



# LPC turns 10: In the Beginning

Sarah Eno

Avraham Yagil (is not responsible for  
the mistakes in these slides)



# In the Beginning



Creation myth of LPC, artist's vision.



# Official History: my slides, US CMS meeting in Princeton, 2004

Creation myth of LPC, bureaucrat's vision.

- First proposed in 1999 by Dan Green at a US CMS meeting at Cal Tech
- strong support by US CMS expressed through email survey
- luke warm support by FNAL management. (Green *et al.* did manage to get 11<sup>th</sup> floor for this center, though)
- luke warm support by funding agencies
- not much active involvement by US CMS in planning/implementing (not even clear how an interested person would go about getting involved)

The truth ...



# My memory

I remember a phone conference, called by Dan Green ...  
And then the next day...

On Mon, 22 Dec 2003, Avi Yagil wrote:

```
> Hi Sarah,  
> I know its a crazy time of year and all, but would very much appreciate if  
> we had a chance to talk before next year... Tried your office, but have no  
> clue about your schedule.  
> If you find an opportunity you can send me time/number, or call me at  
> 630.204.4363 Otherwise we'll just have to wait for next year.  
>  
> In case we do not connect, have a good Christmas and happy new year.  
>  
> Avi.  
>  
>
```



From eno@physics.umd.edu Tue Jan 6 10:04:56 2004 -0500  
Date: Tue, 6 Jan 2004 10:04:54 -0500 (EST)  
From: Sarah Catherine Eno <eno@physics.umd.edu>  
To: Avi Yagil <yagil@fnal.gov>  
Subject: Re: more info...  
In-Reply-To: <NEBBKCACHJOMJFEOKIIACEFPCHAA.yagil@fnal.gov>  
Message-ID: <Pine.OSF.4.44.0401061002570.21061-100000@student1.physics.umd.edu>  
MIME-Version: 1.0  
Content-Type: TEXT/PLAIN; charset=US-ASCII  
Status: 0  
X-Status:  
X-Keywords:  
X-UID: 30

Hi Avi,  
Thinking about it more carefully, while I would very much like to be involved, I don't think I could put sufficient time into this until April. I have too many commitments that I need to finish.  
So, if you really need to get going now, and it can not wait until April, I'll have to say no. You might try Jim Branson as a partner? He is the head of US **CMS physics**, and a very aggressive, smart man.  
Best  
Sarah



# First course of action: get \$\$\$

```
eno — ssh — 165x50
ALPINE 1.10(962) MESSAGE INDEX Folder: lpc Message 19 of 4,497 ANS
+ 1 02/13/04 John Conway (3K) Re: letter
+ 2 02/15/04 John Womersley (3K) Re: letter
+ A 3 02/16/04 Sridhara Dasu (.1M) Re: letter
+ A 4 02/16/04 Bob Cousins 310-825-1928 (2K) Re: letter
+ 5 02/17/04 Darin Acosta (352)846-3144 (3K) Re: letter
+ A 6 02/17/04 Claudio Campagnari (2K) Re: more on the letter
+ A 7 02/17/04 Greg Landsberg (3K) RE: more on the letter
+ 8 02/17/04 Chris Tully (2K) Re: more on the letter
+ 9 02/18/04 Darin Acosta (352)846-3144 (2K) Re: new draft of letter
+ 10 02/17/04 Sridhara Dasu (3K) Re: new draft of letter
+ 11 02/19/04 Dan Green (7K) the letter
+ 12 02/18/04 Greg Landsberg (4K) RE: new draft of letter
+ A 13 02/25/04 John Womersley (2K) Re: final (?) version
14 02/25/04 John Womersley (2K) [Fwd: Avi schedule]
+ 15 02/26/04 Chris Tully (4K) Re: cover letter for Newman/Branson
+ A 16 02/27/04 Chris Tully (6K) Re: [Fwd: Re: US CMS Major Physics Studies]
+ A 17 02/27/04 Chris Tully (5K) [Fwd: Re: US CMS Major Physics Studies]
+ A 18 03/02/04 Harvey B Newman (5K) Re: LHC Physics Center at FNAL
+ A 19 03/02/04 Claudio Campagnari (2K) Re: LHC Physics Center at FNAL
```

On my disk, the letter is called “avi\_letter\_vxxx.txt”



# A pretentious letter



Dr. Sarah Eno  
Department of Physics  
University of Maryland  
College Park, Maryland 20742-4111  
eno@physics.umd.edu  
301.405.7179 TEL. 301.699.9195 FAX

13 February 2004

Mike Witherell, Director  
Fermi National Accelerator Laboratory  
P.O. Box 500  
Batavia, IL 60302

Dear Professor Witherell:

I am writing to you on behalf of a group of University professors who met on February 12, 2004 at FNAL to discuss how to organize an effort to prepare for data taking and physics analysis with the CMS detector at the LHC while at the same time fulfilling our ongoing commitments to experiments currently running in the US, such as BaBar, CDF, and DØ. We invited Dan Green, Avi Yagil, John Womersley, and Lothar Bauerdick to our meeting, to help us understand whether our interests/needs coincide with the lab's plans for an LHC physics center (LPC). The purpose of this letter is to inform you of our thoughts on this subject, and also of the ways we hope the lab can help us on what we think is an effort which could very well determine the health of our field in the United States, both during the LHC era and afterwards.

We unanimously agreed that the only way in the short term we could both prepare for CMS data taking and continue our vital work on running experiments is to find a way to make it effective for postdocs and students to work on both efforts at the same time, and the only way to do this is to cluster them in a place like the proposed LPC. We were also all hopeful that, if started now, such a center could become our preferred place for clustering even after the start of CMS data taking, so that we travel to CERN only approximately 4 times per year, and travel regularly instead to FNAL to interact with our students and postdocs. Whether this works or not depends crucially on the LPC becoming a power research center well before the LHC data taking starts in 2007.

Most of the current indirect evidence for the scale of new physics hints that the LHC may be able to make a major discovery shortly after turn on. The discovery will go to the collaborations and physicists that are best prepared at the start of data taking. CMS takes this possibility very seriously, and has established the "Physics Reconstruction and Selection" (PRS) groups to make sure the collaboration is prepared. Over the next two years, this preparatory work will take the form of the writing of a "Physics TDR". If US CMS wants to play a leading role in these discoveries, we need to lead in the preparation of this TDR through participation in the PRS groups. We also need to do the kind of activities that are going on now within CMS that will enable us to have an intimate understanding of the detector, especially participating in test beams, but also understanding calibration systems, and the development of robust analysis tools. To be successful, we decided we need the following:

- In the next 6 months: establish a physical place at FNAL in the Hirise with first class computing and video conferencing for a core team of about six researchers working full time on CMS who will collectively develop expertise in all areas of the CMS reconstruction code and prepare to support and help the postdocs who will join them, working part-time on CMS.
- Within the next year: have an additional 10 University postdocs and some number of students working part-time on CMS and part time on a running experiment join the core team. These part-time postdocs and students would need desks in the same physical location as the 6 core researchers.
- In the following years: increase the number of University postdocs shared between CMS and a running experiment to 20 by the end of 2005 and 35 by the end of 2006, and start to have students who will do an LHC thesis working at the center.





# Response from Witherell

From my slides at uscms meeting at Princeton

Dear Colleagues:

I am writing to respond to your letter concerning the LHC Physics Center at Fermilab. In that letter you expressed interest in the development of such a center and stated how important it would be for U.S. university groups to take full part in research with the CMS data sample.

Both Fermilab and the leadership of the US-CMS research program have also expressed support for the LHC Physics Center (LPC). One goal of the center is the one you articulated, that is, to make it possible for U.S. physicists working on CMS to be innovative leaders in LHC physics. The other is that Fermilab remain an intellectual center for collider physics in the LHC era. I think that both of these goals serve the larger purpose of advancing particle physics in the U.S.

A broad group of the involved parties recognizes the need of a transition period in which physicists will share effort between CDF or D0 and one of the LHC experiments. This sharing will make it possible to sustain the needed effort to operate CDF and D0 effectively, at the same time that it brings a lot of experience from the Tevatron program to the LHC. At our Annual Program Review, both CDF and D0 said that they are moving to make it easier for scientists to be an active member of their collaborations while sharing time with CMS or ATLAS. P.K. Williams expressed to me his encouragement of the LHC Physics Center here as an effective way of sharing university physicists between CDF or D0 and CMS.

I want to make the LHC Physics Center into one of the leading centers in the world for producing particle physics results, and am ready to commit resources to that end. In planning this startup we will work closely with you and with leadership of the US-CMS research program to make sure that we are establishing an institution that serves all of the interested parties well.





Next: go to the USCMS meeting at Princeton and get involvement

# What is the LPC?

From my slides at  
uscms meeting at  
Princeton

An attempt to reproduce the benefits of being at the lab in our time zone, on our side of the Atlantic.

- a **critical mass** (clustering) of young people who are actively working on software (reconstruction, particle identification, physics analysis)
- one stop shopping for your analysis questions
- analysis tools such as large meeting rooms, video conferencing, large scale computing, “water cooler”
- virtual control room for active participation in the running and quality control of the experiment



# Recent History (Spring 2004)

From my slides at uscms meeting at Princeton

- Lab now strongly supports it
- Funding agencies starting to support it

## More people involved

- Kaori Maeshima: infrastructure, remote control room
- me, Avi Yagil: local analysis groups
- Heidi Schellman: workshops, users organization



# LPC Org Chart/Working Groups

From my slides at uscms meeting at Princeton



## LPC Working Groups

One of the main goals of the LPC is to have a place in the U.S. where CMS Physicists can find experts in all areas of CMS software and reconstruction. Our current working groups and their conveners are:

[Agenda Server for LPC Meetings](#)

[LPC Offline Coordinators](#): Liz Sexton-Kennedy and Hans Wenzel

[Tracking](#): Kevin Burkett and Sasha Khanov

[Electron/Photon](#): Yuri Gershtein and Heidi Schellman

[Muon](#): Eric James and Martijn Mulders

[Jet/Met](#): Rob Harris and Marek Zielinski

[Trigger](#): Sridhara Dasu and Stephan Lammel

[Simulation](#): Daniel Elvira and Boaz Klima

Please click on the link to get to each group's web page.

Hi Avi,

I wanted to send you some thoughts on the analysis center. The projects I do best are those that have definite goals. I'm more a "concrete" type person than an abstract type person. So, either we have to define this better, or I'll have to bow out... (Also, I prefer to think through email, rather than on the phone, cuz my brain is sometimes a little slow!).

I still find I have trouble making concrete what exactly "being in charge of the analysis center" means. So, let me think outload.

First, there is the "steering committee".

- \* Lothar Bauerdick FNAL, computing services
- \* John Conway Rutgers, tracking
- \* John Womersely FNAL, physics?
- \* Darien Wood Northeastern, computing services
- \* Claudio Campagneri UCSB, tracking
- \* Christoph Paus MIT tracking?
- \* Chris Tully Princeton, HCAL
- \* Greg Landsberg not actually on cms
- \* Darin Acosta Florida, muons
- \* Jim Rohlf Boston, HCAL
- \* Sridhara Dasu Wisconsin, Trigger

Note there is nobody currently working on the ecal on this list. Of these, I think Lothar, Chris, Darin, Jim and Sridhara are currently active in CMS, John, Darien, Claudio, Christoph and Greg are not? or, at least have not done any work at all on CMS software. Most people are from east coast. (Also, I'm still suprized Branson is not on this list. He's actually quite smart, and was helpful when he did work for the jet/met group.)

When I talked to Dan, he mentioned that the analysis center is

- 1) for US workers working on test beam analysis.
- 2) for people to do remote test beam shifts.
- 3) to participate in data challenge '04

When I talk to you, you talk about

- 1) getting a team together to write code independent of the CERN team. goal: faster code. simpler code. code we know well in the US.

Some points

- 1) Dan's idea's 1 probably works only for HCAL. maybe 1/4 of US CMS community? However, on the plus side, if this is our goal, what we need to do is well-defined. Also on the plus side: no need to try to interface with Paris, Stickland, etc when we have no official place on the org chart (and thus are not invited to PRS conveners meetings and the like). We need to work with the





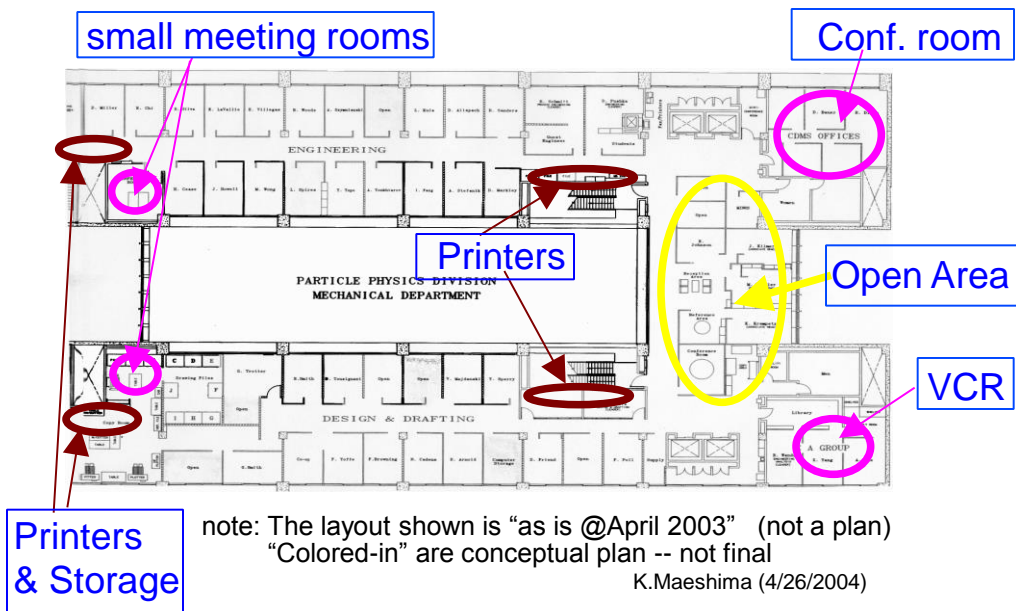
# Kaori managed building





# 11<sup>th</sup> floor

(Kaori Maeshima)



- high speed internet access
- transient area on cross over
- lockers for transients
- 1 large and 2 small meeting rooms
- secretary support, printers, etc
- Italian espresso machine
- remote control room
- offices for permanent workers

Trying to understand appropriate balance between transient and resident areas. Can not afford wasted space, but want everyone to be comfortable

Your input is needed!!

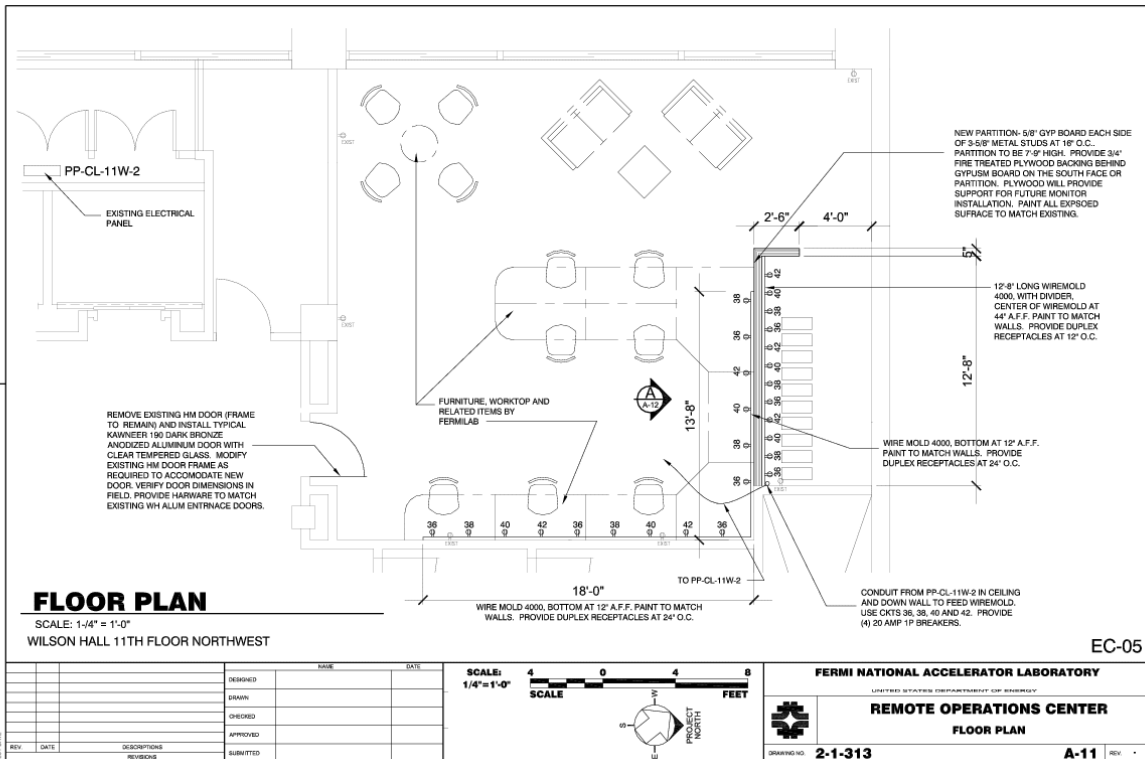




# ROC

15<sup>th</sup> Sept. '05.

Contributors: FNAL (esp Kaori Maeshima, Alan Stone, Patrick Gartung), MD, Kansas State



- Will be used for cosmic slice test and 2006 test beams





# More than just furniture...



Colin



Steve



Eric



Michael



Rob



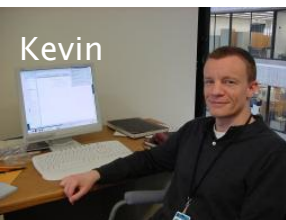
Daniel



Yuri

Run by Avi Yagil, Sarah Eno

- **offline/edm:** Liz Sexton-Kennedy (FNAL), Hans Wenzel (FNAL)
- **tracking:** Kevin Burkett (FNAL), Steve Wagner (CO)
- **e/gamma:** Yuri Gershtein (FSU), Colin Jessup (Notre Dame)
- **muon:** Eric James (FNAL) , Michael Schmitt (Northwestern)
- **jet/met:** Rob Harris (FNAL), Marek Zielinski (Roch)
- **tau:** Anna Goussiou (Notre Dame), Alexei Safonov (Texas A&M)
- **simulation:** Daniel Elvira (FNAL), Harry Cheung (FNAL)
- **trigger:** Greg Landsberg (Brown) , Kaori Maeshima (FNAL)
- **Physics:** Boaz Klima (FNAL)



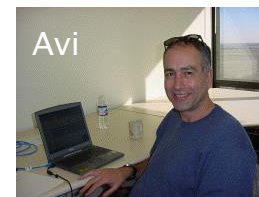
Kevin



Liz



Marek



Avi



Hans



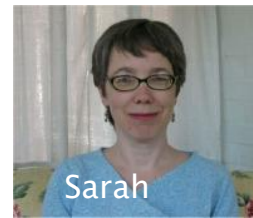
Boaz



Kaori



Greg



Sarah



Harry



# Soon started “infamous” CMS101

May 2005

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 05 May [CMS101](#) (protected)

November 2004

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 18 Nov - 19 Nov [LPC e-gamma workshop](#) (protected)

 17 Nov [CMS101](#) (protected)

September 2004

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 13 Sep [LHC Transition Workshop - CMS101](#) (protected)

August 2004

---

 03 Aug [LHC / Tevatron Tracking workshop](#) (protected)

April 2004

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 14 Apr [Muon Workshop](#) (protected)

January 2004

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 28 Jan - 29 Jan [jet/met workshop](#) (protected)



# LHC Transition Workshop - CMS101

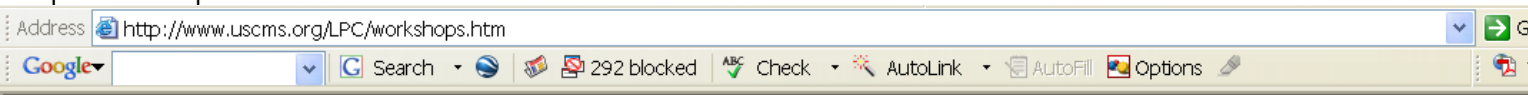
**Date/Time:** Monday, 13 September 2004 - 13:00 (Europe/Zurich)  
**Location:** FNAL: West Wing  
**Chairperson:** S. Eno  
**Description:** This meeting will take place at 1 PM FNAL time in the West Wing (WH10NW).  
 The meeting will be broadcast via streaming video at <http://www-visualmedia.fnal.gov/Real/cms101/index.htm>. Video conferencing will also be available via VRVS in the "Forest" room.

## Monday, 13 September 2004

13:00 ( FNAL )	<a href="#">more information</a>	<b>Introduction to CMS (30')</b>	Eno, S (UMD)
13:30 ( FNAL )	<a href="#">more information</a>	<b>Introduction to the Detector (30')</b>	Freeman, J.
13:55 ( FNAL )	<a href="#">transparencies</a>	<b>Introduction to the Trigger (30')</b>	Acosta, D.
14:30	<b>Coffee Break (30')</b>		
14:55 ( FNAL )	<a href="#">more information</a>	<b>Introduction to the Software (30')</b>	Gershtein, Y.
15:00 ( FNAL )	<a href="#">more information</a>	<b>Introduction to the FNAL UAF (15')</b>	Wenzel, H
15:45 ( FNAL )	<a href="#">more information</a>	<b>The LPC (15')</b>	Sarah Eno



# J-Term Intro to CMS at LPC



## J-Term at the LPC

Want to learn more about the physics potential of the LHC? Want to learn everything there is to know about the CMS detector? Want a detailed introduction to the new software framework, CMSSW? Come to J-Term at the LPC. The list of registered attendees can be found [here](#).

[Jan 10, 2006](#) [Jan 11, 2006](#) [Jan 12, 2006](#) [Jan 13, 2006](#)

The **theory session** is on the afternoon of Jan 11. Chris Quigg has recommended reading for students attending this session

- E. Eichten, I. Hinchliffe, K. Lane, and C. Quigg, Supercollider physics, Rev. Mod. Phys. 56, 579 (1984).
- C. Quigg, Nature's Greatest Puzzles, <http://arxiv.org/abs/hep-ph/0502070>.
- F. Gianotti and M. Mangano, LHC physics: the first one--two years, <http://arxiv.org/abs/hep-ph/0504221>.
- K. Wilson, Some Experiments on Multiple Production, CLNS-131 (1970) <http://lutece.fnal.gov/Papers/KenWilson.pdf>

On the afternoon **Jan 12, 2006**, there will be a **tutorial** on CMSSW, run by Jeremy Mans. To participate in this tutorial, to be held in the LPC transient area, you will need a UAF account (<http://www.uscms.org/SoftwareComputing/UserComputing/GetAccountFermilab.html>) We prefer you use your own lap top, but there are a limited number of public terminals available. Contact Jeremy Mans if you would like to reserve one of these ([jmmans@fnal.gov](mailto:jmmans@fnal.gov))

**Attended by  
over 70 1st  
and 2nd year  
grad students!**







# Summer School

2006 Hadron Collider Physics Summer School - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Links Customize Links

Address <http://projects.fnal.gov/hcps/> Go


Google Search 311 blocked Check AutoLink AutoFill Options

## 2006 Joint Fermilab-CERN Hadron Collider Physics Summer School, August 9-18

Home Program Practical information Participants Sponsors Resources

News / Application / Program

### Announcement:



Done Internet

<http://hcpss.fnal.gov/>.

August 9-19, 2006



# All US CMS Meeting

(almost) every Friday

well-attended both in person and via vrvs

Typical Agenda

News from Dan

News from Ian/Jon

Hardware News (Hadley/Maravin)

one topical talk

May 13 EDM report – Liz Sexton–Kennedy  
May 20 sLHC – Wesley Smith  
May 27 e/gamma – Yuri Gerstein  
Jun 3 trigger – Sridhara  
Jun 10 jet/met – Rob Harris  
Jun 17 (cancel due to cms week?)  
Jun 24 (cancel due to cms annual review?)  
Jul 1 The CMS Forward Pixel Project – John Conway  
Jul 8 Making contact with theorist – Steve Mrenna  
Jul 15 muon alignment – Marcus Hohlmann  
Jul 22 LPC muon group – Eric James  
Jul 27 due to Dan's lecture series  
Aug 5 Authorship list requirements – Dan Green  
Aug 12 Magnet studies – Rich Smith  
Aug 19 Data bases for Cosmic Ray test – Lee Lueking  
Aug 26 luminosity preparation – Dan Marlow  
Sep 2 cosmic analysis in the U.S. – Yurii Maravin  
Sep 9 cosmic workshop  
Sep 16 ROC – Kaori  
Sep 23 CMS week  
Sep 30 Simulation Certification Project – Daniel Elvira  
Oct 7 physics workshop  
Oct 14 (HCAL meeting at FNAL) MET – Richard Cavanaugh  
Oct 21 Calorimetry Task Force – Jeremy Mans  
Oct 28 HCAL calibration – Shuichi Kunori  
Nov 4 P420 Proposal – Mike Albrow  
Nov 11  
Nov 18 Tier 2's for me and you – Ken Bloom



# Contributions of LPC: EDM

On Thu, 1 Apr 2004, Avi Yagil wrote:

- > how about starting an "offline reconstruction project" within the lpc?
- > I mean full-fledged with project manager, deliverables, milestones etc.
- > The goal is to really have something like the support structure a cdf or d0
- > offline
- > group supplies to the collaborations.
- > □
- > Can we swing such a thing?
- > It has some obvious advantages: getting resources from CD is
- > easier, as they are used to this mode of interaction.
- > Also you can set sub-group structure etc. in a visible way.
- > It'll be a nice way to get Uni. people on board as leaders of these, as
- > well as generate context for work to be done.
- >
- > what do you think? am I crazy?
- > That's when I need to call you - to brainstorm.
- > typing is such an un-rewarding activity.
- > sigh.
- >
- >



Was stealing Liz from CDF Avi's greatest contribution???





# EDM/Tools

From my slides at uscms meeting at Princeton

Group heads: Lix Sexton-Kennedy (FNAL), Hans Wenzel (FNAL)

**Code management working group** (Chuck de Baun, Paul Russo, Natalia Ratnikova, Mark Fischler, Mark Paterno, Alan Jonkerheere, Piere Savard, Avi Yagil, Liz Sexton, Hans Wenzel)

- Consulting with experts from CDF, D0, CMS: We investigate what infrastructure has to be in place to support a serious software development effort here at Fermilab to support the LPC activities.

**EDM and Framework Working group** (Walter Brown, Mark Paterno, Jim Kowalkowski, Ken Bloom, Aaron Dominguez, Stefan Stonjek, Mark Fischler, Heidi Schellmann, Lee Lueking, Avi Yagil, Bill Tanenbaum, Liz Sexton, Hans Wenzel)

- Working on Use Case Document (in CVS)

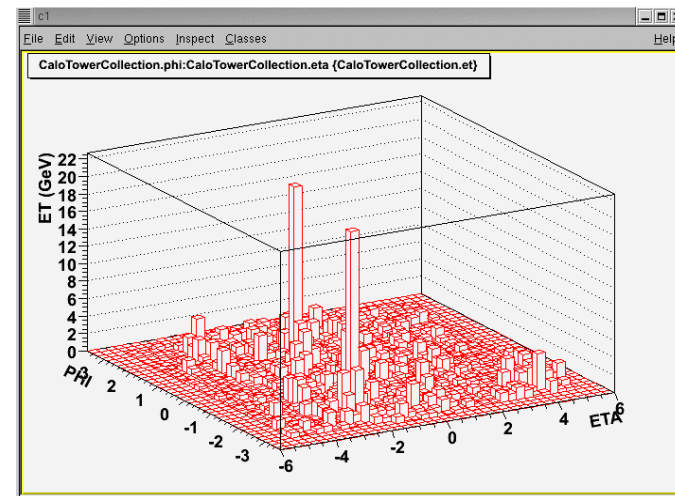
**Supporting the Efforts of the local LPC Groups:**

- scripts
- tutorials
- documentation
- tree maker
- access to releases



# Event Data Model

- working with CMS EDM primary author, began review in early November, 2005
- presented to the collaboration in Jan 11, 2005
- approved in Feb 9, 2005
- early prototype work demonstrated during March 2005 CMS week
- first implementation delivered June 2005
- beginning 2006: all major components of redesign are in place; now in incremental improvements/maintenance phase



```
Terminal
File Edit Settings Help
root [1] Events->Draw("CaloTowerCollection.phi:CaloTowerCollection.eta", "CaloTowerCollection.et", "lego", 1, 13)
<TCanvas::MakeDefCanvas>: created default TCanvas with name c1
(long long)1978
root [2] htemp->SetXTitle("ETA")
root [3] htemp->SetYTitle("PHI")
root [4] htemp->SetZTitle("ET (GeV)")
root [5] htemp->SetLineColor(2)
root [6] htemp->Draw("lego")
root [7]
```



# Somehow, I don't know how, people were frightened and insisted we have an advisory board

Advisory Council
Restricted
Europe/Zurich
S. Eno

**Date/Time:** Friday, 22 October 2004 - 08:00 (Europe/Zurich)  
**Location:** FNAL, Hornet's Nest  
**Chairperson:** Eno, S.

Friday, 22 October 2004

11:00	<b>Introductory Comments (5')</b>	Mike Witherell
11:05	<a href="#">more information</a> <b>Overview of the LPC (15')</b>	S. Eno
11:20	<span style="background-color: #e0f0ff; padding: 2px;">( FNAL, Hornet's Nest )</span> <a href="#">more information</a> <b>LPC Facilities (10')</b>	K. Maeshima
11:30	<a href="#">more information</a> <b>LPC computing and software environment (15')</b>	Hans Wenzel
11:45	<a href="#">more information</a> <b>EDM (15')</b>	Liz Sexton
12:00	<span style="background-color: #e0f0ff; padding: 2px;">( FNAL, Hornet's Nest )</span> <a href="#">more information</a> <b>Tracking (30')</b>	Kevin Burkett/ Sasha Khanov
12:30	<a href="#">more information</a> <b>e/gamma (30')</b>	Yuri Gershtein, Heidi Schellman
13:00	<b>Lunch (1h0')</b>	
14:00	<a href="#">transparencies</a> <b>Trigger (30')</b>	Sridhara Dasu/ Stephan Lammel
14:30	<a href="#">transparencies</a> <b>Muons (30')</b>	Eric James/ Martijn Mulders
15:00	<a href="#">more information</a> <b>Simulations (30')</b>	Daniel Elvira, Boaz Klima
15:30	<span style="background-color: #e0f0ff; padding: 2px;">( FNAL, Hornet's Nest )</span> <a href="#">more information</a> <b>Jet/Met (30')</b>	Rob Harris/ Marek Zielinski
16:00	<a href="#">transparencies</a> <b>Concluding Remarks (5')</b>	Avi Yagil
16:05	<b>Close Out (55')</b>	Advisory Council/ Eno/ Yagil



# Summary

- It was fun.
- Glad to see it is still alive and that many of the programs we founded still exist.
- Looking forward to the next 10 years.