

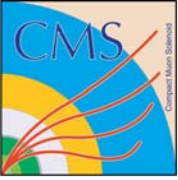
# Di-lepton Group Report

## JTERM-III

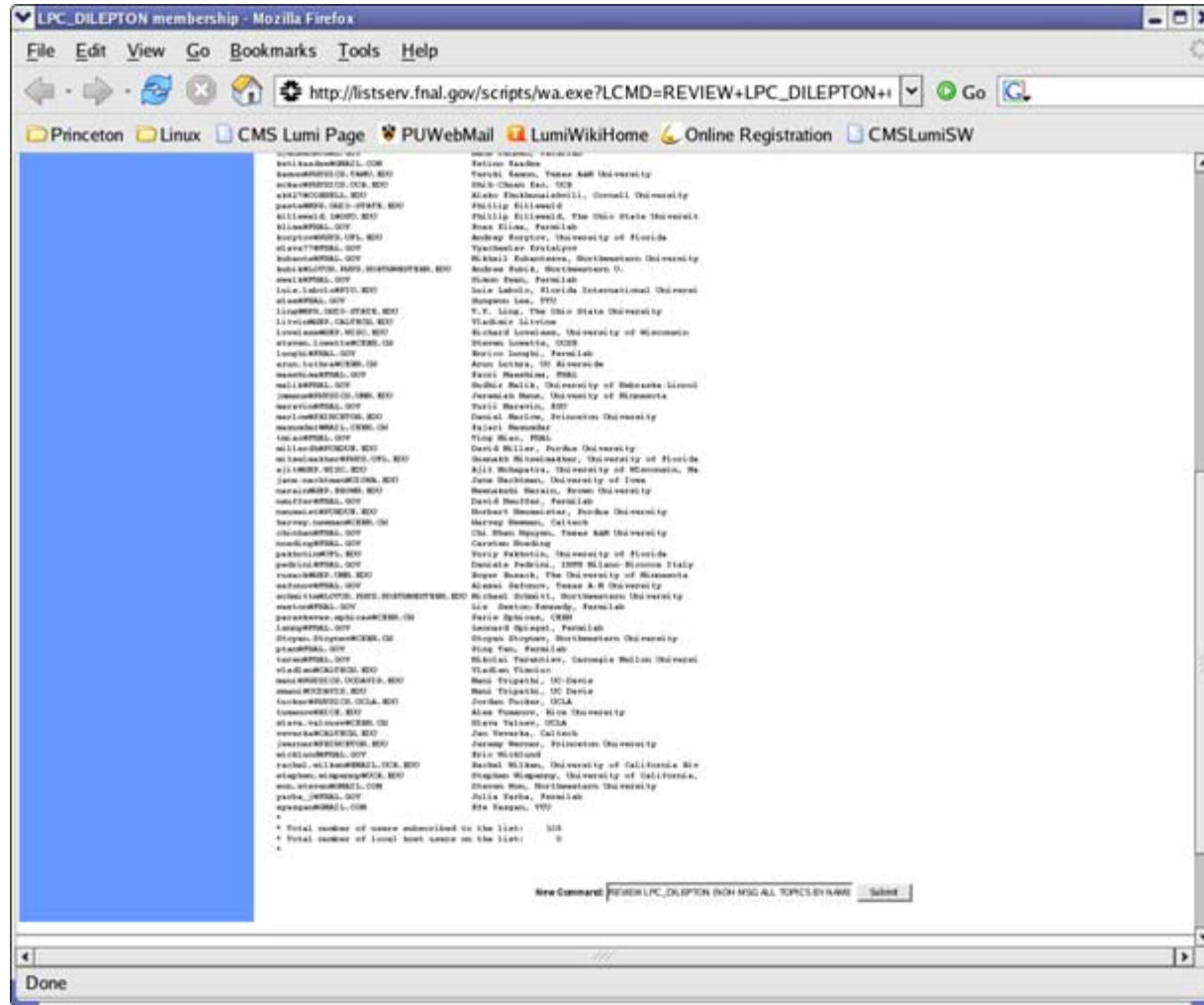
**V. Halyo, Yurii Maravin**

Jan 14, 2009

- Goals
- Ongoing Activities
- Tools/Meetings
- Join Us /Contact us !!!



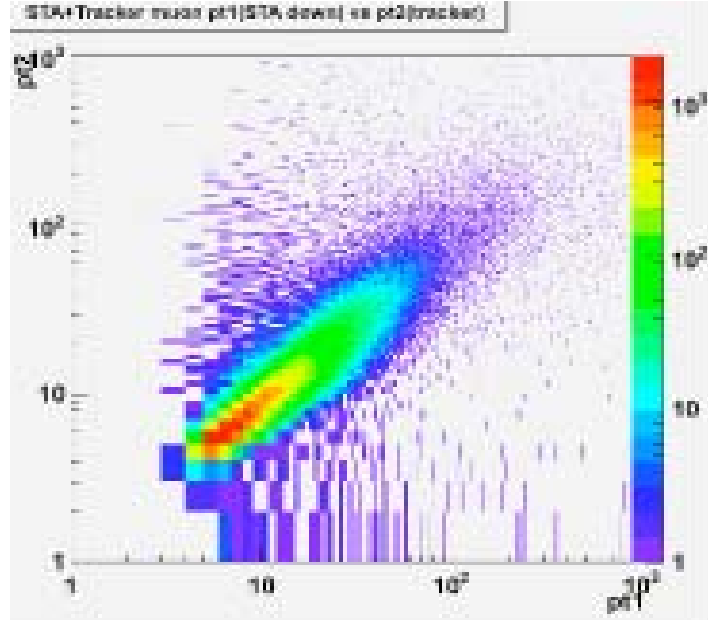
# Di-lepton Members



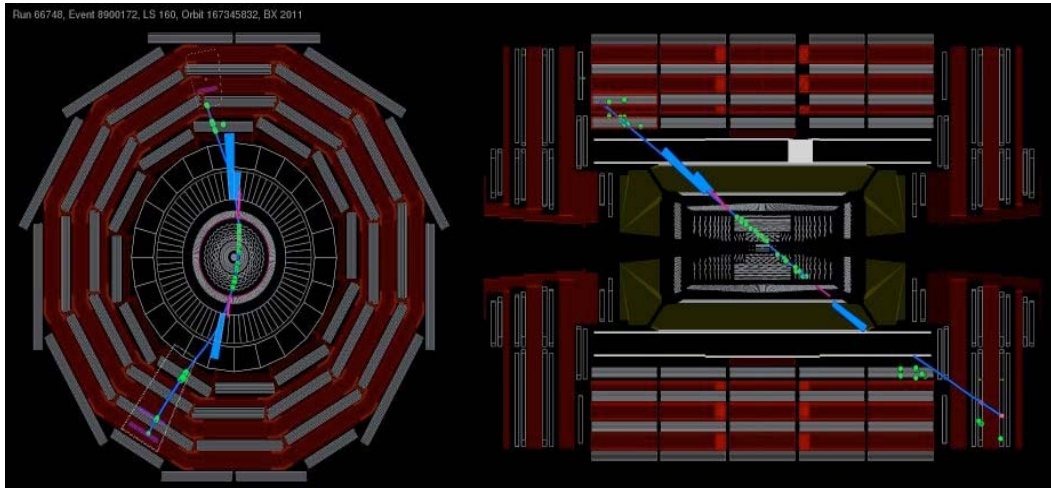
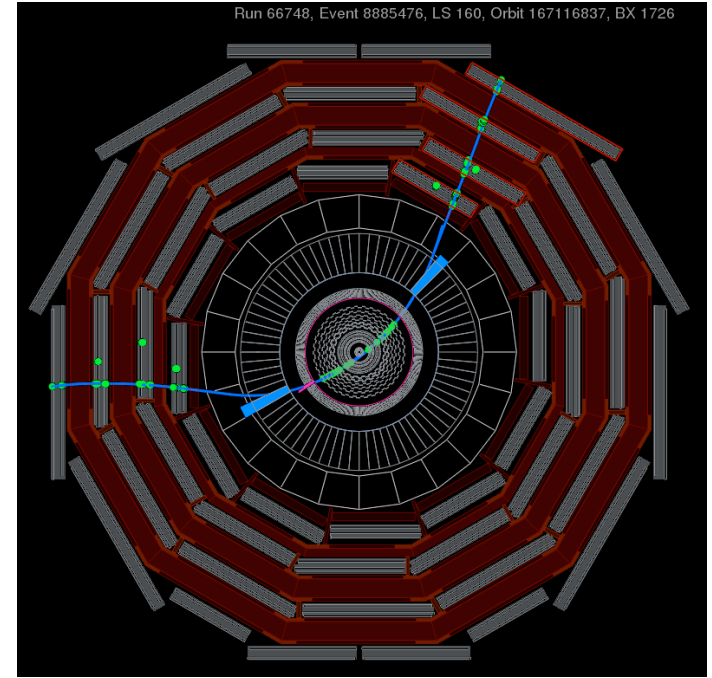
Up to now 117 members have signed up to the Di-Lepton Group

# Cosmic Muons

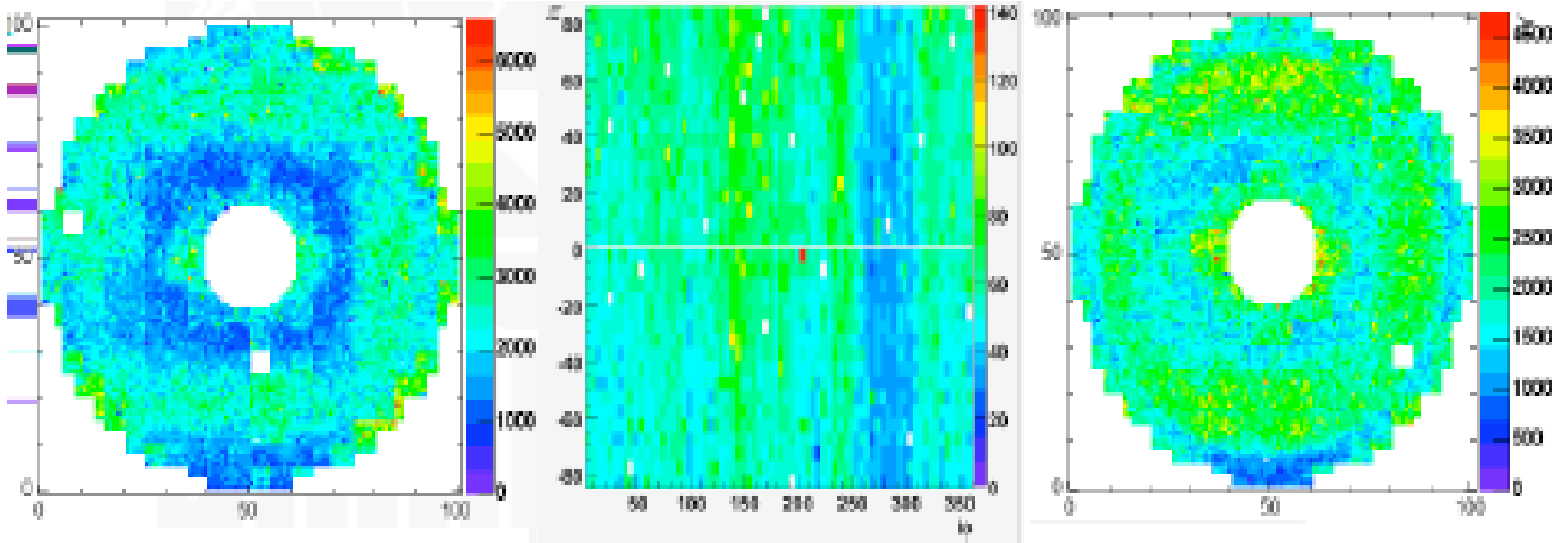
SA



track



Continuous stable running at 4T allowed various studies and measurement and careful tuning of data/MC



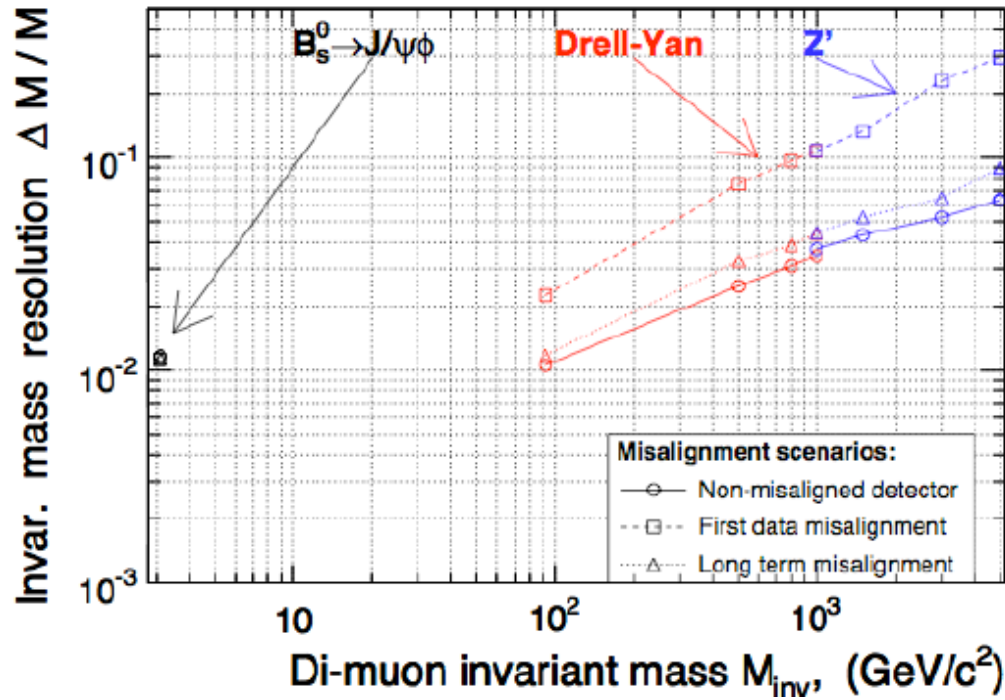
EE-

EB

EE+

Expected ECAL uniformity  $\sim 4\%$  at startup  
 Lepton energy calibrated to  $\sim 2\%$   
 Alignment 20-200  $\mu\text{m}$

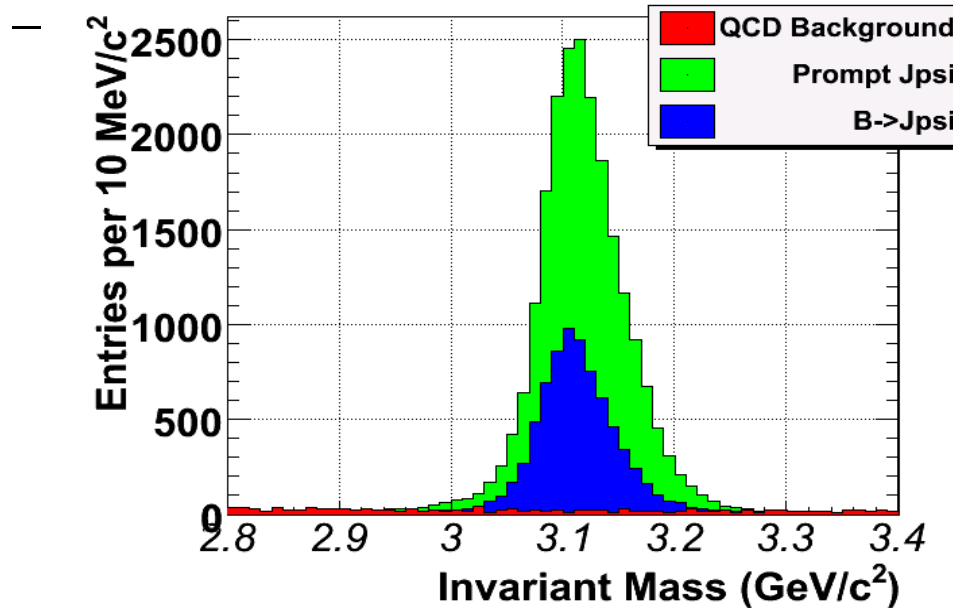
- Excellent mass resolution



Guido Tonelli

1pb-1

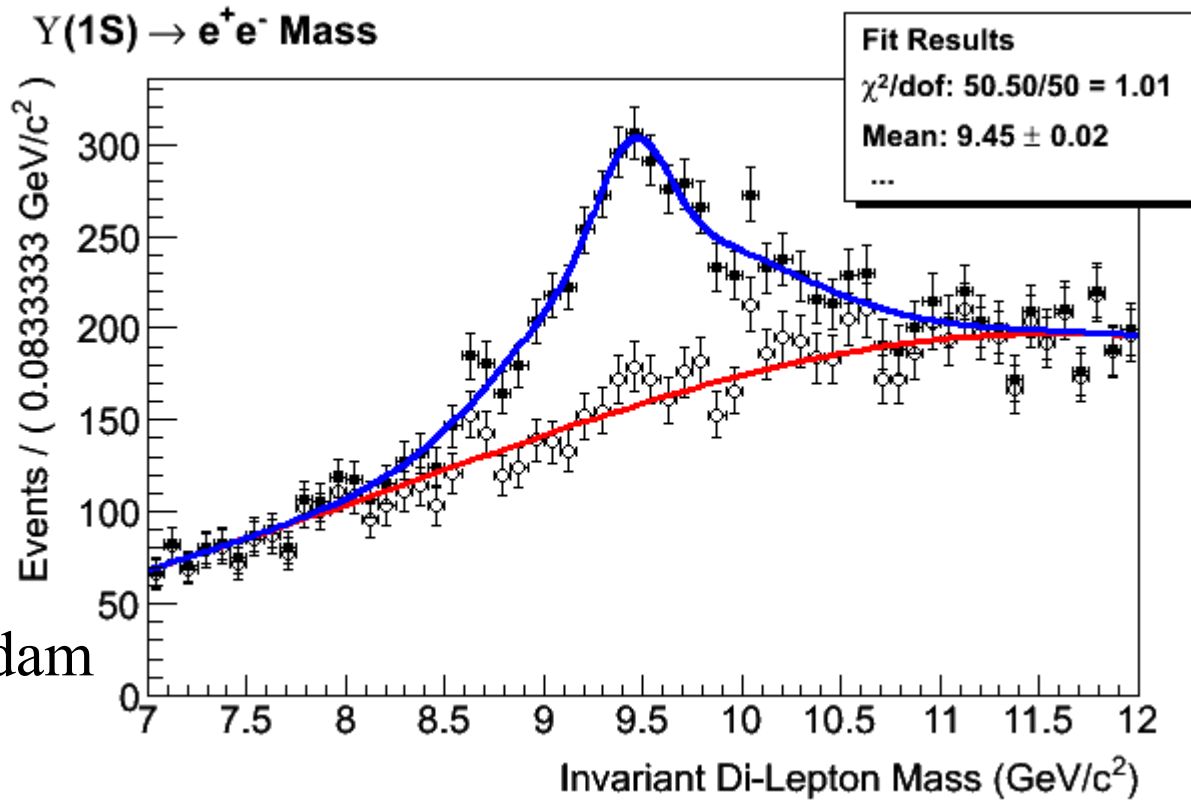
- Rediscovery of the Upsilon, K0, pi0..
  - Improving our calibration/alignments
  - Reconstruction of the Muons electrons photons objects



#(prompt Jpsi)=13K /pb<sup>-1</sup>

Yu Zheng, Ian Shipsey

# Upsilon to ee



Nadia Adam

$\sim 1\text{K events/pb-1}$



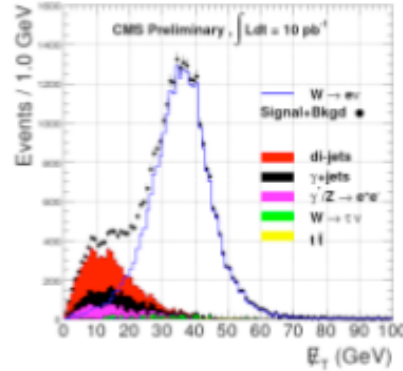
Bunches	Beta	Lumi	Pileup	# Z/week
1x1	18	$10^{27}$	Low	Low
43x43	18	$3.8 \times 10^{29}$	0.05	137
43x43	4	$1.7 \times 10^{30}$	0.21	616
156x156	2	$6.1 \times 10^{30}$	0.76	2213
156x156	4	$1.1 \times 10^{31}$	0.38	3390
156x156	4	$5.6 \times 10^{31}$	1.9	20k
156x156	2	$1.1 \times 10^{32}$	3.9	39.9k

Expected Num of Zs following this physics run is 66k

- Ultimate goal:
  - Determine all your efficiencies from data
  - Determine background fraction in your selection from data
  - If possible have different methods available to cross-check

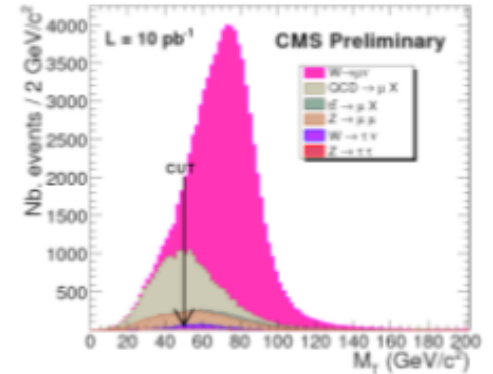
~10<sup>5</sup> W events

$e^\pm \nu$  or  $e^+ e^-$

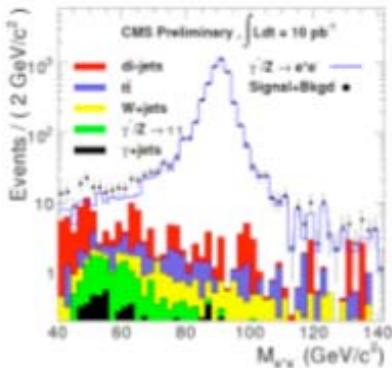


missing transverse energy

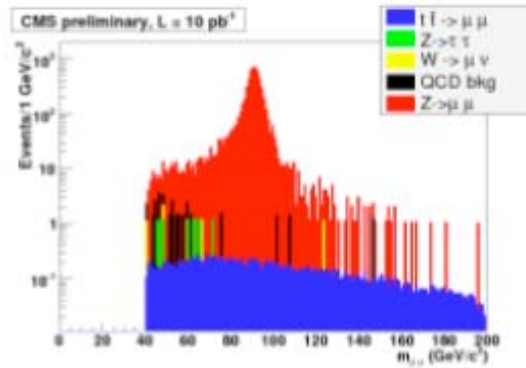
$\mu^\pm \nu$  or  $\mu^+ \mu^-$



transverse mass



$e^+ e^-$  mass



$\mu^+ \mu^-$  mass

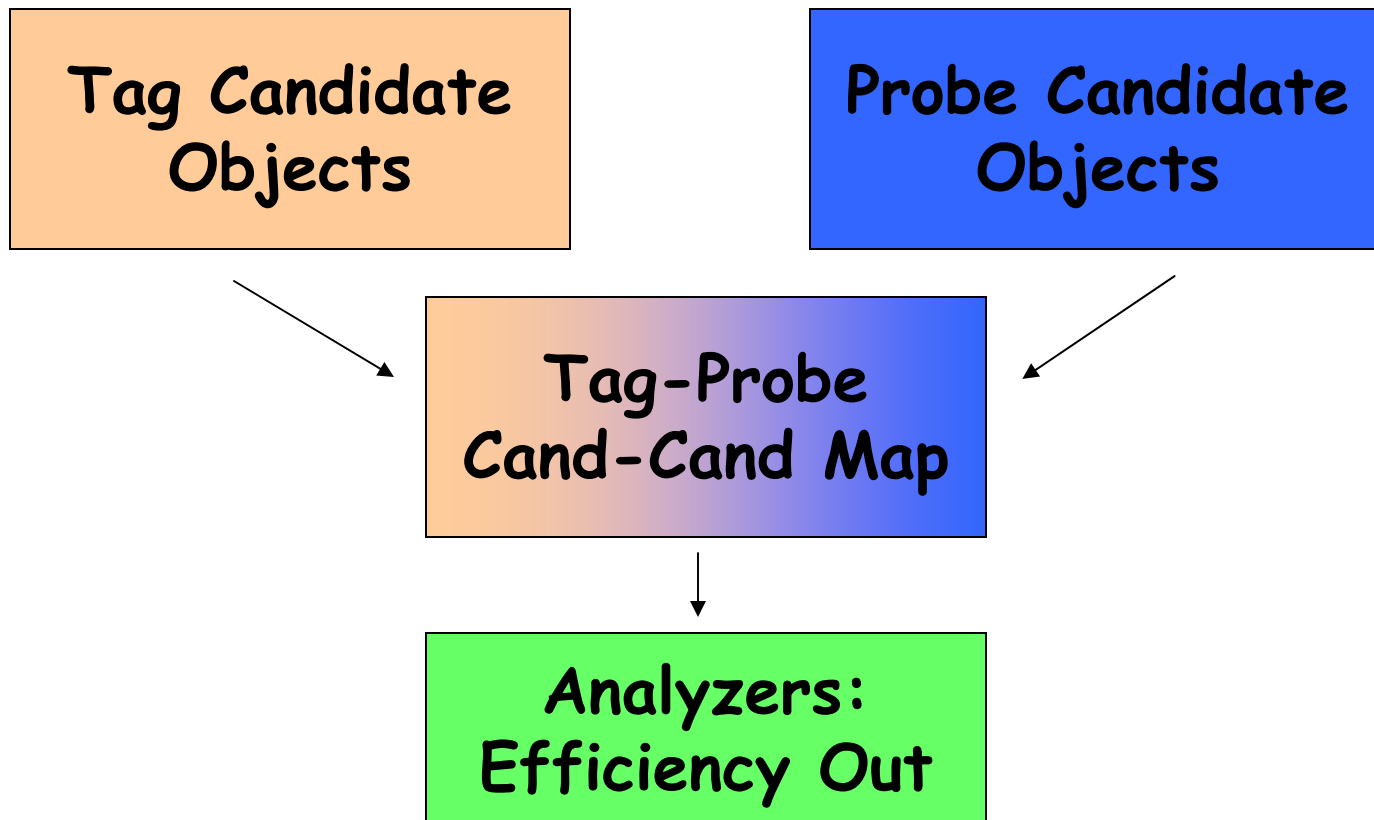
~10<sup>4</sup> Z events

Trigger and offline efficiencies for CMS are about 85% and 77% for electrons and combined about 85% for single muons

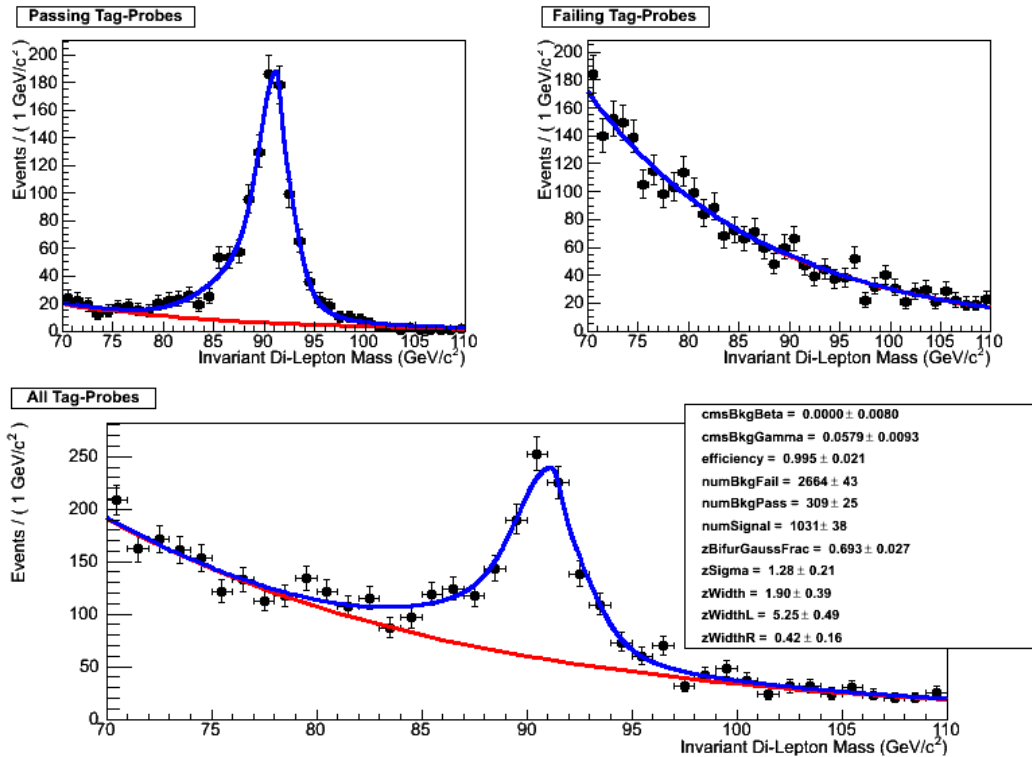
- Z Efficiency determination
- Lepton energy scale and resolution
- Theoretical uncertainty  $\sim 2\%$  (published JHEP)
  
- The lepton efficiencies are evaluated by considering “the tag and prob” method the precision of this method will amount to few percent and account as the dominate systematic

# Generic Tag & Probe Tools

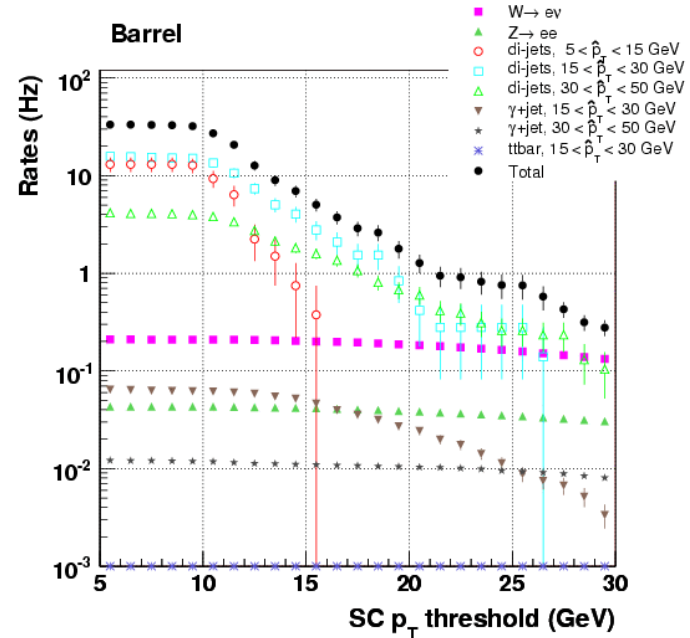
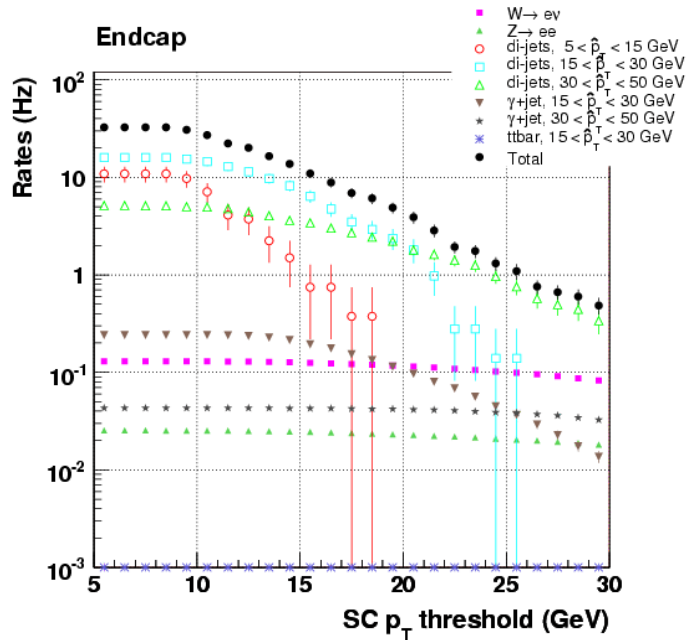
Goal: Generic software package developed by Princeton/FNAL that can be used for any tag-probe style measurement.



## Reconstruction efficiency



Adam Hunt



Jeremy Werner  
Dmitry Bandurin

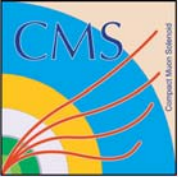
Managed to increase the rejection rate while maintaining the signal efficiency

- Look for inclusive dilepton signatures

Such as Z'/W' (KK/RS/Little Higgs/new gauge boson ...)

- Other following up analysis include tri-lepton (Technicolor, chargino+neutrino decay ...)
- Multiple leptons +Jets
- analysis just started and it needs more man power





# Join us to di-lepton meeting



JTERMIII - Di-Lepton 5Hours Marathon (14 January 2009) - Mozilla Firefox

File Edit View History Bookmarks Yahoo! Tools Help

http://indico.cern.ch/conferenceDisplay.py?confId=47008

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access (application/pdf Object) JTERMIII - Di-Lepton 5Hours Mar... Dibson fest (23 October 2008) Welcome to the Compact Muon Solenoi... electron\_hlt\_opt\_talk\_011209.pdf (app...)

category | view: Indico style | focus on: -- all days -- | manage | LOCAL: US/Central | HALYO, Valerie - logout

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**JTERMIII - Di-Lepton 5Hours Marathon**

Wednesday 14 January 2009  
from 10:30 to 18:00  
US/Central  
at FNAL/LPC ( One West )  
chaired by: Valerie Halyo, Yurii Maravin (KSU)

[Wednesday 14 January 2009](#)

**Wednesday 14 January 2009** [top](#)

- 10:30 Overview of Di-lepton group (15) Valerie Halyo (Princeton)
- 10:45 Measurement of Cosmic Muons charge ratio (20) Ivan Furic (Uni. of Florida)
- 11:05 Overview on Muon Reco (20) Adam Evert (Purdue University)
- 11:25 Overview on Electron Reco (20) Matteo Sani (UC San Diego)
- 11:45 Overview on Tau Reco (20) Alexei Safonov (Texas A&M University)
- 12:05 CSC Beam Halo Trigger (20) Joe Gartner (Uni. of Florida)
- 12:25 break (1h00)
- 13:25 Electron HLT Optimization (20) Dmitry Bandurin (Kansas State University) , Jeremy Werner (Princeton)
- 13:45 Tag & Prob update (20) Adam Hunt (Princeton)
- 14:25 Upsilon -> mu mu production Xsec (Trigger Studies) (20) Zoltan Gecse (Purdue University)
- 14:45 Update on Lepton Differential Cross Section and Charge Asymmetry in Inc W(mu nu)+X (20) Ping Tan (FNAL)
- 15:05 Jpsi Production (20) Yu Zheng (Purdue University)
- 15:25 A measurement of Jpsi Polarization in CMS (20) Zhen Hu (Peking University)
- 15:45 Upsilon -> ee Production Xsec (20) Nadia Adam (Princeton) , Valerie Halyo (Princeton)
- 16:05 Overview on DY Analysis (20) Dimitri Bourilkov (Uni. of Florida)

How to get started

What topics are available

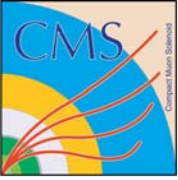
Who else is working on a particular topic

What are the available datasets and where

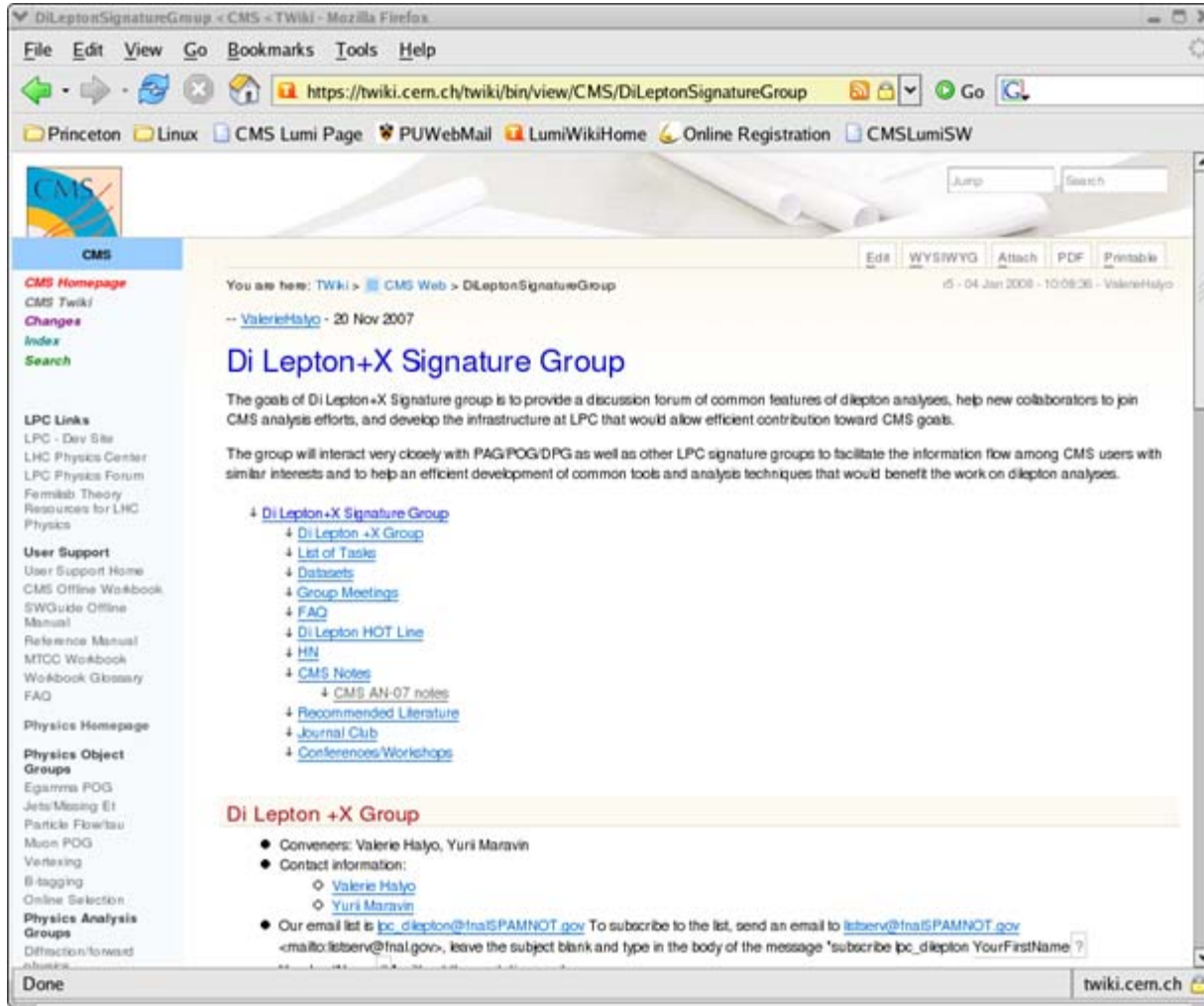
Group area for special skims at the LPC

How often should we meet

Do we have to report at the LPC



# Tools



## Our Website “DiLeptonSignature”

- POG
- PAG
- User Support (Workbook...)
- Tasks
- Datasets Skims
- Workshop..

<https://twiki.cern.ch/twiki/bin/view/CMS/DiLeptonSignatureGroup>

## “Di-Lepton HotLine”

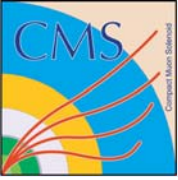
**Permanent Forum** available for any di-lepton related issue or any other help.

- We have representatives from the ECAL/Muon POG and PAG available
- It was used for spontaneous meetings or quik questions

- The main “Di-Lepton” Twiki page is the “Di-Lepton FAQ” page
- Please feel free to post a question and send the link to the “[LPC\\_DILEPTON@LISTSERV.FNAL.GOV](mailto:LPC_DILEPTON@LISTSERV.FNAL.GOV)”

- In addition, [LPC-HOWTO@LISTSERV.FNAL.GOV](mailto:LPC-HOWTO@LISTSERV.FNAL.GOV)
- Disk space at the LPC dedicated for common tools and common skims

- We plan to have next meeting on Jan 29 and you are all invited. We would like hear
  - Your analysis interest
  - Services that you would find useful
  - Feedback of how can we help
- We will have weekly meetings, each week on a different specific topic. We announce the meetings on how Twiki and listserv



# Are you interested in starting the work?

- identify the analysis of interest
- identify the task, if you do not know -- ask us!
- contact us and CERN POG/PAG conveners and express your desire to work on a particular task/topic.
- ask as for any help that you need in getting started!



- ATIC detects an abundance of cosmic ray electrons between 300 – 800 GeV, while PAMELA sees an excess of positrons (but not anti-protons ) at 10-100 GeV. Together with the CMB haze these observations paint a consistent picture whereby DM annihilates primarily into muons and/or electrons
- Motivated an exciting new proposal ] in which a WIMP-like dark matter (DM) particle at 500-800 GeV annihilates primarily into leptons and is charged under a new “dark” force carrier

- "the LHC signals for super unified theory of dark matter" by Nima Arkani-Hamed
- "How to Find a Hidden World at the Large Hadron Collider" Jim Wells