CMS Outreach – Status and Plans

- **Recent progress**
  - CMS Times
  - Brochure
  - CMS Movie
  - Graphic Novel
- **Finances**
  - Discussions with Scrutiny Group
- **Future activities**
  - Filming at point 5
  - Brochures (sub-detectors)
  - Public web site
- **Needs from CB**
  - CMS Times
  - Major events / milestones

Who are the CMS Outreach group?

Recent Progress
- CMS Times
- Brochure
- CMS Movie
- Graphic Novel

Finances
- SG discussions

Future activities
- Filming at P5
- Brochures
- Web site

Needs from CB
- CMS Times
- "milestones"

• Dave Barney	Coordinator and rep. for the Preshower
• Marzena Lapka	CMS Times editor
• Michel Della Negra	Ex-officio
• Jim Virdee	Ex-officio
• Achille Petrilli	Ex-officio
• Vincenzo Chiochia	Pixels rep.
• Geoff Hall	Tracker rep.
• Etiennette Auffray	ECAL rep.
• Laza Lazic	HCAL rep.
• Richard Breedon	CSC rep.
• Gabriella Pugliese	joint RPC rep.
• Pierluigi Paoluci	joint RPC rep.
• Jesus Puerta Pelayo	DT rep.
• Domenico Campi	Magnet rep.
• Lucia Silvestris	CPT rep.
• Sergio Cittolin	TRIDAS rep.
• Christoph Schaefer	Point 5 rep.
• Magnus Hansen	Electronics rep.
• Jan Troska	Web-cam responsible
• Karl Gill	Graphic Novel coordinator
• Judy Jackson	Fermilab press officer
• Marie-Claude Pelloux	Secretariat
• Guy Martin	Secretariat

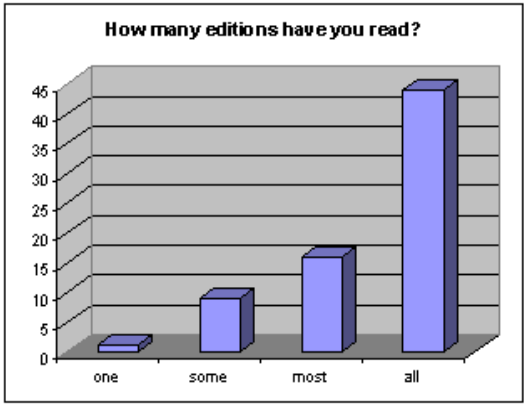
+ several others
inc. CERN Press office

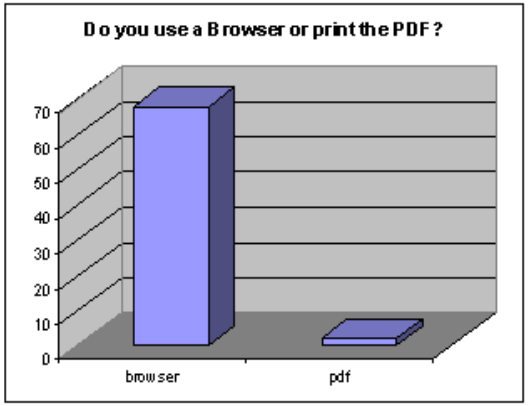
CMS Times

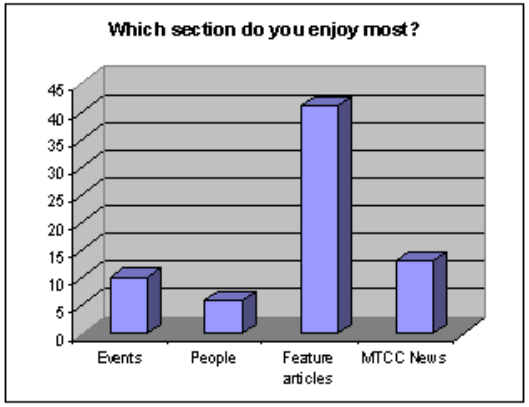
- **Marzena Lapka joined CMS in mid-July to work 100% on Outreach**
- **In one week she produced a template for the CMS Times!**
- **She is now the principle editor of the CMS Times (my role is coordination of stories, English editor etc.)**

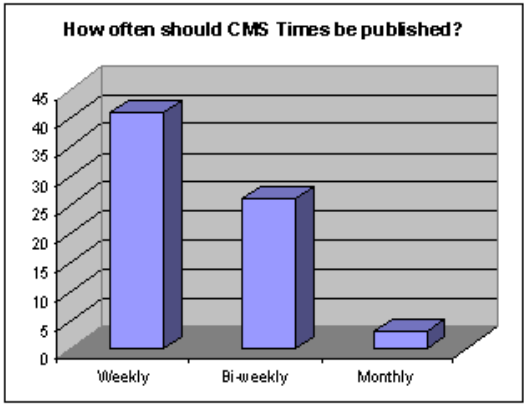
CMS Times Questionnaire September 2006

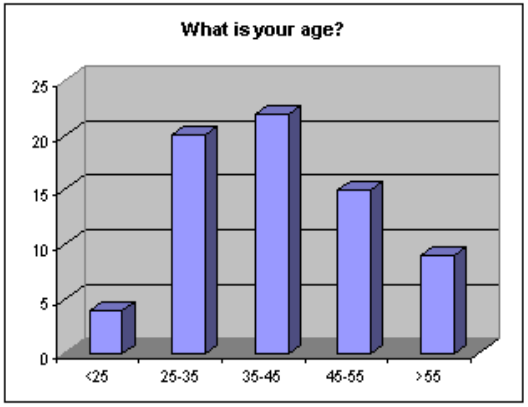
70 respondants











CMS Times

Every week try to focus on one CMS institute and include a video interview with a young person from that institute

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- CMS Times "milestones"


Compact Muon Solenoid Times

SEPTEMBER 25, 2006 — CMS OUTREACH HOME | CMS WORK HOME — ABOUT CMST | SEARCH | SUBSCRIBE | CONTACT CMST | ARCHIVE

Forthcoming activities

September
- **Lower HF+- into UXC**
- End of RB2 cosmic tests
- Start of DAQ installation in USC
- Start to install YE/YB cable chains
- Start of ES module construction

October
- **Start of magnetic field mapping**
- **End of MTCC**
- Start of ES cosmic calibration
- Installation of TIB+ into TOB+
- Start of Tracker commissioning in 186
- End of CSC installation
- Preparation of DTs complete
- End of long-term tests of RPCs

November
- 20 EE supercrystals on one Dee
- Start of HO installation
- Install all 18 ECAL supermodules on + side
- DT installation on YB-1 and YB-2
- Start of YB0 cabling and commissioning
- **Lower YE+3, YE+2, YE+1**
- **Remove HB+ (equipped with ECAL supermodules)**

Major events in 2006
CMS meetings calendar

Introduction

A Word from the Editors

Firstly, congratulations go to Pierre Marage, who has won two brunch tickets to the Faim? restaurant in Geneva by completing the ETT questionnaire.

Over the past two months the CMS Times has evolved in order to appeal to a wider audience. For example, the video interviews with young members of our collaboration are an inspiration to future generations. In order to improve the publication further we need your feedback. We would very much appreciate it if you could take a few moments to complete the simple questionnaire below. All entries are completely confidential.

With kind regards,

David Barney
Marzena Lapka

CMS Times Questionnaire

1. How many editions of the CMS Times have you looked at?
---Choose---
2. How do you prefer to read the CMS Times?
---Choose---
3. Which section of the CMS Times do you find most useful?
---Choose---
4. How often do you think the CMS Times should be published?
---Choose---
5. What is your age?
---Choose---

Feature Stories

Combined ECAL+HCAL beam test

The combined ECAL+HCAL beam tests at the CERN H2 area concluded on the 19th of September 2006.

Combined beam test setup: ECAL supermodule (silver), HCAL (black), scintillators etc. (green).

The features of the ECAL and HCAL response have been studied in detail with different particles and energies. This beam line can provide various types of particles in the momentum range from 1 to 300 GeV/c. In the very low energy (VLE) mode with a tertiary target and special beam optics, the combined calorimeter system is tested in the 1 to 9 GeV/c range. We are able to tag (anti-)protons, kaons, pions and electrons with the use of the Cherenkov threshold, time-of-flight, and large scintillation counters. To our knowledge, this is the first time such low-energy running has been achieved in this beam. In the high-energy mode, the beam energy is as high as 300 GeV for hadrons. The data quality is excellent (see attached preliminary figures) and the planned analyses will undoubtedly result in a much improved understanding of the CMS calorimeter systems.

Particle energy resolution (left) and identification peaks (right). NOT FOR PUBLICATION

Click on any image for a high resolution version.

Submitted by
N. Akchurin

Module Production for the Tracker End Caps is complete

MTCC Latest News

The two ECAL supermodules that participated in MTCC Phase I were taken out last week, as was the tracker tube, which now sits temporarily on the H8 cradle before being moved back to building 186 on a special transport exercise scheduled for this week.

Web-cam image of the MTCC tracker on its transport cradle

Preparations for phase two of the MTCC have begun in earnest, the main goals being to map the magnetic field with a precision of 10^{-4} and complete magnet commissioning studies.

The short circuit bars on the magnet power supply were connected last week and the DCCT will be tested out this week. Alignment and fixes for the HO readout box operation in the magnetic field will be performed. Detailed studies of Lorentz angle will be carried out for the Drift Tubes and HCAL scintillator brightening with sources will be investigated. Depending on the time available trigger targets have also been set, including: the integration of HCAL m.i.p. triggers via the RCT; the integration and test of the Global Trigger (GMT + GT); replacing the LTC as central-trigger controller; systematic tests of the "muon overlap" triggers from the cross links between DT and CSC systems at the Track-Finder level and implementation of the Trigger Supervisor software (TS) to configure and control the trigger systems.

Central DAQ issues will also be addressed during Phase II: switching from local to global mode by sub-detector is often problematic - they are not robust against sync-losses. We need a well defined 'ground' state, where subdet r/o pipelines are empty and ready to accept the next L1A with evtno=1. Writing data to disk is to be reviewed: there are occasional conflicts between writing data and copying to CASTOR. The big power cut exposed the missing configuration for automatic restart of the DCS; this is fixed now and all systems start up correctly. PVSSII access control, alarm handling and visualization will be implemented.
The DQM should run on a dedicated or quasi-dedicated PC (perhaps with visualization). HCAL and CSCs are already included in the global DQM application while DT and RPC will be incorporated for Phase II.

Detailed lessons learnt documentation may be found at:
http://indico.cern.ch/materialDisplay.py?contribId=18&sessionId=18&materialId=18&confId=4749

Submitted by
A.Sharma

Safety during MTCC

6. Do you have any comments/suggestions?

Submit

People

Saima Iqbal in CMS

Saima Iqbal

Saima Iqbal originates from Karachi, Pakistan, where she obtained a Masters degree in Physics, specializing in electronics and communication. Following this course, Saima came to CERN in 2001, associated with the California Institute of Technology (CALTECH) in the USA, under the tutelage of Prof. Harvey B. Newman, she became involved with the development and implementation of online databases for the CMS experiment. During the past five years Saima has also obtained a second masters degree (in software engineering) from the University of West England (with a scholarship from CALTECH) and is currently employed by Fermilab. She will begin a PhD in 2007.

In addition to the technological challenges associated with work at CERN, Saima appreciates the opportunities for travelling around the world and collaborating with different cultures.

Download a video interview with Saima (15 Mbytes mp4)

Click on any image for a high resolution version.

PDF Version

Click here to download printable PDF version.

The ten mechanically different modules used for the TEC

The production of the 6400 Silicon modules needed to complete the Tracker End Caps has been completed. In total more than 7200 modules were built by 14 institutes in Europe and the United States. 12 different module types, 10 mechanically different modules and two alignment modules, had to be assembled. The precision assembly was done using automatic robot systems, a method pioneered by CMS in high energy physics.

Technicians using the robotic "gantry" machine for TEC assembly

The precision achieved is of the order of 10 microns. The assembled modules were subsequently wire bonded and thoroughly tested. Modules not fulfilling the quality criteria or modules later damaged during the integration process were either repaired or disassembled to save the most valuable components. The production was finished with about 6800 perfect modules sufficient to complete the tracker and leave a significant number of spares. These modules comprise about 4 Million channels of which a fantastic 99.8% are fully operational.

Click on any image for a high resolution version.

Submitted by
M. Krammer

For the duration of the MTCC visits to the point 5 assembly hall are restricted to specific areas. A special safety card including a map of the allowed areas can be found here. Private visits to point 5 should be announced by sending an email to cms-ea-visit@cern.ch.

Links
MTCC website: http://cms.cern.ch/MTCC.html
Agendas/minutes of all run meetings: http://indico.cern.ch/categoryDisplay.py?categId=329

CMS Outreach, Visits and Media

Dr Daniel Atkins, Director of the U. S. National Science Foundation Office of Cyberinfrastructure (OCI) and visionary in applications of information technology, made a one-day visit to CERN during which he visited CMS and ATLAS Experiments, LHC Computing, and had informal discussions with U.S. members of the collaborations involved in computing. NSF and OCI have provided long-term support for Cyberinfrastructure programs of significance to CMS including GriPhyN, UltraLIGHT, the DISUN Tier 2c Center, and Open Science Grid (OSG). Additionally, OCI also provides support for cyberinfrastructure/education/ and workforce development through the CI-TEAM program. A CMS Collaborating Group at Florida International University has a program of graduate research and education linking physical, biological and computer sciences called CyberBridges funded under CI-TEAM.

Prof. Bob Cousins (left) and Dr. Daniel Atkins at SX5

To learn more about Dr Atkins and programs in Cyberinfrastructure at the NSF, see: http://www.umich.edu/news/?Releases/2006/Feb06/r022806b and http://www.nsf.gov/dir/index.jsp?org=OCI.

Submitted by
R. Ruchti

Links
- LHC
- ATLAS
- ALICE
- LHCb
- CERN
- CERN Bulletin

Web-cam latest images (click picture to enlarge)

Brochure

Recent Progress
- CMS Times
- **Brochure**
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- Graphic Novel

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- SG discussions

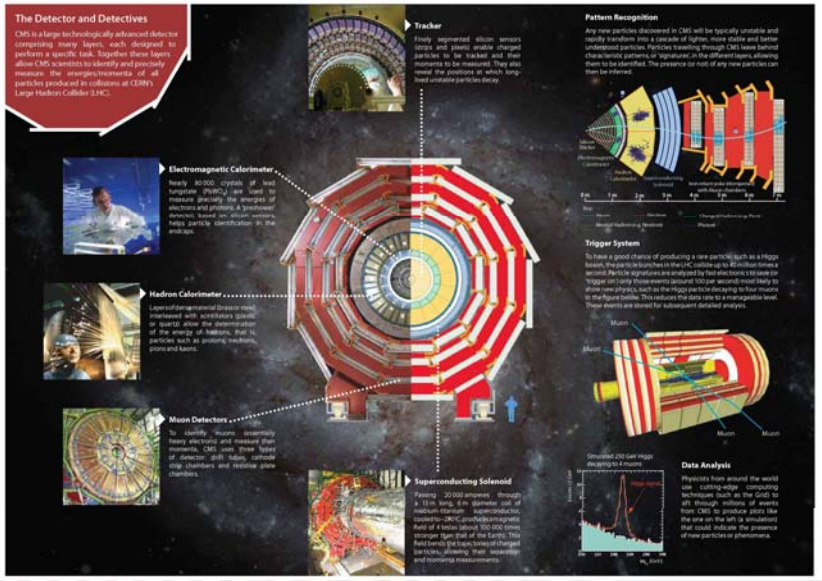
Future activities
- Filming at P5
- Brochures
- Web site

Needs from CB
- CMS Times
- "milestones"

Aim is to intrigue a wide audience – is not meant to explain everything about CMS

Received many excellent comments recently. The brochure is now being printed – in English (5000 copies for CMS; 5000 copies for CERN Press Office)

Is being translated into other languages: French (done), German, Italian, Portuguese, Spanish (done), Polish, Chinese, Dutch, Greek (done), Russian, Serbian, Danish, Finish. Will have help from CERN Teachers program for other languages



Brochure (back and front)

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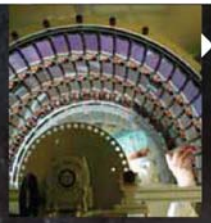
Brochure (centre pages)

The Detector and Detectives

CMS is a large technologically advanced detector comprising many layers, each designed to perform a specific task. Together these layers allow CMS scientists to identify and precisely measure the energies/momenta of all particles produced in collisions at CERN's Large Hadron Collider (LHC).



Tracker

Finely segmented silicon sensors (strips and pixels) enable charged particles to be tracked and their momenta to be measured. They also reveal the positions at which long-lived unstable particles decay.

Electromagnetic Calorimeter

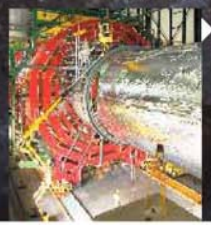
Nearly 80 000 crystals of lead tungstate ($PbWO_4$) are used to measure precisely the energies of electrons and photons. A 'preshower' detector, based on silicon sensors, helps particle identification in the endcaps.

Hadron Calorimeter

Layers of dense material (brass or steel) interleaved with scintillators (plastic or quartz) allow the determination of the energy of hadrons, that is, particles such as protons, neutrons, pions and kaons.

Muon Detectors

To identify muons (essentially heavy electrons) and measure their momenta, CMS uses three types of detector: drift tubes, cathode strip chambers and resistive plate chambers.

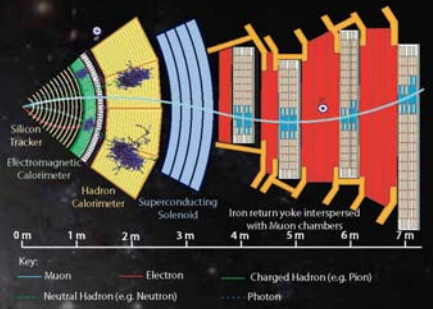


Superconducting Solenoid

Passing 20 000 amperes through a 13 m long, 6 m diameter coil of niobium-titanium superconductor, cooled to –270°C, produces a magnetic field of 4 teslas (about 100 000 times stronger than that of the Earth). This field bends the trajectories of charged particles, allowing their separation and momenta measurements.

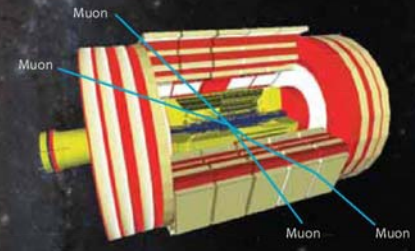
Pattern Recognition

Any new particles discovered in CMS will be typically unstable and rapidly transform into a cascade of lighter, more stable and better understood particles. Particles travelling through CMS leave behind characteristic patterns, or 'signatures', in the different layers, allowing them to be identified. The presence (or not) of any new particles can then be inferred.

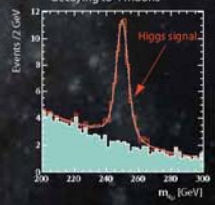


Trigger System

To have a good chance of producing a rare particle, such as a Higgs boson, the particle bunches in the LHC collide up to 40 million times a second. Particle signatures are analyzed by fast electronics to save (or 'trigger on') only those events (around 100 per second) most likely to show new physics, such as the Higgs particle decaying to four muons in the figure below. This reduces the data rate to a manageable level. These events are stored for subsequent detailed analysis.



Simulated 250 GeV Higgs decaying to 4 muons



Data Analysis

Physicists from around the world use cutting-edge computing techniques (such as the Grid) to sift through millions of events from CMS to produce plots like the one on the left (a simulation) that could indicate the presence of new particles or phenomena.

Brochure → poster

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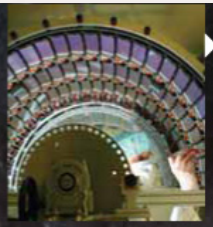

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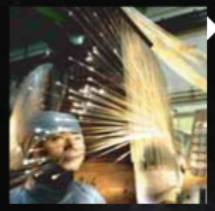

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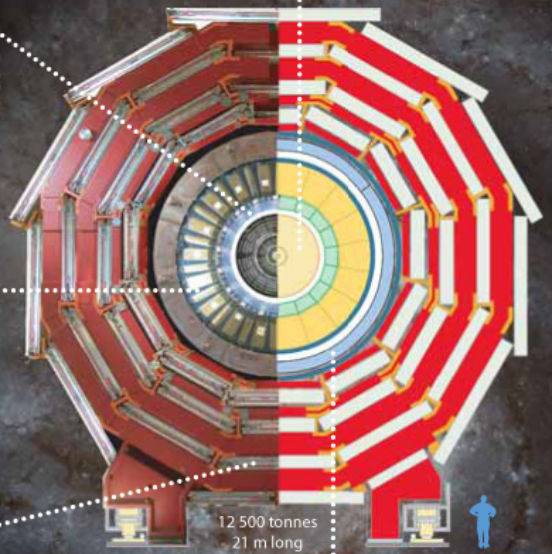

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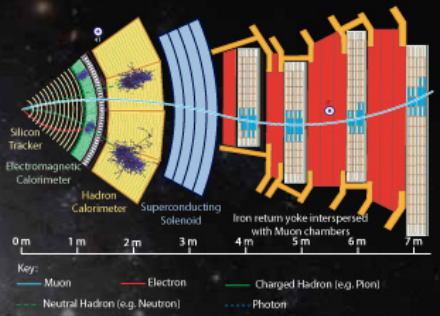

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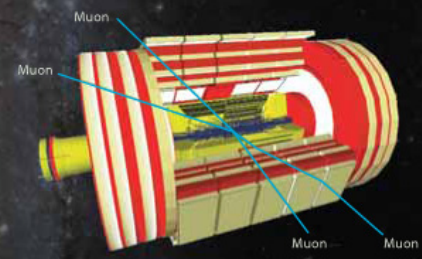

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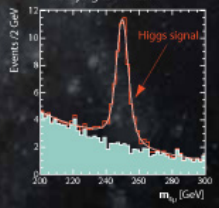

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The Compact Muon Solenoid Experiment
37 countries, 155 institutes
2000 scientists, including about 450 students
http://cms.cern.ch

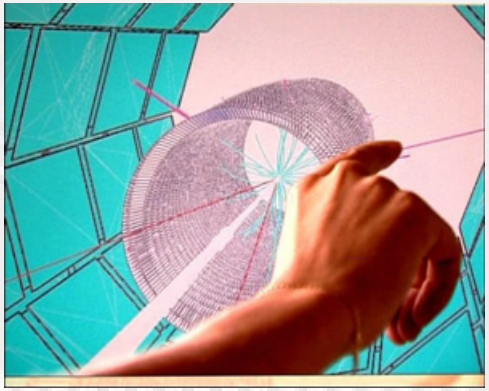
CMS Movie

- **Movie started production (at CERN) in early 2004. First version was available for Open Day 2004**
- **BIG delay in producing final version – indeed no work on it for more than one year. Recently Sophie Mayer has spent ~6 weeks finalizing the movie in English and French**
- **Will be shown after this presentation!**
- **Audience is mainly schools and general public**

CMS Movie etc.

Aim to produce a DVD with English/French language versions

Include CMS brochures, presentation material, interviews etc. as "extras" → need someone to organize this



CMS Graphic Novel

- **Eventual aim is to produce a 20-page book by LHC/CMS startup → target audience is 14-16 year olds**
- **Try to obtain sponsorship by producing a "trial" 4-page brochure in the same style → should be ready by end-October**

Karl Gill is leading player in this project, working with Rolf Landua and the High School Teachers program – particularly Aline Guevara Villegas from the "Universum" in Mexico city

Finances

- **CMS FB approved principle of increase of Outreach budget to 250kCHF/year**
- **Discussions with Scrutiny Group in the past months to address some concerns:**
  - "CMS Times is IN-reach, not OUT-reach"
    - Presently ~80 external subscribers to CMS Times (inc. R.Aymar, J.Engelen)
    - Interviews with young people (inc. video interviews) for showing to high-school/university students
  - "sharing of responsibilities between CMS, CERN, funding agencies etc."
    - CMS Outreach produces dedicated materials
    - CERN has a "co-ordinating" and "dispersion" role
    - PPARC, INFN, FNAL, IN2P3 etc. use material produced by CMS (and are involved in some productions of course)

→ Expect approval from SG soon (probably for 220k CHF)

Future Activities - 2006

- **National Geographic magazine, Discovery Channel etc. + CERN, NSF, FNAL, INFN, PPARC etc. → all wish to make high quality filming of CMS whilst still possible, including the descent of major elements**
- **Idea to produce a CMS "virtual visit" (a la ATLAS)**
- **Mid-late November seems optimum time (while CMS is open)**

→Needs coordinating in terms of safety, non-repetition of effort etc.

→Really require a dedicated person to organize this activity until the end of 2006 → C. Schaefer

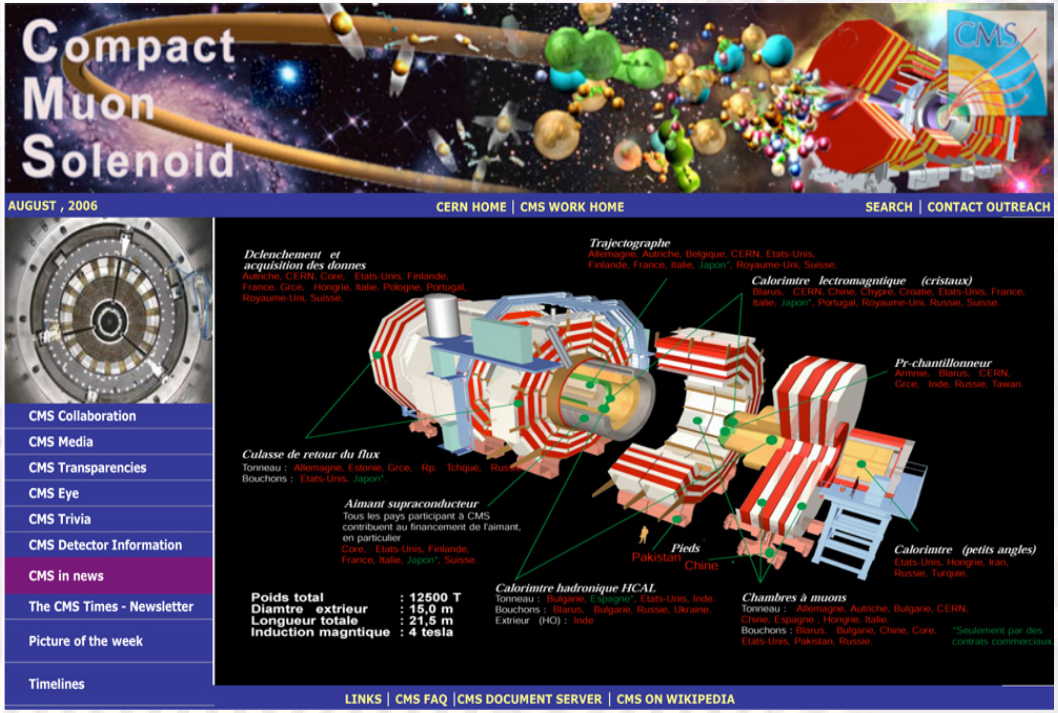
Future Activities - 2006

- **New brochure: translation**
- **Sub-detector brochures**
  - Need to determine the target audience(s)
  - MUST have a common look and feel
    - One graphic designer should produce them all
  - Could be used as teaching tools for university students
  - Probably more than 4 pages
  - Content could be used to produce updated posters, web site etc.
- **Press pack (a la ATLAS)**

Future Activities - 2006

- **Need to update CMS public web site**
- **Front page being examined by Marzena Lapka**
- **Introductory animation required**
  - From Big Bang to the "questions" (a la brochure)
  - The raison d'etre of CMS
- **Need professional help (budgeted) for design, development, navigation etc.**

Content should be provided by CMS



Needs from CB/MB/FB

- **CMS Times**
  - Opinions (simple questionnaire in latest edition)
  - Would like more articles concerning work outside of CERN
  - Institute/people section requires your participation
    - Suggest institutes and young people (not necessarily physicists) to be interviewed. Interviews can be carried out by Marzena at CERN or by people at the institutes
  - Is there still a need for the "picture of the week"? Yes!

- **Major events in CMS**
  - Very useful for CERN press office etc.
  - Almost impossible for me to keep this up-to-date
  - Is it possible to assign someone to this task? (to chase sub-detector reps etc.)