

**International Workshops on
Accelerator Alignment (IWAA)
2012**

Report of Contributions

Contribution ID: 13

Type: **Paper**

Hydrostatic Level Systems at Fermilab and SURF

Tuesday, 11 September 2012 15:40 (25 minutes)

Hydrostatic Level Systems (HLS) have been in use at Fermilab and the Sanford Underground Research Facility for several years. Descriptions of systems, reports on data collected including the ATL law, and stability of systems will be made.

Primary author: Dr VOLK, James (Fermilab)

Presenter: Dr VOLK, James (Fermilab)

Session Classification: Long Term Monitoring, Ground Motion and Vibration

Track Classification: Long Term Monitoring, Ground Motion and Vibration

Contribution ID: 14

Type: **Paper**

Alignment Measurement Program Design of HITFiL

Tuesday, 11 September 2012 13:25 (25 minutes)

the biggest challenges in the design of measuring scheme of Heavy Ion Therapy Facility in Lanzhou is the vertical treatment segment of high-energy transport line which is out of sight and high precision requirements, by using the laser tracker, Portable three coordinate measuring machine and digital levels and so on, and data processing software: SpatialAnalyzer, this article completed the equipment installation project design, such as magnet, vacuum chamber, pipe, Beam diagnostic components, high frequency cavity and so on, the process including control nets transfer measurement, components fiducialization, pre alignment and installation on site. The author use SpatialAnalyzer to simulate the survey of control network and the installation of components, use the bundle adjustment of unified spatial metrology network (USMN), estimated error, and make it satisfy the requirement of accuracy.

Primary author: Mr YUAN, jiangdong (Institute of Modern Physics , Chinese Academy of Sciences)

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Session Classification: Survey & Alignment of Beamline and Machine Components

Track Classification: Survey & Alignment of Beamline and Machine Components

Contribution ID: 15

Type: **Poster**

Survey and alignment design of HITFiL

Tuesday, 11 September 2012 11:40 (5 minutes)

Abstract: The biggest challenge of survey and alignment of HITFiL (Heavy ion Therapy Facility) in Lanzhou is the tight positioning requirement and the big scale vertical beam installation. The laser trackers with their software –Spatial analyzer was used in the Survey and alignment of HITFiL, and the key survey steps are control network fiducialization and installation. Particularly, error budget should be within 0.06mm for control network fiducialization is 0.05mm, and installation is 0.08mm, which is a little smaller than the overall requirement of 0.10 mm. Besides the target of error control, reliability, efficiency, cost are factors considered in the design.

Key words: SpatialAnalyzer, laser tracker; Survey and alignment of accelerator; Control network

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Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 16

Type: **Paper**

SURVEY AND ALIGNMENT FOR THE NEW SWISSFEL ACCELERATOR

Thursday, 13 September 2012 13:50 (25 minutes)

The new SwissFEL Accelerator is a free electron Laser which will be buildt at Paul Scherrer Institute (PSI) Villigen in Switzzlerland. The design of the 700m accelerator consists of the Gun, Injector, C-Band LINAC and 2 Undulator lines. Start of building construction works is 2013, machine Installation will start at the beginning of 2015. 1st Beam is expected for End of 2016. A dedicated 250MeV-Injector-Testfacility is already running since 2010.

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Session Classification: Alignment aspects of Linear Accelerators

Track Classification: Alignment aspects of Linear Accelerators

Contribution ID: 17

Type: **Paper**

Performance and Results of the ATLAS FSI Alignment System

Friday, 14 September 2012 10:40 (25 minutes)

The Frequency Scanning Interferometry (FSI) alignment system has been developed to monitor the movement of the ATLAS SemiConductor Tracker (SCT) at CERN. Over 800 fibre-coupled interferometers are arranged to form a geodetic grid of distance measurements between nodes on the SCT. The full set of interferometers are read out simultaneously and continuously, also during ATLAS data-taking. Since 2009, the FSI system has successfully measured sub-micron deformations in the tracker and contributed to the ATLAS Inner Detector alignment. In this talk, new modes of data-taking are introduced; the performance and measurements of the system are discussed; and a new visualiser application is presented, which has been developed to enable a qualitative appreciation of the significance of displacement data.

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Session Classification: Metrology aspects of Beamlines, Experiments and Detectors

Track Classification: Metrology Aspects of Beamlines, Experiments and Detectors

Contribution ID: 18

Type: **Poster**

Overview on the Preliminary Geodetic Network for SPIRAL2 Process Installation at GANIL

Tuesday, 11 September 2012 11:45 (5 minutes)

The SPIRAL2 project located at the Grand Accélérateur National d'Ions Lourds (GANIL facility - Caen, France) is now under construction. This project aims at delivering rare (radioactive) isotope beams with intensities not yet available with presently running machines. An important aspect of this project is that it is foreseen to deliver up to five different beams in parallel to the users. This poster is focused mainly on the preliminary geodetic network for the SPIRAL2 process installation. The positioning of the process and by extension of the buildings is subject to an important constraint due to future connections of the radioactive beam lines to the existing accelerator complex.

To reach the required accelerator performances, a geodetic surface network made up of concrete monuments around the construction is linked to the local network of the existing accelerator. The surface network has been transferred to the slab of the accelerator tunnel at -2 level (-9.50 m) in order to define the underground reference network for the process setup.

Final goal of the geodetic network is to allow the alignment of the process accelerator components according to design within required tolerance. Various tolerances objectives will be given.

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Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 19

Type: **Paper**

Alignment Process of HLS-II and Some Research Items on Alignment at NSRL

Thursday, 13 September 2012 08:30 (25 minutes)

Abstract: Hefei Light Source (HLS) has been updated. A new machine with full energy injection model has been constructing in the original buildings. This project is called HLS-II. This paper will introduce the alignment process of HLS-II and the alignment methods used during the process. Besides above, some research items about accelerator alignment theory, technology and instruments carried out at NSRL are also introduced in this paper.

Primary author: Dr HE, Xiaoye (University of Science and Technology of China)

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Session Classification: Alignment Instrumentation, Software and Methods

Track Classification: Alignment Instrumentation, Software and Methods

Contribution ID: 20

Type: Paper

Could the AT401 replace digital levelling and “Ecartometry” for the smoothing and realignment of the LHC ?

Thursday, 13 September 2012 10:40 (25 minutes)

The laser tracker AT401 appeared on the market a couple of years ago. It is equipped with a very accurate distance meter, inherited from the Mekometer ME5000, and angular encoders almost as accurate as those of the best total stations. For the smoothing and realignment of the LHC components, the Survey team at CERN normally uses digital levelling measurements to determine the vertical position and offsets to a stretched wire measurements, also called ecartometry, for the horizontal. During the last winter technical stop, a measurement of an LHC sector was carried out using these three technologies in order to compare the AT401 capabilities with the others. The paper will present the methodology applied, the data processing, the results obtained and the conclusions drawn for the future LHC realignment campaign which will take place during the long shut-down of 20 months in 2013 and 2014.

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Presenter: Mr MISSIAEN, Dominique (CERN)

Session Classification: Alignment Instrumentation, Software and Methods

Track Classification: Alignment Instrumentation, Software and Methods

Contribution ID: 21

Type: **Paper**

Measurement and accuracy analysis of 3D distance from nuclear reactors to detectors in Dayabay neutrino experiment

Wednesday, 12 September 2012 11:05 (25 minutes)

This paper describes the activities carried out in order to estimate the distance traveled by the neutrinos beam from nuclear reactors to detectors. Both terrestrial and Global Positioning System (GPS) based geodetic techniques are used in this 3D distance measurement. The positions of the reactor cores and detectors were estimated in a common reference frame through the processing of the collected observations. And the distance measurement accuracy is also analyzed

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Presenter: Ms LIANG, Jing (Institute Of High Energy Physics ,Chinese Avademy of Sciences)

Session Classification: TOF and GPS Observations

Track Classification: TOF and GPS Observations

Contribution ID: 22

Type: **Poster**

What is new at CERN ?

Since 2009, the LHC has running very well and this year reached an energy of 4TEV, producing more luminosity than expected. At the end of 2011 the LHC experiments Atlas and CMS had both accumulated 5 inverse femtobarns. This has left very little time to access the tunnels and accomplish survey campaigns, except for some repositioning of the low beta quadrupoles and a measurement of sector 78 which has been a very unstable area since the era of LEP. From the end of 2012 up to mid 2014, a long shut down will take place in order to repair the splices in the LHC interconnections, allowing in the futur, an energy of 7 TEV. This period will be used by the survey team to re-measure all the components of the LHC in the vertical and horizontal directions. The LHC collimator train also completed its first measurements during the last winter technical stop and studies for a new LHC survey train have been started. The Linac4 project, future proton source for the LHC injectors, is progressing slowly but work has been done for the fiducialisation of components and the determination of the geodetic network necessary for the installation of the infrastructure in the tunnel. The HIE-Isolde project has provided the opportunity to study a permanent monitoring system using the BCAM technology.

This paper will present the status of all these activities and studies as well as the strategy for the survey activities during the next long shut-down.

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Contribution ID: 23

Type: Paper

Design of control network and survey for the CSNS

Tuesday, 11 September 2012 13:50 (25 minutes)

China Spallation Neutron Source(CSNS) mainly consists of an H- linac about 197m in length, a proton rapid cycling synchrotron(RCS) about 228m in circumference, the linac to RCS beam transport (LRBT) about 40m in length, and the RCS to target transport(RTBT) about 144m in length. It is designed to accelerate proton beam pulses striking a solid metal target to produce spallation neutrons. The construction of CSNS is in progress.

The overall arrangement of the control network is presented. The control network of CSNS is classified into two types: the primary network and the secondary network. The primary network is used for the layout of buildings and devices and to provide high accuracy control for the secondary network which offers a reference for installing, locating and adjusting the accelerator devices. The instruments and the methods of the horizontal and vertical measurements are also described.

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Session Classification: Survey & Alignment of Beamline and Machine Components

Track Classification: Survey & Alignment of Beamline and Machine Components

Contribution ID: 25

Type: Paper

HIE Isolde Alignment and Monitoring System – Technical Design and Project Status

Tuesday, 11 September 2012 10:15 (25 minutes)

In the frame of the HIE Isolde project most of the existing ISOLDE REX line will be replaced by a superconducting linac in order to upgrade the energy and intensity of the REX ISOLDE facility at CERN. The linac will be based on the staged construction and installation of six cryomodules, four of them housing 5 high- β superconducting cavities and one superconducting solenoid, the two remaining ones containing 6 low- β superconducting cavities and two superconducting solenoids. Beam-physics simulations show that the optimum linac working conditions are obtained when the main axes of the active components, RF cavities and solenoid located inside the cryostats, are aligned and permanently monitored on the REX Nominal Beam Line (NBL) within a precision of 0.3 mm for the cavities and 0.15 mm for the solenoids at one sigma level along directions perpendicular to the beam axis. This paper presents the proposed alignment and adjustment system based on opto-electronic sensors, optics, precise tables and adjustment mechanical elements which are used, for some of them, in non-standard environmental conditions such as high vacuum and cryogenic temperatures.

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Session Classification: Survey & Alignment of Beamline and Machine Components

Track Classification: Survey & Alignment of Beamline and Machine Components

Contribution ID: 26

Type: Paper

The HIE Isolde Alignment and Monitoring System software and test mock-up

Thursday, 13 September 2012 08:55 (25 minutes)

For the HIE Isolde project a superconducting linac will be built at CERN in the Isolde facility area. The linac will be based on the construction and installation of 4 high- β cryomodules each containing 5 high- β superconducting cavities and 1 superconducting solenoid and 2 low- β cryomodules, each containing 6 low- β superconducting cavities and 2 superconducting solenoids. An alignment and monitoring system of the RF cavities and solenoids located inside the cryomodules is needed to reach the optimum linac working conditions. The alignment system is based on optoelectronics, optics and precise mechanical instrumentation. The geometrical frame configuration, the data acquisition and the 3D adjustment will be managed using a dedicated software application. In parallel to the software development an alignment system test mock-up has been built for software validation and dimensional tests. This paper will present the software concept and the development status, and then will describe the test mock-up and the results obtained.

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Session Classification: Alignment Instrumentation, Software and Methods

Track Classification: Alignment Instrumentation, Software and Methods

Contribution ID: 27

Type: Paper

DEVELOPMENT OF ADVANCED MECHANICAL SYSTEMS FOR STABILIZATION AND NANO-POSITIONING OF CLIC MAIN BEAM QUADRUPOLES

Thursday, 13 September 2012 15:40 (25 minutes)

CLIC is a multi-TeV electron-positron linear collider currently under study at CERN. This accelerator will have a very high number of components. To reach the desired high luminosity, stringent alignment requirements should be satisfied, particularly for the Main Beam Quadrupoles (MBQ). An alignment stage will align the MBQ with micrometre resolution. Displacements due to ground motion and technical vibrations in the 0.1-100 Hz frequency range can however not be corrected with the alignment stage. An active vibration isolation system, based on piezoelectric actuators and inertial reference masses, will therefore be installed between the mechanical alignment stage and the magnet. This system can also be used for relative repositioning in between beam pulses with nanometre resolution and with a range of 10 micrometre. Compatibility between the actuating support and the alignment and fiducialisation should however be guaranteed. The actuating support should, in the same way as the alignment system, be robust against forces acting on the quadrupole and displacements created by the active support should not upset the initial alignment. Stiff piezo actuators with a fast response are therefore combined with flexural mechanisms and joints to create a guide for very precise displacements, to eliminate play and friction between parts and to increase the frequency of internal modes. Precise measurement of the relative displacements and a good analysis of the kinematics are essential to insure that the alignment of the MBQ is always well known. The performance and precision reached with prototypes of the actuating supports and a comparison between different solutions will be presented in this paper.

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Session Classification: Alignment aspects of Linear Accelerators

Track Classification: Alignment aspects of Linear Accelerators

Contribution ID: 28

Type: **Paper**

NSLS II Girder Profiling Activities

Tuesday, 11 September 2012 13:00 (25 minutes)

The ongoing NSLS II project requires +/-30 micron alignment accuracy for the 6 or 7 magnets in each girder assembly. The vibrating wire technique used to align magnets in one girder can achieve a couple of micron precision. However, the transportation and manner change of supporting will change the girder profile, hence the magnet alignment, to the extent of bigger than +/-50 micron. This paper will introduce the approach to be used to define, measure and recover the girder profile. Test result will be presented.

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Session Classification: Survey & Alignment of Beamline and Machine Components

Track Classification: Survey & Alignment of Beamline and Machine Components

Contribution ID: 29

Type: Paper

Straightness evaluation for the 206-m-long part of the KEK electron/positron linac using inclinometers

Thursday, 13 September 2012 13:00 (25 minutes)

We have studied to adopt a precise inclinometer for evaluating alignment of large particle accelerators. We had already evaluated the straightness of the approximately 70-m-long part of the KEK electron/positron linac, which corresponds to the single accelerator sector of the linac. The results had good reproducibility with the standard deviations of less than 49 micro meters and agreed with those by an alignment telescope, our laser-based alignment system, and a laser tracker within sub mm range; however, the measurement distance was limited by obstacles in measurement which block the measurement path.

Here, two straight beams named offset bars are adopted for avoiding the obstacles. Their axes are directed perpendicular to the measurement path with their one ends on the measurement path. The obstacles can be avoided by measuring slope angles between the far ends of the bars. Error arises from the newly adopted bars, such as shape error, distortions, and tilts can be eliminated by reversal measurement, which considers slope angles of the offset bars detected by extra inclinometers. The reversal measurement can also eliminate offset error of the inclinometers.

As a result, straightness for the approximately 206-m-long part of the linac, which corresponds to three accelerator sectors of the linac, could be evaluated. The result agreed fairly well (partially within sub mm range) with those by the alignment telescope and our laser-based alignment system. It indicates that they are fairly reliable with each other. On the other hand, the reproducibility expressed by the standard deviation of the detected slope angles for the four-times of repeat measurements was 15 micro rad, while that for the former measurements was 10 micro rad for their averaged value. It indicates that the shape derived from the newly devised reversal measurement can be expected to have similar reproducibility as the former in spite the measurement system becomes complicated.

It follows that the newly devised method can also be applicable for evaluating alignment of large particle accelerators.

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Session Classification: Alignment aspects of Linear Accelerators

Track Classification: Alignment aspects of Linear Accelerators

Contribution ID: 30

Type: Paper

Validation of the CLIC alignment strategy on short range

Thursday, 13 September 2012 15:15 (25 minutes)

The pre-alignmnet of CLIC consists in aligning the components of linacs and beam delivery systems (BDS) in the most accurate way possible, so that a first pilot beam can circulate and allow the implementation of the beam based alignment. Taking into account the precision and accuracy needed: 10 microns rms over sliding windows of 200m, this pre-alignment must be active and it can be divided into two parts:

- the determination of a straight reference over 20 km, thanks to a metrological network
- the determination of the components positions with respect to this reference and their adjustment.

The second part is the object of the paper, describing the steps of the proposed strategy: firstly the fiducialisation of the different components of CLIC; secondly, the alignment of these components on common supports and thirdly the active alignment of these supports using sensors and actuators. These steps have been validated on a test setup over a length of 4m, and the obtained results are analyzed.

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Session Classification: Alignment aspects of Linear Accelerators

Track Classification: Alignment aspects of Linear Accelerators

Contribution ID: 31

Type: Paper

cWPS versus oWPS

Thursday, 13 September 2012 16:05 (25 minutes)

The strategy of the CLIC pre-alignment relies on Wire Positioning Sensors (WPS) measuring the radial and vertical offsets with respect to a stretched wire. A precision below 2 μm and an accuracy below 5 μm over a whole range of measurement of 10 mm are required for these sensors. Two types of sensors, based on two different technologies are under development and study at CERN: the capacitive (cWPS) is already in use for the monitoring of the position of the low beta triplets in the LHC and the optical (oWPS) is currently under development with Open Source Instruments. The cWPS sensor had to be upgraded in order to reach the specifications required by the CLIC alignment. The oWPS sensor is a new development especially designed to the CLIC demands. The paper presents the two types of sensors, the developments, as well as the latest results obtained through validation tests. These two sensors are part of a common test setup: results of inter-comparison tests achieved on this setup are detailed.

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Presenter: Dr MAINAUD DURAND, Helene (CERN)

Session Classification: Alignment aspects of Linear Accelerators

Track Classification: Alignment aspects of Linear Accelerators

Contribution ID: 32

Type: Paper

Development and validation of raschain alignment systems for the pre-alignment of CLIC

Thursday, 13 September 2012 10:15 (25 minutes)

Raschain alignment system is under development at NIKHEF for the pre-alignment of CLIC. It is a combination of two 3 point alignment systems: RasNik system, consisting of a coded mask illuminated by LED and projected on a CCD through a lens, and RasDif system, where the coded mask & LED are replaced by a laser, and a diffraction plate replaces the lens. Different applications of Raschain are under study: firstly, as a short range alignment system providing a determination of the transverse position of components with a precision and accuracy better than 5 μ m rms over 10m; secondly, as a long range alignment system providing a determination of the transverse position of the components with a precision and accuracy better than 5 μ m rms over 200m, and thirdly, combined with elaborated mechanics, allowing the monitoring of the position of the final focus magnets through the detector, to a precision of 5 μ m rms. This paper presents the first prototypes of Raschain alignment system, the test setups and their associated results. In addition, the next steps of validation are introduced: inter-comparison on short range (4m) and long range (140m), as well as the strategy foreseen for their calibration.

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Presenter: Dr VAN DER GRAAF, Harry (NIKHEF)

Session Classification: Alignment Instrumentation, Software and Methods

Track Classification: Alignment Instrumentation, Software and Methods

Contribution ID: 33

Type: **Poster**

Feasibility study of a multipoint laser alignment system for CLIC linear collider

Tuesday, 11 September 2012 14:30 (5 minutes)

CLIC (Compact Linear Collider) is a study for a future electron-positron collider that would allow physicists to explore a new energy region beyond the capabilities of today's particle accelerators. Alignment is one of the major challenges within the CLIC study in order to achieve the high requirement of a multi-TeV center of mass colliding beam energy range (nominal 3 TeV). To reach this energy in a realistic and cost efficient scenario all accelerator components have to be aligned with an accuracy of 10 μm over a sliding window of 200 m. The demand for a straight line reference is so far based on stretched wires coupled with wire positioning sensors. These solutions are currently further developed in order to reduce the drawbacks which are mainly given by their costs and difficult implementation. However, it should be validated through inter-comparison with a solution ideally based on a different physical principle. Therefore, a new metrological approach is proposed using a laser beam as straight line reference. Optical shutters paired with CCD based cameras are proposed to visualise the laser beam. This new technology is currently studied and developed in an optical laboratory. The paper presents the alignment principle and its theoretical background, and introduces related key-parameters. First experiments were performed based on a 2 m long setup in order to validate the principle. Low cost components were implemented for these tests which are however showing encouraging results. The conclusion allows a first approximation of achievable measurement accuracy, uncertainty and repeatability. In addition these experiments are building up a basis for a first extrapolation of the accuracy over a longer distance.

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Presenter: Dr MAINAUD DURAND, Helene (CERN)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 34

Type: **not specified**

Status Report and Outlook of Alignment and Metrology Aspects at FNAL

For a long time Fermilab was operating experiments at a wide variety of the Energy and Intensity Frontiers. Since the Tevatron ceased operation in September 2011 the Laboratory is now focusing on the Intensity Frontier. This status report outlines the FNAL Alignment and Metrology effort in support of this goal.

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Presenter: FRIEDSAM, Horst (FNAL)

Contribution ID: 35

Type: **Paper**

Laser Scan Analysis of the NOvA Far Detector Layer Surfaces

Friday, 14 September 2012 09:20 (25 minutes)

To determine how well the modules of the NOvA far detector are aligned, a laser scanner measures the positions of points on the upstream side of each layer. A C++ program has been developed to reduce the scanner data and display the shapes of the module boundaries to the construction managers before they start the next layer. In this paper, I present a summary of the program's algorithm and show a sample of its results.

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Presenter: Dr MERCURIO, Brian (NOvA)

Session Classification: Metrology aspects of Beamlines, Experiments and Detectors

Track Classification: Metrology Aspects of Beamlines, Experiments and Detectors

Contribution ID: 36

Type: Paper

The Distance from CERN to LNGS

Wednesday, 12 September 2012 10:40 (25 minutes)

The calculation of the distance from CERN to Gran Sasso involves the combination of three independent sets of measurements: the calculation of the distance between pillars included in the geodetic reference network at CERN and LNGS; and the transfer on each site of coordinates, from the geodetic surface network, underground into the tunnel or experiment hall installations.

The transfer of coordinates, from the surface, underground at the two sites was not done as part of the CNGS Project. Initial survey concerns for the project were directed towards the orientation of the beamline from CERN to LNGS to within ~100 m. Gyro-theodolite measurements underground were planned at CERN so a transfer would effectively only translate the target point. Given the precision estimated for previous transfers, it was decided not to undertake expensive and time consuming measurements campaigns for a negligible gain in accuracy. Therefore only GPS measurements at the two sites were carried out.

The Opera results which raised questions about the speed at which neutrinos travelled, increased interest in the calculated distance between the two installations. In spite of the estimated distance precision two measurement campaigns to establish the link between the surface network and the underground networks were undertaken, together with further GPS measurements. Details of these campaigns, with comparisons to the initial values, and revised estimates of the distance will be given.

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Presenter: MISSIAEN, Dominique (CERN)

Session Classification: TOF and GPS Observations

Track Classification: TOF and GPS Observations

Contribution ID: 37

Type: **Paper**

Survey of the NOvA Far Detector

Friday, 14 September 2012 08:30 (25 minutes)

The primary goal of the NOvA experiment at Fermilab is to search for evidence of muon to electron neutrino oscillations. NOvA consists of a 222 metric-ton near detector located at Fermilab and a much larger 15 kTon far detector located 810 km from Fermilab on the US-Canada border in Ash River, Minnesota. This paper discusses the assembly and survey of the NOvA far detector.

Primary author: Dr OSHINOWO, Babatunde (Fermilab)

Co-author: Mr FRIEDSAM, Horst (Fermilab)

Presenter: Dr OSHINOWO, Babatunde (Fermilab)

Session Classification: Metrology aspects of Beamlines, Experiments and Detectors

Track Classification: Metrology Aspects of Beamlines, Experiments and Detectors

Contribution ID: 38

Type: Paper

Status Report on Storage Ring Realignment at SLRI

Thursday, 13 September 2012 11:05 (25 minutes)

The Siam Photon Source (SPS), a synchrotron light source operated by Synchrotron Light Research Institute (SLRI) in Thailand, was installed and commissioned in the year 2001. During the past eleven years since the commissioning, the 1.2 GeV electron storage ring had been realigned in total three times. The first realignment was carried out and the result was reported in 2002. Optical survey has been regularly carried out on an annual basis afterwards, with the survey data providing assessment whether realignment is necessary. In this report, we describe the realignment procedures at the SPS, together with the results from the second realignment performed in 2006 and the most recent storage ring realignment in June 2012.

Primary author: Ms SRICHAN, Supawan (Synchrotron Light Research Institute, 111 Univerity Ave.,Muang District, Nakhon Ratchasima 30000,Thailand)

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Presenter: Ms SRICHAN, Supawan (Synchrotron Light Research Institute, 111 Univerity Ave.,Muang District, Nakhon Ratchasima 30000,Thailand)

Session Classification: Alignment Instrumentation, Software and Methods

Track Classification: Alignment Instrumentation, Software and Methods

Contribution ID: 39

Type: **Paper**

Developing an iris diaphragm laser alignment system for SPring-8 storage ring magnets

Thursday, 13 September 2012 09:20 (25 minutes)

The magnets on a common girder of SPring-8 storage ring have a critical alignment tolerance, for them we have developed a laser CCD-camera system in 1995. With it the magnets were aligned with accuracy of 20um. As the system become old to use we need to replace it with a new one. For the more, the SPring-8 II in the planning requires magnet centers to be aligned within 20um because of strong field of magnets. That, except for other error sources, demands the alignment system having accuracy of several micrometers.

An iris diaphragm laser alignment system is proposed and under developing. This paper will illustrate the system consideration, element testing, and primary results of this system.

Primary author: Mr ZHANG, Chao (Japan Synchrotron Radiation Research Institute)

Presenter: Mr ZHANG, Chao (Japan Synchrotron Radiation Research Institute)

Session Classification: Alignment Instrumentation, Software and Methods

Track Classification: Alignment Instrumentation, Software and Methods

Contribution ID: 40

Type: **Poster**

Start of construction for the international Facility for Antiprotons and Ion Research (FAIR) – aspects of survey and alignment

Tuesday, 11 September 2012 14:35 (5 minutes)

After years of intensive planning, the construction work for the new accelerator facility FAIR, located next to the existing GSI in Darmstadt / Germany, has finally started. As first action in December 2011, the forest clearance was done, the construction area was prepared and dedicated construction roads were built. The accompanying activities for establishing a spacious 3D surface point network for building survey, monitoring and later for linking the different machine positions to each other, are still ongoing.

Less eye-catching for the public was the contracting of the series production of 113 superconducting dipoles for the synchrotron SIS100. Prior exhaustive tests on prototypes included investigations on deformation of the cryostat by photogrammetric means as well as on deformation and movement of the cold mass vs. its cryostat under different conditions, performed by conventional geodetic instruments. Measurement procedure and results are shown here.

Besides other comprehensive measures - such as e.g. the structural monitoring of the existing GSI buildings and machines - or the metrological support of transport and installation test procedures of a 95 t dipole magnet, contributions to the mechanical design of accelerator components, coordinate systems as well as equipment but also budget and staff planning et al need to be mentioned, too.

Primary author: Ms PSCHORN, Ina (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Co-author: Mr MIERTSCH, Torsten (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Presenter: Ms PSCHORN, Ina (GSI Helmholtzzentrum für Schwerionenforschung GmbH)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 41

Type: **Paper**

SURVEY OF THE SUPERKEKB MAIN RING AFTER THE GREAT EAST JAPAN EARTHQUAKE

Tuesday, 11 September 2012 09:05 (25 minutes)

A survey for SuperKEKB of the KEKB main ring magnets and monuments was carried using laser trackers and total stations after the Great East Japan Earthquake. The damage from the earthquake was concentrated at the thermal expansion joints of the tunnel. Some magnets moved by more than 5 mm, and the 3 km circumference of the accelerator tunnel seems to have lengthened by several millimeters. Examples of damage to the KEKB main ring will be shown.

These survey results are compared with a GPS network that was newly installed after the earthquake. The effects of the Great East Japan Earthquake on the tunnel and the survey network will be reported, along with the realignment strategy for the on-going project, SuperKEKB.

Primary author: Dr MASUZAWA, Mika (KEK)

Co-authors: Dr IINUMA, Hiromi (KEK); Dr MISHIMA, Kenji (PASCO corp.); Mr ABE, Naohiro (PASCO corp.); Dr SUGAHARA, Ryuhei (KEK); Mr ARIYAMA, Takashi (PASCO corp.); Mr KAWAMOTO, Takashi (KEK); Mr OHSAWA, Yasunobu (KEK)

Presenter: Dr MASUZAWA, Mika (KEK)

Session Classification: Other Geodetic and Survey Topics

Track Classification: Other Geodetic and Survey Topics

Contribution ID: 42

Type: **Poster**

Test results of highly-damping components mounted to the support system for the KEKB final focusing magnets

Tuesday, 11 September 2012 14:40 (5 minutes)

Construction of the SuperKEKB has been progressing in KEK. The target luminosity of the SuperKEKB is $8 \times 10^{35} \text{ cm}^{-2}\text{s}^{-1}$, which is 40 times larger than the world record luminosity by the KEKB. Since the vertical beam sizes of electron and positron are designed to be squeezed to the level of 50 nano-meter at the interaction point, vibration of the final focusing magnets generated by the ground motion has an important effect on the luminosity and has to be kept below the allowable amplitude.

In order to isolate vibration from the floor, we plan to install the structural components of highly-damping material into the system. They are expected to minimize amplitude response against the ground motion. The evaluation test was carried out with the real support system for the KEKB final focusing magnets. The proper location for the material to be inserted was determined by the preliminary calculation, and then vibration measurements have been carried out.

Test results of the vibration measurements will be presented and the effects of the high dumping material will be discussed.

Primary author: YAMAOKA, Hiroshi (KEK)

Co-authors: TSUCHIYA, Kiyosumi (KEK); TANAKA, Manabu (Mitsubishi Electric System & Service Co., Ltd); TAWADA, Masafumi (KEK); OHUCHI, Norihito (KEK)

Presenter: YAMAOKA, Hiroshi (KEK)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 43

Type: Paper

Investigation of vibrational properties of the KEKB tunnel after the Great East Japan Earthquake

Tuesday, 11 September 2012 16:05 (25 minutes)

Ground motion measurements of the KEKB tunnel were carried out multiple times over the ten years of KEKB operation. The levels and characteristics of the KEKB tunnel vibrations were consistent among the data taken at various times for identical measurement locations. However, the data we took during the recovery work from the Great East Japan Earthquake indicated that the vibration properties are now different from those observed in data taken before the earthquake. The tunnel seems to vibrate more and has become more sensitive to traffic and cultural noises. Ground motions at various locations in the KEKB tunnel were re-measured after the earthquake and compared with those of before the earthquake. A geological survey was also carried out in order to understand the structure of the KEKB tunnel and the soil conditions surrounding the tunnel. The tunnel damage due to the earthquake was evaluated. The results of ground motion measurements will be presented along with the results of the geological survey.

Primary author: YAMAOKA, Hiroshi (KEK)

Co-authors: TANAKA, Manabu (Mitsubishi Electric System & Service Co., Ltd); MASUZAWA, Mika (KEK); RYUHEI, Sugahara (KEK); OHSAWA, Yasunobu (KEK)

Presenter: YAMAOKA, Hiroshi (KEK)

Session Classification: Long Term Monitoring, Ground Motion and Vibration

Track Classification: Long Term Monitoring, Ground Motion and Vibration

Contribution ID: 44

Type: **Poster**

HLS Installation at KEKB Main Ring after the Great East Japan Earthquake

Tuesday, 11 September 2012 14:45 (5 minutes)

Thirteen Hydrostatic Leveling Sensors (HLS) were installed in the south arc section of the KEKB main ring after the Great East Japan Earthquake. The KEKB tunnel consists of four arc sections connected by four straight sections. It has been observed that the south arc is very sensitive to activities above ground, such as loading and unloading in the truck yard above the tunnel. The tunnel motion observed by the HLS will be reported.

Primary author: Mr KAWAMOTO, Takashi (KEK)

Co-authors: MASUZAWA, Mika (KEK); SUGAHARA, Ryuhei (KEK)

Presenter: Mr KAWAMOTO, Takashi (KEK)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 45

Type: **Paper**

Status Report on Survey and Alignment of J-PARC after the Earthquake

Tuesday, 11 September 2012 09:30 (25 minutes)

The accelerator and experimental facilities located in the J-PARC were displaced by the large earthquake on March 11, 2011 in eastern Japan. At J-PARC a surveying network was prepared on the ground to cover the whole facility and GPS survey and leveling of the ground reference points were carried out in order to support recovery works. Also in the accelerator tunnel the device on the beam line was surveyed by using precise digital levels and laser trackers, and its alignment was carried out. J-PARC resumed its beam operation after the earthquake in December 2011. In this paper, we report the survey result in the accelerator tunnel after the earthquake and realignment of J-PARC.

Primary author: Dr TANI, Norio (Japan Atomic Energy Agency(JAEA), J-PARC Center)

Presenter: Dr TANI, Norio (Japan Atomic Energy Agency(JAEA), J-PARC Center)

Session Classification: Other Geodetic and Survey Topics

Track Classification: Other Geodetic and Survey Topics

Contribution ID: 46

Type: **Paper**

Straight Line Reference System - Status Report on Poisson System Calibration

Thursday, 13 September 2012 13:25 (25 minutes)

For the Alignment of the European XFEL, a Straight Line Reference System will be used for minimizing refraction effects that affect the geodetic reference network. In recent years, a SLRS has been developed at DESY that is based on Poisson Alignment principles. A prototype has been built, and first tests have been performed. However, a decisive factor for system performance is a good system calibration.

Several calibration methods, setups and algorithms have been developed and tested. The presentation will outline our calibration efforts that are mainly based on a combination of Laser Tracker measurement, Photogrammetry and manual processing. The calibration process is explained step-by-step and first results are presented and interpreted.

Primary author: Mr SCHWALM, Christian (DESY)

Presenter: Mr SCHWALM, Christian (DESY)

Session Classification: Alignment aspects of Linear Accelerators

Track Classification: Alignment aspects of Linear Accelerators

Contribution ID: 47

Type: **Poster**

Status Report on the Survey and Alignment of SACLA

SACLA is the Spring-8 Angstrom Compact free electron LAser, whose maximum electron energy is 8 GeV. Its final alignment was finished at January, 2011, and its first lasing was obtained at June, 2011. From the construction phase, we are still continuing measuring deformation of the SACLA building. After the commissioning, the monitoring systems (HLS, WPS) were reinforced. This report presents our activity focusing on the floor deformation of the building.

Primary author: Dr KIMURA, Hiroaki (RIKEN Harima Institute)

Co-authors: Mr KIUCHI, Jun (SPRING-8 Service Co. Ltd); Mr AZUMI, Noriyoshi (RIKEN Harima Institute); Dr MATSUI, Sakuo (RIKEN Harima Institute); Mr KAI, Tomoya (SPRING-8 Service Co. Ltd)

Presenter: Dr KIMURA, Hiroaki (RIKEN Harima Institute)

Contribution ID: 48

Type: **Poster**

Status report on the survey and alignment efforts @ DESY

This poster gives an overview of the Survey and Alignment work at DESY within the past 2 year period. It focuses on the (subterranean) network measurements, laser scanning outcomes and SC-Module alignment procedure for the XFEL.

Primary author: Dr PRENTING, John (DESY)

Presenter: Dr PRENTING, John (DESY)

Contribution ID: 49

Type: Paper

SYNCHRONIZATION BETWEEN REMOTE SITES FOR THE MINOS EXPERIMENT

Wednesday, 12 September 2012 08:55 (25 minutes)

In the context of time-of-flight measurements, the timing at the departure and arrival locations is obviously critical to the outcome of the experiment.

In the case of neutrino time-of-flight experiments, the locations are many hundreds of kilometers apart with synchronization requirements of nanoseconds for several months at a time.

In addition to the already stringent set of requirements outlined above, the location of the origin of the particle beam and the detector are both deep underground.

NIST and USNO have provided the MINOS (Main Injector Neutrino Oscillation Search) collaboration with both hardware and expertise to synchronize the two sites of the experiment, the accelerator at Fermilab in Batavia, IL and the Soudan Mine in northern Minnesota.

Two GPS receivers are installed at each location where the local clocks are commercial Cesium clocks (HP5071, standard performance). Two more GPS receivers are constantly traveling between locations (including NIST in Boulder, CO) to provide multiple differential calibrations of the fixed receivers. The availability of the TWTFST equipment from USNO allowed for one calibration of the GPS-based link between the locations, providing an independent means of determining the accuracy of the synchronization.

Several months of continuous GPS data are now available, including the two-way calibration instance and several differential GPS calibrations. These will be presented in the paper, together with a detailed description of the synchronization apparatus.

The results of data processing yielded synchronization stability below one nanosecond with accuracy at the nanosecond level over several months.

Primary author: Dr JEFFERTS, Steven (NIST)

Co-authors: Dr HABIG, Alec (University of Minnesota Duluth); Ms MCKINLEY, Angela (USNO); Mr FONVILLE, B (USNO); Dr ROSENFELD, Carl (University of South Carolina); Dr JAMES, Catherine (Fermilab); Dr MATSAKIS, Demetrios (USNO); Mr POWERS, Edward (USNO); Dr BARR, Giles (University of Oxford); Mr HIRSCHAUER, J (USNO); Mr WRIGHT, J (USNO); Mr CHRISTENSEN, M (USNO); Dr ASHBY, Neil (NIST); Dr ADAMSON, Phil (Fermilab); Mr BUMGARNER, R (USNO); Dr NICOL, R (University College London); Dr PLUNKETT, Robert (Fermilab); Dr ROMISCH, Stefania (NIST); Dr PARKER, Thomas (NIST); Mr ZHANG, Victor (NIST)

Presenter: Dr JEFFERTS, Steven (NIST)

Session Classification: TOF and GPS Observations

Track Classification: TOF and GPS Observations

Contribution ID: 50

Type: Paper

Experimental Validation of the ESRF Upgrade Program Experimental Hall Prototype Slab

Tuesday, 11 September 2012 15:15 (25 minutes)

In 2008, the Council of the European Synchrotron Radiation Facility (ESRF) launched the ESRF Upgrade Programme 2009-2018, an ambitious ten-year project serving a community of more than 10,000 scientists. Funding for the first phase of the Upgrade (from 2009 to 2015) has been secured to deliver:

- eight new beamlines with capabilities unique in the world;
- refurbishment of many existing beamlines to maintain them at world-class level;
- continued world leadership for X-ray beam availability, stability and brilliance; and,
- major new developments in synchrotron radiation instrumentation.

One of the key elements of the Upgrade Program is to produce nano-sized beams. This will require the construction 120 m and in some cases longer beamlines. A combination of extended experimental hall and satellite buildings will address this need.

One particularly important consideration is the design of the concrete slab that will host these new beamlines. The vibrational stability of the experimental hall slab is a key aspect to in the slab design. However, hydrostatic levelling system (HLS) measurements indicate that slab bending movements driven by temperature gradient variations through the slab are an equally important consideration in beamline stability and performance.

Builders have a difficult time to imagine micrometer movements and nano-radian tilts on a concrete slab. Nonetheless, these were the design specifications they were asked to build to. It took some effort to convert the ESRF design specifications into something that made sense to civil engineers and grounds workers. It was determined that if the slab shrinkage could be maintained below 300 $\mu\text{m}/\text{m}$, then the ESRF design criteria could be met.

To test the construction procedure for the EX2 slab it was a prototype was built. Part of the test procedure was to determine if the prototype slab respected the expected shrinkage tolerance. In addition it was decided to observe the thermally driven slab curling. To do this a survey network and a HLS was installed on the prototype slab.

This paper will present the measurements and that have been made on the prototype slab to help validate its design.

Primary author: Dr MARTIN, David (ESRF)

Presenter: Dr MARTIN, David (ESRF)

Session Classification: Long Term Monitoring, Ground Motion and Vibration

Track Classification: Long Term Monitoring, Ground Motion and Vibration

Contribution ID: 51

Type: **Poster**

Superconducting Undulator Alignment Strategy at APS

Thursday, 13 September 2012 11:40 (5 minutes)

The first prototype superconducting undulator insertion device, SCU0, has been assembled at Argonne National Laboratory and currently undergoing rigorous testing before installation at the Advanced Photon Source later this year. This poster describes the alignment strategy for the SCU0 insertion device and the challenges encountered during the assembly process.

Primary author: PENICKA, Jaromir (Argonne National Laboratory)

Co-authors: DOOSE, Charles (Argonne National Laboratory); SKIADOPOULOS, Denise (Argonne National Laboratory); TRAKHTENBERG, Emil (Argonne National Laboratory); KNIGHT, Keith (Argonne National Laboratory); MIETSNER, Kris (Argonne National Laboratory); KASA, Matthew (Argonne National Laboratory); HASSE, Quentin (Argonne National Laboratory); GWEKOH, Rolando (Argonne National Laboratory); WESLING, Scott (Argonne National Laboratory); JANSMA, William (Argonne National Laboratory); IVANYUSHENKOV, Yury (Argonne National Laboratory)

Presenter: PENICKA, Jaromir (Argonne National Laboratory)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 52

Type: **Paper**

Alignment of the South Straight Section Undulator Switch Yard at the Duke Free Electron Laboratory

Tuesday, 11 September 2012 10:40 (25 minutes)

Duke Free Electron Laser Laboratory (DFELL) located on the campus of Duke University is a dedicated facility for tunable free electron lasers. In this article, a novel design and alignment technique will be presented as part of our recent upgrade to the south straight section of the DFELL storage ring beamline. This assembly consists of a 14.5 meters long kinematic platform which is capable of accommodating two pairs of linear and helical undulators, and a pair of buncher magnet. The Kinematic design has the provision of sliding the entire assembly on a series of linear sliding guide rails in perpendicular direction to the beamline. This will enable us to couple each pair of these undulators with the already existing two helical undulators to achieve lower FEL lasing wavelength and higher Gamma Ray beams energy.

Primary author: Mr EMAMIAN, Mark (Duke University)

Presenter: Mr EMAMIAN, Mark (Duke University)

Session Classification: Survey & Alignment of Beamline and Machine Components

Track Classification: Survey & Alignment of Beamline and Machine Components

Contribution ID: 53

Type: **Poster**

GPS NETWORK FOR SuperKEKB MAIN RING

Thursday, 13 September 2012 11:45 (5 minutes)

A GPS network is being built for the SuperKEKB main rings, which lie about 11 m below the ground level. Eight GPS antennas have already been installed on the roof of the access buildings to the SuperKEKB main ring tunnel. The Goal of this system is to expand the survey network aboveground, and to compare with measurements obtained by surveying the monuments in the tunnel.

Stability of distances between GPS antennas reaches the sub-millimeter level. We also have accomplished dedicated survey to connect two coordinate systems between aboveground and underground.

Preliminary analysis indicates a good agreement between the GPS network and the underground tunnel network. This helps rebuild the alignment network destroyed by the Great East Japan earthquake, and allows us to monitor the aboveground network 24hours a day, 365 days a year.

Primary author: Dr IINUMA, Hiromi (KEK)

Co-authors: Dr MISHIMA, Kenji (PASCO Corporation); Prof. MASUZAWA, Mika (KEK); Mr ABE, Naohiro (PASCO Corporation); Mr ARIYAMA, Takashi (PASCO Corporation); Mr OHSAWA, Yasunobu (KEK)

Presenter: Prof. MASUZAWA, Mika (KEK)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 54

Type: **Poster**

Dipole Survey and Alignment of NSLS-II

Thursday, 13 September 2012 14:30 (5 minutes)

NSLS-II project requires 100 micron alignment accuracy between girders. There are 60 dipole girders totally which have two gaps of 90 mm and 30 mm. The survey of dipoles includes mechanical frame establishment, manufacturing dimension and vacuum clearance verification. There are 3~4 laser tracker setups in order to capture all the information needed. Pole tips are the major references. Measurement Plan (MP) was developed to streamline the computation process which has been proven to be effective. The alignment activities include the positioning of dipole relative to magnetic measurement system and tunnel alignment. Another dedicated MP was developed to provide the positioning information rapidly. The tunnel alignment is ongoing and has been carried out smoothly.

Primary author: KE, Ming (BNL)**Presenter:** KE, Ming (BNL)**Session Classification:** Poster Presentations (5 minutes per poster)**Track Classification:** Poster Presentations

Contribution ID: 55

Type: **Poster**

Status Report

This poster presents the major survey and alignment activities at the SLAC National Accelerator Laboratory since 2010. The major projects during the last two years have been alignment of optics for the Linac Coherent Light Source (LCLS) experimental hutches and the construction of the Facility for Advanced Accelerator Experimental Tests (FACET). Besides this a variety of smaller projects are under way. This poster will give a brief overview of the various projects and the actual implementations in the field.

Primary author: Mr GASSNER, Georg (SLAC National Accelerator Laboratory)

Co-authors: Mrs LE COCQ, Catherine (SLAC); Dr RULAND, Robert (SLAC)

Presenter: Mr GASSNER, Georg (SLAC National Accelerator Laboratory)

Contribution ID: 56

Type: **Paper**

Alignment system for a hall probe inside a vacuum chamber

Friday, 14 September 2012 10:15 (25 minutes)

For magnetic measurements of a delta undulator the position of a hall probe has to be known to a few tens of micrometers. The hall probe is inserted through a 3.5m long 4.8mm diameter vacuum chamber. To localize the hall probe while it is being pushed through the vacuum chamber a laser alignment system is under development. The system is based on an interferometer laser which is narrowed down to a 3mm beam and a retroreflector at the end of the hall probe package. The laser beam travels through the vacuum chamber, reflects off of the retroreflector back out through the vacuum chamber where it is projected 90 degrees onto a CCD camera. This presentation will describe the system in general and provide first results.

Primary author: Mr GASSNER, Georg (SLAC National Accelerator Laboratory)

Presenter: Mr GASSNER, Georg (SLAC National Accelerator Laboratory)

Session Classification: Metrology aspects of Beamlines, Experiments and Detectors

Track Classification: Metrology Aspects of Beamlines, Experiments and Detectors

Contribution ID: 58

Type: Paper

Geodetic distance determination between the MINOS detectors for the Neutrino Time of Flight measurements

Wednesday, 12 September 2012 10:15 (25 minutes)

The NuMI beamline and the MINOS experiment study the long baseline oscillation of muon neutrinos and perform high-precision measurements of the oscillation parameters. The project directs a beam of muon neutrinos from the Fermilab Main Injector towards both near and far detectors capable of studying neutrino oscillations. The accurate aiming of the beam towards both the near and far underground detectors, as well as the precise alignment of the beamline elements, is of vital importance for the experiment.

The beam travels approximately 735 km through the Earth from Fermilab towards a remote iron mine in northern Minnesota where, 710 m below the surface, a massive 5400 metric ton detector has been built. For the neutrino energy spectrum physics to work properly, the primary proton beam must be directed within ± 12 m from its ideal position at Soudan, MN, corresponding to $\pm 1.63 \times 10^{-5}$ radians, i.e. 3.4 arcseconds. Achieving this tolerance requires a rather exact knowledge of the geometry of the beam, expressed in terms of the azimuth and the slope of the vector joining the two sites.

Recent results on neutrino velocity measured with the Opera detector and CNGS beam raised questions about the neutrinos possibly traveling faster than light. As a result, this generated increased interest in determining the precise distance between the two MINOS detectors for verification of the neutrino time-of-flight (TOF).

A rigorous solution for computing the Euclidian distance between the two detectors along the beam path requires precise knowledge of the absolute positions of those detectors in space.

This paper reviews the concepts, methodology, implementation and the results of the geodetic surveying and precise positioning effort for the construction, installation, and alignment of the NuMI neutrino beamline and the two MINOS detectors as well as for calculating the distance between the two detectors for the TOF measurements.

Primary author: Dr BOCEAN, Virgil (Fermi National Accelerator Laboratory)

Presenter: Dr BOCEAN, Virgil (Fermi National Accelerator Laboratory)

Session Classification: TOF and GPS Observations

Track Classification: TOF and GPS Observations

Contribution ID: 59

Type: **Paper**

Geodetic and Alignment Concepts for the LBNE

Tuesday, 11 September 2012 11:05 (25 minutes)

In the context of today's global interest in the neutrino research programs, with special emphasis on long baseline neutrino oscillation experiments, the LBNE project at Fermilab receives special attention as the world's highest-intensity neutrino beam to be sent 1,300 kilometres straight through the earth to an underground detector located 1 mile deep at the Sanford Underground Research Facility (SURF) at Homestake in South Dakota.

This paper presents an overview of the concepts and the proposed methodology to implement geodetic and industrial alignment procedures to support the project recent reconfiguration and optimization design, construction, installation, and alignment of the LBNE particle beam line and the SURF detectors.

Primary author: Dr BOCEAN, Virgil (Fermi National Accelerator Laboratory)

Presenter: Dr BOCEAN, Virgil (Fermi National Accelerator Laboratory)

Session Classification: Survey & Alignment of Beamline and Machine Components

Track Classification: Survey & Alignment of Beamline and Machine Components

Contribution ID: 60

Type: Paper

Quality Control of the NOvA Far Detector

Friday, 14 September 2012 08:55 (25 minutes)

Abstract

The NuMI Off-Axis ve Appearance Experiment (NOvA) project is currently in its construction phase and estimated to be operational around 2015. This experiment is an extension of the Neutrino at Main Injector (NuMI) project that has been operational for several years now. For NOvA a high intensity Neutrino beam is produced at Fermilab and directed to a detector located underground at the Soudan Mine in Minnesota. NOvA requires an upgrade to the beam line to achieve the higher intensities required, however, as an off-axis experiment the pointing direction does not need changing. This presentation outlines the progress made in the construction of the NOvA detector blocks utilizing the HDS 6100 laser scanner as measurement tool for quality assurance. A more detailed explanation of the surface analysis software developed at Fermilab for this purpose is presented by B. Mercurio at this workshop.

Primary author: FRIEDSAM, Horst (FNAL)

Presenter: FRIEDSAM, Horst (FNAL)

Session Classification: Metrology aspects of Beamlines, Experiments and Detectors

Track Classification: Metrology Aspects of Beamlines, Experiments and Detectors

Contribution ID: 61

Type: Paper

MINOS Timing and GPS Precise Point Positioning

Wednesday, 12 September 2012 09:20 (25 minutes)

An overview is presented of the structure of the timing and GPS aspect of the MINOS experiment. Some timing results are presented and analysis is performed to estimate the real-world timing accuracy obtainable using collected data. An overview of the Precise Point Positioning (PPP) method of analyzing GNSS receiver data is also included as well as the specific application of PPP to precise timing. Timing between timing labs of different baselines is investigated to examine precision and accuracy at varying baselines.

Primary author: Mr MITCHELL, Stephen (United States Naval Observatory)

Presenter: Mr MITCHELL, Stephen (United States Naval Observatory)

Session Classification: TOF and GPS Observations

Track Classification: TOF and GPS Observations

Contribution ID: 64

Type: **Poster**

Wireless Operation of the DNA03 at FNAL

Thursday, 13 September 2012 14:35 (5 minutes)

When surveying accelerators, there are two key datum's or networks to be considered, horizontal (X,Y) and vertical (Z). Precision alignment requires that the horizontal and vertical control networks be done independently due to the accuracy limitations of the instruments utilized. This poster outlines the methodology used for data collection and processing of the vertical control networks at FNAL.

Primary author: Mr KYLE, John (FNAL)

Co-author: Mr COPPOLA, Gary (FNAL)

Presenters: Mr COPPOLA, Gary (FNAL); Mr KYLE, John (FNAL)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 65

Type: **Poster**

Fiducialization and alignment strategy for the integrated magnet blocks at MAX IV 3GeV and 1,5GeV rings

Thursday, 13 September 2012 14:40 (5 minutes)

Fiducialization and alignment strategy for the integrated magnet blocks at MAX IV 3GeV and 1,5GeV rings

Primary author: Mr BENGT, Sommarin (MAXIV Laboratory)

Co-author: Mr PAWEL, Garsztka (MAXIV Laboratory)

Presenter: Mr BENGT, Sommarin (MAXIV Laboratory)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 66

Type: **Poster**

Reference network for the MAXIV Laboratory facility

Thursday, 13 September 2012 14:45 (5 minutes)

Different issues when planning the reference network for the MAXIV facility.

Primary author: Mr GARSZTKA, Pawel (MAXIV Laboratory)

Co-author: Mr SOMMARIN, Bengt (MAXIV Laboratory)

Presenter: Mr GARSZTKA, Pawel (MAXIV Laboratory)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 67

Type: **Paper**

Neutrino Time of Flight measurements utilizing the MINOS experiment

Wednesday, 12 September 2012 08:30 (25 minutes)

In the Fall of 2011 the OPERA experiment at CERN reported the measurement of Neutrinos travelling fast than the speed of light. This meant that an independent verification of these results needed to be performed. Fermilab is in a unique position to perform such measurements with the existing MINOS Neutrino beamline and immediately started to upgrade the existing infrastructure to perform high precision timing measurements between the Near and Far Detectors. This presentation provides an overview of the required upgrades and the measurement concept.

Primary author: Dr ADAMSON, Phil (FNAL)

Presenter: Dr ADAMSON, Phil (FNAL)

Session Classification: TOF and GPS Observations

Track Classification: TOF and GPS Observations

Contribution ID: 68

Type: **Poster**

Alignment Design and Status of the Taiwan Photon Source

Tuesday, 11 September 2012 11:50 (5 minutes)

Abstract

Taiwan Photon Source (TPS) is a new 3-GeV ring under construction at NSRRC Taiwan with high brightness and low emittance characteristics. Due to the stability consideration, the whole building is constructed half underground, so the survey and alignment works are quite confined and difficult. For positioning magnets precisely and quickly, a high accuracy auto-tuning girders system combined with survey network procedures were designed to accomplish the alignment tasks. The survey network includes the preliminary GPS network and laser tracker network. Then, the position data from the survey network define a basis for the motorized girder system to auto-tune and improve the accuracy. The networks are established locally during the construction period and also used to monitor the building construction precision. The detailed s alignment design and status are described in this paper.

Primary author: Mr LAI, Wei-Yang (National Synchrotron Radiation Research Center)

Co-authors: Dr LIN, Chang-Sheng (National Synchrotron Radiation Research Center); Mr LIN, Chia-Jui (National Synchrotron Radiation Research Center); Mr KUAN, Chien-Kuang (National Synchrotron Radiation Research Center); Mr HUANG, Din-Goa (National Synchrotron Radiation Research Center); Mr HO, His-Chou (National Synchrotron Radiation Research Center); Mr LIN, Hsueh-Cheng (National Synchrotron Radiation Research Center); Mr LUO, Hung-Ming (National Synchrotron Radiation Research Center); Mr WANG, Jeremy (National Synchrotron Radiation Research Center); Prof. CHEN, June-Rong (National Synchrotron Radiation Research Center); Mr HSU, Keng-Hao (National Synchrotron Radiation Research Center); Ms CHEN, Mei Ling (National Synchrotron Radiation Research Center); Mr SUNG, Pei-Lun (National Synchrotron Radiation Research Center); Mr PERNG, Shen-Yaw (National Synchrotron Radiation Research Center); Mr WU, Thomas (National Synchrotron Radiation Research Center); Mr TSENG, Tse-Chuan (National Synchrotron Radiation Research Center)

Presenter: Mr LAI, Wei-Yang (National Synchrotron Radiation Research Center)

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 69

Type: **not specified**

Establishing and Re-Measuring the Installation Control References of East Tokamak

Friday, 14 September 2012 11:15 (5 minutes)

Establishing and Re-Measuring the Installation Control References of East Tokamak

Primary author: Mr MAN, kaidi (Institute of Modern Physics (IMP))

Presenter: Mr MAN, kaidi (Institute of Modern Physics (IMP))

Session Classification: Poster Presentations (5 minutes per poster)

Track Classification: Poster Presentations

Contribution ID: 70

Type: **not specified**

Fermilab Plan for the Future

Tuesday, 11 September 2012 08:45 (15 minutes)

Fermilab Plan for the Future

Primary author: Dr GREGORY, Bock (Fermilab)

Presenter: Dr GREGORY, Bock (Fermilab)

Session Classification: Keynote Future Developments at Fermi Lab [Dr. Gregory Bock ALD for PPS]

Track Classification: Keynote Future Developments at Fermilab