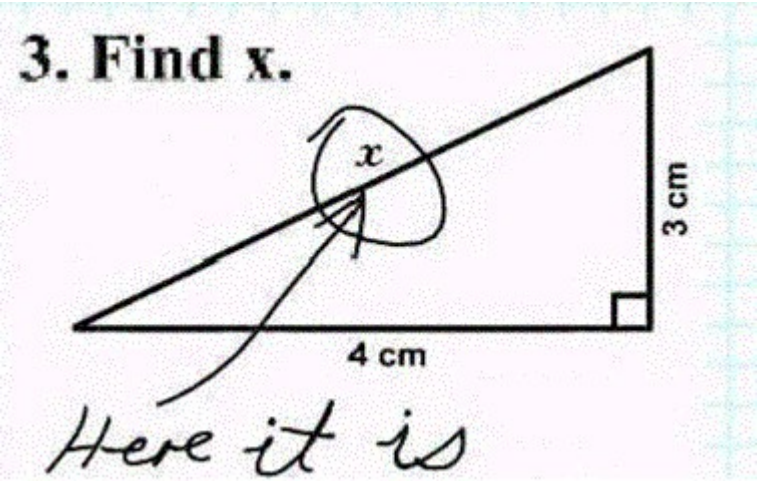


Simplified Models Overview

Phil Harris w/

V. Khoze, M. Spannowsky, C. Williams

K. Hahn, K.Sung, S. Sevova,
T. Du Pree, N. Wardle, J. Marrouche,
C.Paus, L.DiMatteo, G.Ceballos, M.Klute,
D.Abercrombie, K.Bierwagen, J.Veverka,S.
Narayanan,B.Allen, D.Hsu
B.Jayantilaka,M.Zanetti

Processes & Modeling

Vector

$$g_{\mathrm{DM}} Z'_{\mu} \bar{\chi} \gamma^{\mu} \chi$$

EWK style coupling
(equal to all leptons)

Axial

$$g_{\mathrm{DM}} Z''_{\mu} \bar{\chi} \gamma^{\mu} \gamma^{5} \chi$$

EWK style coupling
(equal to all leptons)

Scalar

$$g_{\mathrm{DM}} S \, \bar{\chi} \chi$$

Yukawa style coupling
(Mass based coupling)

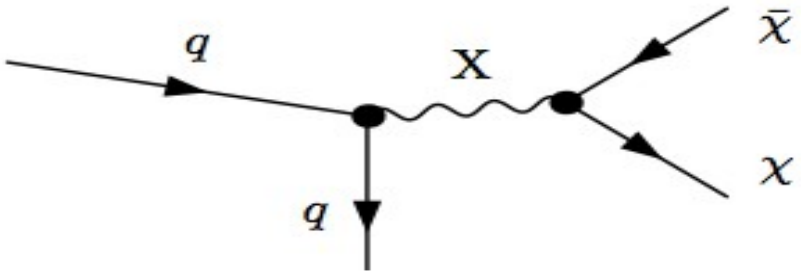
Pseudoscalar

$$g_{\mathrm{DM}} P \, \bar{\chi} \gamma^{5} \chi$$

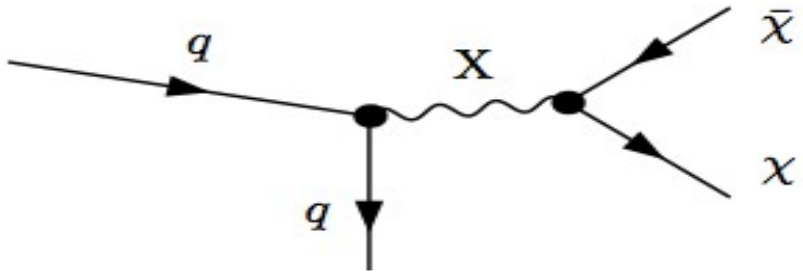
Yukawa style coupling
(Mass based coupling)

Direct Detection

Vector

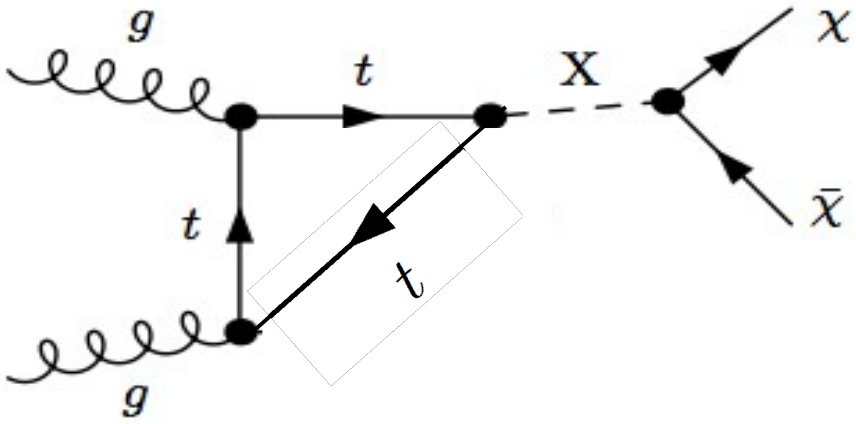


Axial

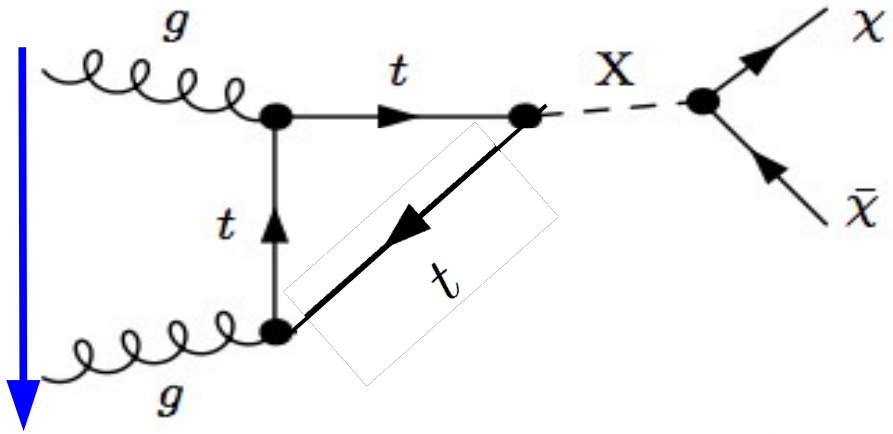


Spin-induced

Scalar

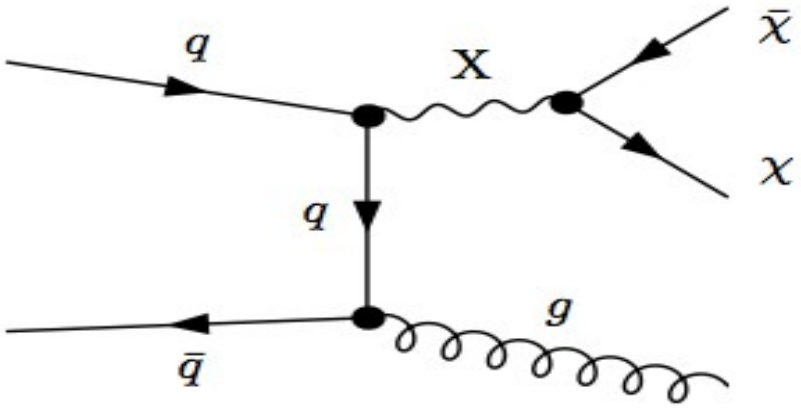


Pseudoscalar

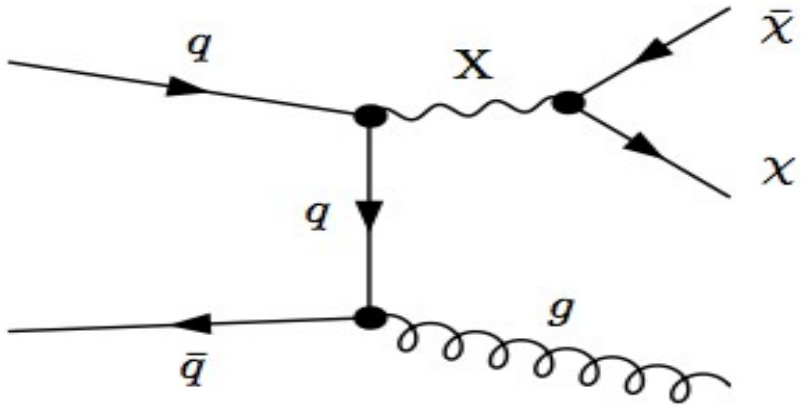


Collider detection

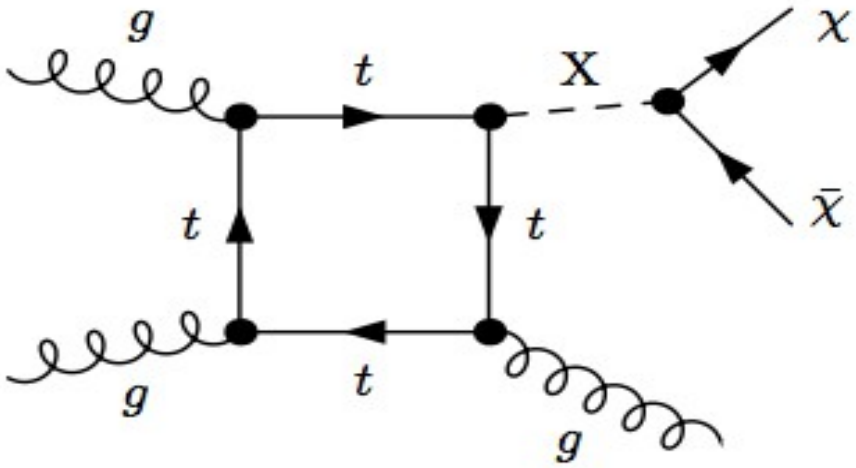
Vector



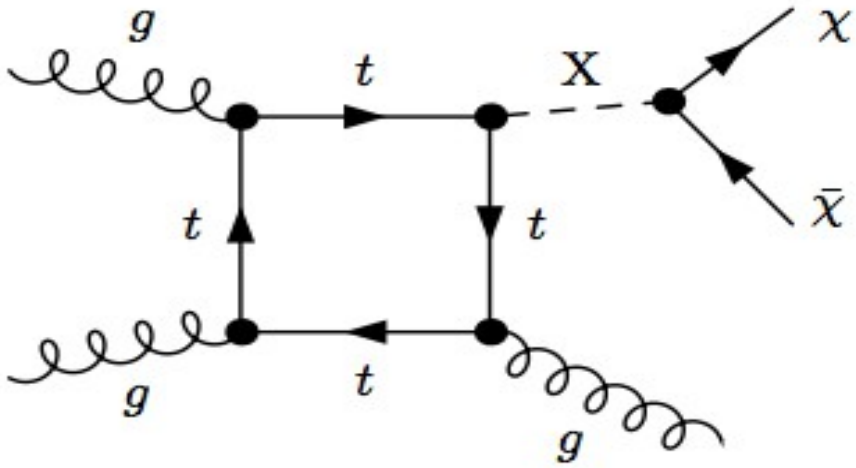
Axial



Scalar



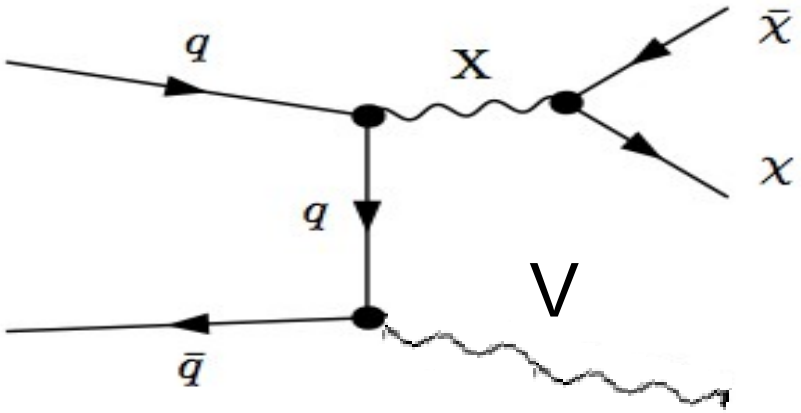
Pseudoscalar



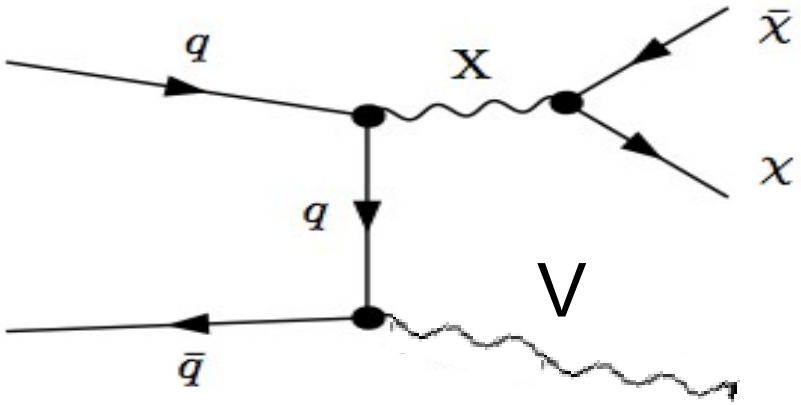
Only difference is one more vertex

Vector Boson Production

Vector

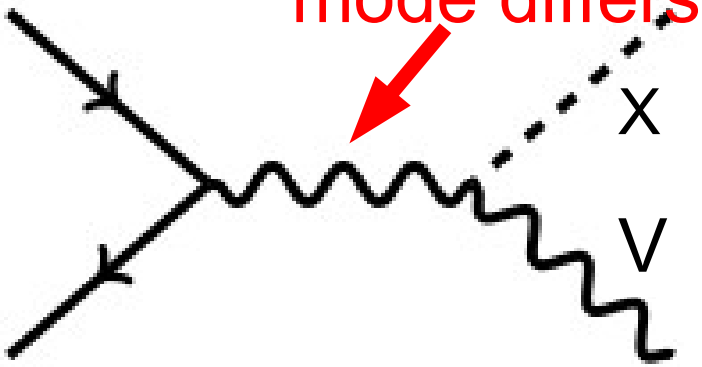


Axial



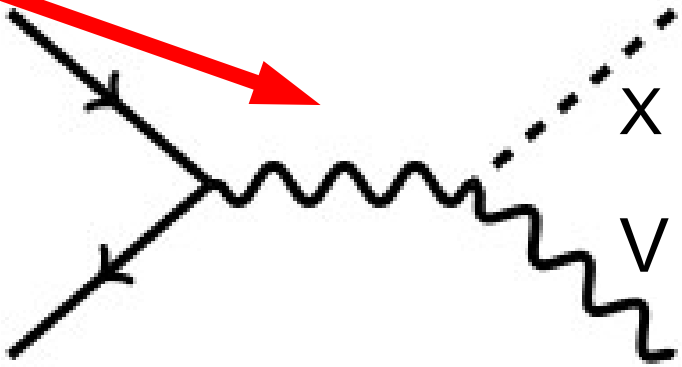
Scalar

Dominant production mode differs



Dominant from V-strahlung

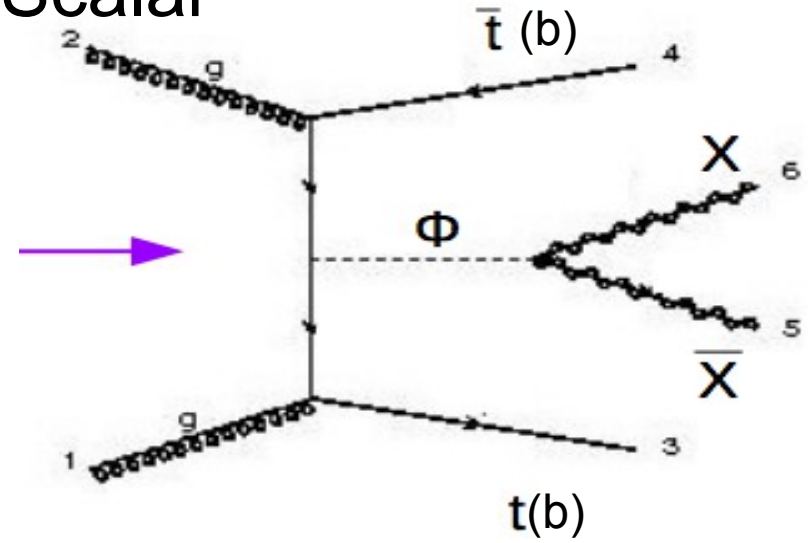
Pseudoscalar



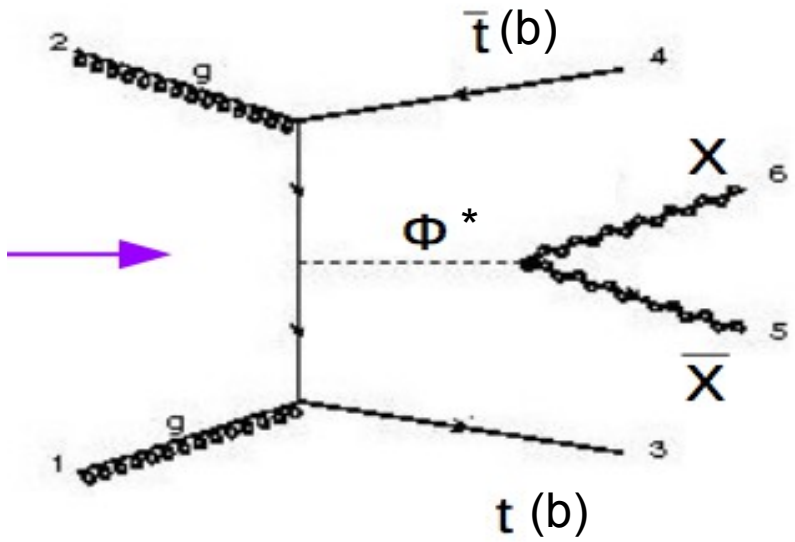
Enhanced boson p_T

Heavy Flavor Production

Scalar



Pseudoscalar



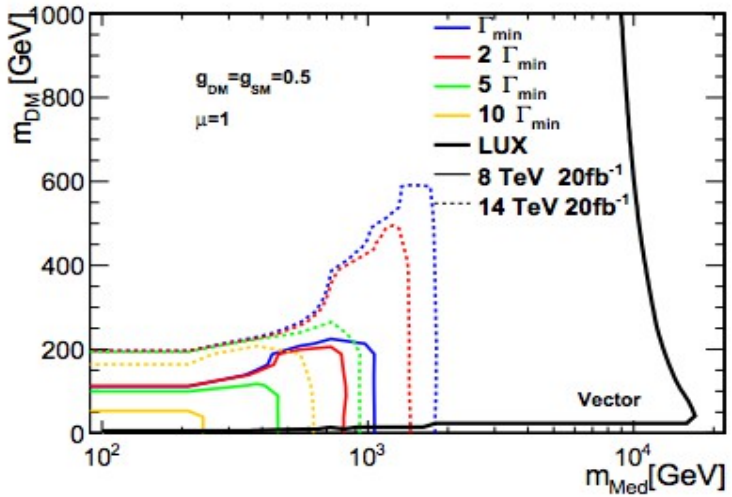
Scheme

- Aim to generate full class of models for all:
  - Jet
  - Vector Boson
  - Top
  - B-quark
- Goal is to scan :
  - Process (Axial/Vector/Scalar/Pseudoscalar)
  - Coupling
  - Mediator
  - Width
  - Dark Matter Mass

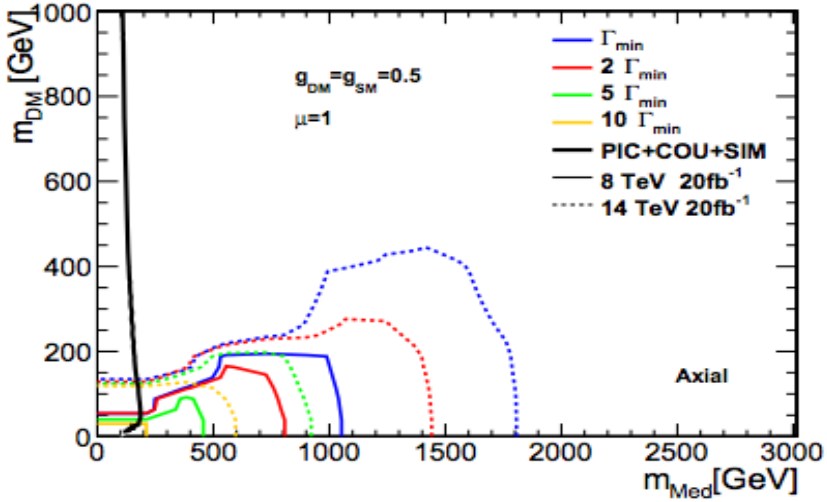
ArXiv/1411.0535 (w/MCFM)

Parameters should be chosen to scan plots

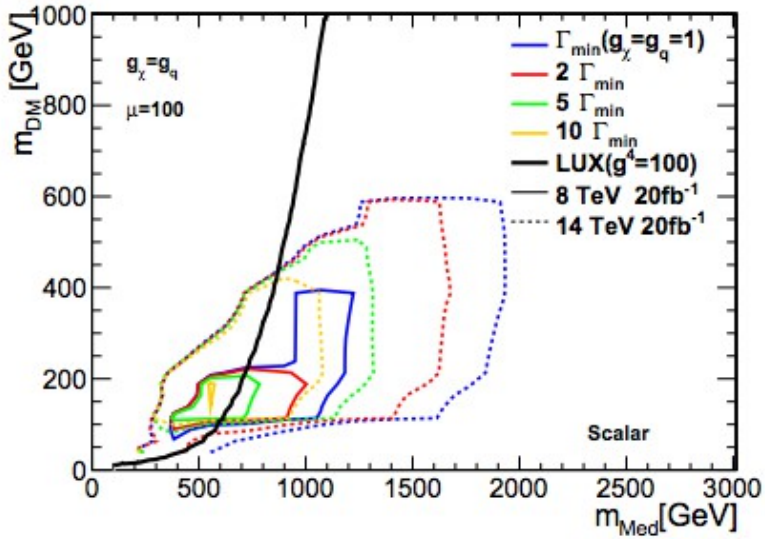
Vector



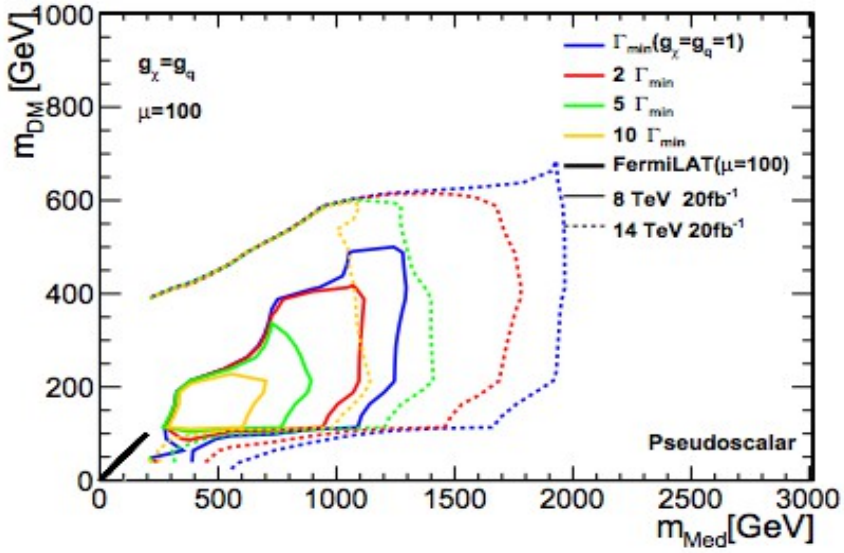
Axial



Scalar

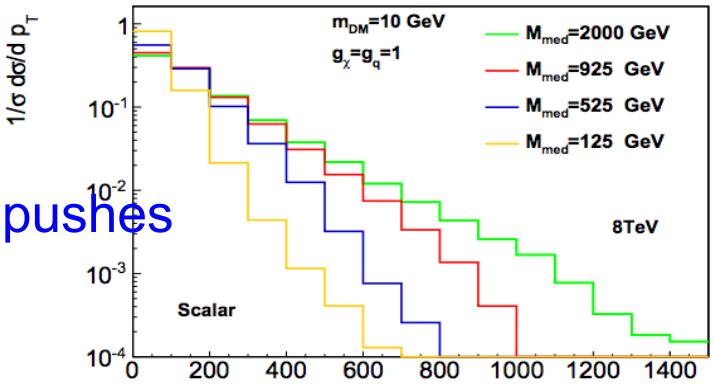


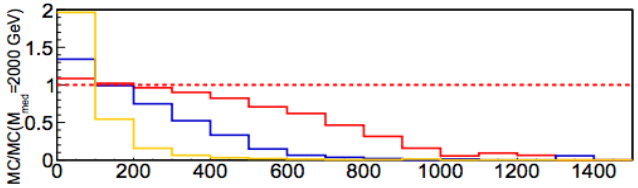
Pseudoscalar



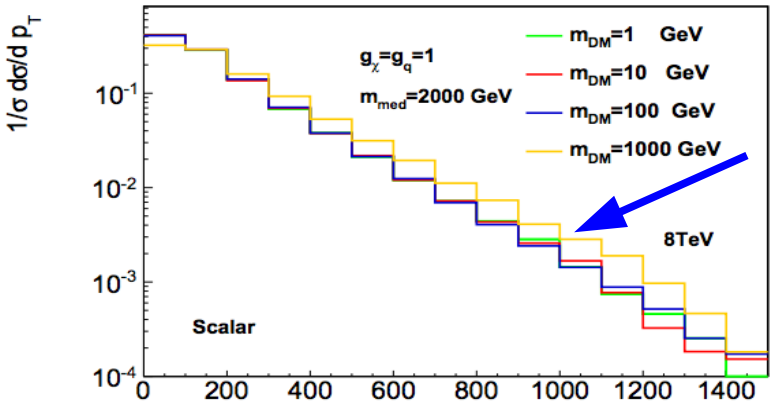
MonoJet Effects (MCFM)

Mediator pushes p_T out

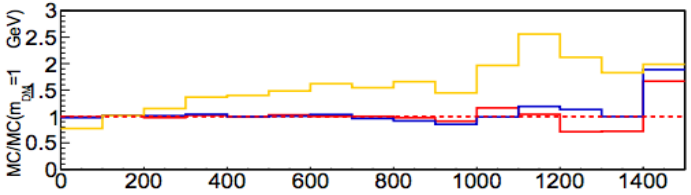




Mediator Mass

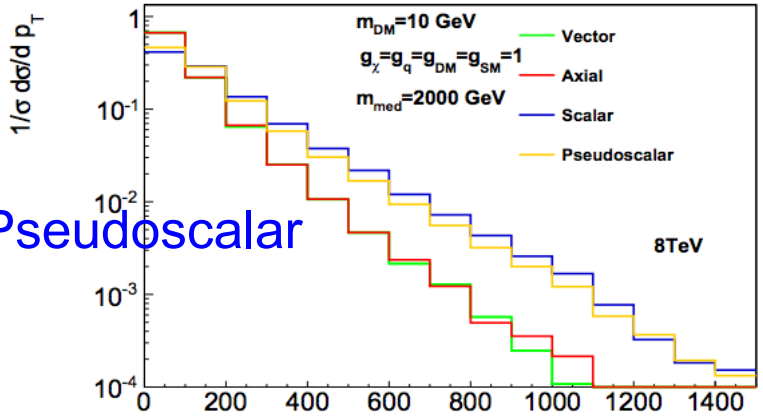


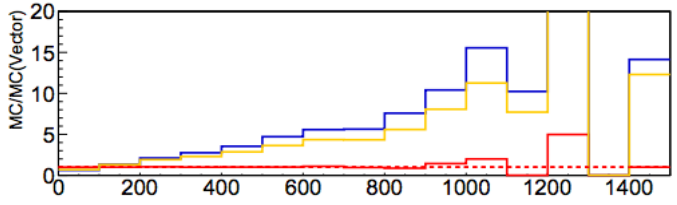
Off-shell
Changes
kinematics



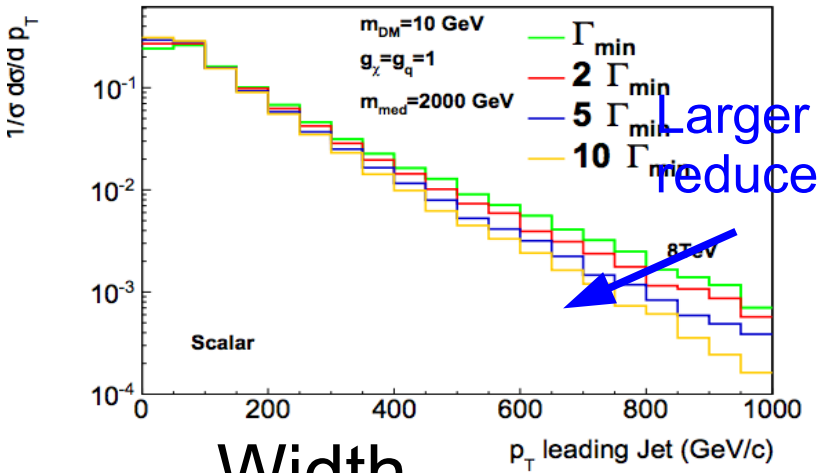
Dark Matter Mass

Scalar/Pseudoscalar
Harder
spectra

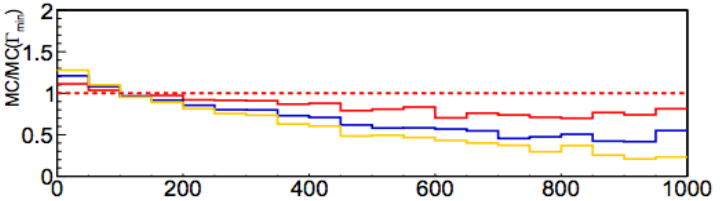




Mediator Model

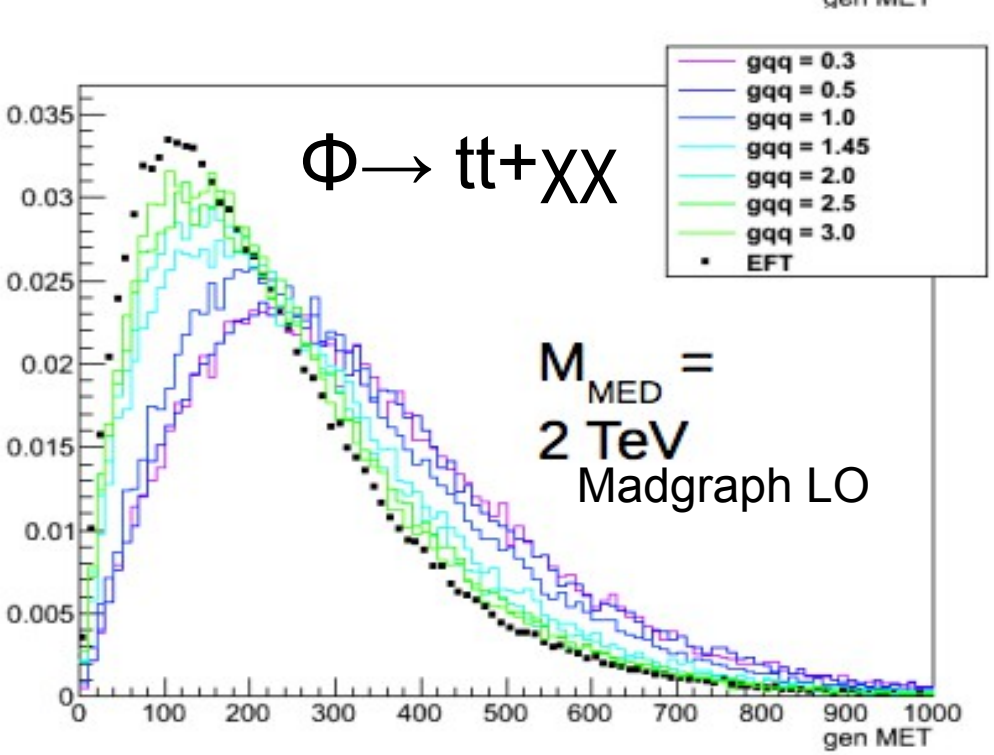


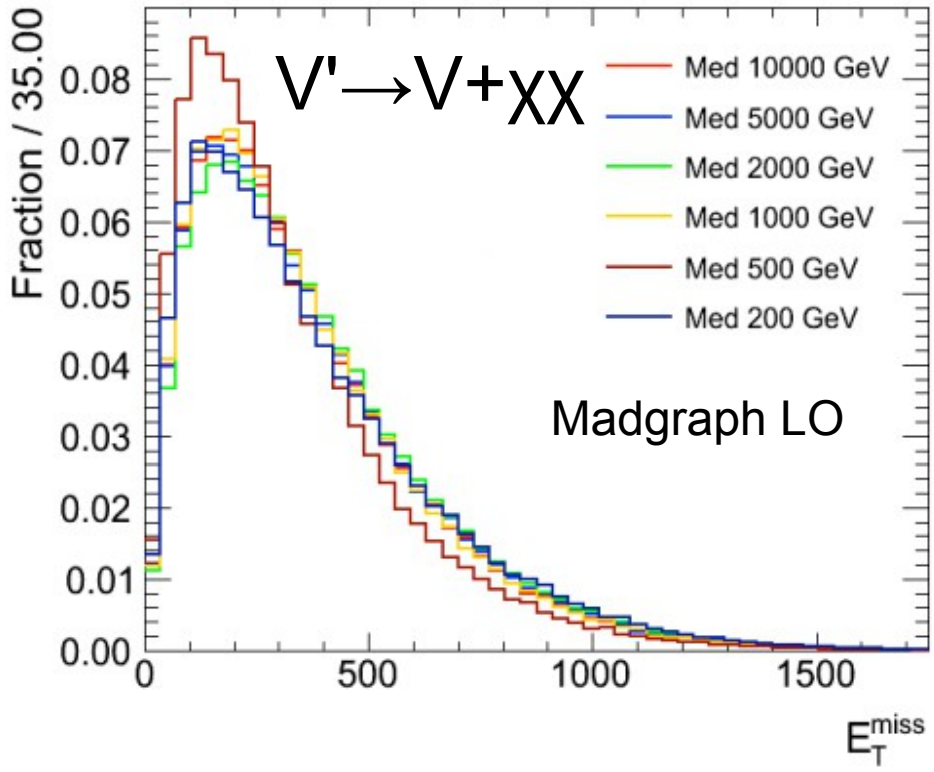
Larger width
reduces sensitivity



Width

Top/V Effects





- Mono-V/HF+ DM are easily generated
  - Natural extensions of Z'/Scalar models
  - Follow the same coupling scheme/width scheme
  - Scan exactly the same parameters
- Validation against EFT for all modelds

Summary

- Simplified models lend well to interpretation
  - Well defined set of parameters to scan
  - Final states are motivated on clear assumptions

- Goal is to scan allowed phase space
  - Clear targets towards scanning permitted
  - Generation over final states is possible
  - Scanning proceeds among the different states
    - Allows for comparison with Direct detection