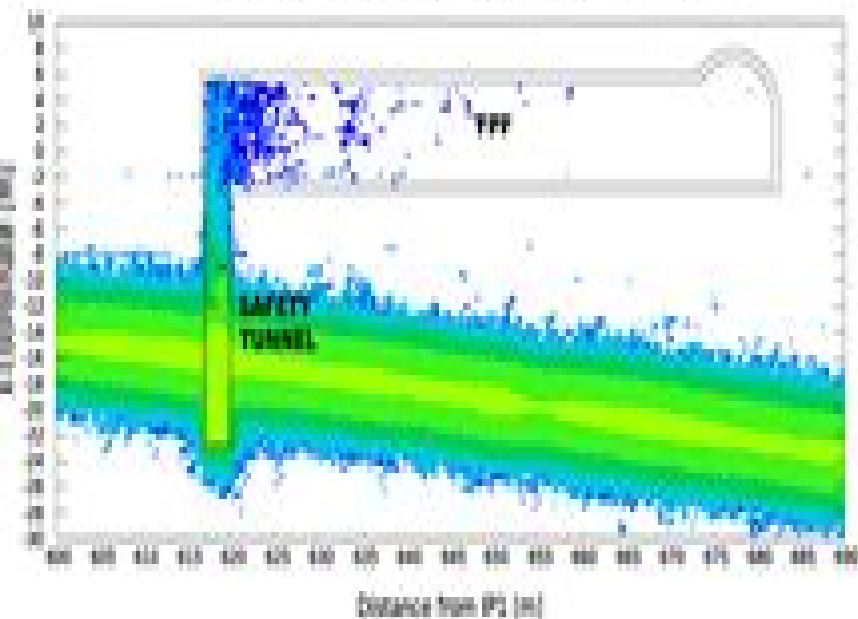
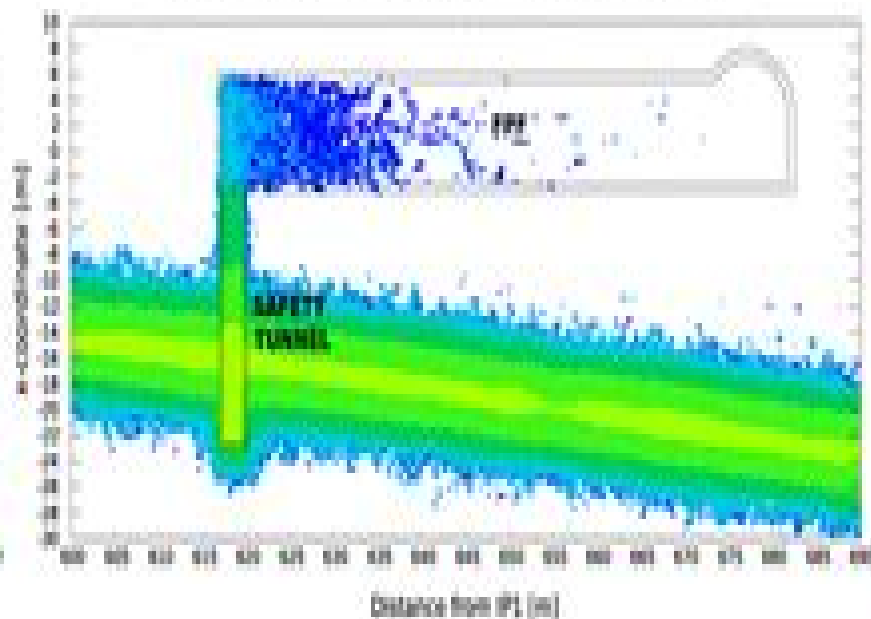


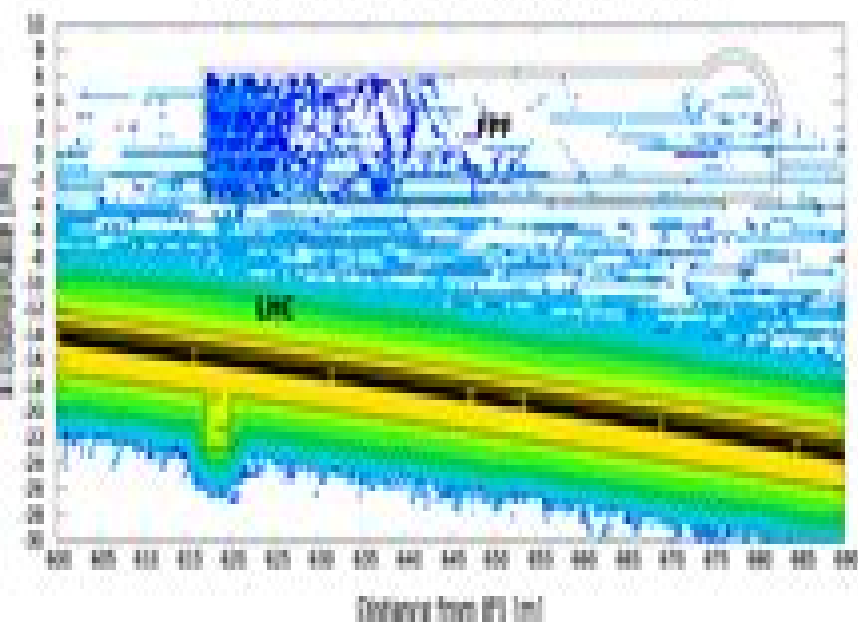
a) BEAM-GAS (10^{11} $n_b = 1$) - HL-LHC CONDITIONS - WITH CHICANE



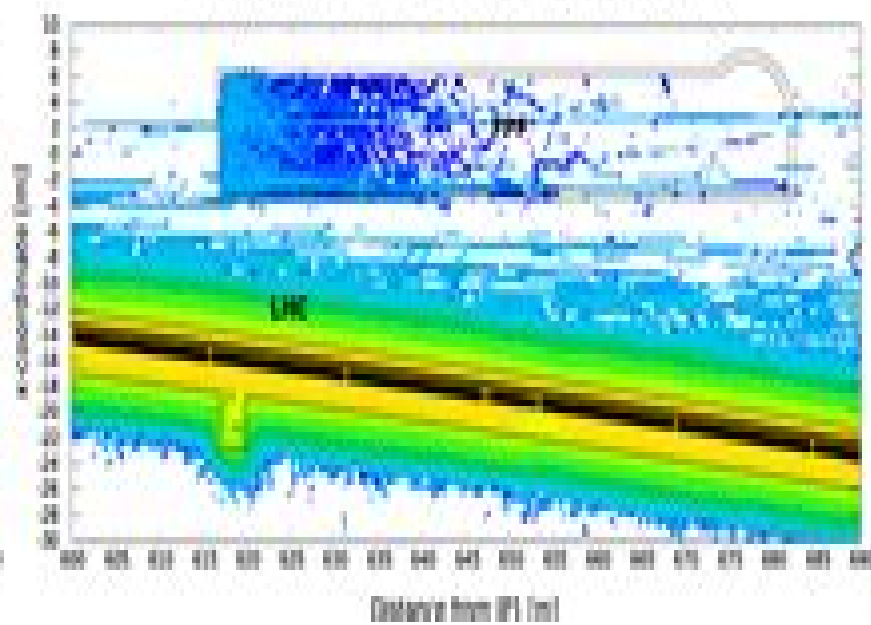
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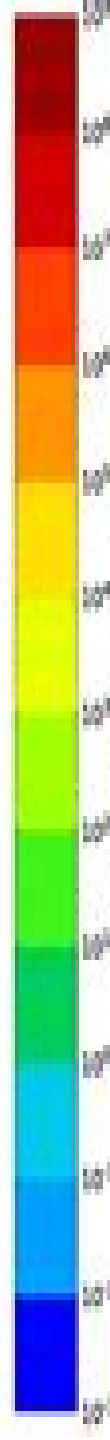
c) BEAM-GAS (10^{12} $n_b = 1$) - HL-LHC CONDITIONS - WITH CHICANE



d) BEAM-GAS (10^{12} $n_b = 1$) - HL-LHC CONDITIONS - WITHOUT CHICANE



Normalised Beam Size (Equivalent to 10⁻³)



Forward Physics And Luminosity Determination At Lhc

Helsinki Finland 31 October 4 November

Oliver Brüning, Lucio Rossi



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Forward Physics and Luminosity Determination at LHC Katri Huitu, 2001 Recently there has been much interest in studying events with tagged forward protons at the existing and forthcoming hadronic colliders the Tevatron and the LHC These studies not only allow one to monitor the luminosity of the colliding protons with high accuracy but also provide new ways of investigating the subtle issues of QCD dynamics and searches for the manifestations of new physics This book reviews the state of the art of forward physics measurements and the theoretical development It will catalyze many new approaches within the framework of the extensive physics programme of the LHC This in turn will stimulate closer contact between the LHC experiments as well as between the experimentalists and the theorists to maximize the potential of LHC physics

Forward Physics And Luminosity Determination At Lhc Katri Huitu, Valery A Khoze, Risto Orava, Stefan Tapprogge, 2001-08-30 Recently there has been much interest in studying events with tagged forward protons at the existing and forthcoming hadronic colliders the Tevatron and the LHC These studies not only allow one to monitor the luminosity of the colliding protons with high accuracy but also provide new ways of investigating the subtle issues of QCD dynamics and searches for the manifestations of new physics This book reviews the state of the art of forward physics measurements and the theoretical development It will catalyze many new approaches within the framework of the extensive physics programme of the LHC This in turn will stimulate closer contact between the LHC experiments as well as between the experimentalists and the theorists to maximize the potential of LHC physics

American Book Publishing Record , 2002 **Subject Guide to Books in Print** , 1991 *Towards a Precise Parton Luminosity Determination at the CERN LHC* M. Dittmar, F. Pauss, D. Zürcher, 1997 **The High Luminosity Large Hadron Collider** Oliver Brüning, Lucio Rossi, 2015-08-28 This book provides a broad introduction to the physics and technology of the High Luminosity Large Hadron Collider HL LHC This new configuration of the LHC is one of the major accelerator projects for the next 20 years and will give new life to the LHC after its first 15 year operation Not only will it allow more precise measurements of the Higgs boson and of any new particles that might be discovered in the next LHC run but also extend the mass limit reach for detecting new particles The HL LHC is based on the innovative accelerator magnet technologies capable of generating 11-13 Tesla fields with effectiveness enhanced by use of the new Achromatic Telescopic Squeezing scheme and other state of the art accelerator technologies such as superconducting compact RF crab cavities advanced collimation concepts and novel power technology based on high temperature superconducting links The book consists of a series of chapters touching on all issues of technology and design and each chapter can be read independently The first few chapters give a summary of the whole project of the physics motivation and of the accelerator challenges The subsequent chapters cover the novel technologies the new configurations of LHC and of its injectors as well as the expected operational implications Altogether the book brings the reader to the heart of technologies for the leading edge accelerator and gives insights into next generation hadron colliders High Luminosity

Large Hadron Collider, The: The New Machine For Illuminating The Mysteries Of Universe Oliver Bruning, Lucio Rossi, 2015-08-28 This book provides a broad introduction to the physics and technology of the High Luminosity Large Hadron Collider HL LHC This new configuration of the LHC is one of the major accelerator projects for the next 20 years and will give new life to the LHC after its first 15 year operation Not only will it allow more precise measurements of the Higgs boson and of any new particles that might be discovered in the next LHC run but also extend the mass limit reach for detecting new particles The HL LHC is based on the innovative accelerator magnet technologies capable of generating 11.13 Tesla fields with effectiveness enhanced by use of the new Achromatic Telescopic Squeezing scheme and other state of the art accelerator technologies such as superconducting compact RF crab cavities advanced collimation concepts and novel power technology based on high temperature superconducting links The book consists of a series of chapters touching on all issues of technology and design and each chapter can be read independently The first few chapters give a summary of the whole project of the physics motivation and of the accelerator challenges The subsequent chapters cover the novel technologies the new configurations of LHC and of its injectors as well as the expected operational implications Altogether the book brings the reader to the heart of technologies for the leading edge accelerator and gives insights into next generation hadron colliders

Luminosity Measurement at the Compact Muon Solenoid Experiment of the LHC

Olena Karacheban, 2018-06-22 This book describes the application of a novel technology for beam instrumentation and luminosity measurement and first results on a cutting edge technology potentially to be used after the upgrade of the Large Hadron Collider to higher luminosity It presents a unique diamond based luminometer with a detailed performance study The online bunch by bunch luminosity measurements provide an invaluable feedback to the Collider for beam optimisation and for the understanding of beam dynamics The precision of the luminosity measurement is crucial for all physics analyses This book highlights the Van der Meer method which is used for the calibration of the luminometers of the CMS Compact Muon Solenoid experiment and describes the estimate of systematic uncertainties e.g. due to radiation damage of sensors and electronics and uncertainties of beam parameters For the future high luminosity upgrade of the collider sapphire sensors are investigated in a test beam It is demonstrated for the first time that sapphire sensors can be used as single particle detectors A model for the charge transport in sapphire is developed and successfully applied

Determination of the Absolute Luminosity at the LHC Simon White, 2010 For particle colliders the most important performance parameters are the beam energy and the luminosity High energies allow the particle physics experiments to study and observe new effects The luminosity describes the ability of the collider to produce the required number of useful interactions or events The Large Hadron Collider LHC was designed to produce proton proton collisions at a center of mass energy of 14 TeV This energy is the highest ever reached in a particle accelerator The knowledge and understanding of particle physics at such high energy is based on simulations and theoretical predictions As opposed to electron positron colliders for which the Bhabha scattering

cross section can be accurately calculated and used for luminosity calibration there are no processes with well known cross section and sufficiently high production rate to be directly used for the purpose of luminosity calibration in the early operation of the LHC The luminosity can also be expressed as a function of the numbers of charges per beam and the beam sizes at the interaction point Using this relation the absolute luminosity can be determined from machine parameters The determination of the absolute luminosity from machine parameters is an alternative to the cross section based calibration and provides complementary information to the fragmentation model In the LHC it was proposed to use the method developed by S Van Der Meer at the ISR to provide a luminosity calibration based on machine parameters to the physics experiments during the first year of operation This thesis presents how this method was implemented and performed for the first time in the LHC to optimize and calibrate the luminosity Additional beam dynamics and optics studies and measurements performed at the RHIC collider will also be presented

First Differential Measurements of $t\bar{t}Z$ Production and Luminosity Determination Using Z Boson Rates at the LHC David Walter, 2024-03-05 This thesis describes two groundbreaking measurements in the precision frontier at the LHC the first ever differential measurement of the Z associated single top quark $t\bar{t}Z$ production and the luminosity measurement using Z boson production rate for the first time in CMS Observed only in 2018 the $t\bar{t}Z$ process is of great importance in probing top quark electroweak couplings These couplings are natural places for new phenomena to happen in the top quark sector of the standard model Yet they are the least explored directly One has to obtain a firm understanding of the modeling of sensitive distributions to new top Z interactions The present analysis marks a major milestone in this long term effort All distributions relevant for new phenomena and or modeling of $t\bar{t}Z$ are studied in full depth using advanced Machine Learning techniques The luminosity and its uncertainty contributes to every physics result of the experiment The method minutely developed in this thesis provides a complementary measurement that results in a significant overall reduction of uncertainties

The Fourth Nordic LHC Meeting, 1994

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