



summary of DISCUSSION on monoJET-LIKE MODELS - 2

<https://indico.cern.ch/event/369001/material/minutes/minutes.html>

**ATLAS/CMS DM Forum meeting
06/02/2015**

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Starting point for list of models

Aim of the final write-up: document and justify these choices, lay the ground for potential future work (reinterpretation/new searches)

Italics: work needed for this purpose

- **Dark Matter type:** Dirac
- **Mediator type(s) and exchange channels:**
 - a. s-channel mediator
 - i. vector
 - ii. axial vector
 - iii. scalar
 - iv. pseudoscalar
 - b. colored t-channel mediator scalar
- **SM and DM Couplings :** see next slide
- **Widths:** see talk by Sasha Belyaev

Couplings for vector mediator

- **Is there a difference in the kinematics between:**
 - a. Vector couplings to SM/vector coupling to DM
 - b. Vector couplings to SM/axial vector coupling to DM
 - c. Axial vector couplings to SM/vector coupling to DM
 - d. Axial vector couplings to SM/axial vector coupling to DM
- ***Generator-level studies needed to distinguish the four cases***
- **Proposal from Bristol workshop: $g_{DM} = g_q = 0.3-1.45$**
lower bound: sensitivity, higher bound: width~mass
- ***Generator-level studies useful to decide scan granularity***
- **Asymmetric couplings: $g_{DM} \neq g_q$**
useful for Mono-X / direct searches comparison
- ***Generator-level studies useful to understand monojet kinematics (priority for this Forum)***

Widths for vector/scalar mediators

- Use minimal width for all models as a starting point
- General considerations:
 - a. two regimes for scalar/pseudoscalar mediator:
 - i. top-dominated decays (above $t\bar{t}$ threshold)
 - ii. DM-dominated decays (below $t\bar{t}$ threshold)
 - b. do we need to scan widths of vector mediator?
→ No change in kinematics according to earlier studies, *but needs justifying with kinematic plots for the write-up*

see talk by Sasha Belyaev for more details

t-channel models

- **Models on the twiki are ~ the same**
 - a. difference between these and usual SUSY models: coupling between squark and WIMP is a free parameter rather than fixed to a small value → could use SUSY samples for low g_{DM} limit, need new event generation for large g_{DM}
- **No studies so far on colored vector t-channel mediator with (vector DM) - mediator masses expected $\mathcal{O}(\text{TeV})$**

How we are proceeding

High priority follow-ups for monojet-like models:

Are experimental signatures (kinematic differences) similar for these models?

→ *Compare the kinematic distributions amongst the models and for a given model amongst different points in parameter space, at generator-level.*

ATLAS analysers and authors of <http://arxiv.org/abs/1411.0535> are working on this and will make plots / code available to this Forum - let us know if you're interested!

This meeting:

- Further discussion on mediator width
- Work on monophoton models (full talk on EW models: next week)

SVN repository available - we need model implementations:

```
svn co svn+ssh://username@svn.cern.ch/repos/LHCDMF/trunk lhcdmf  
(where username = your account username)
```

Discuss with Forum organizers before committing,
to ensure harmonization of directories and models

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(we will perform “librarian duties” if needed,
especially since non-CERN people cannot commit)

What we should have in SVN:

- 1) implementation of models - Lagrangians, Madgraph/MCFM files
- 2) Documentation + READMEs on how to use models
- 3) [once we provide starting skeleton] Text for write-up