

Procedures and analysis tools for the study of correlations between EEE telescopes

ADDENDUM

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Summary:

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1. Introduction

This document has to be intended as an addendum to the documentation already available on the analysis tools for the study of correlations between EEE telescopes. Unlike the previous documentation, that was a base guide to introduce school students and teachers to the analysis of coincidences between telescopes, this addendum is addressed to people that intend to systematically analyze huge amount of experimental data.

The algorithm used is the same described in the full documentation. However, since the final goal is to run the analysis on many sets of data, the user can speed its analysis by directly running the algorithm on the machines where the data are stored.

2. Prerequisites

To run the analysis at CNAF, the user must be able to:

- Have access to the data. Currently the data collected by all the EEE telescopes are automatically transferred to some machines located at CNAF, where the reconstruction procedure takes place. In order to have access to the CNAF resources follow the instructions described in Appendix A.
- Browse the available data. After the reconstruction, the data are saved at CNAF into ROOT files in the path /home/analisi/recon. These files contains a ROOT tree called “Events” (that is used as input for the correlation analysis), together with other trees and histograms useful for other kinds of analysis.
- Have access to the latest version of the code. The whole code of the EEE experiment is managed through the GitHub repository hosting service. To join the Centro Fermi organization on GitHub contact Fabrizio Coccetti <fabrizio.coccetti@centrofermi.it>.
- Compile and run the code at the CNAF machine.

3. Run the analysis at CNAF

Once logged in the CNAF machine, the user have to firstly compile the macro `correlation_EEEcnaf.C` (located in `/home/eesoft/e3analysis/coincidence`), by typing:

`./compileClass`

Alternatively, `./compileClass3` will compile the code for triple coincidences (config file should be as `config_correlation_EEE3.txt`).

Once compiled you can run:

`./analisiCoincAtCnaf.exe -d 2015-04-03 -s BOLO-01 BOLO-03 -p /recon`

To select the telescopes and the period for the analysis, it is possible to use the usual configuration file (as described in the full documentation) or add the info you want to pass from command line using options like: `-d` (date), `-s` (2 schools) or `-p` (path).

You can also run the analysis for triple coincidence:

`./analisiCoincAtCnaf3.exe 2015-03-12`

adding the date if you want to replace the one in the config file.

4. Output files

The main output file is the ROOT correlation tree already described in the full documentation. With respect to the previous version, some new variables have been added to the original tree as shown in Fig. 1.

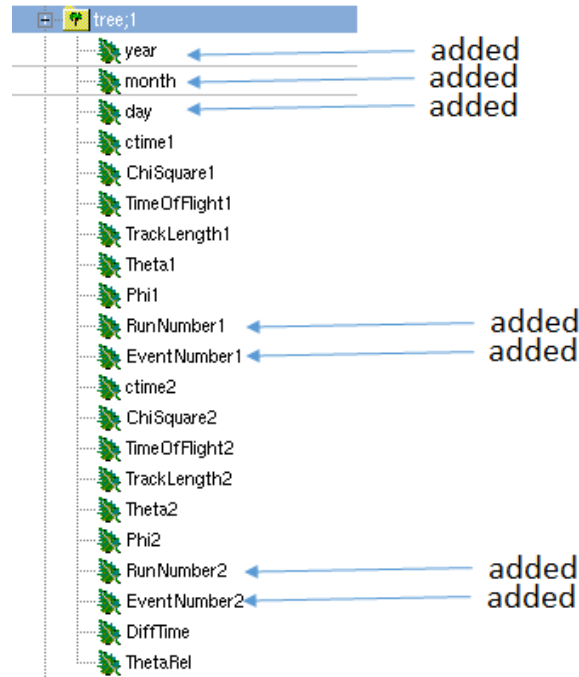


Fig. 1: List of variables saved in the main output tree.

In the same output file, the code saves three additional trees: treeTel1 and treeTel2, which contain quality parameters for each telescope (year, month, day, run, timeduration, ratePerRun, rateHitPerRun, fractionGoodTrack), and treeTimeCommon, that contains the overlap time information for the two telescopes (year, month, day, run, run2, timeduration).

In summary, the output file produced by the correlation code contains the trees shown in Fig.2.

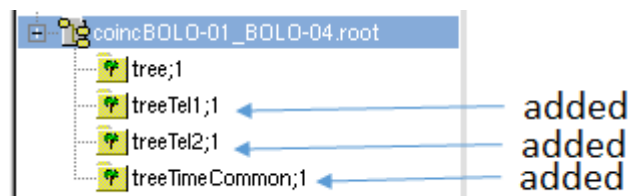


Fig. 2: List of trees saved in the output file.

Appendix A: accessing the CNAF resources

The procedure to follow in order to have access to the CNAF resources is the following:

1. Fill the form available at <https://www.cnaf.infn.it/sites/default/files/accesso-cnaf-IT.pdf> and send it by fax (+39 051 2095 477).
2. Once your personal account has been created, you will receive the username and the password for the login (“ssh USERNAME@bastion.cnaf.infn.it”).
3. Once logged in, change the password (using the “passwd” command).
4. Connect to the user interface using the same username and password (“ssh ui-tier1.cr.cnaf.infn.it”).
5. Create the public and private key by typing the command "ssh-keygen".
6. Copy the public key "ssh/id_rsa.pub" to your local machine and send it to the machine managers (Enrico Fattibene <enrico.fattibene@cnaf.infn.it>, Andrea Ferraro <andrea.ferraro@cnaf.infn.it>).
7. Once the managers have copied your public key to the virtual machine used for the analysis, you can finally have access to it by typing “ssh -i PUBLICKEY USERNAME@cloud-vm185.cloud.cnaf.infn.it”.