

Implications of LHC results for TeV-scale Physics

Working Group 3: Exotics
CERN, Dec 8-9, 2011

The Document

- A preliminary draft has been circulated
- 6 topic sections:
 - Boosted objects: G. Perez, G. Salam
 - New Vectors: M. Perez-Victoria
 - New Fermions: J.A. Aguilar-Saavedra, G. Servant
 - Long Lived Particles: P. Maede
 - Other Exotic Signatures: K. Zurek
 - Flavor: G. Isidori
- Total document should be ~ 20 pages long (3-4 pages per section)

Writing the Section

New Vectors

- Only 3-4 pages. Select topics. Other ones? What should be stressed? Model-independent / model-oriented balance, ... **Suggestions?**
- Connections with other sections and WG
- Experimentalists welcomed
- **What about New Scalars???**

Which new fermions ?

New Fermions

- ▶ Top partners in models of partial fermion compositeness?
- ▶ Fourth family with Higgs ?
data indicates that 4th family and a standard Higgs cannot both exist in agreement with theory
- ▶ “strong” fourth family without higgs
present bounds on $b', t' \sim 500 \text{ GeV}$
- ▶ “exotic” (non-standard quantum numbers)

PLAN FOR WRITEUP

Theory side problem: Validation and Interpretation

Experimental side problem: Detectors weren't designed for this...

Are there priorities or catch all channels?



SUMMARY

Exotic exotics

- Simple extensions of weak scale models give rise to “exotic” Hidden Valley like signatures in broad class of models
- This can affect supersymmetry and dark matter searches
- LHC experiments have broad reach capabilities with the right types of search techniques

Flavor (D)

Outlook: *we need more data and more theory work*

☑ **Data 1**
Measurement of the separate CP asymmetries by LHCb

☑ **Theory**
More into the question: can this be sheer SM ?
Classification of other decay modes where similar enhancements would be expected.
Can Lattice QCD help here?

And into the other question: may this be beyond SM ?
Classification of the "cleanest" modes, e.g. those that are less polluted by QCD penguins

☑ **Data 2**
Data on these modes

Open Questions

- Did we miss anything important?
- What do we do with tops?
- We have theory coordinators, how about experimental input?
- Main outline should be fixed soon, details will wait for latest experimental results:
 - Be ready for discoveries or just exclusions
 - Select most relevant topics

Open Questions

- Boosted objects:
 - use of different algorithms?
- New vectors:
 - Model (in)dependence?
 - New scalars?
- New fermions:
 - Leptoquarks?
- LOLIPS:
 - Many possible channels
 - Timeline: possible to implement by experiments?

Open Questions

- Other exotics:
 - Interplay with other GWs (SUSY, Dark Matter)
 - Many possibilities
- Flavor:
 - Hot topics (CP violation in D, ...)
 - Beyond hot topics?