Cryogenics Operations 2010

Monday 20 September 2010 - Thursday 23 September 2010

TRIUMF
Programme

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Monday 20 September 2010

Welcome Reception and Registration - TRIUMF Hot Spot Cafe and Lobby (18:00-20:00)

Tuesday 21 September 2010

Registration - TRIUMF Boardroom (08:00-09:00)

Welcome - TRIUMF Auditorium (09:00-09:40)

TRIUMF Introduction, Workshop Goals, Logistics

- Conveners: Dr. Comyn, Martin (TRIUMF)

time	title
09:00	**TRIUMF Director's Welcome (00h15')** *Speaker: LOCKYER, Nigel*
09:15	**Workshop Goals (00h15')** *Speaker: WEISEND, John*
09:30	**Workshop Logistics (00h10')** *Speaker: COMYN, Martin*

Cryogenic Developments and Technologies 1 - TRIUMF Auditorium (09:40-10:20)

Progress updates from research centres

- Conveners: Weisend, John (FRIB Michigan State University)

time	title
09:40	**From Commissioning and Consolidation to Routine Operation of the CERN Test Facilities and Detector Cryogenic Systems (00h40')** *Speaker: BARTH, Klaus* The past two years at CERN were dominated by the start-up of the LHC and the associated detectors. The presentation will summarize this first period of continuous operation of the cryogenics for LHC detectors, point out the main operation issues and describe the corresponding maintenance and consolidation measures. The cryogenic operation activities during this period for the non-LHC related detectors and test facilities at CERN will be briefly summarized.

Coffee Break - TRIUMF Auditorium (10:20-10:50)

Cryogenic Developments and Technologies 2 - TRIUMF Auditorium (10:50-12:50)

Progress updates from research centres

- Conveners: Weisend, John (FRIB Michigan State University)

time title

10:50	**The Cryogenic Magnet Test Facility for FAIR (00h40')** *Speaker: SCHROEDER, Claus* For testing fast-pulsed supreconducting model and pre-series magnets for FAIR (Facility for Antiproton and Ion Research), a cryogenic magnet test facility was built up at GSI and is now running for more than 3 years. The facility was operated successfully during testing four complete magnets and several design elements. The last two magnets tested were dipole prototypes for the planned SIS100 accelerator. A recent change in the request of the operation parameters towards more intensive cycle modes made it necessary to adjust the design of these magnets. According to the new design of the dipole, in future the test facility must be able to provide at least double the operating current up to 22 kA. Also the four times lower hydraulic resistance of this high current dipole requires an adjustment of the cryogenic supply system for optimal cooling and effective tuning of the higher mass flow rates of the forced two phase helium flow. In order to operate the new dipoles, to improve the facility itself and to run its two benches more independently, an upgrade of the existing system took place in the beginning of 2010. Design and functionality of the facility and its upgrade will be described.
11:30	**Current State and Perspectives for Helium Cryogenics at TRIUMF (00h40')** *Speaker: KOVESHNIKOV, Alexey* The helium cryogenics capabilities at TRIUMF have been increased more than tenfold over the past decade. There are four helium refrigerators presently operational at TRIUMF. Two of them are used for cooling the ISAC Superconducting linear accelerator (SC-linac), Phase-I and Phase-II. The third one is for the vacuum cryopumping of the 500 MeV cyclotron. The fourth is used for the superconducting detector magnet of the muon experimental facility. There are plans to add two more helium refrigerators within the next 5 year, subject to funding availability: one for 2 K operations of the e-linear accelerator (e-linac), and another one to support the proposed Ultra Cold Neutron (UCN) experimental facility, and to re-liquefy helium used by various experiments on site. The details and the status of all helium refrigerators are discussed.
12:10	**Recent Cryogenics Activity and Plans at Fermilab (00h40')** *Speaker: PETERSON, Thomas* Fermilab's Tevatron is still running, and proposals are being reviewed for extending Tevatron operations for three more years than the currently planned 2011 end, to a 2014 turn-off of the accelerator. Nevertheless, preparations for future physics programs at Fermilab are underway including a new set of accelerators for high intensity neutrino physics and other experiments. Project X, which includes a 3 GeV CW H-minus linac operating at 2 K, is a main component of this program. Associated with Fermilab's superconducting rf efforts are several new 2 K test facilities, some of which are in operation now, and the procurement of a new 2 K cryogenic plant for a test linac beam line. I will provide a brief summary of recent cryogenics activity and plans at Fermilab.

Lunch Break - TRIUMF Hot Spot Cafe and Conference Room (12:50-14:00)

Cryogenic Developments and Technologies 3 - TRIUMF Auditorium (14:00-15:20)

Progress updates from research centres

- Conveners: Mr. Koveshnikov, Alexey (TRIUMF)

time	title
14:00	**Present Status of the Cryogenic System for Chamber A at the NASA Johnson Space Center (00h40')** *Speaker: SIDI-YEKHLEF, Ahmed* NASA Johnson Space Center (JSC) in Houston, TX is currently upgrading its refrigeration system to meet the new requirements for testing the James Web Space Telescope in the environmental control chamber A (40' dia x 100' high) in building 32. The new system consists of a liquid nitrogen thermo siphon system and a 12.5 kW at 20 K helium refrigeration system. These two sub-systems are designed to meet the various operating modes which include fast (or controlled) cool down, warm up and bake out of the chamber, and the required stability at the 20 K load. The cryogenic group at Thomas Jefferson Lab (JLab) is consulting to NASA for the design, procurement and integration of the new system. This paper will present the progress to date and describe the overall improvements to the system in efficiency, operability and reliability.
14:40	**Review of NSCL Operations and Expansion (00h40')** *Speaker: JONES, Shelly* The National Superconducting Cyclotron Laboratory (NSCL) is a NSF-supported facility, with additional support from Michigan State University for conducting research in nuclear and accelerator science. NSCL is in the process of adding a reacceleration capability for experiments requiring rare isotope beams at low energy (6 MeV/u): ReA3. The ReA3 expansion introduces new operational requirements for the present system. NSCL's superconducting devices are either batch-filled or continuous-flow systems that are not very sensitive to changes in return pressure. The superconducting rf cavities are very dependent on constant vessel pressure. In addition, there is a rapid change in load as the cavities are turned on or off. Therefore, to better serve the SRF requirements, a new 900 W plant is being procured from Linde. The expansion includes new transfer lines. Two of the three cryomodules are installed and the remaining one is expected early in 2011. There is additional demand on the plant from testing of SRF cavities at 2 K required for the Facility for Rare Isotope Beams. We review the recent operations and planned expansion.

Coffee Break - TRIUMF Auditorium (15:20-15:50)

Cryogenic Developments and Technologies 4 - TRIUMF Auditorium (15:50-17:10)

Progress updates from research centres

- Conveners: Mr. Yosifov, Dimo (TRIUMF)

time title

15:50	**The FRIB Cryogenic System: A First Look (00h40')** *Speaker: WEISEND, John* The Facility for Rare Isotope Beams (FRIB) is a DOE funded nuclear science facility currently under design at Michigan State University. The heart of FRIB is a heavy ion linac capable of accelerating nuclei up to 200 MeV/nucleon for Uranium. This is accomplished via superconducting rf cavities operating at both 4 K and 2 K. Cryogenic cooling will be accomplished by a centrally located Helium Refrigeration System (HRS) connected to the cryomodules via cryogenic distribution lines. This talk will describe the top level design and sizing of the cryogenic system and describe the next steps in creating this system.
16:30	**The Status of the Cryogenic System at SSRF (00h40')** *Speaker: XU, Jieping* The Shanghai Synchrotron Radiation Facility (SSRF) cryogenic system is designed for cooling three SRF cavities with cooling capacity of 650 W at 4.5 K. A safety margin of 1.5 is used to estimate the heat load from the SRF cavities and the heat loss from the transfer lines. The helium refrigerator made by AIR LIQUIDE passed the acceptance test in April 2008. A high performance multi-channel transfer line was developed and installed by SSRF in July 2008. The system has successfully operated since September 2008. The main operation parameters are given in the paper. The experiences from system building to operating are described.

Wednesday 22 September 2010

Cryogenic System Operation and Maintenance 1 - TRIUMF Auditorium (09:00-10:20)

General operation and maintenance issues

- Conveners: Dr. Bylinski, Yuri (TRIUMF)

time	title
09:00	**From First Cool-Down in 2007 to the 18 Month Continuous Campaign in 2010-2011, 4 Years of Commissioning and Operation for the LHC Cryogenic Systems (00h40')** *Speaker: FERLIN, Gerard* The cryogenic system of the Large Hadron Collider (LHC) has been put in production mode since 2007. The first part of the presentation will show the evolution of the operation from the "expected mode" foreseen during the construction phase to the "consolidated mode" used since the end of 2009. The second part of the presentation will highlight the main problems encountered during this period and will explain improvements done for their resolution. We will finally present a brief introduction to our real-time process control simulator used for operator training.
09:40	**Operational Experience with a Helium Plant and Distribution System at BESSY II (00h40')** *Speaker: PFLUECKHAHN, Dirk* The Helmholtz-Zentrum Berlin (HZB) operates the synchrotron radiation source BESSY II, producing ultrabright photon beams ranging from terahertz to hard X-rays. Since 2003 a LINDE TCF 50 helium plant provides 4.2 K liquid helium for several SC magnets, refrigeration power for a SRF Landau Cavity and 1.8 K helium for the HoBiCaT Superconducting Cavity Test Facility. The 24/7 operation of the plant requires a high availability and reliability of all components. Maintenance, failure analysis as well as optimization of the process and the helium distribution led to energy savings and reliability improvements of the liquid helium supply. The interconnection of the LINDE TCF50 with a LINDE L700 installed in 2009 for the future Berlin Energy Recovery Linac Project (BERLinPro) demanded major changes of piping, installations and of the control system, but since then it provides a redundancy and a very flexible operation.

Coffee Break - TRIUMF Auditorium (10:20-10:50)

Cryogenic System Operation and Maintenance 2 - TRIUMF Auditorium (10:50-12:50)

General operation and maintenance issues

- Conveners: Ms. Jones, Shelly (NSCL)

time	title
10:50	**Improved Helium Refrigeration Plant Reliability at Jefferson Laboratory (00h40')** *Speaker: WRIGHT, Mathew* As a utility in support of many of the current and future particle accelerators, helium cryogenic plants are required to provide a high level of reliability. Beginning in 1988, Jefferson Laboratory has maintained continuous operation of its major cryogenic plants for durations up to 5 years at a time. These plants have included a wide variation of capacity from 750 W at 4.2 K to 4.6 kW at 2.1 K. An outline of the operational changes and methods used to increase system reliability over the past several years from an early 75% to 99%+ will be presented.
11:30	**Cryogenic System for J-PARC Neutrino Superconducting Beam Line - Design, Performance Test and Operation (00h40')** *Speaker: MAKIDA, Yasuhiro* A helium cryogenic system has been constructed to circulate 300 g/s of Supercritical Helium (SHe) at 4.5 K through a series of superconducting magnets for a neutrino beam line at J-PARC. The conceptual cryogenic system design, considering the cooling characteristics of the magnets, was defined in 2005. The engineering design was subsequently carried out by Taiyo Nippon Sanso Corp. The main elements are a screw compressor with a capacity of 160 g/s at 1.4 MPa, a refrigerator with a capacity of 1.5 kW at 4.5 K and a centrifugal SHe pump with a flow rate of 300 g/s. After system integration in 2008, performance tests were successfully carried out. The magnets were pre-cooled from the ambient temperature for eight days and were kept below 4.8 K by circulating pumped SHe. The measured heat leakage at the magnets during these tests, including SHe transfer lines, was 210 W. Since the maximum beam loss predicted is 150 W, the cooling capacity of the cryogenic system is large enough to manage beam operations expected in the future. The cryogenic system has been run after the performance test almost continuously. At this conference, (1) how the specifications of the cryogenic system were decided, (2) operational methods, especially power saving mode, and (3) the impurity check system will be presented.
12:10	**ISAC-II Cryogenic Operations (00h40')** *Speaker: KISHI, David* This presentation will cover the overall operations of the cryogenic system for the ISAC-II Superconducting LINAC. This system comprises two Linde TCF50 helium refrigeration systems, vacuum jacketed helium distribution and cold return piping, warm helium return piping, liquid nitrogen distribution system, eight cryomodules housing the accelerator cavities, and controls interface with our EPICS controls system. There are also secondary transfer lines and helium return piping to support superconducting rf tests in the cleanroom. Day to day operations, maintenance and challenges will be discussed.

Lunch Break - TRIUMF Hot Spot Cafe and Auditorium (12:50-14:00)

Cryogenics Operations Committee Meeting - TRIUMF Boardroom (13:00-14:00)

Cryogenic System Operation and Maintenance 3 - TRIUMF Auditorium (14:00-15:20)

Refrigerant loss and leak prevention / Cryogen contamination problems

- Conveners: Dr. Sidi-Yekhlef, Ahmed (Thomas Jefferson Lab)

time	title
14:00	**Cryogenic Challenges at the Superconducting Electron Accelerator S-DALINAC (00h40')** *Speaker: EICHHORN, Ralf* During the last two years, the operation of the superconducting electron accelerator S-DALINAC was strongly affected by two cryogenic malfunctions: one was related to the cold mass, where gaskets to seal the helium bath against the beam vacuum developed random-like cold leaks. As the source of the cold leaks was finally located and proper operation successfully resumed, the cryo-plant is still under investigation. We will report on the details of cold mass leakage and the methods to locate the malfunction. As a basis for discussion, an overview of the strange cryo-plant behaviour will be given. The measures taken so far will be reported, the last of which was an acetone rinsing applied this summer which hopefully will lead to a decent cool-down within the next weeks.
14:40	**ALICE - 5 Years of 2 K Operations (00h40')** *Speaker: GOULDEN, Andrew* The ALICE 2 K Superconducting RF accelerating modules at STFC Daresbury Laboratory, Warrington, UK are cooled and maintained by Linde cryogenic refrigeration equipment. The system comprises principally a modified TCF50 liquefier, ambient temperature 2 K pumping system and integrated controls. This presentation will describe the operational highs and lows experienced over the last 5 years, focusing on issues such as contamination, gas losses, equipment failures and resultant lessons learned.

Refreshment Pick-up - TRIUMF Auditorium (15:20-15:30)

Bus tour of Vancouver finishing at Granville Island - TRIUMF Auditorium (15:30-18:30)

Conference Banquet - Bridges Restaurant (18:30-22:00)

Thursday 23 September 2010

Cryogenic Project Management and Safety 1 - TRIUMF Auditorium (09:00-10:20)

Project management and scheduling

- Conveners: Laxdal, Robert (TRIUMF)

time	title
09:00	**Management of Cryogen and Related Infrastructure at CERN (00h40')** *Speaker: DELIKARIS, Dimitri* CERN, the European Organization for Nuclear Research, has placed several contracts for industrial type procurement of cryogens as liquid helium and liquid nitrogen in order to fulfill the present organization's requirements. Contracts for the supply of quantities up to 320 tons of liquid helium and up to 70,000 tons of liquid nitrogen over four years, are presently in force. Main users, coupled to dedicated cryogenic installations, are CERN's accelerators complex, physics experiments, test benches and facilities for research and development programs. With the installation, commissioning and now steady state operation of the LHC accelerator and its physics detectors, the procurement and use of related cryogens was adapted accordingly in order to fulfill the dramatic increase of inventory and delivery rates. In this presentation we discuss the liquid helium and liquid nitrogen procurement strategy, global turnover, distribution methods and safety standards. Information will be provided on the upgrade of the general infrastructure including storage capacity, on-site re-liquefaction and purification means, operational consumption and accidental losses with respect to the present total inventory.
09:40	**Schedule and Cost Estimation Methods (00h40')** *Speaker: GOULDEN, Andrew* STFC's ASTeC Department has a considerable portfolio of projects that involve collaborations with Universities, International Laboratories / Facilities, and Industry, as well as other STFC Departments. In recognition of the importance of these programmes and the need to continually develop project management skills, ASTeC is currently establishing a Departmental project support office located at Daresbury Laboratory. This presentation will consider the pros and cons of the various schedule and cost estimation methods currently available to project managers.

Coffee Break - TRIUMF Auditorium (10:20-10:50)

Cryogenic Project Management and Safety 2 - TRIUMF Auditorium (10:50-12:50)

Equipment procurement / Design strategy / Cryogenic Safety

- Conveners: Mr. Peterson, Thomas (Fermilab)

time	title
10:50	**Cryogenic Test Facility Improvements (00h40')** *Speaker: YUKSEK, Errol* The Cryogenic Test Facility (CTF) is a 2 Kelvin helium liquefier which supports the cryogenic needs of Thomas Jefferson National Accelerator Facility's (TJNAF) Test Lab. In order to meet the Test Lab's projected cryogenic needs, an upgrade of the CTF is planned. This presentation will explain the present plant limitations and describe the changes planned to improve its capabilities and efficiency. The expected results of the upgrade are improved liquid helium utilization, a reduction in compressor power and maintenance requirement, and an increased liquid helium storage capacity. The commissioning of the upgraded plant is planned to take place in April 2011.
11:30	**System Overview, Status and Schedule for CHL II at JLab (00h40')** *Speaker: DIXON, Kelly* The doubling of the CEBAF beam energy for the 12 GeV upgrade requires a similar increase of capacity from the Central Helium Liquefier at Jefferson Lab. System performance parameters, equipment specifications, installation status, and a summary of procurement challenges are presented.
12:10	**Open Discussion Session (00h40')** *Speaker: WEISEND, John*

Lunch Break - TRIUMF Boardroom and Auditorium (12:50-14:00)

Closing Remarks - TRIUMF Auditorium (14:00-14:30)

Cryogenics Operations Workshop business

- Conveners: Mr. Koveshnikov, Alexey (TRIUMF)

time	title
14:00	**Cryogenics Operations Workshop Business and Closing Remarks (00h30')** *Speaker: WEISEND, John*

TRIUMF Tour - Site (14:30-16:30)

Coffee Break - TRIUMF Auditorium (16:30-17:00)