The Compact Muon Solenoid Experiment

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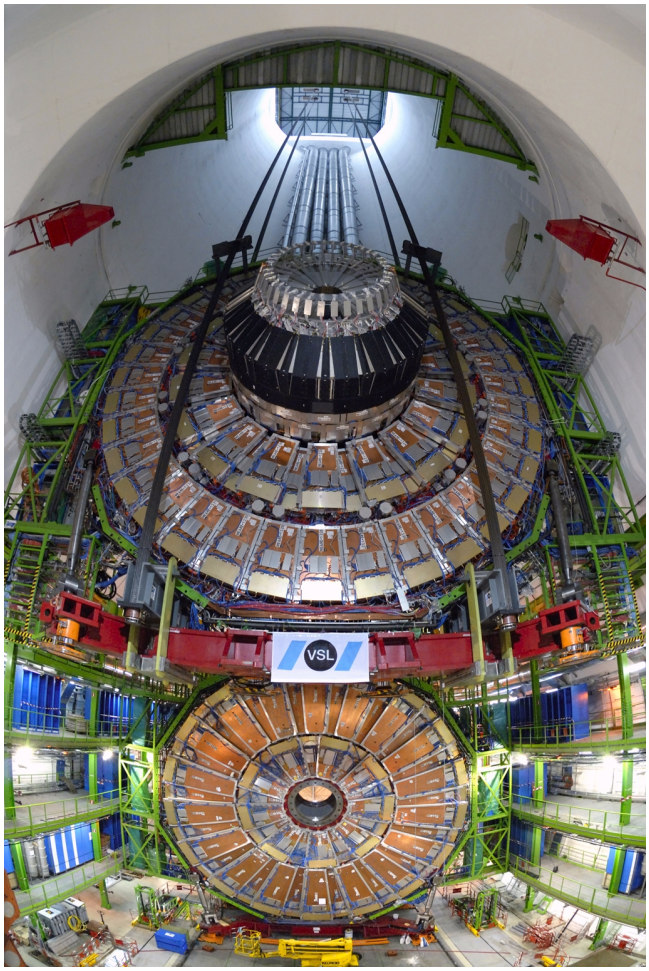
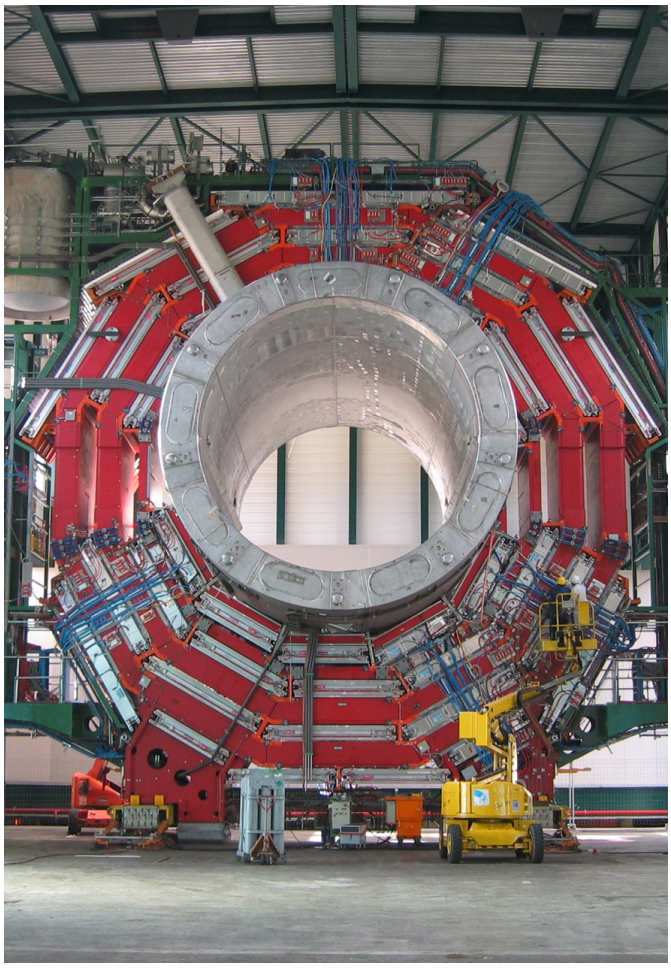
The Great Descent Continues





With precise coordination YE+1 was lowered into the cavern (9-Jan), soon joined by the first barrel wheel YB+2 (19-Jan), then YB+1(4-Feb) and HB+ (13-Feb). The 1920 ton central barrel wheel YB0 rests briefly on the pit-head cover in anticipation of a monumental descent (28-Feb) that will also trigger an intense campaign of installation of services and detectors underground.

DAQ INSTALLATION IN USC COMPLETED

After one year of work at P5 in the underground control rooms (USC55-S1&S2), the DAQ installation in USC55 is completed. The first half of 2006 was dedicated to the DAQ infrastructures installation (private cable trays, rack equipment for a very dense cabling, connection to services i.e. water, power, network). The second half has been spent to install the custom made electronics (FRLs and FMMs) and place all the inter-rack cables/fibers connecting all sub-systems to central DAQ (more details are given in the internal pages). The installation has been carried out by DAQ group members, coming from the hardware and software side as well. The pictures show the very nice team spirit !

submitted by A. Racz

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A NEW MEASUREMENT OF THE W BOSON MASS FROM CDF

by Ashutosh Kotwal
Duke University,
for the CDF Collaboration.

CDF has measured the W boson mass using approx. 200pb^{-1} of data collected at $\sqrt{s}$ = 1.96 TeV. The preliminary result $m_W = 80.413 \pm 0.034(\text{stat}) \pm 0.034(\text{syst})$ GeV supports and strengthens the hypothesis of a light Higgs boson, based on the global electroweak fit in the standard model framework. The total measurement uncertainty of 48 MeV makes this result the most precise single measurement of the W boson mass to date.

The mass of the W boson is a very interesting quantity. Experimentally, it can be measured precisely because of the two-body decay of the W boson into a charged lepton and a neutrino. Theoretically, it receives self-energy corrections due to vacuum fluctuations involving virtual particles. Thus the W boson mass probes the particle spectrum in nature, including those particles that have yet to be observed directly.

The hypothetical particle of most immediate interest is the Higgs boson, representing the quantum of the Higgs field that spontaneously acquires a vacuum-expectation value in the standard model (SM). The interaction of the other SM particles, in particular the W and Z gauge bosons, with the non-zero Higgs field is thought to impart mass to the SM particles while preserving the renormalizability of the theory. Thus the Higgs boson play a critical role in the SM, and it is very interesting to obtain a Higgs mass prediction using as inputs the W boson mass and other precisely measurements, such as the Z boson mass, the Fermi coupling G_F obtained from the muon lifetime, the electromagnetic coupling evolved to the Z pole, and $\sin^2\theta_W$.

Further considerations, among them the stability of the Higgs boson mass under radiative corrections, motivate extensions of the SM with additional symmetries. The mass spectrum of new particles such as supersymmetric particles is also constrained via the radiative corrections they induce to the W boson mass.

In order to extract information on the mass spectrum of new particles, the radiative correction to the W boson mass due to the dominant top-bottom quark loop needs to be corrected for. Analysis of approximately 1fb^{-1} of Run 2 data by CDF and D0 have led to the top mass measurement of 171.4 ± 2.1 GeV. For fixed values of other inputs, this top mass uncertainty corresponds to an uncertainty in its W mass correction of 12 MeV. Improved measurements of the top quark mass will reduce this uncertainty further in the future. Measurements of the W mass from Run 1 of the Tevatron [1] and LEP[2], with uncertainties of 59 MeV and 33 MeV respectively, yield a world average of 80392 ± 29 MeV[2]. It is clearly profitable to reduce the W mass uncertainty further, as it is one of the limiting uncertainties in constraining the Higgs boson mass.

At the Tevatron, W bosons are mainly produced by valence quark-antiquark annihilation, with initial state radiation (ISR) generating a typical transverse boost of O(10 GeV). The transverse momentum (p_T) distribution of the decay lepton has a characteristic jacobian edge, whose location, while sensitive to the W boson mass, is smeared by the transverse boost of the W boson. The transverse energy of the ISR, denoted by vector(u), is measured inclusively by performing a vector sum over all calorimeter tower energies, excluding those towers with lepton energy contributions. The neutrino p_T is inferred from the lepton p_T and vector(u) by imposing p_T balance in the event. The measurement of boson p_T can be used to sharpen the jacobian edge by computing the W transverse mass (m_T), analogous to an invariant mass but only using the p_T vectors of the lepton and the neutrino. We use the m_T and the lepton and neutrino p_T distributions to extract the W boson mass; m_T provides the most precise measurement.

We describe here the latest measurement of the W boson mass from CDF, which uses approx 200pb^{-1} of data collected between February 2002 and September 2003. The data samples consist of 63964 (51128) W boson candidates in the electron (muon) channel, along with important control samples of 2919 (4960) Z boson candidates in the electron (muon) channel. The lepton track momentum is measured in a large cylindrical drift chamber called the COT. The electron energy is measured using the central (barrel) electromagnetic (EM) calorimeter, and its angle measurement is provided by the COT track. The lepton selection criteria of $p_T > 30$ GeV, pseudorapidity < 1 and loose identification requirements, along with u < 15 GeV for W bosons, provide high-purity samples. Backgrounds in the Z boson samples are negligible. Other than the Z $\rightarrow$ mu mu background of 6.6% in the W $\rightarrow$ mu mu sample, where one of the decay muons is at high rapidity outside the COT fiducial volume and is therefore not reconstructed, backgrounds in W boson samples are less than 1%.

The W boson mass is extracted by performing maximum likelihood fits using templates created by a custom fast Monte Carlo simulation of the detector. We perform a first-principles simulation of the lepton tracks at the COT hit-level, including complete calculations of ionization and radiative energy loss and multiple scattering. We incorporate a detailed model of passive material which we validate using our data. Bremsstrahlung photons and conversion electrons are generated and propagated to the calorimeter. Extensive validation of the custom simulation

is performed by cross-checking control distributions between the data and the simulation.

The generator-level input to the custom simulation is provided by the RESBOS [3] program. RESBOS generates the lepton and neutrino momentum vectors in W and Z boson events according to a QCD calculation of the quintuple differential cross section in boson mass, p_T, rapidity, and decay angles. It provides tunable parameters for the non-perturbative form factor which describes the boson p_T spectrum at low p_T. We tune this form factor on the well-measured Z boson p_T spectrum using leptons. QED radiative photons are generated according to the calculation of the WGRAD [4] program, which includes all O(alpha) electroweak processes.

The key aspect of the measurement is the calibration of the lepton momentum. The COT track measurement sets the momentum scale for this analysis. We perform the internal alignment of the COT (which contains about 30,000 sense wires) using high-p_T cosmic rays that traverse diametrically the entire drift chamber. By fitting a cosmic ray's complete trajectory to a single helix [5] and measuring hit residuals with respect to this helix, we align individual cells (containing 12 sense wires) to better than 5 microns, and also strongly constrain baises due to COT endplate rotations and gravitational and electrostatic deflections of the wires. The alignment is cross-checked and final curvature corrections are made based on the observed difference in the ratio (E/p) of calorimeter energy to track momentum for electrons vs positions from the W boson signal sample.

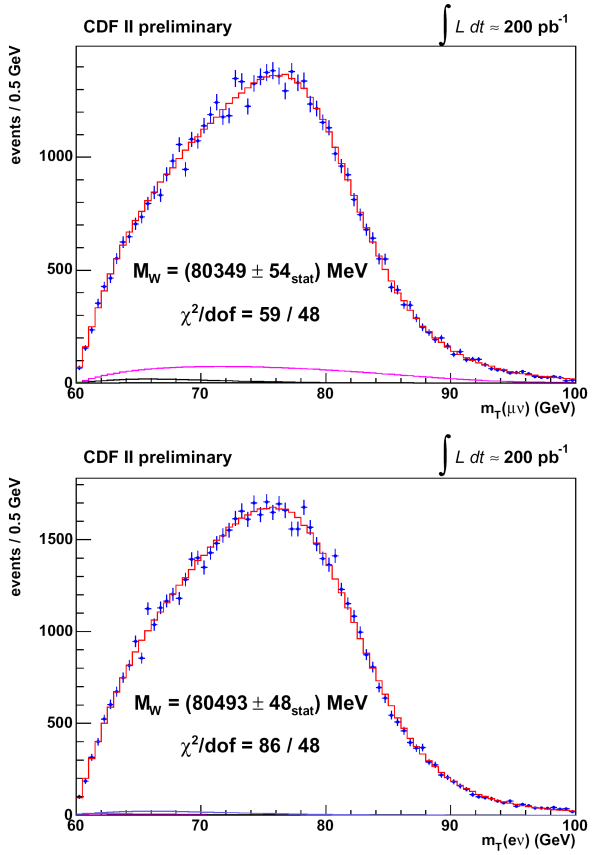

Fig 1: The m_T fit for muon (top) and electron (bottom) channels.

The absolute momentum scale for the tracker is set by measuring the J/psi and upsilon masses using the dimuon mass peaks. The J/psi sample spans a range of muon p_T, which allows us to tune the ionization energy loss model such that the measured mass is independent of muon p_T. We obtain consistent calibrations from the J/psi and Upsilon mass fits, whose combined measurement of the momentum scale is dominated by the systematic uncertainties due to QED radiative corrections and magnetic field non-uniformities. In the future we anticipate reductions in these systematics by improving our corrections for these effects. The momentum scale extracted independently from the Z → mu mu mass fit is also consistent, albeit with a larger, statistics-dominated uncertainty. The tracker resolution model is tuned on the observed widths of the upsilon and Z boson mass peaks.

Channel	Distribution	Fit Result (MeV)	chi^2/ DoF
Electron	m_T	80493 ± 48	86/48
Electron	electron p_T	80451 ± 58	63/62
Electron	neutrino p_T	80473 ± 57	63/62
Muon	m_T	80349 ± 54	59/48
Muon	muon p_T	80321 ± 66	72/62
Muon	neutrino p_T	80396 ± 66	44/62

Table 1: Fit results and statistical errors for electrons and muons from the three kinematic distributions used to extract the W mass.

The EM calorimeter is calibrated with respect to the tracker by template-fitting the peak of the E/p distribution of the signal electrons in the W → e nu sample. The model for radiative energy loss is checked by comparing the number of events in the radiative tail of the E/p distribution between data and simulation, and found to be statistically consistent. The calorimeter energy calibration is performed in bins of electron p_T to also constrain the calorimeter non-linearity. The calibration yields a Z → e e mass measurement that is statistically consistent with the world average; we obtain the most precise calorimeter calibration by combining the results from the E/p method and the Z → e e mass fit. The EM calorimeter resolution model is tuned on the observed widths of the E/p peak and the Z → e e mass peak, separately for non-radiative and radiative electrons.

Systematic (MeV)	Electrons	Muons	Common
Lepton Energy Scale	30	17	17
Lepton Energy Resolution	9	3	0
Recoil Energy Scale	9	9	9
Recoil Energy Resolution	7	7	7
Selection bias	3	1	0
Lepton Removal	8	5	5
Backgrounds	8	9	0
p_T(W) model	3	3	3
Parton Distributions	11	11	11
QED radiation	11	12	11
Total	39	27	26

Table 2: Table of systematic uncertainties for the transverse mass fits.

The response and resolution parameterizations for the hadronic recoil (u) are obtained by fitting the p_T balance distributions in Z boson events. The hadronic resolution receives contributions from the underlying event (which is independent of p_T(Z) and modelled using minimum-bias data) and from jets. The p_T balance is studied in bins of dilepton p_T to fit both the p_T(Z)-independent and p_T(Z)-dependent components of the hadronic response and resolution. The model gives a consistent description of the W and Z boson data.

Experiment	Mass (MeV)
DELPHI	80336 ± 67
L3	80270 ± 55
OPAL	80416 ± 53
ALEPH	80440 ± 51
CDF-I	80433 ± 79
D0-I	80483 ± 84
LEP Average	80376 ± 33
Tevatron-I Average	80454 ± 59
World Average	80392 ± 29
CDF-II	80413 ± 48
New Tevatron Average	80429 ± 39
New World Average	80398 ± 25

Table 3: Current world's best W mass measurements.

The fits to three kinematic distributions in the electron and muon channels give the W mass results and statistical errors shown in Table 1. The consistency of the 6 fits provides an important cross-check. The results are shown in Fig. 1, and their systematic uncertainties are summarized in Table 2. The uncertainty due to parton distribution functions (PDFs) is evaluated using the CTEQ6 [6] ensemble of PDFs that captures the uncertainties in the PDF parameters. The uncertainty due to QED radiative corrections is dominated by the higher order contributions. The six fit results are combined, taking all correlations into account, to obtain the preliminary result m_W = 80.413 ± 0.034 (stat) ± 0.034 (stat). The fit values were hidden during the analysis by adding an unknown random offset in the [-100, 100] MeV range in the fitting program; this offset was removed after the analysis was completely frozen.

Table 3 gives a summary of other recent W mass measurements and averages. With a total uncertainty of 48 MeV, this measurement is the most precise single measurement to date. The updated world average impacts the global precision electroweak fits: the new fitted Higgs mass is m_H = 80 +36 -26 GeV[7] (updated from m_H = 85 +39 -28 GeV [2]). The 95% CL upper limit on the Higgs mass is updated from 199 GeV (166 GeV) to 189 GeV (153 GeV) with the LEP II direct limit included (excluded)[2,7]. The direction of this change has interesting theoretical implications: as Fig. 2 shows, the m_W vs m_{top} ellipse moves a little deeper into the light Higgs region excluded by LEP II, and into the region[8] favored by the Supersymmetry (MSSM) model. While this is a one-sigma effect, it arouses further interest in higher precision measurements of the W mass (and the top mass) at the Tevatron in the near future, and ultimately the LHC. Also, the increased likelihood of the 'light-Higgs' scenario adds to the interest in direct Higgs searches ongoing at the Tevatron.

Most of the systematic uncertainties in this measurement (Table 2) are limited by the statistics of the calibration samples. Improvements in the detector model and the production and decay model (e.g. QED radiative corrections) are likely to shrink the other systematics as well. CDF has now accumulated about 1.5fb^{-1}, and we look forward to a W mass measurement with precision better than 25 MeV (surpassing the current world average) with this dataset.

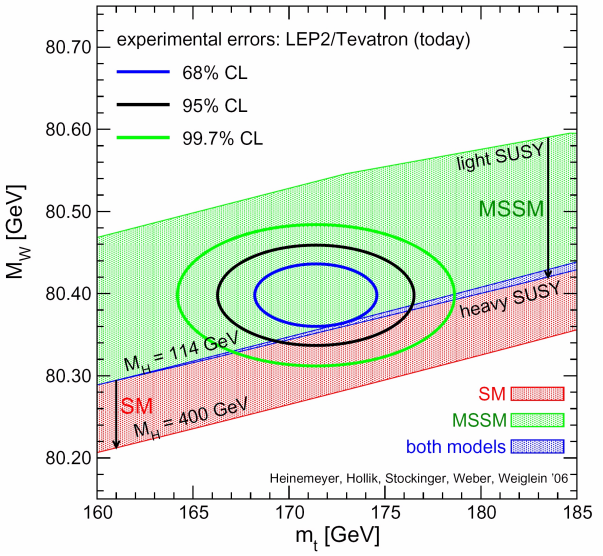

Fig 2: Direct measurements of the W boson and top quark with SM and MSSM calculation [8].

Precise measurements of the W boson and top quark masses are of enduring interest as the direct searches for the Higgs, Supersymmetry and other new physics come to fruition. For example, when the Higgs is discovered, one can immediately ask whether its mass is consistent with the SM fit. In either case, the measured Higgs mass becomes an input to the SM fit, and the W mass can provide constraints on other new physics. Thus, the complementarity of direct searches and precision measurements like the W mass will continue in the post-Higgs-discovery era.

References:

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CMS NEWS

NEW EDITOR OF THE CMS BULLETIN

Walter Van Doninck has been the Editor of the CMS Bulletin since 2000. The Bulletin not only helps disseminate information but also records the progress of CMS. Walter is handing over to Karl Gill. We would like to thank Walter for carrying out this task with enthusiasm and efficiency for so long.

We should also thank Karl for accepting to take over and wish him well over the coming exciting period.

MANAGEMENT BOARD OF 19 JANUARY 07 (MB101)

LHC

The CERN Director General had reported on the progress with the LHC and the schedule in his address to CERN the previous week. The plan remained to have a commissioning run in November followed by a shutdown, and this sequence would be retained even if there were a delay. CERN had made a request to Council for additional funds to complete the LHC and the detectors, and this had explicitly included the ECAL end-caps. A panel of experts had been formed to advise Council on the need for these funds; the panel membership is E. Fernandez, R. Aleksan, S. Bertolucci, P. Dornan, D. Hartill, R-D. Heuer, J. Strait and A. Wrulich.

Recent News

The heavy lowering was progressing well with YB+2 lowered the previous week. The TIB+ had been inserted into the support tube, HB had been removed from the vacuum tank and the surface installation of the Muon Barrel and RPCs had been completed.

The first Executive Board meeting had taken place on January 15th. The role of the Trigger Coordinator had been discussed. There had been oral reports from the Coordinators; the main concerns had been manpower, particularly for the off-line and computing including the database team. The offline Coordinators would draw up a list of people urgently needed at CERN reporting to the coordinators. The Collaboration would be canvassed to provide these people. The CSA07 needed to be defined and a commissioning plan drawn up.

CMS Schedule

The report of the LHCC December meeting (see later) had noted that although there were significant achievements, there was still concern about the schedule. Lowering YB0 had slipped another month to late February and the Tracker installation was now planned for mid-August; this should be advanced as much as possible. The ready-for-beam date was now given as November 15th. Further, there was no contingency.

The detailed schedule requested by the LHCC existed but had not been shown to the committee, being thought to be too detailed for it to consider. Technical Coordination manpower was being increased as suggested, with increased resources for planning. Contingency plans needed to be made. Although the main goal was to be ready for physics in 2008, the Tracker must be installed in July or August 2007.

It was necessary to change the mode of working: the key dates for lowering YB0 and installing the beam pipe could not be allowed to slip further. If there was slippage on items being completed before these key milestones, either they or other tasks would have to be dropped to compensate. The planning should identify ahead of time items to be dropped should the need arise.

The CERN Director General, although concerned about the schedule, had understood the overall approach. There would be further meetings in March and April/May, by which time it was essential to know the exact date for beampipe closure.

A detailed schedule up to installation of the Tracker was being developed and should be finished this week. It was noted that the detailed schedule was likely to closely follow v35.3, as shown in the December CMS Week.

It had been decided to set up a specific Project to manage the installation of services on YB0 and to ensure that the Tracker is installed on time. A large part of this involved the Tracker, although ECAL and HCAL services were also included. P. Sharp had been asked to lead this activity. A resource-loaded schedule should be developed in agreement with all parties before the end of January.

Other News

The first “All CMS Meeting” had been held the previous week, and a recording was available on the web:

http://vksun.vrvs.upjs.sk/ramgen/webuni1/fyzika/2007_01_17_physics_days/08_all_cms_1.rm

There had been considerable progress on securing the funds for the Cost-to-Completion Steps 1 and 2.

The SLHC EoI would be submitted to the LHCC shortly and write-ups of the outcome of the MTCC and CSA06 were nearly ready.

It was proposed to have a ceremony with the press and Funding Agency representatives invited, for the lowering of YB0; this would need to be held separately from the lowering itself. A task force would be set up this week to organise the ceremony and fix the date soon.

The discussions with TOTEM would be resuscitated. G. Tonelli would organise a mini-workshop to discuss the forward detectors and physics.

The Board was reminded of the schedule for the next CMS Week, and it was noted that important sub-detector issues could be brought into the Technical Coordination or Commissioning Plenary sessions if appropriate.

Organisational Matters

C. Paus was being nominated as Level 2 convenor in Computing for Data Operations, Shahram Rahatlou as the second convenor for Reconstruction, and L. Malgeri and O. Buchmuller would continue as convenors for Cal-

ibration and Alignment in Offline Computing. D. Futyan, R. Cavanagh and P. Bartalini were being nominated as second convenors for e/gamma, particle flow/tau and Monte Carlo generators, respectively, in Physics. P. Meridiani was being nominated as second convenor of the ECAL Detector Performance Group. These convenors would start working immediately with the proviso that endorsement from the CB will only be sought during the CMS Week in February. The Management Board took note of these nominations. The CMS organigramme would be updated.

At the end of the Physics Days, two milestones had been established: that CMSSW should be validated for physics by the end of February, and that key startup analyses needed for physics in 2008 should be completed by October 2007. There was competition with resources needed for commissioning and for running in 2007 and it was essential to set priorities. A fuller report will be made by P. Sphicas at the next MB. A special Task force might be set up to prepare for the 2007 run. Nevertheless, having a properly working, calibrated detector (by the end of 2007) must remain the top priority.

Update on HCAL HPDs

From the studies done so far it appears that good operation in the HB and HE area was expected but some tuning might improve the situation with the HCAL trigger. This was being investigated. In the HO, some readout boxes (RBX) had been moved into more field-favourable positions and it was anticipated that this would allow the operation of the HO as a tail-catcher as foreseen. It was considered probable that the observed noise was due to field emission from the silicon anodes.

ECAL Status

The production of Barrel crystals in China was complete. There were 1850 more EB crystals to be delivered from Russia and this should be completed by the end of February. The delivery of End-cap crystals from both China and Russia was beginning. There was no surprise concerning the quality of the Chinese End-cap crystals, but it might be necessary to re-cross calibrate the irradiation facilities.

The first 50 new motherboards had been delivered. Visual, electrical and first thermal cycling tests had all proved satisfactory. One had been irradiated at PSI with no change to the electrical properties. The project was on schedule to within 2-3 days and the electronics integration would start now. The decision on further orders would be made soon. A small change in the kapton design had considerably reduced the amount of force needed for mounting.

A second motherboard testing system had just arrived from Turin. A review of the manpower needed to carry out the (re-) integration had concluded that ECAL was able to provide it. A full supermodule would be completed in the next two weeks.

The Data Performance Group was being organised by C. Seez and P. Meridiani. A workshop on test beam results would be held at the end of March in Rome. Work on the end-cap Dees was progressing. An iteration of the preshower hybrid circuit boards would be tested soon.

Tracker Status

The main objective for the Tracker was the delivery of a complete tracking system calibrated and aligned to 100 microns in April 2008 and to 30 microns after 2 months of good running. This implied that in 2007 all its subdetectors needed to be integrated, that cosmic running at the TIF should be used for alignment, that the YB0 services be installed in time and commissioning and alignment in CMS be carried out with beam in 2007. All sub-detectors of the Tracker (except the pixels) were now at CERN. The quality of the detectors was excellent with few bad channels and a good signal to noise ratio. Before integration into the support tube each subdetector undergoes a performance and quality assurance review.

The status of the Tracker integration and the planning, including manpower needs, were presented. The major challenge was to have the Tracker installed and cabled before CMS closed. The goal was to do this within the official CERN schedule. This would require a large and well-coordinated effort, together with Technical Coordination.

YB0 Services Project

CMS had set up a specific Project to manage the installation of YB0 services, under P. Sharp. Its charge included the publication of a resource-loaded schedule by the end of January. To achieve the goals, work under commercial contracts would be done with 2 shifts/day, and that done by CMS manpower with 3 shifts/day, 6 days/week.

The Tracker project organisation was being adjusted to conform to the new CMS organisation, and included outlines of expected migration of people as tasks were completed.

Technical Coordination

The master schedule v35.3 was presented. It should provide the maximum opportunity for refitting ECAL supermodules. The installations in USC and SCX were now off the critical path. With the heavy lowering proceeding, work was migrating from the surface to the cavern.

YB0 must be lowered in February, before which a few critical tasks must be completed, including the lowering of YB+1 and HB+1 first. The heavy lowering had been going very well and there were only two new types of object left to lower including YB0, for which the gantry's design had been optimised. A detailed rolling plan for the next 8 weeks was used. There were now 22 persons in the Technical Coordination cabling team and a further 6-8 would be added in February. The team would also assist sub-detectors as necessary (at their cost). It was planned to split the team into two halves each of which will work two shifts per day for the cabling on the surface. The addition of management effort with the appointment of a YB0 services manager (P. Sharp) for the installation of the services underground was very welcome. It was estimated that at least 20 more people were needed from collaboration institutes for the cabling underground.

Both end sections of the beam-pipe would be installed by the end of this week, which work constituted about one third of the total beam-pipe installation time.

V35.3 was based on the assumption that the beam-pipe should be ready for beam on October 15th. CERN was expected to decide in May whether this was acceptable. To be able to follow the current official schedule, it was necessary to generate contingency in v35.3 which would not be easy, and to understand what tasks could be postponed to the 2007-08 winter shutdown. Some candidates for possible postponement were being considered, as well as not closing CMS for the 2007 run. Any off-critical path activity which overran would now be curtailed. Visiting teams were being asked to arrive well in time and leave later than the planned work completion date to optimise the rate of progress. Collaboration members resident at CERN would be asked to carry out urgent tasks at short notice.

Additional funding requests would inevitably appear soon. The detailed manpower requests had been published on the web and sent to the Collaboration Board. All steps possible would be taken to avoid delays due to potential single point failures.

In summary, it was essential to make v35.3 work, for which the help of the whole collaboration was needed. It was no longer possible to accept delays in completing tasks and absorb the delay in the master schedule. Some hard decisions would inevitable in the coming months. The work was moving to two shifts per day and this would be increased to three shifts per day as necessary, where the manpower for the third shift must come from the collaboration. Nevertheless deferments to the winter shutdown could not be excluded.

Electronics Status

Production of the Low Voltage power supplies was now underway. A second production line had been opened at CAEN which would speed up deliveries. The priorities had been modified to provide supplies for an early test of a full muon barrel wheel.

The CERN Finance Department was working with both suppliers to prepare contracts for commissioning in 2007 and for long-term maintenance. It was intended to have one maintenance contract for all supplies whether or not bought through CERN, and Project Managers should provide a list of all Low and High Voltage supplies to be covered; the costs would be covered by M&O 'B'. If possible, maintenance should be carried out at Point 5 to avoid INB regulatory problems. For commissioning it was intended to have a one-year field support unit contract which would provide on site support to provide prompt engineering help.

The author list for the SLHC Expression of Interest was being prepared. The Joint workshop with ATLAS on 19-21 March was going ahead as planned. The outcome of the Valencia meeting was now formally submitted to the CERN Director General. 20 MHz operation was now the baseline and 80 MHz strongly discouraged.

LHCC (12-13 DECEMBER 06)

Feedback to CMS from the LHCC CMS Referees

The referees are: S. de Jong, R. Mankel, A. J. S. Smith and R. Yoshida

The prime focus of the meeting was to evaluate progress toward the several important milestones due or imminent at this time, and to review the schedule for the "end game," culminating with the closing of CMS and making it ready for beam. In particular, we were especially interested in plans for heavy lowering, underground services, piping, cabling, and detector installation.

The first section of our report concerns software and computing; the second covers the HLT. We are pleased these activities are progressing well, and offer suggestions that we hope are helpful to CMS. The third section of the report deals with construction, installation, and schedule. Here too there has been major progress, but there are also serious issues and concerns that require immediate attention from CMS. The final section of the report contains our conclusions and recommendations in this regard.

CSA06

The CSA06 challenge has been conducted in the foreseen time window between the beginning of October and middle of November 2006. The CSA06 was designed to exercise in particular HLT tagging, prompt reconstruction with application of calibration & alignment constants, distribution of data to Tier-1 and Tier-2 centres, distributed data-analysis, remote skimming and reprocessing, and an alignment cycle based on 50M events from various physics classes.

The HLT tag was emulated using generator level information. No level 1 trigger simulation could be performed.

Prompt reconstruction at the new Tier-0 facility went rather smoothly. The system was ramped up to a production rate of 100 Hz without major problems, and the peak rate achieved was in excess of 300 Hz. The constants database was populated with calibration data. Retrieval of the constants via the Frontier/Squid scheme was demonstrated at a sustained rate of about 50,000 queries/minute after bugs in an underlying package had been fixed. A verbose logging feature inside the jobs had to be deactivated since it was found to crash the servers.

The measured Tier-0 to Tier-1 transfer rates were generally sustained in excess of the targeted 150 MB/s, during the last 10 days they were well above 250 MB/s in the daily average. Intermittent drops of transfer quality to individual Tier-1 centres could be traced back to service outages at these sites. In general the availability of the Tier-1 centres over 30 days was good. The transfer quality to the Tier-2 centers was much more varied. Only 12 of 29 participating Tier-2's met the goals in terms of sustained data transfer; interestingly some of them greatly surpassed their expectations. Not unexpectedly, in general Tier-2's have less operational experiences in such operation than Tier-1 centres.

Distributed skimming, analysis and reprocessing went smoothly, including application of calibration updates,

except for a problem with a module of tracking code when used on already processed data. A "closed-loop" exercise demonstrated the successful determination and application of tracker alignment constants. For many analyses the challenge provided an important ground for validation of the analysis code under CMSSW.

In summary, the referees regard the CSA06 challenge as a very important and highly successful exercise of the CMS software and computing model.

Some points still need attention: the HLT and L1 simulation software have not yet been participating, and the distributed database infrastructure has not been challenged under massively concurrent read/write accesses. As seen in other areas of LCG, the Tier-1 infrastructure cannot yet deliver sustained high performance over months in a routinely fashion, and the personnel effort by the experiments in spotting problems and urging the centers to address them is very high. The Tier-2 centres have played a smaller role in earlier challenges and will need more practice.

The experiment should plan a fully realistic challenge with massively concurrent read/write accesses for the databases with cyclic calibration, full application of L1 simulation, HLT and pileup at an appropriate time in the near future.

HLT

The HLT has been completely rebuilt when moving it from the ORCA to the CMSSW framework. This includes the basic philosophy, which now uses sequential trigger paths. In these trigger paths decisions can be taken in different stages of the processing by the constituent modules. Optimal ordering of the sequential modules then saves execution time. The HLT can be executed online and offline in the same way, allowing offline testing and verification.

Data unpacking software and especially testing of the unpacking is hampered by the lack of available Monte Carlo generated raw data, although progress is also visible in this area, and a plan of attack is present. Unpacking processing time as revealed in the MTCC for the silicon strips is still much too long and also the ECAL data unpacking needs some extra work to speed up.

The Level 1 emulator software in CMSSW 1.2.0 is due this week.

The HLT performance was successfully tested in the Magnet Test and Cosmic Challenge on part of the DT and CSC detectors. Also the use of dedicated data streams was tested at this occasion and seems to work.

To summarise: the HLT has more or less been rewritten from scratch at an impressive pace and now starts to take shape, the code of the building blocks being fairly well under control. At this moment it is important to start deciding on the trigger algorithms and trigger strategy for running in 2007 and 2008. Although rough plans exist, a clear structure with connections to the sub-detector and physics groups is not yet in place.

Installation, Integration, and Schedule

General Context

At the time of LHCC84, delays in installing movable shielding and other basic services in UXC and USC had rendered the schedule for lowering and assembling CMS underground even tighter than it had been in June. The next phase of the installation appeared even more challenging: to complete the enormous program of cabling and piping of YB0 underground in time for tracker installation in April 2007. In addition, the schedule for cabling the Tracker in time for the fall LHC test run depended on as-yet-unproven compatibility with commissioning of the LHC beampipe.

Summary of Technical Progress on Critical Detector Systems:

It is important to recognize that many important tasks have been completed, with valuable lessons learned. We list a few of the highlights here (ECAL is discussed in more detail in Section 3 below).

The magnet test, field map, and cosmic challenge (MTCC) were completed on schedule, and proved to be unqualified successes.

Heavy lowering is in full swing, with HF+, HF-, YE+3, and YE+2 now underground, and with final preparations complete to lower the more-challenging YE+1 immediately after the holidays. We congratulate CMS Technical Coordination for conducting an efficient and safe operation while overcoming inevitable last-minute obstacles.

The muon group is actually ahead of schedule in installing DT modules.

The TK group continues its steady progress: all subdetectors have been integrated and tested, and brought to the TIF for further testing and insertion into the TOB; the first, TIB+, will be inserted into the TOB before the holidays. Performance of all subdetectors has been excellent: signal to noise, number of failed channels, etc. The Tracker Analysis center is nearing full operation and is proving to be of great value for commissioning, alignment, monitoring, etc.

ECAL status and Issues

The procurement of the crystals both for EB and EE are going according to schedule, although EE crystal production still has many uncertainties. In particular, the completion of EB crystal production at the beginning of March is unchanged.

Weak solder joints and kapton cables in the barrel motherboards have been discovered recently in the check of the integrated EB supermodules. The investigations into these problems show:

a) The origins of the problem (faulty hand soldering, and drilling of kapton) appears to be understood.
b) How the number of bad channels from this problem will grow in time is difficult to estimate, given the statistical limitations. The existing results indicate a problem which is border-line acceptable (<1% bad channels after 10 years) with large uncertainties.

c) New manufacture of motherboards without these problems appears to be understood (although somewhat expensive). CMS has already started the process of procurement, production, and testing of replacement motherboards. The time planning of the replacement of all (or most) of the motherboards was presented. The planning is such that the delays in the EB supermodule integration are largely in the shadow of other delays in the CMS installation schedule. While the schedule is rather complex, it appears that, with the best planning, the EB delays will add an additional 2-3 weeks to the overall schedule. We are somewhat concerned that the scheduling of much parallel work in the hall in order to keep to this latest schedule may be too aggressive and the time estimates optimistic. We urge a very thorough and detailed technical planning exercise in order to have the best chance of success.

Given that CMS depends on the reliable operation of the EB supermodules for many years without service, the referees endorse the decision by CMS to go ahead with these repairs. We urge a general review of the work carried out, previously, on quality assurance and ageing on all parts of the system to see if other potential problems could have been missed.

The review of the other parts of the ECAL project was necessarily brief. However, they appear to be progressing well. The H4 and H2 test beam results look very good. The off-detector electronics appear to be progressing satisfactorily. There is some concern about manufacture quality of hybrid PCBs for the preshower - which should be closely watched, with ECAL personnel involved at the place of manufacture.

Heavy Lowering and Underground Services

The heavy lowering program is in full swing, after surmounting several unexpected problems. This truly significant accomplishment relieves major uncertainties in the schedule, and allows CMS better to estimate the schedule for lowering the large number of remaining components. The problems encountered included late approval from the French authorities, failure of 3 cherry pickers, failure of the 5-ton crane hook, and unforeseeable manpower problems in critical areas.

Unfortunately such problems are common and typical in the course of large, one-of-a-kind projects. CMS must do everything possible to anticipate what might go wrong from now on, in time to prevent further delays. For example, it is absolutely critical to secure "immediate-response" repair service for essential construction equipment, especially the crane in the UXC (a single-point failure). Of equal importance, CMS must plan to prevent failures in staffing the various construction crews at all skill levels.

A highly-positive development since LHCC84 is the likelihood that much of the LHC beampipe installation can be performed early, off the critical path, which would allow CMS additional time and better access to complete cabling the tracker and final preparations for closing. On the other hand, several issues have arisen that adversely affect the critical path (some are listed below):

– Temperature-stabilization infrastructure must be installed on the coil before lowering.
– DT cabling is delayed by HO shielding problems.
– Failure of LHC heat-exchanger tubes requires cabling and repositioning of HF- before YE+1 is lowered, at cost of a week on critical path.
– ECAL will now have to be installed underground.

The new draft schedule presented to us in response to the above developments included several significant delays and raised serious issues:

a) YB0 lowering is delayed yet another month, till late February '07
b) TK installation is delayed till mid-August '07.
c) Ready-to-close date has slipped to Oct. 31, with "ready for beam" at Nov 15.
d) The schedule still contains no contingency.

Conclusions and Recommendations

– The draft schedule presented to us leads to CMS "ready to close" on October 31, 2007, "ready for beam" on November 15, but without contingency. To achieve this schedule CMS has reordered the sequences of operations to allow more work to be performed on the surface, and has scheduled an ever-increasing number of the deferred underground tasks in parallel. They have also simplified the design of some long-lead-time parts to speed up manufacture, e.g. the tracker cooling pipes. These are important improvements; however, at the current level of detail and planning we feel the uncertainties are large. As presented, the schedule did not contain enough detail to reliably judge its robustness.

  We therefore recommend that CMS develop a detailed, resource-loaded schedule, in which the input for each task is provided by the parties directly responsible, and carefully reviewed by Technical Coordination to verify the time estimates, and to ensure compatibility with other tasks going on simultaneously. We also suggest that CMS find a way to advance the Tracker installation as much as possible.
– To create the person power to carry out a timely planning exercise, we strongly urge CMS to expand the TC effort with experienced engineers, schedulers, and physicists, including people from throughout the collaboration as well as those already on site. Fortunately, it would seem that a pool of such people should be available as they complete their responsibilities for sub-detector construction.
– For CMS to be ready for beam on an actual "drop-dead" date prescribed by CERN management (hopefully after full consultation with the LHC and the main experiments), the collaboration must either find extra resources to speed up installation, and/or develop a contingency plan. However it should be kept in mind that the main goal of the 2007 run is to prepare CMS for physics in 2008.

– The referees request CMS to prepare a resource-loaded schedule, that can be reviewed by them during the upcoming January LHCC meeting, along with a progress report on enhancing Technical Coordination.

LHCC (28-29 JANUARY 07)

Excerpts from the draft Minutes – Report from CMS Referees

In the December LHCC meeting the LHCC referees had recommended that CMS must develop a detailed, resource-loaded schedule consistent with the master LHC schedule and expand the Technical Co-ordination effort. CMS has since responded effectively to the recommendations.

Much progress was reported since December 2006 in developing the details of the CMS installation schedule. In particular, intense focus has been put on lowering and connecting YB0, cabling of the Tracker, and general pipework, all of which include credible plans to speed up the schedule. As a result, CMS was able to hold the schedule to the day during January 2007. The schedule to complete the initial CMS detector for the LHC run later in 2007 remains very tight and has no contingency.

submitted by T. Virdee

Summary of the CMS Week 18 - 22 December 2006

FINANCE BOARD, MANAGEMENT BOARD AND COLLABORATION BOARD

Common Meeting FB/MB/CB (FMC21)

Technical Issues (A. Ball)

The topics covered were the status at Point 5, the schedule after the lowering of YB0, installation options for ECAL and the sequence for the beam pipe installation. Many details had already been presented in the opening session. There was a new web page for Technical Coordination on iCMS, thanks largely to A. MacPherson, D. Hudson and L. Taylor.

The MTCCII had been a great success, for which the magnet team and all others involved should be congratulated. This had included the field mapping, the collection of data and finally the re-opening of the magnet in two weeks; this last had shown that it would be possible to reach any element of CMS in one week, and any two elements in two weeks.

The work on the cable chains was going well but there were not enough technicians working underground. The period after the insertion of installation of HCAL until the "ready for closing date", including the installation of services on YB0, had become even more complex due to the retro-fitting of the ECAL. More support would be needed in this period, especially around the period of ECAL installation. Nevertheless, the installation of the ECAL underground did not have a significant impact on the overall schedule to completion. There had been progress on understanding the sequence of operations for the beam pipe installation.

The Boards were reminded that once there was beam, the French nuclear safety rules would be enforced, requiring detailed tracking of all components underground.

Safety coordination required that all activities underground at Point 5 be documented and no impromptu activities were allowed.

A first comprehensive estimate of the manpower resources needed to complete the installations had been developed. These included physicists, engineers and technicians. CMS Institutes were being asked to provide whatever suitable manpower they could. It was becoming increasingly hard to fill gaps as they arose.

In summary, the MTCC phase II had been very successful, the detector opening had been smooth, the heavy lowering was well underway, the surface installation of the muon drift tubes was complete, the YB0 lowering was expected in February, unaffected by the ECAL problem, and the beam pipe installation sequence plan was developing promisingly. The period between lowering YB0 and being ready for Tracker Installation looked like the biggest challenge. All aspects needed more detailed planning and more resources would be needed in many areas, and it was also important to retain the experienced people already in place.

Electronics Issues (J. Nash)

The Boards were reminded that the key dates for Low Voltage distribution were February 2007 for power to the cabinets and March 2007 for power to the systems. The sub-detectors should be moving into USC55 and most were.

The situation for the deliveries of the Low Voltage power supplies had been presented in the Opening Session, as well as the efforts being made to accelerate the delivery schedule. The Boards were reminded that this was a common difficulty for all LHC experiments. It was important to set priorities within CMS but also to agree the delivery schedule across the LHC experiments.

There would shortly be an announcement of the SLHC Workshop to be held jointly with ATLAS on March 19-21 2007 at CERN. Comments on the SLHC EOI had been received and there would be final minor editing before submission to the LHCC.

Outreach (D. Barney)

Issues had arisen concerning permitted content of the CMS Times. It was being proposed that plots should be permitted only if qualitative in nature. They should not, for example, contain analysed results, be performance measurements or discovery claims. They must be approved by the Project Manager. The procedure for publication should be submission to the editors (D.Barney and M. Lapka) who check the overall content and the English, and request improvements as appropriate. The final draft should be sent to the author, the relevant Project Manager and to M. Della Negra for approval; lack of response would be taken as approval. The final layout is sent to the author for approval before publication. For the forthcoming events section it continued to be difficult to get the necessary information, but A. Sharma had agreed to take care of the activities at Point 5 where many events were of interest to the press.

It was proposed to make a new CMS public web site, based on and conforming to the format of the CERN public site. A working group would be formed to define its content, but manpower would be needed to produce it.

The CMS Brochure was available (eg from the CMS secretariat) in English. Versions in 10 other languages were planned; those in English, French, German and Italian would be printed, and the others available in pdf. The Brochure was also available in poster format (A1) with one supplied free to each Institute. A four page version as a graphic novel aimed at younger people had also been produced.

It was being proposed to use a 12-metre high poster as the backdrop to a "Salon des Inventions" exhibition in Geneva in 2007. It was possible that CMS could inherit this poster and (eg) mount it outside Building 40. A sweatshirt and Christmas card had been produced. A good digital SLR camera with a wide angle lens had been donated and had been installed as a web-cam in the cavern. The CMS movie had been finished.

CMS Organisation (T. Virdee)

There had been email input from the Management and Collaboration Boards as well as from CMS as a whole, and widespread discussion inside the appropriate communities and the Executive Board, where the Deputies had also participated. Finally there had been a meeting with the Regional Representative and the Collaboration Board Chair and Deputy to discuss the proposals.

The Management Board was largely the same as had been presented in September except that L. Rolandi was to replace R. Tenchini as Chair of the Publication Board from January 1st, for a two-year term, which the Management Board had already endorsed. The Management and Collaboration Boards were being asked to endorse J. Incandela as Deputy Physics Coordinator. The Collaboration Board was also being asked to endorse P. McBride as Deputy Computing Coordinator. The rest of the Executive Board had already been endorsed in the September CMS Week. The Collaboration Board was also being asked to endorse the proposal that the coordinators and their deputies be appointed for two years with the possibility of a one-year extension.

The Level-2 Convenors in Computing, Offline Software and Physics were all for the Management Board to take note of but for the Collaboration Board to endorse, acting as these Projects' Institution Board. In many cases the second Level-2 Convenor was not yet being nominated, although in some cases negotiations were taking place with specific candidates. Normally Physics Convenors should be rotated out after two-year terms, but exceptions should be allowed. There were more than 30 Physics Coordinators and Convenors in total and it was being proposed to set up a smaller "Physics Planning Group" to work on planning issues. It was also being proposed to formally assign Mentors to Physics and analysis groups whose function would be to follow and guide the work, but not to coordinate or organise it; it was hoped this would enable experienced physicists to contribute effectively to the CMS physics programme.

The Tracker, ECAL, HCAL and Muons Detector Performance Groups were embedded in those Sub-Projects and their Convenors were being presented for the Management and Collaboration Boards to take note of. The second Convenor for three of these Groups had not yet been nominated.

It was being proposed that the Level-2 Convenors in Computing, Offline Software and Physics be appointed by the Spokesperson and the appropriate Coordinator after consultation with the members of a group comprising the Management Board's Regional Representatives and the Collaboration Board Chair and Deputy. The Detector Performance Group Convenors were appointed by the Spokesperson and the appropriate Project Manager. Each group would have two Convenors serving staggered two-year terms; where possible the current Convenors were being asked to continue for one further year. The Boards were reminded that this scheme was intended to institute renewal through rotation while maintaining continuity, in a seamless way. The Management Board had already taken note of these proposals and the Collaboration Board was being asked to endorse them.

The re-organisation had shown that a lot of communication and consultation was required, and it was impossible in such a large collaboration to discuss with everybody. There was a conflict between the need for widespread consultation and the ability to act nimbly and efficiently. The group comprising the Management Board's Regional Representatives and the Collaboration Board Chair and Deputy had been used as the main contacts over the past few months.

Management Board (MB100)

Hybrid Photodiodes (D. Green)

It was necessary to run the HPDs with the cathodes at –8 kV. It was also necessary to have the HPD internal electric field and the Magnet fringe field aligned. One problem was due to the fringe field being not quite as had been expected. The other was the non-optimum electrostatic shielding of the HPD. There were large pulses which raised concern about the long term effects as well as having a minor impact on the trigger. Operational solutions had been found and tests would be conducted in controlled environments to try to understand the problems further. A long-term test had not indicated serious concerns.

Decision on ECAL Motherboards (A. Benvenuti/P. Bloch)

A. Benvenuti reported on the considerations of the Task Force looking into the problems with the ECAL motherboards/kapton cables. The problems seemed to be at the hand-soldered connections. Thermal and chemical stress tests had been carried out. Profile analyses had shown manufacturing and assembly defects, of the sort which typically led to long term unreliability. The faults which had appeared during the tests seemed to be partly due to mechanical and partly due to thermal stresses. The level of the faults observed after these rigorous tests was disturbing but not such as to make retrofitting of all supermodules already assembled imperative.

An installation scenario had been developed which led to no macroscopic delay in the readiness for the Tracker installation. The Task Force recommended that plans should be made to replace the motherboards of the entire ECAL Barrel if this proved consistent with the CMS schedule.

P. Bloch thanked the Task Force for their very useful contribution to a difficult decision. The strategy for implementing their recommendations was to have at all times 18 supermodules ready for installation while steadily retrofitting those already completed as the material became available. First the supermodules not yet equipped would be integrated. Then those already completed would be

retrofitted starting with those with the largest number of faults. The process could be halted at any time, with three weeks notice required to be ready for installation. The level of faults was such that if not all supermodules could be retrofitted it was expected that the ECAL performance would not be seriously compromised.

Orders for new material had been placed to equip 18 supermodules including spares and further orders could be placed later without endangering the retrofitting schedule. The kapton would be made by the company which had made the prototypes and the motherboards by the company which had supplied the VFE boards. The assembly methods would be improved and the quality control procedures strengthened, on the kapton, on the motherboards and on the assembly.

The schedule for equipping the supermodules would be speeded up by doing double shifts, not by reducing the time taken to complete and test each supermodule.

The Management Board approved the proposed actions, and thanked the Task Force for producing a clear, decisive report.

Pixels Commissioning/Installation; Replacement Plan (P. Sharp)

The original pixel system contained 2 barrel layers and 2 end-cap disks. In the meantime this had been upgraded to 3 barrel layers. In addition, a spare inner layer, to be ready in case of a start-up accident, would be added. The source of the funding for this spare layer has to be clarified.

The top priority for the pixels was the production of high quality modules and plaquettes. This was making very good progress. A comprehensive plan for commissioning was being developed, for the delivery of a commissioning system in September 2007 and of the final system in February 2008. The first equipment for the forward pixels had just arrived at CERN. The forward petal integration facility was being set up adjacent to the Tracker Integration Facility. There had just been a successful installation of the pixel support tube inside the aligned TIB+ and TIB-.

Data Base Task Force Report (P. Sphicas)

The Task Force had first documented the status quo and the current strategy, at the online, offline, Tier-1 and Tier-2 levels. It had found that all subsystems were close to having working systems. However, there was still diversity across subsystems with rather independent developments and imperfect communication between them. There was no global CMS coordination body.

There was a satisfactory deployment model using OMDS, ORCON and ORCOFF and the Task Force was recommending using this model for CMS. All critical CMS data should reside in this set of databases, not in detector specific databases. Standard data flow paths should be defined, with only standard supported tools used.

It was being recommended to set up a CMS Core Database Team, with CMS authority to manage conflicts. This should plan the set-up and evolution of CMS database systems. It should define standard access tools and support them. Extra manpower, particularly for on-line operations, would be needed.

The Task Force would be recommending that a coherent documentation of all subsystems' requirements be made, and that all subsystem databases be moved into a common server and exercised together. There remained a number of open questions. It was intended to produce a written report in early January.

The CPT project was now at an end and P. Sphicas and his team were thanked for their efforts in accomplishing the goals set out for the project.

Underground Cabling (A. Gaddi)

There were three major cabling campaigns. That for the cable chains had started in July and would finish in February 2007. The second was for the racks on UXC55, mainly for the Tracker Low Voltage supplies. The YB0 cabling would take place from May to July 2007 (piping installation would start in March). There were also various other minor campaigns. Coordination with other activities going on in UXC55 was essential, of which the heavy lowering had the greatest impact on the cabling schedule. The cabling of the UXC55+ chains was complete, that of HF-1 well advanced. The chains on the UXC55- side were installed and partly cabled. The racks were being installed on the cavern balconies, with powering planned for March 2007. A Tracker Task Force was drafting a detailed cabling plan, which would have two crews working two shifts per day, for a total of six weeks. There was a new organisation for the cabling follow-up, and the tools and scheduling organisation were being improved.

In summary, the UXC55 cabling of the cable chains was well advanced. The critical time would be after YB0 is lowered. More than 40 workers per day would be required, plus supervisors. It was essential to have a good understanding of what should be done and to limit the number of simultaneous activities on YB0.

MATTERS PRESENTED AT THE JOINT BOARDS MEETING

CMS Organisation (T. Virdee)

The Management Board endorsed J. Incandela as Deputy Physics Coordinator; he would move to CERN in the middle of 2007. The Board also took note of the Level-2 Convenors in Computing, Offline Software and Physics. Suggestions for the unfilled positions were still welcome. It was urgent to appoint a Database Coordinator. In the cases where only one Level-2 coordinator was being nominated the second would be nominated in 9 months. It was stressed that the SLHC working group must do real simulations to address questions about the machine design.

The Management Board took note of the proposal to formally assign Mentors to Physics and analysis groups, of the nominations of the Convenors of the Detector Per-

formance Groups and recommended that the Trigger Coordinator be appointed soon.

Discussion on Technical Recommendations (A. Ball)

The Board was reminded of the conclusions presented at the Joint Boards meeting. The present planning assumed that the YB0 services installation could be completed in two-thirds of the estimated 33 weeks needed, to be ready to close on October 15th; that the ECAL Barrel delayed installation should cause less than two weeks critical delay to the overall schedule, provided the tooling was available; that part of the beampipe installation was now off the critical path; that the planning for parallel Tracker connection activity during beampipe installation was becoming solid; that the milestone updates were required the following week; that the safety responsibilities at CERN and Point 5 had been transferred to PH Division; and that Collaboration resources would be needed to carry out the plan in 2007.

The recent problems with the LHC triplets would probably cause less than one week delay to CMS. It was too early to know if there was an impact on the LHC schedule. G. Tonelli commented that in view of the very long time needed to commission such a complex experiment, the CMS completion schedule should not be relaxed in the event of a delay in closing the LHC.

It was necessary, with the transfer of the responsibility for safety to PH Division, that the needed resources were also transferred. A summary of the essential safety regulations for CMS would be circulated. It was emphasised that no unauthorised activities underground were permitted.

A more detailed schedule and list of needed resources would be prepared before the January Management Board meeting. It was essential to have the Tracker installed before the beampipe was closed. Extra manpower for the supervision of the cabling teams was needed, and an additional team with supervisor would be welcome (but where knowledge of English, Russian or French was needed). Job descriptions of the positions where extra manpower was needed would be posted on the web before the end of the year. The extra safety officers (SLIMOS) would act simultaneously as deputies to the area czars. The cost of providing the extra manpower was substantial, and it was important to try to provide Institute manpower to reduce this; Institute manpower was also preferable to contract workers since it was much more flexible.

T. Virdee gave a brief update on the progress since the October RRB on the requests for extra funding; there had been a number of encouraging responses and the request to CERN had been formulated.

Discussion on Electronics Issues/SLHC (J. Nash)

The items to note concerned the Low Voltage power supplies and SLHC matters. The Board was reminded of the delivery plans and the need to set priorities. The Management Board took note of the progress in the power supply installation; of the target to read out the first detectors underground in March 2007; of the internal priorities for the power supply deliveries; and of the upcoming submission of the SLHC Expression of Interest to the LHCC.

All components, including spares, in quarter-micron technology should be ordered since the foundries would soon be closed.

Postscript: M. Della Negra

There followed a small celebration in honour of this having been both the 100th Management Board meeting and the last to be chaired by Michel Della Negra. The Management Board expressed its gratitude to Michel for having led the experiment from its conception, through approval of the proposal until the present time, with great determination and energy.

Collaboration Board (CB54)

Manpower

The Board would hear requests for manpower at CERN to complete CMS, which should be considered seriously. Where possible Institutes should try to support their own manpower at CERN, but requests for support could be considered.

Authorship

The Chair of the Authorship Board (Q. Ingram) had been elected to be Chair of the ECAL Institution Board, and as a consequence was resigning at the end of the year. Proposals for his successor would be welcome and should be sent to L. Foa before the end of January.

CMS Awards

Thesis Award (L. Foa)

Eight theses had been nominated for the Award and all were of very high quality, and the Award Committee had had the difficult job of choosing one for the Award. It had been pleased to note that the results of most of the theses had appeared in the Physics TDR.

The Committee had decided to recommend that Chiara Rovelli of the University of Milano-Bicocca be given the award for her thesis entitled "The CMS electromagnetic calorimeter and the search for the Higgs boson in the decay channel $H \rightarrow WW(*) \rightarrow 2e\ 2\nu$". S. Ragazzi commented that although Dr Rovelli was at the University of Milano-Bicocca, the work had been carried out under the auspices of the LLR in Paris who should therefore share the credit. The Collaboration Board approved the proposal and the Award would be given in the February CMS Week.

Industrial Awards (D. Campi)

There had been six nominations for the Gold Award: Fibernet Limited (Israel) for optical fibres for the DAQ, Hitachi Computer Products (France) for the ECAL Front End Cards, KAPSCH (Austria) for mounting the optohybrids, ADAPT ELEKTRONIK (Germany) for cables for the Tracker, Savelovo Machine Building (Russia)for the Rotating Shieldings, and Brevetti Stendalto (Italy) for cable chains. A late nomination had been received for RIE (Russia) for the VPTs for ECAL and the Collaboration Board agreed to include this exceptionally in the 2006 Awards. All nominations were approved by the Board

and they would be presented at the February 2007 CMS Week.

Publication Committee (R. Tenchini)

The total number of documents published in 2006 was 413 compared to 144 in 2005, including 148 Notes (26 in 2005).

The first draft of the CMS Detector paper was still being written with the final 25% of text and remaining figures promised before Christmas. There would then be some two months of editorial work, followed by internal reviewing, with submission planned for June 2007. This was going to be an important reference paper and people should look at it carefully.

With the demise of PRS the publication procedures needed to be reviewed (a similar review was being undertaken for conference speaker selection – see item 8).

R. Tenchini was ending his term as Chair of the Publication Committee and the Board thanked him for his work. L. Rolandi would take over on January 1st. R. Tenchini would nevertheless bring the Detector paper to completion.

Open Access Publishing (L. Rolandi)

The cost of publishing in commercial journals had risen fast in recent years and was way above the cost of publishing, becoming beyond the reach of small institutes. As a result many articles were appearing in institutional archives where particle physics was leading the world. A better alternative was peer reviewed open access publishing where the quality would be ensured. The start of LHC would provide a judicious opportunity to make a change in our publishing model, and CERN had taken the initiative by setting up a Task Force representing authors, publishers and funding agencies.

SISSA journals were ready to convert to full open access with sponsoring, APS had launched a “free to read” scheme, and Springer and Elsevier were making moves in the open access direction. The Task Force had proposed a Sponsoring Consortium for Open Access Publishing in Particle Physics (SCOAP3) with potential partners HEP Funding Agencies and libraries, with non-HEP Funding Agencies providing generic support.

L. Foa commented that it was important that CMS establish procedures for deciding where CMS papers should be published in good time. It was proposed that the Publications Committee make a proposal in due course.

It was suggested that HEP should consider publishing in very high impact factor journals, notably Nature and Science.

Conference Committee (T. Muller)

The system based on iCMS, CMSDOC and INDICO was now up and working well. The collation of statistics was still in progress which depended on the help of the subsystem committees. CMS had been well represented at all relevant conferences in 2006. The restructuring of the CMS management has implications for the organisation of the conference committee, since the PRS Conference Committee no longer existed. A working group including the T. Virdee, P. Sphicas, F. Pauss and M. Spiropulu would meet early next year and suggest future arrangements. Following the resignation of M. Spiropulu a new scientific secretary, who would also act as deputy Chair of the committee, was needed.

An important project would be the evolution of the database for conferences, once the complex web system of CMS (iCMS/CMSDOC) had been streamlined.

Outreach (D. Barney)

This had been presented in the Joint Boards' meeting but in addition the Board was informed that the CERN Courier was suggesting articles on the MTCC and the Magnet. The deadline for the March issue was January 15th.

The Collaboration Board endorsed the editorial policy for the CMS Times including the proposed way of approving plots for publication, and the continuing attempts to maintain the forthcoming events section. The Board endorsed the proposal for a new CMS public web site based on that of CERN. It recommended that the CMS Brochure should also be printed in Spanish and Russian.

CMS Centre (L. Taylor)

H. F. Hoffmann was thanked for his work on this, in particular in securing the space. The topic was better termed CMS Centre as CCAR was only part of this. It would provide on the Meyrin site office space for about 250 people, visitor space and meeting rooms, as well as a CMS control room able to hold about 50 people. The first office space would become available early in 2007 and some people would be asked to move. The main problem at the moment remained the radiation shielding, although refurbishment, for example of the air conditioning, was also necessary. The estimated cost was 480 kCHF. A Requirements and Technical Assessment Group should report in March 2007. An initial CMS Centre should be in place by the end of 2007, with full systems in operation for Physics running in 2008.

CMS Organisation (T. Virdee)

This had been presented in the Joint Boards’ meeting.

The Collaboration Board endorsed the appointment of L. Rolandi to be Chair of the Publication Board from January 1st, for a two-year term. The Board also endorsed the appointment of J. Incandela as Deputy Physics Coordinator and P. McBride as Deputy Computing Coordinator. The Collaboration Board also endorsed the proposal that the Coordinators and their deputies be appointed for two years with the possibility of a one year extension. Following the recommendation of the Management Board, it was intended to appoint a Trigger Coordinator as soon as possible.

The Collaboration Board endorsed the Level-2 Convenors in Computing, Offline Software and Physics, acting as these Projects’ Institution Board. It was stressed that the SLHC working group must do real simulations to address questions about the machine design.

The Collaboration Board was asked to make suggestions concerning the proposed “Physics Planning Group” to work on planning issues. The Board encouraged the sug-

gestion to formally assign Mentors to Physics and analysis groups, but suggested that first a charge be clearly formulated to ensure that this did not lead to conflicts with the Coordinators/Convenors.

The Collaboration Board took note of the nominations of the Convenors of the Detector Performance Groups.

The Collaboration Board endorsed the proposals that the Level-2 Convenors in Computing, Offline Software and Physics be appointed by the Spokesperson and the appropriate Coordinator after consultation with the members of a group comprising the Management Board's Regional Representatives and the Collaboration Board Chair and Deputy; that the Detector Performance Group Convenors be appointed by the Spokesperson and the appropriate Project Manager; and that each group have two Convenors serving staggered two-year terms, with the current convenors being asked to continue for one further year where possible.

The proposed creation of a formalised "Regional Representatives Group" caused some discussion. It was felt that urgent matters should be brought to the Collaboration Board by email.

Finance Board Matters/MOAs(A. Petrilli)

The main problems foreseen for construction in 2007 were in the area of manpower. Technical Coordination was now supporting a large number of staff, Project Associates and people needing subsistence. The subdetectors were also calling for help from Institutes. The success of CMS required Institutes to supply fully supported manpower help.

The Finance Board had approved an increase in the number of physicists from Russia signing papers from 48 to 59, with a commensurate increase in M&O A contributions. The Board had been pleased to note this increase in support.

There had been a workshop on the Memoranda of Agreements in November. This had contained reports on how such matters were organised at CDF, D0 and Babar. The implications were that CMS might need 600 FTEs on site for commissioning and 250 FTE for later operations. All three experiments made service (non-physics) work mandatory. A small MoA Task Force was being created to interact with those of the sub-detectors to ensure consistency. A draft template MoA would be proposed at the January Finance Board.

It was noted that for some Institutes the expiry of the Construction MoU at the end of 2007 was a concern for securing further support. This was recognised and it was thought that an action would take place in the April 2007 RRB to address this.

New Members of CMS

M. Della Negra reported on the agreement reached with the University of Tennessee and reminded the board that the Technical University of Eindhoven's application for Associate Membership was to regularise their relationship and continue their participation.

Secret ballots were conducted and the University of Tennessee was welcomed as a Full Member of CMS and the Technical University of Eindhoven was welcomed as an Associate Member. Both applications were approved by overwhelming majorities.

Reports from Management Board

General (M. Della Negra)

All critical items discussed in MB98 and MB99 had been rediscussed in the CMS week and in MB100. The important issues from MB100, which were not the subject of a presentation in the meeting were ECAL, pixels and the Database Task Force.

The ECAL had found problems with the motherboards/ kapton cable in the supermodules, leading to a small number of faulty channels and possible long term unreliability. A Task Force had been set up to make recommendations and these had been accepted by the ECAL management. The Management Board had also decided to follow the recommendation, to retrofit new motherboards to all supermodules, consistent with the CMS schedule. All supermodules would now be inserted underground, but there was only a small impact on the overall CMS schedule. It was anticipated that most, if not all supermodules would be fitted with the new motherboards and kapton. The Collaboration Board endorsed the decision. The necessary manpower and the cost were beyond the means of the ECAL institutes and call to other CMS institutes for help was being made.

A commissioning pixel detector should be installed for the 2007 run and the full pixel system for the 2008 run. A spare inner layer should also be available.

The Data Base Task Force was preparing a written report for January, but a key recommendation would be that all critical data should be held centrally. A CMS Database team should be set up urgently.

The HELEN programme of cooperation with Latin American countries, funded by the EU, was producing results in 2006 and 2007. For CMS the countries involved were Brazil, Colombia and Mexico.

Recommendations on Technical (A. Ball)

The Collaboration Board took note of items discussed (see same item under MB).

Electronics Recommendations/SLHC (J. Nash)

The items to note concerned the Low Voltage power supplies and SLHC matters. The Board was reminded of the delivery plans and the need to set priorities. The Collaboration Board took note of the progress in the power supply installation; of the target to read out the first detectors underground in March 2007; of the internal priorities for the power supply deliveries; and of the upcoming submission of the SLHC Expression of Interest to the LHCC. The Board also took note of the successful ESRs for the ECAL selective read-out processor and for the global calorimeter trigger. Young persons should be encouraged to go to the ATLAS-CMS SLHC workshop at CERN, 19-21 March 2007.

submiited by T. Virdee

TECHNICAL COORDINATION, SCHEDULE AND INTEGRATION

A pivotal milestone in CMS underground installation will be reached during this CMS week when the 1920 ton central wheel (YB0) of the iron yoke is lowered into the experimental cavern on Wednesday 28 February. This milestone will be reached on the on the date planned due to the hard work and dedication of many people, on the surface, underground and at supporting sites. Details of the programme for 28 February, visit opportunities and progress updates, can be found on the TC web pages on iCMS.

http://cms.cern.ch/iCMS/jsp/page.jsp?mode=cms&action=url&urlkey=CMS_TC.

Heavy lowering

The build-up to the above event started shortly after the December CMS week, when the YE+2 endcap disk was safely lowered into the cavern, followed by the YE+1 on January 9. The lowering of YE+1 was the most complicated so far because, due to the calorimetry nose, the centre of gravity lies outside the plane of the disk. However, after 10 hours it touched-down safely without any problems. On Jan. 19 the first barrel wheel YB+2 was lowered, followed by YB+1 on February 4. The first HCAL half-barrel, HB+, followed on February 13. Each lowering operation was preceded by a long-list of completion and clean-up activities, examined and documented at lowering reviews held several weeks in advance. The CMS engineering teams, the point 5 crew and the lowering contractor VSL have worked hard, overcoming countless minor setbacks, to ensure that this lowering schedule has kept time like a proverbial Swiss watch.

SX5

By mid-December all barrel muon chambers had been installed at the surface, except in the horizontal sectors where the gantry cables are attached. HO layers were mounted by the end of the year and the last readout boxes were installed by mid January. By this point both HCAL half-barrels were removed from the vac-tank and placed in the hall for modification of the ECAL insertion rails and for the installation of layer 16. Lowering the HB's with layer 16 already mounted will save valuable time underground for the installation of cables and pipes on YB0. Meanwhile, disconnection of the coil from its services was completed, and transfer of components (cold box, DCCT etc) underground for re-installation is now in full swing (see Magnet article).

Two critical path activities needed to be finished on the surface in January and February before YB0 could be lowered. The first, installation of the vac-tank temperature stabilization circuit, was completed ahead of schedule in early February, thanks to intense work by members of the point 5 team and the contractor, ZEC service.

The second, parallel activity was the large cabling campaign, started on 23 January, to cable the YB0 muon chambers (DTs and RPCs) from the detectors to the towers. This work was well organized, closely monitored, carried out with precision and commitment by the central (Russian and Bulgarian) cabling teams and finished on February 15, slightly ahead of schedule. After this the DT/RPC-feet chambers were installed and re-cabled and, following some final clean up and purging of water and gas lines, YB0 began its journey towards the pit-head on February 22 and was handed over to the VSL heavy lifting crew on February 23.

In parallel with the preparation of YB0 for lowering, installation and commissioning, work began again on the negative end of the detector, despite the crowded logistic configuration. By mid February, RPC installation on YE-1 had been finished and work on EE/ES/HE and ME1/1 is currently underway. Installation of the final ring of CSC chambers will start after CMS week, and in the second week of March, with HB- moved to the pit-head, it will be possible to establish the optimum logistic arrangement for completion and surface commissioning of the minus end wheels and disks. Collaboration cabling teams from China and Bulgaria are already at work on the DT/RPC cabling of YB-1. Meanwhile, an environmentally controlled holding area for ECAL supermodules will soon be installed in the former magnet services alcove and a temporary logistics area will be set up in the +z end of the SX5 building to support YB0 services installation.

UXC

In late autumn 2006, the LHC vacuum group agreed to pre-install the forward beam pipe on the positive side of the cavern, early in 2007. This early installation takes a significant fraction of the time allocated for the beam installation off the critical path and allows more time for detector installation in the summer. In practice a vacuum problem was found between the TAS pipe and the forward pipe which requires further study and development. Both sections are leak-free, but the remotely operated connection between them using the tele-manipulator is faulty. In addition there was a minor integration conflict between beam-pipe support and alignment ring in the fully open position. Finding these problems early avoids critical delay later and the solutions can be tested when the minus-side forward pipe is installed in May. The final, corrected installation on the +z side will take place in late summer, but should have no impact on schedule.

After work on the beam pipe finished, the endcap wheels, with alignment components re-installed, were moved to the fully open position, uncovering some issues of precise movement, alignment with the beam axis, and cable chain patch panel alignment, which can now be addressed.

Three days after the first barrel wheel YB+2 was lowered, it had been placed outside the shaft area and the horizontal sector DT/RPC packages were mounted, followed by cabling, MAB installation and survey. This operation was repeated on the second barrel wheel, YB+1. On February 16 YB+2 was moved close to the endcap at the +z end of the cavern, followed by YB+1 on February 20. Finally the HB+ was moved into position for insertion into

YB0, so that, by the evening of February 21, the underground hall was ready to receive YB0.

Infrastructure work had to be closely coordinated with these critical path activities in order to avoid co-activity difficulties and to ensure items were installed on the balconies and cave whilst access was available. Notable recent steps are the installation and commissioning of cooling plants and racks on the balconies and of gas distribution in the cave beneath the YB0 position. The work of the TS experimental area management (EAM) team at point 5 in detailed planning, safety oversight and general assistance has been outstanding.

Schedule and future key activities

The next key step after lowering YB0 on Feb. 28 will be the insertion of both HB's in the vac tank during March, with lowering of HB- scheduled for March 12. This operation was fully rehearsed during MTCC and is expected to proceed smoothly. Shortly after YB0 is in its final position in UXC, the transfer line will be connected and the re-commissioning of the magnet will start, with a target of being ready for operation by late summer. With phase 1 of the lowering soon to be complete, the bulk of the collaboration cabling teams will soon turn their attention to the completion of the –z end cable chains. This activity will be coordinated through the point 5 twice weekly TC meetings and cabling meeting. Subsystem cabling contacts must ensure that all cables are presented for installation in good order and with labelling complete.

Insertion of the HB's will trigger another very intense and complex period of activity, with installation of services on YB0, initially in parallel with ECAL supermodule insertion (also an activity rehearsed during MTCC). YB0 integration and installation planning has recently progressed substantially in conjunction with the YB0 services project. The design of the plus end YB0 services is finished and the material procurement is in full swing. The minus end 3-D model is finished and production drawings are currently being produced. A rigorous scrutiny of the schedule and tasks has been performed and shows that the master schedule v35.3 is credible (as recently acknowledged by the LHCC referees), though it certainly remains challenging.

The problem of how to rapidly install and properly insulate the tracker cooling pipes is close to a solution which may satisfy the demanding schedule constraints. On the basis of a test mockup, successfully equipped with pipes and afterwards insulated by a specialist industrial company, the baseline has been changed. Some issues of robustness and envelope with respect to the previous, more developed solution will be resolved and parts of the pipe pathways remain to be fully specified. A review of the YB0 services installation will be held in March.

The first part of an assembly and tooling review was held on 8 February, with the second part due to take place in the first week of March. The objective was to identify any omissions or inconsistencies in the ancillary equipment needed to complete CMS installation and several issues were highlighted. Much of the second part of the review will be focussed on the procedures and co-activity, centred around beam-pipe installation, which follow insertion of the Tracker. The detailed sequencing and engineering of this phase will be profit substantially from the recent experience with the +z forward pipe pre-installation and the movement of the +z disks to the fully open position.

USC and SCX

In the USC the installation of detector and trigger electronics is in full swing. Central DAQ installation was completed several weeks ago and there is an ongoing programme of tests of FED-FRL connectivity as the first stage of commissioning. The control room on the S2 level of the USC is taking shape and is equipped with the first computers. Together with commissioning coordination, a common objective has been set for May 07, to be able to conduct global runs with several subdetectors active in UXC. This should provide a common focus for ensuring reliable infrastructure, networks, safety systems, controls and operating procedures are in place, that commissioning of the gas, cooling, low voltage and inertion services needed by the participating detectors keeps pace and that the required connectivity between USC and UXC is established. The present situation is frustratingly unsatisfactory for subsystems trying to begin commissioning, but organizational and technical effort released from the lowering sequence will become available to assist in the near future. A recent positive development is that the first LV cabinets have been delivered and are being installed. The installation schedule is complicated because, at the same time in the same area (S4), local magnet infrastructure, such as the cold box, is currently being re-installed. Furthermore, delivery of the gas room is now on the critical path for commissioning.

Safety

With the majority of CMS elements now in UXC, more and more activities will take place underground, where the environment is considerably more complex. In these exciting and sometimes hectic times it is of the utmost importance that everybody gives highest priority to safety. The menu of technical assistance requested from the collaboration (see TC web pages) includes a request for experienced scientists or engineers with safety supervision experience (eg ex-GLIMOS) to help with day-to-day, shift-to-shift, safety oversight in the period April-September.

For the efficient, safe and legal management of co-activities, it is mandatory that all work underground is known to technical coordination, appears in the detailed planning and is documented as a "work-package". CMS is fortunate to have the EAM team embedded in our pt5 structure to assist us. Together with them, the multi-task management and risk minimisation methods used during the Civil Engineering era at Cessy have been adapted for CMS underground installation. Within this team, Martin Gastal follows all underground work-packages, including contractor-work, centrally for CMS and keeps the planning updated. Before any work underground, he, or the "czar" of the area in which the work will take place, must be contacted to start the work-package procedure,

which includes a safety review, a risk assessment and a resource review. The usual process for this and for collective resolution of problems is through the twice weekly 09:00 pt5 technical coordination meetings on Tuesday and Friday mornings. Very large work packages may also need to be represented at the 11:00 Tuesday TECOPA meetings.

In addition to personal safety, safe operation of installed equipment is becoming an issue. Subsystems should note that electrical installations are permitted to be operated unattended only if they underwent a safety inspection. It is the responsibility of the owner to make sure that the equipment is under appropriate DSS monitoring and to inform the GLIMOS (Christoph Schaefer) to arrange inspections prior to unattended operation.

submitted by A. Ball and W. Zeuner

MAGNET / INFRASTRUCTURE

The final fast discharge of the Magnet took place on 3rd of November. The Coil reached a temperature of 70K by internal energy dissipation. By injecting a current of 200 A room temperature was reached on the 23rd November. During the heating of the coil un-connecting of the first magnet connectors on YBO was started to give the earliest possible access to the assembly groups and to continue the installation of the muon chambers.

The removal of the pumping lines and the disconnection of the vacuum system was instead done as soon as the room temperature was reached: more precisely from the 4 to the 18 Dec.ember.

The disconnection of the transfer line from the cold box and the completion of the removal of the control cables of the vacuum system and cryogenics was done at last. In January 2007 the disconnection of MCS-MSS, CDS, vacuum racks and their cable trays was also achieved.

After coil disconnection the effort of the magnet team has been mainly devoted in optimizing the lowering and reassembly of the ancillaries in the USC area. The installation in the USC will start with the current transformers and will continue with the cold box for the cryo-plant, MCS/MSS racks and primary pumps will follow as well as batteries, coil heater, UPS, transformers and power converter. The final connection of the feed-bars as well as the one of the main transfer line will be organized as soon as YBO is in place at the end of February.

Magnet cables from UX55 to USC55 will be pulled starting at the beginning of March for a total duration of a couple of months.

The re-commissioning of the magnet is foreseen to start on 1st of June and last until the end of July.

A specific Control Meeting was organized at Saclay to analyse the results of the Magnet test and implement improvements and corrections to the whole system.

submitted by D. Campi

Summmary of Infrastructure

Infrastructure in USC counting rooms is completed and all racks are operational, with proper cooling, ventilation and safety interlocks. Racks are being rapidly populated with crates. The adjacent temporary control room is taking shape as well, with furniture, desks, network and access controlled doors. In the service area, S4 level, the installation of electrical switchboards for LV system has started and cables, already pulled from UXC cable-chains to USC service area, are being connected to terminals. Priority is given to cables serving YE+1 and HF chains.

The move of cryogenics and magnet components form SX5 to USC55 has started, after the successful test of the coil last summer. The 10-tons cold box providing liquid helium to the coil has been removed from SHL5 building and temporarily stored before lowering trough PM56 to its final destination in USC55. Re-commissioning of the full Magnet system is planned from July this year.

In UX Cavern equipment of racks on balconies is going on. Plans are to complete the equipping of 70 racks with cooling and ventilation internals by the end of February. Powering is subject to installation of LV cabinets in USC55. It will come gradually enter into force, from mid-Mach. Temporary power is provided to racks on YEs and HF metallic structures from sockets installed into UXC55 walls. ECAL cooling racks on balcony level X2 have been installed, completing the equipment populating this balcony level. The final commissioning of Tracker, Pixel and Pre-shower cooling stations is about to start.

The Laser barrack on top of USC55 gas room is completed and delivered to sub-detectors. Six cubicles have been assigned to Tracker, ECAL, HCAL and Alignment systems. They will start the installation of their equipment as soon as access control is operational.

The cabling effort is now concentrated in the SX5 hall to complete DT and RPC systems on YB0. Four crews are working in two shifts to complete the task before YB0 lowering foreseen at the end of February.

submitted by A. Gaddi

INNER TRACKING

The CMS Inner Tracking Detector continues to make good progress. The Objective for 2006 was to complete all of the CMS Tracker sub-detectors and to start the integration of the sub-detectors into the Tracker Support Tube (TST).

The Objective for 2007 is to deliver to CMS a completed, installed, commissioned and calibrated Tracking System (Silicon Strip and Pixels) aligned to < 100μ in April 2008 ready for the first physics collisions at LHC.

In November 2006 all of the sub-detectors had been delivered to the Tracker Integration facility (TIF) at CERN and the tests and QA procedures to be carried out on each sub-detector before integration had been established.

In December 2006, TIB/TID+ was integrated into TOB+, TIB/TID- was being prepared for integration, and TEC+ was undergoing tests at the final tracker operating temperature (-10^{0} C) in the Lyon cold room.

In February 2007, TIB/TID- has been integrated into TOB-, and the installation of the pixel support tube and the services for TIB/TID+ have been completed. The testing of TEC+ at operating temperature was successful and TEC+ has been integrated into the TST. TEC- has been successfully tested at operating temperature in the Lyon cold room and is being prepared for integration into the TST, after the installation of the services for TIB/TID- have been completed.

In March 2007, the integration of the CMS Tracker will have been completed and it is planned to commission the Tracker at the TIF at both room temperature and operating temperature, and to gain very valuable experience in operating, calibrating and aligning the Tracker at the TIF before it is installed into CMS at P5 in July 2007.

A first 25% of the Tracker readout system was installed at the TIF in June 2006 and has been successfully commissioned with the DAQ, DSC and Tracker Safety Systems (TSS). A Cosmic ray trigger has been established and cosmic tracks have been observed in both TIB/TID+ and TOB+. A second 25% of the Tracker readout system has been installed in the USC at P5 and commissioned with the Central CMS DAQ system. Data has been transferred between the Tracker and the Central DAQ systems at 100 KHz with data corresponding to > 3% occupancy in the Tracker.

The CMSSW Tracker software system can be run in both the online and offline environments, and data from the Tracker at the TIF is regularly transferred over the CMS distributed computing system to Tier 2 (T2) centres throughout the Tracker Collaboration.

The primary focus of the Tracker collaboration in the next three months will be to gain as much experience in operating and commissioning the tracker as possible, to understand the performance of the Tracker at the TIF, and to optimize that performance before the tracker is installed into CMS.

The second focus of the collaboration will be to work with CMS Technical Coordination to prepare the installation of systems and services at P5 to ensure that the commissioning of the CMS tracking system is optimized before CMS receives collisions from LHC.

submitted by P. Sharp

ELECTROMAGNETIC CALORIMETER (ECAL)

Crystals and Bare Supermodules

Thanks to an unprecedented delivery rate, in excess of 1200 crystals per month during the last three months, the last Barrel crystals will be delivered at the end of February. The penultimate bare supermodule is under assembly; the last should be assembled in April.

The first batch of Endcap crystals from the mass production has been received from China as well as two pre-series of 100 crystals from Russia.

Electronics

The assembly and test of off-detector electronics crates (each crate containing three triplets, each triplet comprising Data Concentrator Cards (DCC), Clock & Control System card (CCS) and Trigger & Clock Controllers (TCCs) module – i.e. enough to serve three supermodules) is progressing fast. Several crates have already been installed in the USC at point 5.

The production of the specific Endcap electronics is also well advanced. For example, the test of the Front-End cards was recently completed.

Electronics integration

In early Autumn 2006 the test of several supermodules (before shipping them to point 5) showed the appearance of a few dead channels during storage. To understand better the issue, 4 supermodules were dismounted. The faults were found to be located on the motherboards, passive boards holding connectors and flexible prints (Kapton) to connect the VFE electronics to the APDs. These motherboards were visually inspected and subjected to harsh aging tests such as temperature cycling and heating for significant periods of time in a humid atmosphere. Although the number of dead channels after the aging tests was still at the percent level, the tests revealed weaknesses at the level of the soldering of the Kaptons (by hand). A task force chaired by A.Benvenuti, including ECAL and Technical Coordination experts, recommended the replacement of the motherboards and showed that it was possible to reshuffle the CMS assembly sequence (by inserting the supermodules in the underground experiment cavern) to give time to proceed to this operation without impacting on the overall CMS schedule.

New motherboards and Kaptons were immediately ordered and the first batches delivered in early January. The quality is excellent and at the time of writing several supermodules have been re-integrated. The infrastructure in building 867 has been increased (additional assembly frames; new barrack to concentrate all activities at the same location) and the team strengthened, to be able to deliver the supermodules as required by the new schedule.

Endcap Electromagnetic Calorimeter (EE)

Seventeen out of 20 Supercrystals of a prototype comprising 500 channels have been assembled. This prototype will be assembled in the next weeks, including all final integration elements. It offers a unique opportunity to test the complete EE integration sequence before launching the assembly of the first Dee, scheduled to start in April. The prototype will also be used during the Summer at the H4 beam test.

Preshower

A new iteration of Front-end hybrid PCBs has been recently received. Visual inspection and electrical tests gave positive results. An ageing test with temperature cycles is on-going. In parallel, some PCBs have been sent for component assembly. Motherboard production is nearly finished.

Micromodule production is continuing in India, Russia, Greece and CERN. A prototype of the modular VME readout board (a joint project with TOTEM) has just been received and is giving very promising results. The final step in the preparation of the Preshower circular windows (gluing of the heating films) is progressing well. These windows should be installed in CMS in May.

submitted by P. Bloch

HADRON CALORIMETER (HCAL)

The organization of CMS HCAL contains four "geographic" efforts, HB, HO, HE and HF. In addition there are presently five "common" HCAL activities. These efforts are concentrated on electronics, on controls (DCS), on physics objects (JetMet), on Installation and Commissioning (I&C), and on Test Beam (TB) and Cosmic Challenge (MTCC) data taking. HCAL has begun planning to re-organize to be synchronized with the overall CMS management structure.

HF

The full production of the wedges is completed for some time. The 2004 test beam work has established the radioactive source calibration system for HF works at the 5 % level or better and a note is completed. The calibration of the complete HF is complete. HF is now in the UX cavern and will be hooked up and read out as soon as the services are available.

HE

The two HE calorimeters are installed and an initial calibration has been established. In the MTCC the HE was read out and muon data was observed. Event building using ME1 and the HE has been attempted and synchronized data for the two subsystems has been logged. HE+ will be lowered into UX early in CY07.

HB, HO

Much data were taken in the H2 beam in 2006 including exposures to electrons, pions, proton/kaons and muons. Preliminary analysis shows reasonable agreement between G4 and the data. More incisive comparisons can and will be made and G4 may need to be "tweaked". This data is invaluable as it gives a comprehensive response of EB and HB to all particle types with beam momenta from 2 to 350 GeV. In addition, a partition of HE with a pseudo "ECAL" compartment was studied in the H2 line with incident electrons and pions.

HO data taken in H2 confirm the use of the tiles for muon triggers to help with RPC rates and these added trigger planes are being planned. Installation of counters and front end electronics for HO on YB+2 and YB+1 is ongoing. A test of HO readout with solid state photomultipliers was made in H2 with very encouraging results. Note that the fringe field of the CMS magnet was not well modeled in the HO location, which will necessitate a solution involving changing the HO HPD position along the beam. A solution was proposed and tested and is now in train for all HO installation.

Thus, all the geographic elements of HCAL are built and the front ends are tested, burned-in and installed. A preliminary calibration of all HCAL elements has been made, at the ~ 5% level, prior to the MTCC. The MTCC provided calibration data on scintillator brightening and HPD magnetic field proximity focusing.

Electronics

All HCAL electronics, both front-end and data acquisition/trigger, has been built and commissioned.

DCS

The servers and clients for most systems to be controlled in HCAL were made "operational" at the H2 beam test in 2003. Test Beam 04 used XDAQ and created code to use the prototype run control of CMS. Controls are an integral part of the SX5 'slice" tests for HCAL. Construction, characterization, Timing and pedestal data bases are being populated to be loaded at run time, as well as initial energy calibration files mentioned above.

PRS

The PRS group leads the analysis of the H2 test beam data. That data is being tested against G4. This comparison and G4 tuning will be completed before first LHC beam, initial indications are that a simple rescaling of the ECAL hadronic energy response to incident pions will be sufficient to yield a good model of the TB06 data.

I&C

The I&C effort continues. Attention now turns to rigging of the rest of HCAL into UX after the MTCC – II. The HCAL trigger was used in this run and the DCS was made part of global DCS.

Data Taking

Slice tests have a designated HCAL leader and are now a standard agenda item at HCAL meetings as is HCAL test beam planning for CY07. Aspects of DQM and Remote Operations also fall within this group. The organization will be altered to conform to the needs of an HCAL Detector Performance Group.

submitted by D. Green

MUON DETECTOR

Drift Tubes

The long run of chamber certification and test at ISR ended in October. The full lot of 250 DT chambers, and some of the 16 spare not kept in the assembly sites for further studies and tests, were tested and equipped with Minicrates. It's the end of a hard work lasted more than three years.

58 BMU Stations (DT + RPC) were installed in three weeks in the wheels YB-1 and -2 in the surface hall at point 5. With the exception of 6 chambers to be installed in the feet of YB0 and -1,-2 after the cabling this achievement marks the end of the installation of the Barrel MU in surface.

Commissioning of the installed chambers is already going on.YB+2 passed the review to certify its readiness for

lowering. Lowering is foreseen for the beginning of January, followed within a couple of weeks by that of YB+1.

Lot of work is being deployed in the definition of the services on YB0. They are crucial for the definition of the length of many cables foreseen to be installed starting in January.

The design of the thermal screen that cover the power cables on the face of the wheels is finished for the mobile wheels and their production will start in January.

The status of off chamber electronics was revised: Trigger and Read out Sector collectors are in full production, expected to be completed by end of January. Concerns were raised about the delay of the delivery of the Low Voltage Supplies that might make critical the first planned test of a full wheel (YB0, being the more complicated, was chosen as the best candidate) before lowering. In general the late delivery of the off chamber electronics will move its installation in the cavern after the wheel are lowered.

Plans in view of the final commissioning of the detector in the cavern were discussed during the CMS Week of September. The activity for the extension of methods and tools developed for the magnet test on 14 chambers of YB+2 and YB+1 to a full wheel of 50 and to the complete lot of 250 chambers already started. Reports were given on the status of the work going on in Legnaro for the DCS and DAQ part using a subset of the system tested during the summer and dismounted to allow for the lowering of the two wheels.

The plan is to have a first test of the extended set up in time for the test of YB0 before its lowering, planned sometime in February. The analysis of the data taken in the magnet test and cosmic challenge is progressing well. The ambitious goal is to prepare for spring 2007 a "quasi automatic on line chain " for the analysis of the cosmic data of all the chambers of a wheel in order to understand and tune as much and quickly as possible the trigger , synchronization and calibration parameters

The Barrel Steering Committee was dedicated to examine and improve the organization to fit at best the fields of Technical, Commissioning and Offline Coordination as foreseen by the new structure of the CMS Management that will become operational during 2007. Link persons toward the new Executive Board Coordinators were proposed and agreed. Time was also dedicated to the understanding of the issues and definition of the tasks to be included in the new Detector Performance Groups (DPG). A scheme was proposed to be finalized in tight collaboration with the other components of the MU detector (CSC,RPC and Alignment) by the next CMS week of February.

In the MU Institution Board first steps and plans were presented and discussed to strength and make as efficient as possible the collaboration between the different branches of the Muon Subdtector. Meetings are planned that will include this subject starting in January. The subject will be resumed in the next CMS Week of February.

RPC

The status of the barrel&forward chamber production was presented. The last barrel chambers will be produced and tested on time for the installation window already scheduled.

The Bari test site will be closed at the end of the year. Any further test that would be required on future spare chambers will be performed at the CERN ISR site. Also a scenario for production of spare gaps was discussed.

Issues related to the integration and to the cabling were extensive discussed. Cabling of YB+2 and YB+1 has been successfully done. Routing layout and cutting lengths for YB0 and negative wheels are under development (cables for one wheel have already been produced). We are waiting for final cutting length to start labelling.

Long cables between USC55 and UXC55 are under production.

New results on the possible pollution introduced into the closed loop gas system by the purification module were presented. After few days chamber present anomalous increase of current which is reversible as soon as the open loop circulation is restored. Investigation will go on.

Finally some preliminary results from the MTCC were presented. The chambers performance is very good, and also the RPC system trigger capability was proved to be excellent. More refined analysis will be performed to understand cross talk effects.

ALIGNMENT

Installation of alignment components in UX will be completed by the first week of February for +Z side Endcap disks and barrel YB+2 wheel, including Survey and Photogrammetry measurements of YB+2 DT chambers and MAB structures. At the ISR two more calibration bench are operational (for diagonal optical measurements and MAB-tiltmeters verticalization), and final calibration of alignment structures is on going. The installaion of hardware and electronics in the detector will follow the general CMS schedule. Analysis of MTCC data is proceding both for the hardware alignment as well as for the track based alignment, for B=0T and full field, B=4T. Good agreement is found between Survey measurements and track based alignment, in the central wheels, for both field values, which indicates no small internal wheel deformations with field, comfirmed as well by MAB measurements.
Updated results will be discused at the February CMS week.

submitted by G. Iaselli and F. Gasparini

Muon Endcaps

Over the past 3 months, all the endcap disks on the plus side of CMS were lowered into the underground cavern without any major problems. Work now continues in the cavern on the installation of components such as racks for electronics and on the re-installation of items that had to be removed for lowering.

The mini-cable chains, which were installed on the disks before lowering, will be unrolled and bolted into place. This will limit the separation of the disks to about 3.5 m. Fixed and flexible piping has to be installed in the towers and mini-cable chains, but as yet no company has been chosen to do the work. This potentially will delay the delivery of services to the chambers on the plus endcap.

The minus-side endcap in SX5 has been opened up, allowing access so that installation of the muon systems can be completed. The final set of 72 mounting posts for the ring of ME-1/3 CSCs was bolted to the YE-1 disk, and all the RE-1/3 RPCs have been installed. The last ring of CSCs will be installed the week after the CMS Week, marking the completion of the entire system.

Cabling of this last ring of ME-1/3 chambers will begin in mid-March. Racks and cooling manifolds will be installed and the chambers will be commissioned. A Slice Test involving 18 CSCs is planned for the minus endcap.

submitted by R. Breedon

TRIGGER

At the December meeting, the CMS trigger group reported on progress in production, tests in the Electronics Integration Center (EIC) in Prevessin 904, progress on trigger installation in the underground counting room at point 5, USC55, and results from the Magnet Test and Cosmic Challenge (MTCC) phase II. The trigger group is engaged in the final stages of production testing, systems integration, and software and firmware development. Most systems are delivering final tested electronics to CERN. The installation in USC55 is underway and moving towards integration testing. A program of orderly connection and checkout with subsystems and central systems has been developed. This program includes a series of vertical subsystem slice tests providing validation of a portion of each subsystem from front-end electronics through the trigger and DAQ to data captured and stored. This is combined with operations and testing without beam that will continue until startup. The plans for startup, pilot and early running triggers are well underway.

The MTCC was a major success for the Trigger Group. All goals for trigger operation in the MTCC phase 1 and 2 were not only met but many were exceeded. More triggers than originally planned were made operational and ran stably for long periods with good acceptance and correct rates. More than 25 Million events were taken at a trigger rate of ~ 200 Hz with a mixture of barrel muon triggers from the Barrel Drift Tube, RPC Trigger Board and Balcony Collector Technical trigger, from the Endcap Muon CSC track-finder trigger and from the Regional Calorimeter Trigger using signals from the HCAL. The trigger requirements were easily configurable to provide different running conditions. The system ran stably for many runs of more than 500K Level-1 accepts and greater than an hour in duration. The participating CMS subsystems were all synchronized, including the Tracker, ECAL, HCAL, RPC, DT and CSC, and read data from the correct 25 ns crossing that triggered the event. Tests were made with the final Trigger Timing and Control (TTC) infrastructure (TTCci and Local Timing Controller (LTC) boards) with an imposed 40 MHz clock. The Global Muon Trigger and Global Trigger systems were successfully integrated. The Trigger Throttling System (TTS) worked very well, holding the output trigger rate within tolerance even when the input temporarily soared above 1 kHz due to transient hardware problems. The bunch crossing synchronization and resynchronization procedures were tested.

Since the trigger system is now starting installation, the focus of the trigger group is widening to include closer coordination with Higher Level Triggers (HLT) and software efforts. In 2007, there will be monthly TriDAS meetings with the first morning (generally Tuesdays) on trigger electronics installation and commissioning and the afternoon on HLT, trigger emulator, software framework, timing/performance, startup and commissioning triggers, and configuration and conditions databases. The second morning (usually Wednesday) will be a DAQ meeting and in the afternoon the ESSC will meet. There are also "trigger-physics" workshops scheduled in collaboration with Physics Coordination for the weeks of April 23-27 and October 22 - 26. These will focus on collaborative work between the physics and trigger groups on delivery and analysis of the optimum data samples for physics results. The meeting schedule is on http://cmsdoc.cern.ch/~wsmith/Agenda.html.

During the December CMS week, there were many reports on trigger activities. The CERN group reported that the TTCci production boards are under test and the LTC boards are in assembly. The TTC fibers and other infrastructure are being installed in USC55. The prototype new TTC Machine Interface system has been tested by designers in PH/ESS.

The Lisbon group reported on plans for modifications to the 1000 cables carrying the TPG data to the RCT to correct manufacturing defects. This should not have a schedule impact. They have analyzed SLB data in H4 bunched beam at 20 and 50 GeV and showed measurements of the spatial and time structure of trigger primitives and the bunch structure that validated the use of this structure for synchronization. The LLR/Palaiseau group reported they are producing and testing the Trigger Concentrator Cards (TCC) that calculate the ECAL Barrel TPG. They have performed detailed testing of the connections to the ECAL electronics Front End, Regional Calorimeter Trigger, Data Concentrator Card and Selective Readout Processor at full speed. The TCC was also tested with the DAQ at the H4 beam.

The Boston University, Fermilab, Illinois, Maryland and Princeton groups reported on the HCAL Trigger Primitive Generation (TPG) system. The test of the 56 x 8 Serial Link Board links worked well. The 2-time-slice peak-finding TPG with a muon window threshold was developed and validated. The Pedestal suppression and linearization with Look Up Tables (LUTs) was validated. A troublesome HCAL noise problem was found and is under active investigation by HCAL group. The new HF layout is being incorporated into the HF TPG Firmware (FW) and work is starting on monitoring.

The Wisconsin group reported that 13 of 18 full RCT crates are at CERN. More are in shipment. All cards are tested. The Master Clock crate is being worked on. The inter-crate sharing cables are at CERN. Full Crate retests at B904 are ongoing. The rack monitoring system is ready in USC55 and has been tested with PVSS and the Control Ethernet to RS-232 interfaces. The PVSS (detector control) PC is installed. A full RCT Crate operated and was used for triggers in MTCC 2. It ran at about 1 Hz with good coincidences with DT trigger. Integration testing with the Trigger Supervisor is ongoing

The Imperial College, CERN and Bristol groups reported on the new Global Calorimeter Trigger (GCT) project. There are 10 working Source Cards in various setups. Integration tests with the RCT and Leaf Card have been successful. Data transfers have been validated for a BER of 10^{-13}. Source Card production has started with the first batch of 36 cards due at Imperial soon. A test setup has been prepared at Imperial. All 108 RCT to GCT cables and Source to Leaf and TTC optical fibers have been ordered. All 6 Source Card crates have been received from Wisconsin. The GCT Leaf - Source integration tests have been passed using 8 Source Cards, a Leaf Card and 1/3 of the optical patch panel. The Concentrator Card is under test with the first phase of basic tests passed. Integration tests with the Leaf Card have started on schedule. The control chain from VME to the Concentrator Card to the Leaf card is working. The Global Trigger Interface Card is being manufactured. The Wheel Card schematic capture and layout are finished at CERN and it will be ordered for manufacture.

The Rice, UCLA and U. Florida groups reported on the CSC Endcap Muon trigger system. The CSC Trigger operated reliably in the MTCC with the S-Link used to send data to the global DAQ. The Detector Dependent Unit (DDU) and (Fast Monitoring Module) FMM interfaces also worked. A synchronization task force will study optimizing timing and synchronization procedures. Trigger primitive configuration downloading from proms was tested. The data showed clear correlation of the RPC pad bit with the CSC position. They tested the path from the Sector Processor (SP) to the Muon Sorter to the Global Muon Trigger to the Global Trigger. They tested operation with 2 SP cards, triggering the CSCs with DT stubs and triggering the DTs on CSC stubs.

The Bari, Helsinki, Lappeenranta, and Warsaw groups reported on their work on the RPC trigger system. The Link Board system worked stably in the MTCC. The RPC Barrel Collector technical trigger was stable and used throughout MTCC 1 & 2. The main pattern logic (PAC) trigger was tested and synchronized. The RPC DAQ was tested. Link Board production is close to completion. The Trigger Board production is being prepared and there are two full Trigger Crates available. The Sorter Boards are finished and in final checkout.

The Bologna group reported on operating the DT TPG system in the MTCC. There were 159 Million events taken at B fields between 0 and 4 T. They also took 15M events at B = 0 - 3.8 T for DT-CSC overlap studies. Various synchronization procedures were tested: DT vs. RPC, DT vs. CSC. All 14 DT minicrates performed well during MTCC 2 with no broken connections, and were validated with online test software. The Sector Collector production has started with the PCBs designed, delivered to companies and full part procurement almost done. Four production test stands are available, including an optolink test bench.

The Vienna and Madrid groups reported that 2 DTTF crates were moved to the Green Barracks for the MTCC. The connections to the chambers performed well using 3x128m optical cables to the participating sectors. The TTC system worked. The connection to CSC worked both ways: 2x30° DT - 60° CSC muons were found and their timing understood. The PHi track Finder performed reliably. The Local DAQ collected 2.5 M events. The Wedge and Barrel Sorters were set up. The WS generated triggers from 1,2,3 sectors, while the BS delivered trigger signals for both Local Timing Controller and the Central Timing Controller and 2 muons to the GMT. The readout was provided by local readout of PHTF spy units.

The Vienna group reported on the Global Muon Trigger (GMT) and the Global Trigger (GT). The whole chain was tested with cosmic muons from the Drift Tube Track Finder to Global Muon Trigger to Global Trigger Logic Board to Final Decision Logic to Trigger Control System to the L1A Output board through the TTCci back to the Drift Tube Track Finder. Global Trigger Logic and DTTF were read out with "spy readout". The trigger data were checked in GTL and DTTF and were fully consistent. The trigger conditions were correctly reflected in the taken data. Subsequently, similar tests were made with the CSCs. The distribution of L1 accept rate vs. pt looks reasonable and no errors (pt=0) were found. They also tested the FMM system successfully. There was also a successful test with HCAL/RCT. The GT now gets clock and orbit from the machine interface (TTCmi) and then distributes triggers, and other signals to sub-detectors via the TTCci. The stable clock is fed from TTCmi to the TTCi/TTCex downstream of the GT for distribution to all sub-detectors.

The Vienna group is developing the Trigger Supervisor (TS) software that will operate the trigger and interface to Run Control. Trigger Supervisor was tested with the ECAL, HCAL and RCT hardware setups in 904. The next phase involves tests in USC55.

The trigger group also works closely with the PRS Online Selection group. Planning is underway for the startup and pilot run triggers. Particular attention is being paid to the development of min-bias triggers, calibration triggers and other triggers needed for startup.

submitted by W. Smith

DAQ

The CMS DAQ installation status

The year 2005 was dedicated to the production/test of the custom made electronic boards and the procurement of

the commercial items needed to operate the underground part of the Data Acquisition System of CMS.

The first half of 2006 was spent to install the DAQ infrastructures in USC55 (dedicated cable trays in the false floor) and to prepare the racks to receive the hardware elements. The second half of 2006 was dedicated to the installation of the CMS DAQ elements in the underground control.

As a quick reminder, the underground part of the Data Acquisition System performs two tasks:

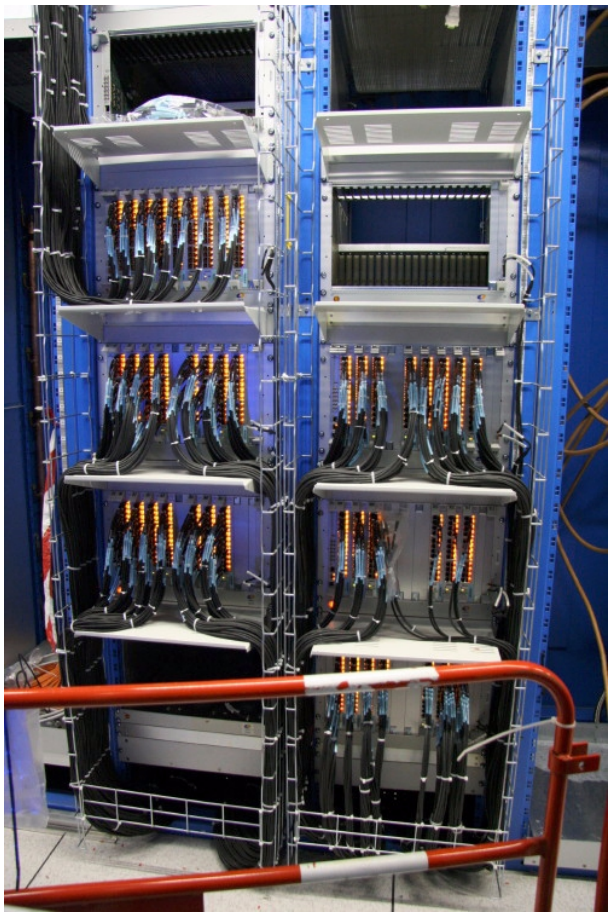
a) Front End data collection and transmission to the online computing farm on the surface (SCX). b) Front End status collection and elaboration of a smart back pressure signal preventing the overflow of the Front End electronic.

The hardware elements installed to perform these two tasks are the following:

- 500 FRL cards receiving the data of one or two sender cards (the sender cards are plugged onto the sub-detector Front End Drivers (FED)
- 650 S-link cables connecting the senders to the FRLs (total length 6 km)
- 56 FMM cards receiving and merging the status from each FED
- 750 RJ-45 cables connecting the FEDs with the FMMs (total length 11 km)
- 500 Myrinet Network Interface Cards (NICs) plugged on the FRLs
- 6 Myrinet switches of 256 ports each
- 1000 optical patch cords connecting the NICs with the switches (total length 38 km)
- 50 Compact PCI crates sub-divided into 60 logical crates (some crates contain dual-backplanes)
- 60 crate controller PCs with their control cables (1.6 km)

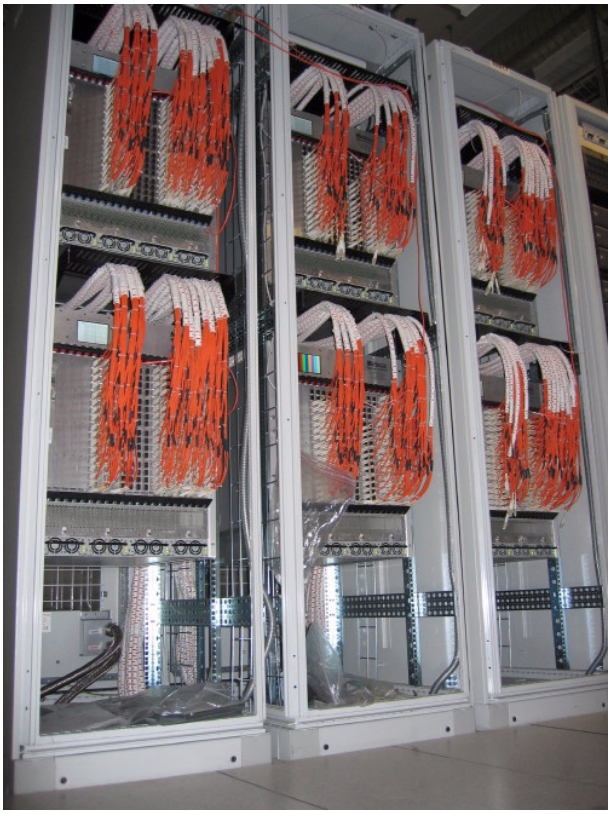
All this equipment has been installed in 18 racks and dedicated cable trays running in the false floors of both levels of USC55 between July'06 and January'07. The installation has been carried out by CMS DAQ GROUP members, mainly by Dominique Gigi, Lucien Pollet, Attila Racz, Sham Sumorok and for the delicate installation of the optical patch cords, helped by many other members of CMS-DAQ GROUP: Vincent Boyer, Esteban Gutierrez, Elliot Lipeles, Frans Meijers, Steven Murray, Steve Pavlon, Jonatan Piedra, Matteo Sani, Hannes Sakulin, Christoph Schwick.

All cables/fibers and hardware elements where tested right after installation and we had very few broken devices: 2 FMM cables, one optical patch cord, 3 FRLs and 2 CPCI backplanes. All these items have been changed or fixed. A very high level of quality has been achieved during this installation, many thanks to the DAQ crew!



Racks containing the 56 FMM cards receiving the status of all FEDs through 750 RJ45 cables

One of the 15 racks containing the FRL cards. In gray, the s-link cables and in orange, the optical patch cords.



The 3 racks containing the 6 Myrinet switches used to collect the data from the FRLs.

Concurrently, the CMS DAQ group purchased and installed the PCs used to control the VME crates of the sub-detectors: it represents about 200 rack-mounted PCs. These PCs are located at the upper floor of USC55 in dedicated racks with horizontal air flow. The software management, the user support and the maintenance are assured by Eric Cano and Marek Ciganek.

As a result of all these intense activities, the first steps of commissioning with sub-detectors have started in USC55 since beginning of February.

In March, the 30 optical cables (18 ribbons of 12 fibers each) connecting USC55 with SCX5 (DAQ surface building) will be placed.

After that important step, the main installation activity will focus on SCX5 that will receive its first computers (~700 units) around May-June time frame.

submitted by Attila RACZ on behalf of CMS DAQ Group

COMMISSIONING AND DETECTOR PERFORMANCE GROUPS

The commissioning effort is presently addressing two main areas: the commissioning of the hardware components at the pit and the coordination of the activities of the newly constituted Detector Performance groups (DPGs).

At point 5, a plan regarding the service cavern and the commissioning of the connections of the off-detector electronics (for the data collection line and trigger primitive generation) to the central DAQ and the central Trigger has been defined. This activity was started early February and will continue until May. It began with Tracker electronics followed so far by HCAL and CSC.

The goal is to have by May every detector commission, as much as possible, their data transfer paths from FED to Central DAQ as well as their trigger setups between TPGs and Global Level 1 trigger.

The next focus is on connections of front-ends to the service cavern. This depends strongly on the installations of services. Presently the only detector which has its link fibers connected to the off-detector electronics is HF. On the time scale of May we expect to have the +side end-caps (CSC and HE) and part of YB0 (DT) also connected.

We are planning to have the first global run (including for sure the Global trigger and HF and hopefully some fraction of CSC, HE and DT of YB0) by the end of May.

From that time onwards we aim to have regular global runs every 4 weeks - of limited length, 3 to 5 days - with increasing participation and scope. Such global runs will be ‘technical’ runs aiming to commission parts of the overall CMS data flow and trigger. Their specific goals will be defined from one run to the next.

The DPGs work within the detector projects on detector-specific tasks including simulation, local reconstruction, calibration, and data quality monitoring. The DPGs have begun meeting regularly and have so far progressed well in the definitions of tasks and responsibilities and the assignment of contacts to the Offline project.

The mandate of the calibration and alignment task has been renewed and this team is now strategically placed between commissioning and offline. The mandate is to ensure overall coherence in the software –DB interface, usage of common tools and assurance that the implementation is coherent with the CMS architecture from sensors readout to storage of constants, application and monitoring of calibration and alignment constants. They have the responsibility of end-to-end tests of the global alignment and calibration procedures and of ensuring prompt calibration and adequate export of constants to the HLT.

The commissioning work is organized through regular meetings: a weekly commissioning meeting (presently 14:00 on Friday), a monthly DPG coordinators meeting and soon a Run organization meeting (which will become weekly).

submitted by D. Acosta and T. Camporesi

COMPUTING

The Computing Project is preparing for a busy year where the primary emphasis of the project moves towards steady operations. Following the very successful completion of Computing Software and Analysis challenge, CSA06, last fall, we have reorganized and established four groups in computing area: Commissioning, User Support, Facility/Infrastructure Operations and Data Operations. These groups work closely together with groups from the Offline Project in planning for data processing and operations.

Monte Carlo production has continued since CSA06, with about 30M events produced each month to be used for HLT studies and physics validation. Monte Carlo production will continue throughout the year in the preparation of large samples for physics and detector studies ramping to 50 M events/month for CSA07.

Commissioning of the full CMS computing system is a major goal for 2007. Site monitoring is an important commissioning component and work is ongoing to devise CMS specific tests to be included in Service Availability Monitoring (SAM) tests of grid services at sites around the world. In addition, tests of the data transfers between sites are ongoing. These tests will run in cycles of five weeks with the goal of establishing smooth bidirectional transfers between all Tier-1 and Tier-2 sites.

Preparations for CSA07 have begun in collaboration with the offline, physics and commissioning projects. The upcoming data challenge is scheduled for the summer or 2007 and the scale of the computing systems will be tested at > 50% complexity of the final system required for 2008 data processing and analysis. As a reminder, CSA06 was a 25% test. The goal is to test the complete workflow and data management systems at the Tier-0, Tier-1 and Tier-2 sites for production and analysis tasks and to test the transfer rates between sites. This challenge will require many simultaneous users to stress the system by performing analysis on the simulated data sets. CMS users interested in participating in physics studies are requested to join in the analysis phase of CSA07.

submitted by P. McBride

OFFLINE

In 2006 major milestones reached were the completion of the new framework and application software suite (CMSSW) to the point where it could be used in the Magnet Test and Cosmic Challenge (MTCC) and the combined Computing, Software and Analysis challenge (CSA06), and the development of new computing systems to enable the running of CMSSW jobs on the grid.

In 2007 the scope of the Offline Project has been extended to include the development of Data and Workload Management tools, with the Computing Project focusing on facility management and operations. The Offline Project is now organized in ten Level 2 tasks, eight of which are now led by 2 co-conveners. Coordination structures are in place to facilitate communication and planning between Computing and Offline (JOC), and with Detector Performance Groups and Physics (CPO).

The Software Release Plan for 2007 envisages a series of 8 incremental releases between January and October and is designed to bring new functionality into production as soon as possible in order to prepare for the Engineering Run planned for the end of this year. The current version of the software has been prepared for the production of large samples of simulated events for HLT and Physics Validation studies and will continue for several months in order to produce samples for physics studies. In Release 1_4_0 (expected end March) the Detector Performance Groups will deliver new software containing improvements that give more realistic descriptions of the geometry of the CMS detector as well as new reconstruction algorithms. Much discussion has taken place over the planning of the introduction of these changes as this version will be incompatible with earlier releases of CMSSW.

The Reconstruction Project has prepared an ambitious schedule for 2007 with further developments planned in order to demonstrate "readiness for beam" by the Summer. The last 12 months has been a crucial period for the development of the reconstruction software. In January 2006 the reconstruction code was limited to a preliminary version of Local Reconstruction algorithms. In May tracking code was added and in August a pre-CSA06 release included all the major reconstruction algorithms up to high-level reconstruction objects. The CSA06 Challenge provided an important focus and drive for the development, resulting in a huge expansion in the production of code. More recently the focus has moved to Physics Validation of the code. With Release 1_2_0 a huge leap has been made towards recovering the performance reported in the Physics TDR Vol 1. The next release (1_3_0), which is in preparation, will be used by Physics groups in the major analysis studies planned for this year. The release planned for May (1_5_0) is designed to demonstrate the ability to run realistically at the Tier 0 by allowing the use of realistic calibrations and corrections and will serve as a solid base for the code that will run when LHC will start to deliver proton collisions.

Since CSA06 the CMS simulation code has been used heavily to produce large samples (130 Million) of simulated events for Physics Validation and HLT studies. The Physics Validation exercise is close to completion and has included production of pileup events using a new validated version of the code. Now the focus is shifting towards new targets: checks of the new Geant4 8.1 version are on-going, the geometry of several sub-detectors is being improved, and the digitization will be made more realistic in the input calibrations and setups used. More long-term projects such as the implementation and testing of the G4Flash parameterization code for simulating hadronic showers are also ongoing and revamping. Even if the basic setup is defined and robust enough to produce several tens of millions events, the simulation is a still very open and active field where developments and new contributions are continuing. In future emphasis will be on improving robustness, reliability and better agreement with reality.

A recent achievement in the Fast Simulation has been the implementation of the nuclear interaction of hadrons in the tracker material. Libraries of nuclear interactions have been created from fully simulated pion samples. In the (fast) simulation process, when a pion crosses a tracker layer, the probability that it undergoes a nuclear interaction is computed and a event is picked up in the relevant library file. The outgoing particles are then added to then event after a proper rescaling of their momentum and a rotation around the pion axis. The level of agreement obtained with the Full Simulation is remarka-

ble. This will have an impact on jets, track reconstruction efficiency, b-tagging, and vertex reconstruction.

The first working version of the Level-1 trigger emulator was delivered at the end of January, in preparation for the HLT exercise. Since then, significant effort has gone into validating the emulator output, with a number of improvements being made. The next major step is integration of the emulator with online and offline databases. Tools are also being developed for validation, analysis and trigger monitoring.

In the Analysis Tools project a more compact format of the HEPMC data format has been developed resulting in a reduction by a factor of 2 in disk space usage, and generic truth association tools are now available based on the new format. The FWLite analysis framework has been ported to MacOS and a generalization of common generic selector/filter modules made to facilitate HLT bookkeeping.

A tutorial on how to develop and use calibration constants in the Conditions Database environment has been prepared to facilitate the development of "physics" oriented calibrations (Jet calibration, b-tag, etc). It is planned to organize a mini-workshop on "survey data" as a first step in harmonizing the survey measurements of the various detectors, which is crucial for the alignment. The project is following closely DPG activities relating to the calibration of the HCAL (using sources) and ECAL (laser monitoring). Several database issues require decisions to be taken quite soon e.g. O2O procedures and non-event data monitoring.

The data and workflow management project is proceeding with new development and deployments, including many features addressing lessons learned during CSA06. The data transfer/placement system (PhEDEx) is deploying a new major version that provides web-based subscriptions and dataset removal as well as simplification of the agents deployed at sites. A new version of the dataset bookkeeping system (DBS2) will be deployed during March with much better support for real data, data provenance and improved data discovery. The user grid analysis tool (CRAB) is adding support to use the data management system for the data output by jobs, and initial development of a CRABSERVER has begun. The MC production system will soon deploy a web-based request system and an automated means of distributing MC assignments to the teams involved in the production. Work has also begun to allow MC requests using the Alpgen MC generator. A new webtools group is focusing on a standard look-and-feel, common tools for creating web interfaces, a common security module and increased interoperability and functionality for the offline web interfaces.

submitted by J. Harvey

PHYSICS

The CPT project came to an end in December 2006 and its original scope is now shared among three new areas, namely Computing, Offline and Physics.

In the physics area the basic change with respect to the previous system (where the PRS groups were charged with detector and physics object reconstruction and physics analysis) was the split of the detector PRS groups (the old ECAL-egamma, HCAL-jetMET, Tracker-btau and Muons) into two groups each: a Detector Performance Group (DPG) and a Physics Object Group. The DPGs are now led by the Commissioning and Run Coordinator deputy (Darin Acosta) and will appear in the corresponding column in CMS bulletins.

On the physics side, the physics object groups are charged with the reconstruction of physics objects, the tuning of the simulation (in collaboration with the DPGs) to reproduce the data, the provision of code for the High-Level Trigger, the optimization of the algorithms involved for the different physics analyses (in collaboration with the analysis groups) and the maintenance of official code that can be used for both production and analysis. There are five such groups, namely

- Electron/Photon
- Muon
- Jets and Missing Energy
- b-tagging
- Particle flow and tau-ID

On the Analysis side, the Higgs and SUSY-BSM groups continue, while the large “Standard Model” group was replaced by five new Physics Analysis Groups, namely

Electroweak (EWK)/W-Z

- Top
- QCD
- B physics
- Diffraction

The division follows that of the current Tevatron experiments, with the exception of the diffraction group which is new in CMS, and is motivated by the extensive diffractive physics program of work and the collaboration with TOTEM.

Finally, there are four other groups in physics coordination:

- Heavy Ions
- Super-LHC
- Online Selection
- Monte-Carlo generators and Physics Utilities

The scope of these groups is evident by their names. The heavy-ion group needs no introduction: it has been producing numerous excellent studies of the rich potential of CMS in heavy-ion collisions and are preparing for submission to the LHCC of the document summarizing the CMS heavy-ion physics potential. The Super-LHC physics group will concentrate on the physics potential of the LHC upgrades. There are already requests for providing input on various upgrade-related physics issues. The Monte-Carlo (MC) generators and utilities group is responsible for the MC generators (porting into CMS soft-

ware, interfacing between matrix-element and parton-shower MCs, tuning MC parameters to the data), the development of general utilities that are deployed by many physics analyses (kinematic packages – including fitting, reconstruction to simulation linkage utilities etc). The software developed in the context of this group will be integrated into CMSSW in the context of the "Analysis Tools" task in the Offline project.

Finally the Online Selection group, which was responsible within the CPT project for delivering the "selection synthesis" of physics requirements at Lvl-1 and HLT, will continue. The group is currently working towards a demonstration of the functioning and performance of the HLT.

The new structure has been in place since the December CMS week, and by now all groups have held at least one meeting. The schedule of individual group meetings can be found on each group's Web page (and all these pages are listed in the main Physics page on iCMS (go to http://cms.cern.ch/iCMS/ then select "Physics" on the bar on the left). There are also plenary meetings, "General Physics Meetings" which are held during CMS weeks, Physics/Trigger weeks (there are two of these in 2007) and "Physics Days". The latter are three-day periods in a plenary-only format reviewing progress and plans of work. The full set of meetings for 2007 is also available on the Web at the physics page.

The first two physics days in 2007 were held on Jan 17-18 and Feb 6-8. The first days concentrated on reviews by the group conveners who reviewed the "lessons learned" during the Physics-TDR exercise, as well as all the progress made since that time. The second set of days was devoted to a first discussion of the analysis topics that we aim to work on during 2007. The goal is to converge on a final list during this CMS week, and to then launch this work aiming for the results to be ready before the start of data-taking in November. A fraction (1/4 to 1/3) of these analyses will also be written up in order to exercise the new publications scheme. Both events were well attended, even though they were close in time. Following numerous comments received, the general physics meetings (whether during major weeks or during physics days) will be separated by approximately one month.

Beyond these "2007 analyses" which should be completed by the fall, the two major milestones related to physics are (a) the upcoming completion of the validation of CMSSW at the end of February (i.e. during this CMS week) and (b) the completion of the current High-Level Trigger (HLT) exercise. CMSSW is now at the level of ORCA at the time of the Physics TDR. Of course, CMSSW has numerous additional features that go well beyond the original ORCA functionality. The status of CMSSW and its comparison to the earlier ORCA-based results was the subject of very intense work by the Software and Detector Performance Validation group that was led by Daniel Elvira and Patrick Janot since 2006 and which is coming to an end during this CMS week. A major summary report of this task force will be given during the physics plenary session on Friday.

The Online Selection group has been working on the integration of the L1 emulator and the HLT algorithms in CMSSW over the last seven months. First versions of trigger menus are being compiled and evaluated. This is done for various scenarios: a luminosity of 2E33 (effectively reviving the trigger paths appearing in PTDR, vol.2), but also the very first runs at 14 TeV, with an emphasis on commissioning triggers. The real challenge is to evaluate the CPU performance of the HLT with a realistic Lvl-1 trigger emulator and correspondingly large background samples, ensuring that CMS can select interesting physics events as fast as possible. This is the so-called "HLT exercise", which is set to end in June of this year with a report to be submitted to the LHCC.

submitted by P. Sphicas.

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/

General - CMS Weeks (Collaboration Meetings), CMS Weeks Agendas

The talks presented at the Plenary Sessions.

LHC Symposiums

Management - CB - MB - FB - FMC

Agendas and minutes are accessible to CMS members through their AFS account (ZH). However some linked documents are restricted to the Board Members.

FB documents are only accessible to FB members.

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 2006 Annual reviews are posted.

CMS DOCUMENTS

It is considered useful to establish information on the first employment of CMS doctoral students 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 rules for Notes, Conference Reports and Theses submission forms and procedures have been updated. A new type, the Detector Notes, has been introduced. Subproject Editorial Boards have been set up.

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-2006/142; X. Aslanoglou et al., First Performance Studies of a Prototype for the CASTOR Forward Calorimeter at the CMS Experiment.

CMS NOTE-2006/148; P. Adzic et al.; Energy Resolution of the Barrel of the CMS Electromagnetic Calorimeter.

CMS NOTE-2006/149; B. Clerbaux et al., Saturation and Energy Corrections for TeV Electrons and Photons.

CMS NOTE-2007/001; X. Aslanoglou et al., Performance Studies of Prototype II for the CASTOR forward Calorimeter at the CMS Experiment.

CMS NOTE-2007/002; M. Albrow et al., The CMS and TOTEM diffractive and forward physics working groups; Prospects for Diffractive and Forward Physics at the LHC.

CMS NOTE-2007/003; K. Cankocak et al., Radiation-Hardness Measurements of High OH- Content Quartz Fibres Irradiated with 24 GeV Protons up to 1.25 Grad..

CMS NOTE-2007/004; P. Gupta et al., Gamma+ Jet Study for CMS.

CMS CONFERENCE REPORTS

CMS CR-2006/098; W. Adam; Track and Vertex Reconstruction in CMS; Vertex06,25 - 29 Sep 2006, Perugia, Italy.

CMS CR-2006/099; N. Magini, University and INFN Firenze; $B_S^0 \to J\psi\varphi$ LHC Review; BEAUTY 2006,September 25th-29th 2006, Oxford, United Kingdom.

CMS CR-2006/101; M. Mulders; Muon Reconstruction and Identification at CMS; IPRD 2006, October 1-5, 2006, Siena, Italy.

CMS CR-2006/102; F.J. Ronga; Tracking and Alignment in the CMS detector; IPRD06, 1 - 5 October 2006, Siena, Italy.

CMS CR-2007/001; O. Buchmueller, F.-P. Schilling; Status and Commissioning of the CMS Experiment; BEAUTY 2006, September 2006, Oxford, United Kingdom.

CMS CR-2007/002; M. Weber; The CMS Tracker Alignment Strategy; Vertex06 - 15th International Workshop On Vertex Detectors, September 25 - 29, 2006, Perugia, Italy.

CMS CR-2007/003; E. Garcia; Heavy Ion Physics with CMS; VI Latin. American Symposium on High Energy Physics, November 1, 2006, Puerto Vallarta, Mexico.

CMS CR-2007/004; G. Roland for the CMS Collaboration; Triggering on Hard Probes in Heavy Ion Collisions with CMS; Quark Matter 2006, November 2006, Shanghai, China.

CMS CR-2007/006; G. Della Ricca on behalf of the CMS ECAL Group; Data Quality Monitoring for the CMS Electromagnetic Calorimeter; 10th Topical Seminar on Innovative Particle and Radiation Detectors, October 1-5, 2006, Siena, Italy.

CMS NOTES

W. Waltenberger, Development of Vertex Finding and Vertex Fitting Algorithms for CMS, November 2004, [HEPHY] HEPHY. (CMS TS-2006/012).

A. Schmidt, Search for $H \to b\bar{b}$ in Association with a $t\bar{t}$ Pair in Proton-Proton Collisions at $s^{1/2}$ = 14 TeV, December 2006, [KARLSRUHE-IEKP] Inst. für Exp. Kernphysik. (CMS TS-2007/001).

S. Paktinat Mehdiabadi, Inclusive search for SUSY in final states with top and missing transverse energy at CMS, October 2006, [IPM] Inst. for Studies in Theoretical Physics & Math. (IPM). (CMS TS-2007/002).

S. Lowette, B-Tagging as a Tool for Charged Higgs Boson Identification, November 2006, [BRUSSEL-VUB] Vrije Universiteit Brussel. (CMS TS-2007/003).

JOB OPPORTUNITIES

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

WK	Monday	CMS Meetings			Non-CMS Meetings/Hols/Notes	WK	Monday	CMS Meetings			Non-CMS Meetings/Hols/Notes
1	1-Jan				Xmas	27	2-Jul	Referees	Tracker(3&4)		LHCC (4-5), US(4 Jul), Sum.Hol.(2Jul-24Aug CH) (7-FR), ALICE WK
2	8-Jan		Tracker (9&10)			28	9-Jul				ATLAS WK (Scotland)
3	15-Jan				US MLK (15)	29	16-Jul	MB(16)	ECAL (18-19)	ESSC/upgrade (18)	
4	22-Jan	MB(22)/FB(23)	TriDAS (23-24)	ESSC/upgrade (24)		30	23-Jul				
5	29-Jan	Referees			LHCC (31 Jan-1 Feb)	31	30-Jul		Tracker (31&1)		
6	5-Feb		Tracker (6-7)		SPSC (6&7?)	32	6-Aug				
7	12-Feb				INTC (15&16), Half term (12-16CH) (13-FR)	33	13-Aug				
8	19-Feb	MB(19)			ATLAS Wk, RB(21), Half term (-26FR)	34	20-Aug				
9	26-Feb	CMS Week				35	27-Aug	MB(27)/FB(28)	TriDAS (28-29)	ESSC/upgrade (29)	
10	5-Mar		Tracker (6-7)		GVA motor show (8-) LHCb WK, ALICE WK	36	3-Sep		Tracker (4&5)		RB(5), INTC (3&4), LECC 3-7 Parague, US Lab. Day (3), J.G. (6)
11	12-Mar				SPC...RCS(12-15), GVA motor show (-18)	37	10-Sep				LHCb WK
12	19-Mar	Referees	TriDAS (22-23)		CMS/ATLAS SLHC workshop (19-21), LHCC (21-22), ATLAS	38	17-Sep	CMS Week			SPC, FC, RCS (17-20)
13	26-Mar	MB(26) FB(27)				39	24-Sep	Referees			LHCC (26-27), ALICE WK, SPSC (25&26?)
14	2-Apr		Tracker (3&4)	ESSC/upgrade (4)	Good Fri. (6), Easter (5-CH) (3-FR)	40	1-Oct		Tracker (2&3)		
15	9-Apr	MB/FB(RRB)(10)			Easter Mon. (9), Easter CH(-13)(-16FR)	41	8-Oct	MB/FB(RRB)(8-9)		ESSC/upgrade (10)	ATLAS Wk
16	16-Apr				SPCS (17&18?)	42	15-Oct				
17	23-Apr	RRB(23)	ECAL (25-26)	Physics Trig WK	ECAL after RRB (23-25)	43	22-Oct	RRB(23)	ECAL (24-25)	Physics Trig WK	ECAL after RRB (22-24), Half Term (22-26CH)
18	30-Apr	MB(30)	Tracker (2&3)		1-May	44	29-Oct				
19	7-May	Referees			LHCC (9-10), SPC (7)	45	5-Nov	MB(5)/FB(6)	Tracker (6&7)	ESSC/upgrade (7)	FC (7), ATLAS Phys. Wk
20	14-May				Ascens. (17)	46	12-Nov		TriDAS (13-14)		INTC (12&13)
21	21-May	MB(21)/FB(22)	TriDAS (22-23)	ESSC/upgrade (23)	INTC (21&22)	47	19-Nov	Referees			LHCC (21-22), US Thanks giving (22)
22	28-May				US mem. Day (28) Whitsun (28)	48	26-Nov				RB (28)
23	4-Jun		Tracker (5&6)		ATLAS Phys. Wk, LHCb WK RB(6)	49	3-Dec	MB(3)/FB(4)	Tracker (4&5)		SPSC (4&5?)
24	11-Jun	Ann. Rev. Week				50	10-Dec	CMS Week			SPC, FC, RCS, OCS (10-14)
25	18-Jun				SPC, FC, RCS, OCS (18-22)	51	17-Dec				
26	25-Jun				SPSC (26&27?)	52	24-Dec				Xmas

Holidays at CERN during this week

MB: Management Board
FB: Finance Board
RRB: Resources Review Board
Referees
TCM: Technical Coordination Meet. (always on Monday)
Run meetings (always Friday afternoon)
ESSC: Electronics Systems Steering Committee
LECC: LHC Electronics Coordination Committee
RB: Research board
SPSC: SPS & PS Experiments Committee
INTC: Isolde & neutron time-of-fligth Experiments Committee

http://cmsdoc.cern.ch/calendar.html

Monthly Calendar

March 07

Date	Day	**CMS Meetings**	**CMS** & non-CMS Meetings
1	Thu	CMS Week	
2	Fri	CMS Week	
3	Sat		
4	Sun		
5	Mon		LHCb, Alice
6	Tue	Tracker	LHCb, Alice
7	Wed	Tracker	LHCb, Alice
8	Thu		LHCb, Alice
9	Fri		LHCb, Alice
10	Sat		
11	Sun		
12	Mon		SPC
13	Tue		SPC
14	Wed		FC
15	Thu		RCS
16	Fri		
17	Sat		
18	Sun		
19	Mon	Referees	MS/ATLAS SLHC / ATLAS
20	Tue		CMS/ATLAS SLHC/ATLAS
21	Wed		S/ATLAS SLHC/LHCC/ATLAS
22	Thu	TriDAS	LHCC / ATLAS
23	Fri	TriDAS	ATLAS
24	Sat		
25	Sun		
26	Mon	MB	
27	Tue	FB	
28	Wed		
29	Thu		
30	Fri		
31	Sat		

April 07

Date	Day	**CMS Meetings**	**CMS** & non-CMS Meetings
1	Sun		
2	Mon		
3	Tue	Tracker	
4	Wed	Tracker / ESSC/Upgrade	
5	Thu		
6	Fri		
7	Sat		
8	Sun		
9	Mon		
10	Tue		
11	Wed		
12	Thu		
13	Fri		
14	Sat		
15	Sun		
16	Mon		
17	Tue		SPSC
18	Wed		SPSC
19	Thu		
20	Fri		
21	Sat		
22	Sun		
23	Mon	RRB / Phys. / Trigger	ECAL after RRB
24	Tue	Phys. / Trigger	ECAL after RRB
25	Wed	ECAL / Phys. / Trigger	ECAL after RRB
26	Thu	ECAL / Phys. / Trigger	
27	Fri	Phys. / Trigger	
28	Sat		
29	Sun		
30	Mon	MB	

May 07

Date	Day	**CMS Meetings**	**CMS** & non-CMS Meetings
1	Tue		
2	Wed	Tracker	
3	Thu	Tracker	
4	Fri		
5	Sat		
6	Sun		
7	Mon	Referees	SPC
8	Tue		
9	Wed		LHCC
10	Thu		LHCC
11	Fri		
12	Sat		
13	Sun		
14	Mon		
15	Tue		
16	Wed		
17	Thu		
18	Fri		
19	Sat		
20	Sun		
21	Mon	MB	INTC
22	Tue	FB / TriDAS	INTC
23	Wed	TriDAS / ESSC Upgrade	
24	Thu		
25	Fri		
26	Sat		
27	Sun		
28	Mon		
29	Tue		
30	Wed		
31	Thu		

June 07

Date	Day	**CMS Meetings**	**CMS** & non-CMS Meetings
1	Fri		
2	Sat		
3	Sun		
4	Mon		ATLAS Phys / LHCb
5	Tue	Tracker	ATLAS Phys / LHCb
6	Wed	Tracker	RB /ATLAS Phys / LHCb
7	Thu		ATLAS Phys / LHCb
8	Fri		ATLAS Phys / LHCb
9	Sat		
10	Sun		
11	Mon	CMS AnnualReview Week	
12	Tue	CMS AnnualReview Week	
13	Wed	CMS AnnualReview Week	
14	Thu	CMS AnnualReview Week	
15	Fri	CMS AnnualReview Week	
16	Sat		
17	Sun		
18	Mon	Annual Rev. / CMS Week	SPC
19	Tue	Annual Rev. / CMS Week	SPC
20	Wed	Annual Rev. / CMS Week	FC
21	Thu	Annual Rev. / CMS Week	RCS
22	Fri	Annual Rev. / CMS Week	OCS
23	Sat		
24	Sun		
25	Mon		
26	Tue		SPSC
27	Wed		SPSC
28	Thu		
29	Fri		
30	Sat		

23/2/07

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- Travel arrangements
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- CMS Notes, Conference reports and Thesis (approval in iCMS)

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- Invitations
- Leys Requests
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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 - 76114

(ECAL + Muon): Ext. 77459 - 76055

Tracking Lab (Blg. 186) Ext. 75725

Crystals Labs (Blg. 27): Ext. 73841

P5-Team at Cessy : 164804

PROCEDURE FOR NEWCOMERS

1.PLEASE COME TO THE CMS SECRETARIAT to complete the CMS registration form and to get forms to be registered at CERN.

2.To open a computer account send an email to:

cms.computing@cern.ch

Full documentation of the procedure is available at:
http://cmsdoc.cern.ch/comp.html

3. To get a film badge:
Dosimetry Service (Bldg. 24-E-007) (E07400)

Dosimetry.service@cern.ch - Tel. 72155