



Summary of the talks for the International Review on the e-lens concept readiness for integration into the HL-LHC baseline



Title: Functional specifications and parameter requirements

Speaker: REDAELLI, Stefano

Abstract: The present target specifications for the LHC electron lenses for enhanced beam collimation are reviewed. After a brief presentation of the basic working principle of hollow e-lenses, which illustrates how they will be used to improve the beam collimation through an active control of beam tails, the key parameters defined in the conceptual design report are presented. Uncertainties on these parameters are discussed and the table of parameter set used for the present technical design are given. The status of ongoing studies on different powering schemes for the e-beam, and of their effects on beam halos and core, are also reviewed.

Keywords: Technical specifications, electron beam powering, general design features (cryostat, vacuum, ...)

Title: Summary of reference design(s) [FNAL and RHIC designs] and CERN reference baseline overview

Speaker: PERINI, Diego

Abstract: This presentation will describe the hardware of the Hollow Electron Lenses for HL-LHC.

In the first part the main design choices and the differences with respect to other existing HELs will be explained.

In the second part the most important components: magnetic system, cryostats, feeding systems, gun, collector, and support structures will be shortly described.

Keywords: HEL design, magnet systems, superconducting solenoids, e-beam generation and disposal

Title: Electron-lens experience at Tevatron and RHIC

Speaker: STANCARI, Giulio

Abstract: The design and operational aspects of the Tevatron and RHIC electron lenses are reviewed, with comments on diagnostics, reliability, maintenance and infrastructure.

Keywords: What aspects of previous operational experience are most relevant for HL-LHC? What could be improved?

Title: Layout and integration boundary conditions in IR4

Speaker: GONZALEZ DE LA ALEJA CABANA, Maria Amparo

Abstract: This talk will provide a general overview of how the Hollow Electron lenses and its ancillaries will be integrated in the LHC tunnel, point 4. In particular the position of the HEL on the beam respect to the nearby components, the possible location of the control power and protection systems and the correlated connection will be discussed. The requirements for the HEL, coming from alignment of the nearby machine components, will be also shown.

Keywords: Integration, HL-LHC, HEL, e-lens, systems

Title: Existing technical infrastructure boundaries (cryogenics)

Speaker: CLAUDET, Serge

Abstract: Presentation of LHC Cryogenics at P4, cooling interfaces available for users, timeline for any new project to be considered including HEL.

Keywords: Cryogenics, interfaces, cooling requirements, timeline

Title: Additional ancillaries for the operation of the HEL

Speaker: ROSSI, Adriana

Abstract: This talk will describe the basic operations with the Hollow Electron Lens, and its ancillaries that will be integrated in the LHC tunnel, point 4. In particular the electronics, power converters, interlocks.

Keywords: Electron lens ancillaries, power converters, modulator

Title: Proposed beam instrumentation for the hollow electron lens

Speaker: JONES, Rhodri

Abstract: This talk will focus on the beam instrumentation requirements for control of the hollow electron beam and its accurate alignment with the proton beam. A set of proposed diagnostic systems to meet these requirements will be presented, taking as input previous experience from similar electron lenses at both FNAL and BNL. This includes beam position monitors, beam current monitors, a novel beam luminescence profile monitor using a supersonic gas curtain and use of a backscattered electron detector as overlap monitor.

Keywords:

Title: Operational aspects and machine protection considerations (benign devices can be made transparent and turned off, ...)

Speaker: BRUCE, Roderik

Abstract:

Keywords:

Title: Safety aspects in IR4 (access constraints for operating the e-beam complex)

Speaker: GAINANT, Christelle

Abstract: This presentation will address the safety-related aspects of the HEL during commissioning and operations based on the present design. Both conventional and radiation hazards will be covered. The possible risk control measures to implement during design, commissioning and operations will be presented.

Keywords: Safety, conventional, radiation protection, hazard, risk, control measure

Title: Simulation studies for the e-dynamics and discussion on the range of interesting e-currents (4-5A) and solenoid fields (4-6T), summary of BINP studies and range of required parameters

Speaker: ROSSI, Adriana

Abstract: This talk will present simulations (from BINP) on electron beam transport showing the interplay between electron current, the required extraction voltage and solenoid field on electron dynamics and stability.

Keywords: Electron, beam, dynamics, stability

Title: Beam Gas Jet monitor

Speaker: VENESS, Raymond

Abstract:

Keywords:

Title: Superconducting Magnet System Conceptual Design for the Hollow e-lens (HEL) proposed for HL-LHC

Speaker: KIRBY, Glyn

Abstract: During the summer of 2017 a number of coil designs have been studied with the aim of finding a configuration of coils and a cryostat design that will fulfil the many requirements associated with the proposed HEL system. We can state that the final fully detailed coil configurations are yet to be reached and are still under optimization. This talk presents the latest design that covers the flexibility of the magnetic field profiles, the magnet protection possibilities for the main solenoids, dipole and quadrupole circuits. We present the initial quench protection calculations. Finally we comment on the possible costs of such a Cryo-Magnet system as a result of a number of budgetary offers.

Keywords:

Title: Injector and dump design details and developments

Speaker: GOBBI, Giorgia

Abstract: The hollow electron beam is injected by a cathode immersed in the magnetic field generated by a set of solenoids. The sum of these components is called electron gun and its geometry evolved over time in order to guarantee sufficient performance in terms of electron density, hollow beam dimensions and gun compactness.

The energy carried by the electrons is dissipated in a dump system in charge of receiving up to 50 kW (conservative value) of power and transfer them to a water cooling system. Feasibility studies of the dump have been performed in order to identify a proper design philosophy and highlight the critical aspects.

Keywords: e-gun, dump, design development, thermos-mechanical analysis

Title: List of ongoing studies and topics for a potential test facility and expected benefits for the reference design.

Speaker: ROSSI, Adriana

Abstract: This talk will illustrate tests to be carried out in an electron lens test facility, aimed at validating simulations and size effects of bends, compression, imperfections, misalignment, A staged approach is proposed, starting with a test-stand with all resistive solenoid magnets that will allow to complement ongoing tests characterizing e-guns with higher extraction energy, while gaining experience and expertise, measure the effect of misalignment, test instrumentation, interlocks, electronics (modulators), ... A second stage will include a bend, possibly with SC magnets, that could come as prototype to check the production quality, or spares, and will permit to complete the studies on e-beam dynamics.

Keywords: test facility, electron beam transport

Title: Planning, budget and schedule proposal for reference design, discussion on required spares and maintenance scenarios

Speaker: REDAELLI, Stefano

Abstract: The figures from the different presentations to this review are wrapped up in a summary that collects budget and planning implications for the deployment of 2 hollow electron lenses at HL-LHC, for the operation in Run IV. Various scenarios are considered taking also into account the procurement needs for prototypes and spares. Open points and possible sources of uncertainties are also discussed.

Keywords: Cost, planning, baseline