

Models for Mono-Z(l^+l^-) (CMS)

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Overview

* to prepare for Run-2, we considered some simplified DM models

* s-channel with vector mediator:

$$\mathcal{L}_{\text{Vector Mediator}} = \mathcal{L}_{\text{SM}} - \frac{1}{4} \mathcal{F}_{\mu\nu} \mathcal{F}^{\mu\nu} - \frac{1}{2} m^2 \mathcal{A}_\mu \mathcal{A}^\mu + \bar{\chi}(i\not{\partial} - m)\chi - \sum_q g_q \mathcal{A}_\mu \bar{q} \gamma^\mu (\gamma^5) q - g_\chi \mathcal{A}_\mu \bar{\chi} \gamma^\mu (\gamma^5) \chi$$

* s-channel with scalar mediator:

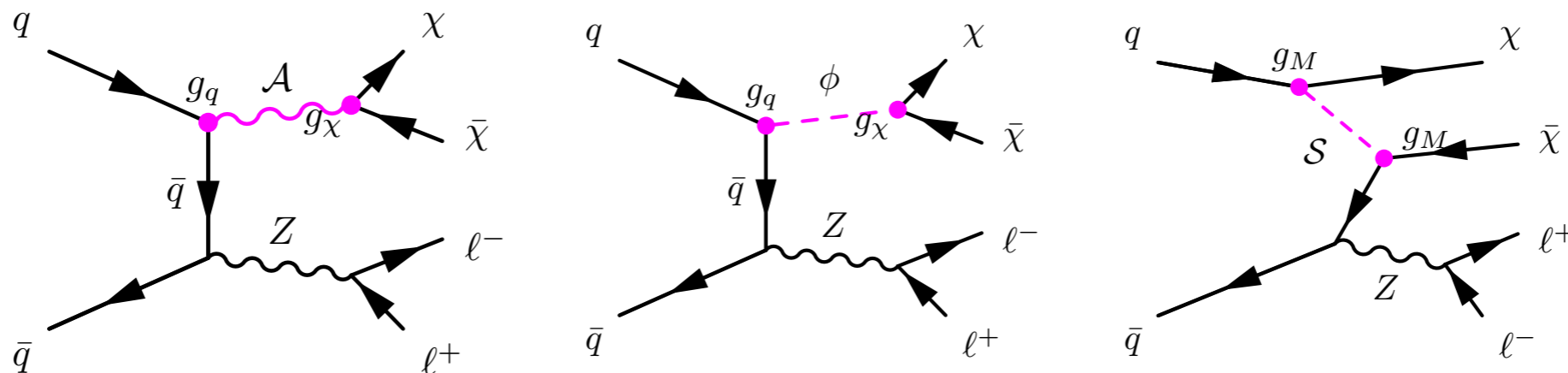
$$\mathcal{L}_{\text{Scalar Mediator}}^{\text{s-channel}} = \mathcal{L}_{\text{SM}} + \frac{1}{2} (\partial_\mu \phi)^2 - \frac{1}{2} m_\phi^2 \phi^2 + \bar{\chi}(i\not{\partial} - m)\chi - \sum_q g_q y_q \phi \bar{q} (\gamma^5) q - g_\chi y_\chi \phi \bar{\chi} (\gamma^5) \chi$$

* t-channel with colored scalar mediator:

$$\mathcal{L}_{\text{Scalar Mediator}}^{\text{t-channel}} = \mathcal{L}_{\text{SM}} + (D_\mu \mathcal{S})^\dagger (D^\mu \mathcal{S}) - m_S^2 \mathcal{S}^2 + \bar{\chi}(i\not{\partial} - m)\chi - \sum_q g_M \bar{\chi} q_R \mathcal{S}^\dagger + h.c.$$

* we build these models with FeynRules2.0, and simulate events @13TeV with MG_aMC_2.1, mediator width calculated automatically

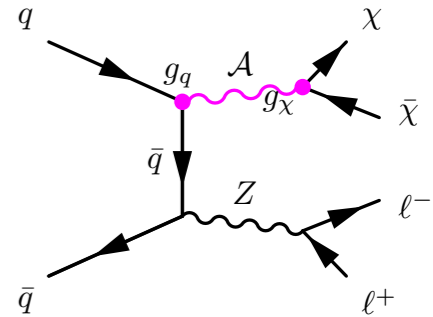
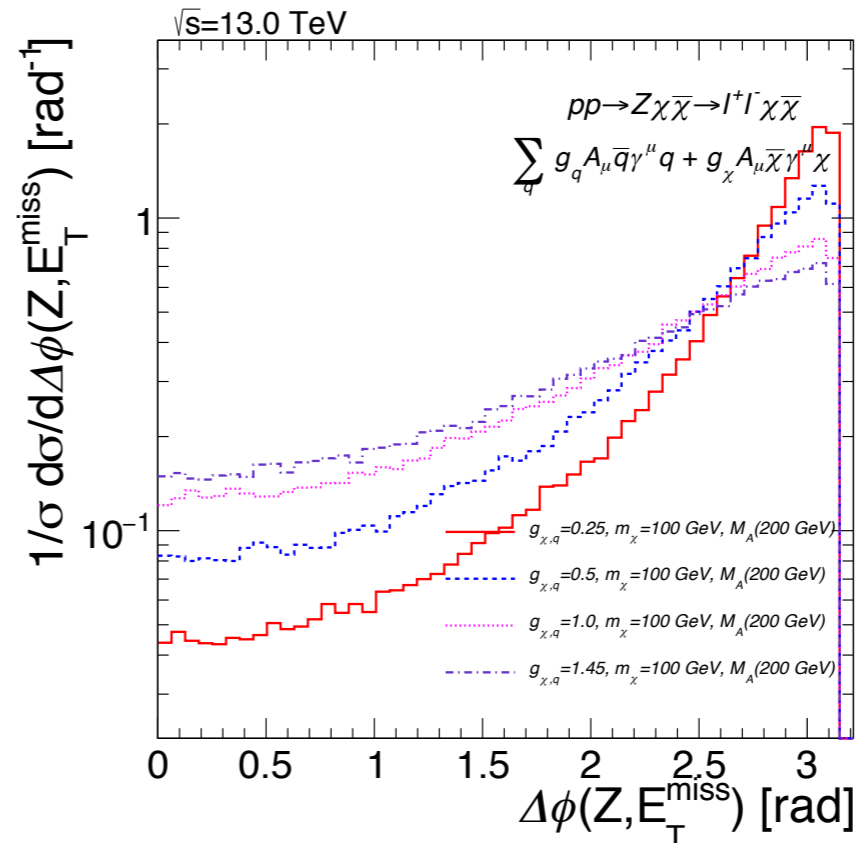
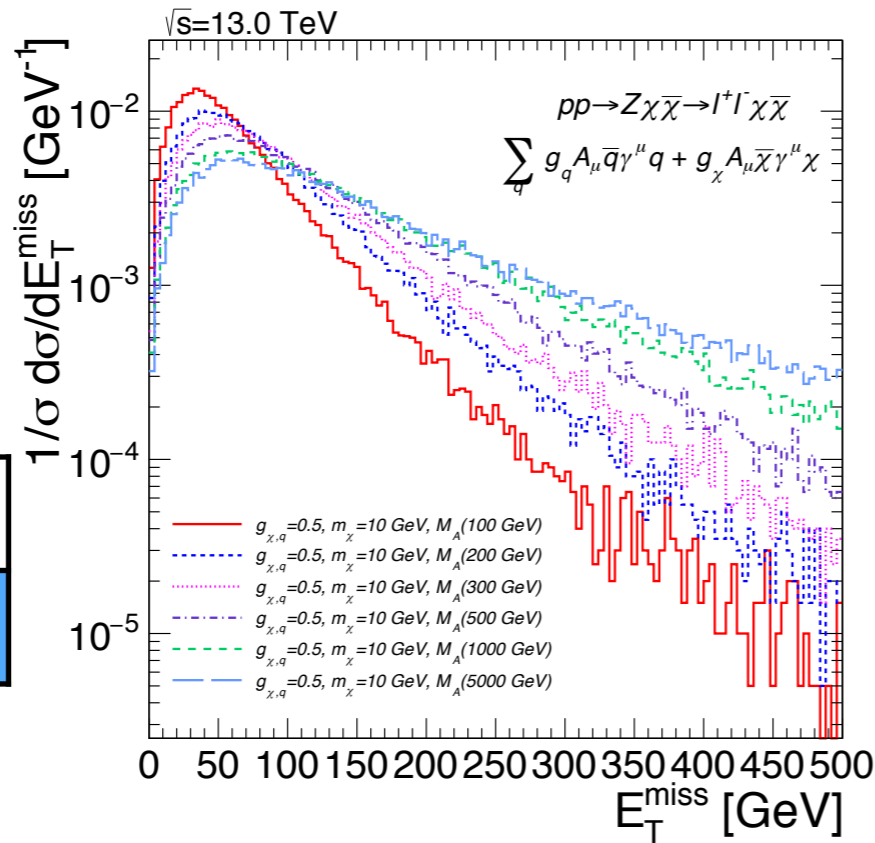
* look at some generator level plots directly from LHE files



Vector mediator

V-V coupling

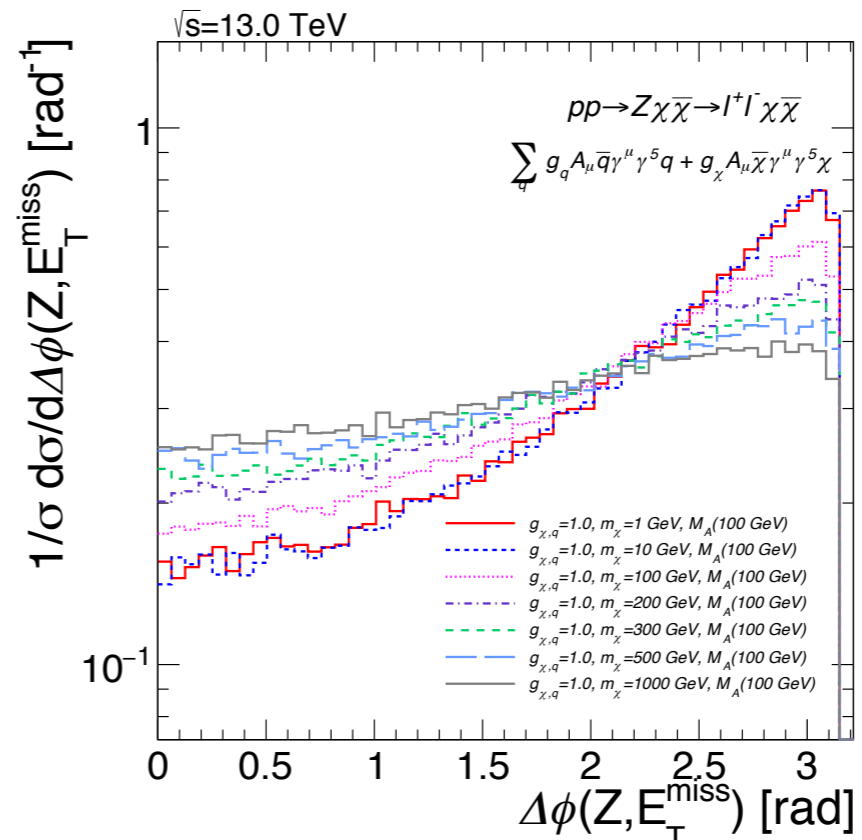
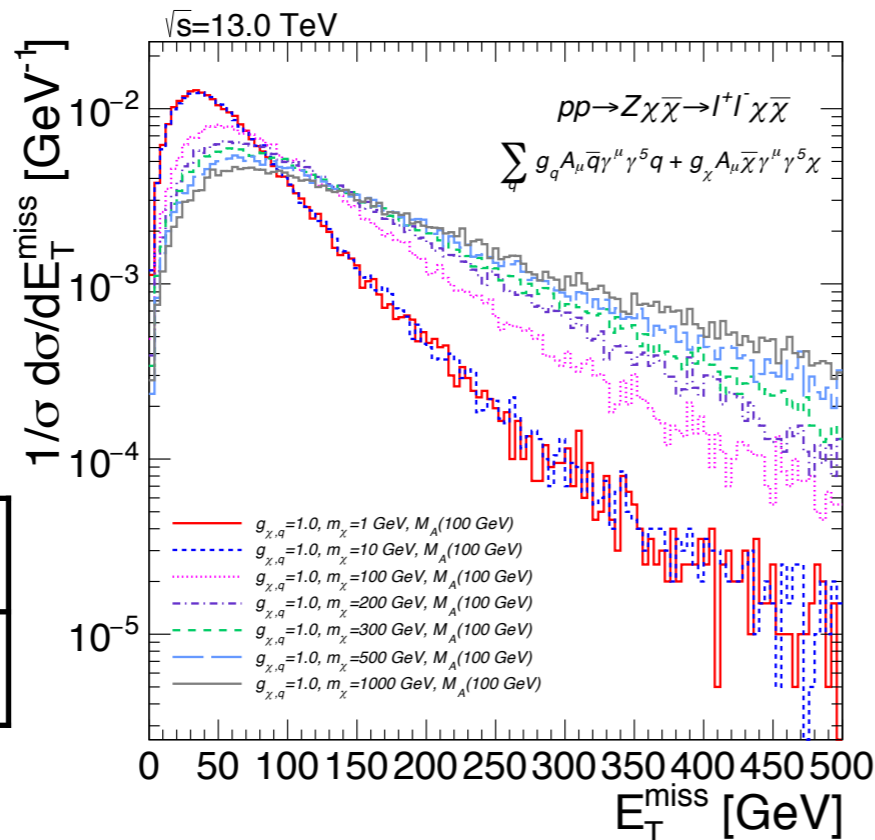
g_χ	g_q
m_χ	M_A



g_χ	g_q
m_χ	M_A

A-V coupling

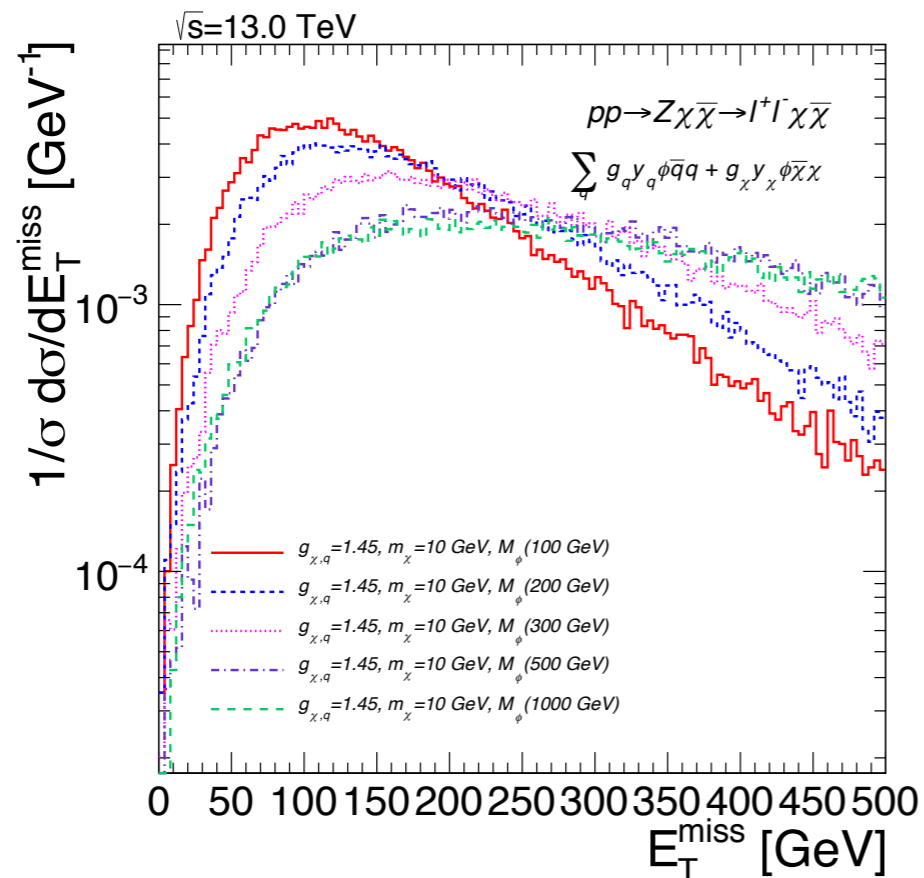
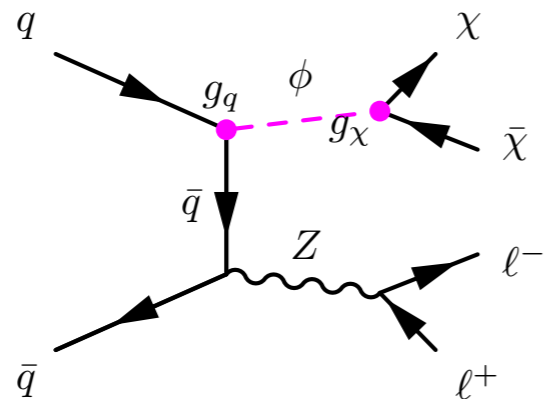
g_χ	g_q
m_χ	M_A



g_χ	g_q
m_χ	M_A

Scalar mediator

s-channel with scalar mediator



t-channel with colored scalar mediator: singlet DM couple with right-handed quarks

