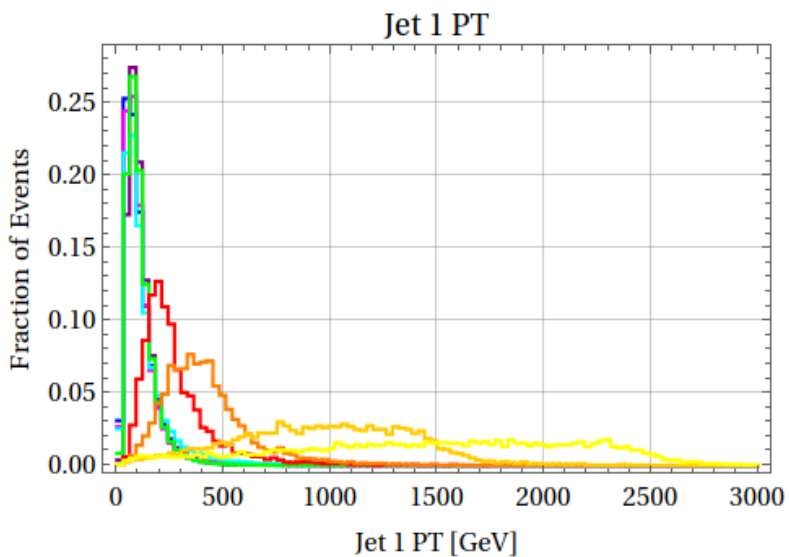
Background Process	Cross Section (pb)	K-Factor Used
$t\bar{t}$	888.78	1.489
$W + \text{jets}$	1361	1.401, 1.234
Diboson	441.7	1.417, 1.316, 1.599
qt	51.84	1.29
tW	91.742	1.4

Phenomenology of the Process

- Two hard jets
- Significant missing energy
- One hard, isolated lepton
- Mass reconstruction from of lepton, MET, and one jet



Kinematic Distributions

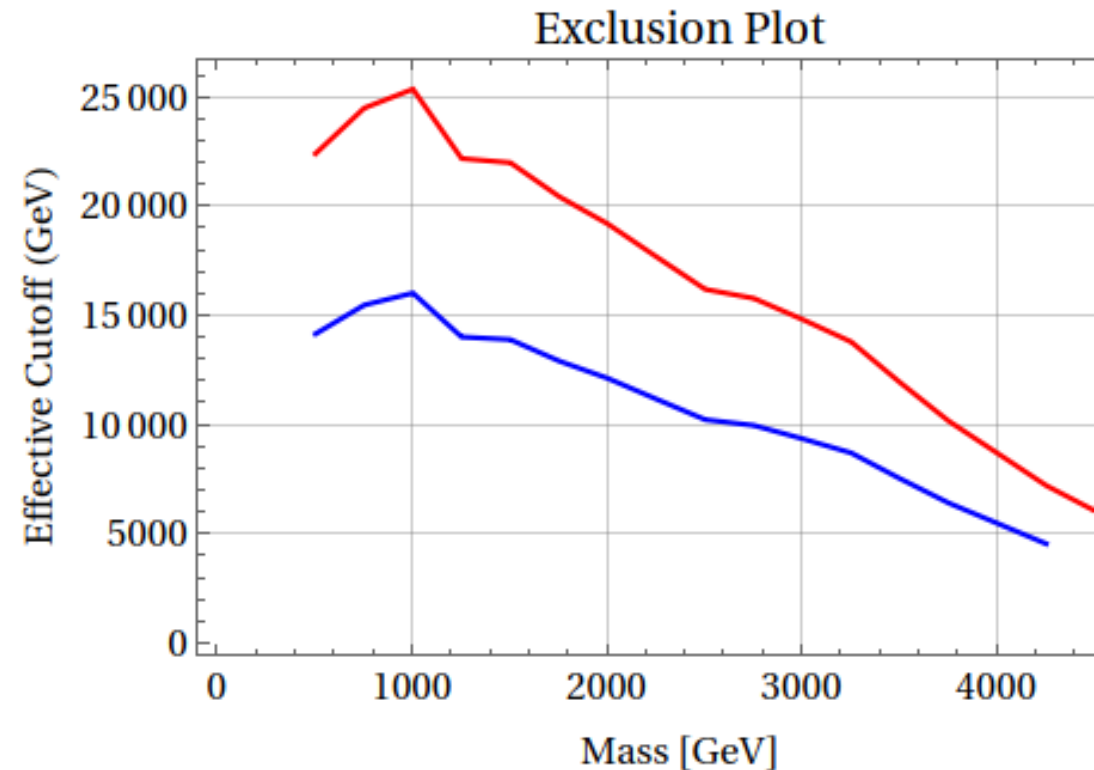


- Diboson
- qt
- ttbar
- tW
- W+jets
- m500
- m1000
- m3000
- m5000

Analysis + Results

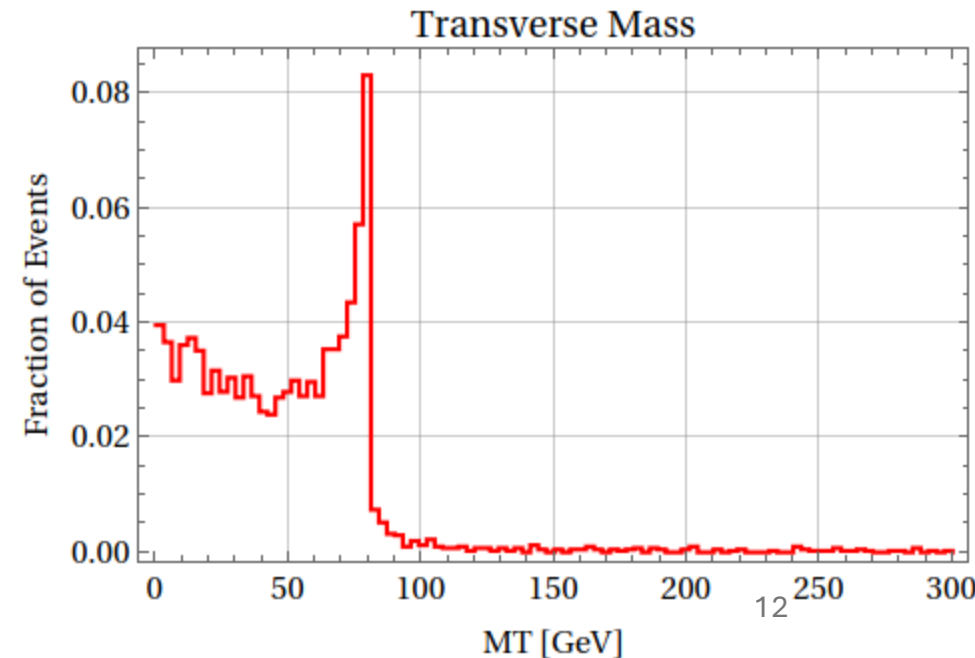
- Binned analysis
 - Signal efficiencies range from 6%–60%
 - Leading backgrounds have efficiency $\sim 0.1\%$ in the low mass bins
 - Even lower elsewhere
- Significance computation

$$S = \frac{N_{signal}}{\sqrt{N_{bkg}}}$$



Sensitivity of Previous Searches

- ATLAS-SUSY-2014-10
 - di-lepton, multi-jet plus MET channels
- Another, more recent search (given in arXiv:2101.01629) required a single isolated lepton
 - But also required a high transverse mass of MET + lepton





Extensions

- SUSY Extensions
- UV Completions
- Complex Scalar Model
- Alternate couplings to the SM

References + Acknowledgements

- Based on work done with Linda M. Carpenter

Linda M. Carpenter and Katherine Schwind. Unusual portals to new exotics, the W-gluon portal. doi:10.48550/arXiv.2410.08195, 2024

Linda M. Carpenter and Katherine Schwind. Strong-Weak Bi-Adjoint, Gluon-W resonances, and new asymmetric LHC production processes. Phys. Rev. D, doi:10.1103/glnh-zg9n, 2026