

Summary of Activities in 2006-07 and Plans for 2007-2008

Simona Rolli
Tufts University

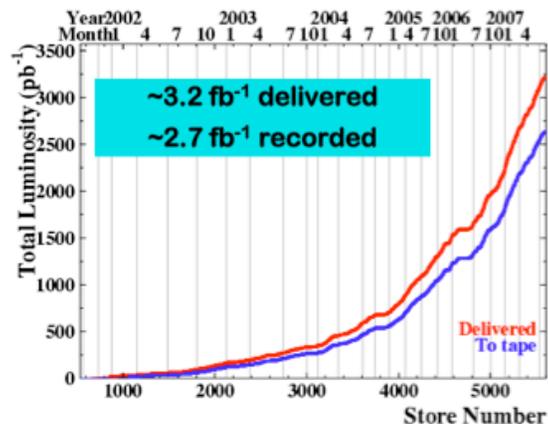
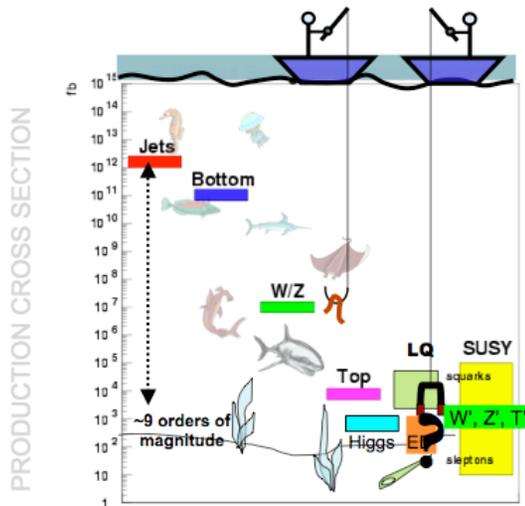


Outline

- CDF
 - ◆ Management work
 - PerfIDia
 - ◆ Physics analysis
 - Search for LeptoQuarks: 1st and 2nd generation
 - Search for LeptoQuarks: 3rd generation
 - Search for quark substructure in dijet events
- ATLAS
 - ◆ Physics Analysis:
 - Single Top
 - CSC Notes
- Miscellanea (talks and presentations)

CDF Status

- CDF is deepening its physics program



- 1st Physics [few 100 pb⁻¹]
 - Heavy flavor physics, inclusive W/Z, re-establish top
- Now [1-2 fb⁻¹]
 - Precision Mt, Bs-Mixing, Top properties, Observation of rare processes
- Looking Ahead [several fb⁻¹]
 - Even rarer processes, New Physics searches, Higgs

CDF Status



People: Summary



- People are migrating to the LHC [and other experiments]
 - This is not new, started a long time ago
- We've taken many measures to mitigate the impact on the experiment
 - We have **stabilized, streamlined and automated** many tasks in operations and in physics analysis
 - We spend considerable effort **retaining, recruiting and planning ahead**
- But very importantly:
 - Luminosity increase has made a tremendous difference
 - The experiment is running very well
 - Very rich and exciting physics program
 - LHC delays have also made a difference
 - Many opportunities for people to make a mark here: physics and leadership
 - The collaboration age profile is ==> young, yet excellent
 - Try to keep senior people engaged at all levels
 - We have focused our physics program through Higgs

Enough people to run the experiment in FY09 and accomplish the physics

PerfIDia

Performance and ID instant answer



The idea is to have much of analysis infrastructure at CDF running in an automatic way to guarantee smooth running in the next two years

Some aspects of all analyses are in common:

lepton ID efficiency,
reconstruction, trigger
Jet Energy corrections
B-tagging Scale factors
tau reconstruction

.....

PerfIDia is an automatic set of tools to calculate Identification/Reconstruction/Trigger Efficiencies for leptons, as well as scale factors between data and MonteCarlo. It also provides automatic validation of Jet Energy Scale, and btagging scale factors.

We are providing a common software framework which incorporates all the relevant piece of code and produces output tables, plots and documentation on the web for every new batch of processed data.

One coordinator (SR) and several experts on call

Current Development



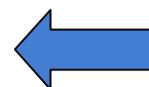
- Automatic tool to check data stability (high PT Leptons)
 - ◆ All code in one common place (cvs)
- TopNt and StNtuple produced shortly after Production data is available: target 4-6 weeks after Production. Turnover rate ~2.5 months.
- The ID code is launched to validate the new ntuples and determine the various efficiencies and SF
 - ◆ Dependency on several tasks:
 - Good Run List
 - Skimmed Data (to avoid large volumes of files)
 - ...
- Output is posted as plots and tables onto PerfIDia web page
- Joint Physics group does the final sign off

Time Line 2006-2007

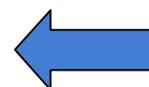


Detailed stream status

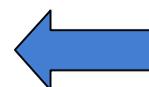
Period	Run-Range	online time	Validation	Release Patch	Dataset	Event numbers / lumi.	Integrated Lumi.	Status	Known Problems
13	241665-246231	13 May 07 - 4 Aug 07	checklist	6.1.1c_f	0j	545M events /317pb-1	2736 pb-1	coming	-
12	237845-241664	01 Apr 07 - 13 May 07	checklist	6.1.1c_f	0j	256M events /185pb-1	2419 pb-1	status (cache)	-
11	233133-237795	31 Jan 07 - 30 Mar 07	checklist	6.1.1c_f	0j	369M events /264pb-1	2234 pb-1	complete	-
10j	228664-233111	24 Nov 06 - 31 Jan 07	checklist	6.1.1c_f	0j	390M events /280pb-1	1970 pb-1	complete	reprocessed of p10
10	228664-233111	24 Nov 06 - 31 Jan 07	checklist	6.1.1c_f	0i	390M events /280pb-1	1970 pb-1	complete	CEM scale calibration (cache)
9	222529-228596	01 Sep 06 - 22 Nov 06	checklist	6.1.1c_f	0i	250M events /180pb-1	1690 pb-1	complete	WHA calibration (cache)
8	217990-222426	09 Jun	checklist	6.1.1c_e	0i	335M events /	1510 pb-1	complete	Hot WHA Tower



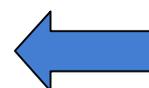
[Ntuple ready Nov 07](#)



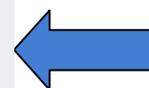
[Ntuple ready Sept 07](#)
[Results blessed Sept 07](#)



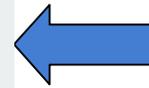
[Ntuple ready July 07](#)
[Results blessed in July 07](#)



[Ntuple ready May 07](#)
[June 07 blessed;](#)
[Muon Trigger Issues Understood](#)



[Ntuple ready Mar 07](#)
[May 07 blessed;](#)
[Muon Trigger Issues](#)



[Ntuple ready Dec 06](#)
[Dec 06 blessed;](#)
[Used to cross-check code](#)

Example: Electron ID



PerfIDia

http://ncdf70.fnal.gov:8001/PerfIDia/PerfIDia.html

Google PerfIDia Apple Tufts Wikipedia News simona julian FNAL CERN Blogosphere (19) References Mac Shopping Travel

Simona Rolli's page chi c'e' in ascolto PerfIDia First ATLAS Physics W... Joint Physics ProductionFarm.Ntu

- [Home](#)
- [High ET Electrons](#)
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- [BTagging](#)
- [Links and Scale Factors](#)
- [Presentations](#)
- [Validation Module](#)



- Documentation:
 - [Web Page](#)
 - [CDF Note 8274, June 1st, 2006](#)
 - [CDF Note 8614, November 27, 2006](#)
 - [Joint Physics Meeting Blessing, November 17, 2006](#)
- Code:
 - [Instructions on how to run the code](#)
- Results:
 - [Period 12 data: Runs 237850-241664 \(MC sample zewkeh\)](#):
 - [Mass distributions with comparisons between data and MC](#)
 - [Efficiencies and Scale Factors for data and MC \(file not formatted!\)](#)
 - [Efficiencies and Scale Factors for data and MC at large ETA \(eta < 2.8\) \(file not formatted!\)](#)
 - [Period 11 data: Runs 233133 to 237795 \(MC sample zewkcd - newly reprocessed as zewkee\)](#):
 - [Mass distributions with comparisons between data and MC](#)
 - [Efficiencies and Scale Factors for data and MC \(file not formatted!\)](#)
 - [Efficiencies and Scale Factors for data and MC at large ETA \(eta < 2.8\) \(file not formatted!\)](#)
 - [Period 10 data: Runs 228664 to 233111 \(MC sample Zemted\)](#)
 - [Period 9 data : Runs 222529 to 228596 \(MC sample zewkcd - newly reprocessed as zewkmd\)](#):
 - [Mass distributions with comparisons between data and MC](#)
 - [Efficiencies and Scale Factors for data and MC \(file not formatted!\)](#)
 - [Efficiencies and Scale Factors for data and MC at large ETA \(eta < 2.8\) \(file not formatted!\)](#)
 - [Post ShutDown data \(June 2006 to September 2006\): Runs 217990 to 222426 \(MC sample zewkcd\)](#):
 - [Mass distributions with comparisons between data and MC](#)
 - [Efficiencies and Scale Factors for data and MC \(file not formatted!\)](#)
 - [bheI0i Pre ShutDown data \(September 2005 to June 2006\): Runs 203819 to 212133: \(MC sample zewkcd\)](#)

Example: Electron ID



PerfDia

http://ncdf70.fnal.gov:8001/PerfDia/PerfDia.html

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Post Shut Down Data (Runs 217990 to 222426, dataset bhel0i)

PerfDia

http://ncdf70.fnal.gov:8001/PerfDia/PerfDia.html

Getting Started Google Email at Fermilab DOGrids Certificate ... Zillow.com - Your E... SSH Public Key Uploa... CDF Fast Navigator

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[Validation Module](#)

CEM Z data counts,

	66-116	71-111	76-106	81-101	86-96
CEM-CEM	5476	5372	5228	5002	4222
CEM-nisoCEM	5692	5576	5421	5168	4342
CEM-looseCEM	6366	6239	6064	5782	4861
CEM-nisoLooseCEM	6620	6478	6280	5967	4993
CEM-LCE	7099	6934	6714	6347	5270
CEM-ssCEM	10	8	8	4	2
CEM-ssnisoCEM	12	10	10	6	3
CEM-ssLooseCEM	21	19	19	13	10
CEM-ssnisoLooseCEM	28	26	23	17	11
CEM-ssnisoLooseCEM	28	26	23	17	11
CEM-ssLCE	155	136	112	90	65

CEM Z mc counts,

	66-116	71-111	76-106	81-101	86-96
CEM-CEM	121262	119318	116486	111492	94658
CEM-nisoCEM	125190	123038	119963	114576	96831
CEM-looseCEM	138135	135876	132562	126679	10737
CEM-nisoLooseCEM	142884	140354	136715	130332	10990
CEM-LCE	151030	148327	144428	137602	11584
CEM-ssCEM	104	100	94	86	56
CEM-ssnisoCEM	130	122	106	94	60
CEM-ssLooseCEM	237	228	216	201	147
CEM-ssnisoLooseCEM	227	214	192	176	132
CEM-ssLCE	1213	1156	1068	966	749

CEM bg fractions (%)

	66-116	71-111	76-106	81-101	86-96
CEM-CEM	0.145276 +/- 0.0514694	0.097666 +/- 0.0426179	0.108489 +/- 0.0455		
CEM-nisoCEM	0.16047 +/- 0.0530537	0.120276 +/- 0.0464158	0.144161 +/- 0.05153		
CEM-looseCEM	0.237459 +/- 0.0610021	0.205104 +/- 0.0572774	0.225573 +/- 0.0609		
CEM-nisoLooseCEM	0.396136 +/- 0.0772025	0.37333 +/- 0.0757729	0.338706 +/- 0.07331		
CEM-LCE	2.07038 +/- 0.168999	1.77299 +/- 0.158481	1.39303 +/- 0.143035		

Background-subtracted CEM efficiencies (data)

	66-116	71-111	76-106	81-101	86-96
CEM	0.78654 +/- 0.00486318	0.787947 +/- 0.00490884	0.788815 +/- 0.00498114		
nisoCEM	0.817441 +/- 0.00458492	0.817684 +/- 0.00463675	0.817643 +/- 0.00463675		
looseCEM	0.91353 +/- 0.00333576	0.914131 +/- 0.00336457	0.913881 +/- 0.00336457		
nisoLooseCEM	0.948469 +/- 0.00262391	0.947549 +/- 0.00267723	0.945536 +/- 0.00267723		

Plans for 2008: forward we go!



- Will continue to lead the PerfIDia effort
 - ◆ Adding btagging
 - ◆ Photon ID
 - ◆ Taus

Date: Tue, 02 Oct 2007 10:19:51 -0500
From: Douglas Glenzinski <douglasg@fnal.gov>
To: Simona Rolli <rolli@fnal.gov>
Cc: Douglas Glenzinski <douglasg@fnal.gov>, VARSHA RAMAKRISHNAN <vramakrishna@wisc.edu>, mmondra@fnal.gov, Fabiola Vazquez <fabiola@fnal.gov>, Salvador Carrillo Moreno <salvador.carrillo@uia.mx>, Lubomir Lovas <lovas@fnal.gov>, Eric James <jameseb@fnal.gov>
Subject: Re: Lepton meetings in the next few weeks

I'd like to add a few words here.

Over the last year you all helped CDF take a big step forward in validating the data quickly. People were very impressed with your efforts. That's the good news. The "bad" news is that they expect you to do it again this coming year!

Staffing Profile (from Doug G.)



CDF-2010 Operations Staffing Profile

CDF-2010 Physics Staffing Profile																	
PROJECT	FTE	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	%	06	06	06	06	07	07	07	07	08	08	08	08	09	09	09	09
Perfidia																	
Convener	30				Thomas Kott	Thomas Kott	Thomas Kott	Thomas Kott	Thomas Kott	Thomas Kott	Thomas Kott	Thomas Kott	Thomas Kott				
Convener	30																
Experts																	
CEM/PEM/PHX Reco+ID	25				Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans	Daryl Hans
CEM/PEM Trigger Eff	25				Bo Young Han	Bo Young Han	Bo Young Han	Bo Young Han	Bo Young Han	Bo Young Han	U-Roch Student	U-Roch Student	U-Roch Student	U-Roch Student	U-Roch Student	U-Roch Student	U-Roch Student
CMUP/X Reco+ID+Trig	25				Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas	Lubo Lovas
BMU Reco+Trig	25				Vansha	Vansha	Vansha	Vansha	Vansha	Vansha	Vansha	Vansha	Vansha				
BMU ID	25				Fabrizio Mangano	Fabrizio Mangano	Fabrizio Mangano	Fabrizio Mangano	Miguel Montenegro	Miguel Montenegro	Miguel Montenegro	Miguel Montenegro	Miguel Montenegro	UW/Mexico	UW/Mexico	UW/Mexico	UW/Mexico
COT Efficiency	10				Jason Han	Jason Han	Jason Han	Jason Han	Jason Han	Jason Han							
W,Z Yields	10				Ar Nagano	Ar Nagano	Ar Nagano	Ar Nagano	Ar Nagano	Ar Nagano							
DJES																	
Convener	30				Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino	Monica Brondino
DJES+Gamma Jet	25	Fabrizio Mangano	Fabrizio Mangano	Fabrizio Mangano	Fabrizio Mangano	Nick van Berckelaer	Fabrizio Mangano	Fabrizio Mangano	Fabrizio Mangano	Fabrizio Mangano	Fabrizio Mangano						
Brigging																	
Convener	30	Chris Yu	Chris Yu	Chris Yu	Chris Yu	Chris Yu	Kiki Paenica	Kiki Paenica	Kiki Paenica	Kiki Paenica	Kiki Paenica	Kiki Paenica	Kiki Paenica				
Convener	30				William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston	William Sproston
SecVtx/JProb Mistags	20				Sarah Bull	Sarah Bull	Sarah Bull	Sarah Bull	Sarah Bull	Sarah Bull							
SecVtx/JProb SF	20				Mike Paenica	Mike Paenica	Mike Paenica	Mike Paenica	Mike Paenica	Mike Paenica							
Jprob Parameterization	20								Tyuka	Tyuka	Tyuka	Tyuka	Tyuka	Tyuka	Tyuka	Tyuka	Tyuka
Roma Tagger	20				Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano
Roma Tagger	20				Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano	Itaiano
Perfidia Total	4.2																

LeptoQuarks

- **Leptoquarks (LQ)** are hypothetical particles which appear in many SM extensions to explain **symmetry between leptons and quarks**

- ◆ SU(5) GUT model
- ◆ superstring-inspired models
- ◆ 'colour' SU(4) Pati-Salam model
- ◆ composite models
- ◆ technicolor

• LQs are **coupled to both leptons and quarks** and carry SU(3) color, fractional electric charge, baryon (B) and lepton (L) numbers

• LQs can have:

– spin 0 (scalar)

- couplings fixed, i.e., no free parameters
- Isotropic decay

– spin 1 (vector)

- anomalous magnetic (k_G) and electric quadrupole (λ_ϕ) model-dependent couplings

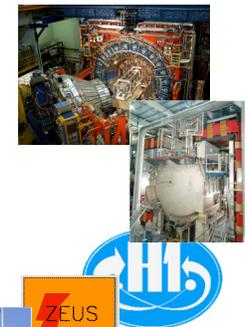
– Yang-Mills coupling: $k_G = \lambda_\phi = 0$

– Minimal coupling: $K_G = 1, \lambda_\phi = 0$

– Decay amplitude proportional to $(1 + \cos\theta^*)^2$

• **Experimental evidence searched:**

- ◆ indirectly: LQ-induced 4-fermion interactions
- ◆ directly: production cross sections at collider experiments

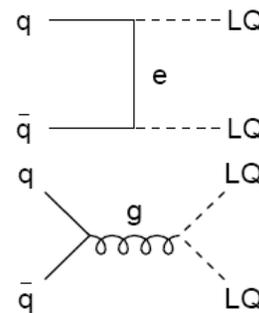


LQ at Hadron Colliders

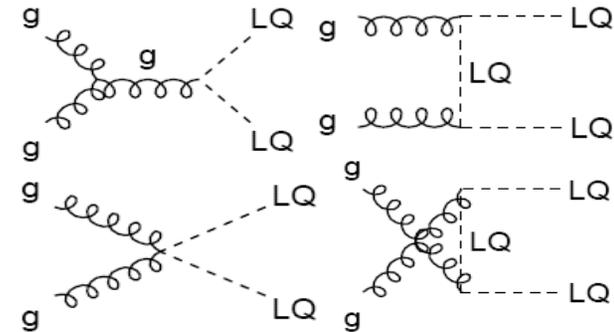
- Pair production**

- Practically independent of Yukawa coupling λ (only g -LQ-LQ vertex)
- Depends mainly on **LQ mass**

$$q\bar{q} \rightarrow LQ LQ$$



$$gg \rightarrow LQ LQ$$



Decay

- Each generation can decay into 3 final states:
 $\beta = \text{Br}(LQ \rightarrow lq)$

$$\beta = 1$$

1st Generation

$$LQ \bar{LQ} \rightarrow e^- e^+ q \bar{q}$$

$$\beta = 0.5$$

$$LQ \bar{LQ} \rightarrow e^\pm \nu_e q_i q_j$$

$$\beta = 0$$

$$LQ \bar{LQ} \rightarrow \nu_e \nu_e q \bar{q}$$

Exclusive to the Tevatron

2nd Generation

$$LQ \bar{LQ} \rightarrow \mu^+ \mu^- q \bar{q}$$

$$LQ \bar{LQ} \rightarrow \mu^\pm \nu_\mu q_i q_j$$

$$LQ \bar{LQ} \rightarrow \nu_\mu \nu_\mu q \bar{q}$$

3rd Generation

$$LQ \bar{LQ} \rightarrow \tau^+ \tau^- q \bar{q}$$

$$LQ \bar{LQ} \rightarrow \tau^\pm \nu q_i q_j$$

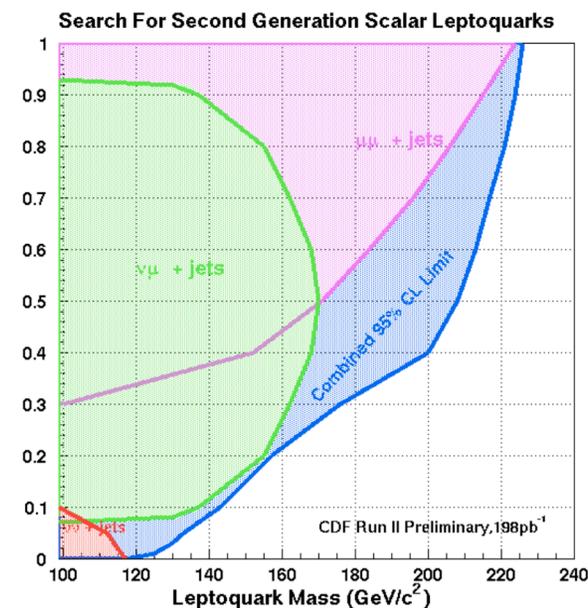
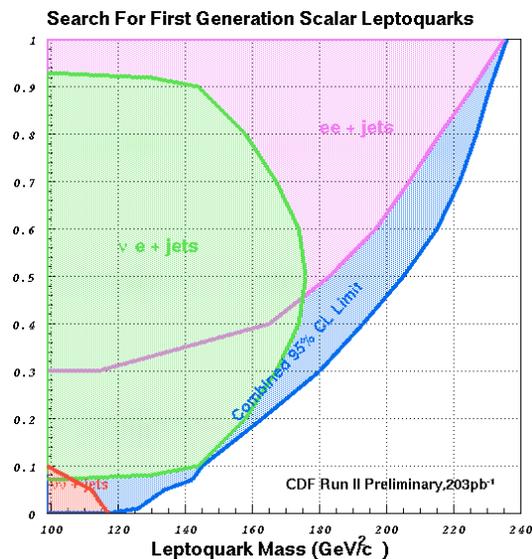
$$LQ \bar{LQ} \rightarrow \nu_\tau \nu_\tau q \bar{q}$$

LQ at CDF

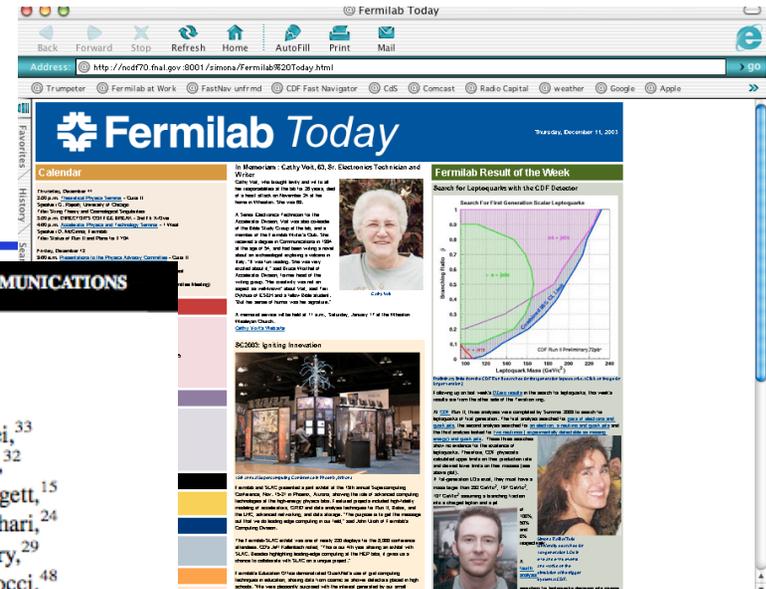


Tufts is the primary institutions doing LQ searches in RunII:

- ◆ 1st generation, $eeqq$, $evqq$ + combined result (Simona)
- ◆ 2nd generation: $\mu\mu qq$, $\mu\nu qq$ + combined result (Dan-Simona)
- ◆ 3rd generation: $\tau\tau qq$ (Hao, Simona, Chris)



Publications



PHYSICAL REVIEW D 72, 051107(R) (2005)

Search for first-generation scalar leptoquarks in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV

D. Acosta,¹⁶ J. Adelman,¹² T. Affolder,⁹ T. Akimoto,⁵⁴ M. G. Albrow,¹⁵ D. Ambrose,¹⁵ S. Amerio,⁴² D. Amidei,³³ A. Anastassov,⁵⁰ K. Anikeev,¹⁵ A. Annovi,⁴⁴ J. Antos,¹ M. Aoki,⁵⁴ G. Apollinari,¹⁵ T. Arisawa,⁵⁶ J-F. Arguin,³² A. Artikov,¹³ W. Ashmanskas,¹⁵ A. Attal,⁷ F. Azfar,⁴¹ P. Azzi-Bacchetta,⁴² N. Bacchetta,⁴² H. Bachacou,²⁸ W. Badgett,¹⁵ A. Barbaro-Galtieri,²⁸ G. J. Barker,²⁵ V. E. Barnes,⁴⁶ B. A. Barnett,²⁴ S. Baroiant,⁶ G. Bauer,³¹ F. Bedeschi,⁴⁴ S. Behari,²⁴ S. Belforte,⁵³ G. Bellettini,⁴⁴ J. Bellinger,⁵⁸ A. Belloni,³¹ E. Ben-Haim,¹⁵ D. Benjamin,¹⁴ A. Beretvas,¹⁵ T. Berry,²⁹ A. Bhatti,⁴⁸ M. Binkley,¹⁵ D. Bisello,⁴² M. Bishai,¹⁵ R. E. Blair,² C. Blocker,⁵ K. Bloom,³³ B. Blumenfeld,²⁴ A. Bocci,⁴⁸ A. Bodek,⁴⁷ G. Bolla,⁴⁶ A. Bolshov,³¹ D. Bortoletto,⁴⁶ J. Boudreau,⁴⁵ S. Bourov,¹⁵ B. Brau,⁹ C. Bromberg,³⁴ E. Brubaker,¹² J. Budagov,¹³ H. S. Budd,⁴⁷ K. Burkett,¹⁵ G. Busetto,⁴² P. Bussey,¹⁹ K. L. Byrum,² S. Cabrera,¹⁴ M. Campanelli,¹⁸ M. Campbell,³³ F. Canelli,⁷ A. Canepa,⁴⁶ M. Casarsa,⁵³ D. Carlsmith,⁵⁸ R. Carosi,⁴⁴ S. Carron,¹⁴ M. Cavalli-Sforza,³ A. Castro,⁴ P. Catastini,⁴⁴ D. Cauz,⁵³ A. Cerri,²⁸ L. Cerrito,⁴¹ J. Chapman,³³ Y. C. Chen,¹ M. Chertok,⁶ G. Chiarelli,⁴⁴ G. Chlachidze,¹³ F. Chlebana,¹⁵ I. Cho,²⁷ K. Cho,²⁷ D. Chokheli,¹³ J. P. Chou,²⁰ S. Chuang,⁵⁸ K. Chung,¹¹ W-H. Chung,⁵⁸ Y. S. Chung,⁴⁷ M. Cijliak,⁴⁴ C. I. Ciobanu,²³ M. A. Ciocci,⁴⁴ A. G. Clark,¹⁸ D. Clark,⁵ M. Coca,¹⁴ A. Connolly,²⁸ M. Conway,⁴⁸ I. Conway,⁶ R. Cooper,³⁰ K. Conic,³³ M. Cordelli,¹⁷ G. Cortiana,⁴² I. Cranshaw,⁵² J. Cuevas,¹⁰ A. Cruz,¹⁶

RAPID COMMUNICATIONS

RAPID COMMUNICATIONS

PHYSICAL REVIEW D 73, 051102(R) (2006)

Search for second-generation scalar leptoquarks in $p\bar{p}$ collisions at $\sqrt{s} = 1.96$ TeV

A. Abulencia,²³ D. Acosta,¹⁷ J. Adelman,¹³ T. Affolder,¹⁰ T. Akimoto,⁵⁴ M. G. Albrow,¹⁶ D. Ambrose,¹⁶ S. Amerio,⁴² D. Amidei,³³ A. Anastassov,⁵¹ K. Anikeev,¹⁶ A. Annovi,⁴⁵ J. Antos,¹ M. Aoki,⁵⁴ G. Apollinari,¹⁶ J-F. Arguin,³² T. Arisawa,⁵⁶ A. Artikov,¹⁴ W. Ashmanskas,¹⁶ A. Attal,⁸ F. Azfar,⁴¹ P. Azzi-Bacchetta,⁴² P. Azzurri,⁴⁵ N. Bacchetta,⁴² H. Bachacou,²⁸ W. Badgett,¹⁶ A. Barbaro-Galtieri,²⁸ V. E. Barnes,⁴⁷ B. A. Barnett,²⁴ S. Baroiant,⁷ V. Bartsch,³⁰ G. Bauer,³¹ F. Bedeschi,⁴⁵ S. Behari,²⁴ S. Belforte,⁵³ G. Bellettini,⁴⁵ J. Bellinger,⁵⁸ A. Belloni,³¹ E. Ben Haim,⁴³ D. Benjamin,¹⁵ A. Beretvas,¹⁶ J. Beringer,²⁸ T. Berry,²⁹ A. Bhatti,⁴⁹ M. Binkley,¹⁶ D. Bisello,⁴² M. Bishai,¹⁶ R. E. Blair,² C. Blocker,⁶ K. Bloom,³³ B. Blumenfeld,²⁴ A. Bocci,⁴⁹ A. Bodek,⁴⁸ V. Boisvert,⁴⁸ G. Bolla,⁴⁷ A. Bolshov,³¹ D. Bortoletto,⁴⁷ J. Bortone,⁴⁶ S. Bortone,¹⁶ A. Bortone,¹⁰ D. Bortone,¹⁰ G. Bortone,³⁴ F. Bortone,¹³ J. Bortone,¹⁴ H. S. Budd,⁴⁸ S. Budd,²³

TeVatron Run II full luminosity



Assumptions:

Same acceptances as now

Number of events observed = number of predicted background

Same errors

$\beta = 1$ mass limit up to 250-300 GeV/c²

$\beta = 0.5$ mass limit up to 230-280 GeV/c²

Preliminary

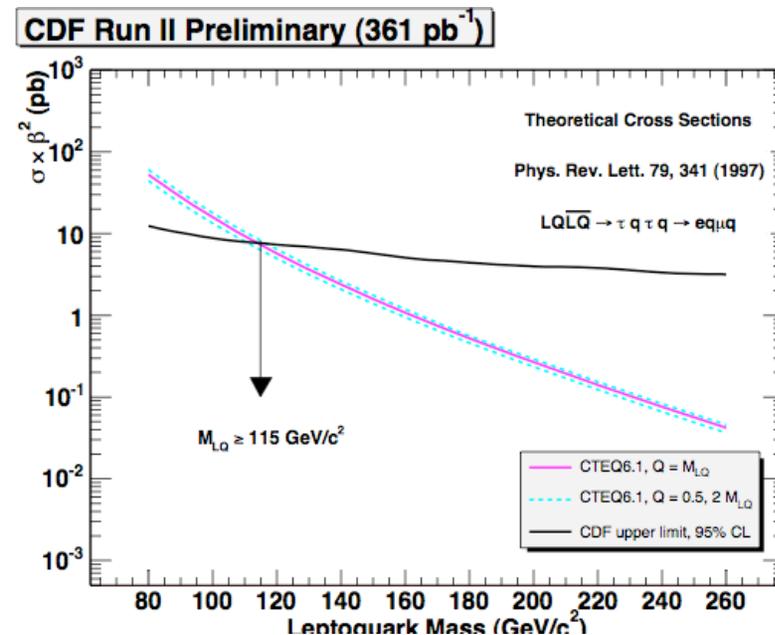
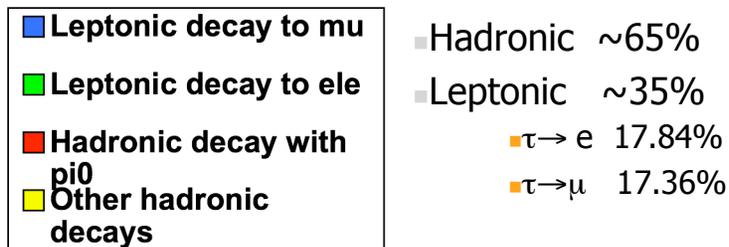
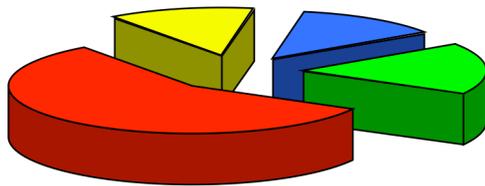
Phys.Rev.D71:057503,2005

*New analysis strategy
(not counting experiment anymore?)
might be necessary.....*

LQ: Current Activity and Plans



- Third generation LQ's
 - ◆ LQ → τb
 - ◆ Leptonic decay of both taus is considered
 - Lower BR but cleaner signature (high P_T) lepton triggers





Third Generation LQ Plans

- Hao Sun graduated in April
- We plan to bless the analysis next year and to bring it to publication
 - ◆ Two undergraduates students will participate
 - One senior thesis

Search for Quark Substructure in Dijet Events



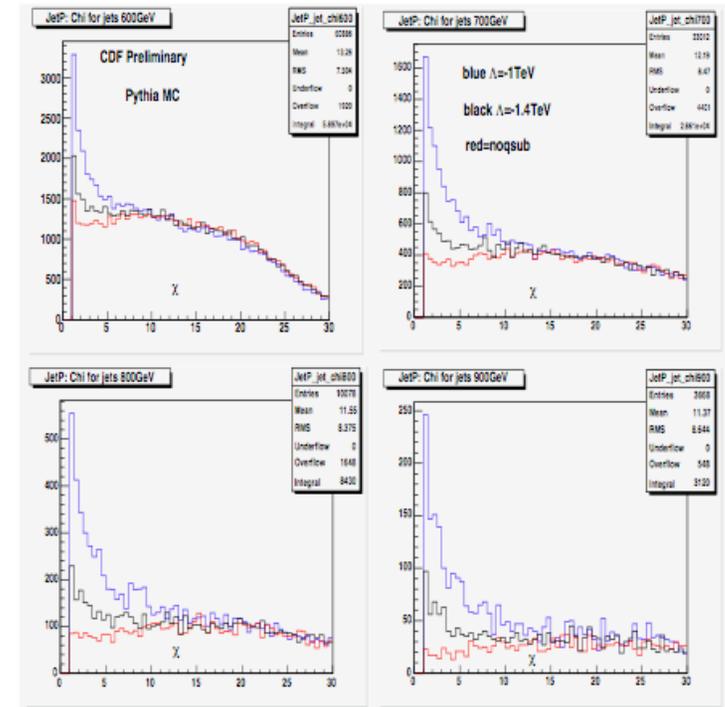
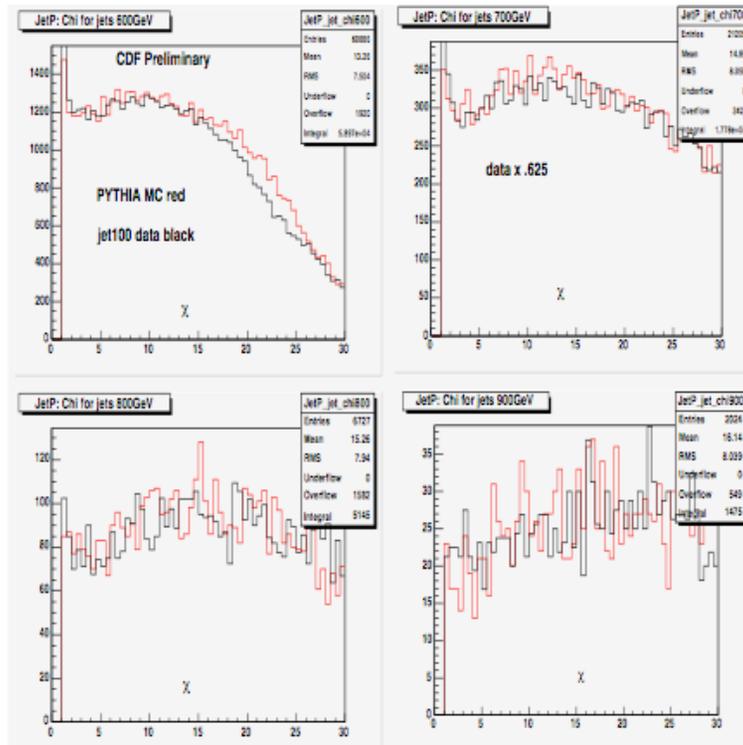
Analysis started by UWM group (L.Pondrom and Y. Shon)

Shape analysis

- comparison of dijet angular distribution to two hypothesis:

SM QCD production

BSM interactions due to quark substructure

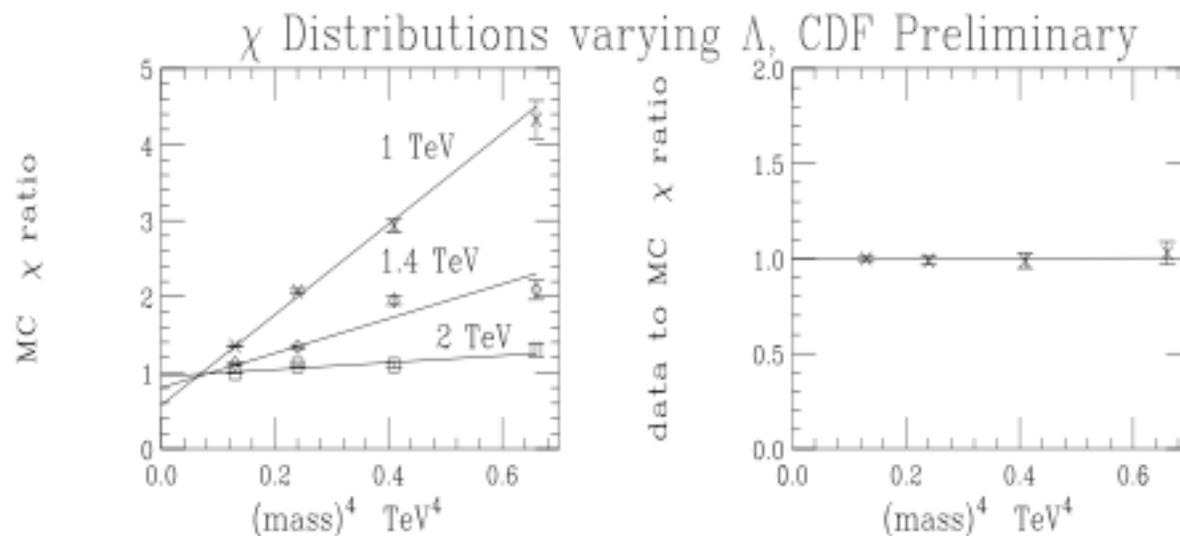




Procedure to extract a limit on Λ

Ratio of MC(Λ)/MC(SM)
is plotted vs mass

The same ratio
is taken for
data/MC(SM)



The data slope is compared to the plot of MC slopes as a function of $1/\Lambda^4$
to determine a bound on Λ .

Current limit is set at $\Lambda > 3.9$ TeV at 90% C.L.

Issues with the analysis and Plans



No systematic effects have been considered so far :

- scale choice for MC predictions (LO QCD calculation, phenomenological model for quark substructure)
- jet energy corrections systematics
- pdf's choice
- other

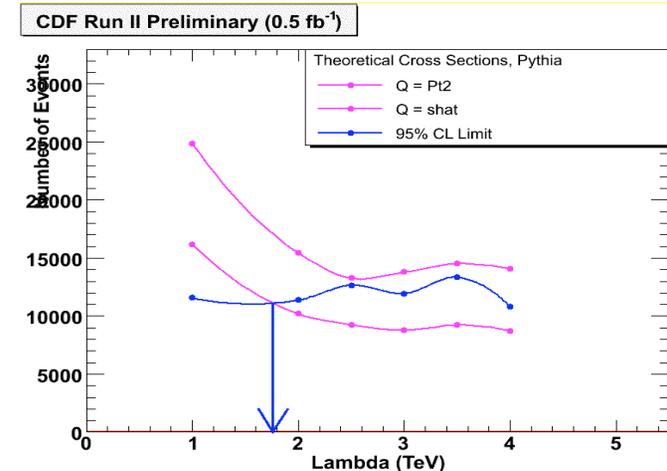
New approach to the analysis (Simona):

- consider it as a counting experiment
- derive acceptances for dijet events (mass intervals)
- derive systematic uncertainties as difference in acceptances

**Preliminary results lower the limit
to $\Lambda > 2.0 - 3 \text{ TeV}$**

1fb⁻¹ of data available

Reconcile UWM's and Simona's analyses



Physics at LHC



- Les Houches 2005

- Fourth in a series whose aim is to **bring together theorists and experimentalists** working on the phenomenology of the upcoming **TeV colliders** .
- The emphasis will be on the **physics of the LHC during its first few years of running**
 - Strong interplay between:
 - what has been learned from the TeVatron
 - how the next linear collider could complement LHC measurements/findings
 - The impact of cosmology and astrophysics will be addressed.
 - Two WG - **convener of BSM**

The projects are to start in January 2005 and should be completed by the end of the year 2005.

- TeV4LHC Workshop

Phys.Rev.D71:057503,2005

- Bringing together the Tevatron and LHC experimental groups and the theoretical community to make the best possible use of data and experience from the Tevatron in preparing for the LHC experimental program:
 - Understanding how to use Tevatron data to improve event modelling
 - Theoretical understanding of cross sections for the signals and backgrounds at LHC,
 - Using experience with real problems at the Tevatron
- INFN MC Workshop, Frascati February-November 2006

bringing together expts and theorists to address MC issues at LHC

4 WG - **convener of Parton Shower and MC interfaces**

Physics Analysis at ATLAS



Area of interest:

Top Group: Single Top

Collaboration with:

Udine (SingleTop)

Work started in the framework of the Rome Physics Workshop (June 2005) and extended to specific studies aimed at publishing a Scientific Note on Single Top at ATLAS by the end of 2007.

Single Top in ATLAS

First Look at
single-top cross-section
measurements in Atlas
with FullSim AOD's

Arnaud Lucotte
IN2P3/LPSC Grenoble

Thanks To :

Within the Top Group :

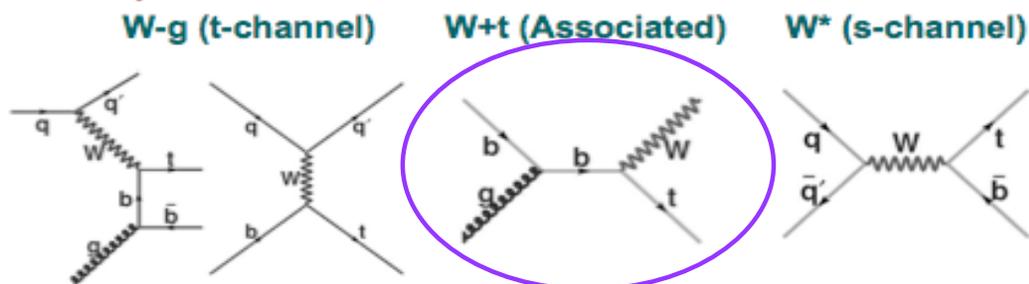
- F. Chevallier (LPSC)
- M. Barisonzi (NIKHEF)
- M. Cöbal, M.P. Giordani (Udine)
- S. Rolli (Tufts)
- C. Roda, I. Vivarelli (Pisa)

The Athena/PhysicsAnalysis/ Experts :

- K. Assamagan (BNL)
- S. Binet (Clermont-Ferrand)
- Production team, etc...

Single-top in the SM

- 3 production mechanisms



→ Two of them could be seen at the Tevatron (W^*, Wg)

→ All will be measured *precisely* at the LHC

Motivations

- **Properties of the Wtb vertex :**
 - Determination of $\sigma(pp \rightarrow tX)$, $\Gamma(t \rightarrow Wb)$
 - Direct determination of $|V_{tb}|$
 - Top polarization
- **Precision measurements → probe to new physics**
 - Anomalous couplings, FCNC → **t-channel, W+t**
 - Extra gauge-bosons W' (GUT, KK)
 - Extra Higgs boson (2HDM) → **s-channel**
- **Single-top is one of the main background to ...**
... Higgs physics with jets...

Selection efficiency

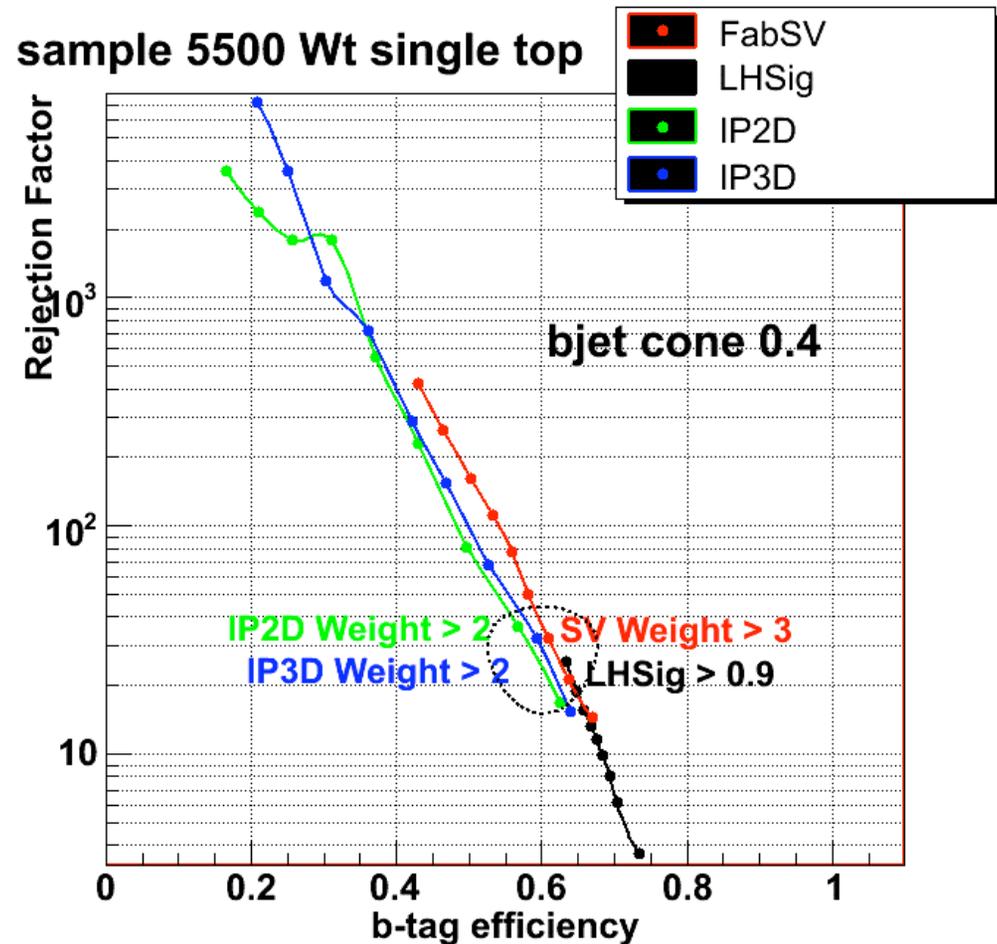
$\epsilon(\%)$	W+t FullSim	W+t TDR
Total processed	--	M. Cöbal, Giordani, Rolli, C. Roda
$N(\text{ele})=1, p_T > 20$	49.5	
$p_T(\text{e}) > 20, mE_T > 20$	44.3	
$N(\text{b-jet}) = 1, p_T > 50$	18.7	
$N(\text{jet}) = 2, p_T > 30$	8.98	
$60 < m_{jj} < 95$	0.93	1.27

Previous Work: btagging performance estimate on single top samples



- Performance Estimators
- **b-jet efficiency ε_b** :
 - ◆ Denominator:
 - jets defined as b using MC truth with $p_T > 50 \text{ GeV}/c$, $|\eta| < 2.5$
 - ◆ Numerator:
 - ditto + cut on a tagging weight
- **light-jet rejection $R_u = 1 / \varepsilon_u$**
 - ◆ $R=100$ means 1% mistag rate
 - ◆ light jets: u, d, s, g

ATL-COM-PHYS-2006-036



CSC Notes



The CSC notes are to be produced by the Physics and joint performance group using data made for the Computing System Commissioning

~100 Notes, 1 or 2 editors each: ~150 people/2000

- ↓ [Standard Model](#)
 - ↓ [Jets and Min Bias \(Buttar, Moraes\)](#)
 - ↓ [W/Z cross section \(Boonekamp, Di Ciaccio\)](#)
 - ↓ [W mass \(Peterson\)](#)
 - ↓ [Asymmetry in Z \(Aharrouche\)](#)
 - ↓ [W/Z+jets \(Huston\)](#)
 - ↓ [Dibosons \(Zhou\)](#)
 - ↓ [PDF's \(Cooper-Sarkar\)](#)
 - ↓ [Gamma+jet \(TBD\)](#)
- ↓ [Top](#)
 - ↓ [T1 Leptons \(Pralavorio\)](#)
 - ↓ [T2 light jets \(Schwindling\)](#)
 - ↓ [T3 B jets \(Hawkings\)](#)
 - ↓ [T5 Trigger \(Wengler\)](#)
 - ↓ [T6 Cross section \(Bentvelsen, Cobal\)](#)
 - ↓ [T7 Top properties \(Onofre, Tokar\)](#)
 - ↓ [T8 Single top \(A. Lucotte, S. Rolli\)](#)
 - ↓ [T9 Mass \(Pallin, Etiennevire\)](#)
 - ...
- ↓ [Higgs](#)
 - ↓ [HG1 \(Carminati, Mellado\)](#)
 - ↓ [HG2 \(Paganis, Nisati\)](#)
 - ↓ [HG3 \(Cranmer, Tsuno\)](#)
- ↓ [Exotics](#)
 - ↓ [Black Holes \(Parker, Issever\)](#)
 - ↓ [Dibosons \(Azuelos\)](#)
 - ↓ [Lepton+jets \(Savinov, Strohmer\)](#)
 - ↓ [Dileptons \(Black, Ferrag\)](#)
 - ↓ [Leptons+ etmiss \(Flores\)](#)
- ↓ [SUSY](#)
 - ↓ [SUSY1 \(Asai\) : Data-driven Estimation of Z/W backgrounds to SUSY](#)
 - ↓ [SUSY2 \(De Jong\): Data-driven Estimation of top Backgrounds to SUSY](#)
 - ↓ [SUSY3 \(Tevan\): Data driven Estimation of QCD Backgrounds to SUSY](#)
- ↓ [BPhysics](#)
 - ↓ [Dimuon Triggers for B-physics \(Kanaya\)](#)
 - ↓ [Single Muon trigger for B-physics \(Tarem\)](#)
 - ↓ [Muons from K/pi in B-events \(Di Mattia\)](#)
 - ↓ [Muons+ Calormimeter trigger for B-decays \(Baines\)](#)
 - ↓ [B to mumu and backgrounds \(Nikitine, Sivoklov\)](#)
 - ↓ [Rare semi leptonic decays \(Reznicek\)](#)
 - ↓ [Trigger efficiency \(Kono\)](#)
 - ↓ [Cross Sections \(Zur Nedden\)](#)
 - ↓ [Onia \(Kartvelishvili\)](#)
 - ↓ [J/psi to ee : b-triggers, offline reconstruction and calibrations \(Derue\)](#)
 - ↓ [B to psi K+ \(Petridou\)](#)
 - ↓ [B to psi K0, psi phi \(Smizanska\)](#)
 - ↓ [B to psi Lambda \(Neal\)](#)
 - ↓ [Triggers for hadronic decays \(Epp, Walkowiak\)](#)
 - ↓ [Chib \(Gazis\)](#)

CSC Note on Single Top



T8SingleTop < Atlas < TWiki

https://twiki.cern.ch/twiki/bin/view/Atlas/T8SingleTop

collaborate with TWiki

Atlas

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ATLAS Home

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Physics

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You are here: TWiki > Atlas Web > AtlasPhysics > TopWorkingGroup > CSCNotes > T8SingleTop

r17 - 27 Sep 2006 - 10:37:18 - AmaudLuco

CSC Note T8: Single top

- ↓ [CSC Note T8: Single top](#)
 - ↓ [Abstract](#)
 - ↓ [Contributors](#)
 - ↓ [Meetings](#)
 - ↓ [Contents \(proposal\)](#)
 - ↓ [Monte Carlo samples](#)
 - ↓ [Analysis Package](#)
 - ↓ [Identification Cuts \(high PT electrons and muons\)](#)
 - ↓ [Documentation](#)

Abstract

At the LHC, the production of single top quarks accounts for a third of the top pairs production. With more than two millions of single top events produced every year during a low luminosity run, a precise determination of all contributions to the total single-top cross-section seems achievable. These measurements will constitute the first direct measurement of V_{tb} at the four percent level of precision, and constitute a powerful probe for new physics via the search for evidence of anomalous

Status of CSC note



1. Introduction

Simona, Arnaud

2. Phenomenology

Reinhard, Arnaud

3. Reconstruction & trigger performance

Mohsen, Akira, Simona, Patrick

4. Preselection of single top events

Arnaud

5. Single-top evidence with the early data

Reinhard, Jenny, Patrick

6. t-channel cross-section measurement

Akira, Nathan

7. s-channel cross-section measurement

Arnaud

8. Wt-channel cross-section measurement

Benoit

9. Common systematics

M. Cristinziani, G. Khorauli, D. Shouten, J. Cochran



ATLAS NOTE

ATL-PHYS-PUB-2007-XXXX

August 29, 2007



Prospect for single top cross-section measurements in ATLAS

First (complete) draft
expected

The ATLAS Collaboration

~~on September 15th~~
October 15th

Abstract

At the LHC, the production of single top quarks accounts for a third of the top pairs production. With more than two millions of single top events produced every year during a low luminosity run, a precise determination of all contributions to the total single-top cross-section seems achievable. These measurements will constitute the first direct measurement of V_{tb} at the few percent level of precision, and constitute a powerful probe for new physics, via the search for evidence of anomalous couplings to the top quark or the measurements of additional bosonic contributions to the single top production.

The single top production mechanisms proceeds through three different sub-processes resulting in distinct final states, topologies, and backgrounds. This report establishes the ATLAS potential for the cross-sections measurements of all three contributions. A common preselection, including triggers, is described and it addresses lepton identification issues, as well as jet reconstruction and b-tagging performance. Specific selections are detailed extensively and the expected performance are assessed in terms of statistical sensitivity and systematic uncertainties. A special emphasis is put on the strategies for an early evidence of single top production, including triggers issues as well as methods which will be used to estimate Standard Model backgrounds from data when possible.



Status of CSC note (II)

Single-top analyses

A cut-based analysis will be used for all channels and serves as a reference

MultiVariate analyses should be used for the 3 analyses and their performance will be compared to the cut-based results

Sensitivity will be assessed as $f(\text{lumi})$ / specifying for 100 pb^{-1} , 1 fb^{-1} , 30 fb^{-1}

Strategy for the discovery with early data should be available

Specific selection \rightarrow use of streamingData

Estimate of the systematics

Experimental biases :

- Jet Energy Scale : use 10% variation for jet. Is there an official recommendation for the choice of this value within the Top Group ?
- b-tagging uncertainty : use variations of ε_b and rejection rates around operating points corresponding to $\pm 5\%$ of ε_b \rightarrow Now in TopView (Akira)

PDFs uncertainties :

- M. Cristinziani, G. Khorauli + D. Shouten are efficiently working on AcerMC+PYTHIA and MC@NLO + HERWIG
 - \rightarrow now producing FastSim with all sets of PDFs in order to assess the effects on selection efficiencies (CTEQ6L : 40 PDFs set, MRST2001 set)
- Note: AcerMC+PYTHIA is used as the default (MC@NLO not validated yet)

Status of CSC note (III)



Estimate of the systematics ('ed)

B-fragmentation parameters uncertainties :

- Some of the people working on PDFs are considering working on the effects of the b-fragmentation parameters as well...
- Liza and Borut agreed to help with the jobOptions

ISR/FSR samples :

- Jim and his team are still working on defining the extreme values to set
- Have shown the effects on distributions. Expect to have the effects on selection efficiencies soon

Pile-up studies:

- This seems to be an important point because we are selecting (very low multiplicity jet events: ~typically 2 and 3 jet events)
- CMS quotes this as one the three most important systematics in their cross-section measurements

FastSim studies of pile-up seems not feasible (Jerome...)

- Would request a limited production of 50kx3 fullSim single-top events

Tools developed for singleTop

A useful tool TRF tag :

- Attribute a b-tag / mistag weight to all jets in the event
- attribute a weight to an event to be seen as “1b inclusive” “2b excl” ...
- Used to estimate contribution from light-jets events backgrounds in analyses based on b-tagging
- avoid large stat. MC production

Could be used widely in the coll. !

Tool validated. Description of
Methods & performance
Available in
ATL-PUB-2007-011

Conclusions on ATLAS work



The analysis framework is well developed in ATLAS
Tools are well advanced and easy to use

The analysis ability is still very much in its infancy:
many people with LEP experience
TeVatron people starting working actively

It is important to step in now and contribute with experience from
the TeVatron

Still the collaboration is oversubscribed....it will be interesting to observe
what happens in 2008!



Talks and Presentations

- Simona Rolli, PASCOS 06, Ohio State University, September 2006
 - Top Physics at LHC
- Simona Rolli, Tufts University Colloquium, March 2007
 - Collider Physics
- Simona Rolli, CTEQ Workshop on Early Physics at the LHC, Lake Gull, Michigan, May 2007.
 - Top Physics at ATLAS
- Simona Rolli, CDF Collaboration Meeting, Paris, June 2007
 - PerfIDia