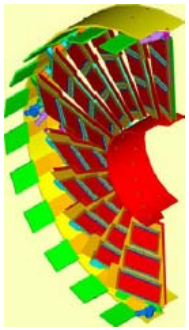
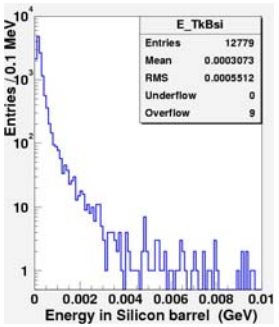
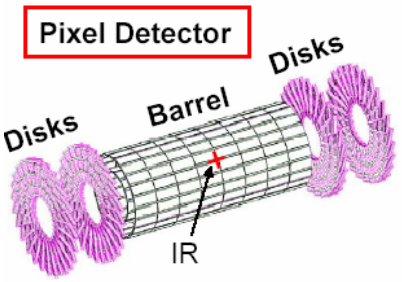
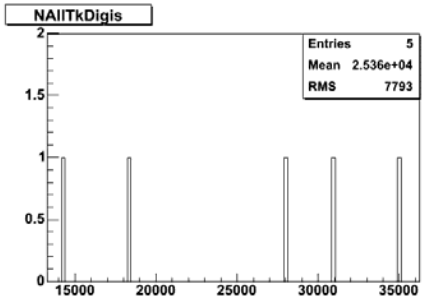


LPC Simulations Group

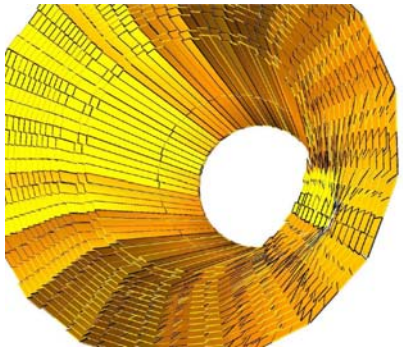






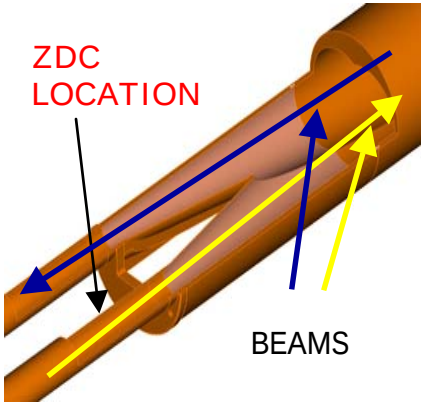
Boaz Klima

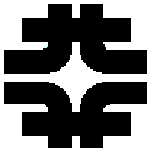
Fermilab



USCMS Meeting

Apr. 1, 2005





The LPC

slides taken from Sarah's CMS101
(see on Agenda Server at
http://agenda.cern.ch/fullAgenda.php?ida=a043388)

The LPC: our mission

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) in a single location (11th floor of the high rise)
- 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

LPC Web Page

http://www.uscms.org/LPC/LPC.htm

The LHC Physics Center at FNAL

The LHC Physics Center (LPC) at FNAL was established in April 2004 by Mike Witherell and Dan Green for the following purposes:

- a "brick and mortar" location for CMS physicists to find experts on all aspects of data analysis, particle ID, software, and event processing within the US, working during hours convenient for U.S.-based physicists
- a center of physics excellence within the US for LHC physics
- a place for workshops/conferences/gatherings on LHC physics
- a place for the training of graduate and postgraduate scientists from URA Universities.
- a "remote control room" that CMS physicists can use to participate in data taking and quality control for the CMS experiment in the U.S.
- a tool to help provide a graceful transition between the Tevatron and LHC experiments for those physicists participating in both, maximizing the manpower available to each during the transition time.

The center is run by Avi Yagil (FNAL) and Sarah Eno (UMD) and is located on the 11th floor of the FNAL hi-rise. The level-2 manager is Kaori Maeshima. The members of our advisory board can be found at this link. Our milestones can be found at this link. The LPC makes use of the promoximity of the FNAL "Tier-1" computing center and the Tevatron experiments.To learn more about our center, choose one of the following options.

Working Groups

LPC & You

There are many different modes to use this center

- your postdoc who is stationed at FNAL work on both CMS and a Tevatron experiment can have a desk on the 11th floor and be near people from both accelerators

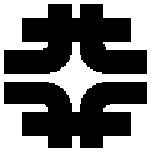
- station a CMS postdoc at FNAL permanently for the same kind of advantages you get in the D0/CDF trailers

- send a postdoc stationed at your university for a month, to get up to speed on analysis basics and to form personal connections that will help his/her later work

- send students for the summer to give them a richer experience by having them interact with more people

- come every other week to help you feel connected to the experiment (who knows! The US is the biggest country on CMS. We'll get the data in real time. Maybe the center-of-mass of analysis for CMS will somewhere in the middle of the Atlantic.

- come for a day for help with a particularly knotty software or analysis problem



Simulations @LPC

What have we done so far?

- We have started almost one year ago – time flies…
- As you all know, it's very hard to build a group/effort, especially in a new (and sometimes not well understood) environment – interesting challenge!
- Major efforts
  - Recruitment (=creating a group…)
  - Understanding what's available (=creating knowledge-base & identifying potential contributions…)
  - Helping customers (=building reputation as a center…)
  - Communication (="webbing"…)

 Great News 

Our group is on the right track to becoming a recognized major force in CMS

Communication

http://www.uscms.org/LPC/lpc_simul/lpc_simulation.html

Simulation Group

(LPC at Fermilab)

Admin

Group Heads

V. Daniel Elvira, Fermilab, mailto:daniel@fnal.gov, (630) 840-3604.
Boaz Klima, Fermilab, mailto:klima@fnal.gov, (630) 840-2323.

Mailing Lists

- lpc_simul@fnal.gov: Ours; currently 52 members (to subscribe or obtain list).
- For experts:
  - cms-oscar-developers@cern.ch: CMS' OSCAR (full GEANT simulation) list
  - cms-famos-developers@cms-lb.cern.ch: CMS' FAMOS (fast MC simulation) list

Meetings and Minutes

The agendas for the LPC Simulations Meeting at Fermilab are available from the LPC Simulations Agenda Server

You can read the minutes of our meetings by clicking here.

Next meeting on Apr. 4, 2005

Current Activities

- OSCAR Validation
- Forward Pixels Implementation in OSCAR
- Luminosity Counters Implementation in OSCAR
- ECAL Crystal Response Studies
- Test Beam 2004 Analysis: Geometry & Simulation
- HF Showerlibrary
- ZDC Implementation in OSCAR
- Detailed Instructions for Generation & Analysis of MC Data
- ...

HowTo @LPC

- Tips for working at the CMS User Analysis Farm (UAF).
- Generating Monte Carlo events (generator,detector simulation, digitization, ...).
- Analyzing Monte Carlo events at pre-reco levels (generator,detector hits, digitization, ...).
- Visualizing any DDD/XML geometry using iguana (HCAL Test Beam 04 example)
- Policy for use of disk space on cmsuaf by users.

CMS Products

- Software Tutorials
- CMS Code Browser
- OSCAR - CMS detector simulation package, based on GEANT4.
- FAMOS - CMS fast detector simulation package.
- ORCA - CMS reconstruction package.
- COBRA - CMS framework package.
- Geometry - CMS Geometry description in xml files.
- DDD - Detector Description Database package (language to describe detector geometry).
- IGUANACMS - CMS visualization package.

Last updated Mar. 31, 2005 by Boaz Klima

We have been communicating on a regular basis with the CMS Simulations (SPROM) people/meetings

How many people are involved?

- Members:
  - Mailing list (voluntarily; announcements & minutes,…) – 52 people!
  - Current LPC-Sim projects ("active") – ~30/52 people
  - >25% on LPC-Sim ("really committed") – ~17/52 people
  - Last meeting – 20 people ⟶ moving from WH11SE to WH11NE
- Institutions: FNAL, FSU, KSU, KU, LTU, Maryland, Northwestern, Notre Dame, Rutgers, Tata, and UIC
- Our strong efforts on:
  - recruitment
  - understanding what's available
  - helping customers, and
  - communication

in consultation with our CERN-based colleagues paid off

We now have an active simulations group at the LPC

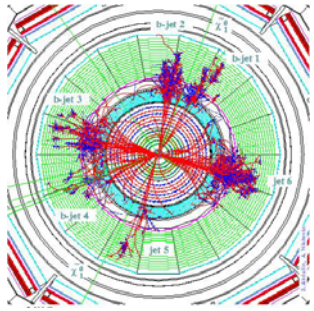
Main Activities

Lead ably and/or guided closely by Daniel Elvira

- OSCAR Validation
- Forward Pixels Geometry Update in OSCAR
- Luminosity Counters Implementation in OSCAR
- ECAL Crystal Response Studies
- Test Beam 2004 Analysis → Geometry & Simulation
- HF Showerlibrary
- Zero Degree Calorimeter (ZDC) Implementation in OSCAR
- Detailed Instructions for Generation & Analysis of MC Data

OSCAR Validation

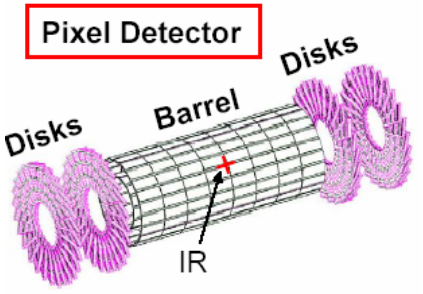
- Purpose: validate a new version of OSCAR by comparing it (eventually automatically) to the currently approved version at a detector level information (hits, digis,…)



- Current key people
  - Avto Kharchilava (ND → SUNY Buffalo)
  - Lisa Shabalina (UIC)
  - Salavat Abdulin, John Marrafino, Xiangtao Huang (FNAL)
  - Sunanda Banerjee (Tata)
- We are coordinating this large-scale effort with Maya (@CERN) & Tommaso (@Pisa) and are being assisted by Liz & Heidi on structure (changes!) and utilities
- Status: just started

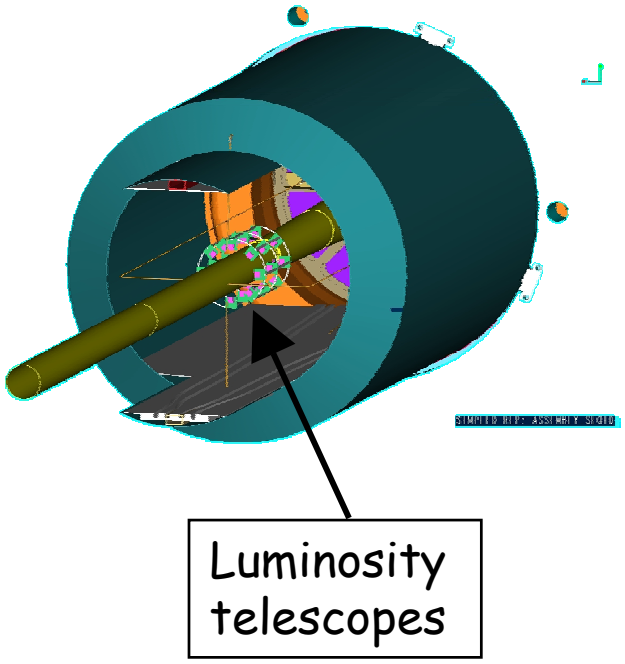
Forward Pixels

- Purpose: implementation of the final (?) design of the Forward Pixels detector in OSCAR
- Current key people
  - Neeti Parashar (LTU)
  - Victoria Martin (Northwestern)
  - Dima Onoprienko & Tim Bolton (KSU)
  - Sunanda Banerjee (Tata)
- We are coordinating this new effort with Bruno (Northwestern) & Morris (Hopkins)
- Status: just started



Luminosity Counters

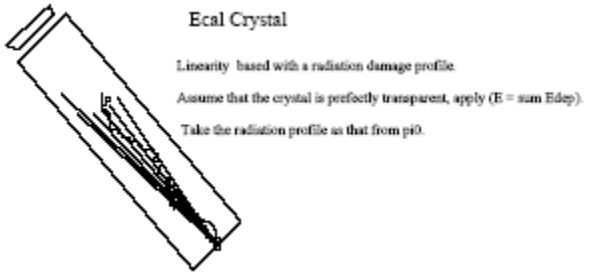
- Purpose: implementation of the Luminosity Counters in OSCAR
- Current key people
  - Lalith Perera (Rutgers)
- We helped making progress on this while waiting patiently for a full collaboration approval of the project
- Status:
  - will be discussed in detail in our upcoming meeting
  - version 1 ready

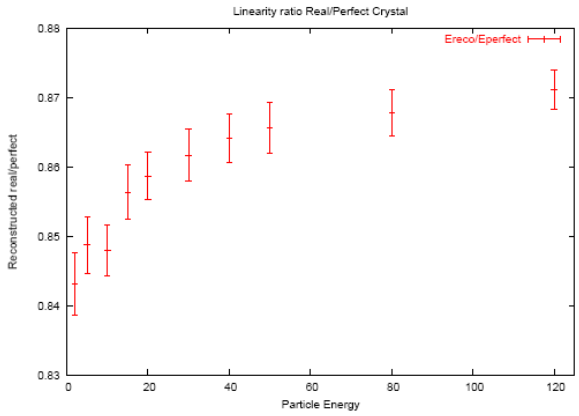


ECAL Crystal Response

- Purpose: study ECAL response (linearity & resolution) as a function of radiation damage (w & w/o tracker)
- Current key people
  - Jeff McDonald and Yuri Gershtein (FSU)
- Very illuminating/challenging studies
- Started with perfect crystals then added reflections from front face
- Status: close to be done/conclusive

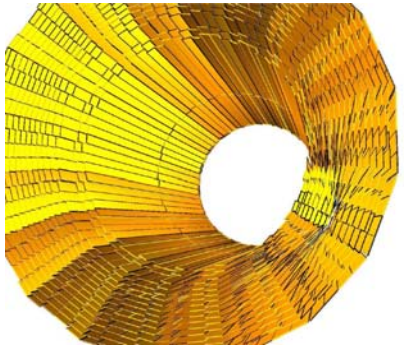
(no effect on resolution from radiation damage)





Test Beam 2004 Analysis

- Purpose: analyze TB04 data, compare with OSCAR-generated data and draw conclusions wrt hadronic evolution within HCAL module and linearity & resolution for low energy π's (fix detector description in OSCAR accordingly)
- Current key people
  - J. Damgov, S. Esen, S. Piperov, T.Yetkin (FNAL)
  - S. Kunori (Maryland)
  - Sunanda Banerjee (Tata)



- Have been making constant progress
- Unique/special geometry description uses algorithm features provided by DDD
- Status: ongoing

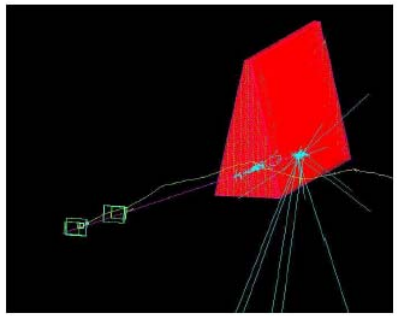
IguanaCMS
Interactive Graphics and User ANAlysis for CMS

HF Showerlibrary

- Purpose: implement the HF detector in OSCAR using a showerlibrary (fast) technique rather than full GEANT
- Current key people
  - Taylan Yetkin (FNAL)
  - S. Kunori (Maryland)
  - Sunanda Banerjee (Tata)
- Works quite well
- Work based on TB04 data
- Visualize using IGUANA
- Status: ready to be released

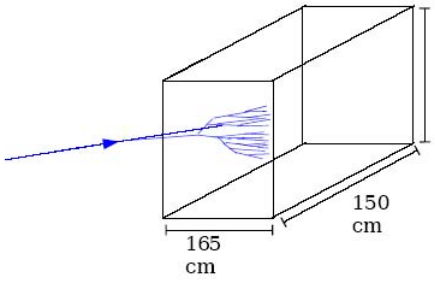
HF Test Beam Setup

One wedge and beam line elements.

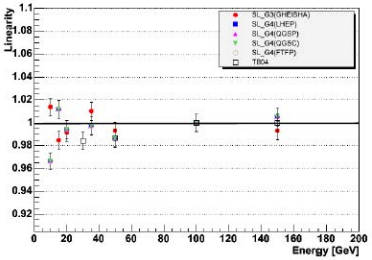


HF Shower Library Setup

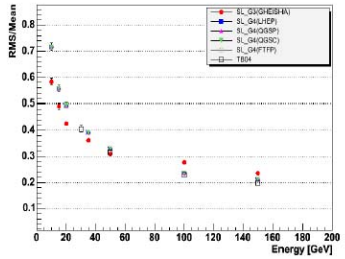
One iron blcok filled with fibers.



Linearity



Resolution

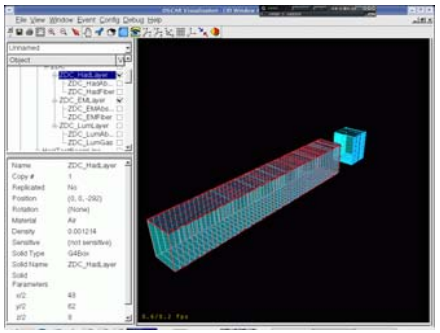


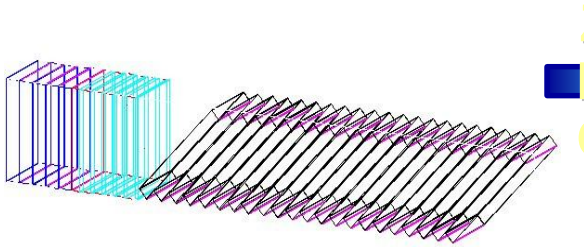
Data vs G4: ~2%

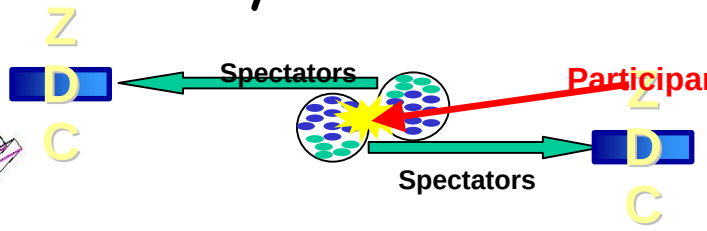
~5%

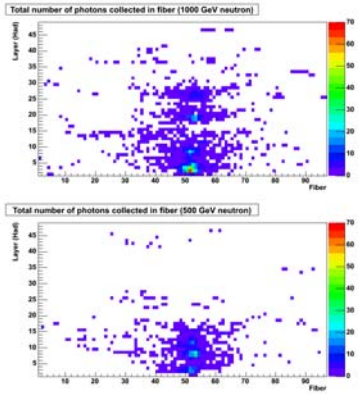
ZDC

- Purpose: implementation of the Zero Degree Calorimeter, which is is part of the heavy ion program at CMS (Cerenkov detector located +-140 m from the interaction point), in OSCAR
- Current key people
  - Chadd Smith & Russell Betts (UIC)
  - Megan Lehnherr & Michael Murray (KU)
- Enormous progress has been made over the last several months in consultation with many experts
- Status: version 1 ready to be released soon



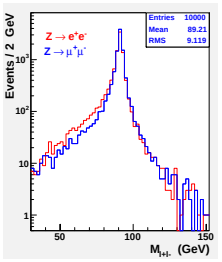


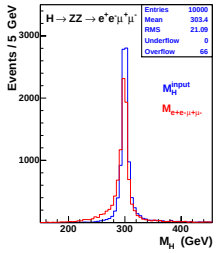




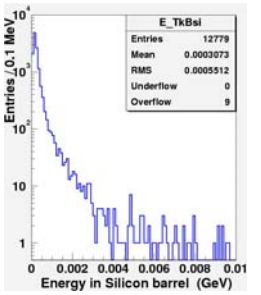
Generation & Analysis of MC

- Purpose: provide users with detailed instructions on how to generate and ROOT-based analyze MC data at the LPC in all levels: generator, detector simulation, and digitization
- Current key people
  - Avto Kharchilava (ND → SUNY Buffalo)
  - Victoria Martin (Northwestern) - testing
  - Xiangtao Huang (FNAL) - testing





- All generation docs were used by non-experts and are working fine (thanks for corrections and clarification)



- Analysis docs: generation – ok, others – still need testing
- Status: close to be ready and advertised

Summary and Conclusions

- Our strong efforts over the last year on:
  - recruitment
  - understanding what's available
  - helping customers, and
  - communication

in consultation with our CERN-based colleagues paid off

We now have an active simulations group at the LPC

- The LPC-Simulations group is deeply involved with quite a few critical simulation efforts for CMS
- We aim at being successful with the current projects as well as making more contributions (new opportunities)

You are welcome to join us any time !