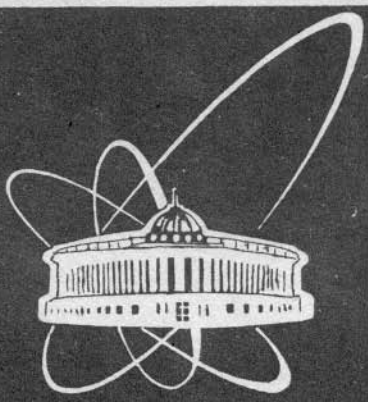

ОБЪЕДИНЕННЫЙ
ИНСТИТУТ
ЯДЕРНЫХ
ИССЛЕДОВАНИЙ

Дубна

E13-95-500

J.Budagov, Y.Kulchitsky[1], A.Lebedev, Yu.Lomakin,
V.Romanov, N.Russakovich, A.Shchelchkov, A.Sissakian,
J.Sorokina, N.Topilin, V.Utkin

ATLAS BARREL HADRON CALORIMETER

JINR – Group Activity

(July — September 1995)

The report has been presented on ATLAS Collaboration Conference,
September 1995, CERN, Geneva, Switzerland

[1]On leave from IP Academy of Science, Minsk, Belarus

1995

All the variety of JINR group completed TILE-CAL works presented here are connected to Ø-module production.

Following the schedule of preparation to September ATLAS working meeting the JINR group has prepared and presented on September, 1995 meeting 8 reports, covering following Subjects:

1. *the Czech steel measurements results;*
2. *Dubna experience on surface preparation;*
3. *DOSATOR design description;*
4. *new results on glue tests;*
5. *surface cleaning for glueing;*
6. *module assembly tools and method;*
7. *cutting experience with laser in Russia;*
8. *module-Ø manipulation tool.*

- **Report 1 main results.**

  For the measurements 10 Czech steel sheets had been used. The measurements results confirmed the previous data obtained earlier by Czech colleagues.

  However JINR group observed the sort of *"transverse waves"* on the steel sheet surface. The maximal height of the wave bump is 0.1 mm and the inter-bumps distance is $\simeq$ 5.5 mm. Before our measurements such a waves have not been observed. These data were urgently reported to steel producer and the necessary technological corrections to steel production rolling process were introduced.

- **Report 2 main results.**

  One of the technological operations necessary for master and spaces plates preparation (before the submodule assembly) is the plates mechanical cleaning (dirt removing) and (possibly) post-laser cutting *"flash"* removing.

  In the Laboratory of Nuclear Problem's machine shop two plates cleaning methods had been tested:

– by cylinder-form roll with abrasive glued to cylinder surface;

– by disk with abrasive glued to its surface.

The best result was obtained with disk. For disk rotating we used the Czech radial-boring machine with movable table.

One period spacers (or one master plate) cleaning time was 10 minutes. Absorber plates thickness decreasing was not observed. (The thickness measurement precision was 10 μm).

JINR group has recommended this cleaning method for all collaboration participants.

- **Report 3 main results.**

On June, 1995 ATLAS-week L. Mirralles (Barcelona) has presented the description of device for spacer plates glue covering when submodules assembly. No doubts this device has obvious advantages. However its price is high: $\simeq$ 27 000 CHF.

As an alternative JINR group has presented the drawings, the design description and the experimental sample of *"DOSATOR"* for portion-controlled supply of 2-components epoxy glue.

This *"DOSATOR"* for rather short period of time was designed by V. Romanov and N. Topilin and manufactured in the Laboratory of Nuclear Problems.

The *"DOSATOR"* consists of

– 2-sectional capsule;

– fram;

– drum with rollers;

– fixative;

– standart mixer;

– elastic tubes;

– clamping device.

By drum rotating (in hour direction) the glue components are moving inside the elastic tubes from the capsule towards the mixer.

The amount of pressed through glue depends on the number of turns on replaceable disk fixation.

When test at CERN the *"DOSATOR"* has demonstrated the 10% precision in glue supply. Withe existing disk the amount of glue moved by 1 *"DOSATOR"* step is 0.2 ± 0.02 g.

Due to its simplicity and low manufacturing price the idea of such a *"DOSATOR"* fabrication was found very attractive by collaboration members.

- **Report 4 main results.**

For master and spacer plates pre-gluing cleaning when 3 submodules assembly at CERN the sand-blasting was used.

This cleaning procedure showed quite good results. However this method is expensive and unhealthy.

To replace the sand-blasting by another cleaning procedure we had under taken some tests. These test consist of determining of glue connection strength for cutting off и tearing off. In function of the method used for metal samples treatment before gluing. Each set' of 5 ÷ 6 samples had been treated by one of 4 methods:

- sand blasting;
- metal brash and degreasing;
- emery-paper and degreasing;
- only degreasing by B-70 gasoline.

The test results are presented in Table. These test have shown quite enough glued connections mechanical strength obtained without the sand-blasting use.

When module-Ø manufacturing the absorber plates will be machined only by abrasive material (disk or roll) with following degreasing.

- **Report 5 main results.**

To protect against the corrosion the rolled steel sheets are covered by some oil after rolling.

Table of the speciments' rupture stress (N/mm^2)

Kind of test	Surfase treatment	Specimen number						Average value	% to sand blasting
		1	2	3	4	5	6		
Shear	Sand blasting	21.6	21.7	23.1	23.3	27.1	—	23.36	100
	Rotary wire brush	18.3	19.2	19.6	20.0	21.4	21.6	20.30	87
	Abrasive paper	17.8	19.6	19.6	19.8	22.0	—	19.76	85
	Degreasing	14.9	17.3	17.4	17.7	19.8	20.5	17.93	77
Tensile	Sand blasting	6.9	7.1	7.5	7.8	8.2	8.2	7.62	100
	Rotary wire brush	6.0	6.1	6.6	6.8	7.9	8.9	7.05	93
	Abrasive paper	4.2	4.7	4.8	5.6	6.3	7.5	5.52	72
	Degreasing	3.4	3.4	4.6	4.6	5.0	5.2	4.37	57

For submodule assembling these (master and spacer) plates arrive being covered by the thin oil layers. Before the plates must be glued they are to be degreased. If the oil layer is abundant, the plates are rolled between two elastic rolls. These rolls are tightly pressed to sheets surface and squeeze out the oil. The following cleaning will be dane in 2 stages.

- First stage:

  The plates surface must be wet by ordinary cups and glasses cleaning liquid;

- Second stage:

  The plates are placed into the water bath at 95° C for two minutes. After the bath the plates are dried quickly without corrosion. Now the plates are ready to gluing.

  This method of clearing plates from oil was used for the preparation of submodules for Ø-module.

• Report 6 main results.

On April, 1995 ATLAS-week we have presented the technical project of the device and the technology for the module assembling. After approval this project by all collaboration participants we have overworked the draft project of the device for module assembling. A final set of the working drawings in *eps*- and *igs*-formats was putted in August 1995 on CADD-disk at CERN.

The differences between working project and technical project consists in great depth study all articles of device.

The detailed description of a design of the module assembling device and technology assembling have been described in the [?] and [?]. This project was approved by all collaboration participants without the remarks and additions.

• Report 7 main results.

The description of spacer plates manufacturing on laser installation in *"SHATURA"* was presented in this report. Two periods of spacers were manufactured from *NOVOLIPETSK* steel. The measurements of the geometrical dimensions were made with use of sliding. The

precision of indication was 0.01 mm. The measurements precision was ± 0.05 mm. The measurements have shown that not all sizes are within the tolerance of ± 0.1 mm. The part of the dimensions were at the frontier of the tolerance while some of them were out of this tolerance (the maximum deviation from nominal value was 0.12 mm).

It was taken decision to continue the study of the geometrical sizes corrections at laser cutting-out.

- **Report 8 main results.**

  We were presented technical projects of the variants for module sling in the position of 3 and 6 hours, and the turn over and universal lifting devices for module in positions between 9 and 12 hours.

CONCLUSION

Even a brief presentation of the exposed reports shows that a large volume of works was preformed by JINR TILE-calorimetry group during the summer holiday period. The topic of the produced work covers practically all stages of Ø-module manufacturing:

1. *the steel manufacturing control;*
2. *the plates production;*
3. *the modules glueing, including all preparatory operations;*
4. *the module assembling;*
5. *the module manipulation.*

The publications on the reports 2÷7 are preparing at JINR Publishing Department.

References

[1] J. Budagov, Y. Kulchitsky, A. Lebedev et al., Barrel Hadron Calorimeter: Module Assembly and Tooling Design Description, ATLAS internal note, TILECAL-NO-52, CERN, Geneva, May 26, 1995.

[2] J. Budagov, Y. Kulchitsky, A. Lebedev et al., Barrel Hadron Calorimeter: Module Assembly and Tooling Design Description, JINR preprint E13-95-254, JINR, Dubna, Russia, June 14, 1995.

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Будагов Ю.А. и др. E13-95-500
Центральный адронный калориметр установки ATLAS.
Результаты работ группы ОИЯИ
(июль — сентябрь 1995 г.)

Кратко изложены основные результаты работ по подготовке к изготовлению модуля Ø адронного калориметра установки ATLAS. Работы были выполнены в июне — сентябре 1995 года и доложены на сентябрьском международном совещании коллаборации ATLAS в CERN. В утвержденную коллаборацией технологию изготовления модуля-Ø вошли многие из представленных научно-технических решений.

Работа выполнена в Лаборатории ядерных проблем ОИЯИ.

Препринт Объединенного института ядерных исследований. Дубна, 1995.

Budagov J. et al. E13-95-500
ATLAS Barrel Hadron Calorimeter.
JINR – Group Activity
(July — September 1995)

Here we present a short report on the main results of the preparatory work for Ø-module, to be manufactured at JINR. The reported period covers July — September 1995 JINR-group activity and includes the main topics considered by TILE-CAL community on September 1995 meeting at CERN. Many of JINR developed proposition have been included in Ø-module production final technology.

The investigation has been performed at the Laboratory of Nuclear Problems, JINR.

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