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DRAFT 2

Scintillator detector "Mu-wall" for measurement of charged particles leakage from the TILECAL prototype

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1 Abstract

Scintillator detector "Mu-wall" constructed for measurement of longitudinal and transversal leakage of hadronic showers from the TILECAL prototype is described. The detector was used during 1994 - 1995 test beam measurements of the TILECAL prototype. Different configurations of the "Mu-wall" detectors used during the test beam measurements are summarized.

2 Introduction

Measurements [1] [2] showed a quite large probability of hadron showers punchthrough. Because the TILECAL prototype [3] of ATLAS barrel and exetended barrel hadron calorimeter has innovative concept of "longitudinal" segmentation of active and passive layers, the measurement of hadron showers punchthrough probability was of special interest.

3 The "Mu-wall" detectors

Basic elements of the "Mu-wall" are plastic scintillator detectors with dimensions 20x40x2 cm^3 which are read-out by 2-inch photomultipliers EMI 9813KB. The scintillators were produced by Chemicals and Technolgy, Prague and their characteristics are similar to NE110.

The backward "Mu-wall" was fixed on a mechanical support independently on the TILECAL prototype and placed behind the calorimeter to register longitudinal leakage. It consisted of up to 9 scintillator detectors and covered the area of about 0.8x0.8 m^2.

Six scintillator detectors of the side "Mu-wall" with its mechanical support were fixed to one side of the central module of the TILECAL prototype to measure lateral leakage of hadronic showers. The side "Mu-wall" covered the area of 1.15x0.4 m^2.

Schematical pictuce of the "Mu-wall" detector is shown on Fig.1.

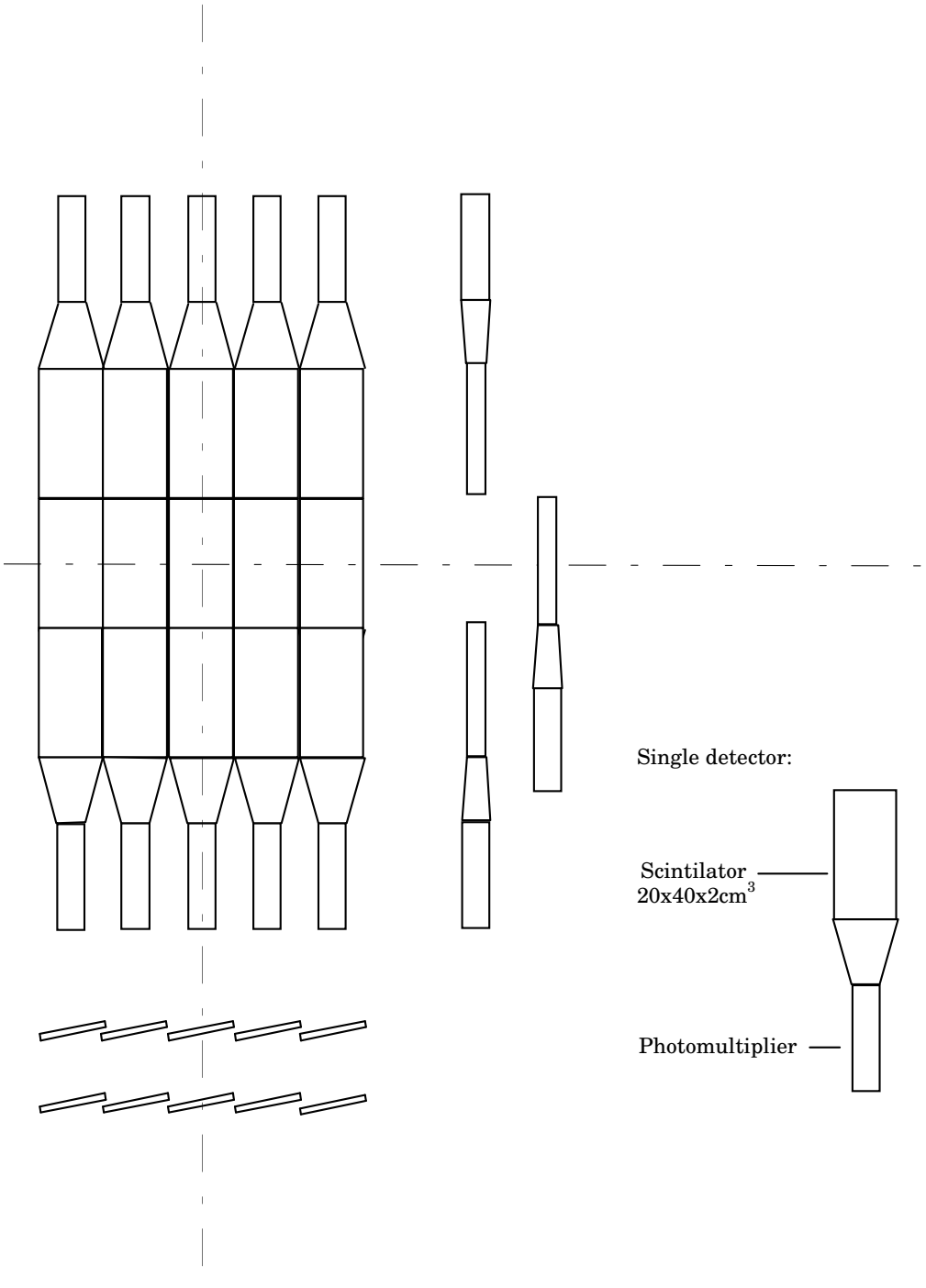
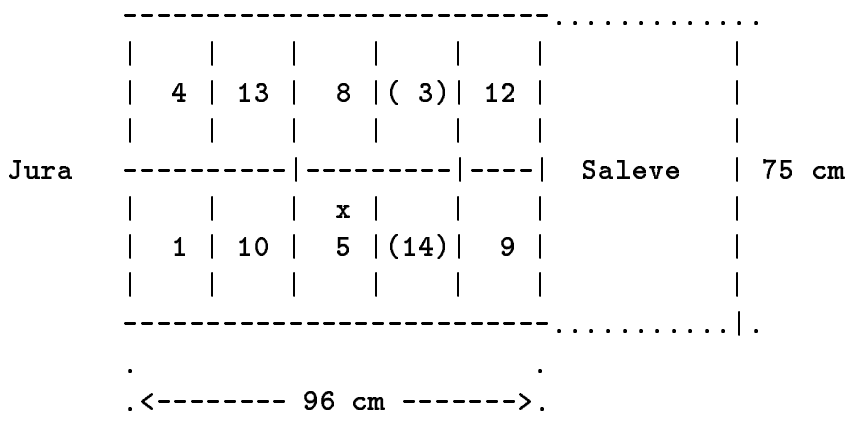


Figure 1: "Mu-wall".

4 Configurations of "Mu-wall" in 1994-1995 test beam periods

- **August 1994 test beam period**

  The backward "Mu-wall" detector was for the first time used during August 1994 test beam period. It consisted of 8 scintillator detectors (see Fig.2). The detectors are numbered according to their generic names *MU...* in standard test beam N-tuples. Only limited information was available from "Mu-wall" in August 1994 because two of central scintillators worked only part of the test beam period.



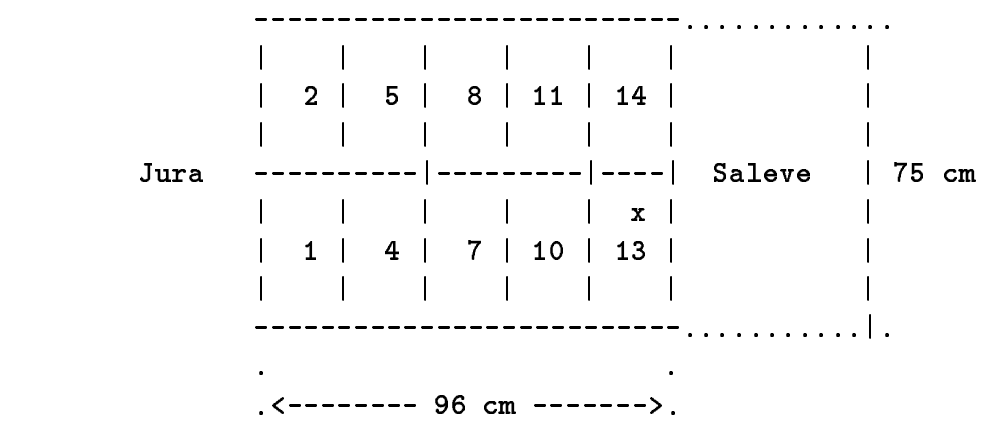
- by X is marked the beam entering the MU-WALL plane.

- problems:
- - ADC of MU14 is rewritten by ADC of MU5 in STAND. NTUPLEs
- - ADC of MU3 was missing due to damaged cable

Fig. 2 AUGUST 1994

- **September 1994 test beam period**

  The problems were fixed and in September 1994 combined tests of TILE-CAL and LAr prototypes the backward "Mu-wall" was used in the configuration shown on Fig.3.



- by X is marked the beam entering in the MU-WALL plane.
  (in the MU#13; 275 mm from low edge)

Fig.3 SEPTEMBER 1994 (COMBINED LAr + TILE)

- **May 1995 test beam period**

  For 1995 tests the side "Mu-wall" detector was constructed and used together with the backward "Mu-wall" in the May 1995 test beam period in the configuration shown on Fig.4.

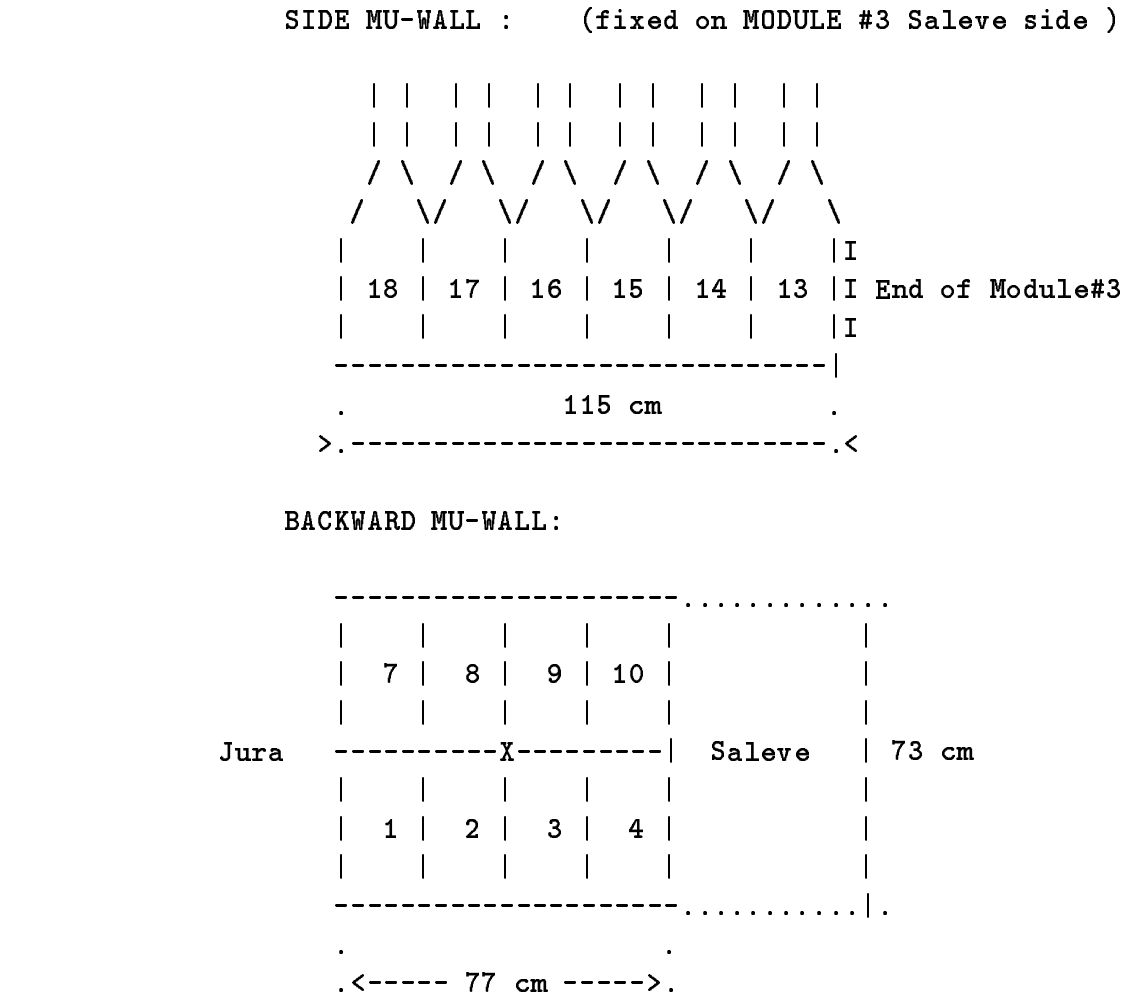
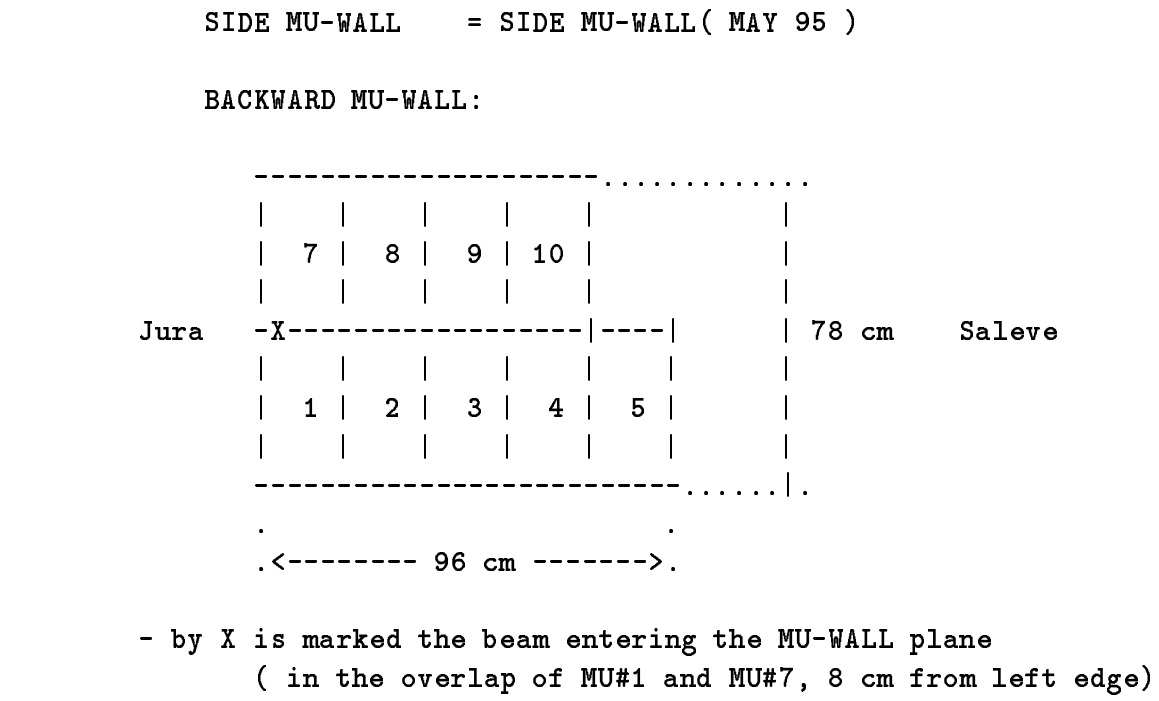


Fig.4 MAY 1995

- **June 1995 test beam period**

  For the short June 1995 test beam period we have extended active area of backward "Mu-wall" by adding one more counter and by minimizing the overlap of scintillator detectors. The whole backward "Mu-wall" was placed asymmetrically with respect to the beam in order to estimate its acceptance. The position of side "Mu-wall" (see Fig.5) was the same as in the May 1995 test beam period.



- by X is marked the beam entering the MU-WALL plane
  (in the overlap of MU#1 and MU#7, 8 cm from left edge)

Fig.5 JUNE 1995

- **July 1995 test beam period**

  The configuration of the "Mu-wall" detectors used during July 1995 test beam period is shown on Fig.6.

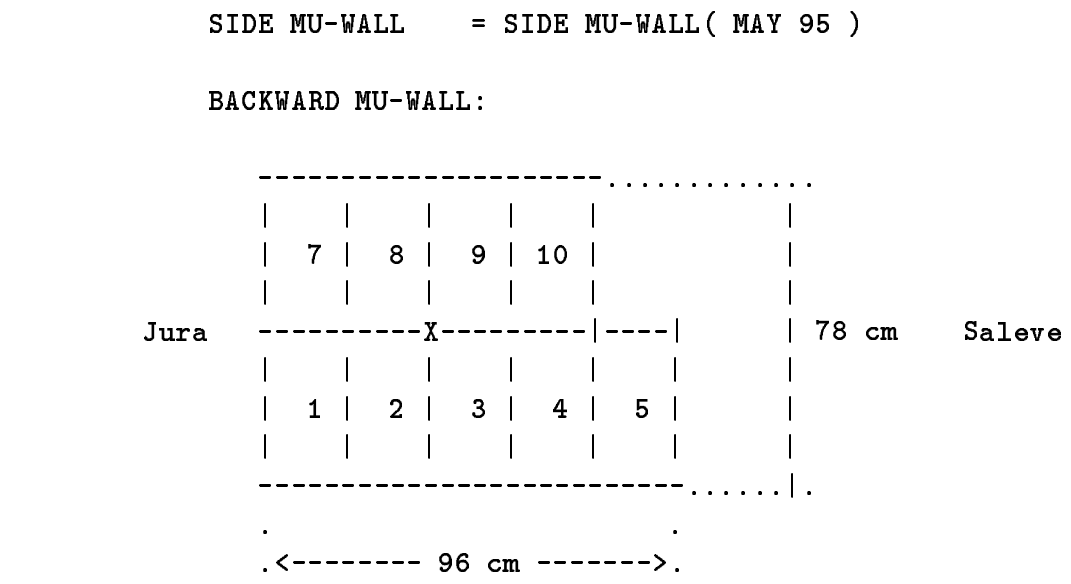


Fig.6 JULY 1995

The correspondence of the physical and logical scintillator detectors numbers is in the Table 1. The physical numbers are internal numbers of scintillator detectors. The logical numbers are the detector numbers used in previous figures.

#Phys. (FZU)	AUG. 94	SEPT. 94	MAY 95	JUNE 95	JULY 95
1	--	--	1	1	1
2	1	1	7	7	7
3	5	7	2	2	2
7	--	--	8	8	8
8	--	--	3	3	4
10	13	5	9	9	10
11	4	2	4	4	3
12	--	--	10	10	9
13	10	4	13	13	13
14	(14)	10	14	14	14
15	8	8	15	15	15
16	(3)	11	16	16	16
17	9	13	17	17	17
18	12	14	18	18	18
20	--	--	--	5	5

Table 1. Corespondence of Logical to Physical number of detectors:

5 Calibration

The "Mu-wall" detector registered charged particles with high efficiency and its information was used in the analysis of the test beam data [4].

The equalization of scintillator detectors was done off-line using μ response. On Fig.7 there is a typical ADC spectrum with the gaussian fit around its peak position. The example of usage the "Mu-wall" information for the analysis of May 95 and July 95 test beam data is the routine *leak.for* which one can find in the directories *snemecek/public/tilecal/may*95 and *snemecek/public/tilecal/july*95 on ATLAS(AFS).

6 Acknowledgements

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References

[1] CCFR Collaboration NIM A245(1986) 27-34

[2] RD5 Collaboration Z.Phys.C60(1993)1-10
RD5 Collaboration CERN-PPE/95-61

[3] RD34 Collaboration NIM A349(1994)384-397

[4] RD34 Collaboration CERN/LHCC 95-44 (1995)

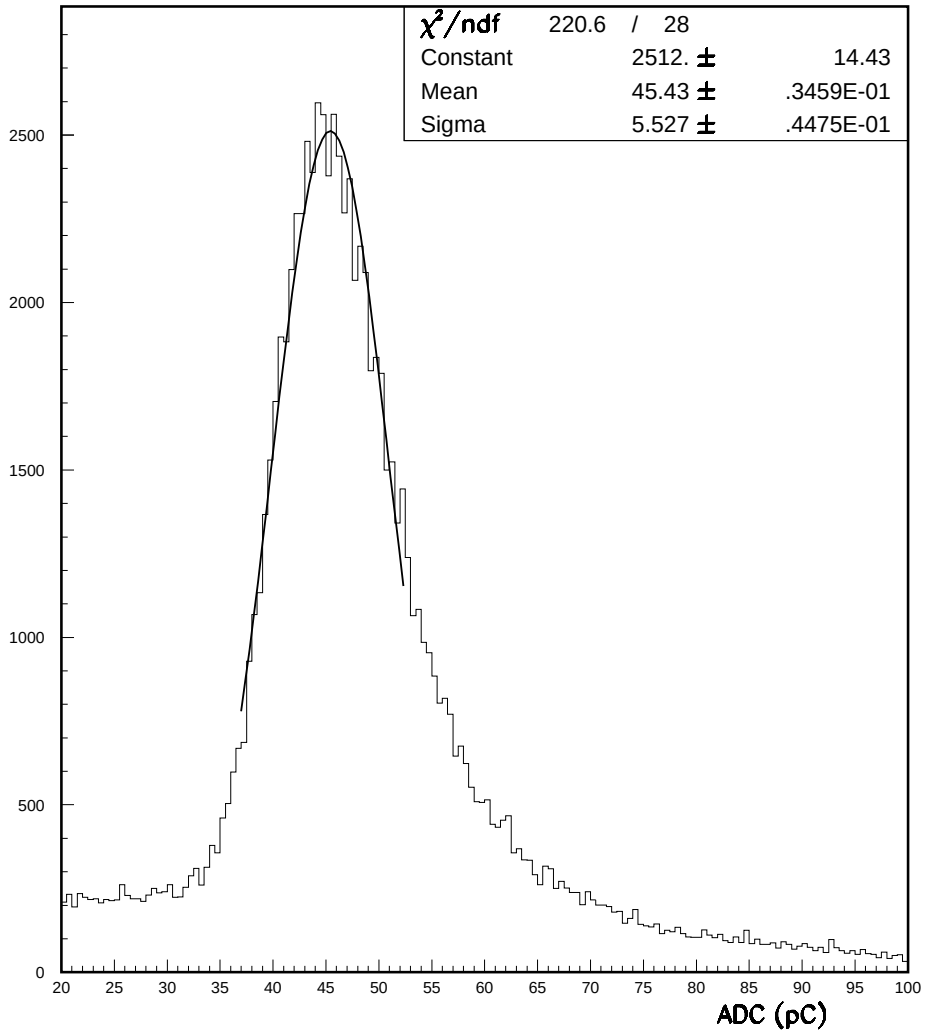

Figure 7: ADC spectrum of a "Mu-wall" counter with a gaussian fit around its peak.