Summary of Activities and Plans
CDF

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Outline

- CDF activities
  - Service work
  - Physics analysis
    - Search for LeptoQuarks: 1st and 2nd generation
    - Search for LeptoQuarks: 3rd generation
- ATLAS
  - Physics Analysis:
    - Leptoquarks
    - Single Top
      - Btagging tests
      - CSC Notes
- Miscellanea (talks and presentations)

CDF Service Work

- evtNtuple
- TRGSim++
- PerfIDia
- Offline Release Coordinator

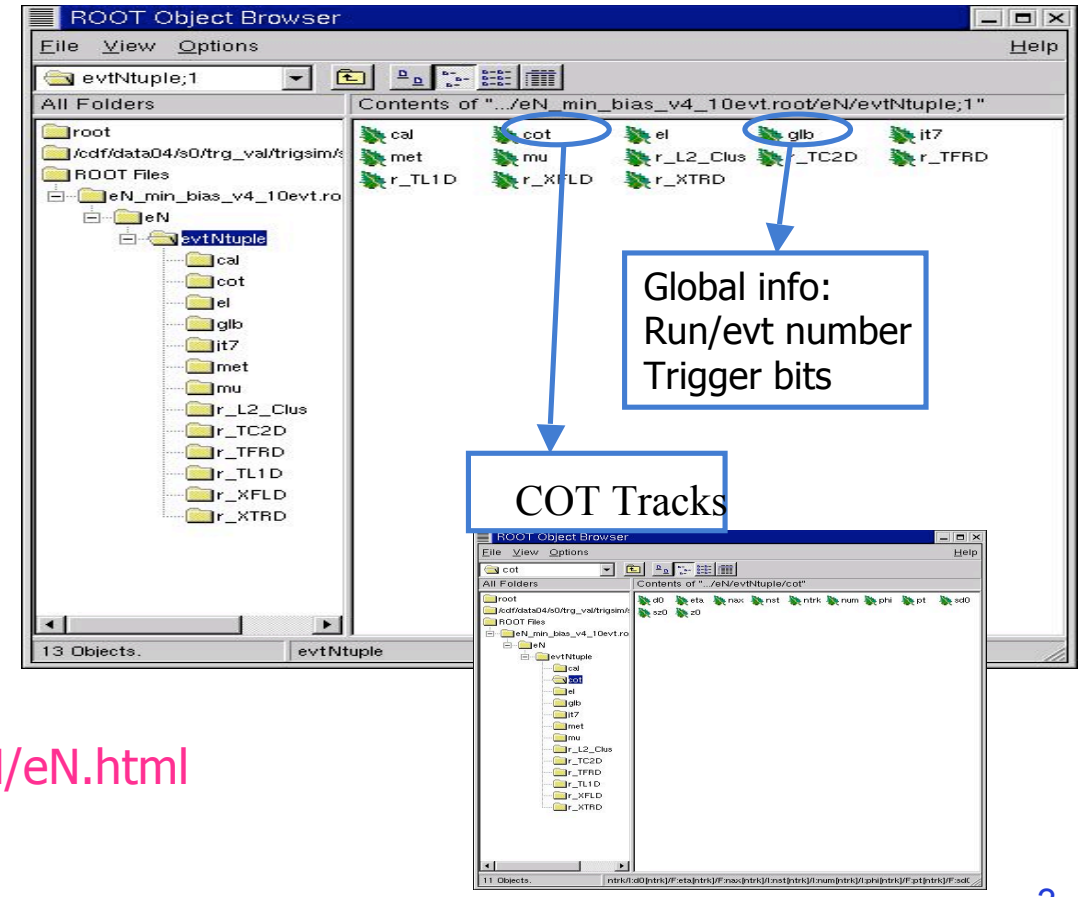
evtNtuple

2001-present

Event information is translated into ROOT branches:

- **High Level Objects**
- **Trigger Information**
- **Raw Data Information**
- **Simulated information**

eN is one of the analysis tools used in CDF



http://ncdf70.fnal.gov:8001/talks/eN/eN.html

TRGSim++

2000-present

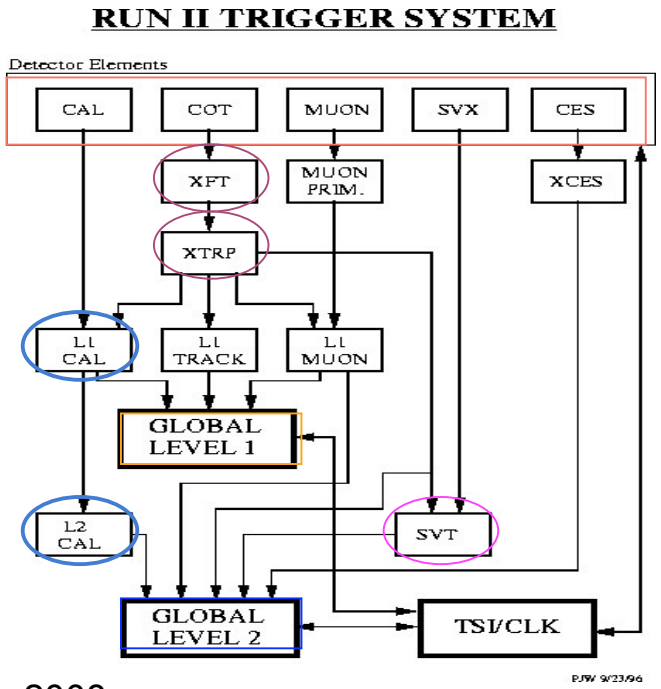
set of (C++) packages which emulate the various trigger levels decision steps (CDF trigger is fully digital)

- **offline tool to calculate rates and efficiencies;**
- **online monitoring tool.**

TRGSim++ modules run off detector raw data and produce emulated trigger data identical to real hardware data.

Trigger decision steps: A_C++ modules, organized in packages:

- **CalTrigger**
- **MuonTrigger**
- **XFTSim**
- **SVTSim**
- **XTRPSim**
- **L2/L1GlobalTrigger**
- **TriggerMods**
- **TriggerObjects**



http://ncdf70.fnal.gov:8001/trigsim/trgsim.html

CDF Status

FNAL PAC presentation
October 2007

People: Summary

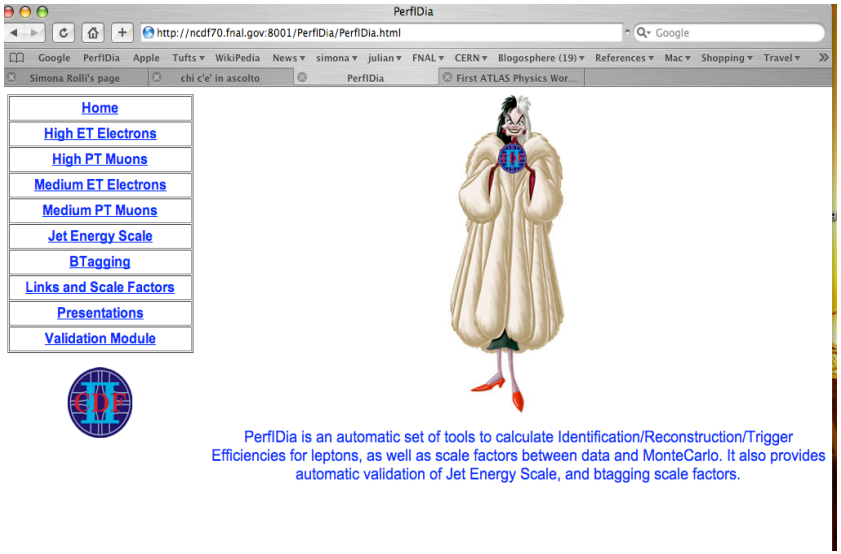
- People are migrating to the LHC [and other experiments]
  - This is not new, started a long time ago
- We've taken many measures to mitigate the impact on the experiment
  - We have stabilized, streamlined and automated many tasks in operations and in physics analysis
  - We spend considerable effort 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)

2007-present

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



Some aspects of all analyses are in common:
lepton ID efficiency,
reconstruction,trigger
Jet Energy corrections
B-tagging Scale factors
tau reconstruction
……

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

Time Line 2007-2008

Period	Run-Range	online time	Validation	Release Patch	Dataset	Event numbers / lumi.	Integrated Lumi.	Status	Known Issues
19	264101-266513	01 Jul 08 24 Aug 08	(([checklist))	6.1.6	0?	320M events /287pb-1	3963 pb-1	processing (cache)	
18	261119-264071	18 Apr 08-01 Jul 08	checklist	6.1.6/6.1.6_a,b	0m	436 events /407pb-1	3676 pb-1	processing (cache)	new offline release
17	258880-261005	28 Feb 08-16 Apr 08	checklist	6.1.1c_f	0k	235M events /188pb-1	3269 pb-1	Completed (6-6-08)	-
16	256840-258787	27 Jan 08-27 Feb 08	checklist	6.1.1c_f	0k	168.6M events /142pb-1	3081 pb-1	Completed (5-15-08)	-
15	254800-256824	5 Dec 07-27 Jan 08	checklist	6.1.1c_f	0k	210M events /159pb-1	2939 pb-1	completed (04-4-08)	-
14	252836-254683	28 Oct 07- 3 Dec 07	checklist	6.1.1c_f	0k	59M events /44.5pb-1	2780 pb-1	completed (02-25-08)	New SVX Alignment (250050)
13	241665-246231	13 May 07- 4 Aug 07	checklist	6.1.1c_f	0j	545M events /317pb-1	2736 pb-1	complete (12-03-07)	ISL Leaks (cache)

Ntuple ready Dec 08
Adding COTEff,
MET_PEM trigger Eff

Ntuple ready Oct 08
Results blessed Oct 08

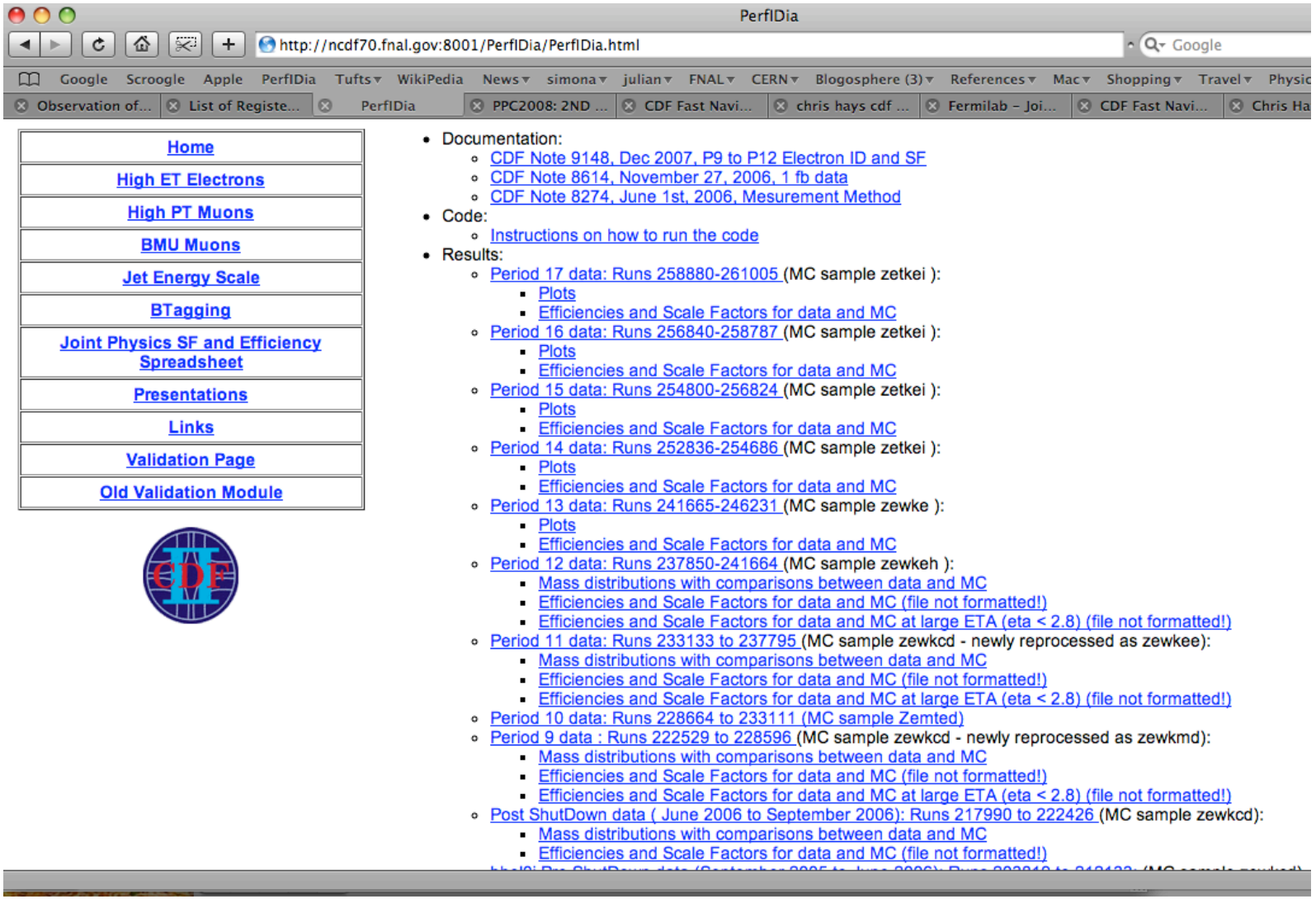
Ntuple ready July 08 -ICHEP
Results blessed in July 08

Ntuple ready May 08
May 08 blessed

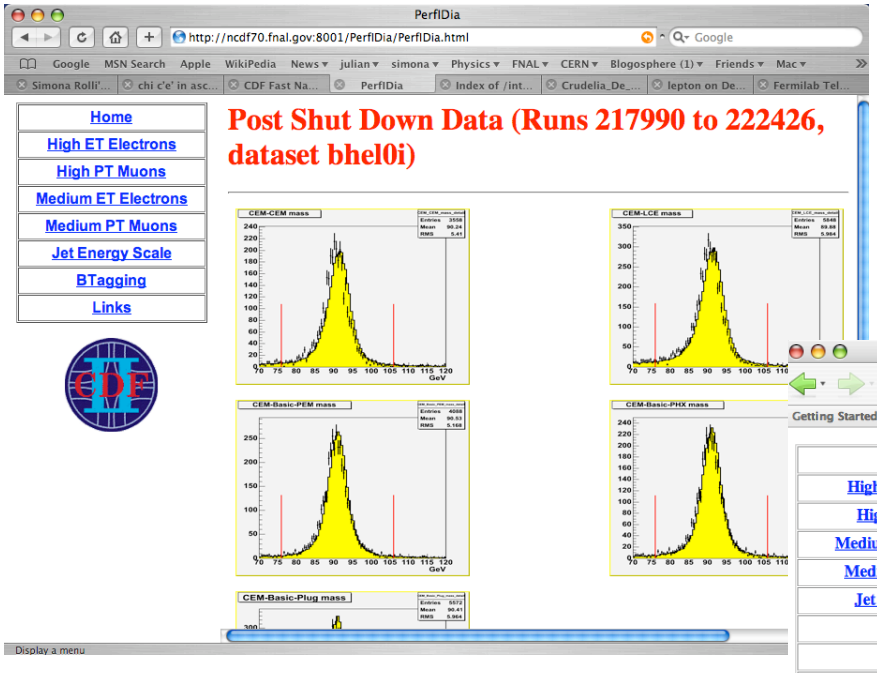
Ntuple ready Mar 08
March 08 blessed;

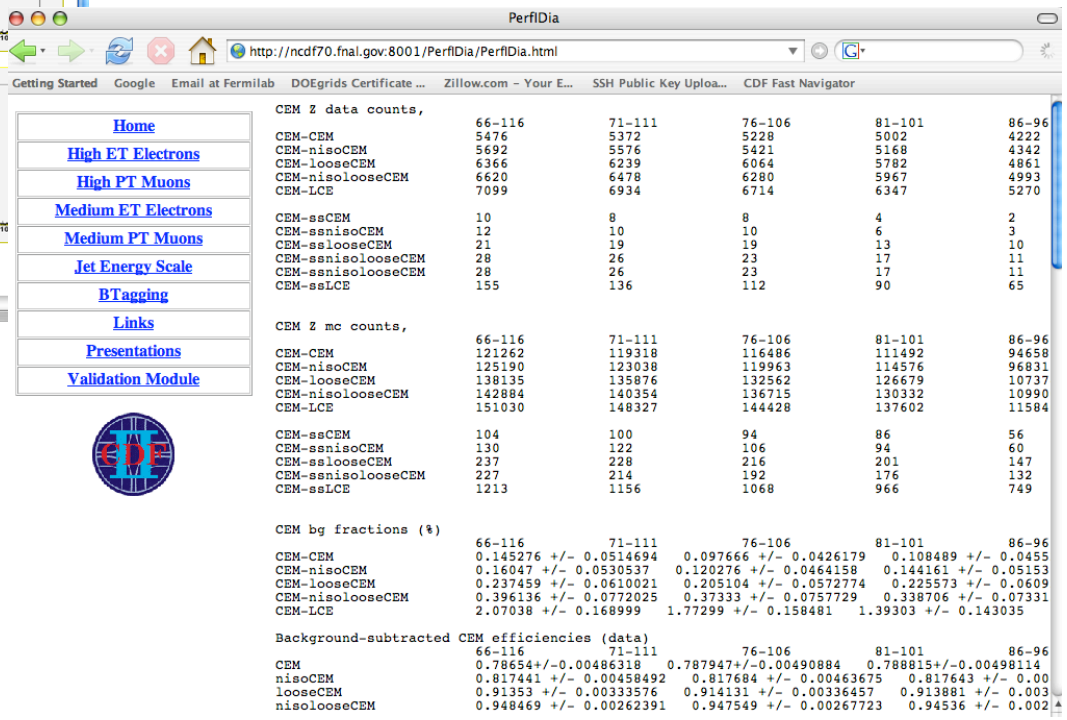
Ntuple ready by Dec07
Jan 08 blessed;

Example: Electron ID



Example: Electron ID





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 +/- 0.00		
looseCEM	0.91353 +/- 0.00333576	0.914131 +/- 0.00336457	0.913881 +/- 0.003		
nisolooseCEM	0.948469 +/- 0.00262391	0.947549 +/- 0.00267723	0.94536 +/- 0.002		

Plans: forward we go!

- **Will continue to lead the PerfIDia effort**
  - **Adding COT Efficiencies**
  - **Photon ID**
  - **Forward Electrons and MET Trigger**

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!

New Responsibility

- Offline Release Coordinator (New!)
  - CDF software releases pretty much stable
  - One last big release before the end of the run
    - 7.0.1
      - Just assembled before I took over
      - 3 steps need to be completed:
        - ProductionExe (data)
        - MC release
        - Physics Validation

        } To be completed in the next year
  - Infrastructure compatibility

Physics at CDF: 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_G) model-dependent couplings

–Yang-Mills coupling: $k_G = \lambda_G = 0$

–Minimal coupling: $K_G = 1$, $\lambda_G = 0$

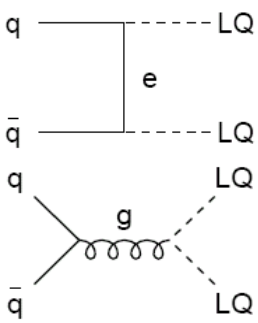
–Decay amplitude proportional to $(1 + \cos\theta^*)^2$

- **Experimental evidence searched:**
  - indirectly: LQ-induced 4-fermion interactions
  - directly: production cross sections at collider experiments

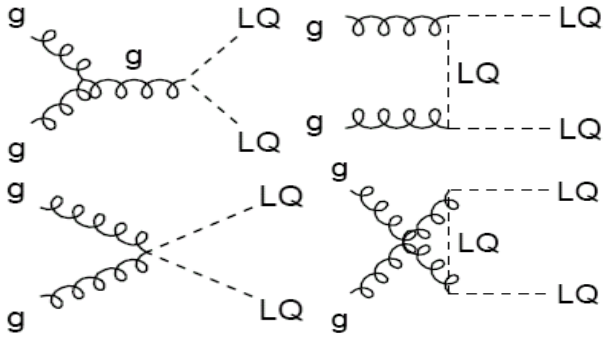
LQ at Hadron Colliders

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

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



$gg \rightarrow LQ\,\overline{LQ}$



Decay

- Each generation can decay into 3 final states:

$\beta = Br(LQ \rightarrow lq)$

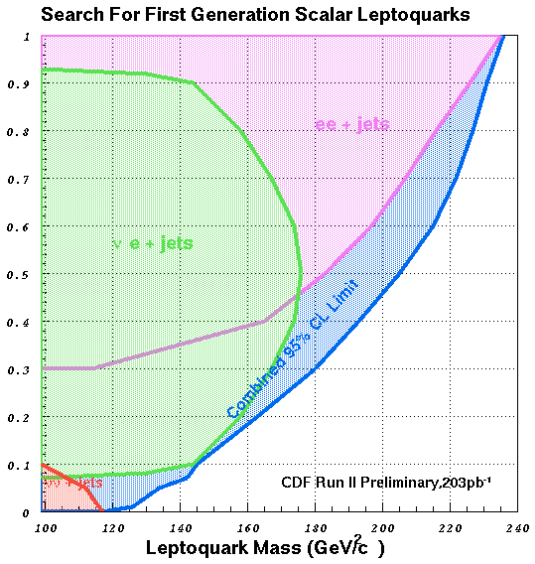
Exclusive to the Tevatron

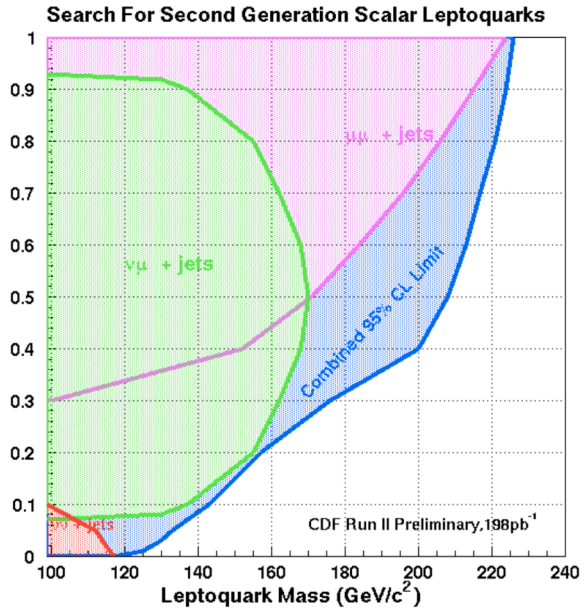
	1st Generation	2nd Generation	3rd Generation
$\beta = 1$	$LQ\,\overline{LQ} \rightarrow e^- e^+ q\bar{q}$	$LQ\,\overline{LQ} \rightarrow \mu^+ \mu^- q\bar{q}$	$LQ\,\overline{LQ} \rightarrow \tau^+ \tau^- q\bar{q}$
$\beta = 0.5$	$LQ\,\overline{LQ} \rightarrow e^{\pm} \nu_e q_i q_j$	$LQ\,\overline{LQ} \rightarrow \mu^{\pm} \nu_\mu q_i q_j$	$LQ\,\overline{LQ} \rightarrow \tau^{\pm} \nu\, q_i q_j$
$\beta = 0$	$LQ\,\overline{LQ} \rightarrow \nu_e \nu_e q\bar{q}$	$LQ\,\overline{LQ} \rightarrow \nu_\mu \nu_\mu q\bar{q}$	$LQ\,\overline{LQ} \rightarrow \nu_\tau \nu_\tau q\bar{q}$

LQ at CDF

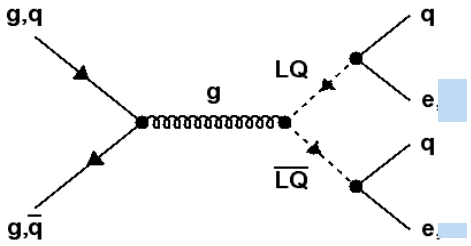
Tufts is the primary institutions doing LQ searches in RunII:

- 1st generation, eeqq, eνqq + combined result (Simona)
- 2nd generation:μμqq,μνqq + combined result (Dan-Simona)
- 3rd generation:ττqq (Hao, Simona,Chris)





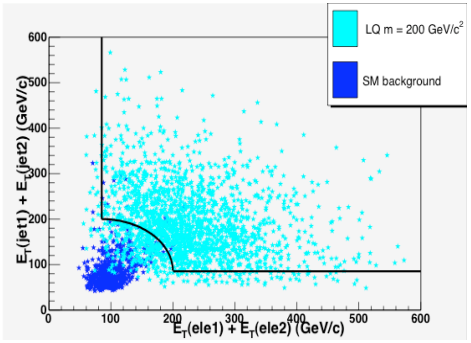
Search for LQ in dileptons + jets (I)

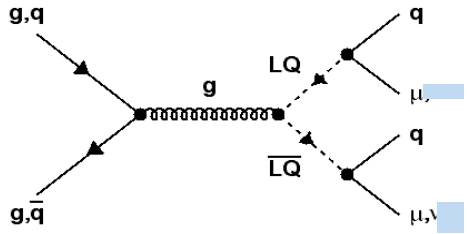


SM background
Drell-Yan+2jets
Top (dilepton)
QCD/Fakes

Selection

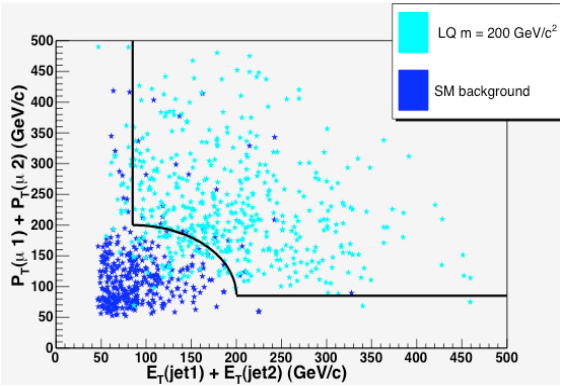
- ✓ 2 electrons (CC,CF) E_T > 25 GeV
- ✓ 2 jets, $E_T(j1)$ > 30 GeV, $E_T(j2)$ > 15 GeV
- ✓ Z Veto (76 < $M_{\mu\mu}$ < 110) GeV
- ✓ **Electrons/Jets: $E_T^{j1(e1)} + E_T^{j2(e2)} > 85$ GeV**
- ✓ **$((E_T(j_1) + E_T(j_2))^2 + (E_T(e_1) + E_T(e_2))^2)^{1/2} > 200$ GeV**



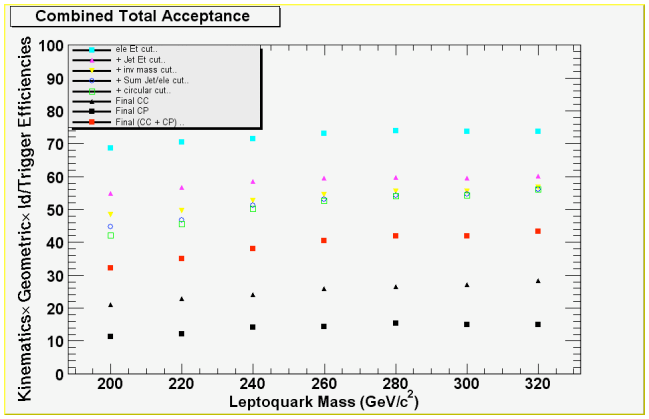


Selection

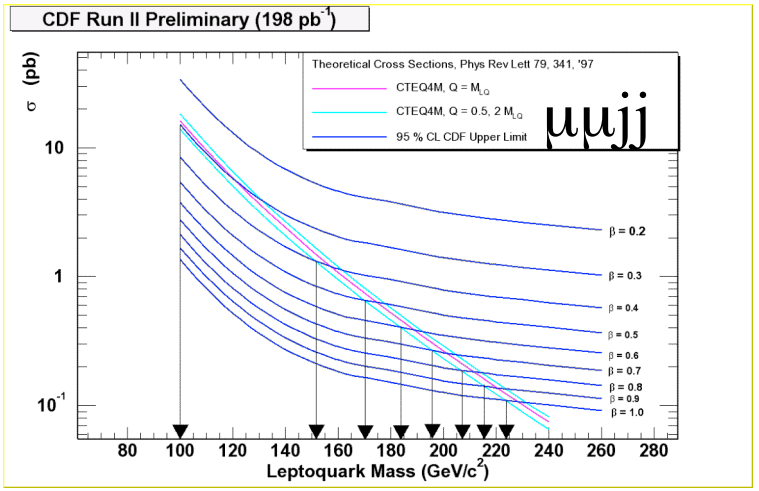
- ❖ 2 muons with P_T > 25 GeV
- ❖ 2 jets with E_T(j1,j2) > 30,15 GeV
- ❖ Dimuon Mass Veto:
  - ❖ 76 < $M_{\mu\mu}$ < 110, $M_{\mu\mu}$ < 15 GeV
- ❖ $E_T(j_1) + E_T(j_2) > 85$ GeV and $P_T(\mu_1) + P_T(\mu_2) > 85$ GeV
- ❖ $((E_T(j_1) + E_T(j_2))^2 + (P_T(\mu_1) + P_T(\mu_2))^2)^{1/2} > 200$ GeV

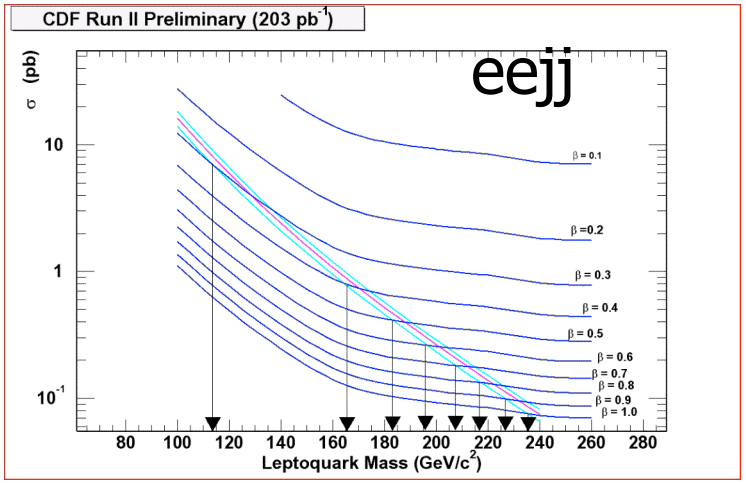


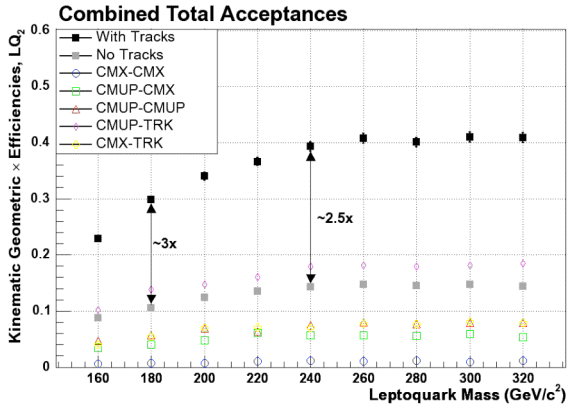
Search for LQ in dileptons + jets (II)



Exclude at 95% CL M_{LQ}<224 GeV/c^2 for β = 1.0

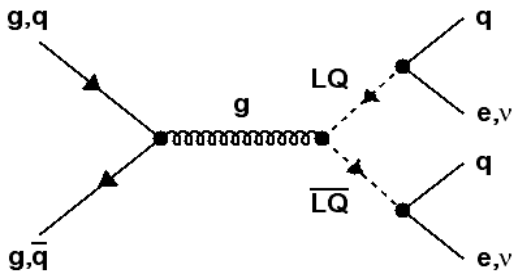






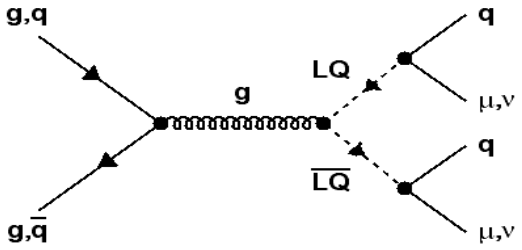
Exclude at 95% CL M_{LQ}<235 GeV/c^2 for β = 1.0

Search for LQ in lepton + MET + jets



SM background

- **W +2jets**
- **Top (l + jets and dilepton)**
- **QCD/Fakes**



Selection

1central electrons with E_T > 25 GeV

MET > 60 GeV

Veto on 2nd electron, central loose or Plug

2 jets with E_T > 30 GeV

$\Delta\phi$ (MET-jet) > 10°

$E_T(j1) + E_T(j2)$ > 80 GeV

$M_T(e\text{-}\nu)$ > 120

LQ mass combinations

Selection

Z veto (tight/loose pair)

No 2nd muon (CMUP, CMX, or stubless)

$P_T(\mu) > 25$ GeV

$\not\!\!E_T > 60$ GeV

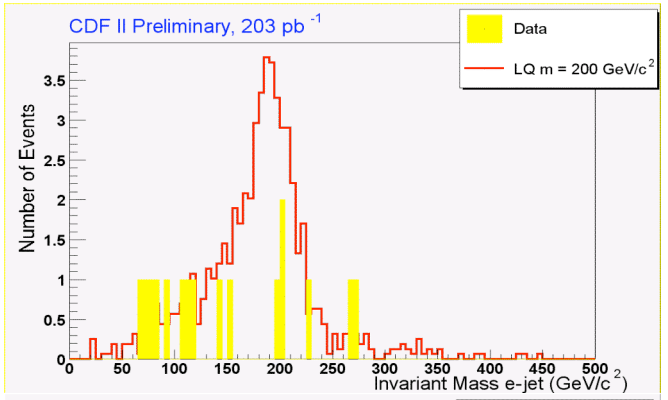
2 jets, @ E_T>30GeV

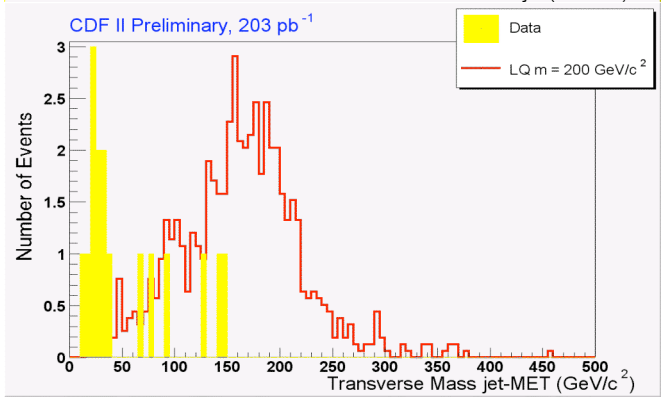
$\Delta\phi(\mu, \not\!\!E_T) < 175°$, $\Delta\phi(\not\!\!E_T, \text{jets}) > 5°$

$E_T(\text{jet1}) + E_T(\text{jet2}) > 80$ GeV

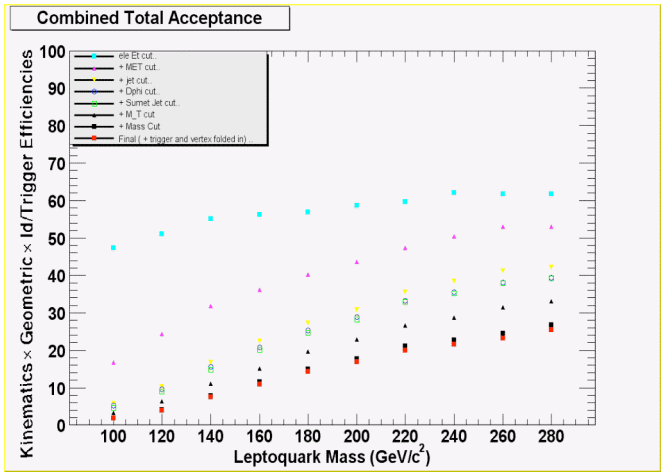
$M_T(\not\!\!E_T, \text{Muon}) > 120$ GeV/c²

Mass Cut

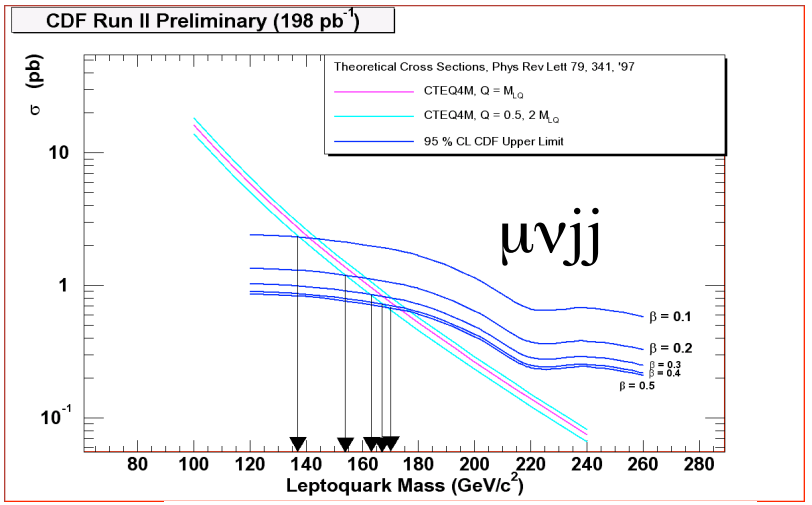


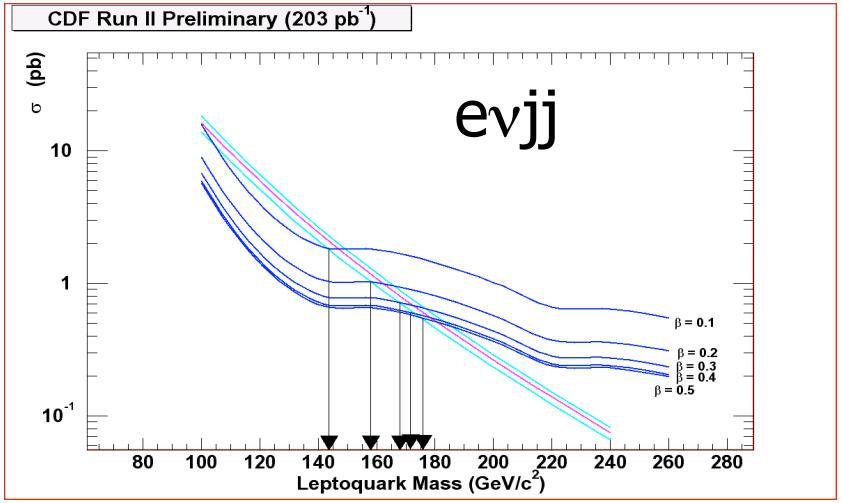


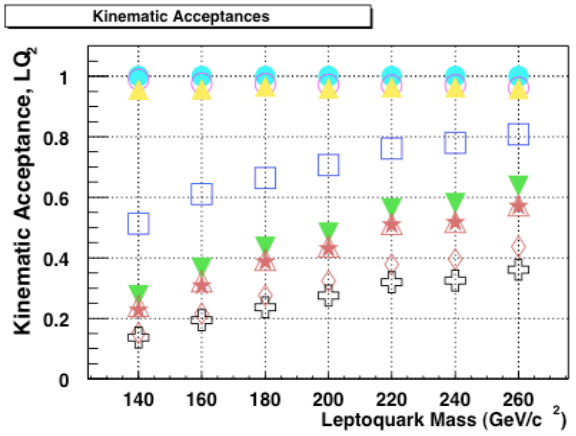
Search for LQ in lepton,MET + jets (II)



Exclude at 95% CL M_{LQ}<170 GeV/c^2 for β = 0.5







Exclude at 95% CL M_{LQ}<176 GeV/c^2 for β = 0.5

Combined Limits

Joint likelihood formed from the product of the individual channels likelihood.
The searches in the dileptons and lepton + MET channels use common criteria and sometime apply the same kind of requirements (for example on lepton identification) so the uncertainties in the acceptances have been considered completely correlated (which gives the most conservative limit).
When calculating the limit combination including also the ννjj channel the uncertainties in the acceptances have been considered uncorrelated.A correlation factor of 0.5 has also been considered (no difference)

$$\sigma_{LIM} = N_{LIM}/(\varepsilon_{average} \times L)$$

$\varepsilon_{average} = (\beta^2\varepsilon(eejj) + 2\beta(1-\beta)\varepsilon(e\nu jj) + \beta^2\varepsilon(ee \text{ as } e\nu))$ for the 2 channels case and
$\varepsilon_{average} = (\beta^2\varepsilon(eejj) + 2\beta(1-\beta)\varepsilon(e\nu jj) + (1-\beta)^2\varepsilon(\nu\nu jj) + \beta^2\varepsilon(ee \text{ as } e\nu))$ for the 3 channels case.

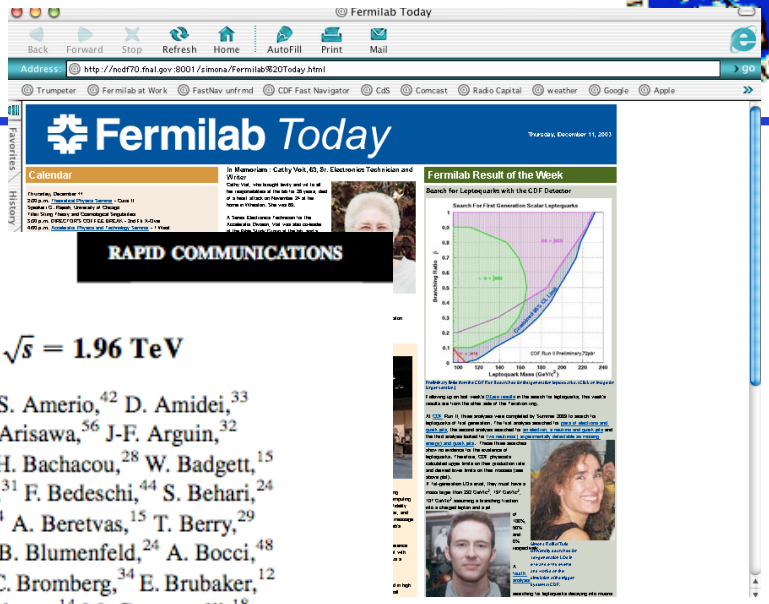
TABLE III: 95% C.L. lower limits on the first generation scalar leptoquark mass (in GeV/c^2), as a function of β.The limit from CDF[7] ($eejj$) Run I ($\sim 120pb^{-1}$) is also given.

β	ee jj	$e\nu jj$	$\nu\nu jj$	Combined	CDF Run I
0.01	-	-	116	126	-
0.05	-	-	112	134	-
0.1	-	144	-	145	-
0.2	-	158	-	163	-
0.3	114	167	-	180	-
0.4	165	174	-	193	-
0.5	183	176	-	205	-
0.6	197	174	-	215	-
0.7	207	167	-	222	-
0.8	216	158	-	227	-
0.9	226	144	-	231	-
1.0	235	-	-	236	213

TABLE III: 95% C.L. lower limits on the second generation scalar leptoquark mass (in GeV/c^2), as a function of β.The limit from CDF[4] ($\mu\mu jj$) Run I ($\sim 120pb^{-1}$) is also given.

β	$\mu\mu$ jj	$\mu\nu jj$	$\nu\nu jj$	Combined	CDF Run I
0.01	-	-	114	125	-
0.05	-	-	110	133	-
0.1	-	137	-	143	-
0.2	-	155	-	157	-
0.3	100	162	-	176	-
0.4	152	168	-	200	-
0.5	171	170	-	208	-
0.6	184	168	-	213	-
0.7	196	162	-	217	-
0.8	206	155	-	221	-
0.9	215	137	-	224	-
1.0	224	-	-	226	202

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]

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]

Publications (cont'd)

In October 2007 I joined the PDG author list as the author of the LeptoQuark minireview

The Review of Particle Physics
Physics Letters **B667**, 1 (2008).

Particle Data Group

C. Amsler,[1] M. Doser,[2] M. Antonelli,[3] D.M. Asner,[4] K.S. Babu,[5] H. Baer,[6] H.R. Band,[7] R.M. Barnett,[8] E. Bergren, J. Beringer,[8] G. Bernardi,[9] W. Bertl,[10] H. Bichsel,[11] O. Biebel,[12] P. Bloch,[2] E. Blucher,[13] S. Blusk,[14] R.N. Cahn,[8] M. Carena,[15,13,16] C. Caso,[17*] A. Ceccucci,[2] D. Chakraborty,[18] M.-C. Chen,[19] R.S. Chivukula,[20] G. Cowan,[21] O. Dahl,[8] G. D'Ambrosio,[22] T. Damour,[23] A. de Gouvêa,[24] T. DeGrand,[25] B. Dobrescu,[15] M. Drees,[26] D.A. Edwards,[27] S. Eidelman,[28] V.D. Elvira,[15] J. Erler,[29] V.V. Ezhela,[30] J.L. Feng,[19] W. Fetscher,[31] B.D. Fields,[32] B. Foster,[33] T.K. Gaisser,[34] L. Garren,[15] H.-J. Gerber,[31] G. Gerbier,[35] T. Gherghetta,[36] G.F. Giudice,[2] M. Goodman,[37] C. Grab,[31] A.V. Gritsan,[38] J.-F. Grivaz,[39] D.E. Groom,[8] M. Grünewald,[40] A. Gurtu,[41,2] T. Gutsche,[42] H.E. Haber,[43] K. Hagiwara,[44] C. Hagmann,[45] K.G. Hayes,[46] J.J. Hernández-Rey,[47†] K. Hikasa,[48] I. Hinchliffe,[8] A. Höcker,[2] J. Huston,[20] P. Igo-Kemenes,[49] J.D. Jackson,[8] K.F. Johnson,[6] T. Junk,[15] D. Karlen,[50] B. Kayser,[15] D. Kirkby,[19] S.R. Klein,[51] I.G. Knowles,[52] C. Kolda,[53] R.V. Kowalewski,[50] P. Kreitz,[54] B. Krusche,[55] Yu.V. Kuyanov,[30] Y. Kwon,[56] O. Lahav,[57] P. Langacker,[58] A. Liddle,[59] Z. Ligeti,[8] C.-J. Lin,[8] T.M. Liss,[60] L. Littenberg,[61] J.C. Liu,[54] K.S. Lugovsky,[30] S.B. Lugovsky,[30] H. Mahlke,[62] M.L. Mangano,[2] T. Mannel,[63] A.V. Manohar,[64] W.J. Marciano,[61] A.D. Martin,[65] A. Masoni,[66] D. Milstead,[67] R. Miquel,[68] K. Mönig,[69] H. Murayama,[70,71,8] K. Nakamura,[44] M. Narain,[72] P. Nason,[73] S. Navas,[74†] P. Nevski,[61] Y. Nir,[75] K.A. Olive,[76] L. Pape,[31] C. Patrignani,[17] J.A. Peacock,[52] A. Piepke,[77] G. Punzi,[78] A. Quadt,[79] S. Raby,[80] G. Raffelt,[81] B.N. Ratcliff,[54] B. Renk,[82] P. Richardson,[65] S. Roesler,[2] S. Rolli,[83] A. Romaniouk,[84] L.J. Rosenberg,[11] J.L. Rosner,[13] C.T. Sachrajda,[85] Y. Sakai,[44] S. Sarkar,[86] F. Sauli,[2] O. Schneider,[87] D. Scott,[88] W.G. Seligman,[89] M.H. Shaevitz,[90] T. Sjöstrand,[91] J.G. Smith,[25] G.F. Smoot,[8] S. Spanier,[54] H. Spieler,[8] A. Stahl,[92] T. Stanev,[34] S.L. Stone,[14] T. Sumiyoshi,[93] M. Tanabashi,[94] J. Terning,[95] M. Titov,[96] N.P. Tkachenko,[30] N.A. Törnqvist,[97] D. Tovey,[98] G.H. Trilling,[8] T.G. Trippe,[8] G. Valencia,[99] K. van Bibber,[45] M.G. Vincter,[4] P. Vogel,[100] D.R. Ward,[101] T. Watari,[102] B.R. Webber,[101] G. Weiglein,[65] J.D. Wells, [103] M. Whalley,[65] A. Wheeler,[54] C.G. Wohl,[8] L. Wolfenstein,[104] J. Womersley,[105] C.L. Woody,[61] R.L. Workman,[106] A. Yamamoto,[44] W.-M. Yao,[8] O.V. Zenin,[30] J. Zhang,[107] R.-Y. Zhu,[108] P.A. Zyla[8]

Technical Associates: G. Harper,[8] V.S. Lugovsky,[30] P. Schaffner[8]

Plans for the completion of Run II

We will repeat the analyses with larger statistics
We do not expect to see LQ, but will be able to set higher limits before the LHC turns on

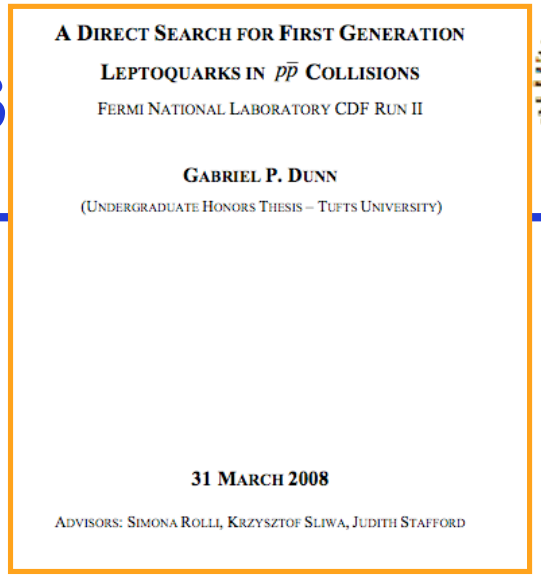
Assumptions:
Same acceptances as now
Number of events observed = number of predicted background
Same errors

$\beta = 1$ mass limit up to 250-300 GeV/c^2
$\beta = 0.5$ mass limit up to 230-280 GeV/c^2

Preliminary

Phys.Rev.D71:057503,2005

Current developments


A DIRECT SEARCH FOR FIRST GENERATION LEPTOQUARKS IN $p\bar{p}$ COLLISIONS

FERMI NATIONAL LABORATORY CDF RUN II

GABRIEL P. DUNN

(UNDERGRADUATE HONORS THESIS – TUFTS UNIVERSITY)

31 MARCH 2008

ADVISORS: SIMONA ROLLI, KRZYSZTOF SLIWA, JUDITH STAFFORD

In 2008 I worked with an undergraduate at Tufts
We revisited the 1st generation analysis with CC electrons and used twice the luminosity of the published results

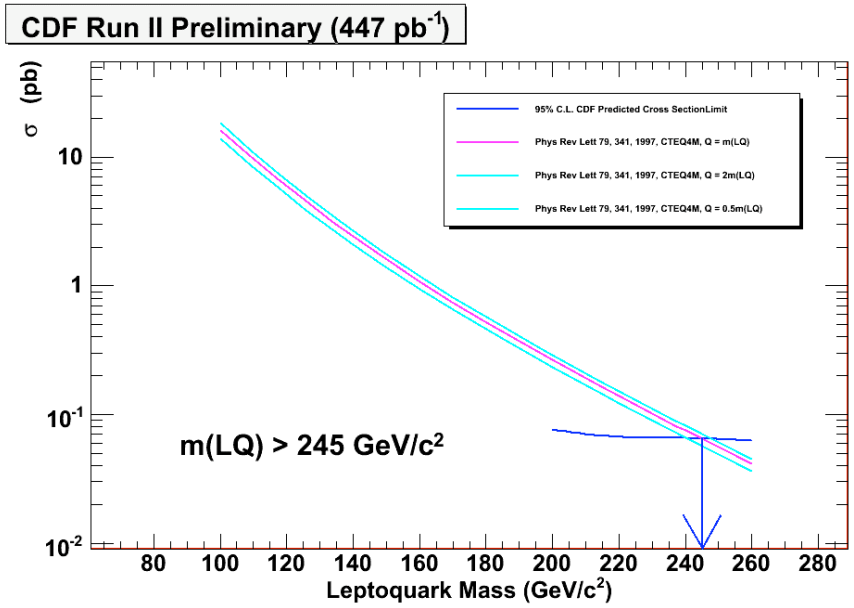
Number of observed events (CC): 4

$$\sigma_{LIMIT} = N_{LIMIT}/(\mathcal{L} \times \varepsilon \times \beta\beta)$$

$$\beta = 1$$

M(LQ)	ε	Relative uncertainty	N limit
200	0.207	0.14	7.217
240	0.233	0.12	7.091
260	0.234	0.10	6.993
280	0.243	0.09	6.951

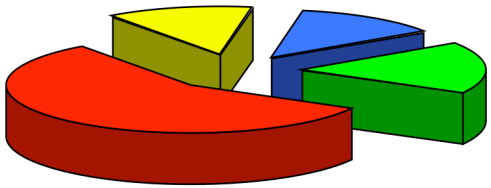
The uncertainty on the signal efficiency is taken from the 200pb analysis



Very promising!

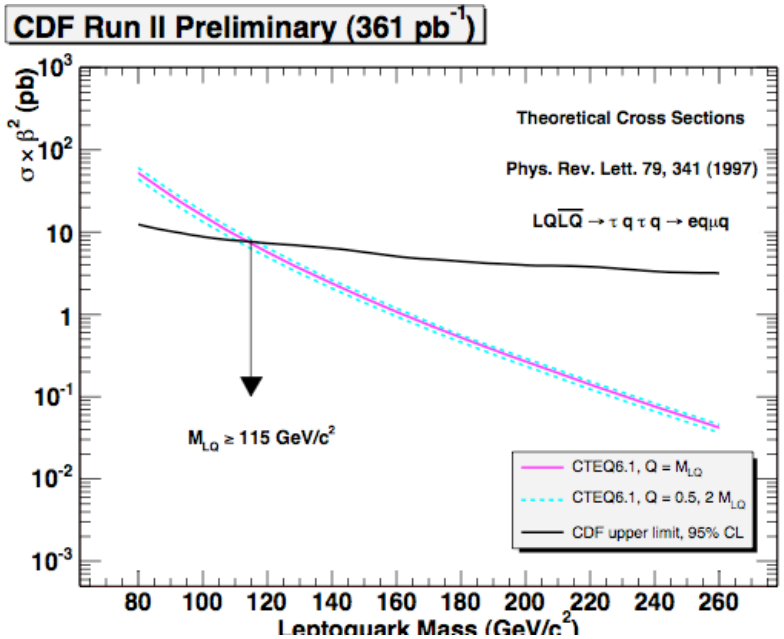
LQ: third generation

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



Leptonic decay to mu
Leptonic decay to ele
Hadronic decay with pi0
Other hadronic decays

- Hadronic ~65%
- Leptonic ~35%
  - τ→ e 17.84%
  - τ→μ 17.36%



Talks and Presentations

- Simona Rolli, I.F.A.E., Pavia April 2006
  - Recent Results on Searches for BSM Physics at the TeVatron
  - Single Top at Hadron Colliders

- Simona Rolli, ATLAS Workshop on SM Physics, Argonne April 2006
  - Single Top Wt Channel Studies

- Simona Rolli, Third North American ATLAS Physics Workshop, Boston July 2006
  - Btagging Perfomance Studies

- Simona Rolli, PASCOS 06, Ohio State University, September 2006
  - Top Physics at LHC

Talks and Presentations

- 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

Talks and Presentations

- Simona Rolli, Pheno 2008, UW Madison, April 2008
  - Searches for New Physics at the TeVatron, plenary talk

- Simona Rolli, BNL Forum, November 2008
  - Recent Results from the TeVatron, plenary talk