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MACRO BOLOGNA HOME PAGE

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Abstract

In this report are discussed the implementations on the Web of the MACRO on-line EVent Display (EVD) and DiaGNostic System (DGN), as well as the controls based on the electronic logbook. For each topic we give a brief description on how the system is implemented on WWW and also give a brief explanation on how to use the facilities. The structure of the MACRO Bologna Home Page on the Web is described, together with the links to the other Home Pages of the collaborating Institutions.

1. Introduction

For a running large underground apparatus, like MACRO, it is essential to have continuous monitoring of its behaviour and of its performances. Most of these controls have to be on-line, while others can be done off-line. We have implemented: (i) an EVent Display, which at first sight yields informations on the functioning of the apparatus, (ii) a DiaGNostic (DGN) program on-line, which gives directly graphs based on event samplings; (iii) Interactive checks based on the informations collected for each run by an electronic logbook.

It is also important that the checks on the apparatus and the general informations on all aspects of the experiment be available to all collaborators at their universities and home laboratories. This is now most easily done using the facilities offered by WWW.

It has to be remembered that the MACRO detector is composed of six adjacent "Supermodules" (SM), each of which is $12.6 \times 12\, m^2$ horizontal area and with a height of 9.6 m. Each SM has a lower and an upper (the Attico) part. The global dimensions of the detector are $76.5\, m \times 12\, m \times 9.6\, m$.

In order to provide redundant and complementary particle identification, MACRO employs three different types of detectors: liquid scintillation counters, gas filled limited streamer tubes and passive nuclear track detectors. Furthermore three modules of transition radiation detectors, with a global area 36 m^2 and 2 m. height, are located inside the Attico.

This report concerns the implementation on the Web of the on-line and off-line controls of the first two types of active detectors, the scintillators and the limited streamer tubes.

We shall first discuss the structure of the MACRO Bologna Home Page on the Web (see fig. 1), then discuss, in order, the on-line EVD display, the on-line DiaGNostic system and the off-line controls. For each topic we shall give a brief description on how it is implemented on the Web and a brief explanation on how to use the facility.

2. The MACRO Bologna Home Page

The MACRO Bologna Home Page (http://boal06.bo.infn.it/) has been designed with the aim of giving up-to-date and quickly accessible informations on MACRO to all collaborators and "visitors" (Fig. 1). Because of this we have chosen not to use some time consuming resources of the html language which, while yielding more pleasant pages, would slow the loading and the utilization, in particular for "home" links with medium power modems and PCs.

The page has been divided into two blocks: the first one contains links to informations about the MACRO collaboration, in particular on the Bologna group. The access to some links is restricted to MACRO collaborators.

We have inserted in the first part:

- a link to the MACRO publications (publications on refereed journals, MACRO/PUBs, Internal reports, conference proceedings, Laurea and PhD theses, etc.), periodically updated;
- a link to the MACRO on-line page (see Fig. 2);
- short presentations of the physics analyses performed by the Bologna group;

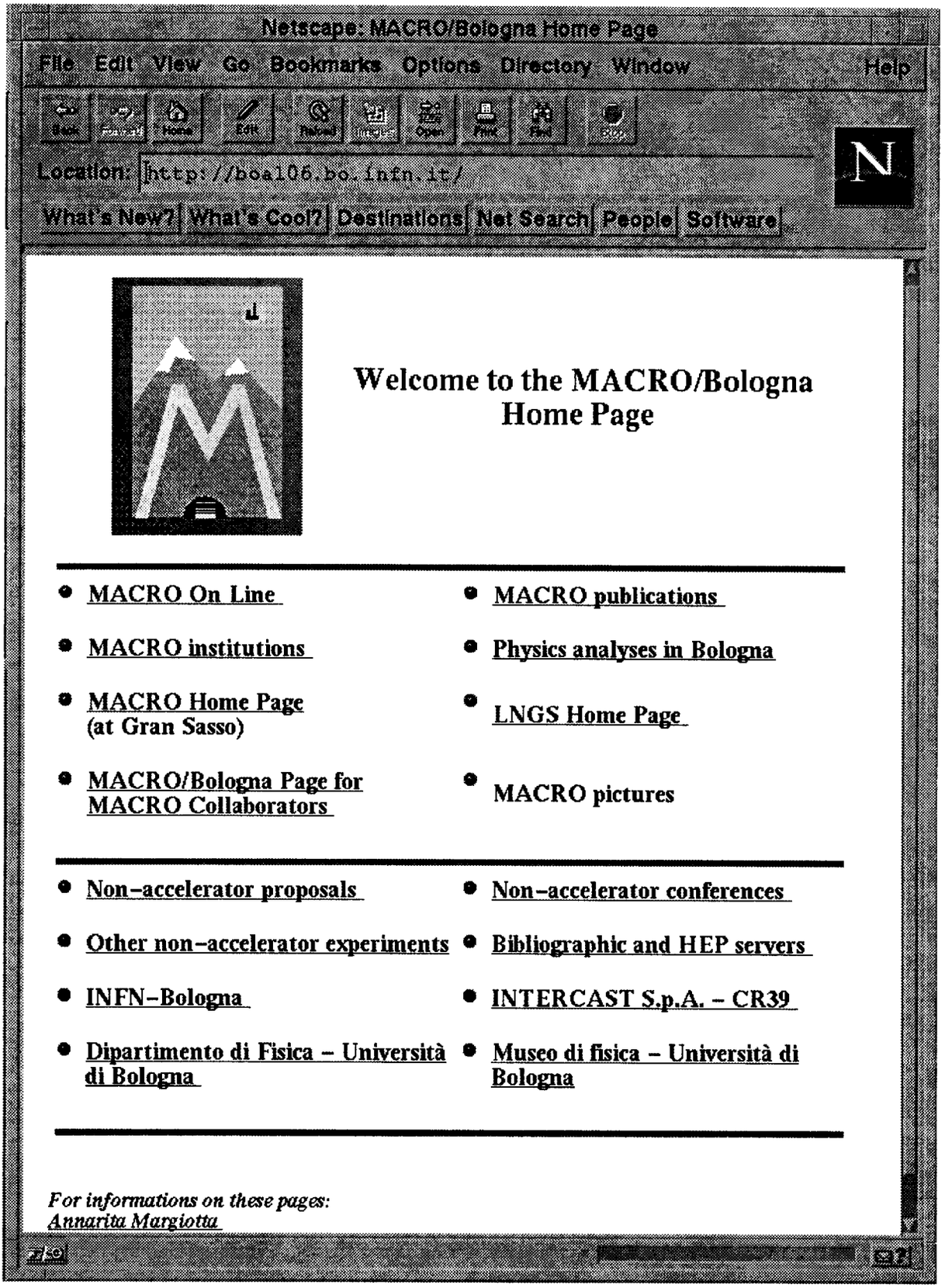

Figure 1: The MACRO Bologna Home Page

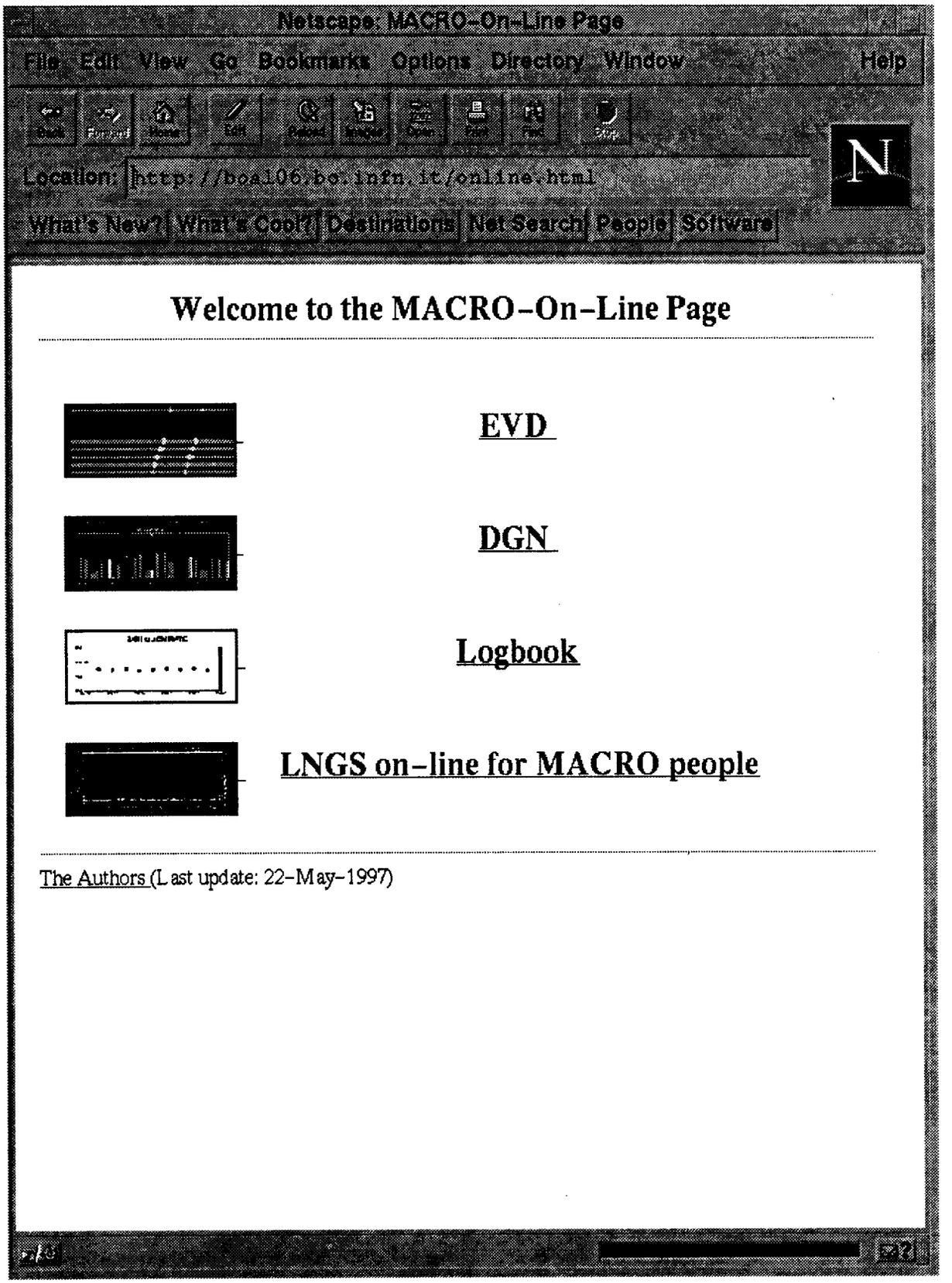

Figure 2: The MACRO On-line Page

- telephone numbers and addresses of collaborators;
- some pages dedicated to the Intercast Europe Company and to the CR39 nuclear track detector used in the experiment;
- links to the LNGS Home Page;
- list of all the MACRO Collaborating Institutions.

The realization of a collection of pictures (plots, photos, posters, etc.), in postscript and/or gif format, of the MACRO experiment is in progress.

The second part of the page contains links to sites of general interest:

- web pages of non-accelerator physics experiments;
- web pages of non-accelerator physics conferences;
- bibliographic and preprint servers (SLAC, CERN, DESY, etc.);
- proposals or letters of intents for new non-accelerator experiments ;
- local pages of the Bologna University and of the Sezione INFN of Bologna.

The MACRO On-line page (see fig. 2) allows the choice of selecting the EVent Display, the DiaGNostic system and the electronic logbook informations. These options are described in the next Sections.

3. MACRO On-line: EVent Display (EVD)

The present version of the MACRO EVent Display (EVD), that is running on the dedicated on-line vaxstation VSMAC2 at Gran Sasso, produces for every event one picture (in format GIF, via the PGPLOT LIBRARY Version 5.1 [10]) of the global view of the apparatus, including wires, strips, scintillators and vertical "walls" with hits in the detector (this view is normally indicated as Projected View; other views, also in 3D, are presently not yet available on the Web).

The Macro EVent Display Page discussed here, copies on the Bologna WWW server (via ftp) and displays the last event stored on the vaxstation at Gran Sasso.

Clicking on the box "Auto Refresh" (see Fig. 3) a new picture is requested and transferred every 10 seconds from VSMAC2. Clicking on the box "Stop", one stops the automatic mode and returns to the "normal request" mode. Fig. 3 shows a typical event with several parallel muons.

It is important to remark that the pictures in the GIF format are produced and stored only if EVD is properly running in automatic mode in the vaxstation at Gran Sasso and if at the same time the reading of the events is made.

4. MACRO On-line: DGN

The MACRO DiaGNostic system (DGN) reads the MACRO on-line data from an acquisition system parallel to the official one. The data are acquired, processed and displayed by several tasks concurrently running on the vaxstation VSMAC2. The visual ispection of the graphs produced by the tasks can be very useful to quickly discover possible malfunctionings of parts of the apparatus.

A selected number of pictures are made available on the this Web page, as listed on Fig. 4. Because of the software complexity of the system, the GIF files are produced

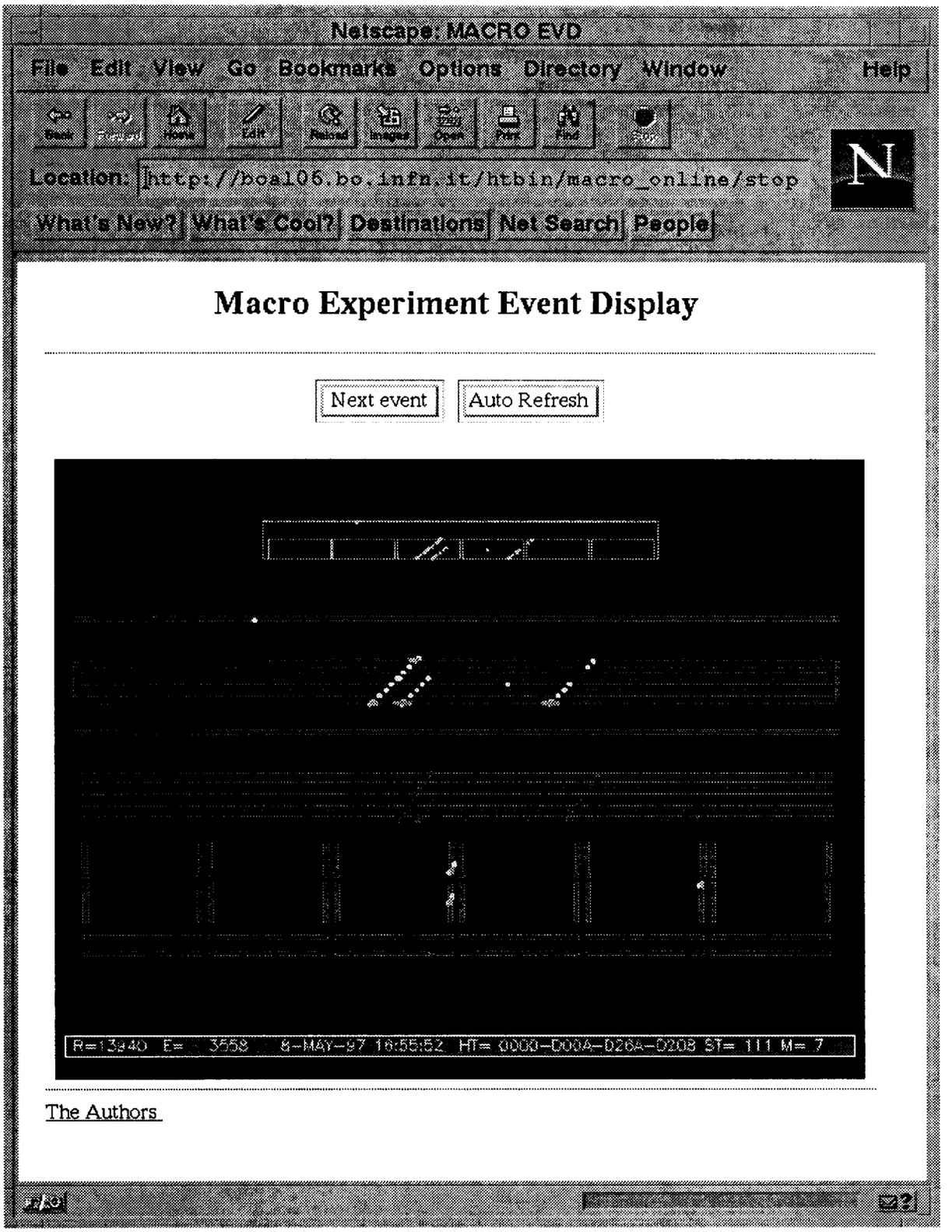

Figure 3: The MACRO EVent Display (EVD) (global view) showing a muon bundle of 3 muons. (a) Top part: global side view of the detector; (b) Central part: side view of the detector: scintillation counter hits are shown as orange boxes, streamer wire hits are shown as yellow stars; (c) view along the strips on the horizontal limited streamer tubes (the hits are shown as red stars); (d) views of the "vertical walls".

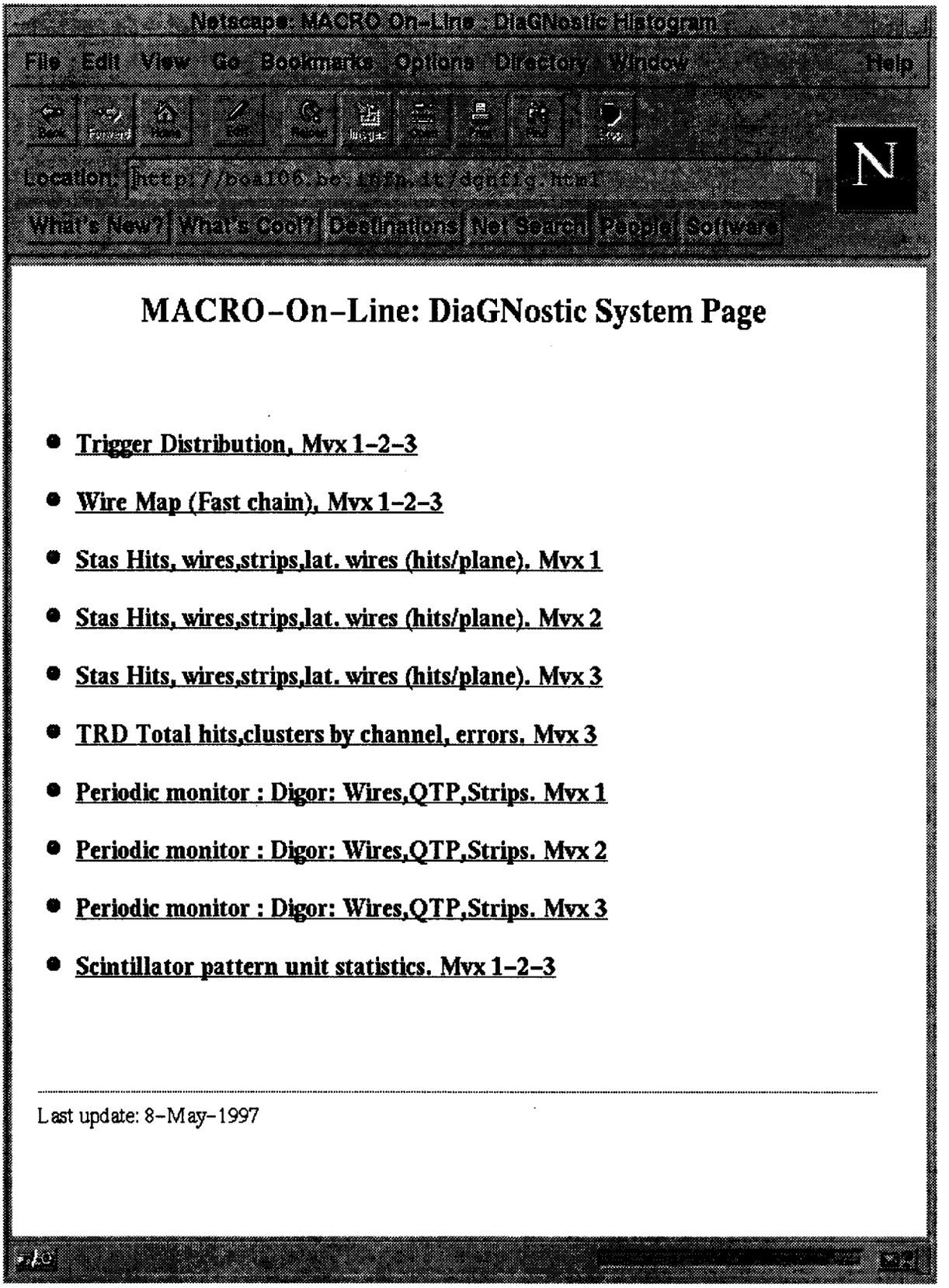

Figure 4: The MACRO DGN Page.

starting from postscript pictures already stored by DGN and then transformed on standard GIF format by the Ghostscript [11] and ImageMagick [12] applications installed on the on-line vaxstation. A new set of refreshed pictures are produced every 15 minutes by the on-line running DGN.

The list of the available pictures is given on the DGN Web page. Clicking on one of them, the corresponding last picture stored is transferred and displayed. In this page a simple menu allows to obtain quickly also the other pictures. In Fig. 5 and 6 are shown two examples of the graphs which may be plotted in the Dgn Web page.

5. Controls based on the electronic logbook

At the end of each run a number of informations (run number, start time, run duration, number of triggers, events from each trigger type, dead times, etc.) are automatically collected by an "electronic logbook". These informations are made in a graphic form with the use of the program WRITER.

On entering the Macro Experiment Logbook page one finds explanations on how to use this new online feature; clicking on three boxes at the end of the page let you choose the histograms to plot and the runs (see Fig. 7).

The first box at the bottom left contains the words Fast Track Rate and a little icon at the end; clicking on this box a new window appears containing the names of the quantities one can plot (see Fig. 8). Select your choice by clicking the mouse and moving the pointer on the desired name of the histogram and releasing the mouse button (with some browsers you have to click on it): the window disappears and in the box appear the selected words; if you make a mistake repeat the procedure.

Now choose the runs you want to control. Select the first run by clicking in the box after Start Run:, and type the run number; type the last run in the box after End Run:. Remember that transferring and elaborating the data take network and CPU time, so it is usually preferable to plot only a small number of runs.

Check the selections, and if they are OK, click on the box with the word Go! to start the procedure plot.com. The job runs the program webwriter.exe that gets the data from the Macro database at Gran Sasso to the Web server at Bologna and elaborates easily readable files. Then Paw is run, and a kumac is executed and a postscript file is created; via the new versions of Ghostscript [11] and ImageMagick [12], the procedure transforms the postscript file in a GIF picture. A new Web page is created in real time; it contains the chosen histogram and the boxes described above, from which you can continue to plot and check histograms, see Fig. 9 and 10 for two examples.

6. Conclusions and Perspectives

The on-line and the electronic logbook systems of controls of the MACRO experiment have been implemented in the WWW server in Bologna. They are now easily accessible by any member of the collaboration and allow a thorough check of every part of the Detector.

Future improvements will include faster tracking on the whole apparatus using a new electronic module, several software improvements and new displays.

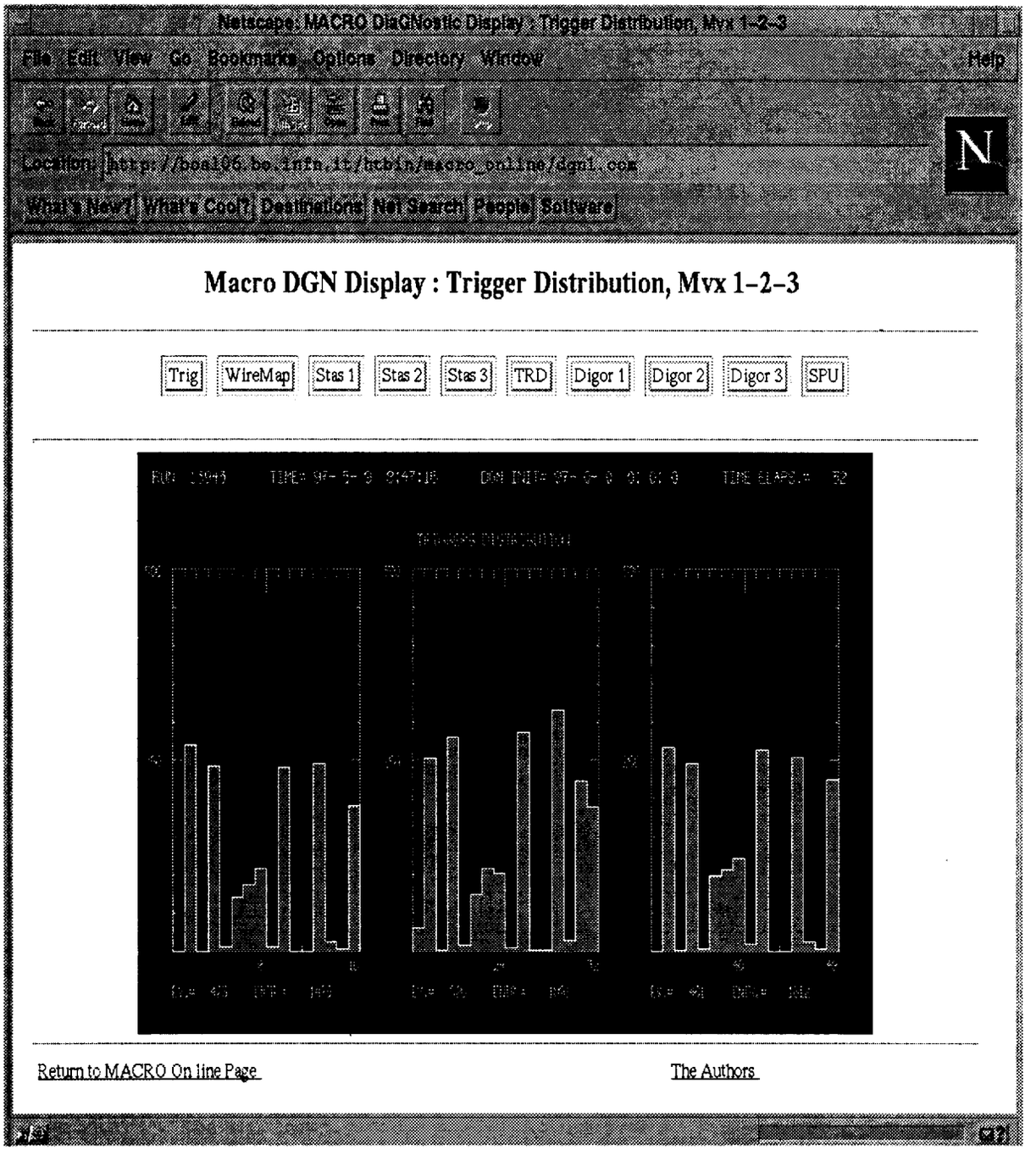

Figure 5: One example of a MACRO DGN display: Trigger distribution: for each type of trigger is given the number of triggers obtained during the present run; f.i. triggers 2, 18 and 34 are the Bari muon triggers)

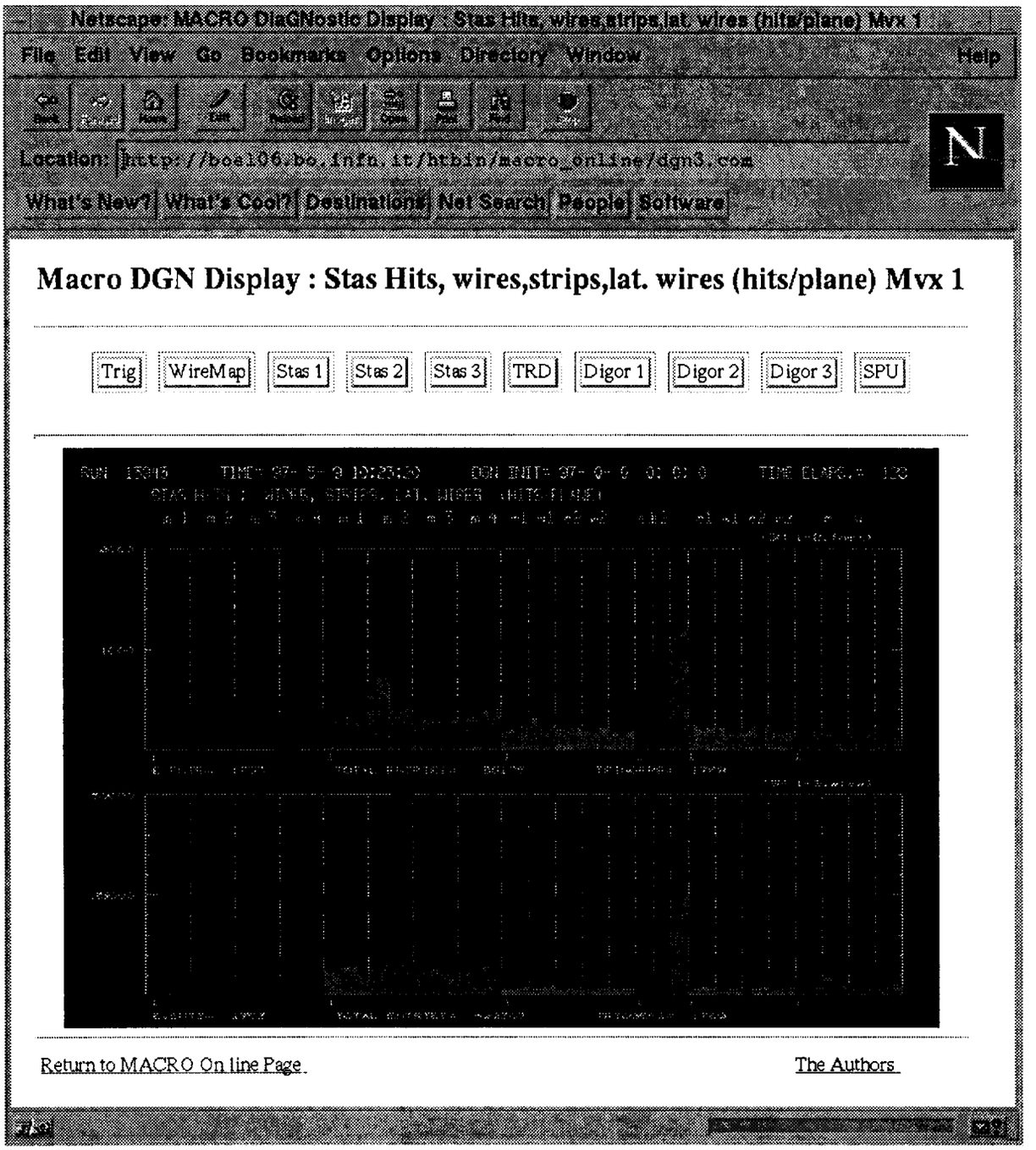

Figure 6: Second example of a MACRO DGN display: Counting rates for streamer tubes: starting from the left hand upper graph, one finds counting rates for wires (blue hist.), strips (red hist.) and lateral wires (pink hist.) for the lower and upper parts of MACRO.

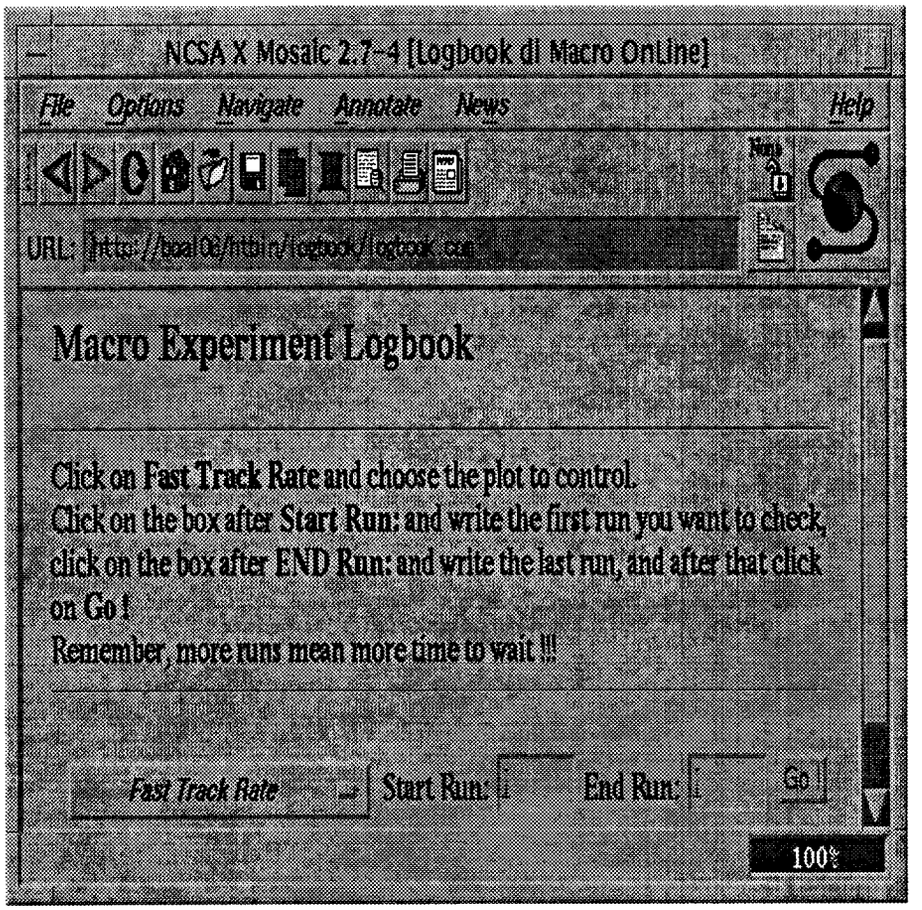

Figure 7: The MACRO electronic logbook Page.

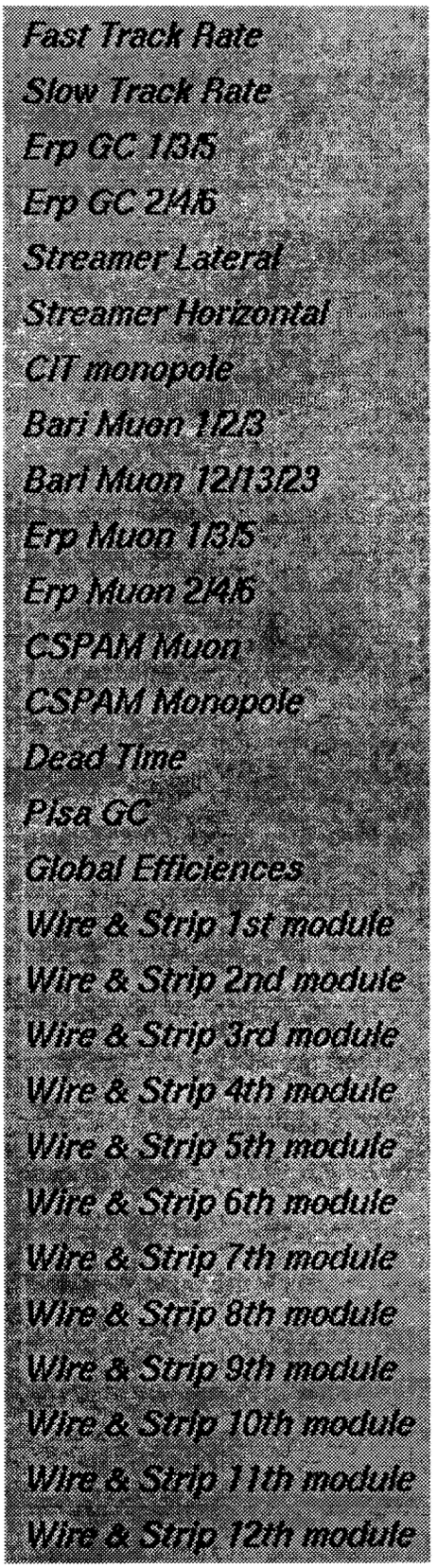

Figure 8: Window of the electronic logbook histogram selection.

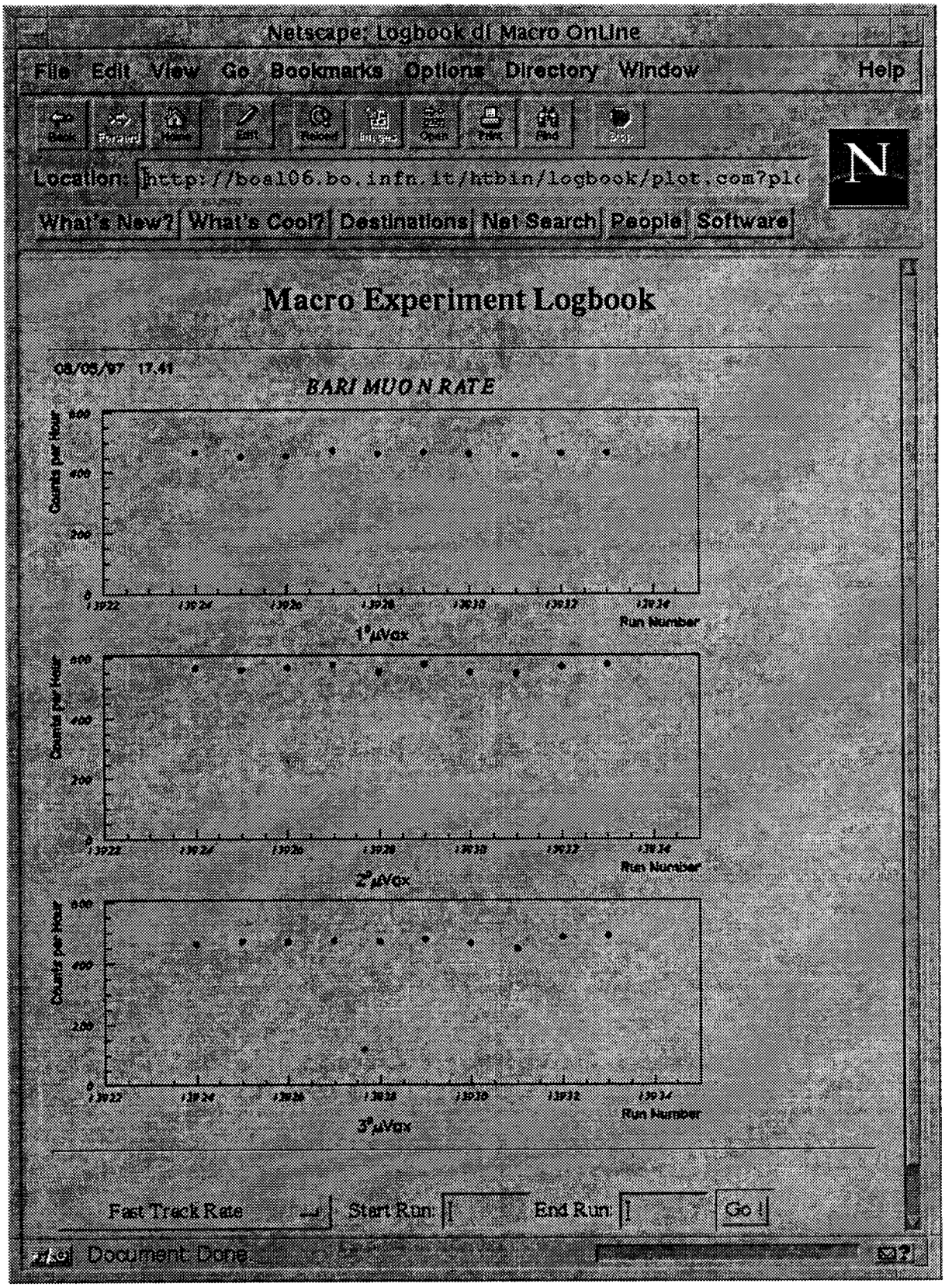

Figure 9: Example of the electronic logbook checks: histograms of the number of "Bari muon triggers" per hour per μVax versus run number.

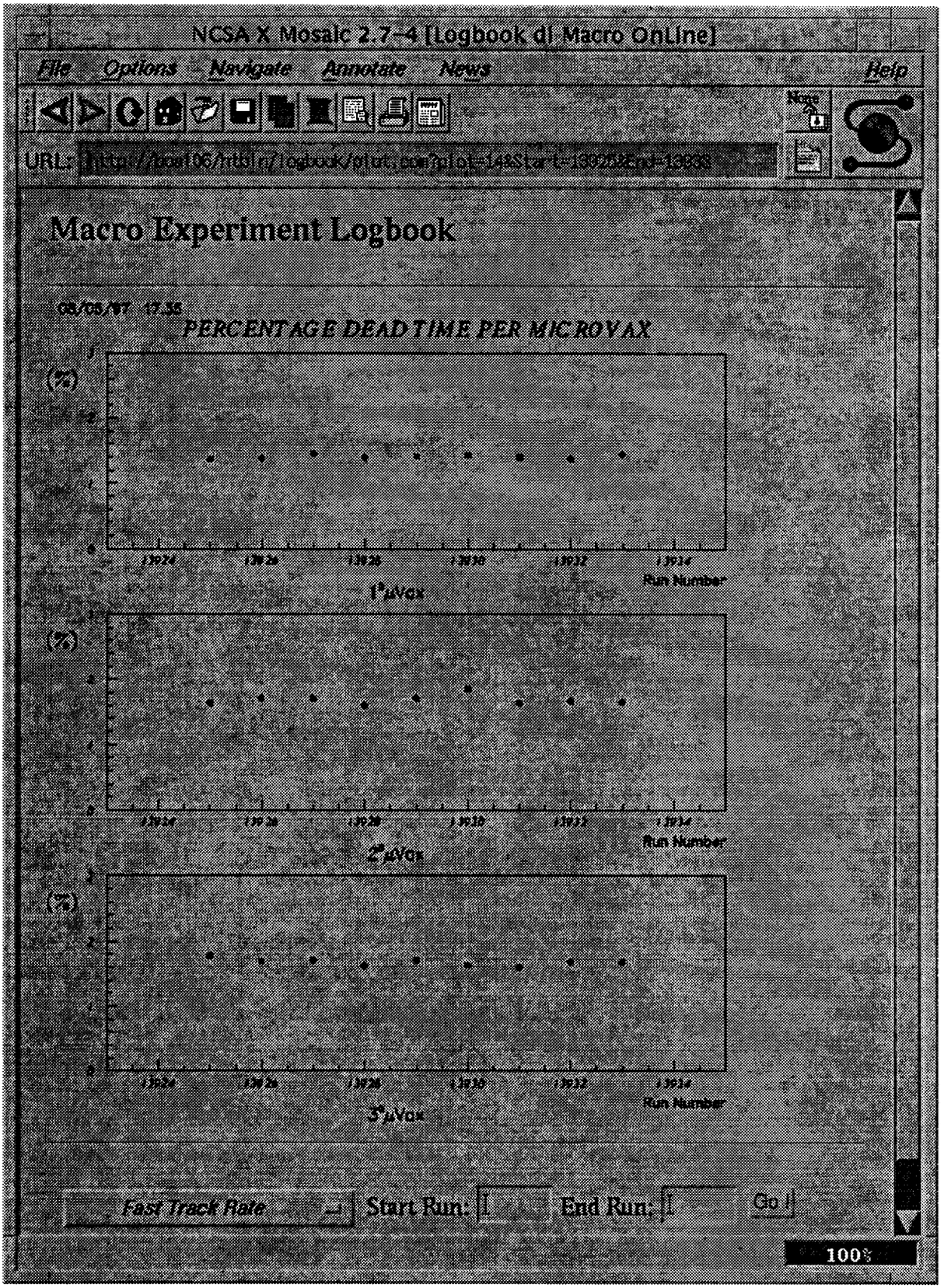

Figure 10: Second example of the electronic logbook checks: histograms of the percentage detector dead time per μVax.

We would like to thank the members of the MACRO collaboration for their cooperation, the Electronic laboratory, the Computer Service and our colleagues of the MACRO group in Bologna for their help and encouragement.

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[10] PGPLOT Library at: http://astro.caltech.edu/ tjp/pgplot/

[11] Ghostscript at: ftp://ftp.cs.wisc.edu/pub/ghost/aladdin

[12] Imagemagick at: http://www.wizards.dupont.com/cristy/imagemagick.html