The Compact Muon Solenoid Experiment
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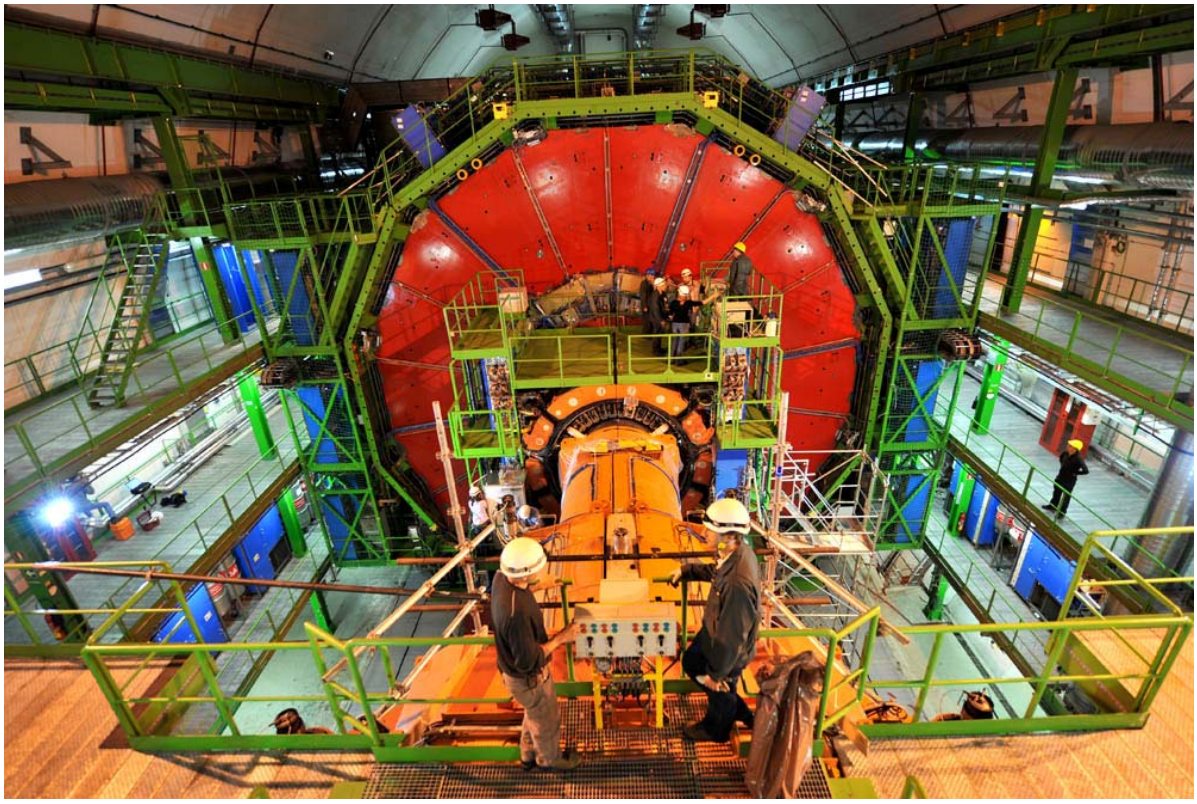
CMS Ready for Physics



After almost 20 years of design, R&D, construction, integration and testing, a monumental milestone was reached with CMS closed and ready in time for the first beams in the LHC.

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NOTE FROM THE EDITOR

As we move from the lengthy construction through commissioning into final Operations with LHC beams the future of this quarterly CMS Bulletin is under review.

As you may well know, since 1996 the CMS Bulletin has been a regular quarterly update of CMS activities. The scope and objectives have remained intact during this period: to communicate the recent CMS management meetings and exchanges with the LHCC; to report progress from the sub-projects and key activities; and to provide important administrative contacts and details including calendars and the list of recent CMS publications. All these reports have resulted in a valuable archive of 12 years worth of activity reports, accessible at:
http://cms.cern.ch/iCMS/jsp/page.jsp?mode=cms&action=url&urlkey=CMS_BULLETINS

In parallel, during the last 3 years, the 'CMS Times' has proved a very popular alternative channel of communication, aimed at informing the Collaboration, as well as people outside CMS, of the most recent news and progress. The content of the Times is, in contrast to that of the Bulletin, much more concise, informal, and in the format of a web-based Newsletter, which complements the more rigid, formal style mandate of the Bulletin.

Your feedback is needed to determine the future of the Bulletin. A survey will be sent to you soon by mail. I would really appreciate your feedback.

In the meantime, one modification has been made to save significant effort at a very busy time: in the CMS NEWS section below you will find instead only links to the minutes of recent Management Board and Collaboration Board meetings instead of the usual long summaries.

Finally, I take this opportunity to draw your attention to the new CMS Public web-pages at:
http://www.cern.ch/cmsinfo
Please send your comments on these new pages to outreach@cern.ch.

Karl Gill
September 2008

CMS NEWS

MANAGEMENT BOARD MINUTES

The Agendas and Minutes of the Management Board meetings are accessible to CMS members through Indico.

http://indico.cern.ch/categoryDisplay.py?categId=223

COLLABORATION BOARD MINUTES

The Agendas and Minutes of the Collaboration Board meetings are accessible to CMS members through Indico.

http://indico.cern.ch/categoryDisplay.py?categId=174

SUMMARY OF THE CMS WEEK 23 – 27 JUNE 2008 AND REPORTS OF RECENT ACTIVITIES

TECHNICAL COORDINATION

Summary of progress since last CMS week.

Ten years of construction work have been completed. CMS is closed, in very close to the ideal low luminosity configuration, and performed well in the first tests with LHC beam.

Behind this encouraging news is the story of a summer of intense commitment by many teams (from the collaboration and 3 CERN departments) working together, against the clock and despite many minor setbacks, to ensure that the experiment was ready to play a leading role in the excitement of September 10.

Following beampipe bakeout and refill with pure neon, a magnificent effort by the ECAL group and the pt 5 technical crew made it possible to install and commission all 4 ECAL endcap Dees before the end of August. In the shadow of this activity, the barrel and forward pixel trackers and part of the beam monitoring were installed within the vac tank. The pt 5 technical teams then succeeded in safely removing the 20t installation tables and their support blocks from beneath the already installed beampipe, without incident. The heavy engineering crews then closed the endcaps, with the beampipe in place, with excellent precision and within the nominal time interval (3 days per end). Both HF structures, completed in the shadow of the closing operations, were then raised to beam height. The beam monitors, the minus end 1/8 of CASTOR and ½ of TOTEM T2 were the last detectors to be mounted, after which HF, the collar shielding and the massive forward shielding system were closed around the beam-pipe. Close-support and rapid reaction from the survey and alignment groups were essential to success. The vacuum group then took over and pump-down of the pipe was completed, with excellent vacuum conditions achieved, in time to open the sector valves on 8'th September.

The 3-month long endgame sequence was thus completed on schedule and without serious incident.

The magnet was re-commissioned and the underground test-programme completed up to the fast dump at 3T, before HF was raised to beam height. In the very last days before beam, the smoke detection and ODH systems were commissioned, the ventilation seals UXC-USC and UXC-LHC completed and the required pressure differentials confirmed.

Finally, the surface control room technical area, including access control, beam monitoring, safety panel and magnet/cryo stations was made operational in a provisional configuration.

During first beam operation, the beam- and radiation monitors, along with the calorimeters and the muon system detected evidence of beam as expected. The injection inhibit and beam abort were made active.

Commissioning of the magnet continued, interleaved with beam operations. Behaviour of the cryogenic and electrical systems and the measured fields within the vac-tank and the yoke is so far indistinguishable from that seen in MTCC. Nevertheless, in aspects not tested in MTCC, there are some surprises. In particular there are larger than expected fringe fields in several locations, notably in X0, USC, the beam triplet region and amongst the very forward detectors and shielding. The plan to address these effects can now be carried out more easily in the break in LHC beam operations caused by the incident on 19'th Sept.

Safety

CMS has had the opportunity to exercise operation mode and the UXC has seen the first beam, which means that new safety and access rules have to be applied.

Access to USC is unchanged. The CERN card with a MIFARE chip and the EDH-access 'CMS-U' allow passage through the turn-style at the surface. Access to UXC is possible only when LHC is not running and an access has been agreed with the CCC. To enter UXC a personal dosimeter, an iris scan and the EDH-access right CMS-U are mandatory. Very shortly a specific CMS-UXC access category will be introduced. Access will frequently only be possible in 'restricted' access mode (eg during final magnet commissioning or when beam operations, once resumed, are interrupted by short breaks). It is important that everybody entering the UXC in this "restricted" mode is familiar with the operation of the personnel (PAD) and material (MAD) access installations beforehand. Violations of the operation rules will immediately break the interlock of the entire region, requiring a time consuming patrol and re-arming of all doors in the hall. A set of operational rules for requesting short accesses has been drafted and will be applied in suture beam operations.

Given the very low amount of circulating beam seen so far, Technical Coordination will ask the Safety Commission to de-classify the UXC cavern to simplify work until the next beam operation period. However, as UXC has seen beam, CMS must, until further notice, consider any material from the hall as potentially radioactive and store it in the buffer zone behind the TX-wall. It can only be brought out once RP experts have measured it and declared it as officially non-radioactive. This rule also applies for any forgotten tools. Therefore it is very important to carefully check-in and check-out all tools used during a UXC access. Eating and drinking in UXC is forbidden.

Plans

Planning for the winter shutdown will have to be adapted to a new set of time constraints once these

become clear. Much work was foreseen for January-March 2009, but this cannot easily be brought forward to autumn 2008 due to lack of material and personnel. In addition, we must not squander the effort invested in the first closure, nor the momentum towards full commissioning at 3.8T, nor neglect the risks associated with opening and closing.
Technical Coordination will now develop a short-term schedule for systematically completing commissioning of the low lumi configuration (minus endcap preshower), culminating in CRAFT. This process will start once we can get vacuum group attention for returning the beam-pipe to 1 atm. Presssure.
All essential or desirable installation and maintenance and consolidation work must be communicated to Technical Coordination, so that a risk-benefit analysis can be applied.
The familiar pattern of Tuesday and Friday point 5 meetings, with TC and/or TIG meetings every 1-2 weeks, will resume immediately.

Austin Ball and Wolfram Zeuner.

MAGNET

The cooling down to the nominal temperature of 4.5 K was achieved at the beginning of August, in conjunction with the completion of the installation work of the connection between the power lines and the coil current leads.
The temperature gradient on the first exchanger of the cold box is now kept within the nominal range. A leak of lubricant on a gasket of the helium compressor station installed at the surface was observed and several corrective actions were necessary to bring the situation back to normal. The compressor had to be refilled with lubricant and a regeneration of the filters and adsorbers was necessary. The coil cool down was resumed successfully, and the cryogenics is running since then with all parameters being nominal.
Preliminary tests of the 20kA coil power supply were done earlier at full current through the discharge lines into the dump resistors, and with the powering busbars from USC5 to UXC5 without the magnet connected.
On Monday evening August 25th, at 8pm, the final commissioning of the Magnet started, working at night to leave the day free for the forward region detector final installation.
The first two nights were dedicated to checking the communications among all the control systems and look at the different interlocks. Minor problems were found on some electronics and sensor connections. A ground was identified on a chassis for the instrumentation used for diagnostic only, not for the process. The faulty ground was removed. The current was then raised up to 3200 Amps, followed by a fast discharge, leaving the coil superconducting. The night after, the current reached 10 kAmps (equivalent to a central field slightly above 2 Tesla) and a flat top of one hour was given to sub-detectors to check their electronics and possible noise. A slow dump was triggered at that stage followed by a programmed fast dump (FD) at 4.5kA in order to dump the current in a faster mode. This worked well as the cryogenics was able to take the complementary heat load. The magnet temperature increased only by 2 degrees and it was back to 4.5K after 5 minutes. This so-called “slow dump acceleration” was validated and will be systematically applied at 4.5kA following a slow dump.
Finally the current was set to 14500 Amps (3 Tesla central field) during the night of August 29th -30th for almost two hours to allow an extensive run of sub-detectors.
A FD was triggered at 3 Tesla to check the maximum temperature and pressure rise in the helium-cooled loops. The magnet average temperature was 55K after the FD and it took no more than 2 days to cool it down to 4.5K. Magnetic field measurements were achieved during the flat tops with the expected precision, using both the Hall probes on the yoke and the NMR probes positioned close to the central detectors. The tests also allowed a check of the fringe field in the experimental and service caverns.
All the parameters were checked and inside their reference values. The test plans up to 3T were fully achieved within the restricted time allowed.
On September 8th, the magnet was again ramped up to 2T, then 3T with continuous monitoring and checks inside the UXC5 in the surroundings of the magnet and detectors. The final test at 3.8T will be at a later date.

Submitted by Benoit Curé and Andrea Gaddi.

INFRASTRUCTURE

With all the technical services running, the attention has moved toward the next shutdown that will be spent to perform those modifications needed to enhance the reliability of CMS Infrastructures. Just to give an example for the cooling circuit, a set of re-circulating bypasses will be installed into the TS/CV area to limit the pressure surge when a circuit is partially shut-off. This problem has affected especially the Endcap Muon cooling circuit in the past. Also the ventilation of the UXC55 has to be revisited, allowing the automatic switching to full extraction in case of magnet quench. (Normally 90% of the cavern air is re-circulated by the ventilation system.) Minor modifications will concern the gas distribution, while the DSS action-matrix has to be refined according to the experience gained with operating the detector for a while. On the powering side, some LV power lines have been doubled and the final schematics of the UPS coverage for the counting rooms have been released.

The most relevant intervention on the infrastructure side, done in the past weeks, has concerned the revamping of the racks ventilation crates in UXC55. As described in the last CMS Bulletin issue, a significant number of units have shown a failure of the motor ball bearings, well before the expected MTBF. Some fifty units have been inspected and retrofitted with a new arrangement of the plastic fan that should prevent these kinds of failures in the near future. In the meantime, a long-term solution has been sought. Six prototypes of field-tolerant ventilation crates are being assembled at the Ziehl-Abegg company, in Germany. These prototypes are expected at CERN by the end of September to undergo magnetic and functioning tests. Following to that, an extensive campaign of replacing the old units with the new ones could take place toward the end of the winter shutdown.

Submitted by Andrea Gaddi.

INNER TRACKER

The last three months have been very productive for the CMS Tracking Systems.
At the June CMS Week the Cooling System problems had delayed the commissioning of the Silicon Strip detector. These problems were successfully solved, and after a little over three weeks of commissioning a large fraction of the Silicon Strip detector was able to join the CMS Cruzet 3 Global Run (8 July). In addition on the Monday (14 July) following the end of the Global Run, the first preliminary results from both the reconstruction and alignment of Cosmic Tracks were presented to CMS.
Starting in the week beginning 21 July both the Barrel and Forward Pixel Detectors were installed into CMS, connected to the pre-installed services and commissioning was started.
Since then all of the tracking Systems have been continuously commissioned and the focus has been on solving a number of small problems, and on calibrating the detectors and synchronizing the detectors with the CMS Trigger. More than 99% of the Silicon Strip Tracker is reliably operating with CMS on a regular basis.
The recent focus of activity has been to be ready to collect collision data from LHC at 900 GeV/c. This has involved understanding the operation of the Beam Condition Monitors (BCM) and the effective operation of both the LHC beam abort and injection inhibit systems. Provided the LHC provides stable colliding beams and the beam safety interlocks operate successfully the CMS Tracking Systems will collect data from the first LHC Collisions.

Submitted by Peter Sharp.

ELECTROMAGNETIC CALORIMETER (ECAL)

ECAL Barrel (EB)
As already mentioned in June, the Barrel ECAL is fully commissioned and routinely used during CRUZET runs. Good progress has been made in the last months to ensure a stable and fully reliable operation, in particular for the Trigger path. More details can be found in the DPG report in this bulletin.

ECAL Endcaps (EE)
In the June CMS bulletin, it had been announced that the Dee's mechanical assembly had been finished end of May. However the electronics integration was still going on for the first Dee.
The Summer has seen a spectacular breakthrough of the Endcap project. The electronics integration of Dee1 was completed early July, and this first Dee was transported to point 5 on July 8th. The completion of the three other Dees followed at a pace of one per week. In all cases the quality of the detector as measured in the assembly center was excellent, with all channels active and the expected noise performance (see for example the reports presented at the mid-July ECAL plenary meeting http://indico.cern.ch/conferenceDisplay.py?confId=37328).

From mid-July until mid-August, an intense activity took place at point 5 to install and commission the 4 Dees inside CMS. About 80 physicists, engineers or technicians were involved in this huge effort requiring multiple shifts, seven days a week. As a result, the complete EE is now operational and large fractions have even been readout out in the recent global runs.

The last equipments remaining to be installed are the specific Endcap Trigger modules(TCC-48). Pre-series modules were produced and qualified in June. The production is now running at full speed and it is expected that the Trigger on Endcap electromagnetic energy depositions will be available for the first 10 TeV collisions.

Preshower (ES)
The Preshower project has also made very large progress during the summer.
The hybrid and micromodule production is almost complete. All the other elements required to complete the detector assembly have been procured.
All the Preshower activities, except the individual ladder cold testing, were moved to the Tracker Integration Facility (Bldg 186) which provides both sufficient space in a clean room and the ability to test large detector elements at the operating temperature (-15 °C).
In July, ladders were successfully installed on the first "Dee shaped" lead absorber (the Preshower comprises in total 8 such absorber planes). This assembly was

followed by an intense set of tests, including many mechanical adjustments, to make sure that the four planes of each endcap can be safely brought together to build a complete ring at point 5 and also to verify the internal cabling sequence. The final cabling of this first plane in the vertical position is now proceeding. In parallel, the assembly of ladders has been completed on the second plane and is proceeding on the third plane.
The target is to finish the assembly of the full Preshower by December, to install it during the 2008/9 shutdown.
The production of the Off-detector readout modules (ES-DCC board and Opto-Rx) is proceeding as well. The first 32 Opto-Rx boards (from a total of 104 required) have been received and tested successfully, whilst 12 ES-DCC boards (from 56) have been successfully tested. This final readout system will be used for the tests in TIF.
Finally, when it became clear that no full Preshower could be installed in time for the first collisions, it was decided to insert in CMS a very small system (a 10 modules ladder) without lead. This "Preshower in a Box" (ESIAB) is now installed inside CMS. It will help to exercise the Preshower integration in the central DAQ and therefore make the integration of the final object next year much easier.

Submitted by Philippe Bloch.

HADRON CALORIMETER (HCAL)

HCAL finished commissioning the central and forward detectors during the summer of 2008. HCAL was able to participate in all global runs. In particular, we were anxious to determine the performance of all of the HCAL HPDs at 3.8T. At this point in time this study still has not been completed because of various difficulties CMS has encountered to reach 3.8T.

HF Commissioning
The HF produces the raw data for the CMS Luminosity determination. It is also an important part of the min-bias trigger and forward jet triggers and physics. In June 2008 the HFs were out of their garages and being worked upon for Castor/Collar platform installation. The HFs were back in the garage position in July and were subject to a series of checks (mainly LED and laser) before starting the CRUZET3 global runs. As part of this sequence, calibration constants were checked via single photo-electrons, the HV choice was finalized and the relative timing was fixed. During CRUZET3 tests of LUMI were performed, and muon signals were measured in HF(-).
Following an internal CMS review last month it was decided to install scintillating crystals in front of a few HF PMT's in order to study the anomalous signals produced by muons crossing the glass windows of the PMT's. A total number of six crystal wafers were installed consisting of several different thicknesses of two different types of scintillating material.

HB and HE Commissioning
HB commissioning has been finished for considerable time. However HE commissioning was only finalized recently. No channels are missing.
All permanent source drivers, six for HE, four for HB, and four for HF have been installed and tested for proper operation. All of the permanent source driver tubes, approximately 2000 in number, have been scanned using "dummy wires", wires without radioactive sources, verifying the integrity of the system.

HO Commissioning
The HO detector and readout boxes were installed in the muon rings in the surface hall of point 5. This installation included the honeycomb panels with scintillator trays mounted inside as well as the RBXs.
Much of the cabling was also finished in the surface hall. Once the wheels were lowered into the experimental cavern the final cable connections were completed and the full system commissioned.
The complete HO detector participated in the sequence of CRUZET global runs. Some mapping corrections were made using cosmic muon data. A calibration of the HO tile system was also performed using the cosmic muons.
HO also took data during the CRAFT runs. These runs concentrated mainly on noise studies and cross-talk studies of the HPD readout system. As a result of the MTCC (2006) HPD noise studies the HO RBXs have been repositioned to minimize the HPD noise in HO. The present set of measurements are important to verify that the HO readout system is viable. Results on HPD response with the main magnetic field as high as 3T were obtained with no indication of runaway noise in any of the HPDs under investigation. However the CMS magnetic field studies have yet to be completed at 3.8T. The magnetic fields inside the muon wheels at the location of the HO RBXs range from 0.25T to 0.35T at full field in the central CMS detector.

HCAL Trigger
Considerable time and manpower was spent on establishing the HCAL trigger options. HCAL Trigger Primitive generation is fully available. Transmission through the trigger chain to L1a generation is fully commissioned through the electron path, but only partially through the jet path. Emulator studies have allowed us to correct a few defects in the HTR firmware TP Generator, and provide a high level of system integrity assurance.
Recently a TTP (Technical Trigger Processor has been commissioned, which allows HCAL to trigger on HF and HO signals over threshold, both globally and in local running. This functionality has proved very useful and flexible in the process of monitoring HPD discharge rates during the commissioning of the CMS solenoid.

HCAL Trigger Commissioning and LUTs

The heart of the CMS calorimeter trigger system uses fast, custom-made FPGA-based electronics, capable of making a snapshot of the calorimeter every 25 ns and deciding whether the energy deposits found in the calorimeter towers form a pattern of potential interest for further analysis. In addition, the system provides means to measure instantaneous luminosity of the collider by summing energy in the sections of forward hadronic calorimeter, the HF, as well as feeds the minimum bias trigger, which counts HF towers with energy deposition above certain threshold.

All of these is achieved via a set of lookup tables and simple algorithms allowing for fast summation of the digital signals. A huge advantage of the digital trigger is the ability to emulate it precisely and to use the trigger emulator for validation and commissioning of the trigger algorithms and the underlying firmware. The commissioning of the HCAL trigger is nearly completed, thanks to a coherent effort of a number of people led by the Brown university group. Using CRUZET data, we have identified and helped to debug a number of firmware glitches and also tune the timing of the calorimeter trigger. In the latest global runs we have observed the agreement between the trigger primitives in the data and the emulator information for 99.9999% of the events. We are working to iron out the remaining small number of discrepancies, which are likely due to rare cases of data corruption somewhere in the trigger system.

In order to accomplish this task we have developed a flexible and simple interface, which allows us to configure the system in many different ways, from very simple, technical lookup tables, which are convenient for debugging purposes, to complex and fully optimized sets of "physics" lookup tables, which take into account gain and pedestal variation from one calorimeter channel to another and maximize the efficiency of jet triggers. These tools are now routinely used by the shifters and HCAL experts to change trigger configuration in a matter of minutes. They also provide interface for the Regional Calorimeter Trigger to properly unpack the HCAL trigger data and add it to the similar data from ECAL.

One of the recent successes was the commissioning of the so-called fine-grain bit, used for the minimum-bias trigger. Each trigger tower in HF represents a sum of 12 digital signals coming from 6 physical towers of the HF; each of the latter providing two independent signals from two sets of fibres of different length, which allow for estimation of electromagnetic fraction for jets found in HF. It turns out that the granularity of the HF trigger towers is not sufficient for robust triggering on minimum-bias interactions. Thus, the transverse energy in each of the six towers within one trigger tower is examined before summing them all together, and a special bit (the fine-grain bit) is set if any of these individual transverse energies exceeds a pre-programmed threshold of the order of 1GeV. One fine-grain bit for each trigger tower is then sent on to the Global Calorimeter Trigger, which counts the number of bits set for the trigger towers forming concentric rings in the HF and decides whether the event should be triggered on. A similar technique is used for measuring instantaneous luminosity of the LHC in real time and is now being commissioned by the Princeton University group based on the information provided by the HCAL trigger. We are now ready to do final tests of the system using first LHC beam data.

Submitted by Andris Skuja.

MUON DETECTOR: BARREL DRIFT TUBES (DT) AND ALIGNMENT

After months of cosmics data taking the drift tube (DT) detector is in good shape, ready for LHC beams. Several hundreds of millions of cosmics events have been recorded; out of those, more than 90% were triggered by the DT system. Data integrity analyses have shown a very reliable read-out system, also during high rate tests. With a 98% of the detector operational, only awaiting the arrival of some low voltage modules and for the completion of the DT Track Finder system, data taking is starting to become routine job. These continuous running exercises have been very useful to study performance and reliability of the detector in a medium term period, allowing understanding and fixing failures that have occurred with low frequency. Drift tubes have become a very stable system, becoming a service of muon triggering for the tracker after its final installation. During the last months, major efforts have taken place in synchronization tasks, within the DT system (250 chambers) and also with the rest of the CMS sub-detectors: all parts have been synchronized with cosmics within 1 bunch crossing. Once the installation and cabling of all electronics parts was completed, major efforts have been devoted to study grounding schemes, to review the control and safety systems of the detector and to improve present tools of configuration and monitoring of the system - which are still evolving. A good understanding of the behaviour of this large system has been achieved.

The huge amount of cosmic data collected during the summer global runs was analyzed using the final reconstruction algorithms. The results show good performance of the DT Chambers and Local Trigger in terms of resolution and efficiency. The cosmic tracks have been used to validate the internal chamber alignment and the survey geometry: the calculated constants have been uploaded in the DB and they are used in the CMS reconstruction. The wheel-to-wheel alignment and the alignment with respect to the tracker is still ongoing. The data quality has been continuously improving thanks to new DQM software with summary histograms and automatic checks that

allow the shifter to make a fast identification of problems. This is complemented by the prompt offline analysis team either at the CMS Center or at the home institutes that provides feedback in a few hours. The calibration workflow has been thoroughly tested; nowadays, new calibration constants are calculated and available to ORCON/ORCOFF within a few hours.
The continuous running exercises have been used also to train a crew of expert shifters that will run the DT detector in the coming months.

Muon Alignment
By June the low voltage power supplies for the alignment system had finally been all delivered. For the first time the entire electronics of all three subsystems (endcap, barrel and link) could be turned on simultaneously.
Installation of all the MABs (Modules for the Alignment of the Barrel) has finished. During the summer the installation of all the Z-bars and their optical sources has been completed. The Barrel Alignment has developed an online data taking procedure which uses the online database both for configuration and data saving. Unfortunately, three MABs experienced electronics problems and are unusable for geometry reconstruction, while other two MABs probably suffered some impact and were broken, but remain close enough to their nominal positions that they are not entirely lost for analysis. All these problems will be fixed during the shut-down. The redundancy of the system allows for a geometry reconstruction in spite of the loss of information.
The commissioning of the Endcap Alignment system has finished. No major hardware issues were found and efforts are now shifting to refine and automate the data taking and to reconstruct the geometry.
The commissioning of the mechanical structures, lasers, sensors and electronics of the Link Alignment has finished. The Alignment Ring (AR) fixations were re-machined in order to compensate for the misalignment of the tracker faces upon which the ARs are mounted. The entire DAQ and data chain has been tested during the recent CRUZET runs and during the ongoing tests of the magnet.
After closing the endcap wheels, the link system can see nearly all lasers in the positive side. The wheel YE-1, however, closed below its nominal position, causing a mechanical target to slip below its corresponding distanciometer. One longitudinal profile used to measure the distance between the AR and the Link Disk (LD) had to be removed to guarantee the detector integrity at nominal field. As a result, the LD in the minus side is misoriented and the link sees no lasers on this side. This problem will be addresses during the winter shutdown.
The track-based alignment has provided tags in ORCON/ORCOFF, ready for use in the CMS reconstruction software. Wheel-to-wheel alignment with tracks is being validated, and the first attempts to align the muon spectrometer with respect to the tracker are going on.
A large effort is going on to integrate all three subsystems into a final detector geometry. The optical geometry reconstruction has developed the first working model of ME+1 which uses link inputs.

Submitted by Marco Dallavalle with contributions from Alberto Benvenuti, Cristina FernanRoberto Carlin and Mary Cruz Fouz for DT, and Gervasio Gomez for Alignment.

TRIGGER

Level-1 Trigger Hardware and Software
The production of the trigger hardware is now basically finished, and in time for the turn-on of the LHC. The last boards produced are the Trigger Concentrator Cards for the ECAL Endcaps (TCC-EE). After the recent installation of the four EE Dees, the TCC-EE prototypes were used for their commissioning. Production boards are arriving and are being tested continuously, with the last ones expected in November. The Regional Calorimeter Trigger hardware is fully integrated after installation of the last EE cables. Pattern tests from the HCAL up to the GCT have been performed successfully. The HCAL triggers are fully operational, including the connection of the HCAL-outer and forward-HCAL (HO/HF) technical triggers to the Global Trigger. The HCAL Trigger and Readout (HTR) board firmware has been updated to permit recording of the tower "feature bit" in the data. The Global Calorimeter Trigger hardware is installed, but some firmware developments are still needed for a few remaining triggers such as the "feature bit" trigger, the H_T and missing E_T triggers and to finalize the transverse energy lookup tables. The jet trigger is fully debugged and is being validated.
The Drift Tube (DT) local trigger participated in CRuZeT IV (the fourth week of Cosmic Runs at Zero Tesla) with 98% of the chambers being read out. The TTC fibre arrangement was changed to allow easier access to the splitter boards, which are now in a drawer at the bottom of the crates instead of in the crates. The DT track finder operated on all wedges except one in the horizontal plane due to a few phi track-finder boards still under repair. Progress has been made on the DT eta track-finder, but the final firmware for the input boards still needs to be implemented. New firmware for the CSC track finder sector processors now allows sending the beam halo bit to the Global Muon Trigger. Some timing issues between the CSC and the DT track finders still need to be solved. The RPC trigger including the link system operated stably in CRuZeT IV. Trigger rate peaks were sometimes seen, which need to be better understood. The Global Muon Trigger worked well during the recent global runs. Its configuration and monitoring software has been further developed.

The Global Trigger counter and scaler monitoring has been improved. Triggering on jet and tau jet algorithms has been performed successfully. Tools for quick development of new GT firmware for new algorithms have been developed. The trigger menus for the LHC startup and the corresponding firmware have been prepared with it. A graphical interface that simplifies the choice of physics trigger algorithms and technical triggers in the final OR is under development. The 'active beam' signal coming from the BPTX will be used for the single-shot LHC runs. The scintillating fibre signal and the Zero-Degree Calorimeter trigger signals are also being prepared. The TTC team has studied issues caused by switching sources of the LHC clock. The LHC injection test was also monitored.
A strong effort is being carried out to validate and further develop the L1 trigger software tools. Extensive tests of stability of Trigger Supervisor cell communications were performed. Improved versions of the trigger Function Manager and trigger "page-one" are now available. Other improvements took place in various areas, namely the L1 trigger emulators online to offline (O2O) translation, data quality monitoring trigger diagnostics, monitoring rate counters and non-event data. Progress was made in the alarm system and on a standard tool used for trigger pattern tests.

Level-1 Trigger Commissioning
With the completion of CRuZeT IV and the first Global Runs with magnetic field, CMS was operating all physics-trigger paths at Level-1 needed for startup and first collisions. The latest achievements were made in the jet-trigger path through the Regional and Global Calorimeter Triggers (RCT & GCT) to the Global Trigger (GT) from all calorimeter regions using the same "physics" look-up tables as those prepared for collisions. It has been shown that the hardware is capable of triggering on jets using the jets path through RCT & GCT and not just through the e/gamma path, so the focus has moved to the diagnostics and treatment of noisy channels and to allow fast, flexible and reproducible masking of noisy channels whenever necessary. Robust and redundant trigger strategies were defined for first (single) beam running and collisions. In parallel, the commissioning of the minimum-bias physics trigger from forward-HCAL (HF) as well as the noise studies to set the thresholds as low as possible have highest priority.
The first technical triggers were received from the Outer HCAL (HO) and HF (for minimum-bias) and triggered on by the GT, proving readiness for the remaining technical trigger inputs. The next technical triggers that are anticipated are those from the Beam Pickup (BPTX) and the Beam Scintillator Counters (BSC) in order to have redundant sources for Zero-bias (or beam passage for single-beam operation) and minimum-bias triggers, as well as beam-halo triggers for tracker endcap alignment.
The barrel and endcap muon detectors have gone through a systematic cross-synchronization exercise and the active RPC and DT sectors have been synchronized to cosmics. A comparison of signal timing in the HCAL endcap for CSC triggers, compared to signals observed in HCAL barrel for DT/RPC triggers, has allowed coarse synchronization of the endcap with respect to the barrel muon systems even with the detector being wide open. Once the endcaps will have been closed, fine synchronization will benefit from cosmic muons seen by both barrel and endcap muon systems in the overlap region.
Another achievement marked the operation of the CSC halo muon trigger, which is based on special angular requirements and is marked as such by dedicated quality bits in the trigger. It has been shown that cosmic muons, which fulfill the CSC halo muon criteria, are properly received and trigger the readout of CMS, together with the rest of the cosmic triggers from all three muon systems.
For a large fraction of the time in between Global Runs, the muon triggers operate as a service for Tracker and Pixel commissioning in various configurations.

Trigger Studies Group
The last few months have seen the completion of several projects for the Trigger Studies Group with the final preparations for the LHC startup and the commissioning of the L1 and Higher Level Triggers (HLT).
Major updates have been delivered for the L1 system with work on the offline Configuration Data Base and the storage of L1 configuration parameters, ongoing development of the O2O system, a newly commissioned jet trigger, and the integration of HF-based minimum bias triggers. In parallel, the L1 algorithms are being validated against the emulator and tested in the cosmic runs.
On the HLT side, relaxed (reduced threshold and topology requirements) triggers for the early collisions have been introduced in the startup trigger menus with an emphasis on the robustness against startup beam and detector uncertainties. The HLT paths for startup calibration and alignment were fully defined. Further optimization of the bandwidth between L1 and HLT has been achieved with the removal of obsolete triggers. Large MC samples have been used for the design of primary datasets and first versions of trigger menus for all expected 2008 luminosities.

Trigger monitoring software is integrated with the offline DQM to provide quick feedback on the trigger performance at the Tier-0. The list includes L1 emulator-data comparison, distributions of four-vector HLT objects and comparison with offline reconstruction, and Physics Object Group specific trigger monitoring tests. Progress has been made with documentation and shifter layouts for online DQM, and the integration of trigger validation code in automatic release validation sequences as part of the Release Validation (RelVal) workflows.

Finally, a significant amount of resources is being spent in the online commissioning of the trigger menus in collaboration with the Event Filter Group. Early trigger menus have been tested in cosmic runs for different values of the magnetic field and detector configurations. Infrastructure is being put in place for the comparison of online and offline trigger decisions. A startup trigger menu has been prepared with new technical triggers to help capture the data from the first protons circulating in the ring and the 450-GeV collisions.

Submitted by Wesley Smith with contributions from Tim Christiansen, Christos Leonidopoulos, Joao Varela and Claudia Wulz.

DATA ACQUISITION (DAQ)

The CMS Storage Manager System

The tail-end of the CMS Data Acquisition System is the Storage Manger (SM), which collects output from the HLT and stages the data at Cessy for transfer to its ultimate home in the Tier-0 center. A SM system has been used by CMS for several years with the steadily evolving software within the XDAQ framework, but until relatively recently, only with provisional hardware. The SM is well known to much of the collaboration through the 'MiniDAQ' system, which served as the central DAQ system in 2007, and lives on in 2008 for dedicated sub-detector commissioning.

Since March of 2008 a first phase of the final hardware was commissioned and used in CMS Global Runs. The system originally planned for 2008 aimed at recording ~1MB events at a few hundred Hz. The building blocks to achieve this are based on Nexsan's SATABeast storage array - a device housing up to 40 disks of 1TB each, and possessing two controllers each capable of almost 200 MB/sec throughput. Each controller is fed via a Fibre Channel switch by a logger PC, corresponding to a DAQ readout 'slice'.

This Phase-I system consisted of 6 logger nodes plus 3-SATABeasts. The typical DAQ configuration of 4-slices, supported by 2 SATABeasts, has been routinely run in the Global Runs this summer. Until higher throughputs are needed the third unit has served as a handy platform for testing and development. Over the three summer months of the Global Runs the 4-slice SM system has recorded and transferred over 60 TB of data to Tier0.

In the spring it was decided to advance the SM upgrade to the final system for the fall LHC run, and orders were placed for the additional hardware. Components started arriving at CERN at the beginning of September, and installation and commissioning began with the aim of having the full system for start of LHC data taking.

The final system nominally corresponds to a16-slice architecture: 8 SATAbeast arrays servicing 16 logger nodes. Performance of the full system is dependent upon the use profile (event size, stream overlap, DQM load,...), but from subsystem tests the data throughput can be expected reach peak rates of 2 GB/sec. During data taking, priority will be given to writing data to disk over reading files for transfers to Tier-0, and thus a large storage buffer is also important. We nominally envisage about 300 MB/sec transfers to Tier0, but the SM can provide up to the design burst rate of about 1000 MB/sec to Tier-0 in between stores. With the dual redundancy of RAID-6, the SM will have about 250 TB of storage at Cessy, enabling up to 34 hours of peak data taking even if the Tier-0 link were completely unavailable.

The newly expanded Storage Manager system is designed to support high data recording rates. This will accord CMS greater flexibility in the development and commissioning of trigger algorithms, and acquiring large data samples from the precious initial stores of early LHC operations.

Submitted by Gerry Bauer.

COMMISSIONING AND DETECTOR PERFORMANCE GROUPS (DPG)

The pace of activity is high for the Detector Performance Groups now that the CMS experiment is complete for 2008 and LHC beams are imminent. This includes refinement of the data quality monitoring tools (including prompt offline analyses), triggers, reconstruction code, and calibration and alignment conditions. Notable since the last CMS Week has been the inclusion of the strip tracker into the global running in July and the inclusion of the pixel systems and ECAL endcaps in August. The following describes the highlights from each group.

During the CRUZET3 global run in July (the third installment of the Cosmic Run at Zero Tesla exercise) the Silicon Strip tracker recorded data with all barrel detectors and one side of the end-cap wheels. The week-long data-taking period delivered about 300k tracks good for detector alignment and was an extremely valuable experience to test the reconstruction, calibration and alignment workflows in their final configuration. Events with tracks were selected in real-time at HLT and promptly reconstructed at Tier-0 with three different track-finding algorithms. Alignment data skims were successfully extracted before the end of the run. About a week after data taking, alignment constants and a list of noisy channels were used for full dataset re-reconstruction. With the newly available data, several analyses were initiated to measure the track reconstruction efficiency and hit resolution, as well as to extract from data the front-end gains and the Lorentz deflection. Module level alignment has been performed with two independent algorithms (MillePede and HIP) and the results have been compared.

Installed at the end of July, the CMS pixel detector has undergone a frenetic test period to qualify all of its parts. Thresholds and noise have been measured for all front-end chips, and a map of dead channels has been compiled for all sensors. The detector was then included in the CRUZET4 global run and combined pixel/microstrip cosmic tracks were reconstructed for the first time! In the coming weeks more work will go into the equalization (trimming) of the pixel readout thresholds and a precise measurement of the gain response function for all channels. This will give us the opportunity to test at full scale (~66M channels) the analysis software for calibration data.

The CRUZET4 run roughly doubled the track sample collected during CRUZET3, enriching the dataset with more tracks crossing the microstrip endcap wheels and attaching pixels hit measurements to tracks for the first time. As a result, the alignment quality has improved. Assuming a momentum of 5GeV for all tracks, the overall average track χ^2 was improved from 4.9 before alignment to 1.8 after. The data from the two CRUZET runs will be combined and re-reconstructed using the best alignment constants.

The focus now shifts to the data taking with magnetic field: short tests have been successfully performed with a 3T field and more stable data taking is expected in the next weeks at 3.8T.

In the past few months a significant effort has been made to understand and optimize the channel-by-channel response for all HCAL subdetectors (HB, HE, HF, HO, and ZDC). For example, the HCAL operating conditions for the start-up of the LHC were updated according to an optimal choice of high voltage values for the HCAL photodetectors. With respect to calibration, analysis of CRUZET HCAL data allowed for the validation of the intercalibration of the HB response to an accuracy of a couple of percent. The absolute energy scale of the HB response to muons has been shown to be in good agreement with test beam results. Cosmic muons also were used to produce the first calibration for HO, which unlike the other subdetectors, did not have an initial calibration from sourcing or test beam data. The tools to validate calibration conditions have been improved, allowing for extensive use during CRUZET and HCAL technical runs.

HCAL DQM tools have significantly improved as well. The most important DQM packages have been integrated into the central CMS online and offline system, and several of them are used for HCAL commissioning tasks. A package is in development to produce an HCAL status word. This status word will provide not only a flag of "good" and "bad" channels, but also will include information on channel stability, noise level, timing accuracy, etc., and will be used in real-time to mask bad channels for the HCAL trigger primitives.

Following the CSA08 exercises, a set of calibration packages were developed and validated. These packages include HCAL alignment and calibration data producers, analyzers for refining the offline event selection, calibrators for the calculation of calibration correction factors and packages for producing validation plots. Further tests of these workflows are now underway using data collected during global runs.

Finally, a first version of the trigger look-up-tables to be used during the start-up has been produced with the latest calibration. The generation and monitoring of these tables using the trigger emulator is well advanced.

The highlight for ECAL during the summer has been the installation and commissioning of the endcaps in the P5 pit. The installation was completed August 18th, after a final effort to lower and install all 4 Dee's. The commissioning went smoothly and took less than 10 days, from connecting the cooling system and powering up to the acquisition of pedestals and test pulse and laser runs. Shortly thereafter, the ECAL endcaps were included into the CRUZET4 global run. Despite the vertical geometry of EE, showers from cosmics in one of the endcaps were soon observed, which guided the time adjustment of the readout.

Parallel to this, studies on the ECAL barrel continued steadily. ECAL has participated in all the global runs this year, with the whole barrel for most of the time: more than 10M events with a visible signal are used for studies on the synchronization of the ECAL readout and trigger and to understand in detail the noise level and the stability of the detector. An attempt is ongoing to obtain, for the top and bottom regions of EB, inter-calibration constants to compare to the available pre-calibrations that were obtained from preinstallation tests on surface. Detailed studies are also ongoing to understand the purity and efficiency of the signal reconstruction, as well as the high-end tail of the energy spectrum.

The ECAL trigger commissioning has advanced and a top-bottom coincidence trigger has been used throughout CRUZET3. More studies and rate measurements are now ongoing in LHC conditions, i.e. single triggers (w/o coincidence) with the APD gain set to nominal (50). The selective readout system, which uses the ECAL L1 trigger information to perform data reduction, also has been commissioned during CRUZET3.

During CRUZET 2&3 the laser monitoring sequence has been exercised regularly through the barrel every half hour as needed for LHC conditions to monitor the crystal transparency. These data are essential to establish an initial pre-collision stability point. Consolidation with simultaneous operation of the sequence in EB and EE is underway.

The collision data will allow an in-situ calibration of ECAL, in particular this year, using two fast ECAL calibration techniques that exploit the phi-homogeneity of the energy response and the neutral pion decay mass constraint. Filters that select in the HLT a high rate of dedicated data samples for the two techniques have been deployed and, for the phi-homogeneity, tested during a global run. This sample is being used to tune the selection cuts in the presence of real noise. In parallel,

studies are ongoing to expand beyond CSA08 for in-situ calibrations, aiming to introduce the usage of the Dalitz π^0, η and J/Psi decays.
The commissioning of the CSC's reached a high point in CRUZET3, with 453 out of 468 chambers delivering good data. Clean cosmic ray muons were seen in the minus endcap for the first time. Only 15 chambers were unable to deliver data, due to known problems with electronics boards which, it was hoped, could be exchanged. Event data integrity is good. The timing of the cathode signals, which are used for precise coordinate measurements, was corrected, fine-tuned, and confirmed by prompt offline analysis. Variations of the recorded charge have been measured, and generally fall within tolerances. The anode timing also was confirmed, and has since been refined during CRUZET4 and after.
The CSC trigger also made important advances, with precise inter-chamber timing established for both the positive and the negative endcaps. For the first time the complete CSC Track-Finder ran for CRUZET3, and all sector processors worked well. Different trigger configurations have been studied, including a beam halo trigger which will play an important role when beams are first circulated. During CRUZET4, the relative timing of the positive and negative endcaps was established with the help of the endcap hadronic calorimeter, and a first attempt to integrate DT and CSC triggers in the overlap region was made.
During CRUZET4 the endcaps were in motion, finally coming to rest in their nominal positions, bolted to the barrel. Initial alignment measurements of the positive endcap show that the disks are within some mm of their nominal positions, but more refined and accurate alignment measurements will be completed in September as more data are collected.
The DT DPG efforts have mainly concentrated on the Global Run activities. The online DT DQM has been revised recently, with the aim to summarize the status of the system with a reasonable number of histograms and to provide some automatic checks that allow the shifter to identify problems faster. Moreover, the results from prompt analyses, conducted by people sitting at the CMS Center and at their home institutes, continue to provide fast feedback to the online team during the global run periods. The calibration workflow has been exercised successfully during the CRUZET3 and CRUZET4 exercises by running standardized programs at the CAF. With regards to alignment, the internal chamber alignment and the survey geometry have both been validated and inserted into the offline databases, and the constants have been included systematically in the official reconstruction of CRUZET data. Work is now focused on the wheel-to-wheel alignment and the alignment with respect to the tracker. An improved geometry description will be provided for LHC start-up.
In the last month and a half the RPC group undertook 2 major campaigns: the final commissioning of 2/3 of the positive endcap and an improved synchronization. CRUZET4 saw, in fact, the achievement of having almost the entire system available, including on both trigger, with improved timing, and readout. Several add-ons were developed to include the forward system in the online DQM, offline DQM and prompt analyses.
Recent news: CMS has successfully taken data in several occasions where beam was either brought to a collimator dump next to CMS or in the memorable LHC startup day of September 10. In all occasions the DAQ, trigger team and subdetectors performed very efficiently: the task to time in the beam using the very first 2-3 shots was a real achievement. The ability of the detector to take data synchronously and provide spectacular images of the beam dump showers which were investing the whole detector was also the conclusion of the hard work that everybody carried out during the, sometime painful, global runs of the past months/year. Last but not least we have to appreciate the ability of Data ops and the offline teams at the CMS center to cope in real-time with the unavoidable surprises coming from the increase complexity of the data coming from the pit. The flawless performance of the acquisition of the whole CMS detector, of the data-operations and of the offline feedback teams during the high visibility moment of the September 10 media extravaganza is also something CMS can be proud of.
If we split the mandate of the coordination into the commissioning phase and the run organization phase we can now claim: commissioning phase, mission accomplished, run organization, just started.
We are now entering a phase were we depend on the whole collaboration to ensure CMS excellence through the shift work, the fast analysis turnaround and eventually the rapid physics paper production.

Submitted by Darin Acosta and Tiziano Camporesi.

COMPUTING

Overview
The main focus during the summer was to handle data coming from the detector and to perform Monte Carlo production. The lessons learned during the CCRC and CSA08 challenges in May were addressed by dedicated PADA campaigns lead by the Integration team. Big improvements were achieved in the stability and reliability of the CMS Tier1 and Tier2 centres by regular and systematic follow-up of faults and errors with the help of the Savannah bug tracking system. In preparation for data taking the roles of a Computing Run Coordinator and regular computing shifts monitoring the services and infrastructure as well as interfacing to the data operations tasks are being defined. The shift plan until the end of 2008 is being put together. User support worked on documentation and organized several training sessions. The ECoM task force delivered the report on “Use Cases for Start-up of pp Data-Taking” with recommendations and a set of

tests to be performed for trigger rates much higher than the standard 300Hz.
The Computing Resource Board (CRB) held its quarterly meeting in July. A task force was mandated to recommend how to account for service work in the special situation of federated Tier-2s. The association of the POG and PAG Groups to Tier2 centres has been decided and finalized in the beginning of September. The monitoring of the resources has been consolidated in preparation for data taking and for interactions with the Resource Scrutiny Board of the WLCG-CRRB.

Facilities/Infrastructure operations
Testing and planning the Facilities Operation Shifts needed for the up-coming data taking continued. The task involved assessing shift-roles and manpower, collecting and integrating relevant monitoring tools, creating and testing electronic information tools (elog, blackboard) and documenting the procedures. This task is still ongoing in collaboration with the CMS Data Operation Project and Computing/Offline management.
In addition, new roles have been defined. The first one concerns the central DBS operator at CERN. A recently hired operator is being trained and will be in charge of DBS facilities operations at CERN, freeing the developers from the task. For Central Frontier operations the work plan remains to be finalized with the persons presently in charge of this responsibility.
Chris Brew/RAL/UK and Claudio Grandi/INFN/IT joined the Facilities Operation project as the Tier1 coordinators: this will help in the communication between central computing operations and Tier1 sites.
The CAF resources were further increased to 900 TB of disk storage capacity and 1.4 MSI2k processing capacity.
Finally, major efforts have been invested into enforcing Savannah ticketing and steering; by this major progress in availability and reliability of all Tier1 and Tier2 centers was accomplished.

Data operations
The team was deeply involved with the Computing Challenges CSA08 and CCRC in May, which was a great success. A detailed report about CSA08 and CCRC appeared in CMS Times. Both challenges were run by a collaboration comprised of the computing operations teams of Data Operations, Facilities Operations and the PADA teams.
Several lessons were learned in the data challenges and in the Cosmic Run processing. Data Operations is working with the Offline developers and the PADA Integration teams on a series of "campaigns" addressing particular open issues, e.g. to make the data management and workflow management systems more robust, improve monitoring, data transfer throughput and to document procedures etc.
In particular the Tier-0 workflow and data flow systems have been developing, and the operations teams have been heavily involved in commissioning a stably running prompt reconstruction system for the data flowing from the detector. The Tier-0 system still requires the full attention from experts. During data taking Data Operations organizes that these experts are available around the clock -- you will find the Data Operations expert on-call in the CMS Center during CERN daytime, and in the Fermilab Remote Operations Center during the US daytime. The so-call "Asia shift" is currently run by from home by one of the experts.
Of particular importance were the CMS workflows of Reconstruction, Alignment, Calibration and Skimming on Monte Carlo data sets in conjunction with Cosmics runs during the summer, including the latest one in August after the detector had closed and ramped up the magnetic field.
Another round of major Monte Carlo production with the latest software version started, after the software release reached production quality, bugs were removed and the proper conditions and configurations for start of data taking became available.

User Support
The consolidation of the CMS Software Documentation Suite has continued. The Work Book - containing tutorial-type instructions for getting started with the computing environment and physics analysis - has been regularly adapted and the work updating the tutorials to the CMSSW series 2_x_x has started.
The cross-linking between the Offline Guide - meant for description of CMS Software - and the CMSSW Reference Manual - containing the release dependent class documentation - has been improved. The work to include the python configuration files in the Reference Manual has also started; this will be an excellent tool for documenting the CMSSW job configurations.
The CMS TWiki Policy, aimed at guaranteeing the logical structure of the CMS TWiki area and TWiki documents in general, has been drafted. Such policy will facilitate the access to information by associating pages with the working groups and project areas, and by assuring that all information pages have a parent page linked.
Several training sessions were organized including a grid tutorial, an introduction session for summer students and a python tutorial. All sessions have been very well attended. The sessions were recorded in EVO and are available on the agenda pages. This effort will continue. In view of the start-up and an expected higher load for computing user support, reinforcements are planned for the user support in the Grid, CRAB and monitoring area. These measures will become effective during the autumn.

2nd report of the ECoM Task Force
The ECoM Task Force released the report, “Use Cases for Startup of pp Data-Taking” by mid July. As the startup phase will require rapid evolution of many workflows and data access patterns considered in the study, the report is expected to be an open document to be updated as conditions change.

In view with the startup in the third quarter of the year 2008, the key numbers for the CMS event model and for the computing resources have been updated. The computing use cases for CMS commissioning as well as for physics at startup have been examined. In several aspects an adjustment of the computing model is recommended, an analysis model initially based on widespread access of the RECO event format, and the storage of the full primary datasets at the CAF are the most salient points. Both are expected to be feasible in 2008 as long as the duty cycle of the machine operation is not reaching values as high as 50%. This will subsequently evolve into the standard analysis, based generally on AOD and the express stream at the CAF. The initial phase will also require that data re-reconstructed at the Tier-1 to be streamed back to the CAF.
An exit strategy for these temporary modifications of the computing model has been formulated, defining the transition towards design luminosity. Finally, the roles of the CAF as well as the express and calibration streams have been clarified, also in view of the asymptotic mode of operation.
In a situation with initially less demanding machine performance, in which short luminosity runs are interleaved with long periods without collisions, a special high trigger rate configuration is attractive in order to obtain larger data samples. Several tests along the data path downstream of the HLT will be necessary to define a safe working point for this scenario.
The full report can be accessed at:
https://twiki.cern.ch/twiki/bin/view/CMS/ECoMReports

Submitted by Matthias Kasemann and Patricia McBride.
(Edited by Marie-Christine Sawley, with contributions from Peter Kreuzer, Daniele Bonacorsi, Christoph Paus, Lother Bauerdick, Kati Lassila-Perini, Akram Khan and Marie-Christine Sawley.)

OFFLINE

Over the last 3 months the Offline project has been focussed on the integration and validation of the CMSSW_2_1_X production release, which is the last release cycle before data-taking starts. The goal has been to include all essential missing functionality, such as the final geometry and the new magnetic field map, and to continue to extend the data quality monitoring and physics analysis capabilities of the software. Development also continues on the data and workflow management tools particularly on their integration in the Tier-0 production environments where they are used to manage the repacking of online data streams into Primary Datasets as well as the reconstruction, alignment and calibration workflows.
The almost continuous series of Global Runs has been extremely useful for exposing the software to unforeseen use-cases and a number of critical bugs have been identified and fixed in rapid succession, which is reflected in the relatively large number of production releases made so far in this release cycle (2_1_7). Work is currently being invested in adapting the build and release environment to support patch releases such that new releases containing a limited set of bug fixes can be deployed as quickly as possible.
Currently the project is putting in place the infrastructure required to run essential services once data-taking starts. Roles are being established to fulfill special duties. The Offline Run Manager will follow day-to-day issues as regards to data-taking needs and on-call support will be provided by experts in order to ensure the availability of critical services on a 24x7 basis.
More details on progress made in each sub-project are described in the following:

Reconstruction
Reconstruction activities are now very much focused on preparation for data taking. Ever since March, prompt reconstruction of cosmic data recorded in the context of Global Runs has been an excellent test bed to define and refine procedures for quasi-real time reconstruction of data to be deployed for the first collision data. During recent CRUZET activities data have been reprocessed several times to benefit from improved calibration and alignment constants as these became available.
In preparation of first collision data, two campaigns took place in summer to provide the capability of changing the geometry and magnetic field configurations used in the reconstruction algorithms. We are currently supporting several different configurations needed to reconstruct simulated p-p collisions, cosmic data with no magnetic field, cosmic data with magnetic field recorded at the end of August, and beam-halo events. Effort is ongoing, together with the software development team, to integrate all these alternative reconstruction configurations into the cmsDriver tool that is to be used by both the production team and individual users.
In addition, significant progress has been made to develop and deploy a first working offline DQM infrastructure during the Global Run activities. In spite of fast development, it was possible to arrange for first shifts of offline DQM during CRUZET data taking and we are confident a first robust offline DQM will be available for the first collision data later this Fall.

Simulation
During the last few months, efforts have concentrated on finalising the version needed for the big Monte Carlo production to be used for comparison with first collision data.
The work of the Calorimeter Task Force has triggered a number of improvements in Geant4 as well as other refinements in the simulation of the CMS calorimeter. In addition a new physics list has been adopted, which includes the Bertini cascade model for simulation of hadronic interactions. There is a penalty to pay in terms

of CPU time and data size, but this is more than compensated by the significant improvement observed in the agreement with test beam data.
Many other refinements have been implemented, including from an improved interface with the generators and the ability to handle realistic Conditions Data for all sub-detectors. The reorganization of the software that handles geometry and magnetic field has allowed to plug in and test the new realistic geometry configurations and magnetic field map in a simple way.
Attention continues to be given to optimizing software performances in view of the forthcoming massive productions, and with a view to supporting simulation with pileup. Other ongoing efforts that are due to yield results in the near future include the mixing of MC and real data and the parameterization of calorimetric showers.

Software development tools
In this quarter the Software Development Tools team concentrated on consolidating the tools and providing releases for the data taking activities of the weekly Global Runs and CRUZET exercises. Since the beginning of June, 11 production releases and 8 development releases were built and distributed to the whole collaboration. In addition, work has started to improve the test suite for the regular Integration Build. In a first step it was updated to better reflect the actual use-cases during Monte Carlo production. This has already resulted in significantly fewer problems found during the following MC productions in August.

DQM monitoring
Data Quality Monitoring appears in various places across the experiment. Efforts have been focused on the technical implementation of the software architecture, the definition and establishing of the procedures and workflows used in DQM across the experiment, as well as the deployment of the services, such as several web servers, in P5, at Tier-0 and at the CAF.
The last few weeks saw significant improvements in the Offline DQM, in particular in terms of the code quality and the speed of the so called "harvesting step", which retrieves the DQM histograms from the reconstruction output files, runs the automated quality tests, and saves the DQM data to permanent storage. In addition, the number of histograms implemented in the DPG and POG Offline monitoring applications has increased significantly.
The first step of the Offline DQM workflow is now fully integrated in Tier-0 operations and runs automatically. This step covers the analysis of data, and the production and saving of histograms in the reconstruction output file. The second step, which covers harvesting and the publication of data to the GUI server, is currently performed manually. DQM, Data Management and Data Operations experts are now working on their integration in the official operations. Histograms produced at Tier0 from global runs are viewable in the offline DQM web server at https://cmsweb.cern.ch/dqm/tier-0
Operation of the Online DQM is now fully integrated in the run-control system. A file-based histogram archive is now in place to store histogram data at the completion of each run and the web server GUI provides access to the file archive such that recorded data can be browsed in the same way as live data.
Online and Offline DQM shifts are provided for 24 hours coverage. Shifts are run in the P5 control room, in the Meyrin CMS CENTRE, at FNAL and at DESY. A registry of good runs, the DQM Run Register, is kept at http://cmsmon/runregistry/. This registry includes combined assessment of the data quality from online and offline shifters where the quality is evaluated based on histograms viewing. A crucial ingredient of the end-to-end DQM chain is the data certification system, with standardized error state reporting lines across different subsystems. A proposal for the data certification workflow was recently elaborated and implemented during the summer global runs (CRUZET-2, 3 and 4) when the summary information from online DQM was written to DBS and when the DQM Report Summaries were inserted in OMDS.

Calibration and Alignment
After the successful exercises in the CSA08 challenge, alignment and calibration have been focussing both on remaining preparations for the first LHC runs, as well as the CRUZET4 global run. The common CMS alignment framework received, among other updates, important changes for an improved treatment of the glued strip tracker modules, which were part of the updates for the software release CMSSW_2_1. For the first time a central prompt production of AlCaReco streams has been organized during CRUZET4, which successfully delivered four types of AlCaReco data as part of the Tier-0 workflow that constitute the compact input for the alignment of the tracker and the muon system. The calibration of ECAL and HCAL needs huge statistics of event signatures that require a skimming of the event content to proceed already at HLT level, resulting in special calibration streams named "AlCaRaw". The creation and processing of these AlCaRaw streams is one of the most sophisticated elements of the CMS alignment and calibration workflow. As a major milestone, in CRUZET4 the simultaneous generation of all four AlCaRaw streams has been successfully demonstrated, and the results are being analyzed.

Data and Workflow Management
The DMWM Project has been working hard over the summer in the run up to data taking, providing processing, transfer and analysis services for the series of global data taking runs. New functionality has been commissioned in support of Tier-0 workflows, and we have now a working repacker and reconstruction system in place, which we continue to test for scaling and to develop as collision data approaches.

Simulated data production continues at scale, with further improvements in the automation of the production system, and worldwide data transfers with PhEDEx are running well.
New initiatives in the data discovery system and ongoing development of the CRABServer, which is in a wide scale rollout phase, should assist users in running analysis jobs on real data and simulated data alike, distributed across the network of CMS computing sites.

Physics and Analysis Tools
The most important effort within the group is to complete the Physics Analysis Toolkit (PAT) project, and many new improvements have been included in the latest 2_1_x release cycle. PAT tutorials will continue in the fall, but now accompanied with an updated and improved set of twiki pages. The PAG prototype analyses (one or two per physics group) are also drawing to a close, and will result in examples and documentation more closely related to each physics group.
Of particular note is a discussion and development of tools for completely general event selection, producing histograms and creating (EDM) n-tuples. While the discussion is still ongoing, there already is a set of classes that work in 1_6_12 and have been under beta-test within the SUSY group; they have also been ported into the 2_1_X series. The user interface (the configuration files) for this set of tools could also be dramatically improved by more effective use of Python. This can be achieved by maximizing the recycling of well-tested objects and macros and allowing them to be trivially deployed within any similar analysis. This development is targeted for CMSSW, however we are hoping to re-use modules of this infrastructure in FWLite as well. In fact, in the coming months, our focus will shift toward FWLite, with the goal of making it both more flexible and more user-friendly.
In the longer-term, we plan to start building expertise within the collaboration on the fitting toolkit called RooFit (originally developed in BaBar), and RooStats, a high-level statistical framework based on it. As the authors of both packages are in ATLAS, CMS needs to augment its base of experienced users, as well as develop CMS-specific examples and documentation.

Fast Simulation
The work of the past few months has been focused on the development of the Fast Simulation code and the optimization of its performances for the CMSSW_2_1_X release series. This release has a special importance not only for its usage in real data taking but also for the simulation world since it will be the base for a very large statistic Monte Carlo production in the Fall geared at early physics analyses. The achievement of this goal touched several aspects ranging from the more technical migration to the python language for configuration files and the emulation of the latest changes in tracking and electron reconstruction, to the inclusion of two major improvements of Fast Simulation capabilities.
The first of these improvements is the addition of material effects for the muon simulated hits which brings to a remarkable agreement the properties of muons reconstructed in Fast Simulation hits compared to those of Geant4-based simulation. The second major step is the development of a new description of the forward calorimeter response, in particular the sharing of the energy in the short and long fibres. Comparison plots for calorimeter related variables, jet and missing energy now show very good agreement not only looking at the total energy quantities but also at a more detailed level of the various components.
Final validation of the overall performance for physics of the Fast Simulation against the Full Simulation samples that are currently being produced will be the next step needed to give the green light for production.

Submitted by John Harvey and Lucia Silvestris.
(Edited by Marie-Christine Sawley, with contributions from Filippo Ambroglini, Fabio Cossutti, Ilaria Segoni, Rainer Mankel, David Futyan, David Evans, Simon Metson, Petar Maksimovic, Luca Lista, Patricia Azzi, Florian Beaudette, Shahram Rahatlou and Andrea Rizzi.)

PHYSICS

The all-plenary format of the CMS week in Cyprus gave the opportunity to the conveners of the physics groups to present the plans of each physics analysis group for tackling early physics analyses. The presentations were complete, so all are encouraged to browse through them on the Web. There is a wealth of information on what is going on, by whom and on what basis and priority.
The CMS week was followed by two CMS "physics events", the ICHEP08 days and the physics days in July. These were two weeks dedicated to either the approval of all the results that would be presented at ICHEP08, or to the review of all the other Monte-Carlo based analyses that were carried out in the context of our preparations for analysis with the early LHC data (the so-called "2008 analyses"). All this was planned in the context of the beginning of a ramp down of these Monte Carlo efforts, in anticipation of data. The ICHEP days are described below (agenda and talks at: http://indico.cern.ch/conferenceDisplay.py?confId=37221).
The physics days (see http://indico.cern.ch/conferenceDisplay.py?confId=37172) saw the presentation of numerous analyses, of varying maturity. One special event of these physics days was a long-overdue workshop on photons. A summary of this meeting can be found below.
For some studies, we continue to perform studies with CSA07 data samples, but look forward to using the forthcoming large data samples produced with

CMSSW2_1 (which translates to a B field of 3.8T, the new tracker format and 10 TeV for the center-of-mass energy). The current plan of work and some of the changes needed to adapt to the new era of data are discussed in the section on the "Fall Plans".

ICHEP Days

In preparation for ICHEP08 a special analysis approval session was held. The event was foreseen to be a marathon, with many analyses gearing up for approval; it was then claimed to be a mini-marathon and ended up looking like a 1500m dash: the event lasted a full day and a half. This was the first major exercise of the analysis approval system since it was put into production and, very likely, the only one prior to data-taking. Despite having only twelve (12) analyses to review, the approval presentations were scheduled within the short span of 1.5 days in order to imitate the high-pressure situation which is very likely to occur ahead of the winter conferences in 2009 – with, hopefully, the first results from LHC data.

The documentation of all analyses was frozen two weeks before the presentations to allow any CMS member to be informed at a reasonable level and to also engage actively in the discussions. The length of the Physics Analysis Summary (PAS) – the document that is eventually approved for dissemination outside CMS – is also kept short (at about the length of a submission to conference proceedings) thus making it possible for everyone to read it before the meeting.

There is a considerable amount of work that goes in the approval of a CMS analysis: during the completion of one analysis the proponents prepare the various drafts of the documentation that is firstly reviewed by the two physics group conveners and eventually by the three (or possibly more) members of the Analysis Review Committee (ARC). The process keeps this group of people very busy for about three-four weeks with discussions, meetings and polishing of the analysis and its documentation. All in all, more than one hundred CMS physicists have been involved in the ICHEP08 approvals; for a number of people, this was the prime occupation during the months of June and July,

Twelve analyses is a small statistical sample, however numerous different analysis cases were "tested". There were analyses which were very well prepared that went through the entire process quite easily, with a small number of meetings and a complete satisfaction of all actors (proponents and reviewers). In other cases the frequency of the iterations between the ARC and the proponents increased exponentially during the few days preceding the presentation: one analysis was withdrawn near the very end, whereas two others were not approved after their presentation.

The final result was that 9 out of 12 analyses were deemed ready to be presented at ICHEP: a reasonable score.

The quality of all the presentations varied from reasonable to good – we still need to find the proper balance between conveying the main aspects of a physics analysis and staying with within a reasonable allocated time (currently, this is 25 minutes followed by about 15-20 mins for questions and answers). One presentation can be singled out for being especially pleasant: Sam Harper and Matthias Moser – students from RAL and Brussels respectively – defended with success the Z' to electron analysis. Given the size and composition of CMS, this was one of their first talks to a large international audience, a feat worthy of placing on their CV. Unfortunately, the conference room booked for the approvals, 40-S2-A01, was not as full as expected.

Experience says that things will change when the approvals of the first results from LHC data will be scheduled: a CMS physics meeting will probably have an attendance larger than a medium-sized conference. We are therefore currently taking measures to avoid people standing outside the conference rooms and on the stairs, while trying to address the quality of the transmissions to remote sites. But above all, we look forward to have many students giving bright presentations on good quality CMS data.

Photon Workshop (23 July 2008)

One of the highlights of the recent July Physics Days was the Photon Workshop that took place on 23rd July 2008. The Workshop reviewed the plans for early analyses using photons, with the aim of focusing development of photon-related tools in the most needed and appropriate directions. Historically, the dominant photon physics motivation has been the measurement of the Higgs boson decay to a pair of photons. This channel is very important to cover the Higgs boson mass region close to the present LEP lower bound, but it requires more integrated luminosity than we will get this year. However there are a number of other interesting physics channels involving photons to be studied in the early phase of LHC, for which appropriate tools must be prepared.

The Workshop was divided into two parts, the first part reviewed the existing photon reconstruction, triggers, and photon identification algorithms and tools, and the second part covered the analyses. The presentations dedicated to analyses concentrated on the specific physics cases and goals for 2008 data taking. The speakers were requested to focus on the online and offline selections, the integrated luminosity required to obtain useful results, the p_T range studied, and the requirements for software tools.

In the introductory talk we were reminded that the present ECAL superclustering works well for converted and unconverted photons with transverse energies larger than 10 GeV. Optimal reconstruction of lower energy photons requires different techniques (such as are being employed in particle flow, for example). One of the goals of the workshop was to clarify the scope, goals and use cases for photons from ECAL superclusters.

Nancy Marinelli reviewed the present photon reconstruction workflow, including the reconstruction of conversion tracks starting from superclusters, and complemented by a vertex fit using tracker information.

Alessio Ghezzi described the trigger paths – initially common to electrons and photons. The clustering algorithms in HLT are intended to be the same as those used offline. Photon paths for startup have been put in place. Yuri Gershtein reminded us of the challenge of validating photon identification with the first data. A clean sample for validation can be obtained from final state radiation photons in Z decays to muons (and electrons), but they are produced at low rate. A strategy for a correct assessment of efficiency at startup is to use variables that are expected to behave similarly for electrons and photons. And we were reminded that the fraction of a photon sample due to fake photons from jets can be obtained with template techniques. Monte Carlo closure tests are required for a solid estimate.
In the physics analysis section Chia-Ming Kuo reviewed the studies of W/Z + gamma production in CMS which are gaining momentum, with groups working on all main decay modes. The luminosity required, however, is sizeable: these analyses are aimed at 1 fb^{-1} or so. Triple Gauge Coupling studies require relatively energetic photons: deviations from the standard model are best detected at high energy. Shahram Rahatlou reviewed the exotics channels involving photons. Photons are a key signature for Gauge Mediated Susy Breaking (GMSB) theories. The typical final states include high transverse energy photons, jets and missing E_T. Depending on the model parameters, photons can be prompt or produced after a significant lifetime. These are high energy photons (typical $E_T > 50$ GeV) and a very high energy dedicated trigger has been developed. Sean Simon described the photon "golden channel" (Higgs decay to a pair of photons), where two high E_T isolated photons are sought. In the LHC startup phase (2008, 2009) the aim is to study and understand the background shape and fake rates. Serguei Ganjour reviewed QCD inclusive photon studies. The study of photon pairs (cross section ~ 80 pb) and single photons (cross section ~ 50 nb) is an important test of QCD. The single prompt photon channel is particularly promising for startup. It requires, however, detailed isolation studies to reject the large jet-jet background. Studies of the measurement of purity from data are needed. Daniele del Re gave a specific presentation on the gamma + jet final state. The presentation was focused on the use of photon + jet events for jet calibration studies. The aim is to use the photon-jet momentum balance in the transverse plane. Since the photon energy is much better known than the jet energy, it can be used to calibrate the jet. A jet rejection factor of 1000 is needed to reach the required signal-over-background ratio. Isolation criteria based on tracks, ECAL, HCAL provide important tools for this. Some remaining background from isolated neutral pions etc can be rejected by studying the shower transverse shape in ECAL. Finally Steven Lowette described the use of very high E_T photons to model jet kinematics and missing E_T in W/Z + jets events, an important background for SUSY. As previously emphasized, the photon + jet final state plays an important role for commissioning. It is also an important tool to understand backgrounds for searches. Photon + jet events can be used to estimate the background due to invisible decays of the Z in SUSY jet + missing E_T searches.
It was a useful and successful Workshop and it was clear from the presentations that a particular effort must be put in understanding the photon + jet and gamma + gamma final states, at startup. There was a consensus at the Workshop to apply a loose isolation cut as a photon preselection at reconstruction time: the specific studies on the isolation criteria must be performed by the interested Physics Analysis Groups. The physics channels presented at the Workshop required isolated gammas with relatively high E_T thresholds. Non-isolated photons and low energy conversions, interesting for particle flow and tau physics, will be discussed at the dedicated workshop at the end of October.
Further information can be found in the transparencies attached to the Workshop Agenda.
(http://indico.cern.ch/conferenceDisplay.py?confId=37172).

Physics Plans in Fall

The imminent advent of the first LHC collisions is going to turn the biggest page in our book of "physics plans" – it will, in fact, signal the completion of the Old Times and the beginning of the New Times... Our structures will simply have to change with the times, to adapt themselves to the new era and its requirements. There are, in fact, two major new initiatives:

(a) The introduction of a new meeting structure throughout CMS. The goal of this change is to facilitate communication between the detector and physics groups but also to streamline the currently overloaded set of meetings which have very large conflicts – some of which are important.
(b) The definition of the early physics publications, the identification of the teams which will work on them and the actually preparation of all the phases of the work (from the basic detector elements to the high-level analysis procedures).

New meeting structure

Foremost, the "detector" groups and the "physics" groups must come to work closely on the physics commissioning of the experiment. The cornerstone of the new plan to achieve (a) is the new meeting structure. This represents a complete overhaul of our current set of meetings and revolves around three basic elements: the introduction of joint detector-performance/physics meetings, the limiting of all formal physics group meetings on a single day of the week and the introduction of a CMS plenary on detector and physics performance.
The joint meetings of the current DPG (Detector Performance Groups) and POG (Physics Object Groups)

are simply necessary if we are going to be efficient in the commissioning of the basic physics objects which will be used in all physics analyses. They are intended as the major (and only) formal forum in which experts from several detectors, software developers and all people active in physics analyses get together to review and discuss our understanding of the detector, its reconstruction and the resulting physics object.

Limiting the formal physics group meetings to a single day (Tuesday) was a request from numerous collaborators and sub-detector projects in CMS. With the old meeting structure there were inevitable clashes between sub-detector activities and the corresponding physics group meetings. This led to the isolation, or at least the presumed isolation, of entire sub-detector communities from specific physics topics (depending on the conflict, people would either have to skip the all-important sub-detector meeting or simply miss out on the new developments on the physics side). In the current system Tuesday is labelled as the "Physics Day of the CMS week". People and groups beyond physics are of course free to schedule other meetings in parallel with the physics ones – but at least this will be something they do knowingly and not by force of schedule.

The plenary meeting (Wednesday) is put forth as the future major get-together of the experiment as a whole. It will concentrate on detector performance and physics issues: all results to be shown outside CMS will have to be presented and approved at this meeting. The intention is to make this the focal point in the weekly life of the experiment. There will also be status reports from computing and offline, news from the trigger. In brief, every significant issue that affects our detector and physics performance is to be brought to the Wednesday plenary. This meeting will be chaired by the DPG and Physics Coordinators.

Finally, there is working time – currently Thursday and Friday. This is where we expect that a lot of parallelism among the sub-detectors and other areas of CMS (computing, offline, trigger) can actually occur. People and groups are "free" to schedule any working group meeting – modulo, of course, limitations of meeting room space. Priority will be given to large groups (e.g. a sub-detector meeting) before one allocates space to smaller working groups involving 5-10 people.

We have high hopes that the new structure will facilitate the quick and effective exchange of information inside the experiment. The first version, i.e. the one we will deploy in the Fall of 2008, right after this CMS week, is expected to teach us a lot. The intention is to draw lessons, good and bad alike, and to tune things in time for the steady-state of the experiment in 2009.

On our side (that of us, CMS collaborators) the most important issue is to support all these activities via our active engagement in these meetings. The plenary on Wednesdays is designed specifically for CMS collaborators to obtain all relevant important information regarding our performance. The meetings on Monday should concentrate on the most important issues on the deployment of our physic object from tracks to jets. These novelties in the weekly life of CMS will be successful, and we very much hope them to be so, if indeed the collaboration makes use of them. We believe it is indeed possible for most of the collaborators to follow in detail the developments in a single detector and to work directly on a physics object in these early days, while still engaging in early analysis. Meanwhile, the plenary will aim to present the "State of (the performance of) CMS".

Planning our early publications

Turning to more physics-like issues, the second change we have to introduce is the concretization of our plans for producing the first analyses. The CSA08 exercises were a successful demonstration of integrating the work leading to four different results (using electrons, muons, jets and tracking) among actors in different parts of the experiment. The next step is to actually put in place teams that will carry out these analyses with LHC data.

The currently approved results from the "2007 and 2008 analysis efforts" are an excellent and strong base for the formation of analysis clusters (team, code and procedures) on the main expected with 10 TeV collisions and a handful of pb^{-1} of integrated luminosity.

We are currently drawing a list of early publications with the intention to actually carry out the work leading to them, alongside writing and reviewing the contents, as soon as possible, and certainly within the time scale of the Physics Week (in early November).

Completion of Monte Carlo analyses

The final major change in the work of the physics groups is the turn away from the production of estimates of physics reach to the production of real physics measurements (and searches). Originally, ICHEP08 (and the review of all remaining analyses the Physics Days that followed) were intended as the cut-off date for the approval of new Monte Carlo results. Of course, every distribution, including that of the "time of completion of analyses in CMS" has tails, so a small number of analyses have been continued – because they were very close to completion and there were previous engagements of CMS to present results on these topics at conferences. For this reason there is a last round of analysis approvals during this CMS week, on Wednesday all day. These analyses will be presented at Split (the Physics at LHC 2009 workshop) and represent the end of the Monte Carlo approvals.

There will, of course, be exceptions for material that appears in PhD theses (where a shorter approval process can be used) or for the approval of "physics reach" figures/numbers that may be requested of CMS by review committees, CERN and funding agencies (e.g. we could be asked for "the CMS Higgs reach with X fb^{-1} of data").

The overriding intent, however, is to move away from these feasibility and expected performance studies with Monte Carlo, and instead to concentrate all our efforts

on understanding the data we record with this incredible instrument we call CMS.

Submitted by J. Incandela, G. Rolandi, R. Tenchini and P. Sphicas.

OUTREACH

The past three months have been very eventful for the CMS Outreach team. The majority of our efforts have concentrated on the update of the public web site at
http://www.cern.ch/cmsinfo
which was released to the public in time for the first LHC circulating beams. Congratulations in particular to Marzena Lapka and Lizzie Gibney for the excellent job that they have done. The layout of the new site roughly follows that of the main CERN public web site, a decision made long ago so that surfers do not feel lost when they jump from CERN to CMS. Both ALICE and LHCb also made this decision (after us!). The text of the new pages was made after interviewing many CMS collaborators, so has a very human feel to it. The site has been very well received by the community and the public/press alike. This is of course a first version so there will be more to come in the future, and comments are more than welcome.

The 10th September is a date that few of us will forget. The world media (represented by nearly 300 journalists!) arrived en masse at CERN, most of them hosted in the Globe with CMS people on-hand to talk to them, with a few over at the CERN Control Centre in Prevessin. In addition, the CMS Centre on the Meyrin site hosted BBC Television for the whole day, with many other journalists (print, radio, television) visiting throughout the day to share the excitement. An audio/video link between the CMS Centre, the CMS Control room (point 5) and the Globe was setup by Lucas Taylor, Joao Fernandes and colleagues, enabling everyone to see and hear the same things. This included a new "CMS TV" website. The hard work that this required really paid-off: within about 3 minutes of the first "debris" events being seen in CMS, images were posted on CMS TV and were available in the Globe for all the journalists to see. This was followed by a rapid update of the CMS public web site, courtesy of Lizzie and Marzena (despite Marzena being on maternity leave!) to include these images. CMS interviews and images were seen by millions of people on Wednesday and public interest is such that follow-up interviews are still taking place!

The next big event will be on the 21st October, the official inauguration of the LHC.

Submitted by David Barney.

CMS Documentation

CMS TALKS AT MAJOR MEETINGS

The agenda and talks from major CMS meetings can now be electronically accessed from the ICMS Web site.
The following items can be found on:
http://cms.cern.ch/iCMS
Management – CMS Weeks (Collaboration Meetings), CMS Weeks Agendas
The talks presented at the Plenary Sessions.
Management – CB – MB – FB
Agendas and minutes are accessible to CMS members through Indico.
LHCC
The talks presented at the 'CMS Meetings with LHCC Referees' are available on request from the PM or MB Country Representative.
Annual Reviews
The talks presented at the 2008 Annual Reviews are posted in Indico.

CMS DOCUMENTS

It is considered useful to establish information on the first employment of CMS doctoral student upon completion of their theses. Therefore it is requested that Ph.D students inform the CMS Secretariat about the nature of employment and name of their first employer.
The Notes, Conference Reports and Theses published since the previous CMS Week are listed in each Bulletin. Any CMS student awarded a Ph.D should post their thesis.
The Publication Guidelines and the submission forms can be found from iCMS Homepage → Documents → CMS Notes.
(http://cms.cern.ch/iCMS/jsp/iCMS.jsp?mode=single&part=publications).

CMS NOTES

CMS NOTE-2008/019; M. Cardaci, B. Bollen; CMS Search Plans and Sensitivity to New Physics using Dijets.

CMS NOTE-2008/020; S. Abdullin et al., Design, Performance and Calibration of the CMS Hadron-Outer Calorimeter.

CMS NOTE-2008/021; P. Musella et al., The CMS Electromagnetic Calorimeter Data Acquisition System at the 2006 Test Beam.

CMS CONFERENCE REPORTS

CMS CR-2008/029; P. Schleper, G. Steinbrück, M. Stoye; Alignment of the CMS silicon tracker using Millepede II; Computing in High Energy Physics, September 2-7 2007. Victoria, Canada.

CMS CR-2008/030; M. Felcini (on behalf of the CMS Collaboration); The Trigger System of the CMS Experiment; International Conference on Instrumentation for Colliding Beams, February 28 – March 5 2008, Novosibirsk, Russia.

CMS CR-2008/031; R. Hollis; Heavy Ion Studies with the CMS detector at the LHC; 24th Winter Workshop on Nuclear Dynamics, April 5-12 2008, South Padre Island, USA.

CMS CR-2008/032; F. Ambroglini; Measurement of the Underlying Event and Minimum Bias at LHC; Moriond QCD and High Energy Interactions, March 2008, La Thuile, Italy.

CMS CR-2008/033; M. Grothe; Forward detectors around the CMS interaction point at LHC and their physics potential; High-energy photon collisions at the LHC, April 22-25 2008, Geneva, Switzerland.

CMS CR-2008/034; L.A. Quertenmont; Search for Heavy Stable Charged Particles at the LHC; XVI International Workshop on Deep-Inelastic Scattering and Related Subjects (DIS 2008), April 7-11 2008, London, UK.

CMS CR-2008/035; J.H. Kim, P. Shukla; B-meson measurement via secondary J/psi production in Pb-Pb collisions at $\sqrt{s}$ = 5.5 TeV in the CMS; Quark Matter 2008 Conference, February 4-10 2008, Jaipur, India.

CMS CR-2008/036; S. Ovyn (on behalf of the CMS Collaboration); Exclusive dilepton and Upsilon production with CMS: a feasibility study; XVI International Workshop on Deep-Inelastic Scattering and Related Subjects, April 7-11 2008, London, UK.

CMS CR-2008/037; D. Fortin; Search for the Standard Model Higgs boson at the LHC; DIS 2008, April 7-11 2008, London, UK.

CMS CR-2008/038; O. Grachov et al., Performance of the combined zero degree calorimeter for CMS; XIII International Conference on Calorimetry in High Energy Physics, May 26-30 2008, Pavia, Italy.

CMS CR-2008/039; P. Katsas et al., Performance studies for the prototype III of CASTOR forward calorimeter at the CMS experiment; Quark Matter 2008, February 4-10 2008, Jaipur, India.

CMS CR-2008/040; E. Yazgan (on behalf of the ECAL/HCAL Collaborations); The CMS Barrel Calorimeter Response to Particle Beams form 2 to 350 GeV/c; XIII International Conference on Calorimetry in High Energy Physics, May 26-30 2008, Pavia, Italy.

CMS CR-2008/041; R. Castello; CMS Tracker alignment and its influence on the b-tagging performance; International Workshop on Top Quark Physics, May 18-24 2008, La Biodola, Isola d'Elba, Italy.

CMS CR-2008/042; P. Van Mechelen; Forward and Low-x Physics Programme with CMS at the LHC; DIS 2008: XVI International Workshop on Deep-Inelastic Scattering and Related Subjects, April 7-11 2008, London, UK.

CMS CR-2008/043; A. Vilela Pereira; Observation of single-diffractive W production with CMS: a feasibility study; DIS 2008: XVI International Workshop on Deep-Inelastic Scattering and Related Subjects, April 7-11 2008, London, UK.

CMS CR-2008/044; M. Weber; Alignment strategy for the CMS Tracker; International Conference on Computing in High Energy and Nuclear Physics, September 2-7 2007, Victoria, Canada.

CMS CR-2008/045; D. Acosta; Status of CMS Commissioning; TOP2008, May 18-24 2008, Isola d'Elba, Italy.

CMS CR-2008/046; F. Blekman, M. Milosavljevic; Prospectives for stop searches at ALTLAS and CMS; TOP2008, May 18-24 2008, La Biodola, Elba, Italy.

CMS CR-2008/047; K. Cankocak et al., CMS HCAL Installation and Commissioning; XIII International Conference on Calorimetry in High Energy Physics, May 26-30 2008, Pavia, Italy.

CMS CR-2008/048; M. Borgia; CMS Tracker Commissioning using cosmic muon data; International Workshop on Top Physics, May 18-22 2008, Biodola, Isola d'Elba, Italy.

CMS CR-2008/049; D. d'Enterria, V. Kumar, A. Mohanty; Exclusive Photoproduction of Upsilon and lepton pairs in Pb-Pb at 5.5TeV; Workshop on High-energy photon collisions at the LHC, April 2008, Geneva, Switzerland.

CMS CR-2008/050; M. Cardaci; Searches for new physics using dijet events at the LHC; Moriond QCD 2008, March 8-15 2008, La Thuile, Italy.

CMS CR-2008/051; M. Cristinzani, G. Petrucciani; Single top: prospects at LHC; Top2008, May 18-24 2008, La Biodola, Elba, Italy.

CMS CR-2008/052; P. Van Mulders; Estimation of the jet energy scale corrections using top quark events; Top2008, May 18-24 2008, Elba, Italy.

CMS CR-2008/053; D. Spiga; Top properties: prospects at CMS; Top2008 International Workshop on Top Quark Physics, May 18-24 2008, Biodola, Elba, Italy.

CMS CR-2008/054; S. Petrushanko; LHC Capabilities for Quarkonia; Hard Probes 2008, June 8-14 2008, Illa da Toxa, Spain.

CMS CR-2008/055: G. Roland et al., Study of photon-tagged jet events in high-energy heavy ion collisions with CMS; Hard Probes 2008, June 8-14 2008, Illa da Toxa, Spain.

CMS CR-2008/056; Y. Onel et al., Quartz Plate Calorimeter as SLHC Upgrade to CMS Hadronic EndCap Calorimeters; CALOR 2008, May 2008, Pavia, Italy.

CMS CR-2008/057; S-W Li, A. Go, C-M Kuo (on behalf of the CMS Preshower collaboration); Performance of CMS ECAL Preshower in 2007 test beam; XIII International Conference on Calorimetry in High Energy Physics, May 26-30 2008, Pavia, Italy.

CMS THESIS

CMS TS-2008/014; F. Nowak; Massive Bosonen aus supersymmetrischen Zerfaellen im vollhadronischen Kanal bei CMS. University of Hamburg.

CMS TS-2008/015; U Gebbert; Kinematische Analyse von Squark-Zerfaellen im vollhadronischen Kanal bei CMS. University of Hamburg.

CMS TS-2008/016; C. Wulz; The CMS Trigger Supervisor: Control and Hardware Monitoring System of the CMS Level-1 Trigger at CERN. Universitat Autonoma de Barcelona.

CMS TS-2008/017; J. Chen; Search for Heavy Stable Charged Particles at CMS Using Tracker dE/dx Measurement. University of Kansas.

CMS TS-2008/018; V. Buege; Virtualisation of Grid Resources and Prospects of the Measurement of Z Boson Production in Association with Jets at the LHC. Universität Karlsruhe. (CMS TS-2008/018).

CMS TS-2008/019; A. Scheurer; Algorithms for the Identification of b-Quark Jets with First Data at CMS. Universität Karlsruhe.

CMS TS-2008/020; A. Kumar; Study of Higgs at LHC Energy using CMS Detector. Panjab University.

CMS TS-2008/021; R. Bellan; Study and Development of the CMS High Level Trigger and Muon Reconstruction Algorithms and Their Effects on the pp → mu+mu-jjjj Vector Boson Fusion Process. Univ. di Torino e Sez. dell' INFN.

CMS TS-2008/022; Martina Malberti; Prospects for the precision determination of the W boson mass with the CMS detector at the LHC. Univ. di Milano-Biccoca.

CMS TS-2008/023; M. Chugunova; Spectral Stability of Nonlinear Waves in Dynamical Systems. McMaster University, Canada.

CMS TS-2008/024; F. Stoeckli, Effects of QCD Radiation on Higgs Production at the Large Hadron

Collider. ETH Zurich.

 **JOB OPPORTUNITIES**

Vacancies in CMS and other institutes are posted on the iCMS Webpage.

CMS CALENDAR 2008 last mod 5 May DH/WZ

WK	Monday	CMS Meetings			Non-CMS Meetings/Hols/Notes
1	31-Dec				Xmas
2	07-Jan		Tracker (8-9)		
3	14-Jan				
4	21-Jan		TriDAS(22-23)	Phys. Days (22-24), ESSC (23)	LHCb WK, US MLK (21)
5	28-Jan	MB(28)/FB(29)			
6	04-Feb		Tracker (5-6)	All CMS meeting (6)	Half term (CH 11-15 Feb)
7	11-Feb				ATLAS wk, Half term (FR 16Feb-3Mar)
8	18-Feb	Referees	MB(22)	ESSC (20?)	LHCC (20-21)
9	25-Feb	CMS Week			
10	03-Mar				Motor show (6-16)
11	10-Mar		Tracker (11-12)		Motor show (6-16), SPC, FC, RCS (10-13)
12	17-Mar				Good Friday (21) Easter(CH 17-31Mar)
13	24-Mar				Easter Monday (24)
14	31-Mar	MB/FB (RRB)(1)	Comp. Off. WK	All CMS meeting (2)	ALICE WK / CERN OEPN DAY (5-6Apr.)
15	07-Apr		Tracker (8&9)	ESSC (9)	ATLAS Wk, Half term (FR 12Apr-28Apr)
16	14-Apr	RRB(14)	ECAL (15-16) / TriDAS(15-16)	Physics Wk	RRB (14-16)
17	21-Apr				LHCb WK
18	28-Apr				1-May & Ascension
19	05-May	Referees	Joint MB/FB(5)	Tracker (6-7), ESSC (7)	LHCC Mini Review (6) LHCC (7-8), SPC (5)
20	12-May		US CMS 2008 Run Plan WS(15-16)	All CMS meeting (14)	Whitsun (12)
21	19-May		TriDAS(20-21)	Phys. Days (20-22)	SLHC Workshop (21-22 @ CERN)
22	26-May				US Memorial day (26)
23	02-Jun	MB(2)/FB(3)			
24	09-Jun		Tracker (10-11)		
25	16-Jun		All CMS HCAL (16-18)		SPC, FC, RCS, OCS (16-20)
26	23-Jun	CMS Week (Cyprus)			Summer (CH 25Jun-

WK	Monday	CMS Meetings			Non-CMS Meetings/Hols/Notes
27	30-Jun	Referees			LHCC(2-3) / ATLAS Wk / ALICE Wk / US (4 July)
28	07-Jul		Tracker (8-9)		Summer (FR 3 July - 2 Sept.)
29	14-Jul				
30	21-Jul		TriDAS(22-23)	Phys. Days (22-24)	
31	28-Jul	MB(28)			
32	04-Aug		Tracker (5-6)		
33	11-Aug				
34	18-Aug				
35	25-Aug		TriDAS(26-27)		
36	01-Sep	MB(1)/FB(2)			LHCb WK, US Labour Day (1)
37	08-Sep		Tracker(9-10)		Jeune Genevois (11)
38	15-Sep	MB(15)			SPC, FC, RCS (15-18)
39	22-Sep	Referees	CMS Week		LHCC (24-25)
40	29-Sep				
41	06-Oct		Tracker (7-8)		ATLAS Wk
42	13-Oct		TriDAS(14-15)	Comp. Off. WK	
43	20-Oct				LHC Inauguration (21)
44	27-Oct	MB/FB (RRB)(28)		ESSC (29)	ALICE WK, Half term (CH 27-31Oct)
45	03-Nov	ECAL (3-4)	TriDAS (4-5)	Physics WK	FC (5)
46	10-Nov	RRB(11)	Tracker(11-12)		RRB (10-12)
47	17-Nov	Referees			LHCC (19-20)
48	24-Nov	MB(24)/FB(25)		ESSC (26)	LHCb WK, US Thanks Giving (27)
49	01-Dec		Tracker(2-3)		ATLAS Wk
50	08-Dec	CMS Week			SPC, FC, RCS, OCS (8-12)
51	15-Dec				
52	22-Dec				Xmas
1	29-Dec				Xmas

Holidays at CERN during this week

MB: Management Board
FB: Finance Board
RRB: Resources Review Board
Referees
Run meetings (always Friday afternoon)
TCM: Technical Coordination Meet. (always on Thursday)
ESSC: Electronics Systems Steering Committee
SPC: Scientific Policy Committee / FC: Finance Committee / RCS: Restricted Council Session / OCS: Open Session of Council

http://cmsdoc.cern.ch/~cmstc/Calendar/

CMS GENERAL INFORMATION

SECRETARIAT

Office: 40-5-B01
Phone: +41 (22) 767 22 77
Fax: +41 (22) 767 89 40

Marie-Claude Pelloux – Ext. 74539
Marie-Claude.Pelloux@cern.ch

- Principal Secretary/CMS secretariat supervision
- Administrative assistant to the CMS Management
- Assistant to the CB and MB chairpersons and secretaries
- Organisation of all CMS Weeks and federal CMS
- Meetings
- Responsible for the CMS and CERN Databases (M&O), Authors list, Institutes' Membership, Grey-book etc.)
- CMS office space
- Correspondence with the Collaboration
- Member of the Authorship Board
- Other tasks (Budget holders, Indico Manager for CMS, organization of social events, Industry/Thesis Awards etc.)

Madeleine Azeglio – Ext. 71540
Madeleine.Azeglio@cern.ch

- Travel arrangements
- CERN material requests, shipping requests, purchasing orders

Biliana Dimitrova – Ext. 78511
Biliana.Dimitrova@cern.ch

- Reservations of Conference rooms
- Incoming Faxes
- CMS Thesis

Polina Morozova – Ext. 71712
Polina.Morozova@cern.ch

- People & Institutes Databases, Registration of Newcomers (WWW, Mailing lists)
- CERN Database (PIE and Greybook updates)
- Contacts with Users' Office (attestations…)
- Invitations
- Key Requests
- Film badges

Dawn Hudson – Ext. 79391
Dawn.Hudson@cern.ch

- Administrative Assistant to the CMS Technical Coordinator
- Administrative Assistant to the CMS Technical Coordination Group
- CMS Visits

Angela Frost – Ext. 77988
Angela.Frost@cern.ch

- Administrative Assistant to the CMS Spokesperson
- CMS Visits
- CMS Shop

Kirsti Aspola – Ext. 74608
Kirsti.Aspola@cern.ch

- Administrative Assistant to CMS Resources Manager and CMS Team Leader
- CMS Finance Board Secretary
- Subsistences and Invitations
- CMS Helen Coordinator
- Funding Matters (invoices, Special funds, M&O…)
- Project Associates

Piritta Heikkilä – Ext. 71705
Piritta.Heikkila@cern.ch

- CMS Contracts
- CMS Team Account Matters, invoices
- Reimbursements, Subsistences

USEFUL PHONE NUMBERS

Test Beam Areas
Prevessin – Hall 887
H2 – General (Muons, tracking…): Ext. 76776
H4 – Calorimetry: Ext. 76771
Meyrin – Hall 190
X5B – Control Room: Ext. 76052
X5C – GIF
(Gamma Irradiation Facility): Ext: 75813
(ECAL + Muon): Ext: 77459 – 76055

P5-Team at Cessy: 164804

HELPDESK AT CERN

CMS-User.support@NO-SPAM.cern.ch

PROCEDURE FOR NEWCOMERS

1. The CMS Registration form is available from the iCMS webpage (under General), as well as the CERN registration forms (User Support – Users' Office).
2. To open a computer account send an email to: cms.computing@cern.ch