

WG3 Summary

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(on behalf of WG3 Group)**

**Workshop on Implications of LHC Results on TeV-scale
Physics**

August-September 2011

WG3

Non-Exempt BSM signatures. There is overlap with other groups

For purposes of report, we expect results based with $4 \pm 1 \text{ fb}^{-1}$ by Moriond

Sessions:

- New fermions and gauge interactions (including TGC & Z' , W' searches)
- Long-Lived particles and other weird things
- Flavour physics
- Extra dimension signatures: BH's, KK states, etc
- Top, Top-like BSM & Boosted Objects

General Question that emerged from discussions:

Topic that came up often (and in other working groups): how to present experimental data to maximize its usefulness to the community:

- Relevant to our task of determining implications of LHC results: a result can have implications for many models
- Timescale to make changes so that it impacts the report of this workshop is short: **need feedback now**

Questions on New Gauge Interactions:

- New vectors: experiments have made efforts to provide generic limits (what is missing?)
 - Parameterizations: balance between number of independent parameters used/constrained vs generality
- Z' , W' : mature analyses. Have already doubled Tevatron limits (SSM W'). Limits will improve but no large increase in mass limits at 7 TeV
 - We must not focus only on high mass end. Look for weaker couplings/BR everywhere in the mass spectrum
 - Add decays to more channels (b-bbar, tau-tau, bosons, etc.)
 - Make sure that we look at wide resonances
 - Some models (e.g. W^*) have different kinematics: default selections can affect acceptance substantially

Questions on New fermions

- What will we be able to say about a sequential 4th generation? Can we rule out this scenario by April?
 - Need to be careful about how this is interpreted (there are other interesting heavy quarks e.g. vector-like)
- What results to expect on single production with new mediators? Large cross sections but model dependent, can also have implications on other new physics: compositeness, top FB, etc.
- What can we say about neutrino physics (heavy neutrinos)

Questions that emerged from discussions:

TGC:

- Effective operators vs form factors?
 - experimental cross checks of validity of effective theories

Other thoughts:

- Models: what results to expect on multi-jet signatures (huge xs possible, some motivated by top physics)
- Models with low MET (not discussed much in WG3 yet). Coordinate with WG2?

Top, Top-like BSM & Boosted Objects:

- NP coupling to 3rd generation is well-motivated
- Report should feature detailed $t\bar{t}$ tail measurements
 - But: need to watch out for light new physics (top motivated but more general)
- What are the prospects for top asymmetry measurement with 4 fb^{-1} ? What can LHC contribute longer term?
 - might be difficult to see if not looked for explicitly, simple modifications of on-going analyses might be very useful

Extra dimension signatures: BH's, KK states

- Important increase of limits with respect to Tevatron. Most of the gains have been made: do not expect large increase of limits with 4x the data
 - But... for BH for example, χ s, decay modes could be (much) smaller (existing searches in dijet final states)
- Wide resonance searches are important. What is the best way to deal with them (energy dependent width?)
- Higgs/Radion interplay (overlap with WG1)
- LED: dijet angular distributions useful, need to interpret in terms of DM

Long-Lived Particles and other Weird Things:



- Wide open field. A lot of potential but often challenging signatures
 - Detectors not built a priori to detect many of those models
 - Slow-moving particles
 - Late-decaying particles
 - Weirdly decaying particles (lepton-jets)
 - Analyses (triggers) need time to develop
 - What do expect in the next months?, next years?

Final Thoughts/Future Meetings

- By the time we write the report, results will have about 4 times the data compared to what was presented at Lepton-Photon.
 - Still have opportunity for evidence of NP to show up
- What are the new searches on top of updates expected? New interpretations?
- We are thinking of having a one-day WG3 meeting in January