

TRDs for the third Millennium

Report of Contributions

Contribution ID: 2

Type: **not specified**

The PERDaix detector

Thursday, 15 September 2011 11:55 (20 minutes)

The PERDaix (Proton Electron Radiation Detector Aix-la-Chapelle) detector is designed to measure charged particles in cosmic rays. It can distinguish particle species up to 5 GV rigidity. PERDaix was flown on the BEXUS-11 balloon on 23rd November 2010. The detector dimensions are 60 x 60 x 85 cm³, the weight is 40 kg, the power consumption 65 W and the geometrical acceptance 32 cm²sr. PERDaix is divided into three subdetectors: a spectrometer, a time-of-flight (TOF) system and a transition radiation detector (TRD).

The spectrometer consists of four double layers of scintillating fiber tracker arranged around a permanent magnet. The scintillating fibers are read out with 32 channel MPPC arrays produced by Hamamatsu. The channels are 1.1 mm high and have a 250 um pitch. They are read out with VA_32/75 chips.

The time-of-flight system is made of scintillator bars arranged in two double layers. It measures the velocity of charged particles, provides the main trigger for other subdetectors and distinguishes downward from upward (Albedo) flying particles. Each scintillator bar is read out with four MPPCs type Hamamatsu S10362-33-100C. The MPPC signals are fed into NINO discriminator chips followed by a HPTDC based digitizing board.

TOF and tracker used a passive compensation circuit to deal with the temperature dependence of the operation voltage of the MPPCs during the balloon flight.

The TRD has 8 layers of radiator fleece followed by proportional counters. The proportional counters are made of straw tubes filled with a Xe/CO₂ (80/20)-mixture at 1.1 bar. A tungsten wire running through the tubes serves as anode operated at 1.5 kV. The TRD is used to discriminate electrons from protons.

Characterization measurements will be presented as well as the detector performance as a whole.

Primary author: Dr KIRN, Thomas (RWTH Aachen University, I. Physikalisches Institut B)

Co-authors: Mr BACHLECHNER, Andreas (RWTH Aachen University, I. Physikalisches Institut B); Mr BEISCHER, Bastian (RWTH Aachen University, I. Physikalisches Institut B); Mr MAI, Carsten (RWTH Aachen University, I. Physikalisches Institut B); Mr SCHUG, David (RWTH Aachen University, I. Physikalisches Institut B); Mr ROPER YEARWOOD, Gregorio (RWTH Aachen University, I. Physikalisches Institut B); Mr WIENKENHOEVER, Jens (RWTH Aachen University, I. Physikalisches Institut B); Mr GREIM, Roman (RWTH Aachen University, I. Physikalisches Institut B); Prof. SCHAEEL, Stefan (RWTH Aachen University, I. Physikalisches Institut B)

Presenter: Dr KIRN, Thomas (RWTH Aachen University, I. Physikalisches Institut B)

Contribution ID: 3

Type: **not specified**

TRD based on the usage of thin scintillators.

Thursday, 15 September 2011 17:30 (20 minutes)

Detector based on the usage of thin scintillators is proposed for particle identification by TRD. Such type of TRD may be especially interesting for space experiments because of no gas. The detector is based on the thin transparent films with incorporated micro-granules of LuBO₃:Ce scintillator. Scintillation signal produced by absorbed gammas is registered by vacuum PMT or by SiPM connected to WLS fibers. Results of measurements with different samples of such films are presented. The clear signals from Fe55 (5 keV) and Am241 (16 keV) gamma sources were observed. The detailed Monte Carlo simulations of such kind of TRD are also presented.

Primary author: Dr TIKHOMIROV, Vladimir (P.N.Lebedev Physical Institute of the Russian Academy of Science)

Presenter: Dr TIKHOMIROV, Vladimir (P.N.Lebedev Physical Institute of the Russian Academy of Science)

Contribution ID: 4

Type: **not specified**

Test beam studies of the GasPixel Transition Radiation detector prototype.

Friday, 16 September 2011 12:10 (20 minutes)

F. Hartjes, M.Fransen, W. Koppert, S.Konovalov, S.Morozov, N. Hessey, A.Romaniouk, M. Rogers, H. van der Graaf.

A combination of a pixel chip and a gas chamber opens new opportunities for particle detectors. These “GasPix” detectors have vector tracking features offering at the same time L1 track trigger and particle identification using transition radiation and dE/dX measurements.

Test beam and MC studies of tracking and particle identification properties have been performed with a GridPix prototype.

The properties of the detector very much depend on the gas mixture. For one layer of the GasPix detector one can obtain a special accuracy down to $11\text{ }\mu\text{m}$ and a vector angular accuracy of about 10 mrad for a beam incident angle of 10° .

For particle identification studies the detector was filled with a Xe/CO₂(70/30) mixture. A block of transition radiation radiator of 18 cm was installed in front of the detector. The pion rejection power using both cluster counting and full dE/dX methods was studied. It was shown that for 5 GeV particles a single layer of the detector gives a pion suppression by about a factor of 7 at an electron efficiency of 90%. Two layers of this detector provide a pion rejection factor of 50 at 90% electron efficiency. A detailed comparison with MC is presented.

Primary author: Dr ROMANIOUK, Anatoli (MEPHI/CERN)

Presenter: Dr ROMANIOUK, Anatoli (MEPHI/CERN)

Contribution ID: 5

Type: **not specified**

From the ideas to the ATLAS TRT

Wednesday, 14 September 2011 18:00 (30 minutes)

Overview of the R&D work related to the development of the ATLAS Transition Radiation Tracker (TRT) is presented. Significant part of the report will be dedicated to the ideas and aside R&D work, which were not necessary realised in the final TRT design, but were directed to find appropriate solutions and might still be interesting for the developments of the transition radiation detectors and gaseous detectors in general.

Primary author: Dr ROMANIOUK, Anatoli (MEPHI/CERN)

Presenter: Dr ROMANIOUK, Anatoli (MEPHI/CERN)

Contribution ID: 6

Type: **not specified**

Commissioning and performance of the ALICE TRD

Wednesday, 14 September 2011 10:20 (30 minutes)

The Transition Radiation Detector (TRD) of ALICE at the CERN-LHC is designed to provide electron identification and an online trigger on high-pt tracks of electron candidates. It consists of 6 layers of drift chambers, covering a pseudo-rapidity range of $|\eta| < 0.9$. In its current configuration, 10 out of 18 sectors in azimuth are installed. The completion of the detector is planned for the LHC shut down in 2013/14.

We will give an overview on the setup and working principle of the TRD and summarize experiences from the commissioning phase. Results on the achieved detector performance, such as the pion suppression factors and the tracking resolution, will be discussed. Also, we will report on online and offline calibration procedures and their performance.

Primary author: Mr BLUME, Christoph (University of Heidelberg)

Presenter: Mr BLUME, Christoph (University of Heidelberg)

Contribution ID: 7

Type: **not specified**

Triggering with the ALICE TRD

Friday, 16 September 2011 09:15 (30 minutes)

The Transition Radiation Detector (TRD) in A Large Ion Collider Experiment (ALICE) at the LHC consists of 6 layers of tracking chambers and covers a pseudo-rapidity range of $\eta < 0.9$. At the moment 10 out of 18 azimuthal sectors are installed. The completion is planned during the long LHC shutdown in 2013/14.

We will discuss how a hardware Level-1 trigger, about 7 ns after an interaction, can be derived from this detector. Chamber-wise track segments from fast on-detector reconstruction are readout with position, angle and PID information. In the Global Tracking Unit these tracklets are matched and used for the reconstruction of transverse momenta and electron identification of individual tracks. These tracks form the basis for versatile and flexible trigger conditions, s.a. single high-pt hadron, single high-pt electron, di-electron (J/Ψ , Upsilon) and at least n high-pt tracks (jet).

The need for low-latency on-line reconstruction poses challenges on the detector operation. The calibration for gain (pad by pad) and drift velocity must be applied already in the front-end electronics and cannot be calculated off-line based on the recorded data. Due to pressure changes an on-line monitoring and control loop for these parameters is required.

After a long period of minimum bias data-taking in ALICE rare triggers are now used in ALICE. We will discuss the tracking performance at the local and global reconstruction stages and report on first experiences with the TRD based triggers.

Primary author: KLEIN, Jochen (Physikalisches Institut, University of Heidelberg)

Presenter: KLEIN, Jochen (Physikalisches Institut, University of Heidelberg)

Contribution ID: 8

Type: **not specified**

Physics with the ALICE Transition Radiation Detector

Wednesday, 14 September 2011 09:45 (30 minutes)

ALICE (A Large Ion Collider Experiment) is the dedicated heavy-ion experiment at the LHC. It is believed that in nucleus-nucleus collisions at LHC energies a Quark-Gluon-Plasma (QGP) is formed. ALICE is designed to measure a large set of observables in order to study the properties of the QGP.

The Transition Radiation Detector (TRD) provides electron identification in the ALICE central barrel at momenta $p > 1$ GeV/c, where pions cannot be rejected anymore sufficiently via energy loss measurements in the Time Projection Chamber. Thus the TRD significantly enlarges the scope of physics observables. These include measurements of semi-leptonic decays of heavy flavour hadrons (charm and beauty), di-electron mass spectra of heavy quarkonia states, e.g. J/ψ , Ψ' , Y , Y' , and jet spectra. For reference the corresponding studies have to be performed in pp and p-nucleus collisions.

We present the electron identification and its performance in pp collisions also in context of the analysis of electrons from heavy flavour hadron decays. Further case studies will be shown as well.

Primary author: Dr PACHMAYER, Yvonne (University of Heidelberg)

Presenter: Dr PACHMAYER, Yvonne (University of Heidelberg)

Contribution ID: 9

Type: **not specified**

Energy Loss Signals in ALICE TRD and Application in Particle Identification

Wednesday, 14 September 2011 11:15 (20 minutes)

The ALICE experiment is one of the four major experiments at the LHC at CERN.

The ALICE TRD is a cylindrical detector system located in radius between 2.9 and 3.7 meters from the beamline and segmented in 6 layers. Each layer consists of a radiator and a drift chamber with pad readout of very good granularity, optimized for Pb-Pb operation. Employing a cosmic-ray trigger and taking advantage of the reconstruction in the complete ALICE setup,

we have measured the energy loss of cosmic muons in the TRD in the momentum range 1 to 300 GeV/c, with and without the contribution of transition radiation.

Together with the energy loss signals from protons and pions measured in proton-proton collisions, the TRD energy loss spectra are extended down to Lorentz factor $\beta\gamma$ below 1.

In this talk, I will present the details of the measurements and the particle identification using the TRD.

Primary author: Mr LU, Xianguo (University of Heidelberg)

Presenter: Mr LU, Xianguo (University of Heidelberg)

Contribution ID: 10

Type: **not specified**

Gain Calibration of the ALICE TRD using a Krypton Source

Wednesday, 14 September 2011 11:40 (20 minutes)

The TRD is an important subsystem of the ALICE experiment at the LHC at CERN. Segmented into 18 super modules, each consisting of 30 readout drift chambers filled with Xe-CO₂ [85-15], the ALICE TRD is designed to be an effective tool in terms of separation of electrons and pions, reconstruction of tracks of charged particles and fast trigger capabilities. Each readout chamber consists of a radiator and a multi-wire proportional chamber, which is segmented into either 16x144 or 12x144 readout pads, giving a total number of 1,118,952 pads. For an early and effective calibration at the level of individual pads, which is crucial for a good particle identification, a dedicated calibration run with a Krypton source has been carried out. We have recorded 2.1 billion decays of metastable 83mKr in the 10 super modules presently installed. We present an overview of the obtained results in terms of gain uniformity over chambers and energy resolution. The obtained gain factors can be used in the front-end electronics, an important ingredient for the TRD trigger.

Primary author: STILLER, Johannes (Physikalisches Institut Ruprecht-Karls-Universität Heidelberg)

Presenter: STILLER, Johannes (Physikalisches Institut Ruprecht-Karls-Universität Heidelberg)

Contribution ID: 11

Type: **not specified**

Electron identification with help of silicon transition radiation detector based on DEPFET pixel matrices.

Thursday, 15 September 2011 17:55 (20 minutes)

Transition Radiation Detectors (TRD) have the attractive features of being able to separate particles by their gamma factor. Replacing the Xenon based gaseous detectors by modern silicon detectors is complicated by the large energy losses of charged particles in 300-700 um of silicon. A silicon pixel detector - DEPFET - has features which allows to overcome the existing limitation on detecting transition radiation photons with an energy losses from a charged particle in the same pixel. The tests of DEPFET with fiber radiator have been carried out at CERN SPS and DESY beams. The results of test beam measurements and Monte Carlo simulation are presented.

Primary authors: Dr FURLETOVA, Julia (University of Bonn); Dr FURLETOV, Sergey (University of Bonn)

Presenter: Dr FURLETOV, Sergey (University of Bonn)

Contribution ID: 14

Type: **not specified**

Possible applications of the SiTRD technique in the next generation collider experiments

Thursday, 15 September 2011 18:20 (20 minutes)

The Silicon Transition Radiation Detector (SiTRD) combines the excellent space resolution of a silicon tracker with the particle identification capability of a conventional TRD.

The detector consists of multiple modules, each composed by a radiator and a tracker plane, separated by an air gap and immersed in a magnetic field. This layout allows to separate the TR photons possibly produced by radiating particles from their trajectories. Provided that the separation in the tracker plane is larger than the granularity of the tracker, the SiTRD can identify radiating particles from non radiating ones. Moreover, the small amount of materials encountered by the particles along their path, does not significantly affect the momentum reconstruction performance of the tracker. These features make the SiTRD an attractive option when designing the inner tracker of a collider experiment.

We have studied a possible SiTRD layout for the inner tracker of a collider experiment at LHC. The detector parameters have been optimized taking into account the geometry constraints derived from an upgrade proposal of the ATLAS inner tracker. A Monte Carlo simulation has been also developed in which the detector performances have been investigated.

Primary author: Dr LOPARCO, Francesco (BA)

Presenter: Dr LOPARCO, Francesco (BA)

Contribution ID: 15

Type: **not specified**

The MRPC-based ALICE Time-Of-Flight detector: status and performance

Friday, 16 September 2011 10:35 (20 minutes)

The large Time-Of-Flight (TOF) array is one of the main detectors devoted to charged hadron identification in the mid-rapidity region of the ALICE experiment at the LHC; it will allow separation among pions, kaons and protons up to few GeV/c, covering the full azimuthal angle and $-0.9 < \eta < 0.9$. The TOF exploits the innovative MRPC technology capable of an intrinsic time resolution better than 50 ps with an overall efficiency close to 100% and a large operation plateau; the full array consists of 1593 MRPC chambers covering a cylindrical surface of around 150 m².

The TOF detector is efficiently taking data since the first pp collisions recorded in ALICE in December 2009. In this report, the status of the TOF detector and the performance achieved both with pp and PbPb collisions are shown.

Primary author: Dr ALICI, Andrea (BO)

Presenter: Dr ALICI, Andrea (BO)

Contribution ID: **16**

Type: **not specified**

Registration

Wednesday, 14 September 2011 08:45 (45 minutes)

Contribution ID: 17

Type: **not specified**

Welcome

Wednesday, 14 September 2011 09:30 (15 minutes)

Contribution ID: 23

Type: **not specified**

From first TR studies to the HELIOS TRD

Wednesday, 14 September 2011 15:20 (30 minutes)

Primary author: CHERNIATIN, Valeri

Presenter: VANIACHINE, Alexandre (Argonne)

Contribution ID: 24

Type: **not specified**

Neutrino geophysics with the delayed muons and TRD

Wednesday, 14 September 2011 16:30 (30 minutes)

Primary author: VANIACHINE, Alexandre (Argonne)

Presenter: VANIACHINE, Alexandre (Argonne)

Contribution ID: 25

Type: **not specified**

Acoustic method of particle detection and its applications for geophysics studies by means of neutrino beam

Wednesday, 14 September 2011 15:55 (30 minutes)

Primary author: BORISSOV, Alexander

Presenter: BORISSOV, Alexander

Contribution ID: 26

Type: **not specified**

Si PM developments and applications

Wednesday, 14 September 2011 17:25 (30 minutes)

Primary author: Dr MIRZOYAN, Razmick (Max-Planck-Institute for Physics)

Presenter: Dr MIRZOYAN, Razmick (Max-Planck-Institute for Physics)

Contribution ID: **28**

Type: **not specified**

Physics potential of the TRT in the ATLAS experiment at LHC

Thursday, 15 September 2011 10:25 (30 minutes)

Primary author: FROIDEVAUX, Daniel

Presenter: FROIDEVAUX, Daniel

Contribution ID: 29

Type: **not specified**

Commissioning of the ATLAS TRT at LHC

Thursday, 15 September 2011 09:00 (30 minutes)

Primary author: REMBSER, Christoph

Presenter: REMBSER, Christoph

Contribution ID: **30**

Type: **not specified**

Performance of the ATLAS Transition Radiation Tracker

Thursday, 15 September 2011 09:35 (20 minutes)

Primary author: ADELMAN, Jahred

Presenter: ADELMAN, Jahred

Contribution ID: **31**

Type: **not specified**

Particle Identification by ATLAS Transition Radiation Detector

Thursday, 15 September 2011 10:00 (20 minutes)

Primary author: HINES, Elizabeth

Presenter: HINES, Elizabeth

Contribution ID: 32

Type: **not specified**

Measuring the Lorentz Factor of Energetic Particles with TRDs

Thursday, 15 September 2011 11:20 (30 minutes)

Primary author: Prof. CHERRY, Michael

Presenter: Prof. CHERRY, Michael

Contribution ID: **34**

Type: **not specified**

TRDs in Cosmic Ray Physics

Thursday, 15 September 2011 12:20 (30 minutes)

Primary author: Prof. MULLER, Dietrich

Presenter: Prof. MULLER, Dietrich

Contribution ID: 35

Type: **not specified**

TRD on the ISS

Thursday, 15 September 2011 12:55 (30 minutes)

Primary author: Dr KIRN, Thomas (RWTH Aachen, I. Physikalisches Institut B)

Presenter: Dr KIRN, Thomas (RWTH Aachen, I. Physikalisches Institut B)

Contribution ID: 36

Type: **not specified**

The Compressed Baryonic Matter Experiment and its TRD

Thursday, 15 September 2011 15:00 (30 minutes)

Primary author: FRIESE, Volker

Presenter: FRIESE, Volker

Contribution ID: 37

Type: **not specified**

Gas/pixel detectors: development and production

Thursday, 15 September 2011 15:35 (30 minutes)

Primary author: DESCH, Klaus

Presenter: DESCH, Klaus

Contribution ID: **38**

Type: **not specified**

Recent advancements in the Micro Pattern Detector Technology

Thursday, 15 September 2011 16:30 (30 minutes)

Primary author: ROPELEWSKI, Leszek (CERN)

Presenter: ROPELEWSKI, Leszek (CERN)

Contribution ID: 39

Type: **not specified**

A Novel Heavily Ionizing Particle Trigger using the ATLAS Transition Radiation Tracker

Thursday, 15 September 2011 17:05 (20 minutes)

Primary author: PENWELL, John

Presenter: PENWELL, John

Contribution ID: 43

Type: **not specified**

Charged hadron identification with the HMPID Cherenkov-based detector in ALICE at LHC

Wednesday, 14 September 2011 12:05 (20 minutes)

Primary author: DI BARI, Domenico (BA)

Presenter: DI BARI, Domenico (BA)

Contribution ID: 44

Type: **not specified**

Overview on the PID techniques

Friday, 16 September 2011 09:55 (30 minutes)

Primary author: Prof. KRIZAN, Peter (Ljubljana Univ. and J. Stefan Institute)

Presenter: Prof. KRIZAN, Peter (Ljubljana Univ. and J. Stefan Institute)

Contribution ID: 46

Type: **not specified**

Particle identification of the ALICE TPC via dE/dx

Friday, 16 September 2011 11:20 (20 minutes)

Primary author: Dr YU, Weilin (University Frankfurt (main))

Presenter: Dr YU, Weilin (University Frankfurt (main))

Contribution ID: 47

Type: **not specified**

Using Time Over Threshold in Conjunction with Transition Radiation to Improve Particle Identification in the ATLAS Transition Radiation Detector

Friday, 16 September 2011 11:45 (20 minutes)

Primary author: MARCHAND, Jean-François

Presenter: MARCHAND, Jean-François

Contribution ID: 49

Type: **not specified**

Simulation of gaseous detectors: state of art

Primary author: VEENHOFF, Rob

Presenter: VEENHOFF, Rob

Contribution ID: 50

Type: **not specified**

Simulation Transition Radiation and Electron Identification Ability of the ATLAS Transition Radiation Tracker

Friday, 16 September 2011 14:30 (20 minutes)

Primary author: KLINKBY, Esben

Presenter: KLINKBY, Esben

Contribution ID: 51

Type: **not specified**

Performance of the ATLAS Transition Radiation Tracker read-out with high energy collisions at the LHC

Friday, 16 September 2011 14:55 (20 minutes)

Primary author: WAGNER, Peter

Presenter: WAGNER, Peter

Contribution ID: 52

Type: **not specified**

The Detector Control System of ALICE TRD

Friday, 16 September 2011 15:20 (20 minutes)

Primary author: BUSCH, Oliver

Presenter: BUSCH, Oliver

Contribution ID: 53

Type: **not specified**

TRT Viewer: the ATLAS TRT detector monitoring and diagnostics tool

Friday, 16 September 2011 15:45 (20 minutes)

Primary author: Mr SMIRNOV, Sergei (Moscow Engineering and Physics Institute)

Presenter: Mr SMIRNOV, Sergei (Moscow Engineering and Physics Institute)

Contribution ID: 54

Type: **not specified**

Summary talk

Friday, 16 September 2011 16:30 (40 minutes)

Presenter: Prof. CHERRY, Michael

Contribution ID: 55

Type: **not specified**

"In memoriam of Boris Dolgoshein": free commemorating speeches

Wednesday, 14 September 2011 15:00 (20 minutes)

Contribution ID: 56

Type: **not specified**

Concert