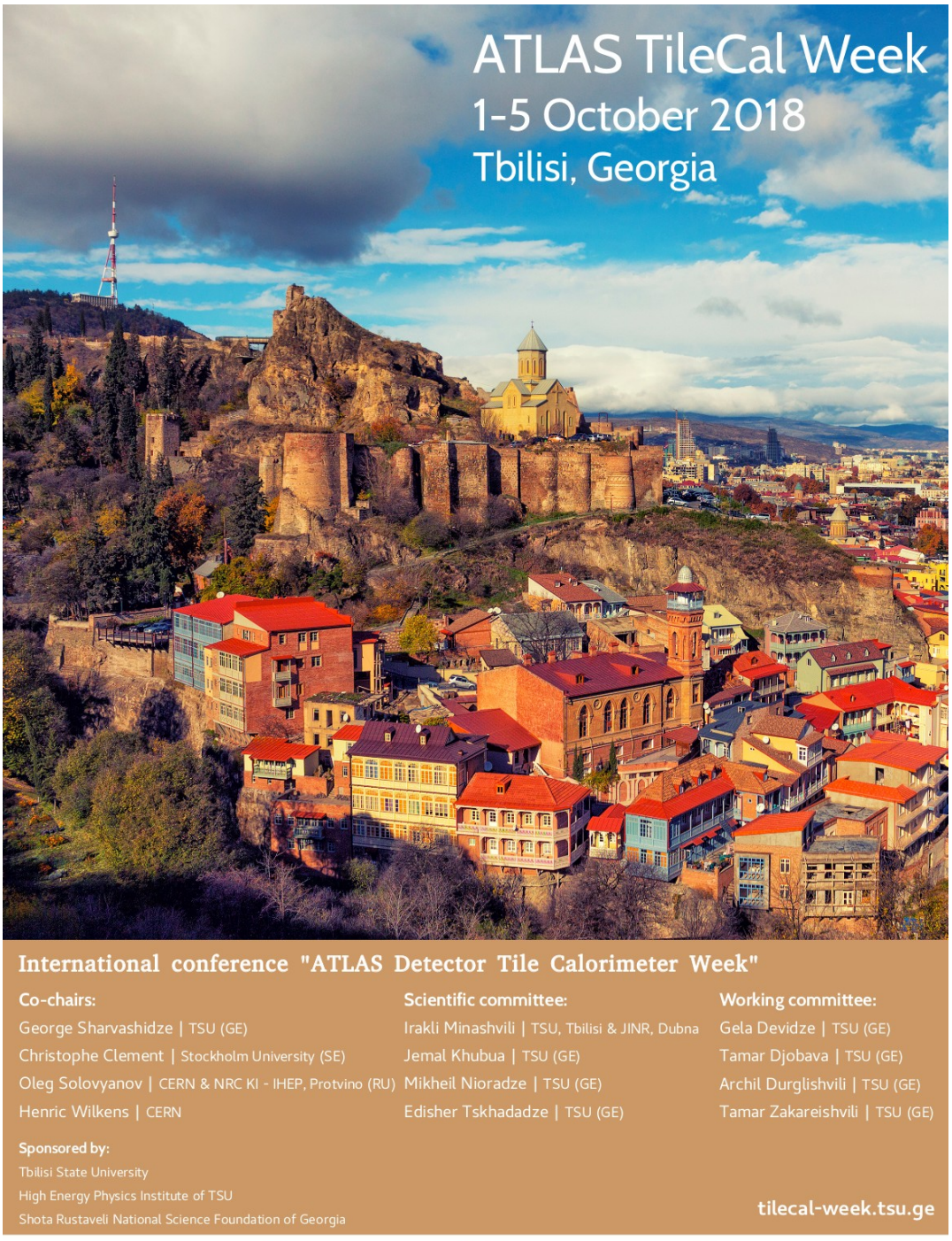
International conference

"ATLAS Detector Tile Calorimeter Week"

Abstracts of Contributed Presentations



Tbilisi
1 – 5 October, 2018

TileCal - LS2 plans

Stanislav Nemecek (Acad. of Sciences of the Czech Rep. (CZ))
Irakli Minashvili (TSU, Georgia & Joint Institute for Nuclear Research (RU))
Oleg Solovyanov (IHEP (RU))

Described the hardware and software concepts of photomultiplier blocks and superdrawers testing/certification facilities. Two test benches for PMT Block testing are needed to provide 100 units certification per day. Software of test benches will be based on the so called Prometheo system. 12 identical Prometheo systems will be produced in total for superdrawers certification.

Test beam Analysis – Measurements at the next TB Oct-Nov 2018

Tamar Zakareishvili
HEPI TSU (Georgia))

Tile Calorimeter Test Beam gives opportunity to take data from Demonstrator - Tile Cal module equipped with new electronics, and use it for further studies.
Data recorded at Test Beam that will be held during 24th of October to 12th of November 2018, can be used to study detector uniformity. For this will be used muon and electron beams, because it is known how they interact with tile calorimeter detector.

PMT Block Test Bench

Irakli MInashvili
CERN
Joint Institute for Nuclear Research (RU)
Iv. Javakhishvili Tbilisi State University (GE)

Described the plans for ATLAS Tile Calorimeter maintenance and consolidation during long shutdown of LHC. The manpower and resources needed for 2019-2020 opening period presented as well.

TileCal phase-II upgrade - introduction

Alberto Valero Biot (Univ. of Valencia and CSIC (ES))
Christophe Clement (Stockholm University (SE))

In this presentation an overview of the progress of the ATLAS High-Luminosity Tile Calorimeter project is given. Significant progress was made in the last 6 months towards establishing production and procurement at all institutional sites. The status of the most critical items was reviewed: the status of the decision process High Voltage remote solution is well under way, the final decision from the adoption of the micro-drawer will be happen in November. For the low voltage power supply system and control significant work remains towards a decision on the architecture to adopt. The road for the next six months of the project was presented, with many important milestones to be reached, in particular several preliminary and final design reviews are expected. The preparation for the demonstrator insertion into ATLAS was discussed.

LVPS Progress in South Africa

Charles John Sandrock (University of the Witwatersrand (ZA))
Bruce Mellado Garcia (University of the Witwatersrand),

A report on the current status of the manufacturer of the Low Voltage Power Supply (LVPS) in South Africa. The PCB, assembly, component orders and expected delivery will be presented.

Supply Voltage and Temperature Control for the PMT blocks with the HV-opto

Ioan Bogdan Belean
(Nat.Inst.for Research & Development of Isotopic and Molecular T)

The mini-drawers (MD) of the ATLAS Tile Calorimeter System are equipped with photo multiplier tubes (PMT) which convert the light generated through proton-proton collision into electronic signals. The PMT are powered using individual channels, through a high voltage power regulator board called HV-opto. The configuration, monitoring and read-out of the mini-drawers are performed by the pre-processor system (PPr) through GB optical fibers. The present work describes an FPGA based controller used for configuring the high-voltage for each PMT channel through specific commands send from a user terminal. Moreover, continuous read of both the high-voltage and the temperatures is performed for each individual PMT channel.

LVPS Developments by UTA

Seyedali Moayedi (University of Texas at Arlington (US))
Haleh Hadavand (University of Texas at Arlington (US))

In order to validate radiation hardness of the LVPS bricks for the HL-LHC, the new radiation levels were found out and a radiation test was setup at CHARM facility at CERN for a period of two weeks for TID and SEE tests. Design of the setup including PCBs and front panel was done by UTA and setup was prepared successfully at CHARM and set up there for the dry run. During the radiation tests, voltages, currents, and temperatures of 4 bricks will be monitored and logged. The bricks are supposed to tolerate up to 480 Gy and we will expect to have the results of the test by the end of October to find out if we need to do some modifications or not.

Status report on FEB production

Romain Madar (Université Clermont Auvergne (FR)),
Stylianos Angelidakis (Université Clermont Auvergne (FR))

This talk describe the current status on the production of the FEB, including modifications to come, planning and updated cost estimations

Status of HV active dividers production at ITIM Cluj-Napoca

Gheorghe-Sergiu Pogacian
(Nat.Inst.for Research & Development of Isotopic and Molecular T)

on behalf of the ITIM - ATLAS group, presented the status of taking over the production of HV active dividers from LPC Clermont-Ferrand, France to ITIM Cluj-Napoca Romania. A batch of 50 HV active dividers were already done in Cluj-Napoca and sent to LPC Clermont-Ferrand for testing. After tests this batch will be used for PMT blocks in upgraded Extended Barrel test beam at CERN. The production plan for the next four years is also presented. Conclusion is that the activities for taking over of the HV active dividers production are going forward according to schedule

Systematics studies for PMT robustness measurements with the Pisa test bench

Vassili Kazanin
(Budker Institute of Nuclear Physics (RU))

The PMT robustness studies on experimental test bench in Pisa still continues. This summer it was made a serie of measurements aimed to better understand the performance of the test bench. As a result, the optimal scheme of data taking using two different light sources was found to apply intensity and covarinace methods to calculate the gain of tested PMTs. The procedure of averaging was applied to these four independent measurements to get better estimation of the gain value reaching 1% accuracy level for daily measurement. Additional photodiodes now used as monitors of the light source, making the accuracy on daily measurement better than 1% for the global response evolution.

Qualification test benches for Phase-II PMT replacememt

Fabrizio Scuri (I.N.F.N. - Sezione di Pisa (IT)),

The motivations for PMT replacement for HL-LHC are recalled. The cost estimate as weel as the time schedule for new PMT procurement, qualification and installation in the Tile PMT bloch are given. A description of the test benches characteristics is done and the procedure for full PMT qualification is described.

Tile Phase-2 Simulation activities

Pavel Starovoitov (Ruprecht Karls Universitaet Heidelberg (DE)),

The results of different studies performed in the TileCal Upgrade Simulation group are represented. Studies of the various methods of the energy reconstruction are disputed. The precision and resolution of several variants of the Optimal Filter as well as Wiener Filter methods under different pileup conditions are studied and compared. A progress in the implementation of the ADC parameters in the Phase-2 upgrade scenario of the TileCal software framework is reported. The studies of the muon tagging performance using calorimeter energy depositions are discussed. The progress in studies of the trigger performance in the Phase-2 upgrade conditions is presented. The analysis of the impact of higher TileCal readout granularity on the large-R jet performance is introduced. The improvements in the jet mass resolution and W/Z-boson jet identification are reported.

Tile Electronics: Main Board Status

Fukun Tang (University of Chicago (US)),
Sidney Mau (University of Chicago (US)),
Kelby Anderson (University of Chicago (US)),
Mark Oreglia (University of Chicago (US))

The Main Board provides the low voltage power, controls, and digitization of the front-end photomultiplier signals. We report on the status of version 3.2 of the Main Board, progress in testing its radiation tolerance, and plans for production testing.

Status report on the Daughter Boards

Christian Bohm (Stockholm University (SE)),
Eduardo Valdes Santurio (Stockholm University (SE)),
Samuel Silverstein (Stockholm University (SE))

The ATLAS hadronic Tile Calorimeter (TileCal) is being upgraded for the High Luminosity Large Hadron Collider (HL-LHC). After the upgrade, approximately 1024 radiation tolerant read-out link and control boards (Daughterboards) will interface the Front-End with the TilePreProcessor (TilePPr) on the off-detector systems providing continuous read-out of the entire TileCal at 40 MHz. We present the status and progress on the development of the latest revision of the Daughterboard (DB). Extensive test and development work is taking place on the firmware/software migration from the previous revision on both the TilePPr and the DB. In order to assure all the Phase-II upgrade requirements are achieved, work is being done on qualifying the DB to be able to withstand the running conditions inside of ATLAS, being them the presence of relatively strong magnetic fields and relatively higher radiation levels that HL-LHC will provide. In parallel, a test-facility is being put together with a testbench aiming to face the challenges of quality control of the DBs during production phase.

Cesium System

Nikolay Shalanda (Institute for High Energy Physics (RU))

Abstract: "Sesium System Control Electronics was designed and produced more than 15 years ago. After the upgrade, approximately 155 new boards of 9 types will be used in Sesium Calibration System. We present the status and progress on the development of the latest types of the Cs- 3U boards prototypes and on detector electronics boards. Staus of Radiation Hardness tests in IHEP of NIEL and TID were presented. Also actions are taken in aspect of providing "leak-less" system. Time schedule and milestones of electronics production was presented.

Tile PreProcessor Status

Alberto Valero Biot (Univ. of Valencia and CSIC (ES)),
Fernando Carrio Argos (Univ. of Valencia and CSIC (ES))

The Tile Calorimeter (TileCal) is one detector of the ATLAS experiment at the Large Hadron Collider (LHC). TileCal is a sampling calorimeter made of steel plates and plastic scintillators which are readout using approximately 10,000 PMTs.
In 2024, the LHC will undergo a series of upgrades towards a High Luminosity LHC (HL-LHC) to deliver five times the current nominal instantaneous luminosity. The ATLAS Tile Phase II Upgrade will accommodate detector and data acquisition system to the HL-LHC requirements. The detector electronics will be completely redesigned using a new readout architecture with a full-digital trigger system.
After the Phase II Upgrade, the on-detector electronics will transfer digitized data for every bunch crossing (~25 ns) to the Tile PreProcessor (TilePPr) in the counting rooms with a total data bandwidth of 40 Tbps. The TilePPrs will store the detector data in pipeline memories to cope with the new ATLAS DAQ architecture requirements, and will interface with the FELIX system and the first trigger level. A total of 32 TilePPr modules will be needed to read out the entire detector. The TilePPr is a FPGA-based system, which is composed of four Compact Processing Modules with single-width AMC form factor and one full-size ATCA carrier with 4 slots.
This contribution presents the hardware and firmware developments for the final design of the Tile PreProcessor for the ATLAS Phase II Upgrade, and the results and experiences with the designed prototypes.

TDAQi@Heidelberg, current status and plans

Pavel Starovoitov (Ruprecht Karls Universitaet Heidelberg (DE))

Abstract: The current situation with the TDAQi development in the Heidelberg University is introduced. Presented a plan of the printed circuit board assembly and tests of the prototype functionality. The status of the firmware development is represented. The results of the link test of the combined TREX-jFEX test bench is presented and discussed.

Status of the FELIX system in the test-beam setup

Francisco Brandan Garcia Aparisi (Univ. of Valencia and CSIC (ES))

The Tile Calorimeter is an ATLAS sub-detector that will be upgraded for the High Luminosity Large Hadron Collider (HL-LHC). Periodical Test Beams are being held at the North Area at CERN to test the new electronics in various conditions. Data will be recorded using a new system called FELIX, which is being developed by the TDAQ group at CERN. It will provide faster data rates and better precision compared to the actual data path. It is being currently being integrated with the new electronics. We present the changes that were done before the latest Test Beam in May, the status during the Test Beam, and what is coming

next. After a code change the system worked as intended, recording data to disk as it comes, which can then be analyzed off-line. Work is currently being done to integrate the final version of the system, called SWROD, that will send data to the online event builder instead of saving it

High Voltage power supplies

Agostinho Da Silva Gomes
(LIP Laboratorio de Instrumentacao e Fisica Experimental de Part)

The Tilecal High Voltage (HV) system needs to be upgraded in the ATLAS Upgrade Phase II to be able to operate in the High Luminosity LHC. The current baseline solution is based on remote HV regulation boards located more than 100 m far from the detector in an electronics room where there isno radiation damage and there is permanent access for maintenance, improving the reliability of the system. This option requires a large number of long HV cables but it also removes the requirement of radiation hard boards. The routing of the long cables for the Extended Barrel modules poses several challenges and the respective feasibility is being evaluated with the ATLAS Technical Coordination. There is also a backup solution based on radiation hard regulation boards located inside the detector. New prototypes of the regulation boards were recently produced and after laboratorial tests they will be tested at CERN in the testbeam, with a long cable prototype that is already installed.A preliminary "calculation" estimates that the routing of the cables is possible but confirmation in situ at the beginning of the next LHC long shutdown is required to confirm the feasibility of the remote solution. Based on this confirmation and on the test results of the prototypes, a decision on the HV system that will be used will be taken early in the next year.

Drawer Mechanics and Tooling system

G. Popeneciu, I. Nadas, S. Pogacian
ITIM Cluj-Napoca, Romania

It is presented the status of the Mini-drawer mechanics as support of the new Tile Calorimeter "on-detector" electronics for the ATLAS Phase-II Upgrade and the Tooling system which concur to the mini-drawers assembly, quality assurances, installation and final certification. Some last developments of the Mini-drawers services distribution – electrical, optical and cooling - are presented together with the test schedule for their implementation in the final drawer mechanics design. In the end were presented the items need to be solve to stay on track with Tile Calorimeter upgrade project.

Cryostat/gap scintillator update for LS2

Joey Huston (MSU/UTA (USA))
Andy White (MSU/UTA (USA)),

This talk provides an update of the effort to replace the E3/E3 scintillators in the ATLAS detector during the LS2 shutdown. The scintillators are being replaced due to the higher radiation environment expected in Run 3. In addition, there is the opportunity to extend the scintillators to smaller radius (higher eta), to provide energy corrections in a new critical region. The schedule for production and installation, along with possible conflicts with the liquid argon cryostat heaters is described.

Fibers for E3/E4 replacement

Joao Gentil Mendes Saraiva

(LIP Laboratorio de Instrumentacao e Fisica Experimental de Part)

The ATLAS Hadronic Barrel Calorimeter (Tile Calorimeter) made with steel and scintillating tiles, readout by WLS optical fibers coupled to photomultipliers is divided into three sectors the Long Barrel (LB), Extended Barrel (EB) and the ITC (Intermediate Tile Calorimeter). The LB covers the central region up to a pseudorapidity of 1.0 and the EB has a pseudorapidity coverage from 1.0 to 1.7. However between the LB and EB is necessary to have free space (GAP+CRACK) so that services to the most inner detectors can pass through. The ITC (GAP+CRACK counters) is mounted over the inner wall of the EB to recover the detector performance in this region. From construction, the GAP+CRACK counters are the only scintillating tiles and WLS optical fibers that can be replaced in the Tile Calorimeter. Furthermore, these counters due to their location and due to the fact that they are mounted inside aluminum cans have a radiation dose exposition considerably higher than any other part of the Tile Calorimeter. During Phase 1 of the ATLAS Upgrade (2019-2020) the most inner ITC counters (covering 1.2 to 1.75 in pseudorapidity) are going to be replaced. The status on the preparation of the WLS optical fibers needed for the replacement of the ITC counters during the next long shutdown starting in 2019 was presented. The optical fibers were requested to the producer in June 2018 and arrived at CERN in September 2018. They were shipped to Lisbon in order to proceed with the top end mirroring. The work plan for the preparation of these fibers in Lisbon was presented.

MBTS for Run II

Jalal Abdallah (University of Texas at Arlington (US)),
Oleg Solovyanov (IHEP (RU))

The MBTS (Minimum Bias Trigger Scintillator) is suffering from large signal degradation due high radiation exposure in Run II. During 2017 end of year shutdown the number of fibers for the readout of outer counters was increased and at the beginning of 2018 operations the MBTS trigger thresholds were lowered. This resulted in better efficiency and uniformity. Nevertheless, a more effective solution for Run III should be provided. This is the purpose of the new MBTS task force established following the amendment of ATLAS Executive Board (action EB 212/1 at EB215).

The physics motivations to keep MBTS running in Run III are many:

- It provides trigger for MinBias events for Soft QCD at low-mu (number of interaction per bunch crossing). This already lead to the publication of many papers in Run II and will certainly be essential for the measurement of the inelastic cross section and MinBias events properties at 14 TeV: MBTS is the primary MinBias trigger for Luminosity vdM scans. It is also one of the main diffractive trigger for high beta runs with ALFA detector (very forward physics). It is used for trigger in soft diffractive with AFP detector. And finally MBTS is largely used during Heavy Ion runs (p-Pb, Pb-Pb, Xe-Xe, etc).

The degradation studies of current MBTS were performed based on the MinBias integrator data. In order to separate the effect of PMT variation from the scintillator degradation, laser data for MBTS channels were also analyzed. The irradiation dose based on simulation of ATLAS Run 2 geometry give an estimate of 10e3 Gy/fb-1 for inner counters and 10e2 Gy/fb-1 for outer counters.

The analysis of the laser data showed about 20% drop in response during 2015 and 2016, then a more stable period afterward. The reason behind is the loss of light yield following the scintillator degradation. Below is a summary of the remaining response for Inner/Outer counters after removing the PMT effects:

– 2015 (3.2 fb-1) : 45% / 67% (3kGy / 0.3kGy)
– 2016 (32 fb-1): 7% / 45 % (32kGy / 3kGy)
– 2017 (50 fb-1): 15% / 47% (50kGy / 5kGy)
– 2018 (48 fb-1): 25% / 52 % (50kGy / 5kGy)

It was also observed a recovery effect of 0.5%/day in average during the Technical Stops and during end of year shutdown.

Irradiation tests performed at IHEP showed high radiation hardness of green polystyrene based scintillators with additives of 2% PTP (paraterphenyl), and 0.05% BBQ (Benzimidazo-Benzisochinolin-7-on). However, these scintillators need orange or red WLS fibers for the readout and new PMTs. Another alternative is to use Eljen-200 with green Kuraray Y11 fibers which showed also good radiation hardness.

The plan for the replacement is by default the same time frame as for the crack scintillators, mid-April 2019 for A side and November 2019 for the C side but this may of course change. There is no clear decision yet on the action to be taken in this regards.

A possible solution is to replace the current scintillators by new ones (BBQ, EJ- 200 or even the same as now) and to proceed with regular replacement during the End of Years shutdown.

Study of energy response to hadrons of energies from 16 to 30 GeV

Tigran Mkrtchyan (AANL, (Armenia))
Claudio Santoni (Clermont-Ferrand, (France))

Short abstract: To validate the upgrade electronics of the ATLAS Tile Calorimeter for the HL-LHC, the calorimeter response to different particles is studied at test beams. In this specific study, the calorimeter response to kaons, pions and protons at energy ranges from 16 to 30 GeV is presented. The hadron species are identified and separated with the help of 3 Cherenkov counters along the beam line. After the selection, the data is compared with the simulation.

Tile Operations Report

Rachel Christine Rosten
(The Barcelona institute of science and technology(Spain))

Short abstract: This talk is a summary of the operations work of the past several months. The ATLAS Tile calorimeter has been performing well in 2018. The biggest challenge, the cooling problem, is well under control and its current status is described. The overall status of the hardware and software are additionally summarized in the talk

Operations during long shutdown 2

Henric Wilkens (CERN (Switzerland))
Jalal Abdallah (University of Texas at Arlington (US)),

This presentation gives the time frame of the CERN accelerator program for the coming years. We are entering the “long shutdown 2” period. It will be a big change for the operations activity, with a focus switch from good pp-collision data taking to supporting the maintenance, upgrades and calibration activities. The presentation lists activities to be addressed by Tilecal to update to the new TDAQ, changes to the Tile muon trigger system, Timing and control distribution and Readout.

DCS Status report

Miguel Fontes Medeiros
(LIP (Portugal)),

On this talk, the status of the ATLAS Tile Calorimeter (TileCal) Detector Control Systems (DCS) is presented. It starts by introducing all the major issues noticed by DCS during the Operation of 2018 until the Tbilisi TileCal Week (1st to 5th October 2018). Additionally, all recent DCS developments are presented, which mainly focused on the improvement of FSM user interfaces, overcurrent protection mechanism and control scripts revision. Later, the foreseen DCS plans for the Long Shutdown 2 (LS2) are shown, highlighting important points such as the Central DCS instructions on system migration, the complete revision of DCS alarms, cooling parameters and the improvement of High Voltage Power Supply (HVPS) crate communication.

PMT Scans and L1 Calo studies

Andrew Caldon Smith
Kathryn Chapman
(University of Chicago (US))

Short Abstract: The Charge Injection System (CIS) is used to compare the signal response from the TileCal readout scheme with the signal response from the Level-1 Calo readout scheme. Differences in the response behavior of these schemes is used to diagnose malfunctioning Photo Multiplier Tubes (PMTs).

TileCal offline software news

Alexander Solodkov ((Institute for High Energy Physics (RU)),
Siarhei Harkusha (Institute of Physics, Minsk)

General status of TileCal offline software is presented. Most important software updates since previous TileCal weekare summarized, as well as plans till end of the year.

Tile conditions Database status and Robot update

Yuri Smirnov
(Northern Illinois University (US))

Abstract: Tile Conditions Robot tool is based on the TileCalibWeb software package and provides the framework for Tile COOL Conditions Database updates, which can be easily performed by DQ leaders and experts. New version of Robot (TileCalibWeb-01-00-04) has been developed, validated and brought to production in September. As the total amount of Tile Condition DB updates is constantly increasing (243 have been completed only for the last 4 months since June 2018), the new functionality implemented in this tool allows us significantly simplify and automatize the procedure of Tile Calorineter DB updating. New Tile Online, Offline and Calo DB updates for Data are described and the latest uploaded tags for MC simulations listed.

Status of AthenaMT migration

Siarhei Harkusha (Institute of Physics, Minsk)

Multi-threading is proposed to use in ATLAS Software in order to efficiently use modern computers. Since size of memory is not increasing so fast as number of cores per processor ratio of memory / core is actually decreasing. It is already now a limiting factor since ATLAS Software is very memory-hungry because of complicated detector, a detailed magnetic field description, calibrations, and etc. Athena Multi Threading (AthenaMT) is supposed to solve this problem thanks to better memory sharing. In this report status of Tile Calorimeter Software migration to AthenaMT is presented.

Data Quality

Tibor Zenis (Comenius University (SK))

The Data Quality (DQ) is an important part of the ATLAS experiment. The DQ checks the recorded or reprocessed ATLAS data and after a possiblecorrection makes an approval and provides a feedback to the detectoroperation system.The TileCal works well on the DQ point of view during the 2018 year. No intolerable defect was set. This means, no ATLAS date were lost for theTileCal. One of the TileCal module from 256 is switch off. Small cold/hot

spots are present. These spots don't influence the physical objects like jets. Also "time jumps" are present, mostly for individualchannels connected with bad pulses or a high level of the noise. Thewrong channels are masked.The software used by the TileCal was improved. Some bugs were removedand new features were implemented.

New Tile-in-One

Juraj Smiesko (Comenius University (SK)),
Sofiia Hyrych (Comenius University (SK))

Abstract: The Tile-in-One is a platform for combining all of the ATLAS Tile Calorimeter offline data quality tools in one unified web site. It achieves this by using simple main web server to serve as central hub and a group of small web applications called plugins, which provide the data quality assessment tools. Every plugin runs in its own virtual machine in order to prevent interference between the plugins and also stability of the platform. In the presentation we focus on the current status of the development of the platform.

Tile Calometer Calibration, Data preparation and Performance

Pawel Jan Klimek (Northern Illinois University (US))

The ATLAS experiment records data from the proton-proton collisions produced by the Large Hadron Collider (LHC). The Tile Calorimeter is the hadronic sampling calorimeter of ATLAS in the region $|\eta| < 1.7$. The TileCal is regularly monitored and calibrated by several different systems. Amongst the calibration systems, a Laser device is used for the monitoring of the response and stability of the calorimeter at the level of the PMTs. This system sends a controlled light pulse via dedicated clear optical fibre to each of the 9852 PMTs composing the readout. It allows to monitor the stability of the gain of the PMTs, perform the timing adjustment of some parts of the readout electronics, and possibly recover from non-linearity problems occurring at very high energy deposit (saturation effects on the readout electronics).

Cesium Calibration status

Alexander Solodkov for IHEP (Protvino team))

Status of TileCal Cesium calibration system is presented. Results of Cesium scans performed in July 2018 are shown as well as new public plots showing aging of scintillator since 2009.

TileCal Combined Calibration

Arely Cortes Gonzalez (CERN)

Studies comparing the response evolution, as measured by the different calibration systems, are presented. Cesium calibration scans data from 2015, 2016 and 2018 are used to validate the laser calibration combined method during those years. Data from LHC pp collisions during Run 2 are used to compare the response measurements using MinBias integrator currents with the laser calibration.

Timing Studies

Krystina Petukhova
(Charles University (CZ))

Time calibration is one of the key parameters which define precise reconstruction of energy in the hadronic Tile Calorimeter. Its aims to adjust the central sample in OF2 algorithm with the maximum of the signal produced by passing particles. In 2018, the time calibration is performed using multi-jet data. Time calibration stability is checked in laser-in-gap events shot during empty BCID in physics runs. All the problems concerning time about time shifts above +-3 ns are studied throughout 2018 data-taking. A list of problematic channels, calibration update, prospectives for reprocessing and calibration methods are discussed.

Charge Injection System (CIS)

Kathryn Meredith Chapman
(University of Chicago (US))

The charge injection system is one of several methods used to calibrate the tile calorimeter. It involves injecting a known magnitude charge into the front end electronics to mimic physics signals. We measure the response of the electronics to these known charges to provide a relative calibration of the readout channels (ADC counts/pC). We update the CIS constants monthly in a database for use by tile cal and the most recent updates have been consistent with the performance of the detector. There has been some drift in CIS constants in channels affected by the recent cooling loop leak, and we plan to investigate this trend further in the coming weeks.

TileCal Luminosity

Sergio Gonzalez Fernandez
(The Barcelona Institute of Science and Technology (BIST) (ES))

Abstract: The Minimum Bias measurements taken by Tile provide important contributions to the overall uncertainty for the Luminosity. Due to the linear dependence between the currents and the instantaneous luminosity and the fact that Tile is robust against pileup this contribution has great value for the LHC. In this presentation the procedure for luminosity calculation is detailed along with results from 2017 and 2018 data taking.

Signal Reconstruction in E4 Cells Using Wiener Filter

Bernardo Sotto-Maior Peralva
(Juiz de Fora Federal University (BR))

Abstract: In high-luminosity conditions, the signal pile-up effect is observed in the ATLAS calorimeter system. Furthermore, in high occupancy cells, such as the Tilecal E4 cells, the deterministic approximation currently employed for TileCal energy estimation becomes unrealistic in severe signal pile-up conditions. This contribution presents an alternative approach for energy estimation in the TileCal E4 cells based on the Wiener-Hopf Filter theory where the data modeling is not required. Both simulation and real data were used for design and performance evaluation considering different signal pile-up conditions. The results showed that the Wiener-Hopf Filter estimator outperforms the current method used for energy estimation in the TileCal E4 cells.