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# The Detector Monitoring System

# user manual

F.Berni, F. Carbognani, V. Dattilo, F. Gherardini, G. Hemming, D. Verkindt

**VIR-0192A-12**

https://tds.ego-gw.it/ql/?c=9006

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# Change Record

| Version | Date | Section Affected | Reason / Remarks |
|---|---|---|---|
| **VIR-0192A-12** | | **All** | |

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# 1. Introduction

## 1.1 Scope

This document describes the features, the software implementation and the upgrades of the Detector Monitoring System, which, in its first implementation, was used in the control room to monitor the detector status and to give in an easy way any information about possible problems and malfunctions.
This document describes also how to edit and work on the configuration file and how to use the various web interfaces.

## 1.2 Abbreviations and Acronyms

| **Abbreviation/Acronym** | **Description** |
|---|---|
| DMS | Detector Monitoring System |
| CDB | Connection Database (https://tds.ego-gw.it/ql/?c=8774 , https://tds.ego-gw.it/ql/?c=8905) |
| AJAX | Asynchronous JavaScript And XML |
| CSS | Cascading Style Sheets |
| HTML | HyperText Markup Language |
| HTTPS | HyperText Transfer Protocol Secure |
| GPL | General Purpose Licence |
| PHP | Pre-Hypertext Processor |
| UI | User Interface |
| W3C | World-Wide Web Council |
| XHTML | eXtensible HyperText Markup Language |

## 1.3 Glossary

| Term | Description |
|---|---|
| Active Directory | Microsoft user management service |
| LDAP | Lightweight Directory Access Protocol (http://en.wikipedia.org/wiki/Lightweight_Directory_Access_Protocol) |
| AJAX | Browser-server asynchronous communication kit |
| Apache | Open source web server (http://httpd.apache.org/) |
| DIV | Block-level HTML element (http://www.w3.org/TR/html401/struct/global.html#h-7.5.4) |
| IIS | Microsoft web server |
| JavaScript | Browser-side scripting language (http://en.wikipedia.org/wiki/JavaScript) |
| jQuery | Javascript library (http://jquery.com/) |
| JpGraph | JpGraph is an Object-Oriented Graph creating library for PHP >= 5.1 The library is completely written in PHP and ready to be used in any PHP scripts (both CGI/APXS/CLI versions of PHP are supported) (http://jpgraph.net/). |
| MySQL | Open source database software (http://dev.mysql.com/) |
| PHP | Server-side scripting language (http://www.php.net) |
| Foxbox | Hardware gateway to send and receive SMS or MMS (reception only) messages using a commercial SIM card (http://www.smsfoxbox.it/). |

## 1.4 Related documents

- The Detector Monitoring System – Authors: F.Berni, F. Carbognani, V. Dattilo, F. Gherardini, G. Hemming, D. Verkindt - (VIR-0191A-12) - https://tds.ego-gw.it/ql/?c=9005 .

# 2. What is DMS?

The DMS is a tool based on a set of monitoring processes providing the needed information and a WEB tool intended to collect, further process, archive and display/notify, in a centralized way, the information regarding the status of the ITF, the technical infrastructures, the electronics equipment, etc... This information is displayed as a *"multi cell"* table, where each cell, named **flag,** denotes the status (codified by a color) of a specific item.

In case of problem the system can perform several types of notification. All the various information is stored in MySQL databases and can be retrieved through dedicated WEB interfaces.

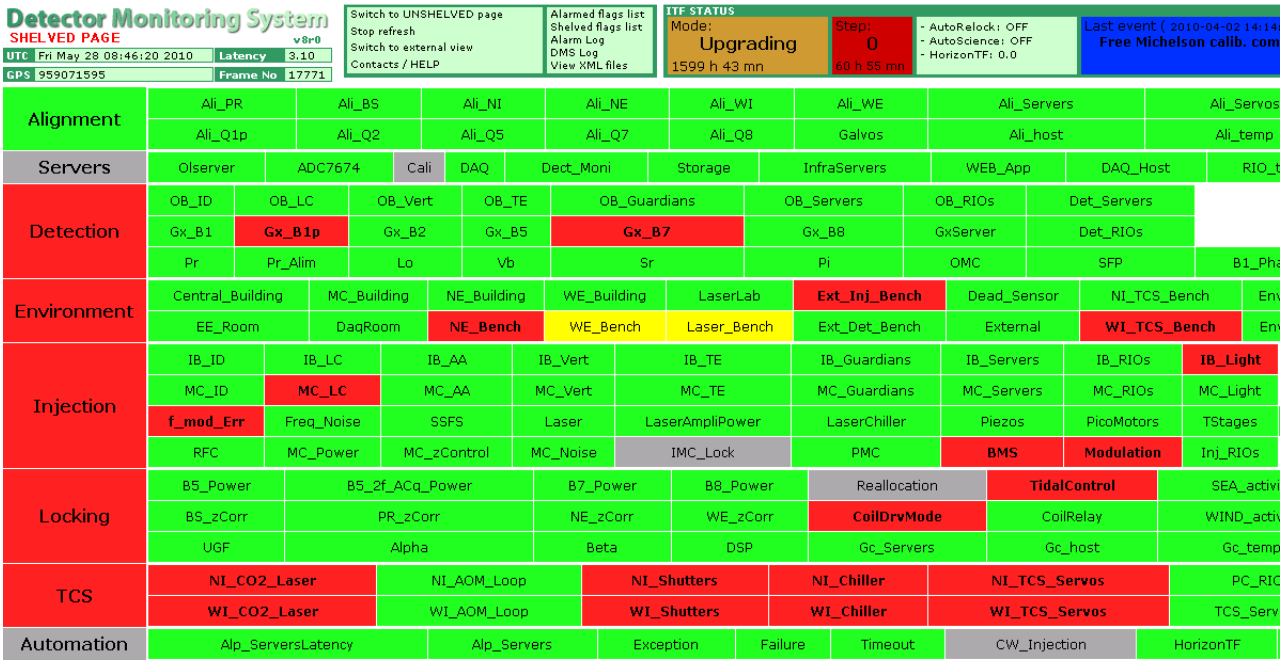



*Fig. 1: DMS Main page*

The information is provided in a hierarchical way and with more features: by clicking on each flag a new page displaying additional info is opened.

Some kind of efficient notifications of the event, besides the displaying on the screen, like SMS, email, or sound has been implemented to avoid that sometime the operator may not realize in due time an event occurrence, thus delaying the triggering of some action or to request the intervention of the on-call person.

## 2.1 How does it work

There are specific monitoring tools (Moni processes, BigBrother, etc …) which can read information from the DAQ; these monitoring tools can perform well defined mathematical/logic operations on that data and finally they send the output to XML files with a predefined structure.

A dedicate PHP script (named *server_db.php*), according to its configuration file, reads these XML files and it translates the information written in the XML files into a MySQL database.

Another dedicated PHP script (named *server_DMS.php*) reads the data stored inside the db and according to its configuration file it implements a set of functionalities and it performs all the necessary operations to fit the requirements.

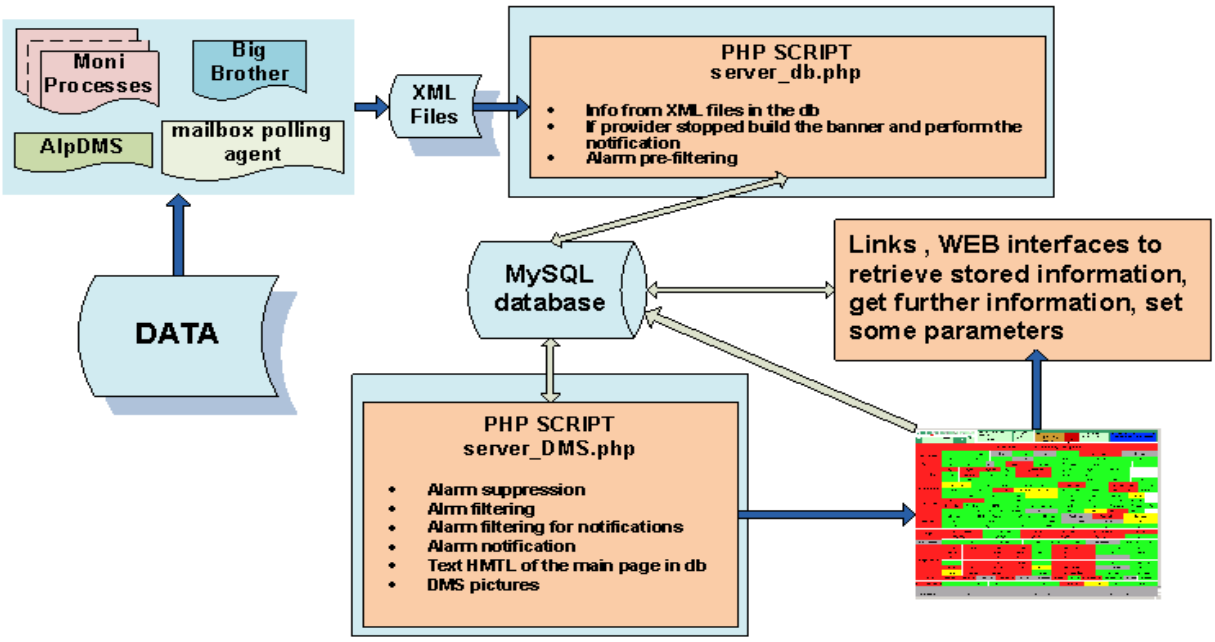



*Fig. 2: General structure of the system.*

A set of functionalities have been implemented in order to better display the information and to filter, reduce as much as possible “false” alarm activations (see paragraph 3.3 – The DMS functionalities).

## 2.2 Diagram block

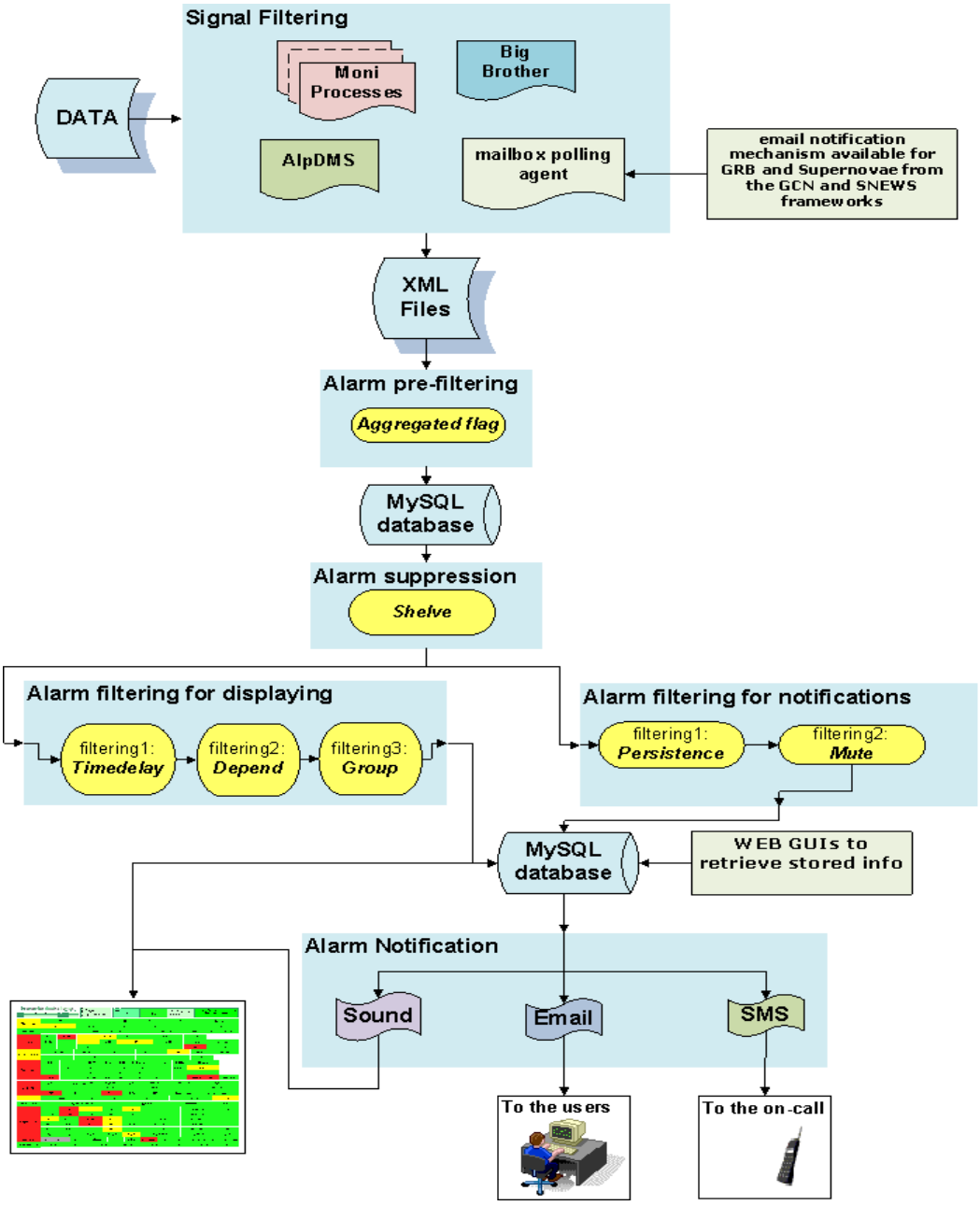



*Fig. 3: Sequence of the implemented functionalities in order to have a better flag displaying and to reduce as much as possible false alarm activations.*

# 3 How to use the DMS

As described before, the DMS is a WEB based tool having a hierarchical structure; in the main page it is resumed all the information concerning the interferometer's status. From the main page it is possible open some other WEB page to get further information.

## 3.1 How to open and use the "Main Page"

The main page can be opened:

- from the homepage of Virgo ( http://wwwcascina.virgo.infn.it/ ) by clicking on the link "Detector Monitoring System" (bottom left of the page);
- from the homepage of the "Detector Operation" group by clicking on the link in the bottom-right of the page (http://wwwcascina.virgo.infn.it/DetectorOperations/index.htm).
- using the link https://pub3.ego-gw.it/itf/detOp/DMS/index_DMS_ShelvedVersion.php?s=&pause=0

In the main page the information is displayed as a multicell table where each cell is named flag and it denotes the status of a specific item; the flags are grouped within specifics subsystem which are listed in the left column of the page.

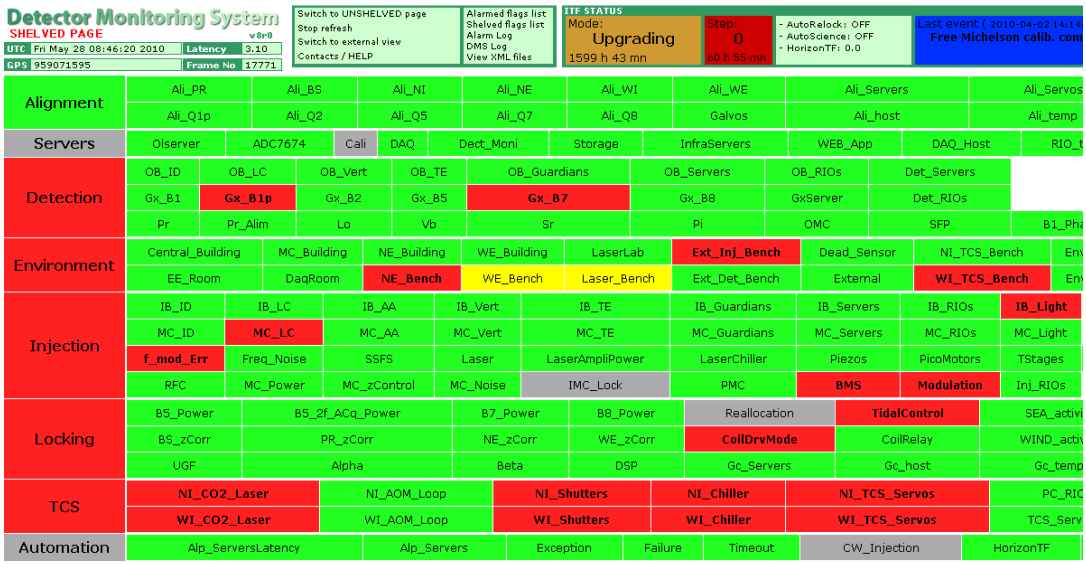



*Fig. 4: DMS main page.*

The message level is codified through a set of colors:

| Flag Color | Denoted State |
|---|---|
| | Problem on that item; it can be the real source of the problem or it can be induced by another item. |
| | The problem is induced by another item. |
| | At least one channel used to compute the flag has corrupted data. |
| | At least one channel used to compute the flag is missing. |
| | Warning on that item: it is almost outside the standard state. |
| | Standard state. |

In the header section of the main page there are complementary information about the date, the ITF step, the ITF Mode and so on…; moreover there are links to open some other WEB pages (see paragraph 3.4- How to use the WEB interfaces -). In case some provider is not updating the relative XML file, a text banner is added below the header section and above the body section.

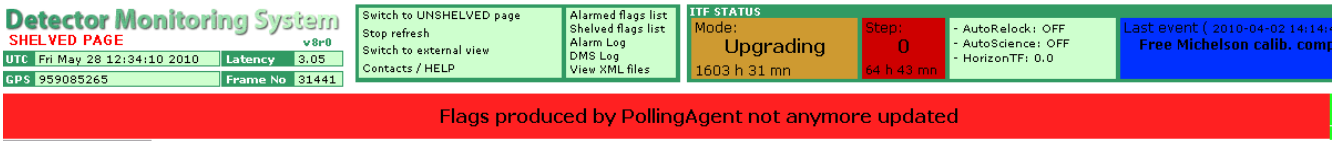



*Fig. 5: Header section of DMS. In this example it has been added the banner which informs that flag produced by the PollingAgent are not updated*

As described before a flag is considered as an item; each flag is constituted by subflags. The subflag can be opened by clicking over a flag on the main page of the DMS.

## 3.1.1 The “Shelved” flags and the “Unshelved” version

The “shelving” is a filtering applied on the flags to remove red flags from the main page and placing them on a dedicated *"shelve"* page. To see how to set the shelving filtering see paragraph 3.4.1 - How to use the “Shelving interface” - .

In the main page of the DMS the overall flags having some shelved subflags are pointed out by the icon: * ; the status of the overall flag is then showed as if the shelved subflag was not present. In this case the overall flag is defined as: **partially shelved**.

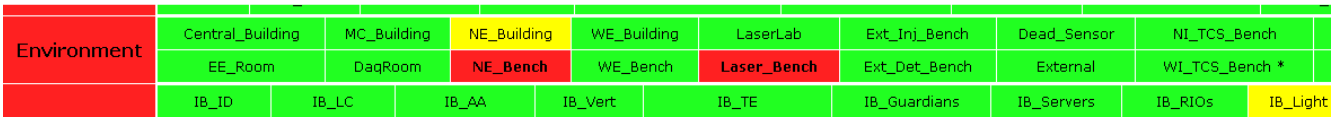



*Fig. 6a: Main Page of DMS; the flag WI_TCS_Bench is partially shelved.*

In the second level section and in the DMSLog section the way to display the flags does not change in the sense that the *"Shelving"* is not applied and the flags are displayed with their real status; the flags and subflags show a message indicating their status.

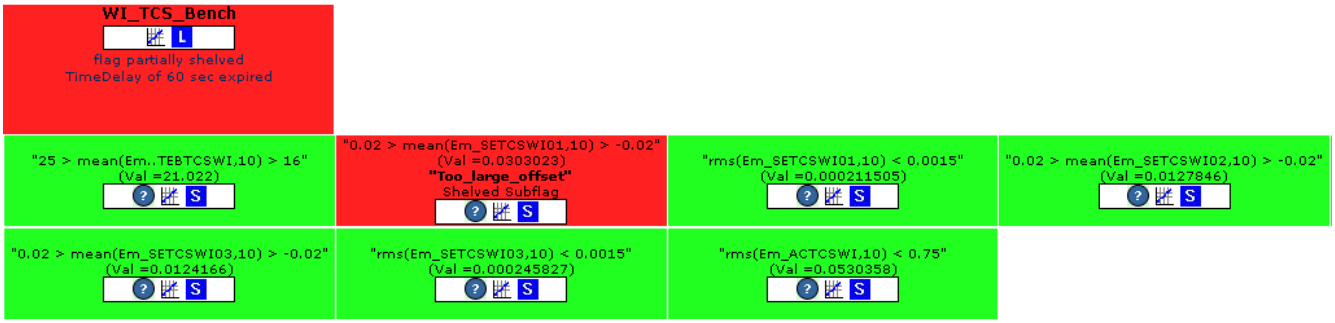



*Fig. 6b: DMS LevelTwo; the flag "WI_TCS_Bench" is partially shelved and the subflag "mean(Em_SETCSWI01,10)" is shelved.*

In the header section of the main page of DMS there is a link ("Switch to UNSHELVED page" ) which allows to see all the flags with their real status; also in this page the shelved flag are pointed out by the icon: *.

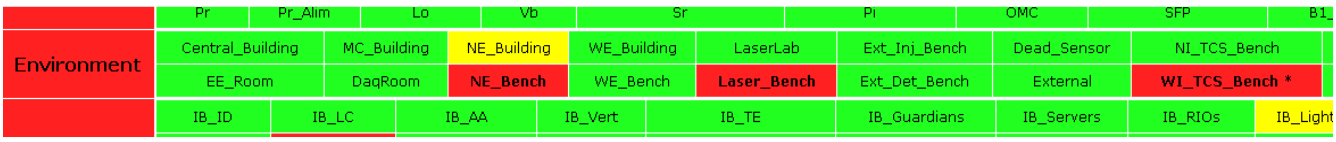



*Fig. 6c: UNSHELVED Main Page of DMS; the flag WI_TCS_Bench is partially shelved.*

In some case an overall flag can be completely shelved and in this case cannot be pointed out in the main page of the DMS but is pointed out in the shelved page of the DMS.

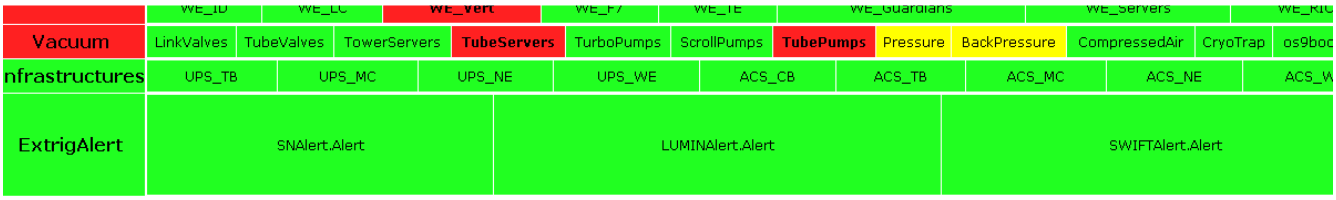



*Figure 7a: Main Page of DMS*

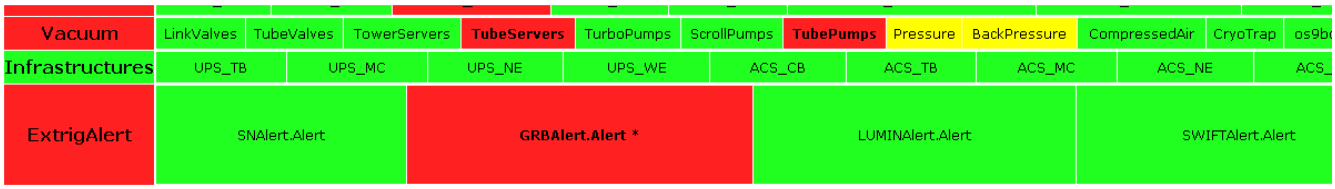



*Fig 7b: UNSHELVED Main Page of DMS*


*Fig 7c: DMS Leveltwo; the flag GRBAlert.Alert is completely shelved..*

The alarm notification is not performed if the flag/subflag is shelved.

### 3.1.1.1 Example figure 6

In figure 6a we are in the main page of the DMS. The flag WI_TCS_Bench is displayed as green and it is pointed out that has some shelved subflags (as we can see in figure 6b). As all the other subflags are green the computed status of the "shelved" overall flag is green and it is correctly displayed in the specific page (as we can see in figure 6a). In figure 6c the flag is displayed with its real status meaning that the subflag are not shelved.

#### 3.1.1.2 Example figure 7

In figure 7a we are in the main page of the DMS. The flag GRBAlert.Alertis completely shelved thus not displayed on the main page. Is instead displayed in “Unshelved main page” (figure 7b).

### 3.1.2 “Stop refresh”

Clicking on this link in the header section you stop the refresh of the content; this means that the system (at client-side) is frozen at the moment of the stop.

### 3.1.3 The Internal/External view

The “External view” allows the user to access the system from a public machine; the system is automatically open in “external view” .
The “Internal view” allow the user to access the system from on a host that is on the *Cascina* network within the firewall. This, of course, restricts access to the application and means that users wishing to gain access to it from without the network, must first authenticate themselves at the level of the firewall.
Some WEB interfaces that can changes the system settings (Shelving interfaces, Muting interfaces) can be open only from the “Internal view”.

## 3.2 How to open and use the “Level Two page”

The Level Two page has the same structure of the Main Page, the header and the main page that shows the flags in detail: status of the flag, name of the channel monitored, thresholds and current value; it is possible to interact with the single flag using the graphical link below its to perform the shelving/muting, to leave a comment or to display a plot.

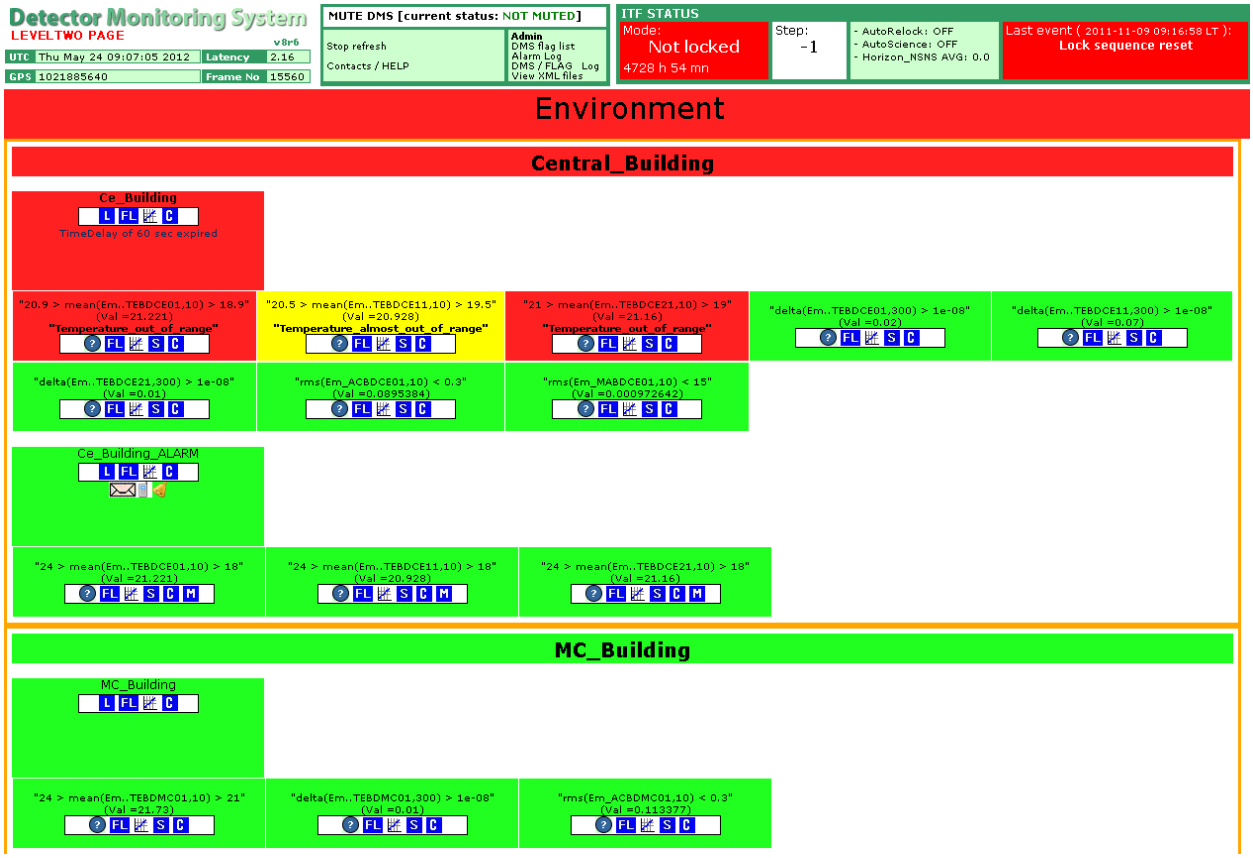



*Fig. 8: DMS Level Two page. This page is opened by clicking on the flag "Central_Building" in the main page. In this page we can see additional info of the flag "Central_Building". On top of this "Level Two page" the header information are still displayed.*

The WEB page can be opened by clicking over a flag on the main page of DMS; from the opened WEB page it is possible to have additional info about the flags and clicking over the icons it is possible to reach others WEB pages.

At this level we can see that the overall flag displayed on the main page is actually constituted by "subflags"; each subflag shows: the signal name; the thresholds inside which the signal has a regular behavior (green flag), a possible irregular behavior (yellow flag), an irregular behavior (red flag).

In case of irregular behavior the subflag shows also a message; this message is stated in configuration files of the Moni processes.

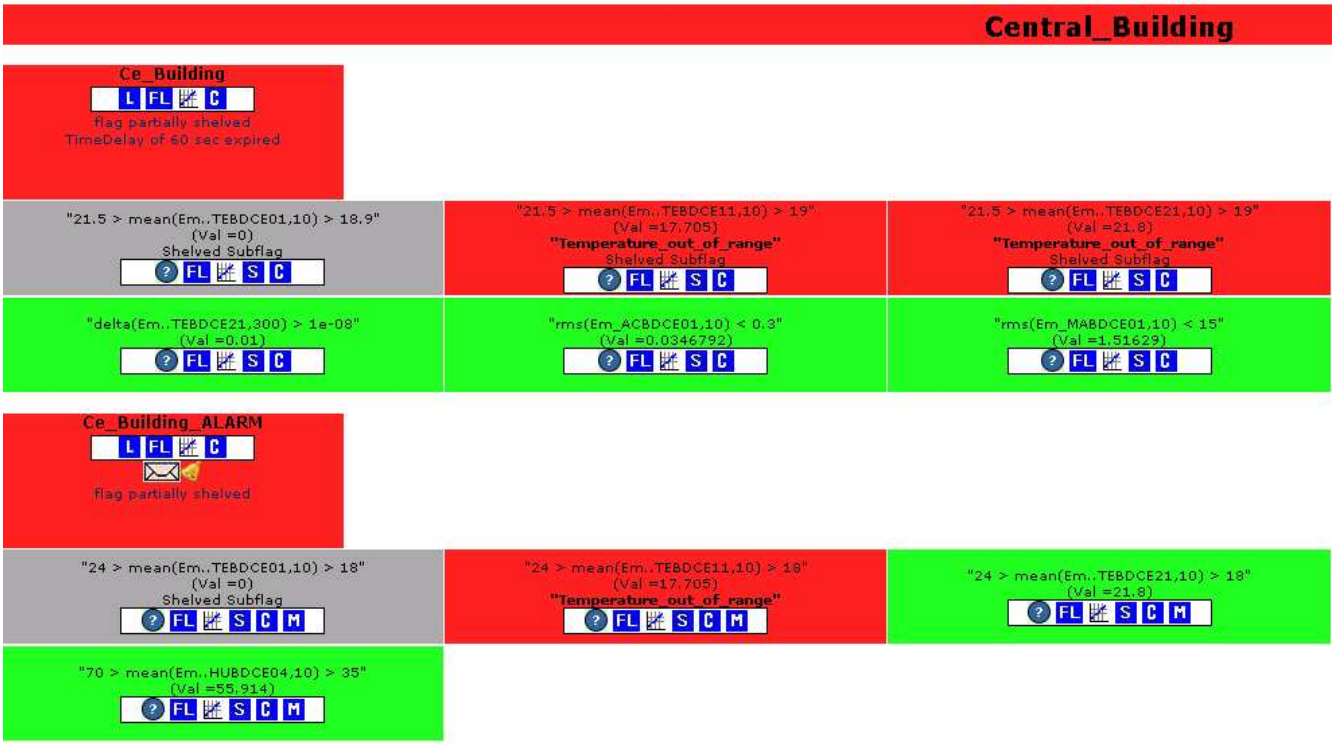



*Fig. 9: Detail of flag in the DMS level two page. We can see the subflags which constitute the main flags and all the possible icons that allows to reach other WEB interfaces.*

The subflags have also some icons and by clicking on it is possible to open other WEB interfaces that give additional info.

Details of the icons:

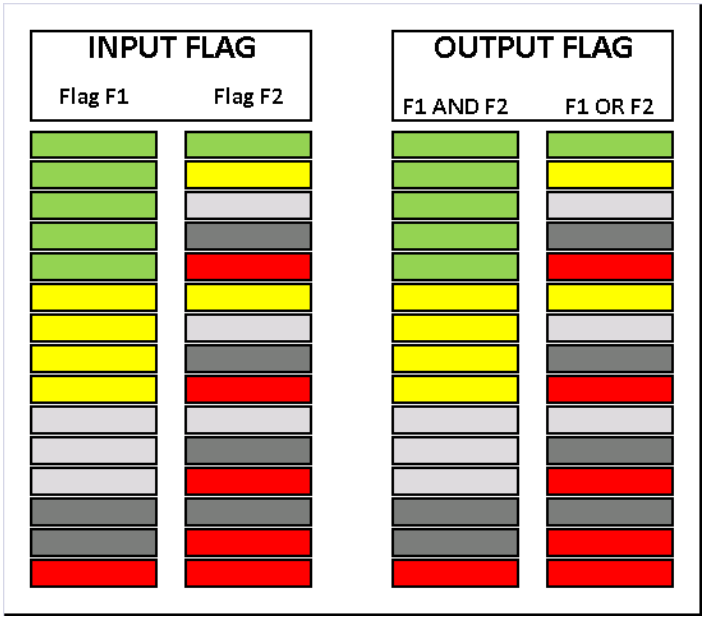
- clicking on it is possible to open a plot which show the evolution of the status (the color) of the overall flag or the evolution of the signal of the subflags (see paragraph 3.4.4 - How to use the “DMS Plot” -).
- L clicking on it possible to open the main page of the *DMSLog* and the parameters are automatically to set to search the red status of the flag in the last five days (see paragraph 3.4.5 - How to use the “DMS Log” - ).

-  this icon indicates that the flag is alarmed and it can perform the alarm notification sending an email; keeping the mouse cursor over this icon a *JavaScript tooltip* is opened and it shows information about the alarm configurations.
-  this icon indicates that the flag is alarmed and it can perform the alarm notification sending SMS; keeping the mouse cursor over this icon a *JavaScript tooltip* is opened and it shows information about the alarm configurations.
-  this icon indicates that the flag is alarmed and it can perform the alarm notification playing a sound and blinking; keeping the mouse cursor over this icon a *JavaScript tooltip* is opened and it shows information about the alarm configurations.
-  clicking on this icon a link we are automatically redirect to the "*ITF Procedures*" (https://pub3.ego-gw.it/procedures/index.php?areaid=1); in particular we are automatically redirected to the procedure of that flag.
  If the procedure is not present the user can create it after authentication.
-  clicking on this icon it is possible to open a popup-window to set shelving parameters (see paragraph 3.4.1 - How to use the "Shelving interface" -).
-  clicking on this icon it is possible to open a popup-window to set shelving parameters (see paragraph 3.4.2 - How to use the "Muting interface" -).
-  clicking on this icon it is possible to open a popup-window to leave a comment ( see paragraph 3.4.3 - How to use the "Comment interface" -).
-  clicking on it possible to open the main page of the *DMS Flag Log* and the parameters are automatically to set to search all the "events" for the flag in the last twenty days (see paragraph 3.4.6 - How to use the "Flag Log" - ).

# 3.3 The DMS functionalities

## 3.3.1 The "Aggregated flags" pre-filtering

It is a new flag created as a result of a logic expression among the flags. The available logic operators are "OR","AND". The new created flag is treated as all the other flags and can have associated all the others functionalities. The status of the new flag is computed following this multicolor truth table:




To know how to create an "Aggregated flag" see paragraph: 4.2.3 - How to add a new "Aggregated flag" -.

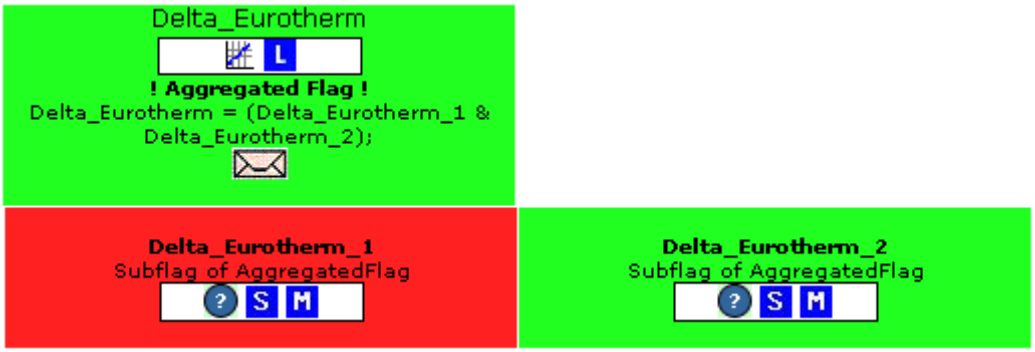



*Fig. 10: Detail of the flag displayed in DMS LevelTwo section.*

### 3.3.1.1 Example figure 10

The flag *"Delta_Eurotherm"* is an aggregated flag. The subflags of the aggregated flags are actually overall flags.

## 3.3.2 The "Timedelay" filtering

It is a filtering to reduce the red flags activation on the main page of the DMS.

Generally it is a functionality to hold back the alarm for a fixed time, and if the signal does not return to normal operation within that time, the alarm is activated; to know how to set this filtering see paragraph: 4.3.3 - How to set the "Timedelay" filtering - .

In our case the alarm is a red flag; if a flag with the *"Timedelay"* filtering applied becomes red it is temporary displayed as yellow in the main page of the DMS; if the alarm is continuously active during the specified set time the flag will be displayed as red.

In the LevelTwo section the way to display the flags are displayed with their real status; the flags show a message indicating whether *"Timedelay"* counting is in progress or expired.

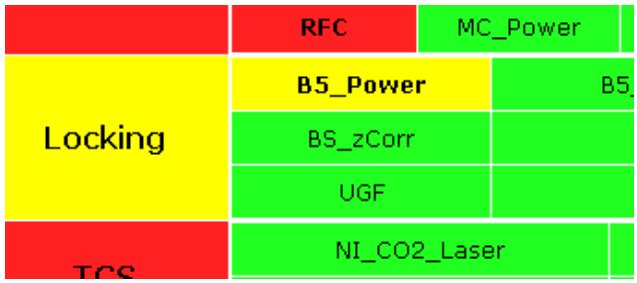



*Fig. 11a: Detail of the Main Page of DMS.*

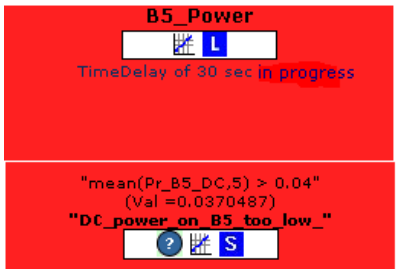



*Fig. 11b: Detail of the flag displayed on DMS LevelTwo section*

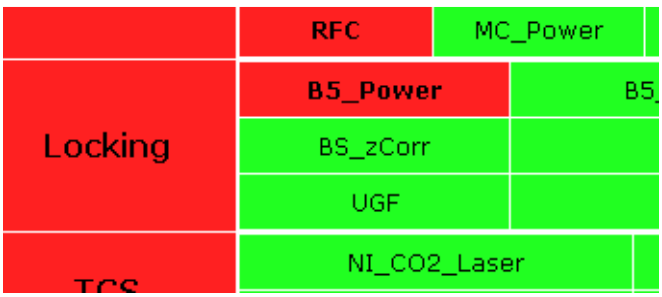



*Fig. 12a: Detail of the Main Page of DMS.*

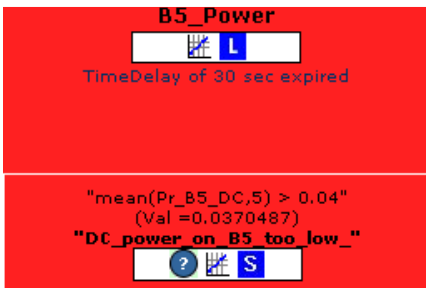



*Fig. 12b: Detail of the flag displayed on DMS LevelTwo section.*

The alarm notification is completely independent by *"Timedelay".*

### 3.3.2.1 Example figure 11,12

The Timedelay filtering for the flag B5_Power is in progress: in the main page of DMS that page is yellow while in DMS LevelTwo section is red and there is a message indicating this (see figure 11).
The Timedelay filtering for the flag B5_Power is expired: in the main page of DMS and also in the DMS LevelTwo section is red and there is a message indicating this (see figure 12).

## 3.3.3 The "Depend" filtering

It is a filtering to reduce the red flags activation on the main page of the DMS.
It is a method to handle alarm flood; such method is based on cause-consequence analysis. This functionality introduces alarm priorities which are represented trough different colors. The alarms which are the real cause of the problem are displayed as red flag, the alarm which are consequence of the previous problem are displayed as 'semitransparent' red flags. To know how to set this filtering see paragraph: 4.3.4 - How to set the "Depend" filtering -.
The flag is displayed with a 'semitransparent' red color both on the main page of DMS and in the DMS LevelTwo section. In this section the flag shows the dependencies.

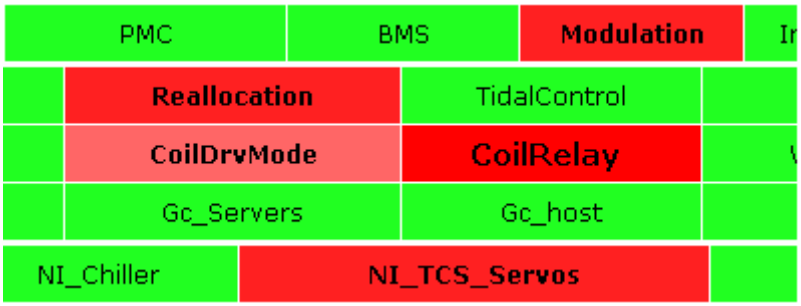



*Fig. 13a:Detail of the Main Page of DMS*

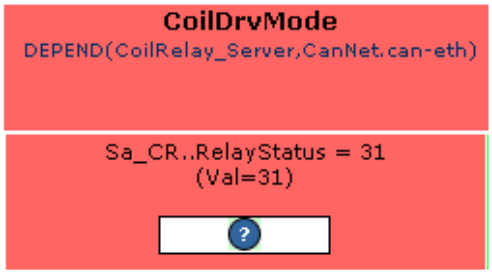



*Fig. 13b: Detail of the flag displayed on DMS LevelTwo section.*

The alarm notification is completely independent by *"Depend".*

### 3.3.3.1 Example figure 13

The status of the flag CoilDrvMode depend by the status of others two flags: CoilRelay_Server and CanNet.can-eth. As the two flags CoilRelay_Server and CanNet.can-eth are red the flag CoilDrvMode is displayed as pink.

## 3.3.4 The "Group" filtering

It is a filtering to reduce the red flags activation on the main page of the DMS.

This functionality allows grouping a set of flags with different names and different associated functionalities inside a group. The status of the group depends by the status of the flags which constitutes that group: the status of the group is computed as the logic "OR" between the flags. To know how to set this filtering see paragraph: 4.3.5 - How to set the "Group" filtering -.

In the main page of DMS the group is shown as a normal flag; the flags inside the group are treated independently. In the DMS LevelTwo section are shown the details of the group and the details of the flags which constitute that group.

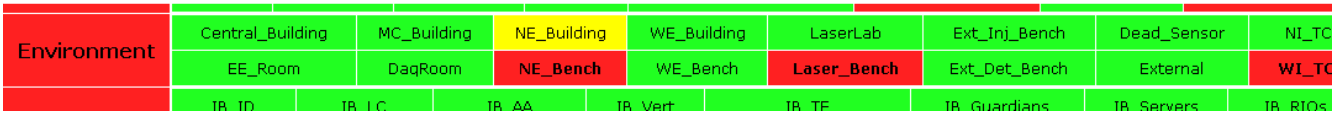



*Fig. 14a: Detail of the Main Page of DM*

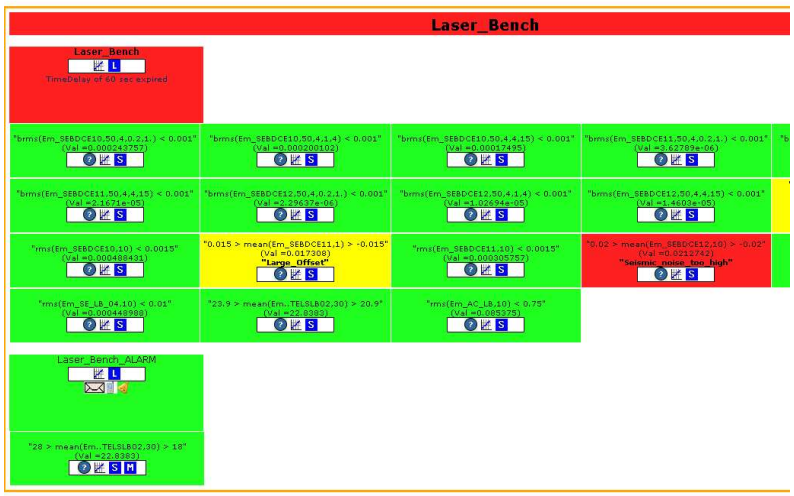



*Fig14b: Detail of the flag displayed on DMS LevelTwo section.*

### 3.3.4.1 Example figure 14

Laser_Bench is actually a “Group” which is constituted by two flags: Laser_Bench and Laser_Bench_ALARM.

## 3.3.5 The “Persistence” filtering

It is a filtering to reduce the alarm notifications.

The persistence time is a parameter which can be stated in the configuration file ( to know how to set this filtering see paragraph: 4.3.6 - How to alarm a “flag” -). An alarm before being notified must be constantly active (the flag must be constantly red) for this period. This parameter is completely independent from the others filtering used to display the flags.

## 3.3.6 The “Muting” filtering

It is a filtering to reduce the alarm notifications.

The muting feature is uniquely applied to the alarmed flags: if alarmed flag/subflag is being muted the alarm notification will be not executed even if the flag would have been triggered the notification. The filtering avoids receiving useless notification. This kind of feature can be applied both at the level of overall flag and at level of subflags. To know how to set this filtering see paragraph: 3.4.2 - How to use the “Muting interface” - .

## 3.3.7 Alarm notification

Once the alarm has been activated (the flag has became red) there is the possibility to notify this alarm in different way: through MAIL, through SMS, trough SOUND, executed by loudspeaker of PC, together with BLINKING TEXT (from black to white) of the flag on the main page of the DMS.

The first two ways are used to notify a remote user while the last one is used to notify the user from its local PC. These three ways of notification can be stated in the configuration file of the script *“server_DM.php”*; see paragraph: 4.3.6 - How to alarm a “flag” - .

# 3.4 How to use the WEB interfaces

Some web interfaces have been developed to allow the user to quickly and friendly retrieve information. These WEB interfaces can be open from the link in the header section of the “Main page” or from the icons displayed on the subflags in the “Level Two page”.
The links on the “Main page” open the WEB interfaces with default or standard parameters and use while the links from the subflags open the WEB interfaces with parameter set according with the subflag from which we have opened the interface.

## 3.4.1 How to use the “Shelving interface”

This interface shows the flag status, the shelving/muting parameters and comments; after the standard Active Directory authentication the user can modify the shelving start and stop time, the trigger (grey, red or all) and leave a comment.

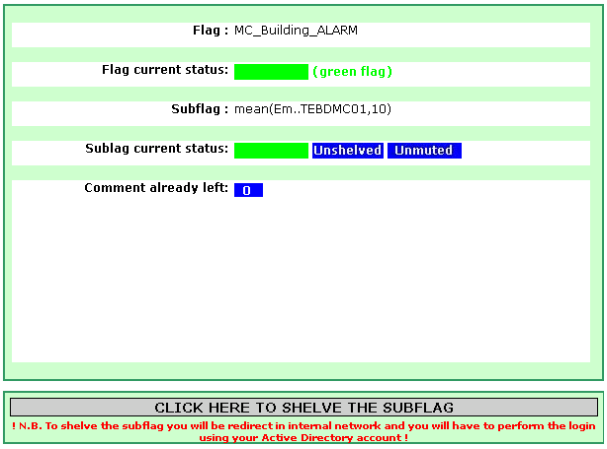



*Fig. 15a: The shelving interface. This page can be see by everyone (no login is necessary) and it shows detailed info about the subflag: “mean(Em..TEBDMC01,10)*

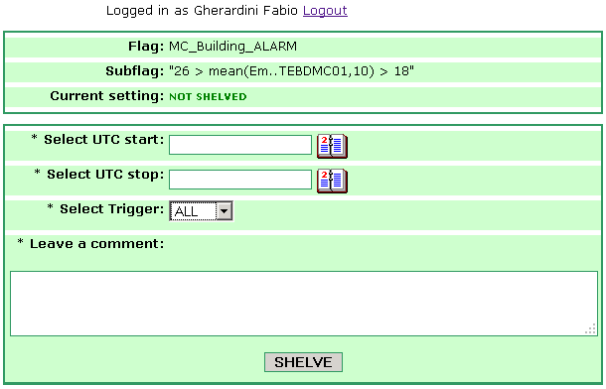



*Fig. 15b : The shelving interface. After Active Directory authentication the user can act on the shelving settings. This part can be reached only from “Internal view”.*

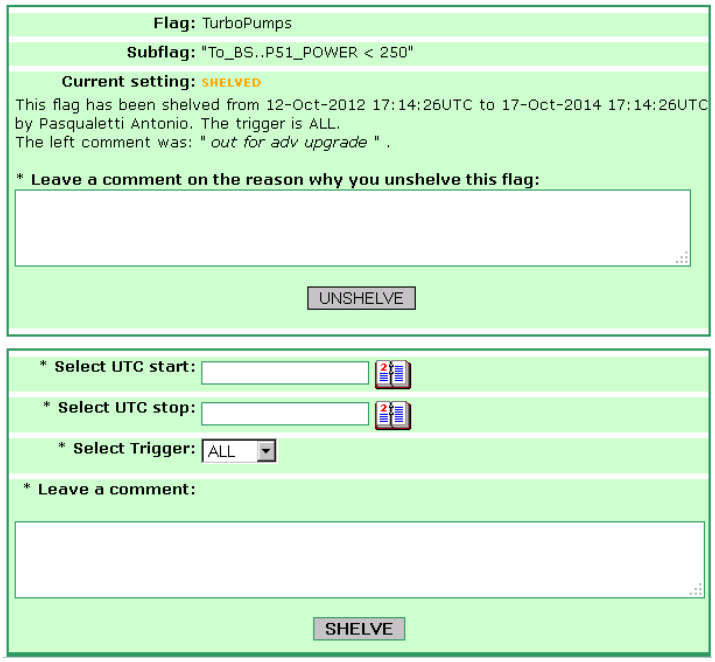
### 3.4.1.1 Setting "Shelving" parameters

The shelving parameters can be set only by dedicated WEB interfaces. There two way to open these dedicated WEB interfaces:

- by clicking on the icon  which appears at the level of subflag.
- from the "*DMS Flag list*" ( https://pub3.ego-gw.it/itf/detOp/DMS/web_interfaces/ShelveMute/shelved_list.php ) WEB interface by clicking on the button  on the interested flag/subflag. (to know how to use this interface see paragraph: 3.4.8 - How to use the "DMS Flag List" -).

### 3.4.1.2 How to "shelve a flag"

Once you have the form of figure 15b you must fill the field "*UTC start", "UTC stop"* and select the *"Trigger"*. The field "*UTC start"* specifies the time start of the shelving; the field *"UTC stop"* specifies the time stop of the shelving and the *"Trigger"* specifies the status of the flag which triggers the shelving. The trigger can be RED (the shelving is triggered if the flag is red or semitransparent red), GREY ( the shelving is triggered if the flag is grey), ALL (the shelving is triggered if the flag is red or semitransparent red or grey).
The section *"Comment"* it is to leave a comment on the reason why the flag has been shelved.




**Example:**

- Flag: TurboPumps
- Subflag: To_BS..P51:POWER<250
- UTC start: 12-Oct-2012 17:14:26
- UTC stop: 17-Oct-2014 17:14:26
- Trigger: ALL

In this example the subflag To_BS..P51:POWER<250 is shelved if we are between the UTC start and UTC stop and if the subflag is RED or GREY. The reason of the shelving is reported in the comment: “out for adv upgrade”

*Fig 15c: The shelving interface*

### 3.4.1.3 How to change “Shelving” setting and how to unshelve a flag

Once the parameters are set they can be changed from the same form filling the fields “*UTC start”, “UTC stop”* and selecting the *“Trigger”* with new parameters.

The flag can be unshleved by clicking on the button *“Unshelve”*.

## 3.4.2 How to use the “Muting interface”

This interface shows the flag status, the shelving/muting parameters and comments; after Active Directory authentication the user can see the alarm configuration, modify the muting settings (start and stop time, etc…), and leave a new comment.

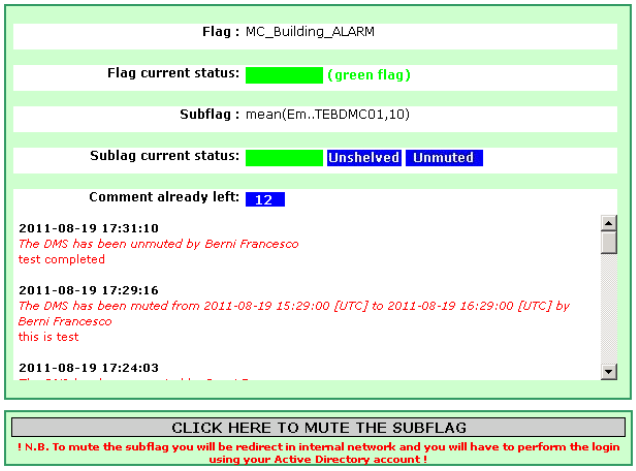



*Fig. 16a: The muting interface. This page can be see by everyone (no login is necessary) and it shows detailed info about the subflag: "mean(Em..TEBDMC01,10) .*

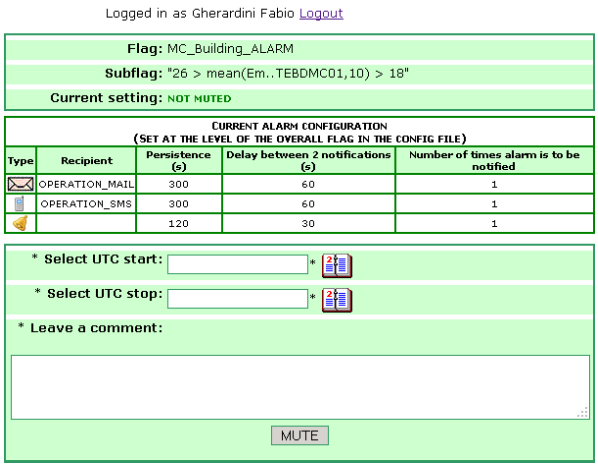



*Figure 16b: The muting interface. After Active Directory authentication the user can act on the muting settings. This part can be reached only from "Internal view".*

### 3.4.2.1 Setting "Muting" parameters

The muting parameters can be set only by dedicated WEB interfaces. There two way to open these dedicated WEB interfaces:

- by clicking on the icon H which appears at the level of subflag.
- from the "*DMS Flag list*" ( https://pub3.ego-gw.it/itf/detOp/DMS/web_interfaces/ShelveMute/shelved_list.php ) WEB interface by clicking on the button Mute on the interested flag/subflag (to know how to use this interface see paragraph: 3.4.8 - How to use the "DMS Flag List" -).

### 3.4.2.2 How to "mute a flag"

Once you have the form of figure 16b must fill the field "*UTC start", "UTC stop"*. The field "*UTC start"* specifies the time start of the muting; the field *"UTC stop"* specifies the time stop of the muting

The section *"Comment"* it is to leave a comment on the reason why the flag has been muted.

### 3.4.2.1 How to change "muting" setting and how to unshelve a flag

Once the parameters are set they can be changed from the same form filling the fields "*UTC start", "UTC stop"* The flag can be unmuted by clicking on the button *"Unmute"*.

## 3.4.3 How to use the "Comment interface"

This interface shows the flag status, the shelving/muting parameters and comments; after authentication the user can leave a new comment.

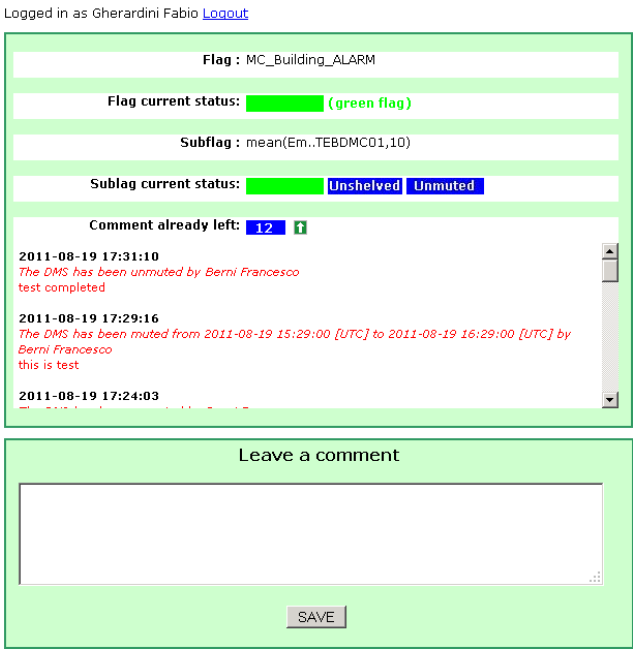



*Fig. 17: The comment interface. After Active Directory authentication the user can leave a comment..*
*This part can be reached only from "Internal view"*

The comment can be left only by dedicated WEB interface that can be open by clicking on the icon C which appears at the level of subflag. Once you have the form of figure 17 you have just to fill the textarea with the text and then click on the button "SAVE".

## 3.4.4 How to use the "DMS Plot"

The plot shows the evolution of the status (the color) and the signal of the flag; the background color follows the color of the flag; there is the possibility to interact with the plot: change the duration, zoom/unzoom the axis and save the image.

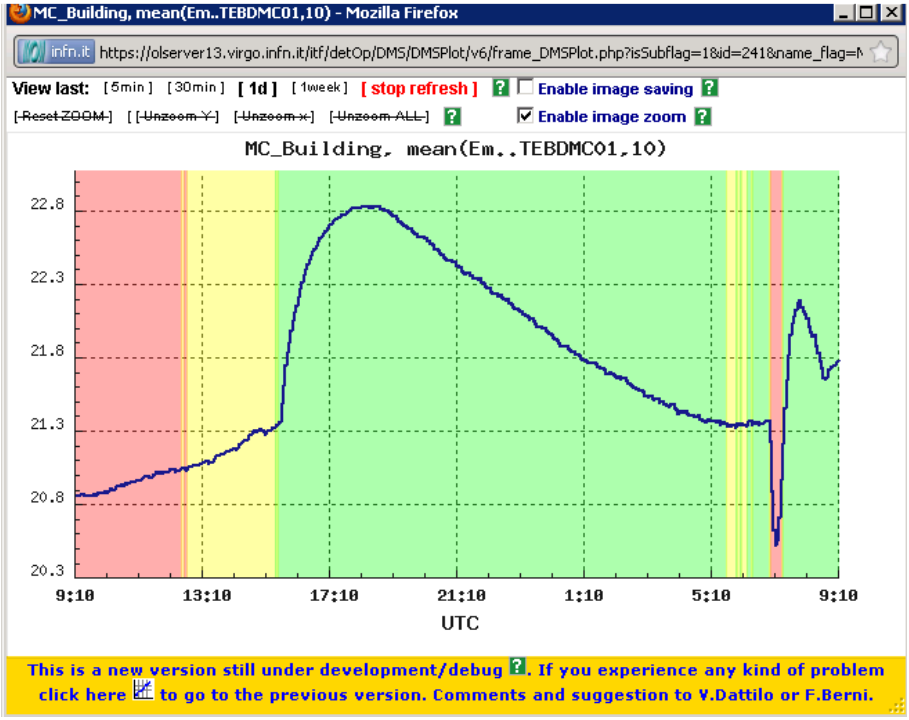



*Fig. 18: DMS Plot. This page shows the evolution of the signal "mean(Em..TEBDMC01,10) which is a subflag of the flag MC_Building. The background of the plot reproduce the evolution of the color of the subflag.*

The plot can be open by clicking on the icon  which appears at the level of subflag.

### 3.4.4.1 How to zoom the plot

There are three different ways or three different possibilities to zoom the plot:

#### 3.4.4.1.1 XY ZOOM:

A. Put the mouse cursor above the plot and inside the x,y axis; the designed area in which it is possible to perform an x-y zoom is denoted by a crosshair mouse cursor.

B. Click and release the left mouse button
C. Start to draw the dark, opaque figure; this will set the X and Y values.
D. To zoom the original figure click and release the left mouse button

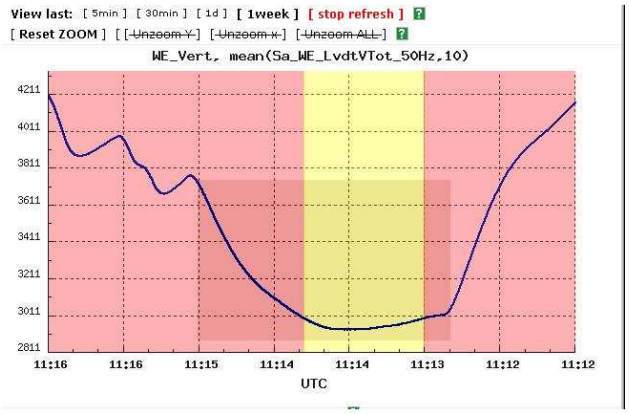



*Fig. 19a: the user starts to perform a zoom on a desiderated area (grey opaque rectangle).*

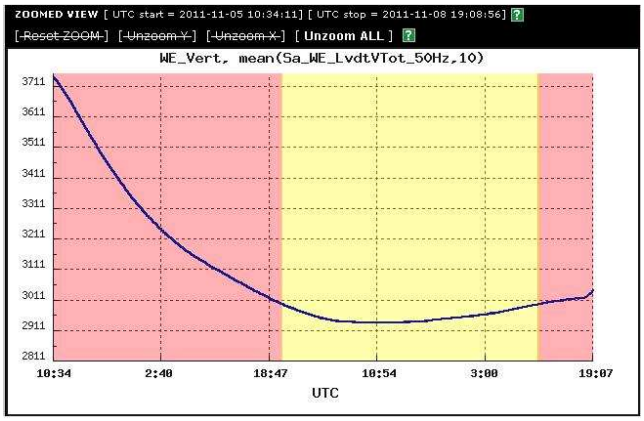



*Fig. 19b: the plot zoomed on the desiderated area.*

The zoom is executed only if the desiderate area is higher than [50px]X[50px].

It is possible to reset the zoom after the first click just putting the mouse cursor above the button [RESET ZOOM] .

### 3.4.4.1.2 X ZOOM

A. Put the mouse cursor above the plot and inside the x axis and below the y axis; the designed area in which it is possible to perform an x zoom is denoted by a ew-resize mouse cursor
B. Click and release the left mouse button
C. Start to draw the dark, opaque figure; this will set the X values.
D. To zoom the original figure click and release the left mouse button

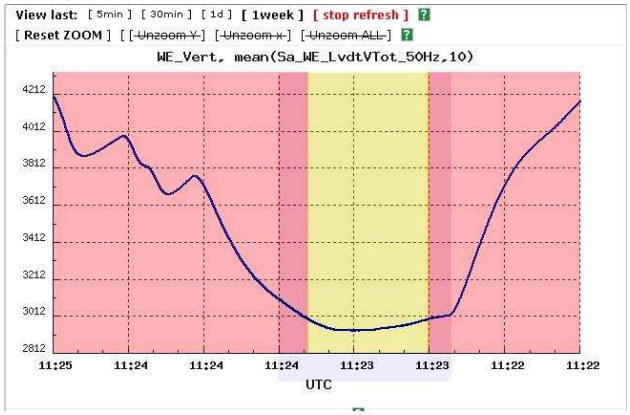



*Fig. 20a: the user starts to perform a zoom on a desiderated area (grey opaque rectangle).*

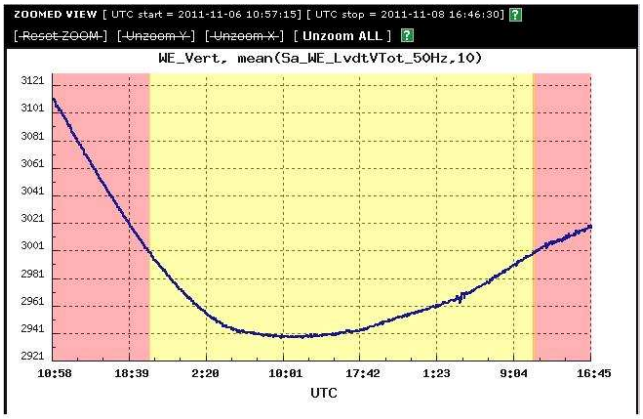



*Fig. 20b: the plot zoomed on the desiderated area.*

The zoom is executed only if the desiderate area is higher than [50px]X[50px]

It is possible to reset the zoom after the first click just putting the mouse cursor above the button [RESET ZOOM].

### 3.4.4.1.3 Y ZOOM

A. Put the mouse cursor above the plot and inside the Y axis and on the left of the x axis; the designed area in which it is possible to perform an x zoom is denoted by a ew-resize mouse cursor
B. Click and release the left mouse button
C. Start to draw the dark, opaque figure; this will set the Y values.
D. To zoom the original figure click and release the left mouse button

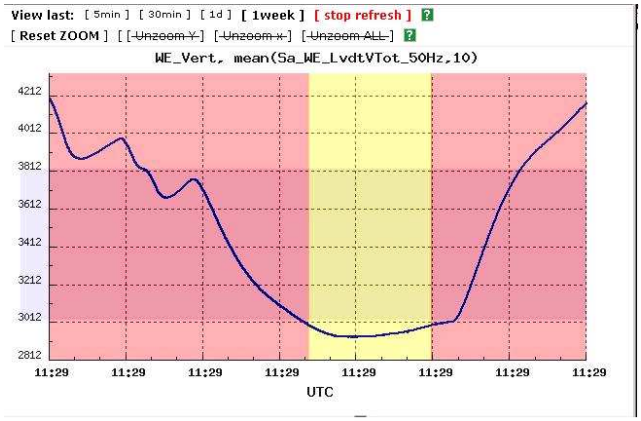



*Fig. 21a: the user starts to perform a zoom on a desiderated area (grey opaque rectangle).*

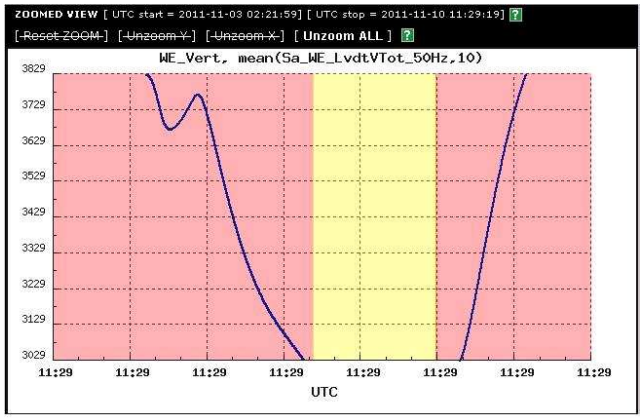



*Fig. 21b: the plot zoom on the desiderated area.*

The zoom is executed only if the desiderate area is higher than [50px]X[50px].

It is possible to reset the zoom after the first click just putting the mouse cursor above the button [RESET ZOOM] .

### 3.4.4.2 How to unzoom the plot

Clicking on the button [Unzoom ALL] you can unzoom the plot.

The buttons [Unzoom Y], [Unzoom X] are not yet active.

## 3.4.5 How to use the "DMS Log"

The "DMS Log" interface allows retrieving the DMS pictures specifying also some search criteria; the detail search provides a variety of searchable options. These have been tailored in such a way as to produce easily manageable and modifiable result sets.

It can be open:

- from the link "*DMS Log*" on the header section (https://pub3.ego-gw.it/itf/detOp/DMS/web_interfaces/DMSLog/v1/DMSLog.php
- by clicking on the icon L which appears at the level of subflag.

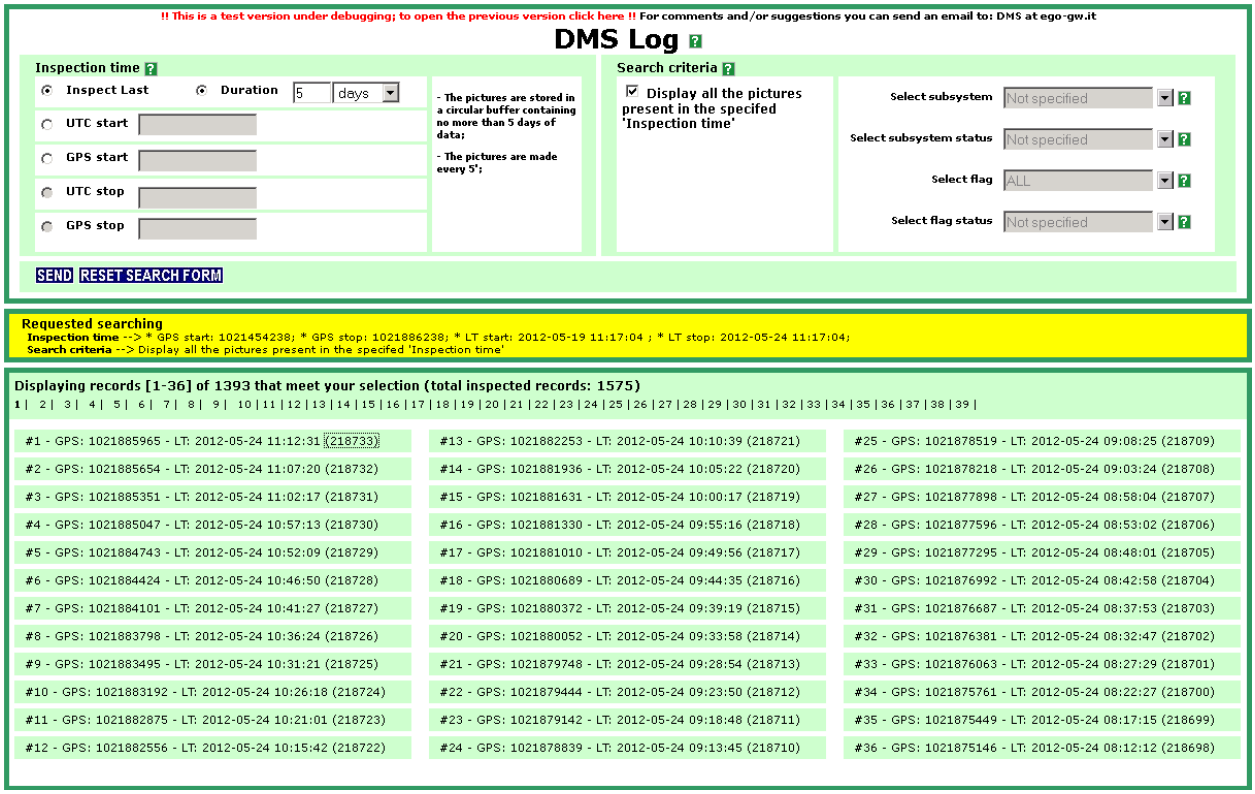



*Fig. 22: DMS Log opened from the link of the "DMS Main page". As we can see no search criteria are set and the system displays by "default" the last pictures.*

The possible searchable areas are:

- *Start Time*: to restrict the searching of the snapshots starting from the specified time;
- *Time Inspection*: to express how much time forward (Duration) or backwards (Inspect Last) starting from the Start Time;
- *Search Criteria:* to looks for specific status of the Subsystems/Flags in the image of all photos in the database
- *Subsystem:* to specify a subsystem to be searched
- *Flags:* to specify flag/flags to be searched
- *Status:* to specify the status of the previously selected subsystems/flags

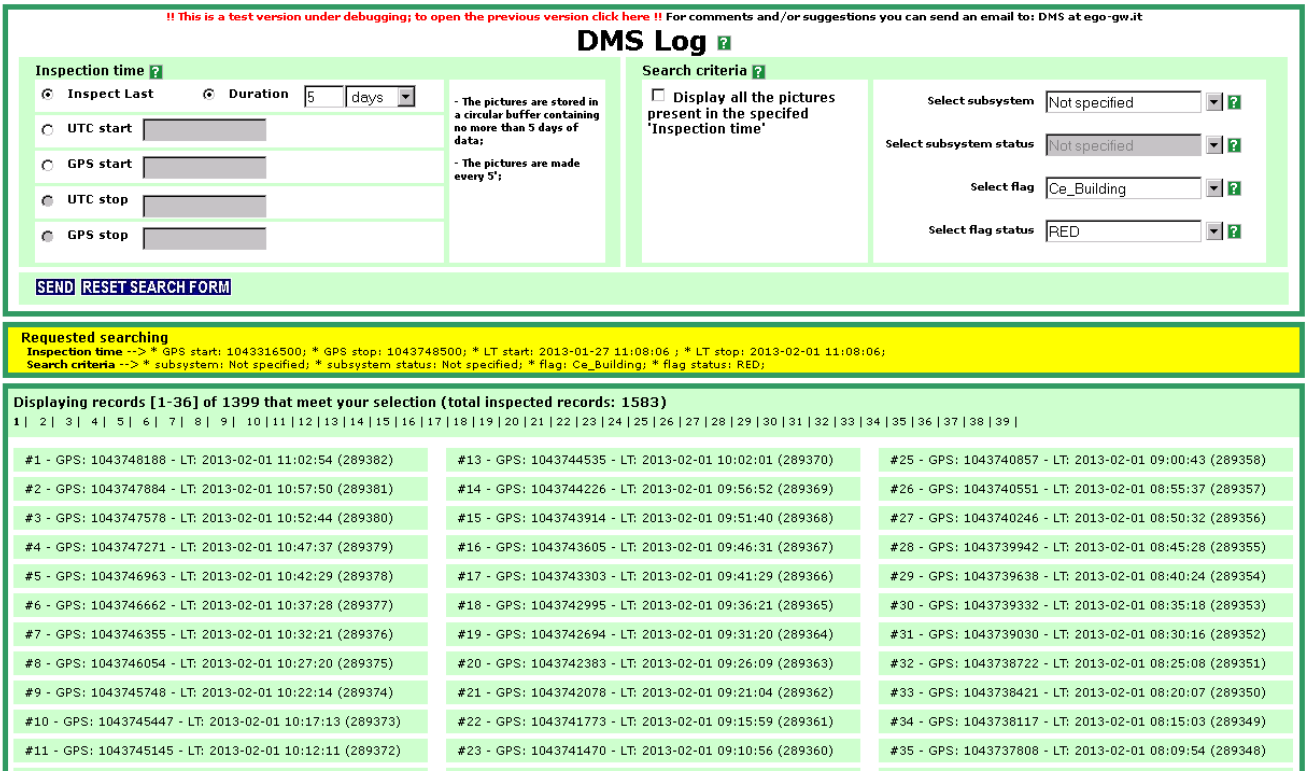



*Fig. 23: DMS Log opened from a subflag. The search criteria is automatically set and the system displays the last pictures that match the search criteria automatically set (in this case fla: Ce_Building in red status).*

The bottom part of the page lists info about the DMS pictures i.e.:

#1 - GPS: 1043748188 - LT: 2013-02-01 11:02:54 (289382)

where:

- #1: it is a counter;
- GPS: 1043748188: it is the GPS of the picture;
- LT: 2013-02-01 11:02:54: it is the local time of the picture;
- (289382) : it is the id of the picture. Clicking on it is possible to open the picture;

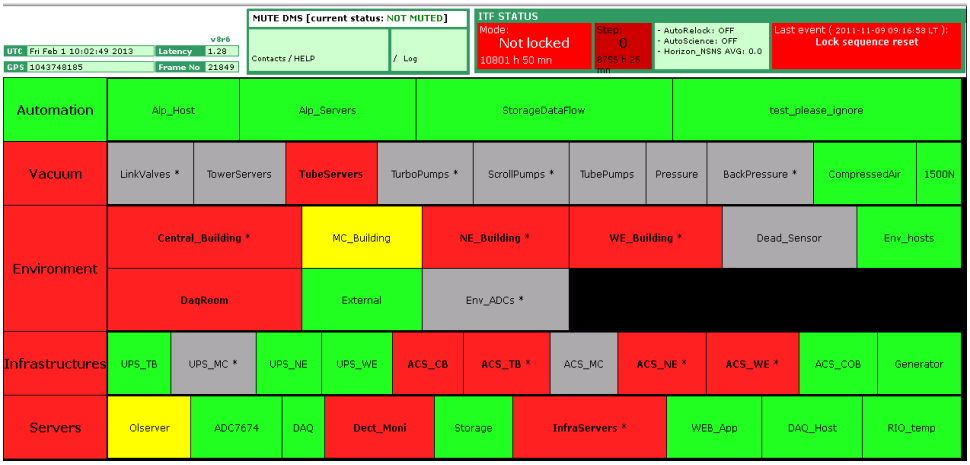



*Fig. 24: Picture of the "DMS Main page". This has been opened by clicking on the picture id of the figure 23. This picture represents a kind a snapshot of the "DMS Main page" taken at a certain time.*

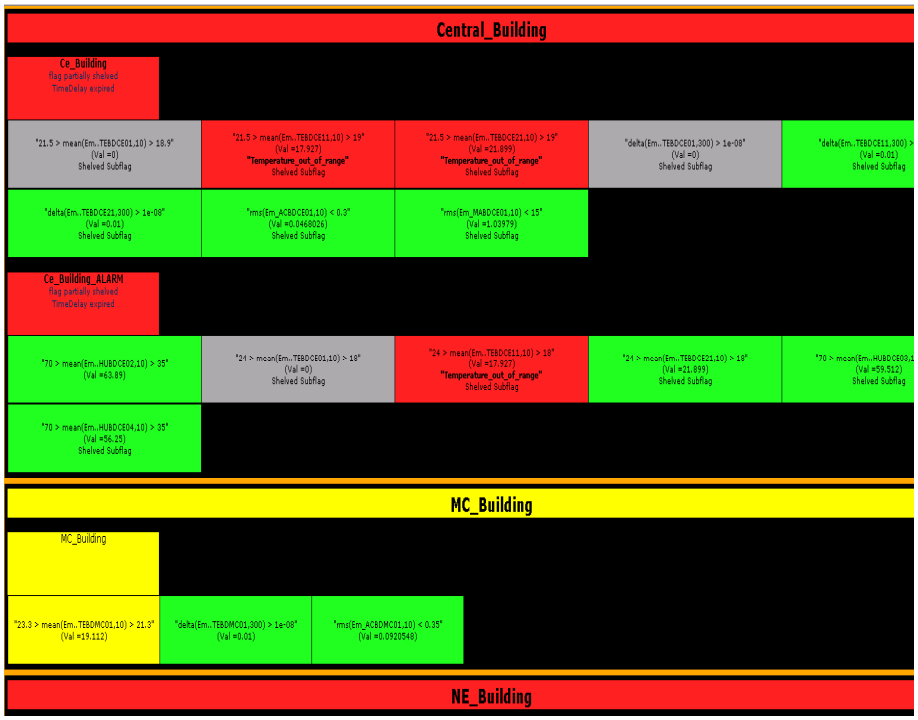



*Fig. 25: Picture of the "DMS Level Two". This has been opened by clicking on the flag of the figure 24; the hierarchy it is still present. This picture represents a kind a snapshot of the "DMS Level two page" taken at a same time of the one of the "DMS Main page".*

## 3.4.6 How to use the "Flag Log"

The "Flag Log" page shows all the DMS events: events mean changing of a flag/subflag status, alarm notification, shelving/muting and comments ordered by time.

Through the section on the left it is possible to set some search criteria; the detail search provides a variety of searchable options. These have been tailored in such a way as to produce easily manageable and modifiable result sets.

It can be open:

- from the link "Flag Log" on the header section (https://pub3.ego-gw.it/itf/detOp/DMS/DMS_FlagsLog/v7/index1.php)
- by clicking on the icon FL which appears at the level of subflag.

The possible searchable areas are:

- DMS: in this section are listed in an hierarchy way the DMS subsystems, flags and subflags which constitutes the whole DMS. The user can restrict the log of the events to some specified subsystem, flag or subflag.
- Event: in this section are listed all the possible DMS events.
  -  : email notification;
  -  : sound notification;
  -  : SMS notification;
  - Comment: the comment left for a flag
  - : the flag/subflag has became green;
  - : the flag/subflag has became grey;
  - : the flag/subflag has became red;
  - Shelved: the shelving setting has been applied to a flag/subflag;
  - Unshelved: the shelving setting has been removed (by the user or automatically expired) to a flag/subflag;
  - Muted: the muting setting has been applied to a flag/subflag;

- o **Unmuted**: the muting setting has been removed (by the user or automatically expired) to a flag/subflag;

The user can restrict the log of the events to some specified event.

- Time: section to restrict the time inspection of the vents.

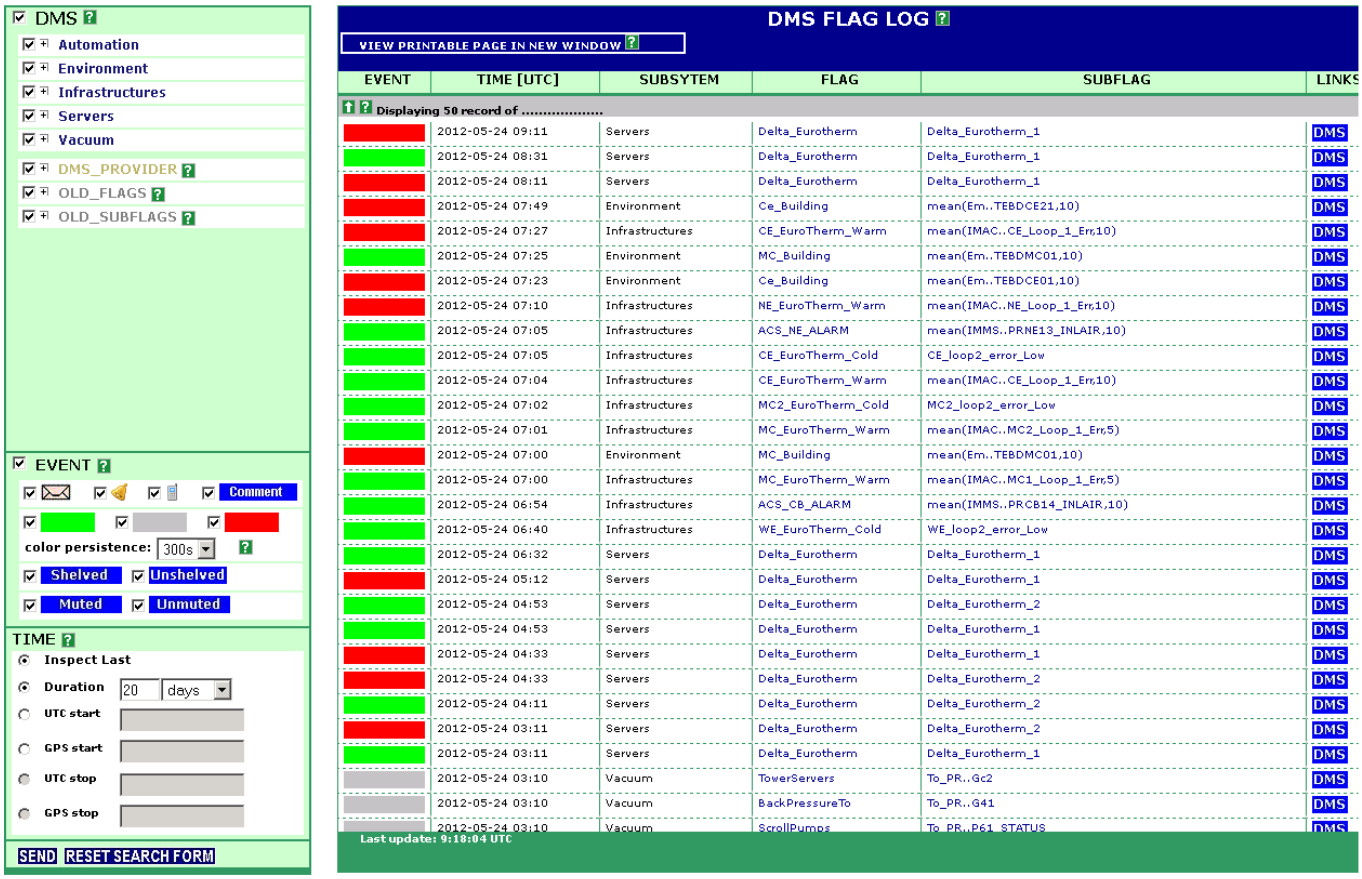



*Fig. 22: DMS Flag Log opened from the link of the "DMS Main page". As we can see all search criteria are set and the system displays by "default" all the last event.*

In case of alarm notifications, shelving/unshelving, muting/unmuting or comment the user can click on the icon to open a new window which shows further information about the event and links to reach specified DMS WEB interfaces al "*DMS Alarm log*", …

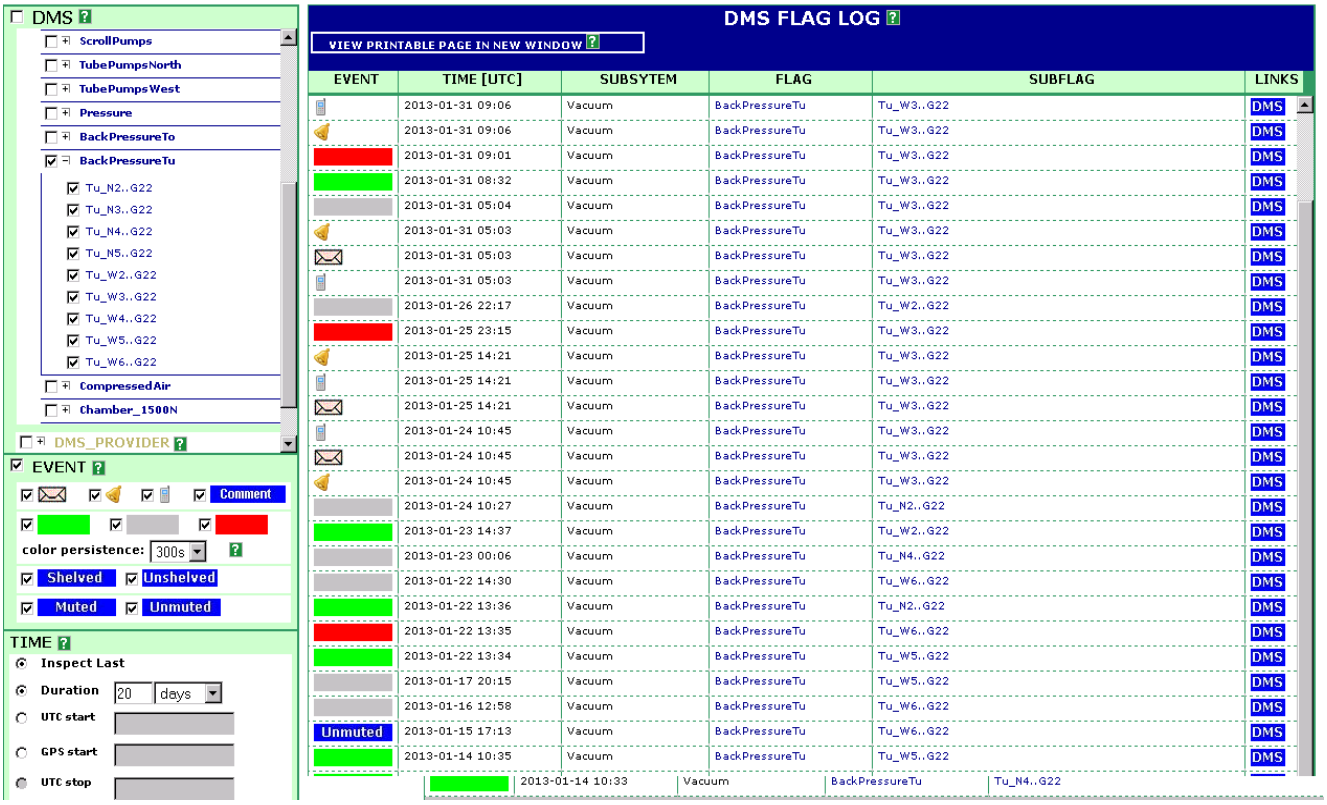



*Fig. 15: DMS Flag Log opened from the flag BacPressureTu.. The search criteria is automatically set and the system displays all the last events of that flag.*

## 3.4.7 How to use the "Alarm Log"

The "Alarm Log" interface allows retrieving notification events providing information about actual/past alarm configuration and all the notification's details as: recipient, notification message, etc.

It can be open from the link "*Alarm Log*" on the header section of the main page (https://pub3.ego-gw.it/itf/detOp/DMS/web_interfaces/AlarmLogs/v2/logAlarms2.php).

The detailed search provides a variety of searchable options; these have been tailored in such a way as to produce easily manageable and modifiable results sets. The possible searchable areas are:

- Notified alarms;
- Configuration of the flags read from configuration file;

- Inspect last notifications;

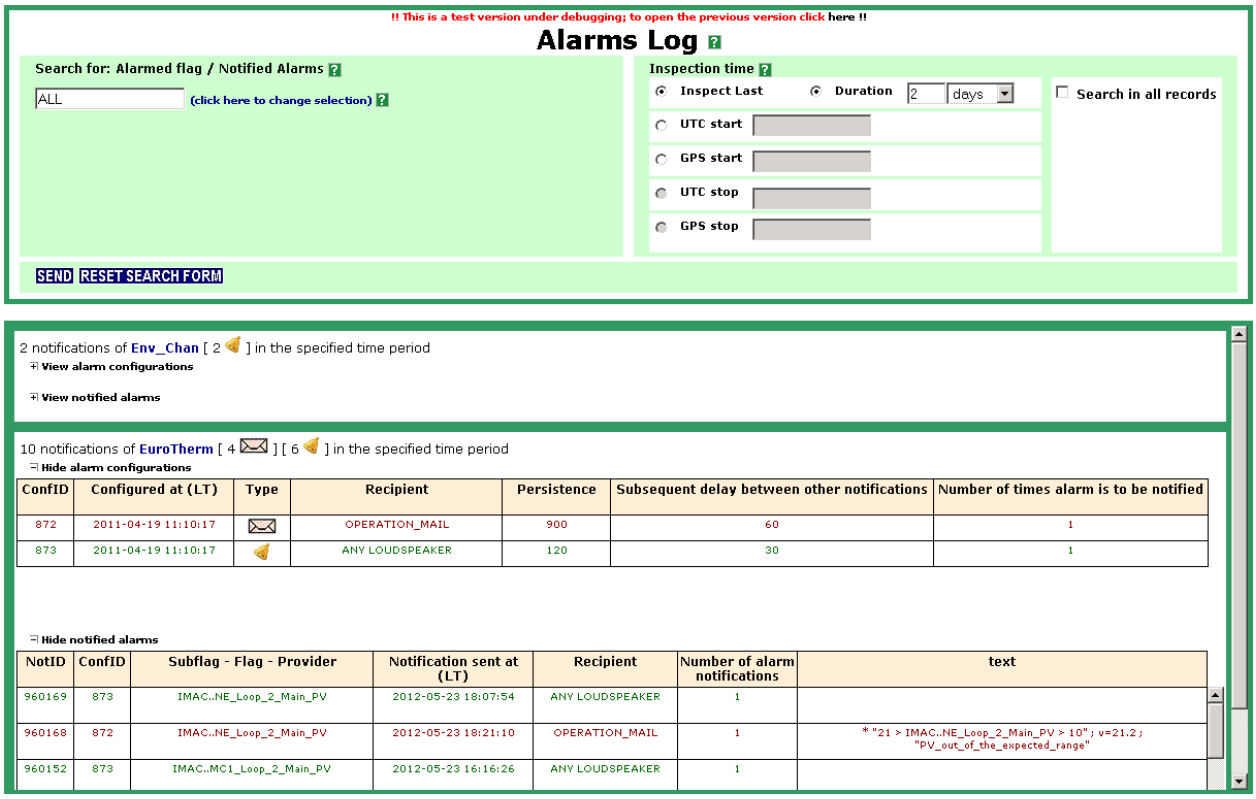



*Fig. 28: DMS Alarm Log.*

After having choose the desired area and then clicking on the button *"SEARCH"* a list of alarm notification and configuration is displayed. The actual alarm configurations are in bold, they have the background white and they are noted with the signature (in use); Instead, the past alarm configurations have the background grey. A legend is used to denote the kind of notifications: red text means email notification, blue text means SMS notification, grey text means sound notification. The field *NotId* is the notification index while the field *ConfID* is the alarm configuration index.

The result of the search is a list of alarm notification and configuration. The alarm configuration section shows the actual configuration, denote by the signature (in use) and the list of the old configurations.

The notified alarm section shows all the notifications ordered by the time related to the flag.

## 3.4.8 How to use the "DMS Flag List"

This interface lists all the flags and for each flag we can have information about alarm configurations (if present), shelving status, and muting status.

It can be open from the link "*Alarm Log*" on the header section of the main page (https://pub3.ego-gw.it/itf/detOp/DMS/web_interfaces/ShelveMute/shelved_list.php)

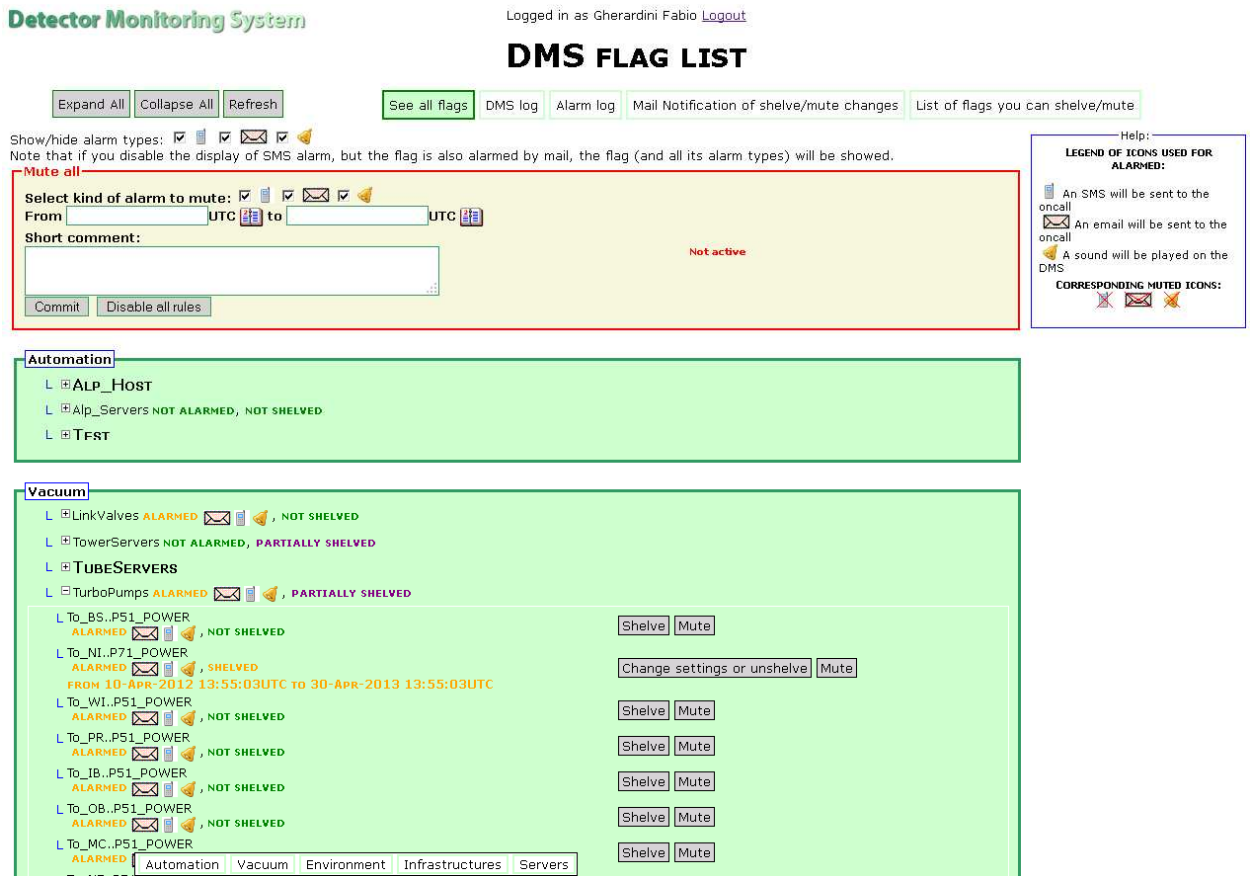



*Fig. 29: DMS Flag List*

### 3.4.8.1 Example figure 30

In the following example the flag "*test_please_ignore*" is alarmed to perform SMS notification; the subflag "*Alp_Test1_..DM_flag*" is muted. To see the mute setting you have to click on the button View mute settings and after authentication you get the form shown in figure 16.

The information about the muting is also shown in the LevelTwo section of the DMS.

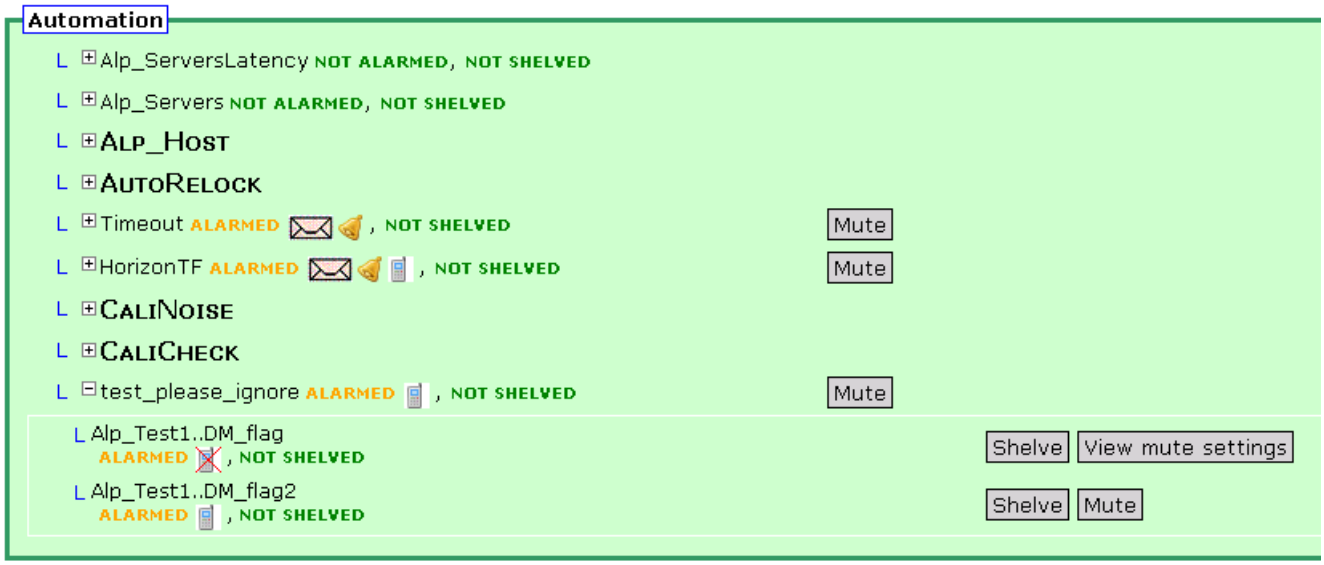



*Figure 30a: a section of the WEB page "DMS Flag list". By clicking on the button* View mute settings *on the line of the subflag Alp_Test1..DM_flag you can get the same form shown on the right side of figure 16b.*

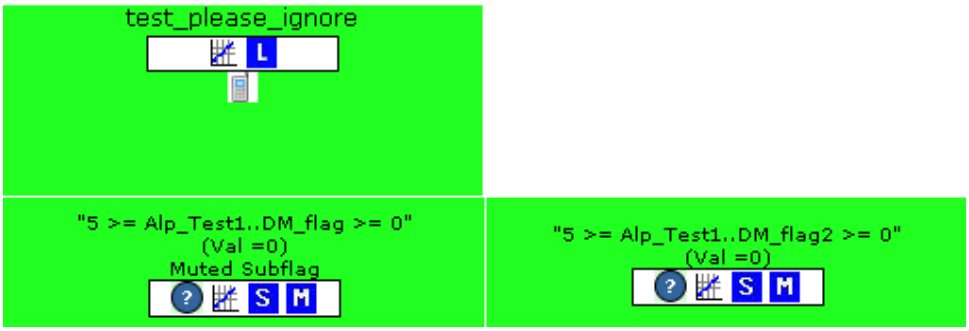



*Figure 30b: DMS Level two. As we can see the page shows that the subflag Alp_Test1..DM_flag is muted; by clicking on the icon* M *you can open the form shown on the right side of the table of figure 16b.*

### 3.4.8.2 Example figure 31

The flag “Modulation” is partially shelved; as we can see only one of the two subflag is shelved. To change the shelving setting you have to click on the button Change settings or unshelve and after authentication you get the form shown in figure 15.

The information about the muting is also shown in the LevelTwo section of the DMS.

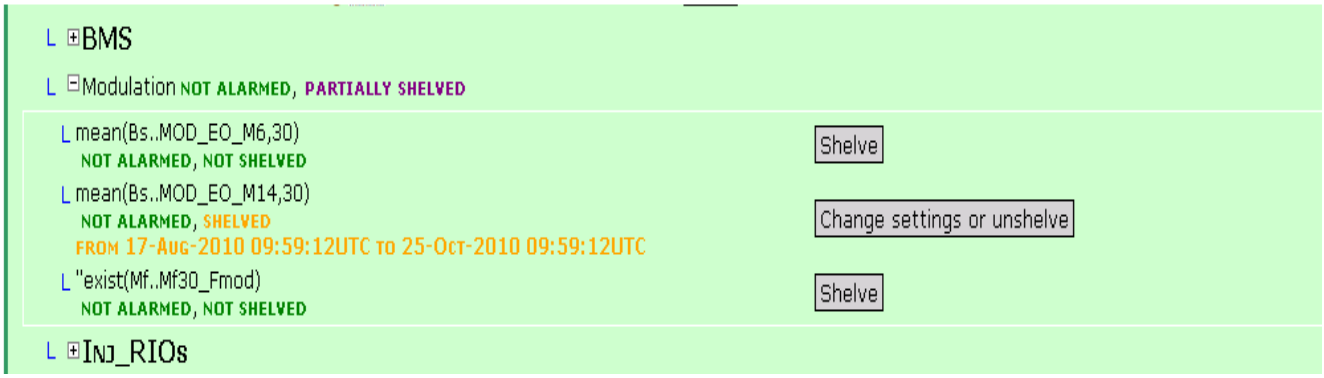



*Figure 30a: a section of the WEB page “DMS Flag list”. By clicking on the button* Change settings or unshelve *on the line of the subflag Bs..MOD_EO_M14 you can get the same form shown on the right side of figure 15.*

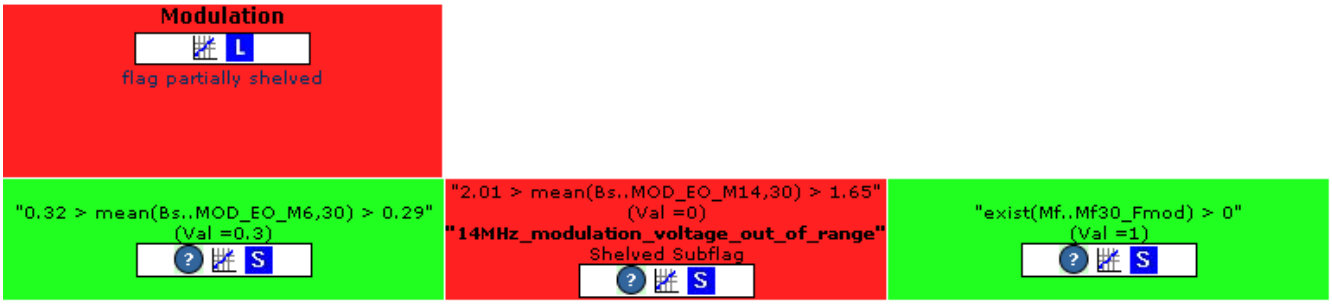



*Figure 30b: DMS Level two. As we can see the page shows that the subflag Bs..MOD_EO_M14 is muted; by clicking on the icon* S *you can open the form shown on the right side of the table of figure 15.*

### 3.4.9 How to be notified in case Muting/Shelving changes

This interface allows the user to set the flags for which wants to be notified in case of shelving/muting changes; this interface can be open after Active Directory authentication and using the link "Mail notification of shelve/mute changes" on top of the page of "DMS Flag list".

### 3.4.10 How to get a procedure to perform in case of red flag

By clicking on the icon  which is shown in LevelTwo section, you are automatically redirect to the ***"ITF Procedures"*** (https://pub3.ego-gw.it/procedures/index.php?areaid=1); in particular you are automatically redirected to the procedure of that flag.

### 3.4.11 How to know which is the real information written in the XML files

As described in the previous chapters the 'input' data are read from specific files having the information formatted following the XML structure; this interface allows choosing the input file and reading the content of that file.

It can be opened by clicking on the link "*View XML files*" ( https://pub3.ego-gw.it/itf/detOp/DMS/web_interfaces/XML_files/index.html ) on the *"Header section"* (see figure 5 of paragraph 3)

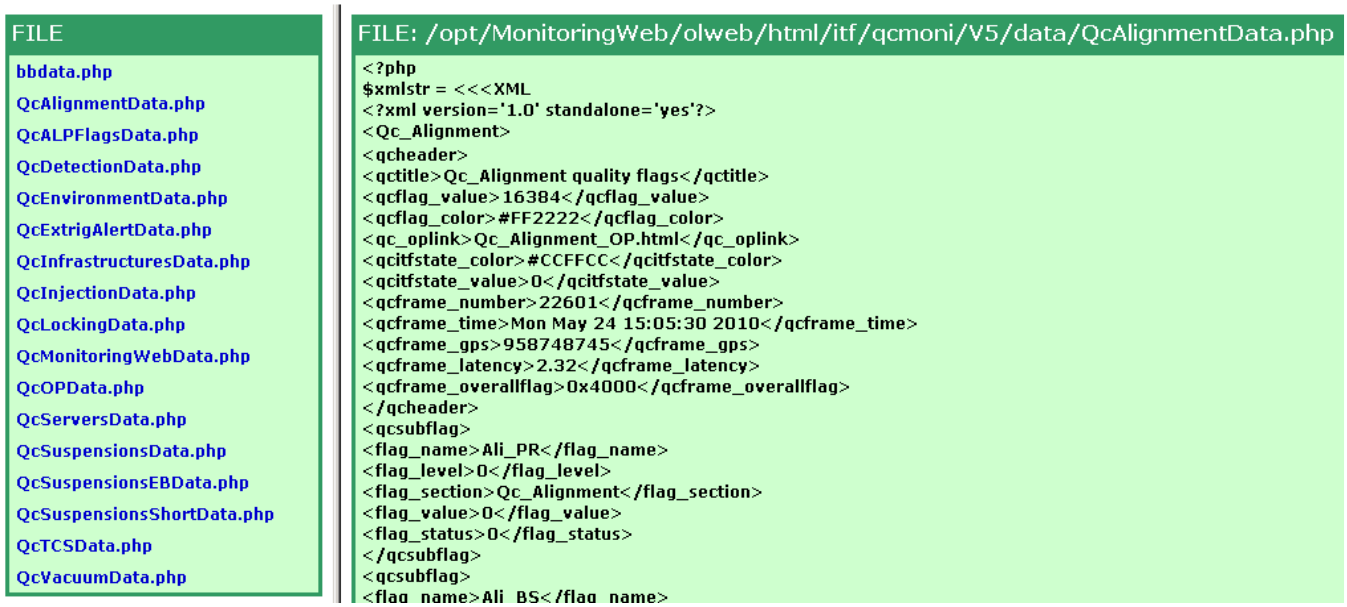



*Fig. 32: Content of the file provided by the process AliMoni; as we can see the information is formatted following the XML format.*

# 4. Working on the configuration files

## 4.1 Who can work on these files

Only the expert  people can edit and work on these files.

## 4.2 Editing server_db.php configuration file

The structure of the config file is the following:

```
<config>
 <param>bbdata BigBrother DEAD(600) EMAIL(OPERATION_MAIL,1,120,60) SOUND(302,1,120,30)</param>
 <param>QcAlignmentData AliMoni DEAD(120) EMAIL(OPERATION_MAIL,1,360,60) SOUND(302,1,120,30)</param>
 <param>QcALPFlagsData ALPDMS DEAD(600) SMS(OPERATION_SMS,1,120,60) EMAIL(OPERATION_MAIL,1,120,60)
SOUND(302,1,120,30)</param>
…
```

```
…
<param>QcTCSData TCSMoni DEAD(120) SMS(OPERATION_SMS,1,900,60) EMAIL(OPERATION_MAIL,1,360,60)
SOUND(302,1,120,30)</param>
 <param>QcVacuumData VacuumMoni DEAD(120) SMS(OPERATION_SMS,1,900,60) EMAIL(OPERATION_MAIL,1,360,60)
SOUND(302,1,120,30)</param>

<af name="Delta_Eurotherm">
       <af_channel>@Delta_Eurotherm = (@Delta_Eurotherm_1 #AND @Delta_Eurotherm_2);</af_channel>
       <af_comment>"Eurotherm server could be stuck";</af_comment>
       <af_subflags> Delta_Eurotherm_1  Delta_Eurotherm_2  </af_subflags>
</af>
…

</config>
```

## 4.2.1 How to add a new “XML file Provider”

It is the section delimited by the tags <param>; the syntax used to add a new “XML file provider” is the following:

```
<param>FileName ProviderName DEAD(y) MAIL(a, b, c, d, x)  SMS(a, b, c, d, x)  SOUND(e, b, c, d)
</param>
```

Where:

- FileName: it is the name of the XML file.
- ProviderName: it is the name of the process which generates the XML file.
- DEAD(y): it is a keyword and it used to set time to declare the provider as dead; this time (expressed in seconds) it is specified by the parameter y written between the brackets.
- MAIL(): it is a keyword to alarm the provider by mail notification;
- SMS(): it is a keyword to alarm the provider by SMS notification;
- SOUND(): it is a keyword to alarm the provider by sound notification;

The alarm notification is performed if the provider remains dead for the persistence time; to know how to proper alarm a provider see the paragraph below.

### 4.2.1.1 Example 1

```
<param>QcExtrigAlertData PollingAgent DEAD(600) EMAIL(OPERATION_MAIL,1,360,60)
SOUND(302,1,120,30)</param>
```

If the GPS written in QcExtrigAlertData it is not updated for more than 600s the system considers the provider PollingAgent as dead and it shows this information by a red banner displayed on top of the main page of the

DMS (see figure 5). The flags generated by Polling agent are then displayed as grey. A notification by mail and by sound of the fact that the process is not anymore updating the flag is also performed.

#### 4.2.1.2 Example 2

```
<param>QcTCSData TCSMoni DEAD(120) </param>
```

If the GPS written in QcTCSDA it is not updated for more than 120s the system considers the provider TCSMoni as dead and it shows this information by a red banner displayed on top of the main page of the DMS. The flags generated by TCSMoni are then displayed as grey.

### 4.2.2 How to alarm a "Provider"

A specific "Provider" is alarmed stating in the row delimitated by the tags <param> </param> the following keywords:

- EMAIL(a, b, c, d, x)
- SMS(a, b, c, d, x)
- SOUND(e, b, c, d)

where:

- a: is the recipient (see paragraph 11: - Managing alarm recipients -). There is the possibility to state more than one recipient; each recipient must be separated by %.
- b: is the number of times alarm is to be notified.
- c: is the persistence time.
- d: is the subsequent delay between other notifications.
- x: is an optional parameter and it is additional text to add to the notification message
- e: is the name of the file to be sounded.

#### 4.2.2.1 Example 1

```
<param>bbdata BigBrother DEAD(600) EMAIL(OPERATION_MAIL,1,120,60) SOUND(302,1,120,30)</param>
```

### 4.2.2.2 Example 2

```
<param>QcEnvironmentData EnvMoni DEAD(120) SMS(OPERATION_SMS,1,900,60) EMAIL(OPERATION_MAIL,1,360,60)
SOUND(302,1,120,30)</param>
```

## 4.2.3 How to add a new "Aggregated flag"

It is the section delimited by the tags <af name="AggregatedFlagName">; the syntax used to add a new "Aggregated flag" is the following:

```
<af name="AggregatedFlagName ">
        <af_channel>@ AggregatedFlagName = (@Flag_1 #LogicOperator @Flag_2);</af_channel>
        <af_comment>"TextToDisplay";</af_comment>
        <af_subflags> Flag_1  Flag_2  </af_subflags>
</af>
```

Now the aggregated flag is created and it can be added as a standard flag on the DMS (see paragraph:10.2: -Adding a new *"flag"* -).

### 4.2.3.1 Example figure 33

```
<af name="Delta_Eurotherm">
        <af_channel>@Delta_Eurotherm = (@Delta_Eurotherm_1 #AND @Delta_Eurotherm_2);</af_channel>
        <af_comment>"Eurotherm server could be stuck";</af_comment>
        <af_subflags> Delta_Eurotherm_1  Delta_Eurotherm_2  </af_subflags>
</af>
```

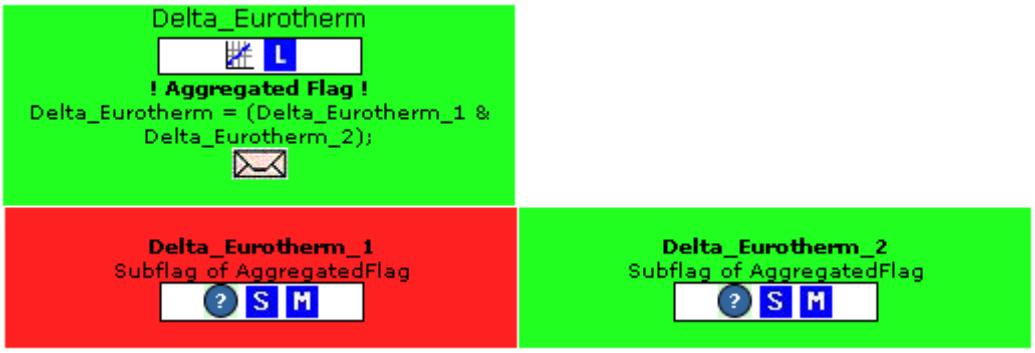



*Fig. 33: DMS Level Two. How the Aggregated flag is shown at the second level.*

# 4.3 Editing server_DMS.php configuration file

The structure of the config file is the following:

```
<config>
 <param>alignment 2 ROWS_HEIGHT(28)</param>
 <param>servers 1 ROWS_HEIGHT(28)</param>
  ….
<s name="Alignment">
 <f>Ali_PR 1 TIMEDELAY(30)</f>
 <f>Ali_BS 1 TIMEDELAY(30)</f>
 <f>Ali_NI 1 TIMEDELAY(30)</f>
 <f>Ali_NE 1 TIMEDELAY(30)</f>
…
</s>
<s name="Servers">
<f>olserver.conn 1 GROUP(Olserver) SOUND(302,1,120,30)</f>
 <f>olserver.cm 1 GROUP(Olserver) SOUND(302,1,120,30)</f>
 <f>olserver.db 1 GROUP(Olserver) SOUND(302,1,120,30)</f>
 <f>olserver.el 1 GROUP(Olserver) SOUND(302,1,120,30)</f>
 <f>olserver.vmm 1 GROUP(Olserver) SOUND(302,1,120,30)</f>
…
</s>
…
</config>
```

## 4.3.1 How to add a new “Subsystem”

It is the section delimited by the tag <param>; in this section are defined the various subsystems which are being displayed in the left side of the main page of the DMS, f. i. :Alignment, Servers, … ; the syntax used to add a new “Subsystem” is the following:

```
<param>SubsystemName NumOfRows ROWS_HEIGHT(px)</param>
```

where:

- SubSystemName: is the name of the subsystem (Alignment, Servers, etc…).
- NumOfRow: is the number of the rows of the subsystem. If this number is set to 0 the subsystem is not shown.
- ROWS_HEIGHT(xx): it specifies the height in pixel of the rows which constitute the subsystem.

## 4.3.2 How to add a new “flag”

It is the section delimited by the tag <s name="SubsystemName">; the syntax used to add a new “flag” is the following:

```
<s name="SubSystemName">
    <f>FlagName yPos Keyword1(x1,x2,…) Keyword2(x1,x2,…) … </f>
    <f>FlagName yPos Keyword1(x1,x2,…) Keyword2(x1,x2,…) … </f>
    <f>FlagName yPos Keyword1(x1,x2,…) Keyword2(x1,x2,…) … </f>
</s>
```

where the possible keywords can be:

- TIMEDELAY(xxxx) used to set the *"Timedelay"* filtering;
- DEPEND(xxx) used to set the *"Depend"* filtering;
- GROUP(xx) used to set the *"Group"* filtering;
- EMAIL(a, b, c, d, x)used to alarm a flag with email notification;
- SMS(a, b, c, d, x)used to alarm a flag with SMS notification;
- SOUND(e, b, c, d)used to alarm a flag with SOUND notification;

Each of the previous keywords has to be separated by blank spaces.

The parameters related to a keyword/functionality are passed as arguments in brackets just after the keyword name and separated by a comma. This kind of structure makes the system very flexible because in the future a new feature or new parameters can be added in a modular way. Moreover at the same flag can be associated more than one feature: a flag can be inside a group, can have both "alarm sound" and "alarm e-mail", etc…

## 4.3.3 How to set the "Timedelay" filtering

The syntax used to set the *"Timedelay"* filtering is the following:

```
<f> FlagName yPos TIMEDELAY(xx) </f>
```

where the parameter in the brackets is the time (seconds) before displaying the flag as red.

### 4.3.3.1 Example figure 11,12

```
<f>B5_Power 1 TIMEDELAY(30)</f>
```

## 4.3.4 How to set the "Depend" filtering

The syntax used to set the *"Depend"* filtering is the following:

<f> FlagName yPos DEPEND(xx,xx,..) </f>

where the parameter in the brackets is/are the flag that we supposed by the real cause of the problem.

#### 4.3.4.1 Example figure 13

```
<f>CoilDrvMode 1 DEPEND(CoilRelay_Server,CanNet.can-eth)</f>
```

## 4.3.5 How to set the "Group" filtering

The syntax used to set the *"GROUP"* filtering is the following:

```
<f> FlagName yPos GROUP(GroupName) </f>
<f> FlagName yPos GROUP(GroupName) </f>
```

…

where the parameter in the brackets is the name of the group.

#### 4.3.5.1 Example figure 14

```
<f>Laser_Bench 2 GROUP(Laser_Bench) TIMEDELAY(60) … </f>
<f>Laser_Bench_ALARM 2 GROUP(Laser_Bench) TIMEDELAY(60) …</f>
```

## 4.3.6 How to alarm a "flag"

The syntax to alarm a flag is the following

```
<f> FlagName yPos EMAIL(a, b, c, d, x)  SMS(a, b, c, d, x) SOUND(e, b, c, d) </f>
```

where:

- a: is the recipient (see). There is the possibility to state more than one recipient; each recipient must be separated by %.
- b: is the number of times alarm is to be notified.
- c: is the persistence time.
- d: is the subsequent delay between other notifications.
- x: is an optional parameter and it is additional text to add to the notification message
- e: is the name of the file to be sounded.

### 4.3.6.1 Example

```
<f>NI_CO2_Laser 1 EMAIL(OPERATION_MAIL%TCS_MAIL,1,300,60) SMS(OPERATION_SMS,1,300,60)
SOUND(302,1,120,30)</f>
```

## 4.3.7 Commented examples

### 4.3.7.1 Example 1

```
<s name="Injection">
…
        <f>BMS 4 GROUP(BMS) TIMEDELAY(30)</f>
        <f>BMS_FFh_offset 4 GROUP(BMS) EMAIL(OPERATION_MAIL,1,3600,60) SOUND(302,1,3600,30)</f>
…
</s>
```

In this example are stated two flags which are grouped into the group “BMS”; the group is displayed on the fourth row of the subsystem “Injection”. The flag “BMS” has applied the Timedelay filtering while the flag “BMS_FFh_offset” is alarmed by email and by sound.

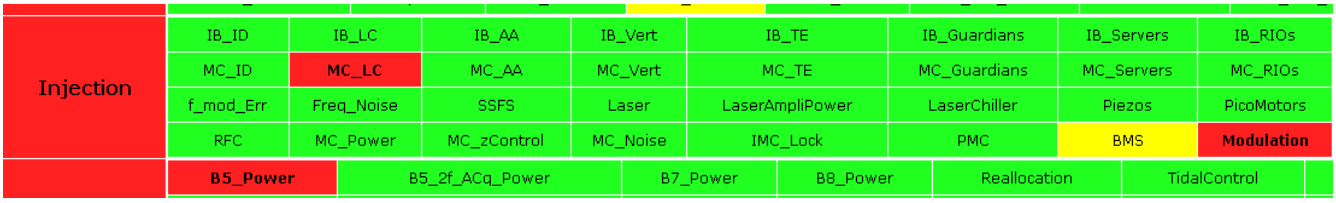



*Fig. 34:: DMS main page. On the main page the group BMS is displayed as a standard flag.*

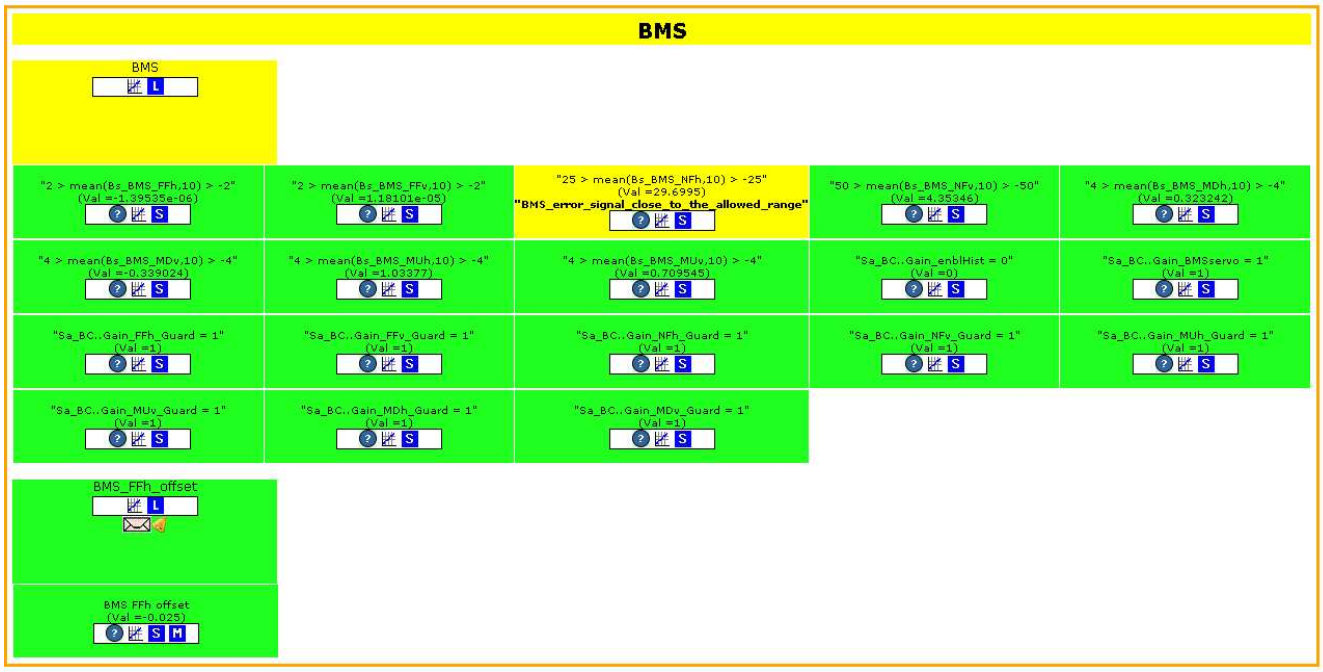



*Fig. 35: DMS LevelTwo section. At the second level we can see that BMS is actually a group constituted by two flags: BMS and BMS_FFh_offset.*

## 4.3.7.2 Example 2

```
<f>CoilDrvMode 2 DEPEND(CoilRelay_Server,CanNet.can-eth) TIMEDELAY(60)</f>
```

The flag CoilDrvMode has applied the Timedelay filtering and the depend filtering. When the flag CoilDrvMode becomes red the Timedelay filtering of 60 sec is applied; then, if the flag stays constantly red for 60 sec the depend filtering is applied. This is in agreement with the diagram block.

## 4.3.7.3 Example 3

```
<f>NI_Chiller 1 GROUP(NI_Chiller) EMAIL(OPERATION_MAIL,1,300,60)  SOUND(302,1,120,30)</f>
<f>NI_Chiller_ALARM 1 GROUP(NI_Chiller) EMAIL(OPERATION_MAIL,1,300,60)
SMS(OPERATION_SMS,1,300,60) SOUND(302,1,120,30)</f>
```

#### 4.3.7.4 Example 4

```
<f>PR_LC 1 GROUP(PR_LC) TIMEDELAY(30)</f>
<f>PR_Coil_Current_ALARM 1 GROUP(PR_LC) TIMEDELAY(30) EMAIL(OPERATION_MAIL,1,300,60)
SMS(OPERATION_SMS,1,900,60) SOUND(302,1,300,30)</f>
```

# 4.4 Managing alarm recipients

The structure of this configuration file is the following:

```
…
<e>OPERATION_MAIL email_user_address, email_user_address, … </e>
<e>OPERATION_SMS SMS@gatewaysms.it,phonenumber@foxbox</e>
<e>OPERATION_TEST SMS@gatewaysms.it</e>
<e>VACUUM_MAIL email_user_address, email_user_address, … </e>
<e>TCS_MAIL email_user_address, email_user_address, … </e>
…
```

Each of these recipients can contain only users to be notified by mail or only users to be notified by SMS

## 4.4.1 Recipient for email notification

The syntax to define a recipient for email notification is the following:

```
<e> RecipientName_1  email_address, email_address, email_address </e>
<e> RecipientName_2  email_address, email_address, email_address </e>
```

#### 4.4.1.1 Example:

```
<e>OPERATION_MAIL aaaaa@xxx.it, bbbbb@yyy.fr,.... </e>
<e>VACUUM_MAIL cccc@zzz.it,....</e>
```

## 4.4.2 Recipient for SMS notification

The syntax to define a recipient for SMS notification is the following:

<e>RecipientName_1 SMS@gatewaysms.it, phonenumber@foxbox</e>

<e>RecipientName_2 SMS@gatewaysms.it, phonenumber@foxbox </e>

### 4.4.2.1 Example:

```
<e>OPERATION_SMS phonenumber1@foxbox, phonenumber2@foxbox,  </e>
<e>VACUUM_SMS phonenumber3@foxbox </e>
<e>CONDITIONING_SMS phonenumber4@foxbox </e>
```