Compact Muon Solenoid Times

1 NOVEMBER, 2010

Editorial

Dear Friends

The LHC has now approached the end of the 2010 proton-proton run and we are in the midst of preparing for the heavy ions run. Despite the hectic months since first physics, CMS has demonstrated its ability and versatility to the world during this run.

An important part of this demonstration is the CMS Page1, which provides live information about all the detector components to all the members of the collaboration. Kaori Maeshima describes for CMS Times the changes made to it over the last few weeks, and the purpose of the fresh-looking Page1.

We also hear from Andrei Gritsan who tells us about the experience of the CMS group members at the 1st National Science and Engineering Festival held in Washington, DC last month. Gritsan and others enthralled the audience with an exhibit on the LHC that included a cloud chamber for visitors to observe cosmic rays.

We hope you enjoy this edition of the CMS Times. We look forward to bringing you news of the heavy ions run, and wish everyone involved the very best.

With kind regards

The CMS Times Editorial Team

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Cosmic ray synergies

In laboratories, cosmic rays have been the subject of scientific research for many years. A more recent development is their appearance in schools, as educational tools. A recent workshop at CERN, organised by ASPERA in collaboration with EPPOG and EPPCN, had the goal of bringing together ideas and initiatives with a view to setting up a future common project.

Presentation at the workshop on 15 October.

In research, as in education, you can sometimes get things done more rapidly and easily by joining forces. For roughly the past decade, physicists have been taking their particle detectors to secondary schools. “The challenge now is to bring all of these existing projects together in a network,” says Arnaud Marsollier, in charge of communication for the ASPERA network and organiser of the workshop.

The workshop held on Friday, 15 October was attended by representatives of major European educational projects and members of the

CMS Outreach, Visits and Media

From *The New York Times*, 1 November 2010:

Trillions of Reasons to Be Excited

(...) “Seven minutes too late,” grumbled Darin Acosta, a physicist from the University of Florida, whose shift running a control room here, among sunflower fields and strip malls, had just ended. On the walls around him, computer screens were suddenly blooming with multicolored streaks and curling tracks...

Read the full article

From *Physics Today*, 27 October 2010:

Baby phase transition, multilayer graphene, LHC now

(...) Dan Green, a Fermilab physicist who also works on the Compact Muon Solenoid (CMS) project at the Large Hadron Collider, reported colorfully on the latest news from Geneva. It was too early for new phenomena to be uncovered, but early collisions had succeeded in recapturing previously known aspects of the standard model of particle physics—such as the production of the Z boson and the top quark...

Read the full article

From *Swissinfo*, 27 October 2010:

Life, the Universe, and Everything

When Jay asked David Barney at Cern what he hoped to learn from his current experiment, he replied "Life, the universe, and everything." He said it with a wonderful smile, but it's not really a joke...

Read the full article

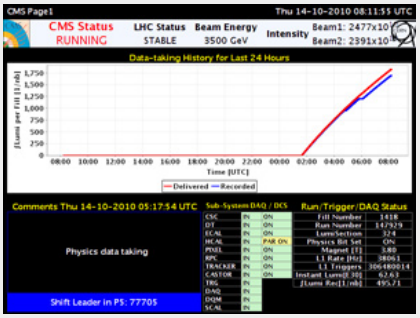
From *CERN Courier*, 26 October 2010:

The window opens on physics at 7 TeV

(...) At the end of September, the CMS collaboration announced the observation of intriguing correlations between particles produced in proton–proton collisions at 7 TeV. It measured two-particle angular correlations in collisions at 0.9, 2.36 and 7 TeV – the three centre-of-mass energies at which the LHC has run...

Read the full article

New CMS Page1



CMS Page1 screen snapshot.

The online Web Based Monitoring (WBM) team is happy to present a new summary of information called CMS Page1. This web page displays real-time CMS data taking status, detector conditions, and accelerator configuration, all in one location.

With such a complex particle detector, with so many channels, sensors, and configurations, properly presenting all of the monitoring data is a formidable challenge. Obtaining and archiving the information are two of the behind-the-scenes steps, but synthesis and presentation turn it into a visual service. Most of the monitoring tools at CMS, many of which are provided by WBM, go into great detail, and provide flexible interfaces for sifting through copious event information and metadata. In contrast, this time the WBM team has thought carefully about how to provide a concise and useful summary on one top-level page.

The layout of CMS Page1 intentionally resembles LHC Page1, with which we have all become familiar. It is also meant to be complementary,

Furthermore, the greater scientific community and the public will also have access to the page through an offline replica, without requiring a CMS-specific login. Admittedly, there are some abbreviations on the page that might puzzle your grandparents and neighbours, but it's good outreach to make such a summary available outside the collaboration.

Figure 1 shows a screen snapshot of CMS Page1. The top section shows the status of the CMS data acquisition system, the LHC beam mode, the beam energy, and the beam intensities. The plot in the middle displays the integrated delivered (red) and recorded (blue) luminosities as a function of time for the previous 24 hours. The bottom-right includes information about the fill, run, magnetic field, and trigger. It also shows the instantaneous luminosity and the integrated recorded luminosity for the current run. The table in the bottom-middle shows whether each of the listed sub-systems is in or out of the run and gives a summary of their high voltage status (on, off, or partially on). Shift Leaders' comments at the bottom-left add a bit of a human touch to the page. When you are performing your duty as Shift Leader, please remember this feature!

The core WBM team members: Front row (left to

European Particle Physics Communication Network (EPPCN) and the European Particle Physics Outreach Group (EPPOG). In all, 21 countries were represented, among them the United States with its QuarkNet project (see box). The purpose of the meeting was to discuss the possibility of enhancing the network of activities, in particular by pooling the various efforts. The large number of participants at the workshop showed the very considerable interest in and enthusiasm for this project. "By presenting ideas to everyone and sharing our practical knowledge, we reflected on how to put life into this project, at the European and not just at the national level," notes Arnaud. "Currently, the various players throughout Europe tend to work in isolation, with considerable efforts required to build and operate their individual cosmic ray detection systems and to conduct the project with teachers and pupils. I am convinced that, if we work together, we will be able to learn from each other's successes, and help new projects become operational more rapidly."

One of the advantages of jointly running a project using different detectors would be the creation of a common data format, which would make it possible to manage the data centrally and make them accessible for everyone. This would open the way to their exploitation for real science, although that is not the main focus. Another possibility is the creation of a simplified, low-cost kit that could be used to launch activities more rapidly in countries where the necessary resources do not yet exist. "Participants need not sign up to the full network immediately. An easy-to-use device would be a way of attracting the interest of new teachers," explains Arnaud.

The workshop spawned a large number of ideas. These now need to be structured with a view to proposing a network project to the European Commission. "It's very encouraging that we managed to get so many people together around a table. The support we received from CERN and the other institutions represented at that meeting will also be crucial for the project's success," he concluded.

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and similar in appearance, to other sources of summary information at CMS such as the DAQ Status display.

The page has a broad audience. It is intended for CMS collaborators, the wider scientific community, and the public at large, as well as for display at the LHC CCC. Viewers of the page can see whether the LHC is delivering stable beams and the CMS data acquisition system is running, and can get an impression of the data-taking history over the past 24 hours. For CMS collaborators, the page offers high-level summary information that can impact their daily plans. For example, will they have data to examine, or is it the right time to request a special test run? At a glance, a detector expert can see whether their system has high voltage on and is in the read-out.

This CMS Page1 was also assembled to satisfy a request from members of the LHC operations group. Initially, they expressed interest in receiving the individual quantities and building the display themselves, but after seeing that the page contains the information they want and that the style resembles that of their own LHC Page1, it has been agreed that this page will serve as a useful line of communication.

right): I. Chakaberia – main CMS Page1 developer (Kansas State University), B. Sulmanas (FNAL), S. Maruyama (UC Davis); middle row: W. Badgett (FNAL), J. A. Lopez Perez (FNAL), A. Soha (FNAL); back row: Z. Wan (Kansas State University), K. Maeshima (FNAL).

Over the years, the WBM team has developed various tools to provide Run Coordination and Operation support. These tools include RunSummary, RunTimeLogger, TriggerRateMonitor, and ConditionBrowser, among others. All of them can be reached from the WBM home page at http://cmswbm.cern.ch. The source data is a mixture of real-time and historical information from a diverse set of systems, such as data acquisition, trigger, luminosity, detector control, beam monitoring, and the accelerator. The new CMS Page1 utilises much of the existing underlying infrastructure. The beta version is available for CMS collaborators and feedback is welcome.

Submitted by:

Kaori Maeshima

Hadron collisions reach out to people in Washington

From left to right: Prof. A. Gritsan, PI of the NSF grant supporting the exhibit; M. Narayanan, a JHU undergraduate student with a Provost's award for developing the exhibit; JHU graduate students: N. Tran (from Fermilab), G. Hu, and A. Whitbeck (from CERN). Not pictured, but also contributed: Prof. B. Barnett, graduate students Ch. Eskew and Ch. Martin.

The value of fundamental science, such as at the LHC, may be taken for granted by many engaged in this research. However, public awareness of the importance of both fundamental and applied science in their lives cannot be for granted. It has been alarming even in such countries as the United States, where science and technology have been strong historically, that new efforts are required to reinvigorate the interest of the nation's youth in science.

With this mission in mind, hundreds of people gathered for the 1st National Science and Engineering Festival on the National Mall in Washington, DC for a weekend in late October. Hundreds of tents were erected in front of the Capitol building, each with scientific content for entertainment and education. The Mall had thousands of visitors of all ages and backgrounds, from professionals to novices, from science enthusiasts to those who were merely curious.

The CMS group from the Johns Hopkins University presented an exhibit called "Science of the Large Hadron Collider". It explained that hadron (proton) collisions happen in the upper atmosphere and their debris penetrates everything and everybody at every instant.

A dark area behind curtains contained a diffusion cloud chamber for the observation of the cosmic rays. This was very enigmatic and had a permanent line of people. Just to see the cosmic ray particle's path with the naked eye in the cloud chamber was a revelation for many visitors. Some were shocked to watch the increasing count in electronics from cosmic rays passing through some scintillator counters. Computer simulation of the exhibit and animated event displays from CMS connected these to the giant apparatus at CERN.

Getting a glimpse into LHC technology led visitors to ask: Why is the LHC needed? The answers are complex and this is where personal interaction with the science enthusiasts from CMS was essential. It would suddenly make sense to many that reaching the highest energy is equivalent to reaching temperatures about 100000 times the temperature on the Sun in the tiny spot of a collision. They were intrigued that this was the equivalent of travelling back to the earliest moments of the Universe and recreating conditions that do not exist any more.

The visitors would learn that the Higgs boson might be one of the extinct "creatures", but dark matter or signatures of extra space-time dimensions could also emerge in such conditions. The explanation for the appearance of matter vs antimatter may be among the many other things that one could learn at the LHC.

People queuing-up to get to see the LHC exhibit

Overall, the exhibit was a great success. Over one thousand people visited the exhibit during the two days. Around 150 quiz prizes were given to the visitors. Even little kids had fun playing with the magnet colliders, weightless magnets, and magnet motors. This overall experience gives us hope that there will be strong support for the kind of science we do at the LHC. We just need to try to reach out to people and explain the value of the science and technology behind it.

Submitted by:

Andrei Gritsan