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17 NOVEMBER, 2008

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Editorial

Dear Friends

Before the winter shutdown there was just time for CMS to complete successfully its month-long Cosmic Run At Four Tesla (CRAFT) last week. This was a major data-taking effort involving running the complete experiment for twenty-four hours a day, seven days a week, collecting data from cosmic rays and giving CMS further operational experience even without LHC beams. Read about the success of this run in our first feature article.

Images of CMS both big and small are also highlighted in this week's edition, with an exhibition in Strasbourg showing CMS in its full-scale glory in our second feature article, and an opportunity to take a little piece of the experiment home through our new CMS photo book featured in the Outreach section.

As usual you can also catch up on news from the cavern in Point 5 News, and in the People section hear from collaborators from this week's featured institute, PSI.

With kind regards

Elizabeth Gibney
Marzena Lapka
Bob Cousins

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People

Paul Scherrer Institut (PSI), Villigen (Switzerland) in CMS



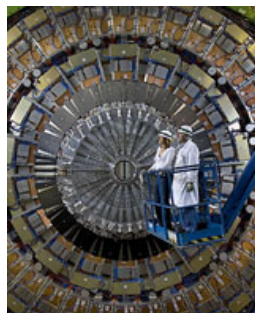
The PSI CMS group.

There are 11 staff physicists in the PSI CMS group, Willi Bertl, Konrad Deiters, Wolfram Erdmann, Roland Horisberger, Quentin Ingram, Hans-Christian Kaestli, Stefan Koenig, Danek Kotlinski, Dieter Renker, Tilman Rohe and Andrey Starodumov. In addition, there are four graduate students, Lea Caminada, Sarah Dambach, Christina Eggel, and Carmelo Marchica in positions held jointly with the ETHZ. Zdenek Hochman, Beat Meier and Silvan Streuli provide invaluable technical support. In addition, Derek Feichtinger in the IT Division of PSI provides support both for the Swiss Tier 2 centre,

CMS Outreach, Visits and Media

From Time.com:

TIME's Best Inventions of 2008:



From a genetic testing service to an invisibility cloak to an ingenious public bike system to the world's first moving skyscraper — here are TIME's picks for the top innovations of 2008...

Read more: http://www.time.com/time/specials/packages/article/0,28804,1852747_1854195_1854117,00.html

From physicsworld.com, 31.10.2008:

A new view of particle physics



Long before C P Snow's two cultures, there was only one. Its supreme embodiment was the great Renaissance master Leonardo da Vinci. Da Vinci saw no barriers between art

and science...

Read more: <http://physicsworld.com/cws/article/indepth/36455>

Point 5 News

Monday 17th November was the kickoff of the CMS winter shutdown. After having taken our magnet through a series of tests it has now been turned off. During these tests, the field was successfully pushed to its maximum value of 4 Tesla. The next step after returning to the operating field value of 3.8 Tesla was to perform a fast dump of the magnet. All these tests demonstrated the quality and reliability of the magnet and of its cryogenics and control components. It also gave an opportunity for the magnet crew to demonstrate their skills while operating this unique piece of unique equipment.

The new CMS Photo Book



The new CMS Photo Book, entitled The Compact Muon Solenoid Experiment at the LHC: Images of the Assembly & Installation, illustrates the assembly, installation and commissioning of the CMS detector at Point 5 in Cessy, France, between 1998 and 2008.

This makes the perfect souvenir for all of the many people who have contributed to the successful construction of CMS and a wonderful Christmas gift for colleagues, family and friends.

Now available to buy from Rebecca Leam in the CMS Secretariat Office (40-5-B01) for SFr.25- each. Special 10% discount for sales of ten or more (Eg. Buy ten for SFr.225-). For large quantities, payments may be made via TIDs using your team account number.

To see a further range of CMS gifts, including the new Magic Cubes and Prisms, visit the Secretariat Office or the online CMS Shop: <http://cms-project-cmsinfo.web.cern.ch/cms-project-cmsinfo/Souvenirs/index.html>

The next step was to allow access to the beam pipe and the forward region. This was done by opening the rotating shielding on the +Z side of the UXC55.



The rotating shielding open, with the beam pipe visible.

and a Tier 3 cluster being built up at PSI to be used by the ETHZ and the University of Zuerich as well as ourselves. Theorist Michael Spira is a CMS Associate member. PSI is the main Swiss national physical sciences research laboratory, hosting a number of facilities which have been used by the CMS group during the R&D and construction phases of CMS (as well as other CMS teams). These include a 590 MeV proton accelerator with a 1 MW extracted beam.

The PSI group led the design and construction of the barrel pixel detector as well as developing important components shared with the forward pixel detector like the radiation hard readout chip. All 800 barrel pixel modules were built at PSI, including the complex bump-bonding in which the silicon sensors were attached to the readout chips. The detector was fully assembled, commissioned and tested at PSI before being transported to CERN. The PSI pixel group is also heavily involved in the CMS tracker upgrade project for SLHC, mostly in the area of the new readout chip design, improved sensors, low mass cooling and a better mechanical design. For the ECAL, PSI led the R&D effort for the APD read-out of the barrel crystals, as well as the quality control of the 140,000 APDs delivered. In addition it helped with testing of crystals and front-end electronics and proposed and demonstrated the feasibility of intercalibrating the Supermodules (to a precision of about 1.5%). On the physics side the group is involved in B Physics analysis including the study of rare di-lepton decays of B mesons.



Lea Caminada

My name is **Lea Caminada** and I am a PhD student based at PSI in Villigen. Villigen is a small town in the northern part of Switzerland and is a 4 hour train ride away from CERN. I'm in the second year of my PhD and I'm working on two projects within CMS: I'm doing an analysis in the B Physics

group and I'm involved in hardware commissioning for the Pixel Barrel Detector which was developed at PSI.

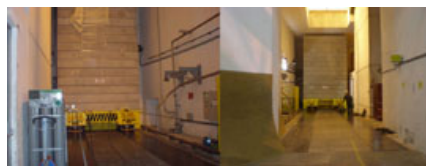
The Pixel Barrel Detector is the innermost part of CMS. It was built at PSI and then shipped to CERN as a whole. It was the last subdetector to be installed in CMS before closing the detector. I took part in the installation that happened this summer. It was a busy and exciting period but in the end everything worked fine and we are pretty happy about the performance of the detector. At the moment, I'm joining the effort of commissioning and operating the detector.

The aim of my analysis is to make use of the data the detector collects. I'll be measuring the b quark production cross section in the very first data we will get from LHC. Until then, I'm preparing my analysis on simulated data in order to be ready for the real data.

I spend my spare time doing many different things. I like to do sports, I go for walks in the city, I enjoy going to the cinema or to concerts or I just do whatever comes to my mind. And if the opportunity arises I like to leave Switzerland for a while and travel to other countries and see the world.

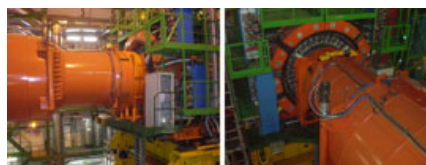
Watch the interview with Lea on You Tube:

Links



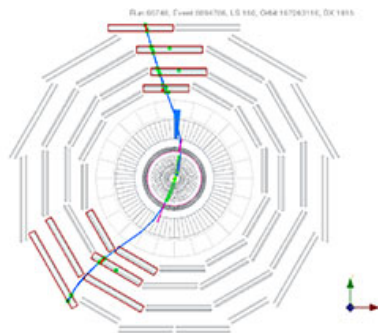
TX54 shielding being opened.

The first steps into the shutdown were about restoring access to the experimental cavern. The TX54 mobile shielding was opened (figure 1), and the PX54 plug in the surface building was fully retracted. In this configuration, loads can be lowered into the UXC55 through both the PM54 and the PX56 shafts.



The rotating shielding closed.

Cosmic success



A cosmic muon that traversed the barrel muon systems, the barrel calorimeters, and the inner strip and pixel trackers.

The CMS collaboration successfully concluded a month-long data-taking challenge known as the Cosmic Run At Four Tesla (CRAFT) on 11-Nov. This was a major effort to run CMS continuously 24/7 as a complete experiment in order to gain further operational experience even without LHC beams, and to record 300 million cosmic muons with the solenoid at its operating point of 3.8T for fine detector studies (a sample that matches in quantity the data collected without magnetic field during the CRUZET runs earlier this year). The actual tally at the end of the exercise was 290 million muon triggers, yielding a rich sample of more than 6 million tracks in the strip tracker and approximately 60,000 tracks in the pixel tracker. The total data volume is 400T Bytes, and runs were reconstructed at the Tier-0 centre with a typical latency of 6 hours and then shipped to several Tier-1 and Tier-2 centres.

During CRAFT operations the CMS data flow was stressed in a way similar to what is foreseen for LHC operation, with calibration sequences performed for ECAL, Tracker and the muon systems during the run. The High Level Trigger ran a menu similar to the LHC startup one, and at the end of the run the full complement of nearly 4500 filter processes for the CMS filter farm was deployed for the first time. Along with the main cosmic data, special raw data streams created for specific calibration and alignment purposes were shipped to the Tier-0 centre. Teams residing at the CMS analysis facility in Meyrin and at remote centres like DESY and Fermilab checked the data quality offline and validated the online DQM run quality assignments.

The week to come will be challenging with many delicate operations next to the CMS beam pipe. The goal for the coming days will be to have HF+ in its garage by the 26th November.

Images by Stephen Rew

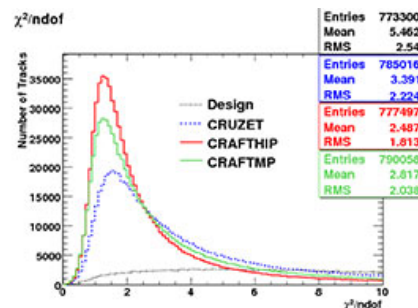
Submitted by:



Martin Gastal

The tracker alignment results that had been obtained using data recorded without field are now improving significantly using data collected during CRAFT since the momentum measurement allows more control of the uncertainty due to multiple scattering. This improvement can be seen in the figure of the reduced χ^2 distribution for tracks fit to various aligned geometries, including the first one determined from CRAFT data. Not shown, but also achieved, was an initial alignment of the modules comprising the barrel pixel detector.

A first reprocessing of the CRAFT data incorporating these newly determined calibration and alignment constants will start soon. Several analysis teams will use these data to perform some basic physics measurements, including measurements of the charge ratio and momentum distribution of cosmic muons.



A comparison of the reduced χ^2 for tracks in the strip tracker as fit assuming the nominal design geometry, the aligned geometry obtained from the CRUZET exercises, and the aligned geometry obtained from two alignment algorithms deployed on CRAFT data.

After CRAFT the solenoid was successfully ramped to 4.0T on 14-Nov in order to check its operating margin, and a test of a "fast dump" (a ramp down of 18000A in a matter of minutes!) from a field strength of 3.8T was successfully conducted. CMS now enters a period of maintenance activities until early 2009, when we will again resume the commissioning program to improve our readiness for LHC physics.

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Darin Acosta

Tiziano
Camporesi

Visiting CMS in Strasbourg or in your own lab



The Main Hall of the "Palais Universitaire" in Strasbourg with the real size CMS image. Photo copyright : Pascal Disdier/CNRS. The real size image is produced using a picture from Maximilien Brice (CERN).

Visiting the CMS detector underground is becoming increasingly difficult. Although access restrictions are necessary, it is a pity for the public at large and public relations. Indeed, although various sub-detector parts are still available around the collaboration for exhibitions, they do not give an exact idea of the CMS's gigantic size and complexity.

The members of CMS and ALICE at the "[Institut Pluridisciplinaire Hubert Curien](#)" (IPHC) of Strasbourg organised a peculiar event with the ambition to really render this gigantic size and complexity. The event, an exhibition entitled "[LHC: l'infiniment petit vu en grand](#)" took place in [the main hall of the "Palais Universitaire" in Strasbourg](#) from 13 to 25 October. This site was chosen almost by chance but very soon its beauty and dimension (15 m high, 21 m large, 25 m long...) proved to be inspiring and motivating: the exhibition had to be as good and spectacular! In this context, two ideas rapidly emerged.

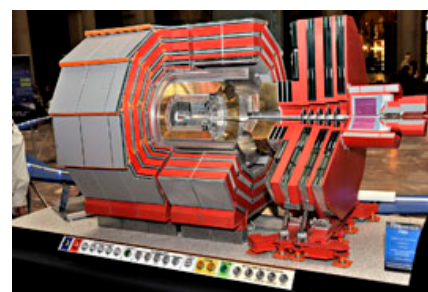
The first idea, inspired by the size of the hall was to impress people using a picture of CMS printed in real size! Visitors are able to approach the image closely like being in the CMS cavern, and are even more impressed by its size.

The second idea, more classical, was the production of a detailed model of the CMS detector. The scale of 1/20, makes it easy to explain how the detector was assembled and how particles are detected. Each detector, from pixels to muon chambers including TOTEM and CASTOR, is precisely reproduced. Parts are movable to show the assembly procedure as in "real live" and some LED's can be switched on to show the detector response to particles, like a track or a shower.

Much thought was also given to the setting in the grand hall. We chose to represent the area of the pays de Gex together with the LHC circle on the floor, including the border between France and Switzerland and other known locations. We were lucky since the "Laboratoire de physique théorique et astroparticules" in Montpellier had produced a 13 meter diameter model of the LHC for a similar purpose, which they kindly agreed to lend us.

The exhibition was completed by sub-detector components or LHC parts lent to us by our colleagues (CEA, CERN, IN2P3, and INFN) and a newly developed set of posters partially inspired by the exhibition of IN2P3 "[Nom de code: LHC. La machine à remonter le temps](#)". The ambition is to explain, without any formulas, the basic ideas of accelerators, particle detection and LHC physics.

Local press and television relayed the event and the exhibition was a considerable success! People were really attracted and impressed by the scene. Often, they took many pictures of the exhibition hall. Furthermore, most of them stayed a long time to read the posters and to talk with us. About 20 physicists, engineers and PhD students from Strasbourg provided on site shifts during the 12 days of the exhibition. We counted over 2000 active visitors, including 20 school classes. Four lectures accessible to a public audience were organised around the exhibition in October. It is also valuable to notice that the "Palais Universitaire" is hosting some art and theology faculties, which sometimes triggered interesting discussions with walking around students and faculty people.



The CMS model produced in Strasbourg. Photo copyright : Pascal Disdier/CNRS

The real size picture will now be reused for the "fête de la science" in Strasbourg from 20 to 23 November, the CMS model has been displayed from 14 to 16 November at the "Grand Palais" (Paris) at the occasion of the "Ville Européenne des sciences", the posters are being shown in Colmar and the LHC model has returned to Montpellier.

For any information about the exposition and its elements: lhc-com@iphc.cnrs.fr or the exposition's web site <http://www.iphc.cnrs.fr/expoLHC/>.

Submitted by:



Pierre Van Hove

Web-cam latest images (click picture to enlarge)