https://indico.cern.ch/event/590262/timetable/
For this meeting we didn't produce complete minutes, but Steven took notes:

Notes
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Visible/invisible searches comparison

Antonio Boveia
-> question on why so different lepton couplings for V2 and A2 models
  - A2 model implies g_q and g_lep being very similar, indeed strongly constrained
  - V2 has more freedom and thus a value is chosen where complementarity stands out. V2 with g_lep ~ 0.1 would be very similar to A2, because the resonance searches cannot distinguish between A and V
-> what coupling choice for wide resonance searches?
  - ongoing work

2HDM

Nicole Bell
-> can we recast our current bounds?
  - Higgs interference effects missing ; also yukawa's can be different
-> how far away from alignment limit can we go?
  - there is room, if you keep the mixing angle <.4 (not terribly small), and you don't mess too much with Hinv
  - there can be misalignment with some finetuned yukawa's, though Higgs being very SM like makes alignment compelling, but it's not the only possibility.
-> does the pseudoscalar get any coupling to the DM?
  - not here, but you can also do extra pseudoscalar instead of S (or CP violation)
-> charged scalars with MET?
  - there will be bounds on charged scalars, including from flavour bounds (eg. b->sgamma), so these cannot be too light (>400Gev or so). Charged scalar with MET will be possible, but won't be dominant.
-> model implementation? can this be shared within dmwg?
  - yes, can be done. Though no collider work yet, so only in testing phase of a madgraph implementation.

Jose No
-> bb+MET+Z/h is new. What cross sections are we talking about for the bb+MET+Z/h?
  - these 2HDM+a models actually got a lot of attention in efforts to explain the galactic center excess: pseudoscalar to avoid direct detection, but with b's.

-> constraints from width?
  - actually width of mediator is small, nwa is no problem

Martin Bauer
-> how does this compare to the current Z' -> Ah model, where the Z' can go up to 2.5TeV?
  - in this model you have less freedom. At higher masses, even still below 1 TeV, the A->tt will make the mono-h channel close
-> comment: this is a low-MET signal, so h->gammagamma is probably best here, not so much h->bb
-> discussion on importance of monojet
  - you cannot switch off the decay to ttbar channel
-> 450 GeV?
  - cross sections go down so much, widths blow up, etc; boosted h->bb is not the discovery channel here.
-> what about the visible searches for ZA etc?
  - missed the answer

Zhen Liu
-> resolving this bump-dip kind of structure depends on ttbar mass resolution. As you go up in tanbeta the resonance gets narrower, and you lose the bump-dip nature. At what tanbeta that happens.
  - at large tanbeta probably bb+S is going to get more important
-> no interference problem

Peter Galler
-> q on validity of infinite top mass, since top loop is resolved at this high mass.
  - effect at most 10% at 1TeV
-> some more discussion, but I was running around with the microphone

Stefan Von Buddenbrock
-> can results in the HSchi be directly translated to more complete 2HDM models.
  - this has not be done, but in principle yes

Jonas Lindert
-> should the uncertainties be treated gaussian?
  - no, they are not gaussian by nature. A box or smeared box could work, especially since the considered ranges are already extreme.
  - remark that theorists would like to also learn from our postfits
-> can these uncertainties also be used for VBF?
  - no, one needs to be careful there.
-> plans to extend to higher jet multiplicities, monophoton,...
  - yes, plans for jet binning. Other processes, like monophoton need completely new, different calculations.

Sasha Belyaev
-> benchmarks proposed by other authors
  - agree one should converge on this
-> some more discussion, eg. this iHDM can also lead to soft leptons + jet + MET, and long-lived signatures.

Matthew McCullough
-> A question from Antonio on blind spots.
  - "when you take models seriously you often get more than you ask for. Alternatively you can write down higher dimensional operators."
-> too many parameters for experimentalists to present results. Not obvious what the extreme cases would be. Shouldn't we just go for model-independent approach? Or how to focus?
  - that is what this group should be doing after today's discussion, come up with benchmarks that cover the experimental signatures.

Jinmian Li
-> no questions

Bjoern Penning
-> slide 11: lambda values not high enough for EFT to be applicability
-> one more question I missed from Sasha.

Seyda Ipek
-> considered benchmark scenario is not ruled out by MSSM searches, because they don't directly apply; the searches have much higher A/H->tautau branching fraction.
-> why large tanb for benchmark?
  - mostly to get b's for galactic center excess, but not necessarily necessary to be at highest tanb

Stefania Gori
-> slide 13 has m(H+)=300GeV, but other mass constraint mas >480 GeV.
  - indeed, this comes from a paper before that bound came, so it needs update. Will be little bit more difficult to have large mass splitting, but also b->sgamma may get additional contributions in more complete models
-> what are the allowed splittings in your scenario, how far can you push that?
  - one needs to play, and things get more complicated, but you can really push to get very large mass splitting

Discussion
-> why do we want these models?
  - new final states -> only few things
  - things that should focus our efforts? (eg. trigger thresholds)

  - complementarities between seaerches -> consistent combinations
-> how to align to the existing report discussing 2HDM?
  - they have not necessarily looked at complementarity with MET +X final states
  - but we clearly put this together and learn from each other
-> what about the huge number of parameters?
  - natural direction with LHC running still 20 years
-> signatures in flavor violation + MET?
  - unexplored territory, but many possibilities
-> approach things incrementally. First step with sound simplifying assumptions, then explore further
-> "if we extend, we need a punchline", such that it clearly shows a way forward
  - things that show from different angles, different measurements, complementarity do provide such punchline
-> Type-1, Type-2, etc, should we care?
  - pretty much similar for low tanb, so top-philic mediator
  - at high tanb MET searches are probably not the best searches anyway
  - Uli's gut feeling: if you allow flavour violation, MET will not be the most important thing.
-> iHDM experimentally different than 2HDM?
-> can we capture 2HDM pheno when just adding scalar-vector coupling into existing DMF models?
  - theoretical preference to just do it properly
  - handful of parameters in addition, which can be fixed or constrained
-> is 2HDM+PS and 2HDM+S a solid basis to move forward?
  - get together to hash out differences and come to concrete proposal of benchmarks that characterize these two.
-> organizers will initiate work and start putting together proposal on timescale as given in intro.

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The conclusions and and outcome were sent around to the whole list, and this initiated a dedicated effort towards a 2HDM recommendation:

Dear all,

This is an update on the work toward 2HDM+DM recommendations. Since our December meeting (https://indico.cern.ch/event/590262/), Uli, Martin, Felix have developed a UFO representing the models in [1-4]. That UFO is now available in our SVN repository:

https://svnweb.cern.ch/cern/wsvn/LHCDMF/trunk/models/Pseudoscalar_2HDM/

In the folder there is a README.txt which contains some useful information about the notation used in param_card.dat compared to the notation in [1]. We chose a simplified model with a pseudoscalar mediator as a starting point, since this can evade DD constraints, while scalar mediators (as e.g. in [5]) will be discussed at a later stage.

While the above UFO doesn't include all of the models presented in December, this is the most comprehensive UFO currently available. We have identified ATLAS and CMS volunteers who will spearhead the model investigation, and we have been in contact with those within the theory community who expressed interest at the DMWG meeting. Nevertheless, let us know if you would like to help us further in making this UFO the basis for a set of a set of 2HDM+DM benchmarks that we intend to use as the next DMWG recommendation.

Meanwhile, though, we would also like to keep the door open for other theorists who have compelling complementary ideas for the 2HDM+DM sector, i.e., kinematically distinct signals that the above UFO cannot provide but to which ATLAS and CMS could be sensitive with Run 2 data. Some of these were already presented in December. Our recommendation will likely touch on 2HDM+DM models more broadly, and we'd like to develop a clearer picture of the theory landscape in light of the existing model.

[1] M. Bauer, U. Haisch, F. Kahlhoefer, CERN-TH-2017-011, DESY-17-010 [arxiv:1701.07427 [hep-ph]].
[2] S. Ipek, D. McKeen and A. E. Nelson, Phys. Rev. D 90, no. 5, 055021 (2014) [arXiv:1404.3716 [hep-ph]].
[3] J. M. No, Phys. Rev. D 93, no. 3, 031701 (2016) [arXiv: 1509.01110 [hep-ph]].
[4] D. Goncalves, P. A. N. Machado and J. M. No, arXiv:1611.04593 [hep-ph].
[5] N. F. Bell, G. Busoni and I. W. Sanderson, arXiv:1612.03475 [hep-ph].