

**DRAFT**

CERN/DG/Research Board 2009-409

Minutes-190

26 January 2010

ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE  
**CERN** EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

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**CERN RESEARCH BOARD****MINUTES OF THE 190<sup>th</sup> MEETING OF THE RESEARCH BOARD  
HELD ON WEDNESDAY 2 DECEMBER 2009**

Present L. Alvarez-Gaume, S. Bertolucci, P. Bloch, F. Bordry, H. Breuker,  
P. Butler, P. Collier, M. Ferro-Luzzi, R. Forty (Secretary), E. Heijne,  
F. Hemmer, A. Herlert, R. Heuer (Chairperson), S. Myers, T. Pettersson,  
E. Rondio, E. Tsesmelis, C. Vallée, V. Vuillemin, T. Wyatt

Invited P. Janot

Items

1. Procedure
2. Report from the SPSC meetings of 29-30 September and 24-25 November 2009
3. Report from the LHCC meeting of 23-24 September 2009
4. Report from the INTC meeting of 16-17 November 2009
5. Any other business





## 1. PROCEDURE

- 1.1 R. Heuer opened the meeting. This was the last meeting that E. Heijne would attend as official observer from the Staff Association, and he was thanked for his participation. P. Janot is taking over that role, and was welcomed.
- 1.2 The **minutes** of the last meeting [1] were approved without modification. A number of matters arising from the minutes were discussed, listed in the following paragraphs.
- 1.3 P. Butler presented the **international context of the ISOLDE programme** [2], discussing the physics measurements and the competition from other radioactive ion beam facilities in operation or planned around the world. At present the ISOLDE facility is very competitive for a wide variety of physics measurements, and HIE-ISOLDE will provide a broad range of both proton-rich and neutron-rich radionuclides unrivalled in variety, energy and intensity. Comparing the accelerated yield for a particular isotope ( $^{132}\text{Sn}$ ) currently ISOLDE can provide  $10^6/\text{s}$ , an order of magnitude higher than HRIBF at Oak Ridge. The TRIUMF p-driver is expected to soon provide  $10^7/\text{s}$ , but the HIE-ISOLDE upgrade could further increase this to  $10^8/\text{s}$ , while at the same time increasing the energy to 10 MeV/nucleon, higher than other facilities that are foreseen to start in the next five years.
- 1.4 Following the discussion of **HIE-ISOLDE** (item 1.5 of the previous minutes) S. Bertolucci read the following statement from the directorate, that was **agreed by the Research Board**: “The Research Board endorses the recommendation of the INTC to approve the project HIE-ISOLDE, on account of its scientific potential as well as of its several unique features in the field of the ISOL ion facilities. However, it needs to be noted that a recent evolution in the budgetary plan of the project, which registers the (hopefully temporary) freezing of a large contribution from one of the funding agencies, as well as an increase in the global cost, might pose severe risks to the program realization, or to its timely completion. CERN agrees to contribute its share; however there are only limited resources that CERN can endow to the project, which therefore need to be adequately matched. The Research Board therefore urges the collaboration to present a resource-loaded schedule of the project, while exploiting in parallel the search of additional contributions.”

- 1.5 P. Butler gave the following **response** on behalf of the ISOLDE community: “The ISOLDE collaboration applauds this landmark decision as it heralds a new era of capability for ISOLDE that will enable it to continue to make major contributions to the field of radioactive beam science. It is also an important decision for the future of European nuclear physics, and the central role of CERN within this field. I should point out that the presentation made at the September Research Board on HIE-ISOLDE only referred to external funds that were still available for the project; in fact an equal amount of resources from member states had already been spent on the project. Nevertheless, the collaboration is conscious that significant additional funding is required and it has already embarked on a number of initiatives. These initiatives are galvanized by the Research Board decision and the collaboration is confident that the upgrade will be ready for physics according to the project planning.”
- 1.6 S. Bertolucci presented conclusions from the **workshop on future neutrino physics** that had recently taken place at CERN. There had been strong participation, and a clear interest for CERN to play a significant role in the future European strategy for neutrino physics. CERN is prepared to contribute with accelerator expertise, even for facilities not on site, and to act as a centre for R&D on future detectors. Further study is encouraged of the possible use of beam from the PS to clarify the effects seen by the LSND and MiniBooNE experiments. Following a report to the SPC later in 2009 a plan would be prepared, which should be discussed at the next Research Board. R. Heuer stated that this had been a useful workshop, but noted that not all requests for CERN participation can be satisfied. S. Myers commented that possible future upgrades of the injector complex, which may have relevance for neutrino physics, will be discussed further at the Chamonix workshop early in 2010.
- 1.7 H. Breuker summarized the **proton deliveries in 2009** and their comparison to expectations [2]. Arbitration had taken place in April between representatives from the various experiments requesting beam, in discussion with the Research Director and chairpersons of the scientific committees, to define the share of protons to be delivered to each of the experiments. The run has been very successful, and almost all of those goals have been met or surpassed. An exception was the beam delivery to DIRAC, which suffered from a delayed start and some down time of the experiment. The users

would all like to increase their share of the beam next year, so a similar arbitration process will be organized. **The Research Board congratulated those responsible for the excellent performance of the accelerator chain in 2009.**

- 1.8 A draft of the **accelerator schedule** for 2010 was presented by H. Breuker [2], with start of physics expected at the end of April, with fixed-target beams running until 22 November. It was approved as a basis for planning the accelerator operation, but the details will depend on the outcome of the arbitration discussed above. The final schedule will therefore be presented at the next Research Board.

## **2. REPORT FROM THE SPSC MEETINGS OF 29-30 SEPTEMBER AND 24-25 NOVEMBER 2009**

- 2.1 C. Vallée reported on the last two meetings of the SPSC, including the annual reviews of NA48, NA49, NA60, NA61, NA62, CRYSTAL (UA9), CAST and OSQAR [2]. **The Research Board took note.**
- 2.2 The **PAX** proposal [3] for a measurement of the spin dependence of the p-bar p interaction at the AD has been considered by the SPSC, and the collaboration had provided answers to questions raised by the referees. The committee remains concerned by the potential impact of PAX on the AD program, and the risk factor and manpower requirements for implementing the experiment at the AD. The SPSC encourages the PAX collaboration to first perform their spin filtering measurements at COSY and to report these to the committee, after which the SPSC will further review the proposal. **The Research Board took note.**
- 2.3 The **ELENA** proposal [4] concerns the addition of a decelerating ring to the AD, which would help to increase the trapping efficiency, and would allow for the simultaneous operation of four experiments. The SPSC recognizes the substantial potential impact of ELENA on the AD experimental program, and strongly supports the proposal. **The Research Board endorsed the conclusion from the SPSC concerning the strong scientific case for ELENA. The manpower requested from CERN for the implementation of the proposal will need to be considered in the**

**context of the review of the consolidation and optimisation of the CERN injector complex that is currently in progress, and will be returned to at the meeting of the Research Board in June 2010.**

- 2.4 The **GIF++** proposal [5] submitted to the SPSC concerns the proposed implementation of a new gamma irradiation facility in the SPS H4 beam line in hall EHN1, motivated by the requirements of the LHC and sLHC detector and accelerator communities for tests of LHC components and systems. The new facility follows up on the successful GIF facility in the SPS west area, which lost access to a particle beam in 2004 and which currently suffers from limited source intensity. The H4 beam line currently provides an electron beam, used by CMS, which could be affected by the proposed installation. An alternative site for the facility in the H8 beam line would avoid interference with the electron beam use, but would entail restricted space and access, which might have safety implications. The SPSC recognizes that GIF++ represents an important experimental facility for CERN, and encourages further studies to be made of the detailed design and its optimal location. **The Research Board endorsed this recommendation, in particular concerning investigation of the future use of the unique electron beam, and of safety issues.**
- 2.5 A document advocating the need for a high precision muon DIS program at CERN [6] has been submitted to the SPSC, aimed at improving the knowledge of the proton structure for the LHC experiments. Although the document is only signed by three individuals, the project would imply a substantial experimental program. The SPSC invited the proponents to present their arguments in the relevant forums, such as the PDF4LHC workshop, and will examine the scientific motivation of the project once it is supported by a suitable experimental collaboration. **The Research Board endorsed this conclusion.**
- 2.6 The SPSC recommended the formal extension of **CNGS** approval to the end of 2012, and this was **endorsed by the Research Board**. Their request for the nominal annual yield of  $4.5 \times 10^{19}$  p.o.t. was noted, but this will depend on the arbitration discussed in item 1.7 above.

2.7 **NA61** have submitted an addendum to their proposal [7], concerning running with light ions. The heavy ion programme of NA61 is currently approved for the ion species that are prepared for use in the LHC. The SPSC recommends that the necessary preparations for a secondary boron beam be started in 2010, that an energy scan with this boron beam should be performed as soon as technically possible, and also to start the preparation of sources for heavier ions. P. Collier stated that the test will be made concerning the boron beam, but that further preparation for other ion species would require additional manpower. P. Bloch suggested that a clear decision should be made on whether light ions would be part of the fixed target programme, to help in the planning of the experiment. R. Heuer stated that before such a decision is taken, input will be required from the review of the consolidation and optimisation of the injector complex that is currently in progress. **The Research Board took note.**

### **3. REPORT FROM THE LHCC MEETING OF 23-24 SEPTEMBER 2009**

3.1 T. Wyatt reported on the previous meeting of the LHCC, that included mini reviews of ALICE and CMS, and reports on the other LHC experiments and the LCG [2]. Due to the excellent state of readiness of the experiments it had been decided to cancel the LHCC meeting foreseen for November, so that the experiments could focus on their preparation for first beam, which has subsequently been a great success. **The Research Board congratulated the accelerator and experiment teams, who have contributed to the exceptional progress that has been made during the restart of the LHC.**

3.2 A meeting had taken place concerning the upgrades for higher luminosity running, focused primarily on collimation, aperture and beam pipe issues for Phase I of the machine upgrade [2]. **The Research Board took note.**

3.3 The **MoEDAL** experiment concerns the use of track-etch detectors (NTDs) to search for highly ionizing stable particles. It consists of stacks of NTD sheets attached to the walls around the interaction point of LHCb. A Technical Design Report for the experiment has been submitted [8]. A very productive interaction between the referees

and the collaboration took place, and a summary of referee questions and the answers from MoEDAL is given in Ref. [9]. The TDR was recommended for approval by the LHCC. It was confirmed that close coordination is in place between MoEDAL and LHCb. **The TDR was approved by the Research Board.**

#### **4. REPORT FROM THE INTC MEETING OF 16-17 NOVEMBER 2009**

- 4.1 P. Butler reported on the latest meeting of the INTC, including the status of the nTOF facility (now fully commissioned and running experiments after a long break), the ISOLDE experiments, and preparations for HIE-ISOLDE [2]. Five experiments were recommended for approval at ISOLDE, for 76 shifts out of a total of 146 requested. They are listed in the following paragraphs.
- 4.2 **P271** *Laser Spectroscopy of Cadmium Isotopes: Probing the Nuclear Structure between the Neutron 50 and 82 Shell Closures* [10] was **approved for 17 shifts**, and will be known as **IS497**.
- 4.3 **P214 Add.2** *High-Precision Laser Spectroscopy on  $^{12}\text{Be}$*  [11] was **approved for 18 shifts**, and will continue to be known as **IS449**.
- 4.4 **P273** *High-Precision Mass Measurements in the Rare-Earth Region to Investigate the Proton-Neutron Interaction* [12] was **approved for 8 shifts**, and will be known as **IS498**.
- 4.5 **P268** *Study of the effect of shell stabilization of the collective isovector valence-shell excitations along the  $N=80$  isotonic chain* [13] was **approved for 18 shifts**, and will be known as **IS496**.
- 4.6 **P257** *Study of oblate nuclear shapes and shape coexistence in neutron-deficient rare earth isotopes* was **approved for 15 shifts**, following a letter of clarification [14], and will be known as **IS495**.



## 5. ANY OTHER BUSINESS

- 5.1 The **next meeting** of the Research Board will be held on 3 March.
- 5.2 The **major issues** for the next Research Board meeting were discussed. They will include a discussion of neutrino physics plans at CERN, following up on the workshop on future neutrino physics; presentation of the results of the arbitration concerning the proton delivery for 2010, the final accelerator schedule for that year, and conclusions from the Chamonix workshop; and a report from the Recognized Experiments Committee.

## ENCLOSURES

1. Minutes of the 93<sup>rd</sup> SPSC meeting held on 29-30 September 2009 (SPSC-2009-035/SPSC-093).
2. Minutes of the 94<sup>th</sup> SPSC meeting held on 24-25 November 2009 (SPSC-2009-037/SPSC-094).
3. Draft Minutes of the 99<sup>th</sup> LHCC meeting held on 23-24 September 2009 (LHCC-2009-017/LHCC-099).
4. Minutes of the 35<sup>th</sup> INTC meeting held on 16-17 November 2009.

## REFERENCES

- [1] Minutes of the 189<sup>th</sup> meeting of the Research Board (CERN/DG/RB 2009-407/M-189).
- [2] Copies of the transparencies are attached to the agenda: <http://indico.cern.ch/conferenceDisplay.py?confId=73386>
- [3] The PAX proposal, "Measurement of the Spin-Dependence of the p-bar p Interaction at the AD-Ring" (CERN-SPSC-2009-012/SPSC-P-337).
- [4] ELENA: An Upgrade to the Antiproton Decelerator (CERN-SPSC-2009-026/SPSC-P-338).
- [5] A GIF++ Gamma Irradiation Facility at the SPS H4 Beam Line (CERN-SPSC-2009-029/SPSC-P-339).
- [6] F. Dydak, M.W. Krasny and R. Voss, "The measurement of the W mass at the LHC: shortcuts revisited" (CERN-SPSC-2009-028 / SPSC-I-239).
- [7] The NA61 Collaboration, "Revised data taking schedule with ion beams" (CERN-SPSC-2009-031/SPSC-P-330-ADD-5).

- [8] Technical Design Report of the MoEDAL experiment (CERN-LHCC-2009-006/MoEDAL-TDR-001).
- [9] “MoEDAL - LHCC Referee’s Questions & Answers” (CERN-LHCC-2009-015).
- [10] Laser Spectroscopy of Cadmium Isotopes: Probing the Nuclear Structure between the Neutron 50 and 82 Shell Closures (CERN-INTC-2009-036/INTC-P-271).
- [11] High-Precision Laser Spectroscopy on  $^{12}\text{Be}$  (CERN-INTC-2009-038/INTC-P-214-ADD-2).
- [12] High-Precision Mass Measurements in the Rare-Earth Region to Investigate the Proton-Neutron Interaction (CERN-INTC-2009-039/INTC-P-273).
- [13] Study of the effect of shell stabilization of the collective isovector valence-shell excitations along the N=80 isotonic chain (CERN-INTC-2009-024/INTC-P-268).
- [14] Study of oblate nuclear shapes and shape coexistence in neutron-deficient rare earth isotopes (CERN-INTC-2009-035/INTC-CLL-006).

CERN/SPSC-2009-035  
SPSC-093  
29 – 30 September 2009

MINUTES of the 93rd Meeting of the SPSC  
Held on Tuesday and Wednesday September 29<sup>th</sup> and 30<sup>th</sup> 2009

**OPEN SESSION:**

- |                            |                    |
|----------------------------|--------------------|
| 1. NA60                    | E. Scomparin       |
| 2. NA61 – SHINE & Addendum | M. Gazdzicki       |
| 3. CAST                    | T. Dafni           |
| 4. ELENA                   | W. Oelert          |
| 5. GIF++                   | M. Capeans Garrido |

**CLOSED SESSION**

Present:

S. Bertolucci<sup>2</sup>, P. Bloch<sup>1</sup>, B. Bloch-Devaux, H. Breuker, M. Charlton, F. Close, P. Collier, M. Erdmann, A. Ereditato, L. Feld, L. Gagnon, L. Garrido, P. Giubellino, S. Katsanevas<sup>1</sup>, J. Knobloch, M. Mannelli (Secretary), P. Marage<sup>1</sup>, S. Maury, P. Newman, E. Rondio, C. Touramanis, C. Vallée (Chairman), U. Wiedemann

Apologies: E. Gallo

- 1) Present on Tuesday only
- 2) Present on Wednesday only

## 1. MINUTES OF THE 92<sup>nd</sup> MEETING OF THE SPSC

The Minutes of the 92<sup>nd</sup> Meeting of the SPSC held on June 30<sup>th</sup> and on July 1<sup>st</sup> were approved.

## 2. REPORT FROM THE CHAIRMAN

The Chairman reported on the Research Board (RB) meeting, RB189. The following points were presented to the RB and, where necessary, discussed:

- 2.1 The SPSC reported the fast recovery of the OPERA experiment from the April 6th earthquake, the best ever detector status at the time of CNGS restart and the efficient start of beam delivery and data taking.
- 2.2 The SPSC highlighted the progress of the ICARUS experiment in getting closer to operational, as well as the new problem which recently affected one thermal insulation panel and requires a timely solution.
- 2.3 The SPSC expressed to the RB its congratulations to the LNGS, OPERA and ICARUS communities for their remarkable success in re-establishing operational conditions after the earthquake.
- 2.4 The SPSC reported on the on-going COMPASS spectroscopy data taking and analysis, as well as on the good progress towards final publication of the spin measurements performed with the available muon data.
- 2.5 The SPSC summarized the motivations of the COMPASS experiment to take two more years of data with muon beams and expressed its positive recommendation to perform these measurements in a timely manner.
- 2.6 The SPSC recalled the history and the motivation of the PAX proposal at the AD ring, and summarized the current points in discussion with the Collaboration and the AB Department, concerning the preparatory program at COSY and the manpower, cost and risk implications for CERN.

The Research Board noted points 2.1), 2.2), 2.4), 2.6) and acknowledged point 2.3).

As regards point 2.5), the Research Board endorsed the SPSC recommendation and approved the 2 years of COMPASS muon data taking.

## 3. STATUS OF ACCELERATORS

S. Maury reported on the status of the Accelerators.

In September, a large vacuum leak occurred in the **Linac2**. Luckily this was in a place where differential pumping could be installed to recover the vacuum without a major intervention. This solution should hold until the next technical stop. This problem stopped the entire accelerator complex for few days. Apart from this vacuum leak, the availability was very good.

The **Booster** has been delivering all user and MD beams with high availability and quality.

A failure of the main-magnet bus bar in the **PS** occurred at the beginning of September.

A temporary fix has been put in place for restarting the operation of the machines but the bus bar will be exchanged during the advanced and prolonged technical stop in October. All told, the temporary fix took 3 days to carry out.

Some minor failure of the **MPS** caused a bit of stress since no spare power supply (POPS) will be available until 2011. In case of failure of the MPS, solutions to run LHC, CNGS and SFTPRO beams with lower duty factor are being tested and are well advanced.

A power glitch, which put the MPS in an unknown state, stopped the PS for about 4 hours. All beams were cut in the PS complex for over 5 hours due to a fire incident on the roof of the MPS building, next to the rotating machine in building 355. The workers on the roof put out the fire using the powder extinguishers. The use of these extinguishers poses a hazard for electrical equipment, as the products are extremely corrosive, and a careful cleaning was necessary.

Finally, a problem with a sextupole of the extraction used for the **EAST area** caused about 2 days stop for the experimental area. A spare will replace this magnet during the next technical stop.

For the **MTE** extraction of the **CNGS** beam from the **PS**, 16% to 17% of the intensity is regularly trapped in the islands. The trajectory has been globally corrected in TT2/TT10 transfer line. The extraction of the CNGS beam after injection and acceleration in the **SPS** the extraction has also been set-up. Over the last weekend the MTE beam was delivered to CNGS with an intensity of  $1.5 \cdot 10^{13}$  on target. The planned operation of the MTE beam over the weekend, in view of training the OP teams with this new type of beam and to check its stability, was unfortunately postponed due to problems with CNGS ventilation.

The **SPS** has also suffered with 3 main-magnet water leaks. Two magnets have been repaired in situ. An attempt to repair the third magnet in situ failed but, as the leak was stable, it was decided to restart the machine and to wait the next technical stop for the repair. Because the SPS cycle is quasi-ppm the time switch between different super cycles is minimized and the production for CNGS is 1 week ahead of the planning.

Apart from frequent beam stops due to control of the stochastic cooling PU, the **AD** has been delivering all the experiments with a very good availability. A high intensity of about  $4 \cdot 10^7$  antiprotons was delivered to the users with a very good deceleration efficiency of better than 90%.

In conclusion, all the machines have suffered all along the last month. In parallel with the operation and beam delivery to the experiments, the RF commissioning with lead ion beam was continuing in the SPS with great success in order to be ready for sending this beam next year to LHC.

#### 4. STATUS OF EXPERIMENTAL AREAS

Lau Gatignon reported on the start-up on schedule of the East and North Areas.

In the **East hall** DIRAC and the irradiations facility have been running smoothly.

Some magnets in the unused T7 beam line, which had been switched on inadvertently and overheated subsequently, have been inspected and no evident damage has been found. A leak on a water connection of a quadrupole in the T9 beam line was repaired during a technical stop two weeks later. This caused no loss of beam time as the user, COMPASS-CALO, could be relocated in the neighbouring T10 beam line. The installation of the CLOUD experiment is ongoing.

In the **North Area** NA61 has been running smoothly apart from occasional trips of their cooling water system. The 10 GeV/c run was postponed till later because of low proton production rates and beam instabilities at that very low momentum. COMPASS has had smooth running, mostly with positive and negative hadron beams, but also with muons beams in preparation of a possible future DVCS program. Preparations for the forthcoming NA62 R&D tests are well under way. Good running conditions have also been provided for NA63, the UA9 run in H8 and a vigorous test beam programme with more than 20 users since the previous meeting. One quadrupole in the H6 line developed a water leak and had to be exchanged.

The **AD** has been running with 90% up time and 82% overall efficiency including the injectors. The AD4 run in week 38 has been successful. The AD performance was gradually improved to excellent values with a maximum of  $4.9 \cdot 10^7$  antiprotons injected and  $4.27 \cdot 10^7$  extracted. New GEM beam-profile monitors are tested now in the DEM beam line with a view to replace the analog wire chambers.

**CNGS** has been running smoothly and the accumulated proton flux is slightly above the prevision:  $2.24 \cdot 10^{19}$  delivered for  $2.10 \cdot 10^{19}$  protons on target expected. The new all-metal cartridges in the horn and reflector cooling circuits allow to at least double the time between cartridge exchanges.

#### 5. PS, SPS AND AD SCHEDULES

H. Breuker gave the update of the user's schedules for PS, SPS and the AD.

At the **AD** we had just finished very successful the dedicated run for the ACE experiment. We are now back to standard operation, sharing the beam among ALPHA, ATRAP and ASACUSA.

At the **PS** we switched between the test-beam users in T9 and T10 as planned. The DIRAC experiment was running smoothly up to last Friday afternoon. After the exchange of a compressor for the air ventilation in the experimental area they suffered from various problems with their electronics and their spectrometer magnet. These problems are under investigation.

The CLOUD experiment has incurred some delays, and is still in set-up mode: the hope is to start running with the chamber in 2009.

The nTOF collaboration has finished the target commissioning and is close to completion of its first physics run, which is the measurement of the neutron capture cross-section on iron.

At the **SPS** we had some problems with the water-cooling of the power supplies for the NA61 readout system, which have been overcome by now. NA62 is preparing for its next run and NA63 is running fine. COMPASS is about to finish its muon program for this year and will switch back to hadrons. The many test beam users are switching as planned and make good use of the beams. Looking back at the beam “arbitrations” we had decided on at the SPSC 16<sup>th</sup> of April we conclude that we will exceed the amount of protons in all cases with respect to what was promised to the experiments.

Although we had recently some down time due to a vacuum problem at the Linac 2 and due to a bus-bar problem at the PS running efficiencies are still high. At the PS and the AD they are above 80 % for all beams and at the SPS they are around 75 %.

The first draft of the 2010 Injector Accelerator Schedule was shown. The start up for fixed target experiments is foreseen a week later compared to this year, the overall time is 28 weeks as in 2009.

## 6. DISCUSSION OF THE OPEN SESSION

### 6.1 NA60

**The SPSC notes with pleasure** that, since its last Annual Review NA60 has maintained a vigorous analysis program, to fully exploit the physics content of their data sets. A number of new results have been published, which contribute significantly to the field, and several more analyses are ongoing.

In the light of this, **the SPSC recommends** continued support for the NA60 data analysis.

## 6.2 NA49 (Written report for Annual Review)

**The SPSC notes with pleasure** that, since its last Annual Review NA49 has maintained a vigorous analysis program, to fully exploit the physics content of their data sets. A number of new results have been published, which contribute significantly to the field, and several more analyses are ongoing.

In the light of this, **the SPSC recommends** continued support for the NA49 data analysis.

## 6.3 NA61 and ADDENDUM

**The SPSC notes with satisfaction** the progress of NA61 in the installation and commissioning the upgraded apparatus, and the advanced status of the analysis of the 2007 data.

**The SPSC also notes with pleasure** that, so far in 2009 the required data with the T2K replica target has been collected, and that NA61 continues to take data and to pursue its program efficiently.

**The SPSC notes** that secondary light ion beams can be used for atomic weights up to and including Boron, but that primary beams are required for the heavier ion species necessary to complete the proposed NA61 program.

**The SPSC recommends** that the necessary preparations for a secondary Boron beam be started in 2010, and that an energy scan with this Boron beam be performed as soon as technically possible. In addition, **the SPSC also supports** carrying out the necessary preparatory work for possible energy scans with primary beams of heavier ion species in timely manner.

## 6.4 CAST

**The SPSC congratulates** the CAST Collaboration for the publication of the results from the He<sup>4</sup> data, **and acknowledges** the efforts and the resources invested in the successful recovery of the He<sup>3</sup> leak.

**The SPSC also notes with pleasure** the successful commissioning of the new Micro-Megas detector, and the excellent performance of the experiment in 2009, **and welcomes** the efforts to optimize the scanning protocol, to reach axion masses up to 1.2eV by the end of 2010.

## 6.5 ELENA Proposal

**The SPSC notes** receipt of the ELENA proposal.

Following the Open Session presentation, **the SPSC is in the process** of reviewing the proposal.

## 6.6 GIF++ Proposal



**The SPSC notes** receipt of the GIF++ proposal, **and is the process of further reviewing it.**

## 7. FOLLOW UP ON EXPERIMENTS AND PROPOSALS

### 7.1 CNGS1 - OPERA

**The SPSC congratulates** the CNGS for the successful neutrino beam delivery throughout 2009, **and notes with pleasure** the efficient data taking of the OPERA experiment.

**The SPSC also notes** the efforts to optimize the physics analysis procedures, and to improve the quality of the simulation, **and looks forward** to the continued monitoring of the data quality and of the regular progress of the analysis towards completion.

Finally, **the SPSC strongly supports** the request of the OPERA experiment for continued operation throughout 2011 and 2012, to complete the foreseen data taking.

### 7.2 CLOUD

**The SPSC notes with pleasure** that the financing for the CLOUD facility is now in place, and looks forward to continued progress towards the completion and commissioning of the full apparatus.

**The SPSC also notes** the recent publication of results from the initial run in 2006.

### 7.3 PAX Proposal

**The SPSC notes with pleasure** the response of the PAX Collaboration to the issues raised by the review.

**The SPSC notes** that the Collaboration develops a preparatory program at the COSY ring with protons, for which first results are expected on the timescale of a year.

**The SPSC remains concerned** by the potential impact of PAX on the AD program, and the risk factors and manpower requirements for implementing the PAX apparatus at the AD.

Taking into account the timeline and constraints of the various projects concerned, **the SPSC encourages** the PAX Collaboration to first perform their spin filtering measurements at COSY, and to report these to the Committee, following which the SPSC will further review the proposal.

#### 7.4 “The measurement of the W mass at the LHC: shortcuts revisited”

**The SPSC notes** the submission of a document (CERN/SPSC-2009-028; SPSC-I-239) advocating the needs for a high precision muon DIS program at CERN, aimed at improving the knowledge of the proton structure for LHC experiments.

Although only 3 individuals sign the document, the project would imply a substantial experimental program.

**The SPSC invites the proponents** to present their arguments in the relevant forums, such as the PDF4LHC workshop, and will examine the scientific motivation of the project once it is supported by a suitable experimental collaboration.

#### 7.5 DATES FOR THE SPSC MEETINGS IN 2010

The dates for the 2010 meetings of the SPSC were approved as follows:

January 19 – 20;  
April 13 -14;  
June 29 – 30;  
September 28 – 29;  
November 16 -17

## 8. DOCUMENTS RECEIVED

1. Minutes of the 92nd Meeting of the SPSC held on Tuesday June 30th and Wednesday July 1st 2009; CERN-SPSC-2009-024 / SPSC-092.
2. Response to SPSC recommendations on PAX; CERN-SPSC-2009-034 / P-337-ADD-1.
3. Status and further Analysis Plans of the NA49 Collaboration; CERN-SPSC-2009-033 / SR-052.
4. Memorandum from the OPERA Collaboration to the SPSC: Future plans of the OPERA experiment; CERN-SPSC-2009-032 / SR-051.
5. NA49: Revised data taking schedule with ion beams; CERN-SPSC-2009-031 / P-330-Add.5.
6. Status Report of the CAST Experiment; CERN-SPSC-2009-030 / SR-050.
7. A GIF++ Gamma Irradiation Facility at the SPS H4 Beam Line; CERN-SPSC-2009-029 / P-339.
8. The measurement of the  $W$  mass at the LHC: shortcuts revisited; CERN-SPSC-2009-028 / I-239.

CERN Document Server (CDS):

<http://cdsweb.cern.ch/search?sc=1&p=SPSC+2009>

CERN/SPSC-2009-037  
SPSC-094  
24 – 25 November 2009

MINUTES of the 94th Meeting of the SPSC  
Held on Tuesday and Wednesday November 24<sup>th</sup> and 25<sup>th</sup> 2009

**OPEN SESSION:**

- |                  |             |
|------------------|-------------|
| 6. NA48 / NA62   | A. Ceccucci |
| 7. UA9 – CRYSTAL | W. Scandale |
| 8. OSQAR         | G. Morville |

**CLOSED SESSION**

Present:

S. Bertolucci<sup>1</sup>, P. Bloch<sup>1</sup>, B. Bloch-Devaux, H. Breuker, M. Charlton, F. Close, A. Ereditato, L. Feld, E. Gallo, L. Gagnon, L. Garrido, P. Giubellino, S. Katsanevas<sup>1</sup>, J. Knobloch, M. Mannelli (Secretary), S. Maury, P. Newman, E. Rondio, C. Touramanis, C. Vallée (Chairman), U. Wiedemann

Apologies: P. Collier, M. Erdmann, P. Marage

- 1) Present on Tuesday only
- 2) Present on Wednesday only

1. MINUTES OF THE 93<sup>rd</sup> MEETING OF THE SPSC, HELD ON SEPTEMBER 29<sup>th</sup> and 30<sup>th</sup> 2009

The Minutes of SPSC 93 were approved with a minor change.

2. REPORT FROM THE CHAIRMAN

There has been no Research Board meeting since SPSC 93.

The Chairman reported about the requests for extension of the run by two weeks issued from the AD experiments and the CLOUD Collaboration. These requests have been briefly discussed between the Chairman, the corresponding SPSC referees and the experiments, and have been considered positively. These run extensions were then granted by the CERN Management.

3. STATUS OF ACCELERATORS

S. Maury reported on the status of the Accelerators.

It was announced that the LHC has had two beams simultaneously circulating with very good lifetimes. First test of synchronization of the beams and collision tests in the experiments have started. Great progress!

The **LINAC2** was running since the last meeting at the end of September without any major problem. We shall only mention that the fire on the roof of the PS-MPS building hosting the transfer line power converters in September caused a few worries and perturbations due to the cleaning of the power converter after the use of the fire extinguishers.

The **BOOSTER** has been delivering all physics and MD beams, with minor problems due to the new RF tubes showing faster ageing than the previous ones; the operation was also disturbed by some stability issues of the ring 4 distributor.

A major failure due to a water leak inside the vacuum chamber of the injection septum of the **PS** occurred the 2nd of October. More than one week was required to replace the septum magnet and bake out the new one. As a technical stop was foreseen the week after, and as a long period was necessary for the repair, the technical stop was advanced in all machines in order to minimize the time lost for operations. In the PS, the bus-bar of the main magnet 23 and the slow extraction sextupole in SS07 have been replaced. The bus bar is part of the ageing hardware of the PS. Minor problems occurred during the start-up period: the trip of the figure-of-eight loop, impossibility to operate the 80Mhz cavity for the ions, etc., which have disturbed operations.

A new pick-up configuration of the radial loop has improved the radial position of the beams during the transition crossing in the PS. As a result, all beams now require only minor readjustments, which eases the operation.

For the **MTE** about 17% of the intensity is regularly trapped in each of the four islands. The trajectory has been globally corrected in TT2/TT10 transfer line. The beam has been injected and accelerated in the SPS, and the extraction to CNGS has been set-up on one cycle. MTE extraction of the beam worked correctly, and a maximum intensity of  $1.9 \cdot 10^{13}$  was extracted, with efficiency up to 98%. For a 7 hours shift all the CNGS beams were delivered using this MTE beam from the PS.

The **SPS** has also suffered with the PS septum magnet exchange. During the advanced technical stop 2 magnets have been exchanged and a quadrupole repaired. Similar to the PS machine, the start-up after the advanced technical stop was difficult due problems such as a wrong injection B-field, wrong settings on the extraction kicker, and so on.

Apart from that **SFT** and **CNGS** beams were delivered regularly with only minor problems. The MD period dedicated to the UA9 experiments with coasting beam at 120 GeV was very efficient and successful.

All physics programmes stopped on the 22<sup>nd</sup> of November except AD, AMS and CLOUD, which were extended until December 7<sup>th</sup>.

The **CNGS** has accumulated  $3.5 \cdot 10^{19}$  protons on target during the run.

In October the operation efficiency in the AD was reduced, due to intermittent problems with the stochastic cooling electronics, kickers, power converters, and even a flood in TT6! In addition to that the beam stability was spoiled by a jitter of the RF synchronization between the PS and the AD. The situation was improved in November with the AD back to excellent performance.

2009 saw the end of the commissioning of the ion injection chain for the LHC. On October 23rd, for the first time, single-bunch beams of  $\text{Pb}^{82+}$  were sent to the LHC through TI2 and observed interacting with the residual gas by the ALICE experiment.

The beam had the required characteristics for the ion run planned for the autumn 2010, or even better:  $7 \cdot 10^7$  ions/bunch, normalized r.m.s. transverse emittance below  $1 \mu\text{m}$ , bunch length below 1.8 ns,  $\Delta p/p$  smaller than  $\pm 3 \cdot 10^{-4}$ , etc.

In addition to the good result obtained on the early beam, three weeks were used in the PS to establish the RF gymnastics to produce the structure of the nominal beam: a four-bunch train with 100 ns spacing, including two batch expansions, and a bunch splitting.

The ion injector chain is now ready for the physics run in LHC at the end of 2010.

In conclusion, the main loss of time for operations in the accelerator complex occurred in October, and this was minimized by advancing the planned technical stop to take place in the shadow of the downtime due to equipment repair. In parallel with the operation and beam

delivery to the experiments, the commissioning of the injector chain with the lead ion beam was completed, and beam sent to the LHC, where it was observed by ALICE experiment.

#### 4. STATUS OF EXPERIMENTAL AREAS

Lau Gatignon reported on the start-up on schedule of the East and North Areas.

In the **East Hall** the beam for DIRAC performed well, but the experiment lost about a week due to cooling and ventilation problems in their barrack and due to some trips of their spectrometer magnet. The irradiations and test beams have been operating without any major problem. Good beam was delivered to the CLOUD experiment starting on the 18th of November.

In the **North Area** NA61 has had a long and successful run where good beams were provided covering a wide range of beam momenta. Only the 10GeV/c point was delayed due to the low particle production rates at that low momentum. COMPASS has collected large samples of negative hadron beam data, complemented with electron beam calibration data and muon data for DVCS tests and Primakoff reference data. They ended the run with a successful short test with  $\pi^-$  beam for tests in preparation of a future proposal for Drell-Yan studies.

NA62 has successfully performed tests of a STRAW prototype in vacuum with 40GeV hadron beams, of a first LAV module integrated in the vacuum exposed to muon beams and very low energy electron beams and of a new muon veto prototype.

Stable beams of good quality were also provided to the UA9 experiment in the H4 and H8 beam lines and to the NA63 experiment, also located in H4. In parallel a dense program of test beam activities was performed in the EHN1 experimental hall. Only some minor problems of collimator and rectifier control degraded the convenience of operation during some periods, but without causing significant downtime.

In the **AD** the three main users were mostly provided with good quality beam of an intensity of about  $4 \cdot 10^7$  antiprotons per pulse, apart from a period in October where the up-time and efficiencies were lower. In mid-October the Brescia group in ASACUSA used the multi-ejection mode where six pulses were extracted in a 2.4 second interval. ASACUSA has completed on the 23rd of November some reconfiguration for the Yamasaki group, which allows them (as well as the other users) to take full advantage of the two-week extension of the AD run.

**CNGS** has been running very well and the integrated proton flux on the CNGS target at the end of the run was  $3.52 \cdot 10^{19}$ , some 10% above the aim for this year.

## 5. PS, SPS AND AD SCHEDULES

H. Breuker gave the update of the user's schedules for PS, SPS and the AD.

The official end of fixed target physics was reached yesterday 23rd of November at 8 o'clock. For three projects, the CERN management granted an extension period.

The Alpha Magnetic Spectrometer (**AMS**), which is due to be launched and installed on the ISS by the middle of 2010, has control of the H8 beam up to the 16<sup>th</sup> of December. AMS will be installed in the test beam area from the 3<sup>rd</sup> to 7<sup>th</sup> of December. The plan is then to complete the beam campaign by December 12<sup>th</sup>. Protons will be delivered at 400 and 180 GeV/c and positrons or electrons at 180 and 100 GeV/c. This will allow AMS to precisely align their tracker and calibrate their electromagnetic calorimeter. Another aim is to study its powerful proton over positron rejection capacity.

The **AD** complex with its three experiments **ALPHA**, **ATRAP** and **ASACUSA** received an extension until Monday 7<sup>th</sup> of December 8 o'clock. This was mainly motivated by the first indications of trapped anti-hydrogen atoms, which need further confirmation.

Following a series of delays, the **CLOUD** experiment has finalized its installation, connected all necessary instrumentation and finished the work on the DAQ integration, and started data taking on the 18<sup>th</sup> of November. The data being taken now are essential for the preparation of next years run, and the CLOUD run was extended until Monday 7<sup>th</sup> of December 8 o'clock.

Overall, 2009 was an excellent year in terms of beam delivery, as all projects have received the amount of protons that were scheduled at the SPSC meeting of 16<sup>th</sup> of April. The exception to this is the **DIRAC** experiment on the T8 beam line. This can be attributed in part by the experiment's own down time, and by an over estimate of the cycles available per super-cycle.

The 2010 Injector Accelerator Schedule (V1.1, 7/10/2009) has been prepared by M. Lamont. The foreseen start dates for fixed target physics are:  
**EAST Hall**: 29<sup>th</sup> of April, **NORTH Area**: 10<sup>th</sup> of May, **AD**: 10<sup>th</sup> of May (4 weeks earlier than in 2009), **CNGS**: 13<sup>th</sup> of May, **nTOF**: 17<sup>th</sup> of May.

The end for fixed target physics in 2010 is foreseen for the 22nd of November.

## 6. DISCUSSION OF THE OPEN SESSION

### 6.1 NA48 / NA62

**The SPSC congratulates** the NA48 / NA62 Collaboration for the excellent quality of the physics results being produced from the existing data sets, **and notes with pleasure** that further results are still forthcoming.



**The SPSC notes with pleasure** that the Collaboration continues to make rapid progress on all aspects of the new experimental apparatus, and continues to work towards an aggressive schedule for first data taking in 2012.

As the experiment starts to enter the construction and installation phase, **the SPSC looks forward** to a more detailed schedule, and a corresponding set of milestones, by which to monitor progress towards data taking.

## 6.2 UA9 – CRYSTAL

**The SPSC congratulates** the UA9 Collaboration for the successful data taking campaigns carried out in 2009. Both channelling and reflection have been studied, and the results appear to be promising in view of the use of crystals in accelerator collimation systems.

The studies so far have been performed using proton beams. In view of the potential applications in the LHC, these studies should also be extended to ion beams.

**The SPSC supports** additional data taking in 2010, with an improved experimental setup, which would allow further understanding of the performance potential of this technique for beam collimation.

## 6.3 OSQAR

In light of the substantial delays to the OSQAR program, due to the un-availability of spare LHC dipole magnets, **the SPSC looks forward** to a revised program, and a corresponding set of milestones, for further axion generation measurements.

**The SPSC notes** that OSQAR collaborators have produced accurate measurements of the electric bi-refringence in a variety of gases. The possible application of some of the techniques used for these measurements, to the VMB measurement was also presented.

# 7. FOLLOW UP ON EXPERIMENTS AND PROPOSALS

## 7.1 CNGS1 - OPERA

**The SPSC notes with pleasure** the continuing progress in the OPERA operations and data analysis procedures, and looks forward to seeing results from the 2008 data next year.

**The SPSC supports** the OPERA request for a running scenario in 2010 and beyond, which aims to provide the nominal  $4.5 \cdot 10^{19}$  protons on target to the CNGS.

## 7.2 DIRAC

**The SPSC notes** with pleasure the improved signal to background for pi-K production in the 2008 data, thanks in particular to the commissioning of the scintillating fibre tracker. The

present results indicate that some running in 2010 appears to be necessary to provide conclusive evidence of the production of pi-K atoms.

### 7.3 CLOUD

**The SPSC notes with pleasure** the successful installation of the experiment, and the start of data taking.

### 7.4 NA63

**The SPSC notes with pleasure** that, with the data taken in 2009, NA63 has successfully completed its approved program.

### 7.5 ELENA Proposal

**The SPSC recognizes** the substantial potential impact of ELENA on the AD experimental program, **and welcomes** recent studies of the possible integration scenarios of ELENA in the existing complex, which would minimize disruption to the ongoing experiments while also maximizing the floor space available for new experimental beam lines.

These scenarios also provide sufficient space to allow for possible further upgrades to ELENA, including in particular the possibility of a slow extraction. **The SPSC recommends** that the potential for such a future upgrade option be maintained in the detailed design of ELENA.

**The SPSC also notes** with pleasure, that a number of the Institutes participating in the AD are willing to contribute a substantial share of the costs for the ELENA project, and that some of these funds have already been secured.

**The SPSC strongly supports** the ELENA proposal, and encourages the parties concerned to write a full Technical Design Report, and to secure the full resources required to make this a viable project.

### 7.6 GIF++

**The SPSC recognizes** that the GIF++ is an important experimental facility at CERN.

**The SPSC encourages** further studies of the detailed design and of the exact location of the GIF++, in particular in order to minimize interference with the existing beam lines.

## 8. DOCUMENTS RECEIVED

1. Minutes of the 93rd Meeting of the SPSC Held on Tuesday and Wednesday September 29th and 30th 2009 (CERN-SPSC-2009-035/SPSC-093).
2. UA9 – CRYSTAL: Report for 2009 \*)
3. OSQAR, Status Report: Progress in Ultra-fine Birefringence Measurements (CERN-SPSC-2009-036 / SR-053).
4. DIRAC: Results from 2008 Data, in particular on  $\pi$ K-atoms with improved precision after 2007\*).

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\*) Will be submitted to the CERN Document Server by the authors to have an official CERN reference number.

CERN Document Server (CDS): <http://cdsweb.cern.ch/search?sc=1&p=SPSC+2009>



**DRAFT**  
CERN/LHCC 2009-017  
LHCC 99  
23 September 2009

## **LARGE HADRON COLLIDER COMMITTEE**

Minutes of the ninety-ninth meeting held on  
Wednesday and Thursday, 23-24 September 2009

### **OPEN SESSION**

1. LHC Status Report: Steve Myers
2. LHCb Status Report: Themis Bowcock
3. ATLAS Status Report: Christophe Clement
4. CMS Status Report: Tiziano Camporesi
5. ALICE Status Report: Werner Riegler
6. LHCf Status Report: Yoshitaka Itow

### **CLOSED SESSION:**

Present: F. Bedeschi, S. Bertolucci, G. Blazey, P. Bloch, H. Breuker, C. Cecchi,  
D. D'Enterria, E. Elsen, M. Ferro-Luzzi\*, J.-F. Grivaz, C. Hawkes,  
W. Kuehn, D. Macina, M. Mangano, M. Martinez-Perez, P. Mato,  
A. Nomerotski, B. Panzer-Steindel (replacing J. Knobloch), D. Pitzl, S. Smith,  
E. Tsismelis (Scientific Secretary), T. Wyatt (Chairman)

\*part-time

Apologies: M. Gonin, R. Heuer, J. Knobloch, R. Yoshida

#### **1. PROCEDURE**

The minutes of the ninety-eighth LHCC meeting (LHCC 2009-010 / LHCC 98) were approved.

The Chairman thanked the outgoing members of the Committee – Michel Gonin, Mario Martinez-Perez, Stewart Smith, and Rik Yoshida – for their significant contributions to the Committee over many years. This being their first meeting, the Chairman welcomed David D'Enterria and Daniela Macina to the LHCC.

#### **2. REPORT FROM THE DIRECTOR FOR RESEARCH & SCIENTIFIC COMPUTING**

The Director for Research and Scientific Computing reported on issues related to the LHC.

He reported on the status of the LHC. All four experiment caverns have been isolated from the LHC machine tunnel, thus allowing access to the experiments during LHC machine power tests. He reported that the LHC will initially run at an energy of 3.5 TeV per beam when it starts up in November this year. This news comes after all tests on the machine's high-current electrical connections were completed over the summer showing that no further repairs are necessary for safe running at this energy. The procedure for the 2009 start-up will be to inject and capture beams in each direction, take

collision data for a few shifts at the 450 GeV beam injection energy, and then commission the ramp to higher energy. The first high-energy data should be collected a few weeks after the first beam of 2009 is injected. The LHC will run at 3.5 TeV per beam until a significant data sample has been collected and the operations team has gained experience in running the machine. Thereafter, with the benefit of that experience, the energy will be taken towards 5 TeV per beam. At the end of 2010, the LHC will be run with lead ions for the first time. Details of the 2011 LHC physics run will be worked out later and will depend on how the 2010 LHC run proceeds and on the mandatory work requested for the CERN infrastructure during 2010-2011.

He also reported on the enhancement of the Tier-0 computing centre for LHC operations. Offers from Member States to provide computing infrastructure in their countries is being evaluated.

The choice of video conferencing solutions for the experiments is being evaluated. Following a recent market survey, a new product will be tried out with the experiments as of October 2009 prior to being rolled out widely at CERN.

### **3. REPORT FROM THE CMS MINI-REVIEW**

The CMS Mini-review was held on 21 September 2009 and encompassed seven presentations. The mini-review covered the detector status and commissioning, results from the analysis of the cosmic-ray data, the status of the trigger and software and preparations for beam.

The LHCC congratulates CMS for their highly-successful shutdown work and experiment re-commissioning. The current shutdown period is focused on mending problems and ensuring the sustainability of the CMS experiment for the long-term and will serve as a good model for future shutdowns. The objective of sealing the UXC55 and USC55 caverns from the LHC tunnel was met, thus allowing access to the CMS experiment during LHC power tests.

Re-commissioning of the CMS magnet proved to be more difficult than expected. An unexpected movement of the table supporting CASTOR was noticed at 1.2 T when the CMS detector was open. CASTOR is being fastened to the CMS magnet in both directions. Extra magnetic field shielding of vacuum pumps has been implemented and shielding the photomultiplier tubes of CASTOR is under investigation.

The Cosmic Ray At Four Tesla 2009 (CRAFT09) run was very successful. About 300M cosmic-ray events were collected and the run re-established the good performance for all sub-systems and the integrated CMS detector. The magnetic field in the flux return is now understood to within a few percent. The detectors showed good availability in CRAFT09 and the measured resolution, alignment and efficiency all meet expectations. The CRAFT09 run revealed two problems with CMS sub-detectors. The HO outer barrel hadronic calorimeter had two Hybrid Photon Detectors (HPDs) discharging and a project is underway to replace them with silicon photomultiplier tubes. It was reported at the mini-review that 17 of the 3900 Tracker Inner Barrel (TIB) channels have tripped, drawing a large current ( $\mu\text{A}$ ), and that investigations of the cause were in progress. Fortunately, by the time of the Closed Session the cause of this potentially serious problem had been identified to be due to human error, and it is highly unlikely to recur or to affect additional channels. The latency of the prompt alignment should be re-examined and a report given to the next session of the LHCC. The LHCC encourages CMS to continue to analyze and eliminate sources of data-taking inefficiency. The planned

publication of the CRAFT09 results will serve as a good motivation to engage the experiment at large.

The LHCC noted a number of issues related to the general infrastructure and technical support. CMS has had several potentially dangerous incidents and must continue in its efforts to analyze and eliminate potential sources of future risk. For example, the problematic magnet energy dump after the power failure subjected the system to an unexpected power-down sequence. Risk prevention procedures should be further developed and adhered to during maintenance and repair activities. A better integration is needed among CMS and the various service groups. The establishment of an infrastructure integration committee is reasonable and TOTEM should be invited to participate. The development of plans for maintenance of future systems is very important and to this end the requests of CMS for infrastructure facilities at Point 5, in Bldg. 186 and in Bldg. 904, are valid and should be supported.

Excellent progress was reported on the CMS offline software and major improvements have been made in all applications – fast simulation, full simulation, reconstruction, analysis and event displays. The software performance figures are improving continuously and are well within the requirements. The LHCC welcomes the introduction of an Offline Run Manager during data-taking to handle the deployment of urgent fixes and the introduction of a new computing model with shorter release cycles. Validation of the Scientific Linux SL5 native builds is underway but the risk remains that the full validation will not be completed on time by the LHC start-up, with the result being of running SL4 binaries on SL5 LCG resources which have migrated to SL5.

The CMS computing is ready and well managed and is focused on anticipating potential issues. CMS has developed continuous monitoring of the Tier-1 and Tier-2 sites. The LHCC noted that not all the Tier-1 centres are equally ready to accept physics data and both CMS and ATLAS are discussing with those three Tier-1 centres that are underperforming. The overall performance of the Tier-2 sites has improved but the smaller sites still exhibit limitations resulting from missing manpower. The resources requested by CMS for the 2009/2010 period are essentially in agreement with the recommendations from the Computing Resources Scrutiny Group (CRSG).

The CRAFT09 was a highly-profitable exercise for the CMS Trigger and the experiment has shown that it is ready to properly utilize the LHC beam. The Committee noted that the End-cap Electromagnetic Calorimeter (EE) trigger is not yet fully operational and completing its commissioning should remain a high priority. Moreover, CMS should complete its Resistive Plate Chamber (RPC) trigger analysis and evaluate the utility of special runs for the trigger.

CMS has completed an impressive amount of work for being ready for physics analysis. The effort is well advanced and is led by a highly-effective leadership and organization structure. The LHCC looks forward to seeing that the outstanding preparations result in prompt physics results and publications.

In conclusion, the LHCC considers that CMS has shown very good progress in all aspects of the experiment and is in excellent shape for the start of the LHC physics programme. The LHCC would like to express its appreciation of the outgoing CMS Spokesperson, Jim Virdee, for the contribution his leadership has made to CMS achieving such an excellent state of readiness.

#### **4. REPORT FROM THE TOTEM REFEREES**

The LHCC heard a report from the TOTEM referees, concentrating on the status of the experiment and the commissioning activities.

The referees reported on the status of the TOTEM detectors. Good progress was reported on the Roman Pot detectors. All Roman Pot stations are now installed at the LHC together with the ancillary systems. The referees pointed out issues for further deliberation concerning the determination of the beam position and the strategy for the protection of the Roman Pot detectors. Progress was reported since the previous LHCC meeting on the production of the T1 Telescope. Construction of the first half of the T1 Telescope is complete and the Cathode Strip Chambers (CSCs) for the second half, together with spares, have been delivered to CERN. Commissioning of the T1 telescope is underway at the SPS test beam and the LHCC is looking forward to receiving the results from the test beam commissioning of the complete T1 Telescope, using the final DAQ, Detector Control System (DCS) and offline software. Prior to installation, a joint meeting between TOTEM and CMS should be arranged to discuss the ready-for-installation procedure as required by the latter. Commissioning of the T2 Telescope is advancing well and much has been achieved over the past months. All three TOTEM sub-detectors – T1 Telescope, T2 Telescope and Roman Pots - need to be integrated and tested as complete systems.

The LHCC also heard a report on the Trigger, DAQ, DCS, and offline software. The Trigger hardware is ready and the synchronization system is under development. A preliminary Trigger system will be available for testing in about a month. Much progress was reported on the DAQ and the system is on track to be ready for first LHC beam. Good progress was reported on the DCS, with the system being fully operational at Point 5. The Committee took note of the reported progress on the offline software. The referees will follow up on the remaining work needed to ensure that it is possible to run a complete analysis chain with the three TOTEM sub-detectors.

The LHCC recommends that TOTEM creates a liaison team to CMS to ensure continuous close contact with the CMS installation and operation groups.

#### **5. REPORT FROM THE LHCb REFEREES**

The LHCb referees reported on the status of LHCb, concentrating on the status of the experiment and preparations for the LHC start-up.

The LHCC heard a report on the status of the LHCb experiment. The LHCb cavern has been separated from the LHC tunnel, thus allowing access to the LHCb experiment during LHC power tests. The LHCb detector, software and physics organization is ready for first data and physics analysis and the experiment is in excellent shape for the start of the LHC physics programme. Good progress was reported on the Vertex Locator (VELO), Ring Image Cherenkov (RICH), Trigger Tracker and Muon System and all systems are well-prepared for the LHC start-up. The referees reported on the issue concerning the development of high-ion currents in some Hybrid Photon Detectors (HPDs) for the RICH system. Sixty HPDs have already been replaced. The repair procedure is ongoing and up to 15 more HPDs are expected in September 2009 to be installed the following month. The first data runs with the M1 Muon System integrated in the read-out of the complete LHCb detector have started and commissioning of this detector is underway. LHCb is preparing for the dedicated TED beam stopper run in October 2009.

Good progress was reported on the LHCb read-out and computing. LHCb is ready for the read-out of every sub-detector at a 1 MHz frequency. The production of the 2009-2010 Monte Carlo sample is well underway and LHCb is pleased with the outcome of the recent review of computing resources by the LHCC.

## 6. REPORT FROM THE LHCf REFEREES

The LHCC heard a report on the status of the LHCf experiment. The LHCf detectors have been installed since 2008 and have been fully commissioned. LHCf considers that data-taking at various energies is a very important element of their physics programme and request that the experiment collects data at 0.45 TeV, 3.5 TeV, 5 and 7 TeV beam energies. LHCf is also interested in data-taking with heavy ions sometime after 2010.

Concerning the running scenarios for 2009-2010, the LHCC favours the scenario whereby LHCf takes data at 3.5 TeV beam energy with an exposure of less than  $\sim 10$  Gy and continues to collect statistics until the luminosity reaches  $10^{31}$  cm<sup>-2</sup> s<sup>-1</sup>. At this stage the LHCf detector will be removed from the TAN and will be replaced by the ATLAS Electromagnetic Zero Degree Calorimeter (ZDC) during a short stop. LHCf can then start the work of replacing the scintillators, and carry out the test beam calibration at the SPS during the first opportunity in summer 2010. Should the detector be ready for further data taking in 2010 at 5 TeV beam energy, the LHCC shall review the possibility of a new installation taking into account the needs of ATLAS. Otherwise the data taking at higher energy will be postponed to the beginning of the 2011 LHC run. The Committee reiterates its endorsement of LHCf taking data at 7 TeV beam energy, whenever this energy is attained at the LHC. Should the LHC be ready to start the 2011 run at 7 TeV beam energy, the LHCC will review the merits of an additional dedicated run at 5 TeV beam energy.

## 7. REPORT FROM THE ALICE MINI-REVIEW

The ALICE Mini-review was held on 22 September and included 14 presentations. The mini-review covered the current shutdown activities, the detector installation, progress in the commissioning and construction, detector performance and preparations for the first LHC run.

### Shut-down Activities

The Miniframe was dismantled in November 2008 and brought to the surface. It was modified so as to provide access to the Time Projection Chamber (TPC) Side-A electronics. This major operation was successful and the Miniframe was back in position in May 2009.

Four super-modules of the Electromagnetic Calorimeter (EMCAL) were installed. There are now also seven Transition Radiation Detector (TRD) super-modules and three PHOS modules in place. The Photon Multiplicity Detector (PMD) is complete and installed in the Miniframe.

In order to comply with the LHC convention, the dipole polarity was reversed. The L3 magnet ventilation was decoupled from the shielding and the ALICE cavern is now decoupled from the LHC tunnel, thus allowing access to ALICE during LHC powering tests.

A cosmic-ray run took place in August and September 2009.



### **Status of the Detectors and Data Acquisition**

The cosmic-ray detector ACORDE is fully operational. The T0 detector and the Zero Degree Calorimeters (ZDCs) are ready for data taking. The V0 detector suffers from after-pulses of the photomultipliers, but this is not a source of concern for the upcoming run, during which the TPC past/future protection can be disabled. Solutions are being investigated for the future. The high-voltage of the High Momentum Particle Identification Detector (HMPID) was adjusted to conform to the specifications.

A low-voltage power supply of the Forward Multiplicity Detector (FMD) needs to be replaced. The PMD is currently over-heating, and the ventilation system has to be upgraded. Both of these operations are foreseen to take place during the next two months. The installed EMCAL super-modules are commissioned and two more will be available for installation in January 2010, should there be an opportunity. The PHOS modules cannot yet be cooled to their optimal temperature because of residual humidity in the cases. They are being flushed with dry nitrogen and there is good hope that they can be cooled down within the next months.

The Muon Spectrometer was commissioned with cosmic-rays for the first time. Large samples of data were recorded with dipole on and off, the latter for alignment purposes. The electronics of both the tracking and triggering systems are in excellent shape.

The Time-of-Flight (TOF) system was heavily used for triggering during the cosmic-ray run. It is performing very well, with a time resolution approaching the design value and already sufficient to extend the particle identification capabilities of the TPC to higher momentum.

High-voltage capacitors on the Side-A of the TPC were exchanged, and the cooling system was improved. The whole electronics is in excellent shape, with less than 1% faulty or masked channels, and a noise level of 0.7 ADC counts. A full Kr<sup>83</sup> calibration was performed, resulting in excellent uniformity. Adding 50 ppm of water to the gas reduced occasional high-voltage trips.

The status of the Inner Tracking System (ITS), consisting of the Silicon Pixel Detector (SPD), the Silicon Drift Detector (SDD) and the Silicon Strip Detector (SSD), was extensively discussed. The SPD has a serious issue related to the cooling system where problems have deteriorated since the last LHCC session. In July 14 % of the pixel channels were not working, mainly due to insufficient cooling, while in September, even after extensive work on the cooling system, this number has gone up to 29%. Such a large loss of pixel channels might result in considerable degradation of the tracking performance. The Committee **encourages** the ALICE Collaboration to seek external advice from experts in thermodynamics engineering in order to find a solution as quickly as possible.

The SDD has performed well during the recent cosmic-ray run, with more than 93% of all channels included in the data acquisition and more than 97% of those channels working. Temperature stability and temperature monitoring are of utmost importance for the position resolution since the drift velocity is strongly dependent on temperature. The Committee **recommends** exploring the possibility of continuous drift time measurement exploiting the built-in charge injection system and a dedicated trigger.

The SSD has successfully participated in the cosmic-ray run with about 10% of the half ladders shut off, mainly due to high-bias currents or shorts. In laboratory tests, this was traced to the paper insulation that is very sensitive to the ambient humidity. De-

humidification of the system is in progress, but at a very slow rate due to the constrained airflow at the location of the ITS.

The TRD is operational as foreseen for this year's run with seven installed super-modules. Cosmic-ray and Kr calibration data have been successfully taken. To speed up super-module production, task sharing by Münster and Heidelberg has been established. The estimated production time is now 5 to 6 weeks per super-module. The full TRD (18 super-modules) should be ready by early 2011. Front-end electronics production has restarted smoothly after the problem with the MultiChipModule (MCM) design has been solved using a modified chip packaging design.

The Data Acquisition System (DAQ) has been successfully upgraded from 40% performance to 100% performance. The new hardware has been commissioned and is ready to be used. During the cosmic-ray tests, regular time intervals were used for subsystem commissioning ("happy hour"). It was observed that a significant amount of time had to be spent after such maintenance intervals in order to bring the complete DAQ system back to a running state.

Despite some ongoing maintenance work concerning faulty turbines and power supplies, the Detector Control System (DCS) is in good shape and ready for the upcoming run.

#### **Status of Computing and Trigger**

No changes were reported on the computing since the meeting with ALICE in May 2009 and with the LCG referees in July 2009. Computing resources (based on the Computing Technical Design Report) were presented with a modified profile to match the LHC running scenario. The goals for the first LHC run are to accumulate  $5 \times 10^9$  minimum bias proton-proton events and  $10^8$  minimum bias Pb-Pb events, and the Monte Carlo simulations (adjusted to real detector performance) will match the expected real-data statistics. A prompt offline reconstruction (pass 1 at the Tier-0 centre) of cosmic-ray data was carried out with a two-week accumulated delay due to issues in various sub-detectors that could only be discovered by running on raw data. As of the day of this mini-review, 55% of the total data was reconstructed (more than 85% of the available data).

ALICE requirements before LHC data taking include an urgent deployment of: (a) Scientific Linux 5 in all WNs & VOBoxes, in agreement with GDB push for T1/T2 migration; and (b) CREAM-CE at all sites by mid-November 2009.

All needed hardware (servers/network) for the High Level Trigger (HLT) is ready to trigger on data from the first proton-proton run: ~1400 CPU cores, ~3TB RAM, and Gigabit connections have been installed. The online reconstruction is 3 to 10 times faster when compared to the offline analysis. The Pb-Pb run will need (and will have) more computing power. The Committee **recommends** implementing a realistic rare-probe physics menu that should be tested by flagging triggered events (without pre-scale factors) for proton-proton and Pb-Pb data in the upcoming run.

#### **Cosmic-ray Run**

ALICE took cosmic-ray data on a 24/7 shift mode basis from 17 August to 16 September 2009. All detectors were included, except EMCAL/PHOS (under commissioning) and PMD (due to the cooling problem). The DAQ/DCS/CTP/HLT were stable. Two DAQ partitions were used: «PHYSICS» (central-barrel), and «MUON» (muon-arm). First data are available to align the spectrometer.

Other global tests that had been carried out include the adjustment of detector timing/trigger (CTP) with LHC injection tests, the commissioning of the quality

assurance framework and large scale raw-data reconstruction. The time lag between data-taking and reconstruction should be improved.

### **Preparations for First Physics**

Concerning plans and preparations for physics, the focus for the first LHC run is on minimum bias proton-proton event characterization in order to have comparison data for the heavy-ion programme. The lower LHC centre-of-mass energy of 7 TeV and luminosities are convenient. Furthermore, these data will be useful to tune the minimum bias proton-proton event generators. Specific studies of very-high-multiplicity events are foreseen.

The preparation for physics is organized in “paper preparation groups”. Four papers have been drafted with the main focus on (i)  $dN/d\eta$ , (ii)  $dN/d\eta$  vs. multiplicity, (iii)  $dN/dp_T$ , and (iv)  $\langle p_T \rangle$  vs. multiplicity. All papers aim at including data at 900 GeV and 7 TeV centre-of-mass energy. The first paper can be done with just 20k events. The corresponding analyses were tested on 200k simulated events with the simulation adjusted to the real detector status. A second round of papers will focus on more complex observables such as particle identification spectra (for pions, kaons and protons), heavy flavour and high- $p_T$  neutral pions.

In conclusion, the LHCC **congratulates** the ALICE Collaboration for the significant progress achieved during the shutdown period. The detector is in good shape for the upcoming LHC run.

## **8. REPORT FROM THE ATLAS REFEREES**

The LHCC heard a report from the ATLAS referees, concentrating on the status of the experiment and the upgrade activities.

Good progress was reported on ATLAS sub-systems. The ATLAS cavern has been separated from the LHC tunnel, thus allowing access to the ATLAS experiment during LHC power tests. The LHCC noted certain concerns. The failure rate of the LAr Calorimeter optical transmitters remains worrisome as the cause is unknown. Since May 2009, there have been 15 failures which represent about 1% of the LAr Electromagnetic Calorimeter channels. The Committee recommends that ATLAS continues to monitor the failures and develops a long-term plan to resolving the issue. The read-out rate of the Cathode Strip Chambers (CSCs) has improved to 15 kHz but to reach the desired 100 kHz may require new electronics. In order to ensure the successful preparation for the next long LHC shutdown, ATLAS should decide very soon on the plan to deal with the low CSC read-out rate.

The evaporative cooling system’s compressor vibration level remains high and is not compliant with engineering standards. Given the lifetime of the experiment, replacement of the evaporative cooling system compressor and pump is warranted. The gravity-fed solution is reliable and investigations should continue.

ATLAS has held Analysis Readiness Walkthroughs for the  $J/\psi$  and minimum bias events. The participants found this exercise very useful and the respective reports are becoming available. ATLAS should continue to pursue the Walkthroughs and broaden them to ensure that all analyses appropriate for accumulated luminosities of 200  $\text{pb}^{-1}$  benefit.

The referees also reported on the Insertable Barrel Layer (IBL) ATLAS upgrade project. The Technical Design Report will be submitted to the LHCC by April 2010. In order to

ensure that the IBL remains on schedule, the LHCC recommends that funding for 2010 should be identified.

## 9. MoEDAL TECHNICAL DESIGN REPORT

The LHCC has completed its scientific and technical evaluation of the MoEDAL Technical Design Report (TDR) submitted in June 2009 (LHCC 2009-006 / MoEDAL TDR 001). The Committee was impressed by the quality of the work presented in the TDR and congratulates the Collaboration. The MoEDAL detector is well suited to search for highly-ionizing particles at the LHC – monopoles/dyons as well as stable and pseudo-stable singly and multiply-charged heavy stable particles. The MoEDAL detector is based on track-etch detectors and will be housed in the LHCb Vertex Locator (VELO) cavern at LHC Point 8. The MoEDAL Collaboration has agreed to deploy a fourth layer of CR-39 plastic track-etch layer to the detector. The TDR demonstrates that the technological issues do not pose potentially prohibitive problems.

The Committee has no major concerns. The ancillary documents (LHCC-2009-015 / LHCC-G-151 and LHCC 2009-016 / LHCC-G-152) record the overall assessment by the LHCC of the project at this time, thereby emphasizing some points which should be monitored in the future as the project progresses. The LHCC review of the TDR was not a detailed review of the engineering or procurement readiness.

### **Recommendation:**

The LHCC recommends general approval of the MoEDAL Technical Design Report. The LHCC considers the schedule given in the Technical Design Report to be appropriate. The schedule will be used by the Committee to measure and regulate the future progress of the project.

## 10. REPORT FROM THE LCG REFEREES

The LHCC heard a report from the LCG referees, concentrating on the status of the project and the status of the computing for the LHC experiments.

Stable operation of the World-wide LCG was reported for the period since July 2009. The Committee noted a significant increase in the reliability of the Tier-2 centres. A clearer situation of the transition from Enabling Grids for E-Science (EGEE) to the European Grid Initiative (EGI) has emerged since June 2009, with CERN now being a member of the EGI Council and being proposed as a special support centre for high-energy physics.

The referees also reported on the status of the computing for the LHC experiments. The computing for ALICE, ATLAS, CMS and LHCb is ready for LHC data-taking. No major concerns were reported on this computing.

Interactions between the LHCC and the Computing Resources Scrutiny Group (CRSG) have continued through the summer. The CRSG has produced a new report on resources for 2009/2010 taking into account recommendations from the LHCC. The experiment and CRSG estimations for 2009/2010 resources are now in broad agreement. For ALICE some not-fully resolved discrepancies are still present. A new updated report from the CRSG will become available shortly. Given the broad agreement between the computing resources estimates, the LHCC recommends that the experiments' estimates, which are based on more detailed inputs, should be taken when assessing the actual resources to be installed. Computing resources for 2009 are being currently installed and the computing models for 2011 and beyond should be reviewed in view of the first experience with

LHC data taking and processing. By general consensus, the LHCC and CRSG will in future conduct joint meetings with the experiments and LCG Management from the outset of such review processes in order to facilitate a consistent refereeing process and avoid unnecessary duplication.

#### **11. REPORT FROM THE LHC UPGRADE REFEREES**

The LHCC heard a report from the LHC upgrade referees, focusing on machine-experiment interface issues and updates of the experiment upgrade plans.

The referees reported on the collimation system, experimental beam pipes and machine aperture limitations for Phase I. Scenarios for upgrading the collimation system for the LHC upgrade are currently being studied. The TAN absorbers need to be replaced with a new larger aperture TAN for Phase I. The LHC Experimental Beampipes group was created in January 2009 with representation from the LHC experiments and machine groups to advance the specifications and design of the experimental beampipes required for the LHC upgrade. The LHCC took note that the ATLAS experimental beampipe cannot be replaced during a standard winter shutdown period and it is proposed to fabricate a new spare chamber that can be inserted in ATLAS without removing the Pixel Detector, thus reducing considerably the required time for its installation. Moreover, no spare exists for the CMS experimental beampipe in the end-cap regions. A reduction of the central experimental beampipe radius from 29 mm to 25 mm in ATLAS and CMS has been shown to be feasible with the Phase I optics.

The Committee also heard a report on the experiment studies for the Phase I upgrades. Good progress was reported on the development of the ATLAS Insertable Barrel Layer (IBL) detector, with many institutes showing interest in contributing to this project and with a Technical Design Report to be submitted to the LHCC in mid- 2010. The design of a new ATLAS experimental beam pipe with a reduced inner radius of 25 mm. from the current 29 mm. appears to be feasible. The CMS Pixel Detector design for Phase I is underway and a Technical Design Report is to be submitted in 2010. The interest of ALICE in a smaller beampipe radius is to be re-visited after experience with first beam. The Technical Design Report for the LHCb upgrade will be submitted in 2010.

#### **12. REPORT FROM THE LHC PROGRAMME CO-ORDINATOR**

The LHCC heard a report from the LHC Programme Co-ordinator. He focused on the planned LHC running scenarios and the schedule. The LHC will start with collisions at 0.45 TeV proton beam energy and then move progressively to 3.5 TeV and 5 TeV proton beam energies before completing the 2009-2010 run with heavy-ion collisions. He also reported on the two machine development requests for the LHC injector chain: a) creating bunch trains for specific ALICE luminosity and pile-up studies by testing a bunch spacing greater than 100 ns and b) shifting bunch trains to optimize the sharing of colliding beams between experiments. A combined TI2 and TI8 test is scheduled for 25-29 September 2009 and a special TED beam stopper run is planned for LHCb on 12 October 2009. Injection into the LHC is scheduled for 24-25 October with circulating beam in the LHC scheduled for mid-November 2009. The Co-ordinator also showed the preliminary LHC schedule for 2010, details of which will depend considerably on what is learnt from the first beams and collisions.

### 13. TEST BEAMS

The SPS and PS Physics Co-ordinator reported on the 2009 physics run. He reviewed the 2009 LHC injector accelerator schedule and the schedules of the SPS and PS fixed target programmes. He reported that good use is being made of the SPS and PS beams by the LHC experiments. Many tests are underway by the LHC experiments, including calibration, irradiations and tests of inner trackers, calorimeters and muon systems for the experiment upgrade projects. Moreover, TOTEM and UA9, the latter being the study of beam collimation with crystals, have run at the SPS. Preparation of the injection chain for the LHC is on schedule, and the LHC cycles will be included in the supercycle as planned for the LHC start-up.

### 14. REFEREES

The LHCC referee teams are as follows:

ALICE: M. Gonin (Co-ordinator), W. Kuehn, J.-F. Grivaz

ATLAS: J. Blazey (Co-ordinator), C. Cecchi, P. Mato, D. Pitzl

CMS: E. Elsen, M. Martinez-Perez, S. Smith (Co-ordinator), R. Yoshida

LHCb: F. Bedeschi (Co-ordinator), C. Hawkes, A. Nomerotski

TOTEM, LHCf, MoEDAL: C. Cecchi, E. Elsen, M. Mangano, P. Mato

LCG: J.-F. Grivaz, C. Hawkes, M. Martinez-Perez (Co-ordinator)

Experiment Upgrades:

Co-ordinator: D. Pitzl

RD39: D. Pitzl

RD42: A. Nomerotski

RD50: A. Nomerotski, R. Yoshida

RD51: W. Kuehn

### 15. The LHCC received the following documents:

Minutes of the 98<sup>th</sup> Meeting of the LHCC, held on 8-9 July 2009  
(CERN-LHCC-2009-010)

Report on LHCC mini-review of the Computing Resources  
(CERN-LHCC-2009-011 G-148)

LHCf Status Report Memorandum  
(CERN-LHCC-2009-012 G-149)

MoEDAL – LHCC Referee's Questions & Answers  
(CERN-LHCC-2009-015 G-151)

Report from the Computing Resources Scrutiny Group  
(CERN-LHCC-2009-013 G-150)

## **16. DATES FOR LHCC MEETINGS**

Dates for **2009**:

18-19 November (CANCELLED)

Dates for **2010**

17-18 February

5-6 May

7-8 July

22-23 September

17-18 November

Emmanuel Tsesmelis  
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CERN-INTC-2009-041

INTC-035

December 1, 2009

ISOLDE AND NEUTRON TIME-OF-FLIGHT  
EXPERIMENTS COMMITTEE

Minutes of the 35<sup>th</sup> meeting of the INTC  
Held on Monday 16 and Tuesday 17 November 2009

**OPEN SESSION**

Monday 16 November 2009 at 14:00 h, Council Chamber

The Chairman of the INTC, Peter Butler, opened the meeting and announced the agenda. He informed the Committee on the approval of the HIE-ISOLDE project by CERN management and welcomed the new members of the Committee Prof. Hanns-Ulrich Habermeier and Dr. Danas Ridikas.

**ISOLDE Technical Report**

The EN-representative for the INTC, Richard Catherall, summarized the main issues from ISOLDE operation in 2009. For the whole running period 23 target units were produced including 12 uranium-carbide targets. Several target/ion-source developments have been pursued: The new VADIS arc-discharge ion source, which has been tested successfully in 2008 and has meanwhile drawn the interest of other facilities, was combined with different target units and gave again higher ionization efficiencies. Another target test concentrated on the production of intense <sup>6</sup>He beams using a BeO target material and a neutron converter. In addition to the successful production, the spectrum of neutrons from the converter was investigated in more detail. Finally, a low work-function cavity for the suppression of surface ionized contamination was tested in order to be applied in future runs.

The REX-ISOLDE system was operated for 9 different beams. In case of neutron-rich Kr isotopes, the failure of a vacuum seal of the last acceleration stage led to the cancellation of the run. It was rescheduled and was running nicely, but was then stopped due to sequential power cuts which fully cut the ISOLDE vacuum system for one week. For another run on <sup>11</sup>Be isotopes the cathode of the EBIS broke just before the setup time and the run was very much delayed and could only take a few shifts for tests. Otherwise the REX-ISOLDE campaign was very successful including post-accelerated iron isotopes after in-trap decay and transfer reactions with <sup>66</sup>Ni at MINIBALL. The REX-ISOLDE low-energy part is looking forward to a new control system upgrade. It is foreseen for the shutdown period 2010-2011. In addition a new Pico-Ampere meter has been designed and tested and will be implemented during the upgrade. The installation of a shielding close to the REX-EBIS charge breeder to reduce the



effect of the magnetic field of WITCH was not sufficient. The A/q scaling from the stable beam to a weak radioactive beam was not working with the WITCH field being operated. The REX-LINAC consolidation has progressed. The cooling and ventilation of the RF amplifier room was improved to give a better temperature stability which will allow longer RF tube lifetimes. Furthermore, the REX-LINAC concrete shielding tunnel has been put in place and will be closed in the upcoming shutdown. This will make future interventions much easier and the X-ray background at the MINIBALL experiment will be greatly reduced. The beam instrumentation controls have been brought to CERN standard to allow better support and much easier extension and/or modification. Finally, a new tuner mechanics for the 7-gap resonators have been designed which will improve the reliability and stability for operation. Technical development concentrated on new setups for tilted-foil polarization and the recently recuperated beta-NMR system. First tests are planned at the end of the 2009 running period.

Many radioactive beams made use of the selective RILIS laser ionization. In 2009, the new solid state Nd:YAG lasers have been used to pump the dye lasers for all RILIS runs. The schemes comprised the following elements: Be, Ge, Ag, Nd, Po, Mn, Mg, Sn, Zn, and Ni. Especially in the case of manganese a new scheme has been applied which was found in the off-line LARIS laboratory. More than 2100 hours of RILIS operation was distributed on 14 different radioactive ion beam runs.

The main incidents for ISOLDE operation include the failure of the robots. In the case of the GPS a wrong shelf position was programmed which could have led to a collision with an already stored unit. A re-programming of the robots and shelf positions is planned for the upcoming shutdown. The failure of the HRS robot was related to a wrong pick-up which caused the robot to be jammed at the front-end. The intervention resulted in a high collective and individual dose for the participating engineers. Other incidents hampering ISOLDE operation and the Physics program include the proton steering from the PS Booster to ISOLDE, general problems with the controls, vacuum equipment, sparking of the high-voltage of the targets, and failure of diagnostic tools like Faraday cups and beam scanners. Despite all these problems the physics program was very successful and all support groups involved are thanked for their help and contributions.

The robot incidents mentioned above and an internal Safety Audit held this summer led to a new approach to safety at ISOLDE. The Safety Audit was regarded as an exercise to review safety standards and to define recommendations in order to improve procedures and documentation. Concerning the robot incidents it was decided to implement a new procedure for the PS complex with respect to interventions: Depending on the level of radiation, different procedures will be applied, with a special ALARA Committee being in place for the highest risk level. For the latter, a DIMR (Dossier d'Intervention en Milieu Radioactif) has to be initiated.

The 2009/2010 shutdown planning is governed by two major tasks: The replacement of the HRS front-end FE#3 with the new front-end FE#6, and the renovation of the ISOLDE vacuum system. An overview of the front-end exchange planning was given and key dates for the start up of ISOLDE in 2010 defined. It is expected to have both major interventions finished on April 5, 2010 in order to take protons from the PS Booster on April 26, after a two-week cold check out period.

The report was concluded with an overview on the HIE-ISOLDE project plan. It is expected to start the project January 1, 2010 and to have the cryogenics building ready end of 2011. All

installation infrastructure is planned to be in place end of 2012. With the cryogenics installed and commissioned in June 2013, the high-energy beam line up to 5.5 MeV/u is planned to be installed in March 2013 and the full energy upgrade to 10 MeV/u by January 2014. One cavity prototype is completed and will soon be tested at TRIUMF. The cryomodule concept design has been finished and work will start as soon as manpower is available. The complete cavity-configuration test is planned by the end of 2010. A resource-loaded project plan will be prepared for CERN management in order to release required resources as early as possible.

### **ISOLDE Physics Report**

The ISOLDE Physics Coordinator, Alexander Herlert, gave an overview on the final experimental schedule for the 2009 campaign, summarized the main problems and failures, and presented some of the highlights of the 2009 ISOLDE experimental program. In the last two INTC meetings 11 new ISOLDE experiments were recommended for approval by the Research Board (IS484-IS494) with in total 384 RIB shifts. From all 84 ISOLDE experiments 11 experiments declared their scientific program as completed and 51 experiments out of the 73 remaining active experiments requested beam time for the 2009 period. Out of the 627 requested RIB shifts, 437 RIB shifts were scheduled (about 70%) with beam to 39 experiments. Furthermore, additional target and ion-source development runs were scheduled. For REX-ISOLDE 9 experiments were scheduled (in 8 REX-ISOLDE runs) with in total 140 scheduled RIB shifts.

The main problems affecting the physics program include power cuts, problems with the vacuum system, problems with the control system, low performance of some targets, and failures of the injector chain, i.e. problems with LINAC2 or the PS Booster operation. While in many cases only slight delays occurred and experiments were able to take data, three experiments did not get beam at all: In the case of IS478 the target was not ready and in addition a series of power cuts stopped ISOLDE operation for several days. The second experiment was IS480 which was not able to run as the LINAC2 was stopped due to a severe vacuum leak, which took several days for the repair until protons were delivered to the PS Booster and ISOLDE. The third experiment was IS413, which was cancelled because of severe high-voltage sparking in the target due to a wrongly set extraction electrode.

Some of the highlights of the physics results obtained in 2009 comprise data from precision mass measurements with ISOLTRAP, laser spectroscopy with COLLAPS, as well as in-source laser spectroscopy. Furthermore, neutron-rich manganese isotopes were studied with MINIBALL and with a background-free detector setup for decay experiments. With MINIBALL and a dedicated detector chamber T-REX a successful one-neutron transfer reaction with  $^{66}\text{Ni}$  was performed. Many results of the 2009 campaign will be presented at the ISOLDE Users Workshop 2009 right after the INTC meeting.

Finally, an outlook for the 2010 measurement campaign was given. It is expected to start with the physics program on April 29 and the last protons will be delivered on November 22. This will give about 30 weeks for ISOLDE experiments, which is similar to the 2009 period.

### **n\_TOF Facility Status Report**

The representative of the n\_TOF Collaboration, Enrico Chiaveri, summarized the status of the n\_TOF facility and gave an overview of the 2009 experimental program as well as an outlook of the campaign in 2010. The new target design was reviewed including the new target

cooling station and the ventilation station. During May 2009 the new cooling station was installed, which comprises several mechanical filters, ion-exchanger cartridges, a degassing device, and two physically separated circuits, one for the cooling and one for the moderator. The cooling station and its parameters can be monitored on-line during operation. The ventilation station continuously flushes the target area and releases the air into the atmosphere as requested by Radiation Protection. The operation of n\_TOF started on May 26 and is expected to end on November 23 as scheduled and the planned number of  $7.2 \times 10^{18}$  protons on target in 2009 will be reached.

The plans to modify the experimental area into a Work Sector of Type A were then presented. Several safety issues have to be addressed like fire proof installations, improved ventilation, special access procedures, and the availability of a decontamination area. A new layout of the n\_TOF facility was presented including the plans for a changing room and a new experimental area.

An update was given on the use of borated water. The circuit is in the engineering phase and it should be possible to run with and without boric acid in the water and to change within reasonable time. It is planned to have either 0% boron content or fully saturated borated water. First tests for the photon-energy distribution showed an additional 470 keV line for borated water due to neutron capture of  $^{10}\text{B}$ . However, a prominent 2.2 MeV line due to neutron capture of  $^1\text{H}$  was reduced at the same time. Furthermore, the neutron fluence is not changed above 10 eV and the effect of  $^{10}\text{B}$  is visible as a suppression of the 'thermal' peak below 10 eV.

Finally, the experimental program of the n\_TOF phase II was reviewed. The measurements can be grouped into neutron capture, neutron fission, and other applications. The main focus in 2009 was put on the neutron capture measurements with  $^{56}\text{Fe}$  and  $^{62}\text{Ni}$ . These experimental runs were preceded by the commissioning of the new target which was finished on August 15, 2009. The performance of the new target is as expected and new and multiple detectors were used to evaluate the beam characteristics. For 2010 it is planned to look into angular distributions of fission fragments (nTOF14), capture measurements with  $\text{C}_6\text{D}_6$  detectors (nTOF13), capture measurements on actinides (nTOF15) and to finish the commissioning program with tests of borated water moderator (nTOF12).

### **n\_TOF Commissioning**

The result from the commissioning of the new n\_TOF target was summarized by Vasilis Vlachoudis. The proposed measurements included the determination of the neutron fluence, the beam profile, the neutron energy resolution function, and the relation between neutron energy and the time-of-flight. All these tests require the measurement of cross sections. In addition, further measurements are required to obtain information on systematic uncertainties: The scattered in-beam  $\gamma$ -ray background or the scattered neutron background need to be determined as well as the off-beam background.

The requested beam time added up to a total of  $2.45 \times 10^{18}$  protons on target. For the measurements several experimental setups were proposed, including a fission chamber from PTB or Medipix detectors. The start of the commissioning run was delayed due to problems with the PS accelerator. Some of the tests measurements were hampered, e.g., due to

alignment problems and part of the program was pushed to the end of the running period, e.g., the determination of the scattered neutron background.

The results from the commissioning run were reviewed, showing data on the beam profile, the resolution function, and the neutron fluence. The beam profile is in good agreement to the simulated result and only a small deviation is present which can be explained with a tilted second collimator. The neutron fluence is about 20-25% lower than expected which can be attributed to the collimator misalignment. For the resolution function no significant change to the previous target was found. The analysis is still in progress and additional measurements are planned for the remainder of the 2009 period as well as the 2010 campaign, especially taking data with the borated water circuit.

The following proposals were then presented:

1. **CERN-INTC-2009-024 and INTC-P-268**, *Study of the effect of shell stabilization of the collective isovector valence-shell excitations along the N=80 isotonic chain*, Norbert Pietralla
2. **CERN-INTC-2009-034 and INTC-P-270**, *Study of the onset of deformation and shape coexistence in  $^{46}\text{Ar}$  via the inverse kinematics (t,p) reaction*, Kathrin Wimmer
3. **CERN-INTC-2009-036 and INTC-P-271**, *Laser Spectroscopy of Cadmium Isotopes: Probing the Nuclear Structure Between the Neutron 50 and 82 Shell Closures*, Deyan Yordanov
4. **CERN-INTC-2009-037 and INTC-P-272**, *Study of single particle properties of neutron-rich Na isotopes on the “shore of the island of inversion” by means of neutron-transfer reactions*, Thorsten Kröll
5. **CERN-INTC-2009-038 and INTC-P-214-ADD-2**, *High Precision Laser Spectroscopy on  $^{12}\text{Be}$* , Christopher Geppert
6. **CERN-INTC-2009-039 and INTC-P-273**, *High-Precision Mass Measurements in the Rare-Earth Region to Investigate the Proton-Neutron Interaction*, R. Burcu Cakirli

## **CLOSED SESSION**

Tuesday 17 November 2009 at 8:30 h, room 60-6-002

**Present:** S. Bertolucci, J. Billowes, Y. Blumenfeld, H. Breuker, P. Butler (Chairman), R. Catherall, E. Chiaveri, M. Doser, H.-U. Habermeier, P.-H. Heenen, A. Herlert (Secretary), R. Julin, Y. Kadi (for point 6), H. Leeb, N. Orr, D. Ridikas, E. Rondio, P. Roussel Chomaz, Ch. Scheidenberger, V. Vlachoudis, U. Wahl

**Apologies:** -

### **1. INTRODUCTORY REMARKS**

The Chairman welcomed Dr. Danas Ridikas and Prof. Hanns-Ulrich Habermeier as two new Committee members. He also thanked four members, Jonathan Billowes, Paul-Henri Heenen, Rauno Julin and Christoph Scheidenberger, who agreed to continue their membership in the INTC, and introduced Enrico Chiaveri as the new Chair person and deputy spokesperson for the n\_TOF collaboration.

### **2. MINUTES OF THE LAST INTC MEETING**

The minutes of the 34<sup>th</sup> INTC meeting held on 18 and 19 May 2009 were approved without amendments.

### **3. STATUS OF ISOLDE**

The Committee regarded the 2009 running period as a success despite some incidents including robot failures and power cuts. There is some concern that with the new safety procedures in place certain emergency repairs will be delayed by several days which might even cause cancellation of ISOLDE experiments. Nevertheless, with the installation of the new HRS frontend and the consolidation of the vacuum system, it is expected to have a much smoother operation and fewer failures. Furthermore, it was mentioned that a new laser physicist will be hired and additional funds from the ISOLDE Collaboration will be provided to improve the operation of the RILIS laser system. Furthermore, collaboration with SPES has been established. Concerning REX-ISOLDE operation a three-day setup period is required and cannot be condensed much further. With additional training of all ISOLDE operators the setup of the post-accelerator should improve as well.

### **4. STATUS OF N\_TOF**

The Committee congratulated the n\_TOF Collaboration and all people involved for the successful 2009 running period. The commissioning of the new target went very well and deadlines were kept. All progress points in the right direction and on-line monitoring is in place for better operation. Although part of the envisaged experimental program on Fe and Ni isotopes was accomplished in 2009, experiments with actinide targets were postponed until the classification of the experimental area as a Work Sector Type A is achieved. As European funding for these experiments will end in 2010, priorities for the future measurements campaigns have to be defined. With the Work Sector Type A environment any open target with unlimited activity may be used and thus it should be possible to apply unsealed actinide targets in the upcoming running period. It is also looked into the possibility to extend the European funding until 2011. In general, there is a long list of measurements to be done and it

is most likely that in 2010 a similar amount of protons will be assigned to n\_TOF as it was the case in 2009. The Committee acknowledged the idea to use and test the application of borated water as part of the approved commissioning program. However, these tests and additional calibration measurements require a non-negligible amount of protons which will not be available for the approved experiments. Thus the Committee **requested** for the upcoming INTC meeting a priority list for all n\_TOF experiments and tests planned in 2010 as well as the number of required protons for each of these runs. This should also take into account the installation and operation of a Work Sector Type A laboratory and application of actinide targets.

## 5. DISCUSSION ON THE OPEN SESSION AND OTHER DOCUMENTS

The proposals presented during the open session as well as a letter of clarification were then discussed:

**CERN-INTC-2009-024/P-268**, *Study of the effect of shell stabilization of the collective isovector valence-shell excitations along the N=80 isotonic chain*

It is planned to employ the MINIBALL experimental setup for the investigation of mixed-symmetry states in rare-earth nuclei along the N=80 isotonic chain. The signature of these states is a strong M1 transition, which can be excited in a single step by Coulomb excitation. Up to date mixed-symmetry states have not been observed in unstable nuclei and for the stable nuclides  $^{136}\text{Ba}$  and  $^{138}\text{Ce}$  a fragmentation of the transition strength has been seen. Recently large-scale shell model calculations have been done and comparisons to the IBA model are feasible. However, the question remains how reliable the calculations are and what information the measurements will give. It is not clear if and how much the transition strength will be fragmented and thus it is of interest to determine the evolution along the N=80 isotonic chain. The experimental challenge is the identification of such a state and with beam energies as planned for HIE-ISOLDE the proposed experiment will be feasible. As a precursor experiment it is proposed to measure the B(E2) values of  $^{140}\text{Nd}$  and  $^{142}\text{Sm}$  for the normalization of future measurements. The Committee decided to **recommend** for approval by the Research Board **18 shifts** and asked the Physics Coordinator to schedule the  $^{142}\text{Sm}$  beam after initial target and RILIS tests.

**CERN-INTC-2009-034/P-270**, *Study of the onset of deformation and shape coexistence in  $^{46}\text{Ar}$  via the inverse kinematics (t,p) reaction*

This proposal aims to investigate the N=28 nucleus  $^{46}\text{Ar}$  using two-neutron transfer. Only the ground and lowest lying  $2^+$  state have firm spin-parity assignments and the principal motivation of the proposal is to confirm the identification of the second  $0^+$  state (suspected to lie at 2.7 MeV) and establish its 2p-2h character. The collaboration has successfully undertaken a two-neutron transfer measurement on  $^{30}\text{Mg}$  using a tritium target and has recently tested and successfully used the new target and detector system T-REX. It was noted that two-neutron transfer on  $^{44}\text{Ar}$  to populate states in  $^{46}\text{Ar}$  should be easier than for the  $^{30}\text{Mg}$  experiment. It was pointed out that  $^{44}\text{Ar}$  beams are available at GANIL, however, the use of a tritium target is, at the moment, only possible at ISOLDE. The Committee considered the general physics case – evolution of structure around N=28 – of high interest and one that will open up a new region for physics at ISOLDE. However, the Committee felt that the specific physics case was not well developed. In particular, it is not clear precisely what physics can

be derived from the measurements. The proposal aims to explore shape coexistence, yet little information is provided as to how this will be done from the measurements themselves. For example, what will be learnt (and how) beyond confirming the identification of the 2.7 MeV state as the second  $0^+$ ? The Committee therefore decided to **request a letter of clarification** in which the proponents should address the physics case in more detail and justify the large number of requested shifts.

**CERN-INTC-2009-035/CLL-006**, *Letter of Clarification for the proposal CERN-INTC-2009-009/P-257: Study of oblate nuclear shapes and shape coexistence in neutron-deficient rare earth isotopes*

This letter of clarification gives additional information on the technical feasibility of the planned experiment on rare-earth isotopes. Results from recent target/ion-source tests are reported on which show a sufficiently high suppression of surface ionized contamination by use of a GdB<sub>6</sub> cavity. Since the physics case was endorsed in a previous meeting and the open technical questions have been addressed with this letter of clarification, the Committee decided to **recommend** for approval by the Research Board **15 shifts** for the investigation of <sup>140</sup>Sm. As in the case of P-268, the scheduling of the experiment is subject to successful RILIS tests planned in 2010. The Committee suggested to submit a new proposal for the case of <sup>142</sup>Gd which should be handed in after successful developments and tests on Gd beams.

**CERN-INTC-2009-036/P-271**, *Laser Spectroscopy of Cadmium Isotopes: Probing the Nuclear Structure Between the Neutron 50 and 82 Shell Closures*

The proposed experiment wants to employ laser spectroscopy to determine nuclear spins, moments and root-mean-square charge radii of Cd isotopes between the N=50 and 82 closed neutron shells. The Committee found the proposal well written and the physics case well motivated. The COLLAPS experiment has produced many data in the past and it is expected that also with the presented measurement program valuable data will be retrieved. However, the neutron-rich isotopes, especially up to the r-process waiting point <sup>130</sup>Cd, are regarded as of higher interest and the Committee therefore decided to **recommend** for approval by the Research Board **17 shifts** for the neutron-rich isotopes <sup>106-120</sup>Cd (8 shifts) and for one experiment on <sup>121-130</sup>Cd (9 shifts). The committee noted that off-line work would be necessary to assess the suitability of the transitions being considered for the measurement. The scheduling and availability of off-line shifts for tests shall be discussed with the Physics Coordinator.

**CERN-INTC-2009-037/P-272**, *Study of single particle properties of neutron-rich Na isotopes on the "shore of the island of inversion" by means of neutron-transfer reactions*

The proposal is directed towards the investigation of the shores of the 'island of inversion'. Intruder states in <sup>28</sup>Na are proposed to be probed by the (d,p) single-neutron-transfer reaction using the MINIBALL coupled to the T-REX system. This is a very challenging experiment as an odd-odd nucleus will be populated and as such one must rely on the gamma-rays depopulating the excited states to separate them and allow the proton angular distributions to be constructed for each state. The Committee found the physics case of high interest. However, the use of a <sup>27</sup>Na beam from ISOLDE at present would render the measurements impossible owing to the very strong <sup>27</sup>Al contamination. The Committee thus decided to **not**



**recommend the proposal** to be accepted and requested the proponents to discuss target ion-source development issues and the possible suppression of  $^{27}\text{Al}$  with the ISOLDE technical group before considering resubmission.

**CERN-INTC-2009-038/P-214-ADD-2**, *High Precision Laser Spectroscopy on  $^{12}\text{Be}$*

This second addendum to the proposal P-214 asks for additional shifts in order to measure the charge radius of  $^{12}\text{Be}$ . The Committee found the physics case well motivated and noted that with the COLLAPS experiment magnificent results were obtained for  $^{11}\text{Be}$ . The main interest for  $^{12}\text{Be}$  is governed by (i) the conflict between data from GSI and the data obtained by Tanihata et al., (ii) the importance of  $^{12}\text{Be}$  as a first step towards  $^{14}\text{Be}$ , and (iii) the importance of the charge radius of the Be isotopes for nuclear structure. The number of shifts is well justified and thus the Committee decided to **recommend** for approval by the Research Board **18 shifts** for the continuation of the measurement program. The scheduling of off-line shifts shall be discussed with the Physics Coordinator. The Committee asked the proponents to submit a new proposal if further shifts are required.

**CERN-INTC-2009-039/P-273**, *High-Precision Mass Measurements in the Rare-Earth Region to Investigate the Proton-Neutron Interaction*

With this proposal systematic mass studies as well as differential mass studies are planned with the ISOLTRAP mass spectrometer. The ISOLTRAP experiment is a well established system and has provided several hundred mass values up to date. The proposed program is feasible and should be straight forward to accomplish. However, the Committee found part of the physics case not well motivated. While with the two-neutron separation energies  $S_{2n}$  the evolution of the mass surface can be studied and thus may reveal its explorative character and could give first data on so far unknown nuclei, the study of the proton-neutron interactions by examining double mass differences  $\delta V_{pn}$  is somewhat questionable. Especially in the case of deformed nuclei it is not clear if the  $\delta V_{pn}$  values will reflect the true nature of the p-n interaction in that mass region. The Committee suggested to also look into other mass differences or mass filters to provide alternative approaches to the interpretation of the data. The Committee decided to **recommend** for approval by the Research Board **8 shifts** for the study of the mass surface for the Dy, Er, and Yb isotopes.

Out of the **146** radioactive beam shifts requested to the INTC a total of **76** have been recommended for approval by the Research Board.

## 6. HIE-ISOLDE

The Chairman and the Director for Research and Computing summarized the status of funding for this project at the time of the “New Opportunities” workshop in May, the adverse situation that had developed by the time of the Research Board meeting in September, and the considerations taken by CERN management afterwards. The decision was taken to approve the HIE-ISOLDE project, as it was very important to start immediately with the work, otherwise the whole project would have been jeopardized. As resources become available, CERN will take responsibility for the necessary infrastructure, while the ISOLDE Collaboration is urged to find additional matching funds from outside CERN. The Committee decided to set up a steering group which will follow the progress of the project and shall

report to the INTC on a regular basis. The Committee also decided that Letters of Intent related to experiments at HIE-ISOLDE should be discussed at the INTC meeting in June 2010, and a call for LoIs will be published in January. These should address, in addition to the proposed physics programme, the required beam properties and layouts of proposed experimental setups.

## **7. A.O.B.**

7.1 The dates of the next INTC meetings were announced: February 4-5, June 23-24, and November 4-5, 2010.

7.2 The following inactive experiments were requested to give a status report at the next INTC meeting: IS410, IS420, IS431, IS438, IS461, and IS470. All these experiments did not request beam in the last three years or have no shifts left. The Committee suggested to close these experiments and asked the users to submit new proposals rather than addenda.

## **8. DATES OF NEXT MEETING**

The next INTC meeting will take place on **Thursday 4 and Friday 5 February 2010**. The deadline for submission of proposals is **Friday 8 January 2010**.

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