Accelerators Technical and Operation Review (ATC/ABOC Days)

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Book of Abstracts

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Session 1: Major Events / 26

Statistics of Operational Events and Consequences

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2006 has been a difficult year for the operation of the accelerator chain. In this presentation an overview of the major faults occurring during operation of the accelerators and their implications on the 2006 running period will be given. The faults will be categorized and the impact for different users discussed. An attempt will be made to point out possible improvement measures.

Session 2: Issues of a General Nature / 27

General Safety Aspects and PS Access System Issues

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The presentation will highlight the most important changes from 2006 to 2007 on safety aspects for accelerator operation. Any important modifications of procedures or systems will be outlined (e.g habil. electrique). The implementation of the PS inflector zone will be analysed and the requirements on access system and zone layout will be discussed. Last year during extensive electrical tests after the PS magnet exchange and LEIR installation, a lack of procedures for access management and safety during electrical tests in PS and inflector zone became evident. Rules for future tests will be outlined.

Session 2: Issues of a General Nature / 28

The Holiday effect, reliance on experts for operations, Standby and intervention services

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The present trend towards reliance on a single expert for specific accelerator and infrastructure systems or on a service supplier which does not have staff adequately trained due to excessive staff turn-over has evidenced a number of issues that directly influences the availability of the accelerators for physics.

The talks will present the issues as seen from the AB/CO group and some solutions adopted in the IT/IS group.

Session 2: Issues of a General Nature / 29

PLC programming QA

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Common-of-the-shelf industrial PLCs have been integrated on a large scale into many subsystems for accelerators, infrastructure, and detectors as reliable and robust controllers. The use of these systems does, however, introduce a novel set of challenges ranging from security issues to code management. Some events during the run last year indicate that these challenges are not met in a homogenous and adequate manner everywhere. The presentation will give an overview of what is being done at CERN and how the groups employing PLC's can get help to overcome many known issues.

Session 2: Issues of a General Nature / 30

Quality assurance –documentation and diagnostics during interventions

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Diagnostics and follow-up of interventions including the final sign-off and documentation are key elements to quality assurance both for the requestor and the service responsible for interventions. The presentation will give an overview of the workflow used in the infrastructure domain seen from the CCC, high-light advantages and weak areas with the current set-up and will give hints to how other areas of the department might benefit from a similar procedure.

Session 3: The LHC Injector Chain / 32

The SPS Beam Dump

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During the 2006 SPS run problems with the SPS beam dumping system were encountered. The newly installed beam dump block TIDVG showed strong outgassing when high intensity beams were dumped on the block. This often resulted in an interlock of the injection kicker system MKP located close to the TIDVG and by this stopping the SPS operation. Possible cures for 2007 and longer term options are presented. During the same period one of the two vertical beam dump kickers MKDV suffered from high voltage breakdowns. During the year the operational voltage of both MKDV magnets was lowered significantly, giving a temporary solution to this problem. The disadvantages of this operational mode are explained, together with the foreseen hardware improvements to the MKDV kicker system for the short and long term.

Rapid SC changes: can it ever work?

Author: Jorg Wenninger^{None}

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Rapid supercycle changes are essential to ensure best usage of the machines in theLHC area. Fast cycle changes can be limited by controls issues, equipment limitations and magnetic history. Current limitations are reviewed for the SPS that is now running under the new LSA control system. Issues of reproducibility at the PS and PSB will be discussed.

Session 3: The LHC Injector Chain / 34

Operational issues in the low-level beam controls of the PS

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The remarkable versatility of the PS machine comes at the price of the complexity of its rf beam controls, which never cease to evolve. Historically, these systems have not only been maintained, but to a large extent, have also been operated by the specialists who put them together. How can we ensure their operational reliability when such expertise is becoming thin on the ground?

Session 3: The LHC Injector Chain / 35

Keeping Linac 2 going until Linac 4

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Linac 2 is entering its 29th year of operation and still provides a very high availability of proton beams for injection into the PSB. The main issues of the last few years operation will be summarised, and the consolodation foreseen in the future will be presented.

Session 4: Isolde / 36

Isolde Operation

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We will present the OP/ISO section's activities, its working methods, and its relationship to the other groups involved with Isolde.

The sharply delineated boundaries between groups presents a particular challenge to operation, which by its nature is involved in all areas of activity. OP/ISO takes care of planning and communication between the many different equipment experts, the Isolde users, and the rest of the Isolde technical team.

The ongoing consolidation of the new control system is being driven by OP/ISO. We will look at the very heavy development cycle for controls software, and ask if efficiency could be improved.

We will look back at the 2006 run and examine the breakdowns, with particular emphasis on time lost at the start of the scheduled physics run. We will look for common causes and recurring problems, and propose improvements. We will also examine feedback from Isolde users and colleagues regarding OP/ISO skills and experience, and see how best to improve our methods.

Finally we will look at new projects and tasks coming our way, most especially REX operation. We will ask for priorities to be set, so that we can adapt ourselves and our resources to the needs of the Isolde community.

Session 2: Issues of a General Nature / 37

Infrasctructure consolidation - roofs, tunnels, etc.

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Following a period of low infrastructure consolidation activities, the TS department has been enabled to increase the resources allocated to this domain.

A number of issues related to buildings, cooling& ventilation and electricity have been raised in the past years. One issue in particular has however caused real problems –equipment buildings having leaking roofs with rain coming down on electrical equipment and racks.

The presentation gives an overview of the buildings with problems known to TS and the actions taken in 2006 and the last years to rectify them.

Session 3: The LHC Injector Chain / 38

Controls issues through the backbone

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The LHC injector chain had a difficult restart in spring 2006. Apart from the major hardware related problems that are discussed in first session, there were also control issues, in the large sense of the word, that deserve or need attention. The SPS software big bang is now over and the dust has only just landed. A brief overview of the encountered problems, the remaining work but also the achievements will be given. However, a new challenge lies ahead for the SPS; it has now to deal with more and more rapid super cycle changes. Never in the history of the SPS, it had as many different beam types to deliver in a short period of time.

The PS complex is spared of such a big bang, but the software is getting out of

date as the controls group and the equipment groups are renovating the controls of their equipments. The user software has to follow without disrupting machine operation and loss of functionality, on the contrary one should profit from the occasion to add new functionalities that are missing in the present system.

Diagnostics tools play a major role in the good functioning of the LHC injector chain and the production of a good quality LHC beam. Some of the beam diagnostics systems did not work properly and we should make sure that we are in a good shape before the LHC starts. More and better hardware diagnostic tools should become available especially in case the responsibility of the different systems is getting more and more decentralized. A very important general diagnostics system like OASIS had a very difficult start, which hampered the machine start-up considerably, but progress was made and next run we will again be in a better shape.

Session 3: The LHC Injector Chain / 40

Beam Loss and Radiation with High intensity Beams

Author: Simone Gilardoni^{None}

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High intensity beams will be a new challenge in term of losses reduction for the injector complex, in particular at the PS.

This talk will present the identified sources of losses in the PS during high-intensity operations, with particular attention to the CNGS. Possible solutions to alleviate the impact of the increased irradiation on both the machine equipments and the area surrounding the PS tunnel will be discussed.

Session 1: Major Events / 41

The situation of the Static Var Compensators at CERN - risk analysis, maintenance strategy and consolidation

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The Static Var Compensators at CERN are critical for the operation of the machines since a breakdown of an SVC usually stops the corresponding accelerator chain.

This presentation will analyse the technical state of all SVCs at CERN and classify the risk of breakdown for each individual installation, including expected machine downtimes for major failure scenarious.

This analysis will cover the year 2007 as well as the LHC era, and will also outline the steps which have been taken since June 2006. Conclusions will be drawn for a reliability centered maintenance and renovation strategy for the medium-term future.

The safety electrical networks at CERN

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In introduction, the four levels of availability of the CERN electrical supply will be explained. The presentation will then focus on the diesel-generator assured and safety networks, describing the tasks fulfilled by these networks, the types of load connected, the autonomy available, the philosophy chosen for each site (Meyrin, SPS with North Area and CNGS, LHC) and the corresponding power balance. The periodic maintenance program and tests carried out will be addressed followed by the results of the 4th of December test. Finally, an upgrade program proposed for the assured and safety networks will be introduced.

Session 6: Experimental Areas North, East and CNGS / 50

CNGS: Status and Outlook

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An overview of the CNGS performance during the commissioning and physics operation in 2006 will be given. The prospects for 2007 will be discussed; Emphasis will be on the needed maintenance work, the repair of the water leak in the reflector and on the status of the OPERA experiment at Gran Sasso.

Session 1: Major Events / 52

Electrical network: selectivity and protection plan

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As a result of the construction of the LHC accelerator and the consolidation of the other accelerators, the electrical network at CERN has been under continuous evolution. The new equipment and their requirements have increased the complexity of the distribution network. Since 1993 several main substations have been renovated while some others have remained unaltered. New technologies have been recently developed and electrical equipment installed, but their implementation in the electrical network often results in incompatibilities with older technologies.

The coordination between the operating protective

relays in the HV network (known as "selectivity") has been a major problem observed during recent disturbances on the CERN electrical network. Disturbances of this nature have become more and more frequent and have demonstrated areas of the CERN electrical network that are particularly susceptible to selectivity issues. This indiscriminate feeder tripping has resulted in power cuts to areas that have not been directly involved in electrical faults and increased the time for the reestablishment of the service. This lecture reviews the present situation of the HV network concerning protection selectivity and the corrective actions to be undertaken since the last serious event.

Session 1: Major Events / 64

PS MAIN POWER SYSTEM: What has been done from June 2006? What will be the situation in 2007?

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The PS main magnets are fed by a very special power system including a 90MVA rotating machine in operation since 1968. In 2004, an earth fault appeared on the generator rotor and the spare rotor had to be installed. The machine was stopped during six weeks in 2006 to replace again the rotor, suffering of insulation problems.

The presentation will show the actions taken to reduce the fatigue of the rotating machine, the test results of the back-up system up to 26GeV for LHC physics and the different scenarios in case of breakdown. The project for a new power system will be presented with a provisional planning.

Session 6: Experimental Areas North, East and CNGS / 65

SPS North Area Power Converters: What is the situation of the power converters of the SPS north area after the EA renovation?

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Around 300 power converters are in service for the SPS north area since the end of the seventies. Their electronic generates four times more failures than the power converters of the SPS ring. The presentation will detail the works done under the EA renovation project. The start-up problems of the new POWERJC will be explained. The major concerns for operation in the coming years will be listed.

Session 2: Issues of a General Nature / 66

Requirements on StandBy and intervention services for accelerator operation

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The presentation will review the requirements for Standby and Intervention services for accelerator operation. The actual support provided by the various equipment groups and the needs for future operation will be analyzed. Recommendations on the optimum way of providing the required call-out services will be given.

Session 5: AD Machine & Experimental Areas - nTOF Facility / 67

AD experimental areas - operation and majors problems in 2006, outlook for 2007

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The restart of the AD after the 18 month shutdown 2004-2006 was unusually problematic. During the physics run, beam conditions were generally stable, but the fault rate was high. An analysis of the major problems encountered is presented along with some ideas on how to avoid similar problems in 2007. For the AD experimental areas, outstanding issues and plans for the 2007 run will be discussed. Finally, the consolidation program will be reviewed together with a new risk analysis looking at only AD issues and not the whole accelerator complex.

Session 5: AD Machine & Experimental Areas - nTOF Facility / 68

RP issues for safe operation of the nTOF facility

Author: Thomas OTTO^{None}

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The technical and organizational requirements for n-TOF, a neutron spallation source, are given with the aim of ensuring its safe operation with minimal radiological impact on personnel and the environment. The presentation focuses on the target and target area, but an outlook on a future experimental area is given.

The steps achieved and those to be accomplished are listed, with an estimation of the resources required for radiation protection.

Session 5: AD Machine & Experimental Areas - nTOF Facility / 69

What needs to be done to restart nTOF

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After two year of cooling, the old target should be moved to the provisional storage place available in the Service Gallery. The problems related to this operation are described and the solution presented. An additional storage place for the new target is foreseen. The solution for the storage of two targets is presented. The impact of the air activation in the target area and consequent release of activated aerosols outside the tunnels has been evaluated. The measures envisaged to control and monitor the radioactivity released are presented. The trend for the design of the new target based on the experience gained with the old target are presented.

Session 5: AD Machine & Experimental Areas - nTOF Facility / 70

New nTOF target design issues

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Following the radiation safety requirement that the lead of the nTOF target shall not be in contact with the cooling water, an entirely new target assembly must be developed. The concept of a cladded target is being described. Preliminary designs of target geometry and target integration in the existing cooling loop are shown, as well as structures for positioning and installation.

Session 5: AD Machine & Experimental Areas - nTOF Facility / 72

Characterization of the nTOF radioactive waste

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After more than two years of cooling, the old target will be moved to its provisional storage place available in the nToF service gallery. Detailed simulations performed with the Monte Carlo code FLUKA allow for an accurate characterization of the target activation. Additional measurements are foreseen to be performed as soon as possible during the target removal including the taking of samples from the target surface for further spectroscopy analysis. In this talk, the FLUKA simulations and the evolution of the total and specific radioactivity over ten years are presented. This defines the input needed for the transport to and the final storage outside CERN. Design trends for the new target construction based on the gained past experience are discussed.

Session 6: Experimental Areas North, East and CNGS / 74

Introduction to the North and East Areas and CNGS

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The restart of the accelerator complex in 2006 after the long shutdown found all the beam lines of PS and SPS fully booked with impatient users and experiments. The introduction of the new CESAR control software for the SPS North Area beam lines along with the deployment of the new renovated hardware for the beam instrumentation helped achieving an overall quite positive score. Highlights of the success cases will be presented, as well as an analysis of the major problems and breakdowns and their impact on the physics program. With the large number of experiments and users each year, safety is a major concern. The major safety issues for the beam lines (general safety as well as radiation protection issues), will be presented along with the actions taken to resolve the problem in the short and long term. Finally, in view of the preparation for the 2007 run a summary of the outstanding issues for the beam lines will be presented as well as the list of major scheduled shutdown interventions. The presentation will conclude with an overview of the physics program for 2007 and the beam requests available so far.

Session 6: Experimental Areas North, East and CNGS / 75

Operations of the North and East Area and CNGS

Author: Karel Cornelis^{None}

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In this contribution, the operation of the NORTH AREA, CNGS and PS EAST HALL will be discussed. The operation is organised in a close collaboration with the secondary beam line physicists who take care of the lay out and the setting up of the different lines. Frequent changes in the beam lines, conflicting user demands and special devises (magnetic horns, spectrometers, special counters

etc.), makes their expertise indispensable. The problems encountered during daily operations and an evaluation of the new controls will be presented.

Session 6: Experimental Areas North, East and CNGS / 76

Status and Outlook for Instrumentation and Controls

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This presentation starts with a brief reminder of the renovation project and a review the work that has been so done far, both at hardware and software level. It then focuses on missing functionality and problems experienced during the Physics Run 2006. Based on this information, and taking into account requirements and priorities for the Run 2007, a work plan is presented for the rest of the renovation project's lifetime. Finally, some information is given on the long-term maintenance scheme to be put in place once the renovation project is terminated.

Session 6: Experimental Areas North, East and CNGS / 77

PS East Hall + SPS North Area magnets

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The problems encountered with the F61S.BHZ01 (MNP23) magnet and design improvements will be discussed. For the operation in 2007 it is proposed to replace it by a suitable C-shaped magnet allowing to service the North and the South branches on different super-cycles. The status of 'weak' magnets, the insufficient spare situation, the problem of too restricted accessibility in a high radiation environment and a strong quest for an improved layout will be presented.

Session 6: Experimental Areas North, East and CNGS / 78

CERN Experimental Areas Access Systems for 2007 and beyond

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This paper and accompanying presentation shall discuss principles and architecture of the foreseen Access system for all CERN Experimental Areas and the current status of implementation. The objective is to obtain a PLC-based safety system that can be scalable from the size of the PS to the size of the SPS experimental areas and that can be easily reconfigured as the areas change. The transition phases for the several areas shall be discussed as well as the assumptions and premises necessary for the execution of this long sought homogenisation.

Session 6: Experimental Areas North, East and CNGS / 79

Outlook by the Physics Coordinator

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In this presentation, an overview on the schedule for beam-tests and experiments at the PS and SPS in the year 2007 will be given. The status of experiments at the CERN accelerator facilities will be briefly reviewed, and the demands for the 2007 run period will be presented. For experiments and beamtests which are approved for a running beyond 2007, a summary of their plans and requests will be listed.

In addition, future prospects, medium and long-term plans for the use of the CERN beam-test and experimental facilities (non-LHC) will be discussed.

Session 1: Major Events / 80

Introduction to the ATC/ABOC days

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Session 5: AD Machine & Experimental Areas - nTOF Facility / 81

The physics program at n_TOF in 2007 and beyond

Author: Alberto Mengoni^{None}

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The n_TOF Collaboration has identified the physics cases and a set of experiments which constitutes the plan for the "Phase 2" of the activities to be performed at n_TOF, from 2007 and beyond. An outline of this plan, together with the perspectives for developments foreseen for the facility will be presented.

The experimental program follows the lines defined during the measurement campaigns in 2001-2004, which identified the three main objectives of the experimental activities at n_TOF: (1) neutron cross section measurements for nuclear astrophysics, (2) nuclear data measurements for advanced nuclear technologies and nuclear waste transmutation, and (3) neutron cross section measurements for basic nuclear physics.

The most important measurements to be performed during this second phase of activities at n_TOF have been identified and the related detection systems defined. These will be presented in this contribution. In addition to the plan for measurements in the present experimental areal (EAR-1), a first sketch of the proposal for the construction of a second neutron beam line and of the corresponding experimental area (EAR-2) will be presented together with a discussion of the decisive improvements, which this initiative would bring in terms of neutron intensity, background conditions, and a more efficient use of the facility.

Session 5: AD Machine & Experimental Areas - nTOF Facility / 82

Towards a permanent disposal of the nTOF radioactive waste

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The final disposal of the old target of the nTOF facility has to be performed according to the current radiation protection regulations in CERN Host States. The presentation gives an overview of legal framework for the elimination of the target and summarizes the current information available on transport and disposal requirements. A budgetary estimate for the final disposal of this specific radioactive waste is also assessed.

Session 4: Isolde / 83

Organization of the ISOLDE facility

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The organization of the ISOLDE facility is described and discussed from the physics proposal via target production and test to the beam time. The various support groups 2006 resources will be presented and the critical points highlighted. The propositions for improvement gathered throughout the preparation time with the experts will be compiled and presented.

Session 3: The LHC Injector Chain / 84

Introduction

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Session 4: Isolde / 85

Introduction and Physics Requirements

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The presentation will introduce the ISOLDE facility and its overall organization: ISOLDE CERN groups, users, the ISOLDE collaboration, the main committees and the program advisory committee. The requirements and requests from the point of view of the ISOLDE users will be discussed.

The main aspects will deal with: a) Physics and experiments: scale, physics needs, targets and beams, proton sequence, proton intensity. b) Schedule and operation: integration of requests in the schedule, efficiency, constraints, GPS/HRS alternation. c) Analysis of 2006 and possible improvements: maintenance, technical integration, experiment and user support.

Session 4: Isolde / 86

REX-ISOLDE

Author: Frederick Wenander^{None}

A brief introduction to the REX-ISOLDE machine and its functioning will be given. Similarities and differences in terms of technology and operation compared with ISOLDE and other CERN machines will be pointed out. Thereafter the weak links of the machine, the status of the consolidation project and the involvement of the support groups will be presented. Finally the operational organisation of the machine until now will be described.

Session 4: Isolde / 87

Targetry

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The production of standard, and the development of new, target and ion source units, will be reviewed for 2006 at CERN-ISOLDE. About 20 standard units were produced and 5 prototypes developped and tested. Our Task is plit between the production of the units, R&D activities, and tests of the intensity and quality of the delivered Radioisotope Ion Beams. Organization of the activity will be described and issues related to time constraints, human and material ressources more particularly addressed. Specificity of the year 2006 will also be highlighted.

Session 5: AD Machine & Experimental Areas - nTOF Facility / 88

Introduction to the session

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AD Physics in 2007 and beyond

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The AD is delivering p-bar beams since quite some years by now to serve four different experiments studying both basic and fundamental physics as well as applications in actuarial survival rates of cells when being treated with p-bars. After a short introduction of the experimental set-ups the essential goals will be presented with an outlook for upcoming activities.

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Discussion on AD issues

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(no title)

<i>Discussion</i>

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Discussion

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Summary Session 1: "Major Issues"

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Summary Session 2: "Issues of a General Nature"

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Summary Session 3: "The LHC Injector Chain"

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ATC / ABOC Days Summary / 97

Summary Session 4: "Isolde"

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Summary Session 5: "AD n_Tof"

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Summary Session 6: "Experimental Areas North, East and CNGS"

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