**Vitaly Kalendarev**

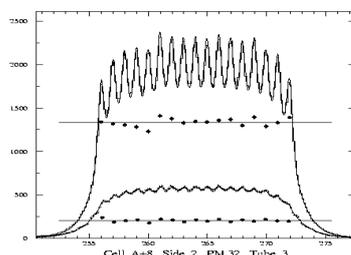## TileCal data check procedure

Introduction

The ATLAS Tile Calorimeter is a sampling scintillation hadronic calorimeter designed as one barrel and two extended barrel parts. All three sections (LB=LBA+LBC,EBA,EBC) have a cylindrical structure divided in phi by 64 wedges (modules). Each module consists of the scintillator plates (tiles) inserted into iron structure, the light is collected via fibers and registered to photo multiplier. There are 45 photo multipliers in each wedge of barrel and there are 32 photo multipliers in each module of extended barrels. Modules are divided into a number of pseudo-projective cells (ϕ , R, θ).
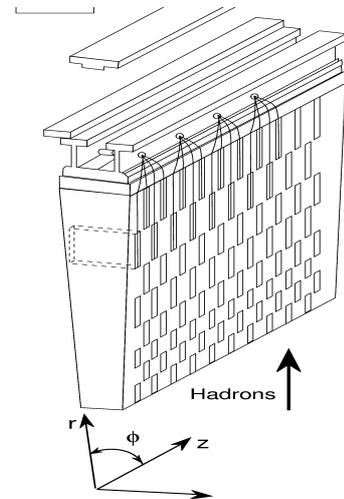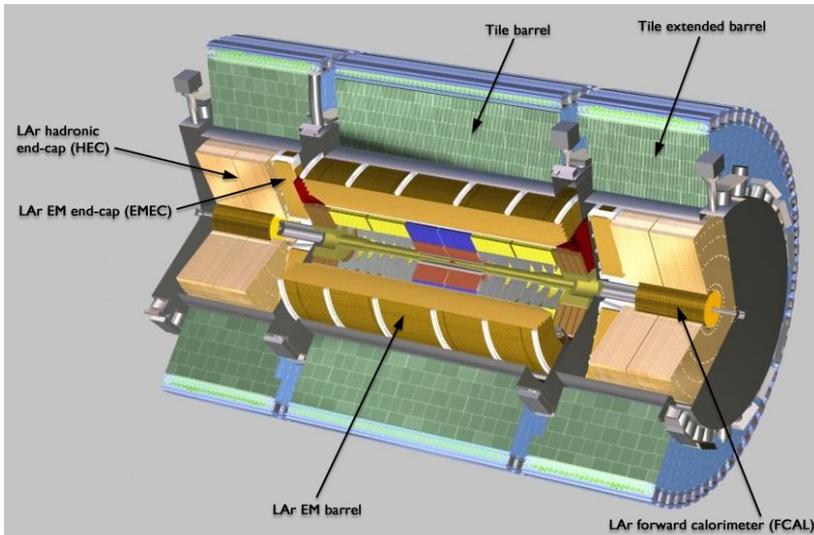
The calibration of the calorimeter is organized with the movable radioactive ^{137}Cs-source moving inside stainless steel calibration tubes with a flow of liquid (water). It passes through every scintillating tile, as it is shown in the picture bellow, that allows to follow the evolution of the quality of the scintillator-fiber-PMT chain.
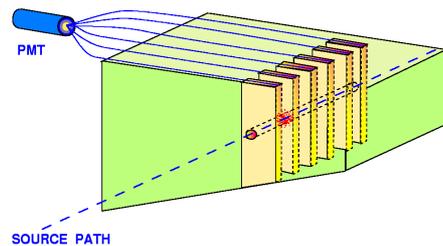

To describe the response of cells of the calorimeter two methods are used: integral and amplitude. Integral method is faster and produces reliable results. The amplitude one is slower, but it allows more detailed picture of the response, down to individual scintillating tiles. Both methods are used for the calibration data treatment. In the next picture there are typical shape of cell's response. The integral of response are showed here too.

The calibration process is controlled with GUI that gives a way to see source movement and scan picture of the cells responses. GUI screen is shown in the next picture.
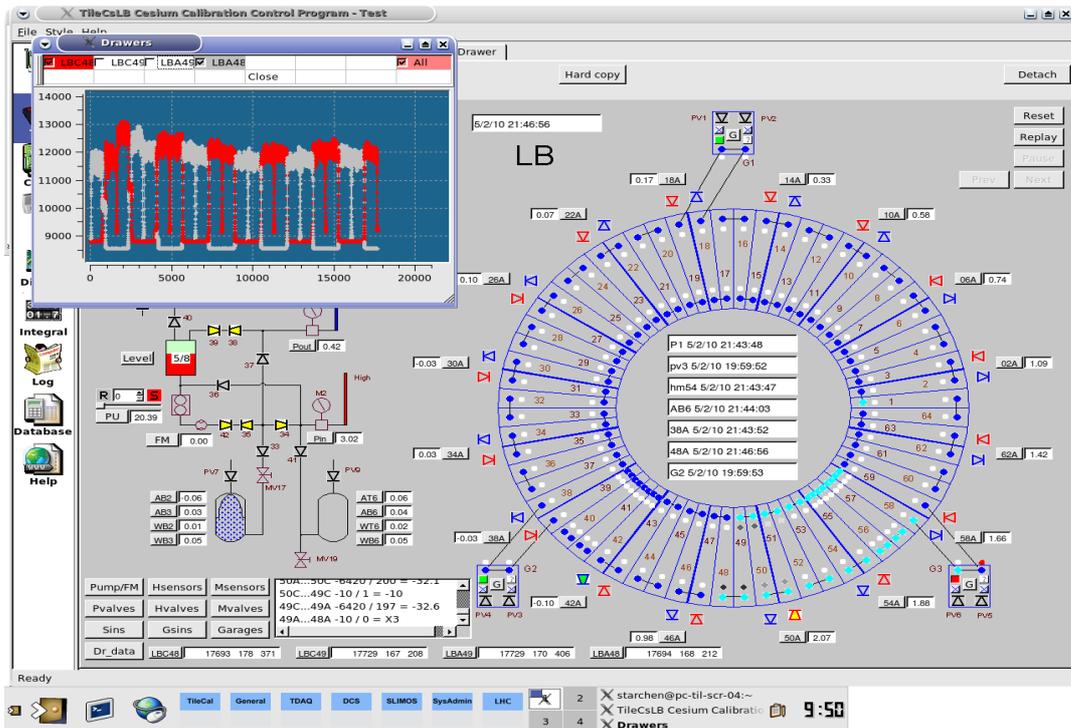
The program allows to manage the process of the calibration and shows general picture of the response.

Calibration data treatment usually done some time afterwards, and it might be too late, as the calibration take a few hours. It is desirable to do a primary check on-line comparing current data with the latest ones. Here is an attempt shown to create a program to make this comparison.

Requirements

The program for prompt data quality monitoring should:

1)   find and sort all existing runs and display them so user can choose runs, or set of runs, for comparison

2)   display photo multipliers HV(high voltage) and HV difference between selected run and the reference run

3)   display responses integrals and integrals difference between any selected runs

4)   the program should have a GUI and a several styles of results presentation

Program description

A program for prompt monitoring of the ATLAS Tile Calorimeter has been made based on ROOT. A screen shot of the GUI and different results are shown in the next pictures. As the full barrel scan is consist in three separate runs, the full picture of each barrel contains three pieces, each of them belongs to different runs, so runs are united in sets.


Every run has a number that's growing with the date of the run, but as runs are numbered irregularly in each set, the automatic unification to sets is very important. Every set has got a number, the smaller the number the more recent the run. The user can choose sets to display by selecting them in combo boxes.

To display the run it has to be added to the play list. One can click "Auto" button to add a whole set to play list or use "Add", "Del", "Clear". In case of more than two sets in the play list only the last two will be displayed. To
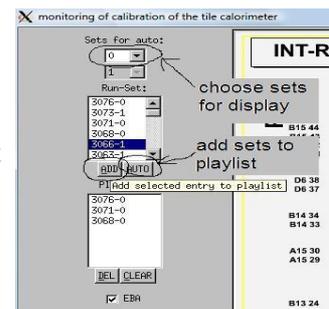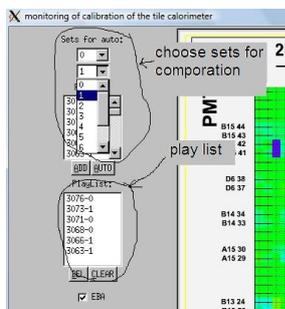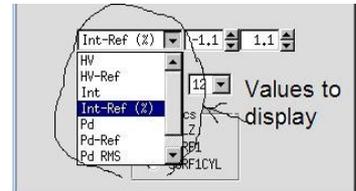
compare integrals of two different runs or sets all of them must to be in a play list. For fast addition of runs in this case use "Auto" button, but one has to choose comparable runs in the run-set combo boxes before.

The user can choose the value to be displayed and limits. The draw pad can display from 1 to 4 pictures (for barrels LBA,LBC,EBA,EBC).
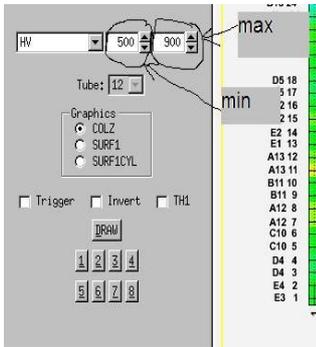

There are a few options for a display – "Trigger" (draw "true" if value belongs to selected interval of value), "Invert" (inversion of limits of variance of value), "TH1" (collect all values to 1D histogram). It allows fast finding of bad cells in one barrel.

The program can display HV, difference between HV and reference values, integral of response of cells and difference of integrals between any two sets or runs. To display picture press "Draw". For more convenient comparison there are 8 additional canvas to use. To display picture to one of them press buttons "1"-"8". To choose style of picture (color plot, surface, etc.) press suitable radio button.
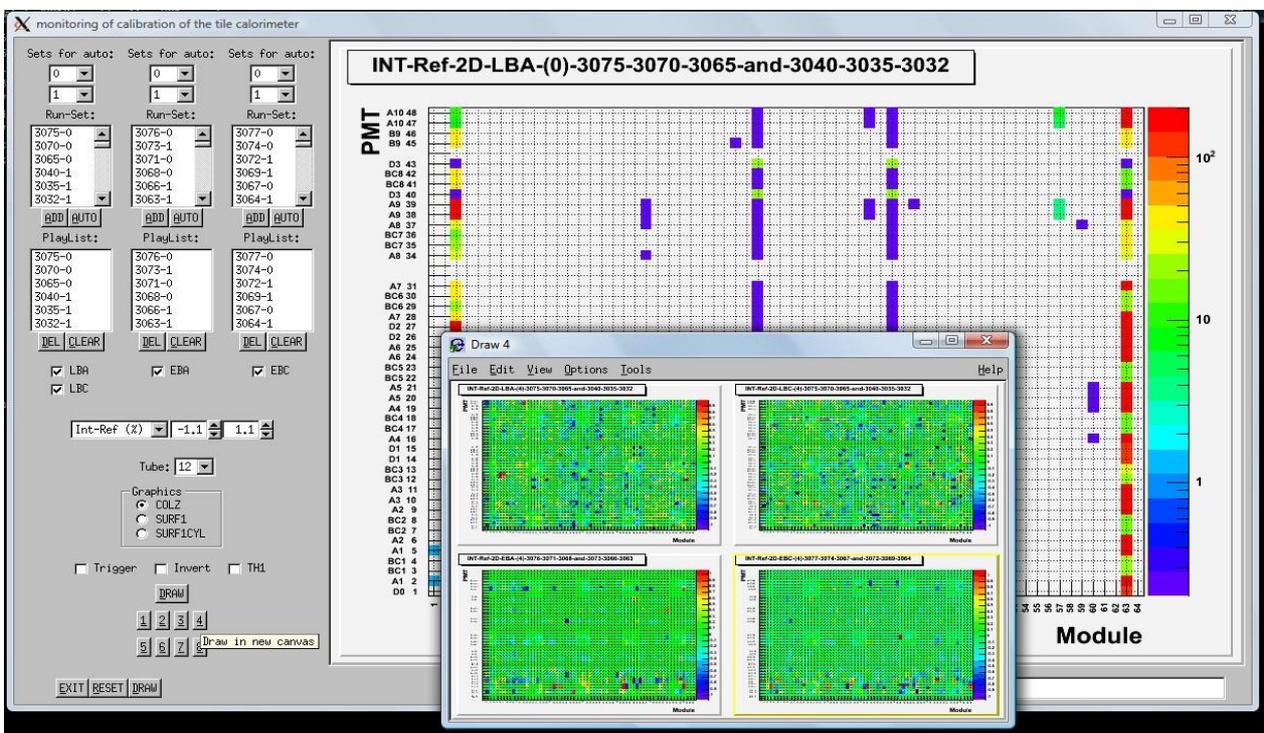
Summary/Results

• A program for off-line data quality monitoring of Cesium calibration runs created. The program is based on ROOT GUI classes.

• It allows quick overview of the individual runs and comparison of run sets or reference values.

• It is supposed to be used as a main program to and monitor accumulated data quality .