

Overview of the new TopBSM Physics group

David Toback & Costas Vellidis

CDF Collaboration Meeting

March 2012

Outline

- **Overview of TopBSM**
 - Structure/Management
 - TopBSM in 2012
 - Collaboration Meeting talks
- **Analyses**
 - Papers published since last Collaboration Meeting
 - Analyses Submitted/in Godparenting
 - Analyses with Internal Reviewers
 - Analyses in Progress
- **Summary**

Structure/Management

- In January the Top and Exotics groups merged to become the *TopBSM* physics group
 - New Conveners: Costas Vellidis and David Toback
 - Thanks to former Exotics Convener Oscar Gonzalez Lopez and former Top Convener Fabrizio Margaroli
- Very active group with lots of exciting things going on
- Meet on Thursdays at 8:30AM

TopBSM in 2012

- *What kind of analyses remain?*
 - Both searches and measurements
 - Analyses where we still have competitive advantages
 - $Q\bar{q}$ production vs. gluon production
 - A_{FB} , Spin correlations, s-channel single top
 - Legacy Measurements
 - Following up on hints in the data... need to put those to bed or claim evidence

Collaboration Meeting Talks

Wednesday afternoon:

- "Measurement of the ratio $R=B(t \rightarrow Wb)/B(t \rightarrow Wq)$ at CDF"
 - Pierfrancesco Butti
- "Search for New Physics in the Exclusive Delayed Photon + MET Final State"
 - Adam Aurisano
- Overview of Dilepton Group Activities
 - Yen-Chu Chen
- "Measurement of W-boson polarization from Top-quark decay"
 - Mousumi Datta

Thursday morning:

- "Recent Developments in A_{FB} in $t\bar{t}$ production"
 - Jon Wilson
- "The first measurement of A_{FB} in $b\bar{b}$ production at CDF"
 - Pavol Bartos
- "Top Mass measurement using template method"
 - Jian Tang
- "Measurement of Single Top Quark at CDF"
 - Ben Wu

Wine and Cheese on Friday

"The Top Pair Forward-Backward Asymmetry at CDF in 8.7 fb^{-1} "

Dave Mietlicki

Papers published since last Collaboration meeting

- High mass resonances into ZZ
 - PRD 85, 012008 (2012)
- ZZ+Met
 - PRD-RC 85 011104 (2012)
- Same-Sign Dileptons
 - PRL 107 181801 (2011)
- Top Mass in Met+Jets
 - PRL 107 232002 (2011)
- Search for T' in $N_{\text{jets}}+\text{Met}$
 - PRL 107 191803 (2011)
- Search for Heavy Top like Quark
 - PRL 107 261801 (2011)
- Search for Resonant Production of $t\bar{t}$ pairs
 - PRD 84 072003 (2011)
- Top mass in lepton+Jets
 - PRD 84 071105 (2011)

BSM Papers with GPS or Submitted

- Search for Dark Matter in Monotops
 - Submitted to PRL, arXiv:1202.5653
- Search for Dark Matter in MonoJet + Missing ET
 - Accepted to PRL, arXiv:1203.0742
- Search for Heavy particle decaying to a top quark and a light quark ($tZ' \rightarrow ttj$)
 - Submitted to PRL, arXiv:1203.3894
- Search for stop decaying to charm+neutralino
 - Submitted to PRL, arXiv:1203.4171
- Chargino-Neutralino search
 - Working on 1st reading draft of paper with GPS
- Same-sign dileptons with Taus
 - Had first GPS meeting for PRL

Top Papers with GPS or Submitted

- Top Mass in all hadronic
 - Dealing with 2nd reviews of PRL, arXiv:1112.4891
- Top Mass and cross section in Tau+Jets
 - Working on 1st Reading Draft for PRL
- M_{top} in lepton+jets ★
 - GPS just assigned for PRL
- $\Delta(M_{\text{Top}})$ ★
 - GPS just assigned for PRL
- A_{fb} in $t\bar{t}$ lepton+jets (b-tagged) ★★
 - GPS requested

Combination Papers with DZero

- **Combination W helicity dilepton**
 - Submitted to PRL, arXiv:1202.5272
- **Combination of Top Mass for PRD**
 - Working with Dzero editorial board, will then go to CDF GPS
- **Combination in $\sigma(t\bar{t})$ for PRL**
 - Starting “combination” procedure
 - Will request GPS when a draft is ready

BSM Analyses with Reviewers

- Fermiophobic Higgs in the $3\gamma+X$ Channel
 - Working on new MC backgrounds and extending mass limits
 - Full status update 2/16
- GMSB: Exclusive $\gamma_{\text{Delayed}}+\text{Met}$ ★
 - Full Status 3/15

Top Analyses with Reviewers

- $BR(t \rightarrow Wb)/BR(t \rightarrow Wq)$ ★
 - Blessed some material for Moriond 3/1 & 3/8
 - Need to bless Zero-tags
- Single top in lepton+jets ★
 - Need to rebless numbers from 3/1 Blessing
- M_{top} in MET+jets ★
 - Preblessed 3/8, update 3/15
- W Helicity with full data ★
 - Full Status 3/15
- A_{fb} for b quarks ★
 - Full Status 3/22

BSM Analyses in Progress

- $Z' \rightarrow t\bar{t}$
 - Full Status 2/16
- Monopole Search
 - Fixed GEANT simulation issues, validating
- $Z' \rightarrow g^* g \rightarrow t\bar{t} j$
 - First showing 3/1
- Sub-resonances in $t\bar{t}$
 - First presentation soon
- Search for heavy vector quarks decaying $T \rightarrow Wb, tZ$ and tH
 - Generating signal, then presentation
- GMSB: Delayed photons in $\gamma + \text{jet} + \text{Met}$ and exclusive $\gamma\gamma + \text{Met}$
 - Re-optimizing with full datasets
 - Will go after Exclusive Delayed photon
- $tZ' \rightarrow tj\bar{j}$
 - Update 11/3
 - Will go After Higgs

Top Analyses in Progress

- Differential A_{fb} in $t\bar{t}$ lepton+jets (b-tagged) ★
 - Update on unfolding $\text{Cos}(\theta_t)$ 3/15
- Cross section measurement in dilepton with a tau
 - Update 1/19, Finalizing systematics
- Top width
 - Will go after $\Delta(M_{top})$

Top Measurements in Dileptons ★

- A_{fb} in dileptons (b-tagged)
 - Update 3/1, dealing with parton projection issues
- $\sigma(t\bar{t})$ in dilepton
 - Part of the overall dilepton plan
- Spin correlation in dilepton
 - Blessed 12/1. Need to identify who will do with full dataset
- Top polarization in dileptons
 - Re-Blessed in 12/11. Finish with full dataset

Summary

- Despite the excellent turn-on of LHC, the spring conferences show that CDF TopBSM is still competitive
- Still in a VERY productive stage
 - 8 papers published since the last Collaboration meeting, 1 more accepted, 5 submitted, and 8 more about to go out the door. Many more in the pipeline
- The legacy measurements are progressing nicely and we are actively following up on a number of interesting hints
- Still planning to be around if you want to get involved
 - Analyses that could use help
 - E.g. Legacy measurements in dileptons
 - New starts that may be competitive?
 - Low-mass Supersymmetric top quarks
- Enjoy the large number of excellent collaboration Meeting talks