

# *Quality flags in Virgo Data Base*

*D. Verkindt, LAPP*

*On behalf of the Virgo « data quality task force »*

# *Purpose*

- We produced during VSR1 a set of online quality flags
- We are starting to produce VSR1 offline quality flags
- Both are useful to define the data segments for data analysis
- **Needs:**
  - To manage those quality flags
  - To have common definitions
  - To have common naming conventions
  - To have ONE repository for the quality flags segments lists (VDB)
- **A « task force » has raised some weeks ago to:**
  - Produce a reference ScienceMode segments list
  - Setup quality flags definitions
  - Setup tools for quality flags management
  - Produce quality flags segments list to be uploaded into VDB

# Quality flags / VDB task force

## Current team

M. Bizouard

L. Bosi

S. Chatterji

G. Hemming

N. Leroy

D. Verkindt

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ITF state  
ITF Data Quality

**Events Viewer**  
Inspiral  
Burst  
Stochastic

**VDB**  
VDB server Cascina  
statistics

**DataQuality Segments Lists Manager**

**Select task:**  
Data Quality List Viewer Data Quality List Upload ~ ScienceMode and DQ combine

**Documentation:**  
- Data Quality definition - Science Mode definition  
- DataQuality segments lists documentation link

**DQ Segments Lists Documentation**

LISTNAME	VERSION	CREATOR	URL
SSFS_CORR_SAT	VSR1_v1	Marie Anne Bizouard	<a href="http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_dqinfo.html">http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_dqinfo.html</a>
ITF_SCIENCEMODE	VSR1_v1	Didier Verkindt	<a href="http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_itf.html">http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_itf.html</a>
ITF_LOCK	VSR1_v1	Didier Verkindt	<a href="http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_itf.html">http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_itf.html</a>

Developed by Leone B. Bosi - INFN Perugia

VDB developed by [L. Bosi](#) and G. Hemming

Based on [MySQL](#)

Current location: <https://virgo.pg.infn.it/VDB/main.php>

# *Quality flags / VDB task force*

<http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/DOCUMENTS/proposal.pdf>

## Science, injection, and data quality segments for Virgo DRAFT PROPOSAL

Marie Anne Bizouard, Leone Bosi, Shourov Chatterji,  
Gary Hemming, Nicolas Leroy, Didier Verkindt, ...

2007-Oct-02

### 1 Overview

The purpose of this document is to standardize the definition, naming conventions, and storage of science mode segments, injection segments, and data quality flags for use in Virgo data analysis.

### 2 Definitions

#### 2.1 Science Mode

Science mode segments are the baseline segment list for all data analysis.

We desire to recover as reliably and accurately as possible the science mode segments as marked by the operator in the Virgo control room at the time the data was taken.

# VDB Documentation

<http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc>

## Virgo Data Base documentation

### Overview

The Virgo Data Base (VDB) aims at storing different kind of information that are important for the analysis of the Virgo data:

- bookkeeping: Virgo frame files geographical position (SITE, PATHNAME, FILENAME, ...)
- metadata information: data about frame data (science mode, data quality and ITF status)
- segments information: ITF specific segments (e.g. science mode) and user defined segments
- events: inspiral, burst and others
- triggers and veto: ITF specific or user defined

The User Interface is the [web VDB UI](#)

Not all functionalities are yet implemented, this is an on-going endeavour! This web page provides information both for users and for contributors.

### Segments definitions

[Science Mode segments definition](#)  
[Data Quality flag segments definition](#)

### Segments list documentation (lists available in VDB)

[VSR1 ITF Status already inserted in VDB](#)

[VSR1 Data Quality flags already inserted in VDB](#)

### VDB upload and download procedure

- Science Mode segments list is fixed (one per run) and no user's modification is allowed.
- Any user can upload a data quality flag segments list using the VDB toolkit or the VDB web interface. This list is tagged as "unstable" with no version number until it is validated by the responsible.
- There is only one person responsible to tag the uploaded DQ flag segments list as "stable" (validate it for data analysis). This responsible still needs to be appointed and the validation procedure still needs to be defined.
- By default, VDB provides always the last version of segments list validated by the responsible.
- Downloading information can be done easily using the VDB UI or with the VDB toolkit
- [VDB toolkit user manual](#)
- VDB toolkit software (package VDB) is archived in CVS. The v0r2 version is the production version.

# ScienceMode segments definition

Science Mode Segments definition - Microsoft Internet Explorer

Fichier Edition Affichage Favoris Outils ?

Précédente Rechercher Favoris

Adresse <http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/sciencemode.html>

Google Envoyer Paramètres

## Science Mode segments definition

Any Science Mode segment is defined by the value of channel Qc\_Moni\_ScienceMode (+1 for ITF in Science Mode, -1 for ITF in Adjusting Mode, 0 when data is missing). This value is transformed inside VDB as the following:

- Value +1 corresponds to "Interferometer in Science Mode"
- Value 0 corresponds to "Interferometer not in Science Mode"

Science Mode segments are defined, for each run, with:

- a segment number starting from 1,
- a start GPS time (inclusive),
- a stop GPS time (exclusive),
- a state (0 or 1)

In addition, VDB provides the segment's duration.  
By default, VDB provides to the user only the segments where the value is +1.

In case of missing data between dates t1 and t2, the following definition applies:

```
If value= 0 before t1 and value= 0 after t2: value= 0 between t1 and t2
If value=+1 before t1 and value= 0 after t2: value= 0 between t1 and t2
If value=+1 before t1 and value=+1 after t2: value=+1 between t1 and t2
If value= 0 before t1 and value=+1 after t2: value= 0 between t1 and t2
```

For users who want to exclude missing data segments even if located within a "Science Mode" segment, a specific quality flag will be provided. It will be named QCMONI\_MISS and will follow the definition of the data quality flags (+1 if data is missing, 0 if data is present).

Last update: 10/09/2007 14:52:54 by D. Verkindt : <http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/sciencemode.html>

# Quality flag segments definition

**Data Quality flag segments definition**

Any quality flag segment available from VDB is defined by the value of a quality flag defined offline or online. This value is transformed inside VDB as the following:

- **Value +1 corresponds to "Quality flag applies"**
- **Value 0 corresponds to "Quality flag does not apply"**
- **Value -1 corresponds to "Quality flag not available or data not yet tested"**

Data quality segments are defined, for each run, with:

- a flag name
- a start GPS time (inclusive),
- a stop GPS time (exclusive).
- a state (-1,0,+1)

In addition, VDB provides the segment's duration.  
By default, VDB provides to the user only the segments where the value is +1.

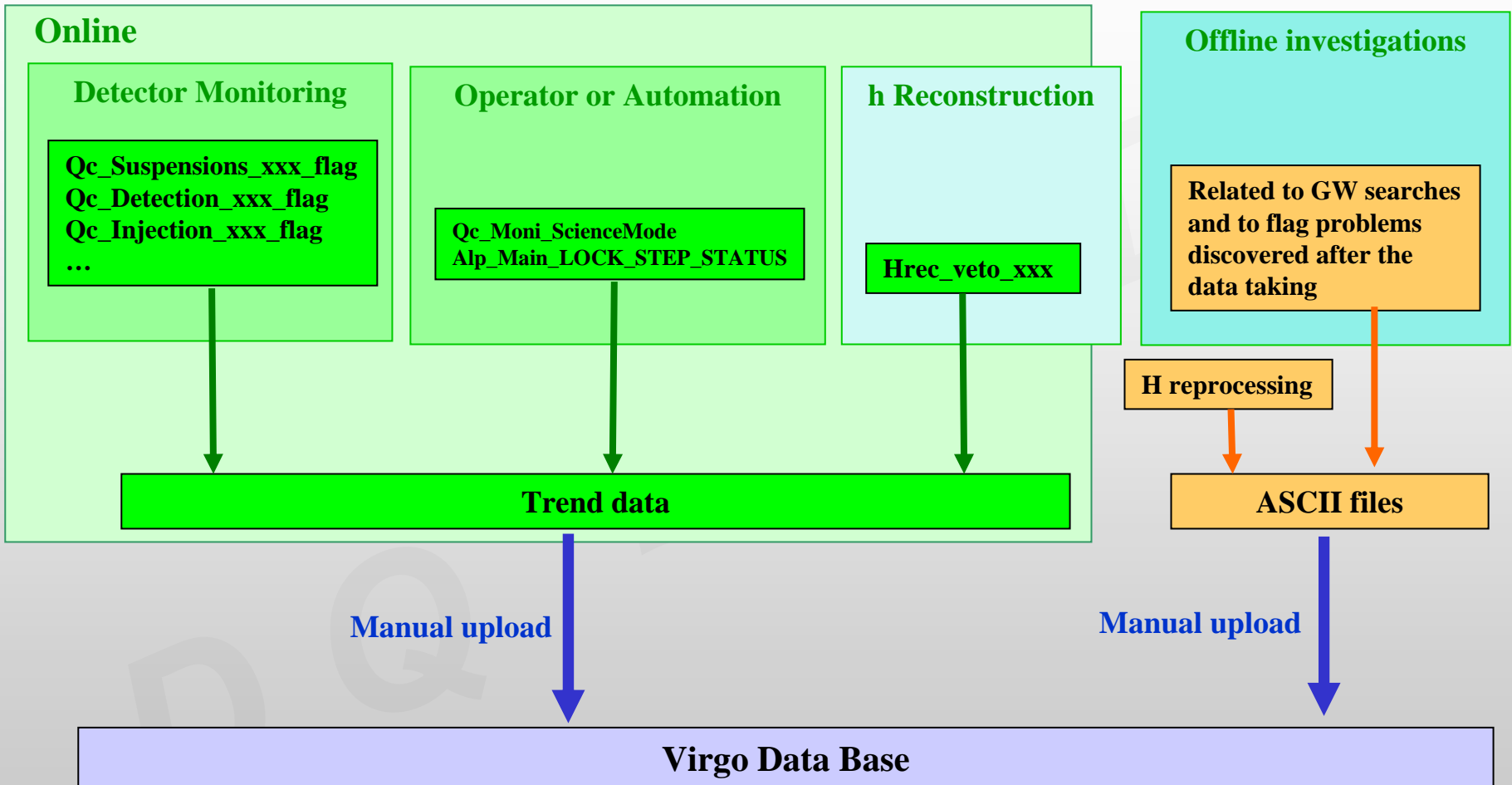
For each quality flag, additional fields exist in the database:

- a run tag (for instance VSR1)
- a version number starting from 1

Doing a AND between the science mode segments list and a quality flag segments list provides the segments of data in science mode to be excluded from the analysis. By default, VDB will provide the NAND, that is the segments of data in science mode to be kept for analysis.

*Last update: 10/09/2007 14:53:03 by D. Verkindt : <http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/dqflag.html>*

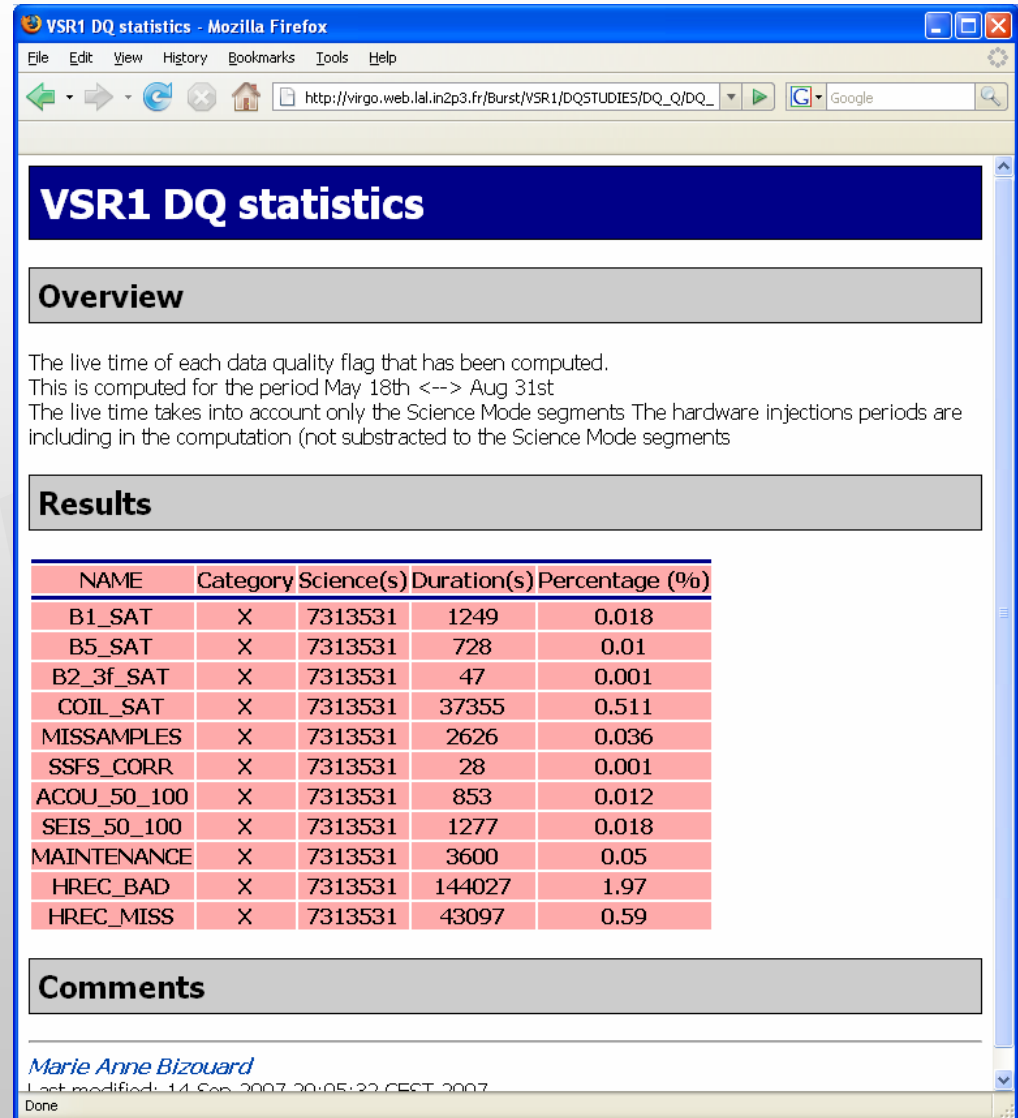
# Quality flags → VDB





# Offline quality flags from burst group

Migration of quality flag segments in VDB



The screenshot shows a Mozilla Firefox browser window titled 'VSR1 DQ statistics - Mozilla Firefox'. The address bar contains the URL 'http://virgo.web.lal.in2p3.fr/Burst/VSR1/DQSTUDIES/DQ\_Q/DQ\_'. The page content includes a title 'VSR1 DQ statistics', an 'Overview' section with explanatory text, a 'Results' section with a table of quality flags, and a 'Comments' section.

**VSR1 DQ statistics**

**Overview**

The live time of each data quality flag that has been computed. This is computed for the period May 18th <--> Aug 31st. The live time takes into account only the Science Mode segments. The hardware injections periods are including in the computation (not subtracted to the Science Mode segments).

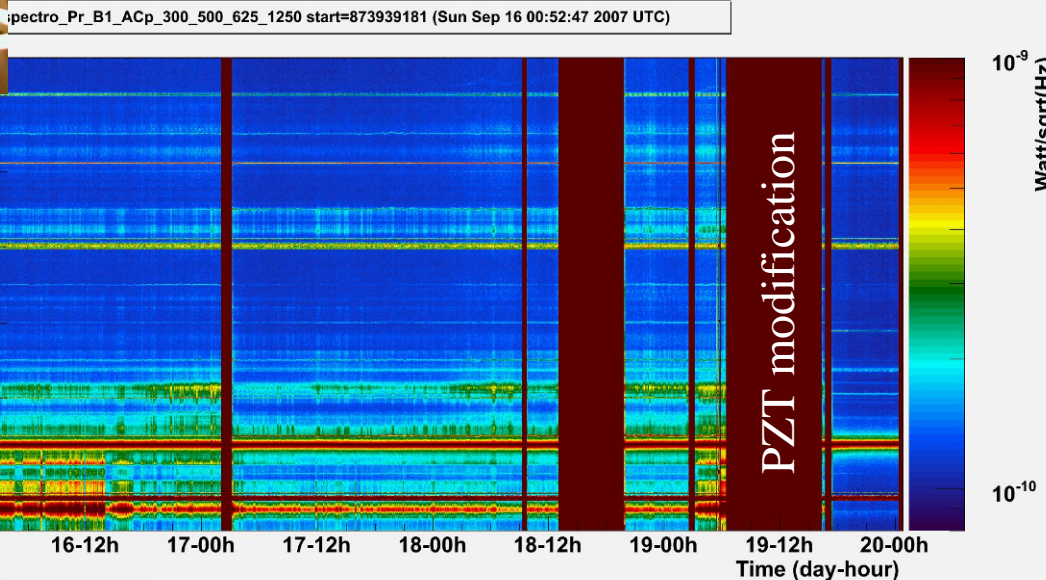
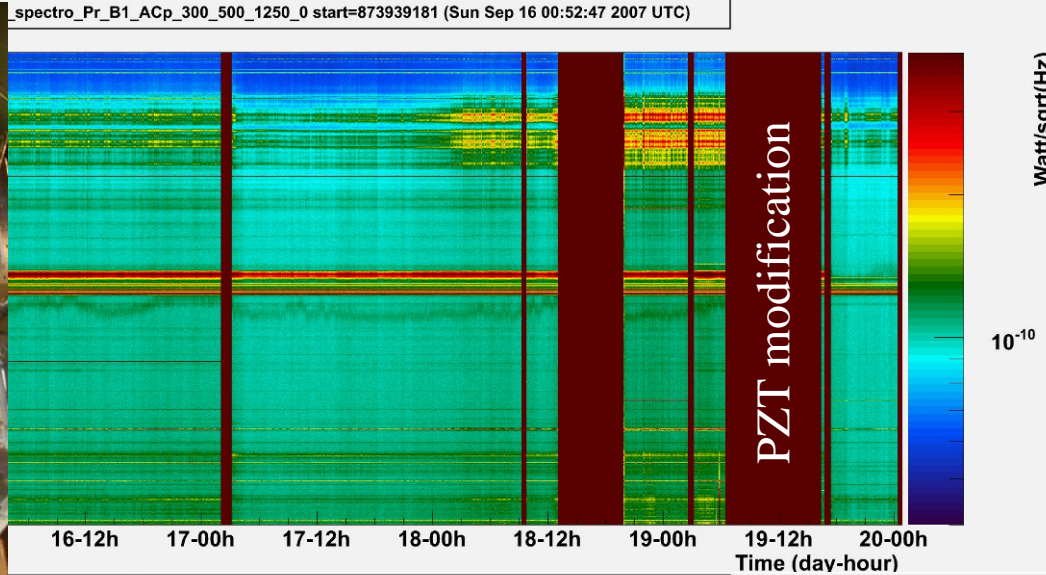
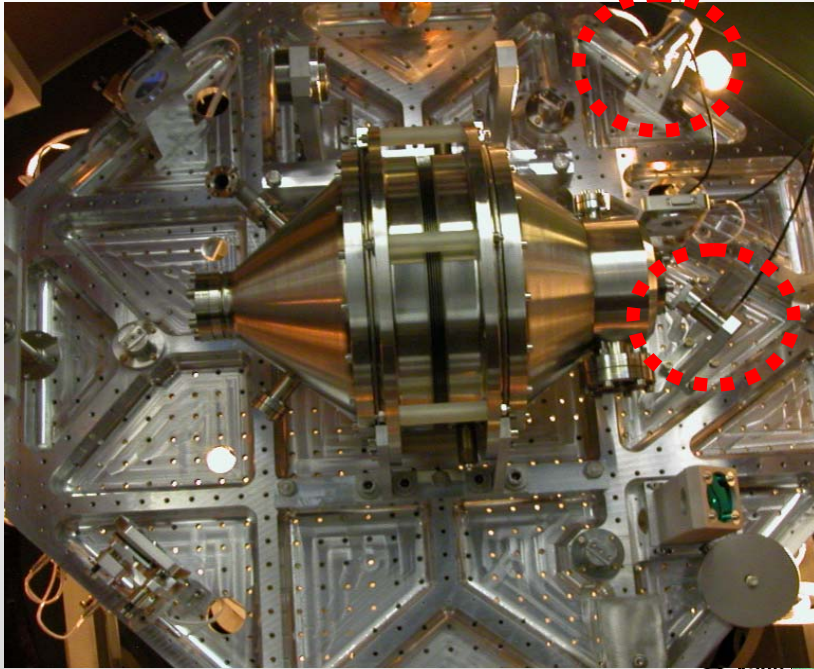
**Results**

NAME	Category	Science(s)	Duration(s)	Percentage (%)
B1_SAT	X	7313531	1249	0.018
B5_SAT	X	7313531	728	0.01
B2_3f_SAT	X	7313531	47	0.001
COIL_SAT	X	7313531	37355	0.511
MISSAMPLES	X	7313531	2626	0.036
SSFS_CORR	X	7313531	28	0.001
ACOU_50_100	X	7313531	853	0.012
SEIS_50_100	X	7313531	1277	0.018
MAINTENANCE	X	7313531	3600	0.05
HREC_BAD	X	7313531	144027	1.97
HREC_MISS	X	7313531	43097	0.59

**Comments**

*Marie Anne Bizouard*  
Last modified: 14 Sep 2007 20:05:22 CEST 2007

# Reference Cavity piezo → noise non stationarity



Piezo used by the Reference Cavity  
Alignment actuation system

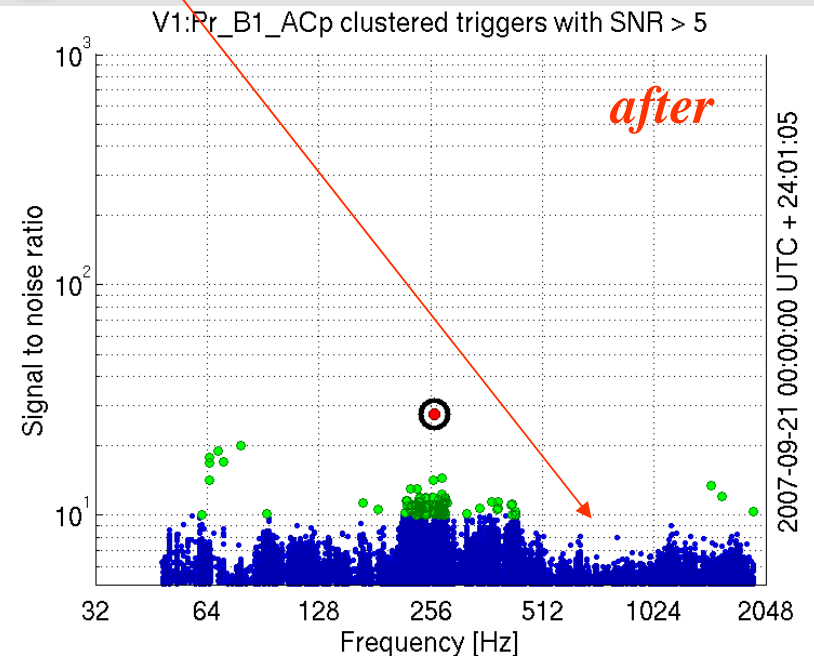
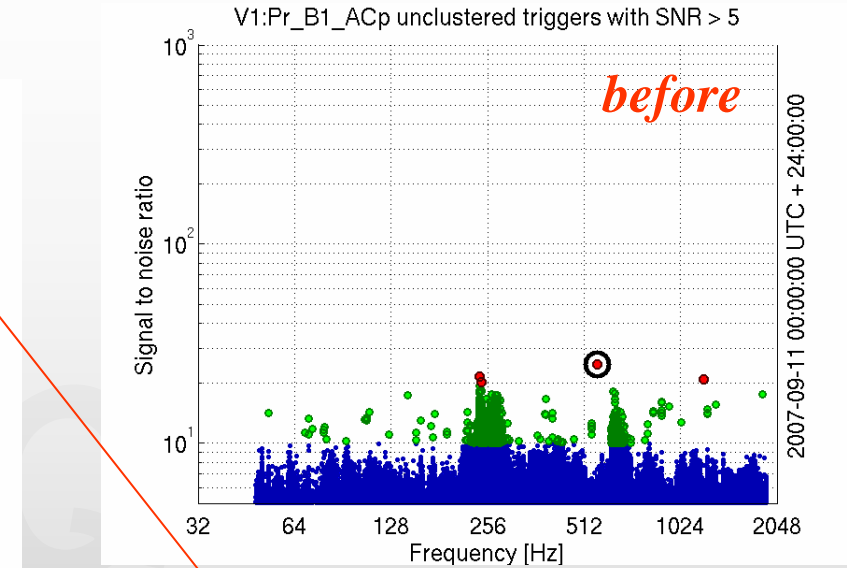
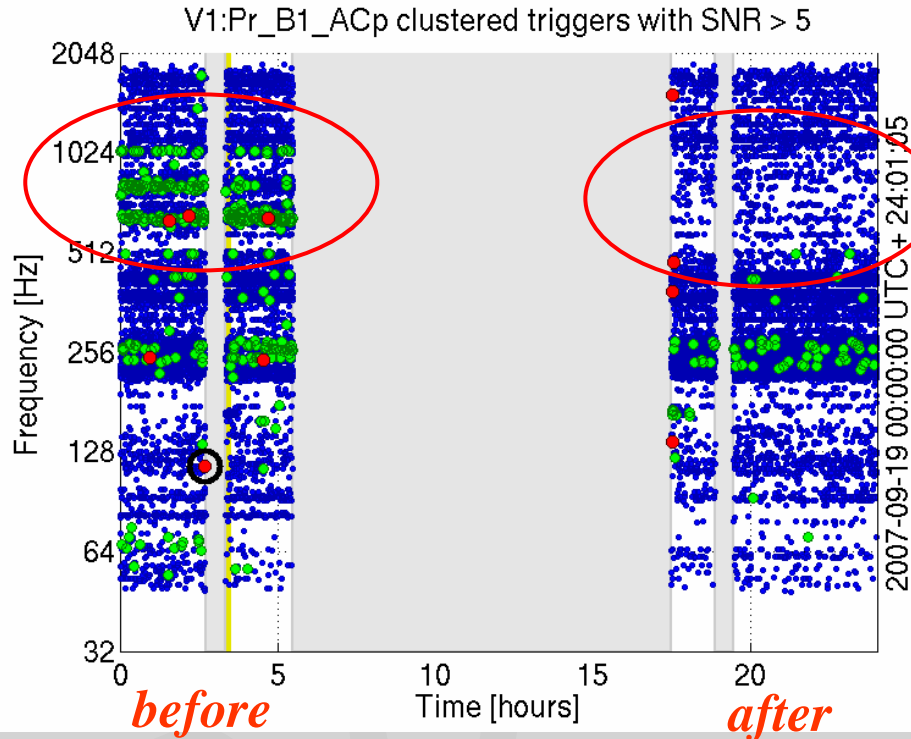
“Dirty” voltage applied on Piezos induced micro seismic motion of the suspended Injection Bench. This induces phase noise inside the Input Mode Cleaner cavity.

20 Oct. 2007

GPS T0: 16/09/07 00:53:21

# Reference cavity piezo voltage fixing (Sep. 19<sup>th</sup> 2007)

## Online results



**A quality flag will be developed to veto the events previous to Sep. 19th**

# Quality flags upload to VDB

**1 - Create a text file containing, for each segment, the start GPS, stop GPS and flag value (0 if flag does not apply, 1 if flag applies)**

**ATTENTION: flag applies = segment is excluded from analysis**

**2 - Upload the file content into VDB using the VDB toolkit developed by L. Bosi**

## Procedure and Rules:

- Anyone can upload a data quality segments list
- The uploaded list is tagged as “unstable”
- For any quality flag segments list uploaded, a html document should be provided that explains how the quality flag has been determined (what is the dead time, what triggered this flag, which channel has been used, threshold, additional seconds put before and after, etc...)  
→ see examples in [http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1\\_dqinfo.html](http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_dqinfo.html)
- Then, the “VDB Quality flags” responsible validates the uploaded list and puts a version number (this is done according to a [validation process](#) to be defined).



# Quality flags information

Offline data quality information - Microsoft Internet Explorer

Fichier Edition Affichage Favoris Outils ?

Précédente Revenir Arrêter Rechercher Favoris

Adresse [http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/WSR1\\_dqinfo.html](http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/WSR1_dqinfo.html) OK

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## Offline data quality information. Last update: 2007/10/05

### Details:

- When the SSFS control signal saturates at  $\pm 10$  V, the laser frequency noise is no more controlled properly. The periods during which one of the channel `Sc_IB_SSFS_Corr` saturates is computed applying a threshold at  $\pm 9.5$  V. The starting time and the end time are rounded down and up to integer values. And then the segment is increased by 1 second added at the beginning and the end of the segment, such that the minimal duration is 3 seconds. Note that the last 3 seconds of the segment are not considered because for a majority of the SCIENCE segments the `Sc_IB_SSFS_Corr` signal saturates 2 seconds before the end of the segment and then comes back to 0 at the last second. That features generates "fake" `SSFS_CORR_SAT` segment.

**Flag:** `SSFS_CORR_SAT`  
**Investigator:** Marie-Anne Bizouard ([mabizoua\\_at\\_lal.in2p3.fr](mailto:mabizoua_at_lal.in2p3.fr))  
**Category:** II

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*Marie-Anne Bizouard*  
Last modified: Thu Oct 11 19:30:32 CEST 2007

# *Quality flag validation process*

1. Study with triggers list (burst, CB, ...) if this quality flag suppresses “loud” events
2. Provide figures of merits (efficiency for the loudest events, etc... )
3. Propose a category for the flag:  
I = flag to be applied before data analysis  
II, III... = flag to be applied after the data analysis

*The previous three points are the duty of the person who proposes the quality flag but can be done by several people, sharing the work and making some cross checks...*

1. Final step:
  - either the flag is interesting and segments list in VDB is tagged as “stable”,
  - or the flag is removed from VDB

# *Quality flags download from VDB*

- Download with web interface or using the VDB toolkit developed by L. Bosi
- Result is a text file containing by default “data OK for analysis” segments with, for each segment:
  - segment number
  - start GPS (inclusive)
  - stop GPS (exclusive)
  - duration
  - flag value

# ScienceMode download from VDB

## Virgo DataBase

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- Book keeping
- Data Quality & ScienceMode
- Segments list Manager
- Events Explorer
- Triggers Explorer
- Help

Home

### Shortcuts

Get framefiles Location  
Frame Infos@gpstime  
Triggers@gpstime

### Segments List Viewer

ITF Science Mode  
ITF state  
ITF Data Quality

### Events Viewer

Inspiral  
Burst  
Stochastic

### VDB

VDB server    
statistics

### DataQuality Segments Lists Manager

**Select task:**  
  ~

Documentation:  
- Data Quality definition - Science Mode definition  
- DataQuality segments lists documentation link

#### >Dataquality Viewer

SELECT DATA QUALITY SEGMENTS LIST  - include unstable versions

Optional selection rules:  
- SEGMENTS DURATION  (s)  
- GPSTIME PERIOD: start  stop   
or chose from the predefined PERIODS SEGMENTS

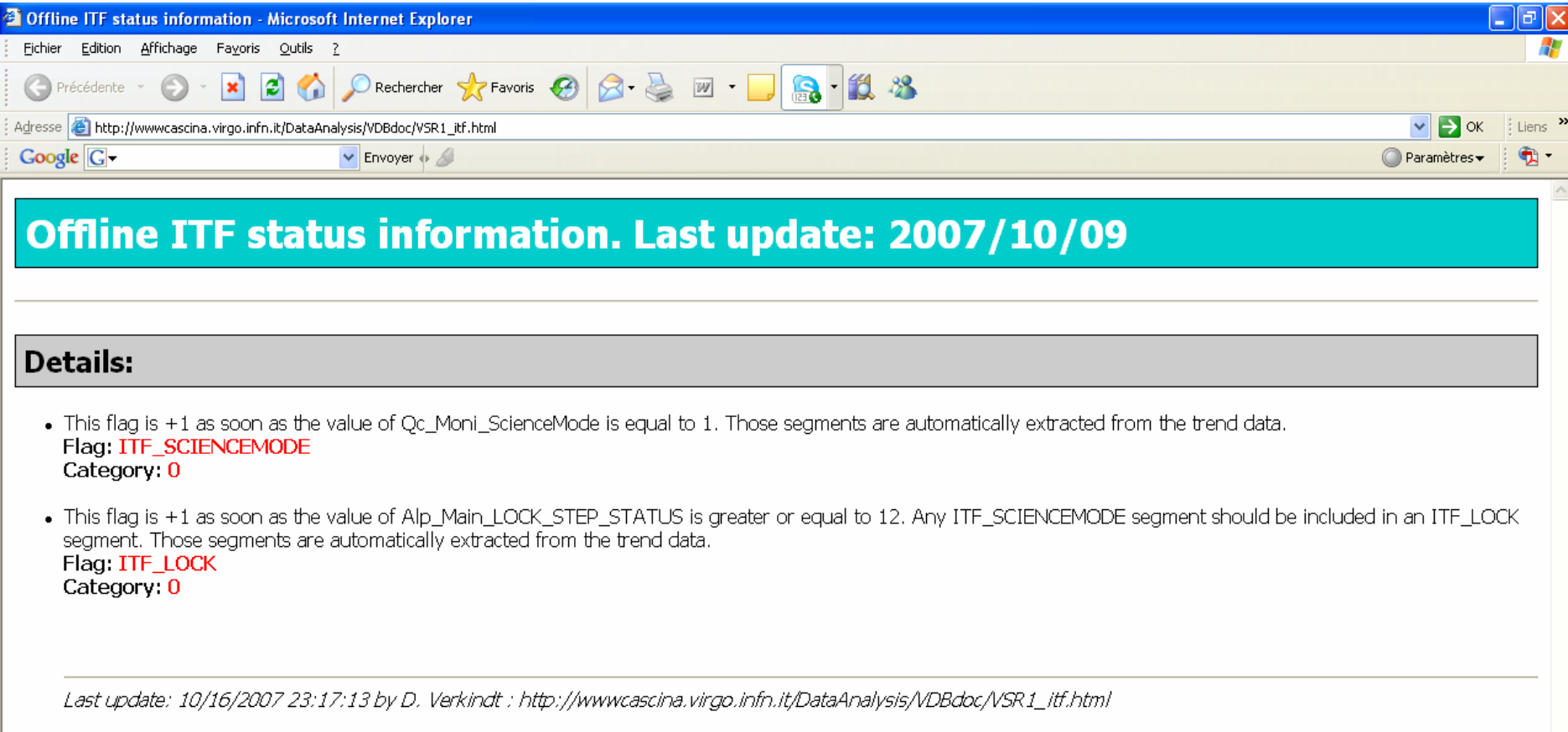
- SHOW SEGMENTS WITH VALUE

**LIST INFOS:**  
- configuration :  
- description :  
- creator : Didier Verkindt - created : 2007-10-12 17:22:24  
- documentation URL: [http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1\\_itf.html](http://wwwcascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_itf.html)

index	timestart	timestop	duration	value
1	863558082	863562057	3975	1
2	863566373	863647684	81311	1
3	863651222	863656308	5086	1
4	863658170	863664741	6571	1
5	863671684	863678716	7032	1
6	863680497	863702124	21627	1
7	863702298	863744870	42572	1
8	863745155	863788721	43566	1



# ITF\_SCIENCEMODE and ITF\_LOCK flags information



The screenshot shows a Microsoft Internet Explorer browser window with the title 'Offline ITF status information - Microsoft Internet Explorer'. The address bar contains the URL 'http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1\_itf.html'. The main content area features a teal banner with the text 'Offline ITF status information. Last update: 2007/10/09'. Below this is a grey header for 'Details:' followed by two bullet points. The first bullet point states that the flag is +1 when Qc\_Moni\_ScienceMode is 1, with 'ITF\_SCIENCEMODE' as the flag and '0' as the category. The second bullet point states that the flag is +1 when Alp\_Main\_LOCK\_STEP\_STATUS is greater than or equal to 12, with 'ITF\_LOCK' as the flag and '0' as the category. At the bottom, a footer provides the last update date and time, and the author's name and URL.

**Offline ITF status information. Last update: 2007/10/09**

**Details:**

- This flag is +1 as soon as the value of Qc\_Moni\_ScienceMode is equal to 1. Those segments are automatically extracted from the trend data.  
**Flag: ITF\_SCIENCEMODE**  
**Category: 0**
- This flag is +1 as soon as the value of Alp\_Main\_LOCK\_STEP\_STATUS is greater or equal to 12. Any ITF\_SCIENCEMODE segment should be included in an ITF\_LOCK segment. Those segments are automatically extracted from the trend data.  
**Flag: ITF\_LOCK**  
**Category: 0**

*Last update: 10/16/2007 23:17:13 by D. Verkindt : [http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1\\_itf.html](http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_itf.html)*

# Quality flags download from VDB

## Virgo DataBase

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Home

### Shortcuts

Get framefiles Location  
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### Segments List Viewer

ITF Science Mode  
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### VDB

VDB server   
statistics

### DataQuality Segments Lists Manager

**Select task:**  
  ~

**Documentation:**  
- [Data Quality definition - Science Mode definition](#)  
- [DataQuality segments lists documentation link](#)

#### >Dataquality Viewer

**SELECT DATA QUALITY SEGMENTS LIST**  - include unstable versions

**Optional selection rules:**  
- SEGMENTS DURATION >  (s)  
- GPSTIME PERIOD: start  stop   
or chose from the predefined PERIODS SEGMENTS

- SHOW SEGMENTS WITH VALUE

**LIST INFOS:**  
- configuration :  
- description :  
- creator : Marie Anne Bizouard - created : 2007-10-12 17:15:10  
- documentation URL: [http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1\\_dqinfo.html](http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/VSR1_dqinfo.html)

index	timestart	timestop	duration	value
1	863558082	863562057	3975	0
2	863566373	863647684	81311	0
3	863651222	863656308	5086	0
4	863658170	863664741	6571	0
5	863671684	863678716	7032	0
6	863680497	863702124	21627	0
7	863702298	863744870	42572	0
8	863745155	863790731	45576	0
9	863790875	863792835	1960	0
10	863793073	863795050	1977	0
11	863795188	863815978	20790	0
12	863816245	863831689	15444	0

# Quality flags information

Offline data quality information - Microsoft Internet Explorer

Fichier Edition Affichage Favoris Outils ?

Précédente Revenir Arrêter Rechercher Favoris

Adresse [http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/WSR1\\_dqinfo.html](http://www.cascina.virgo.infn.it/DataAnalysis/VDBdoc/WSR1_dqinfo.html) OK

Google Envoyer Paramètres

## Offline data quality information. Last update: 2007/10/05

### Details:

- When the SSFS control signal saturates at +/- 10 V, the laser frequency noise is no more controlled properly. The periods during which one of the channel Sc\_IB\_SSFS\_Corr saturates is computed applying a threshold at +/- 9.5V. The starting time and the end time are rounded down and up to integer values. And then the segment is increased by 1 second added at the beginning and the end of the segment, such that the minimal duration is 3 seconds. Note that the last 3 seconds of the segment are not considered because for a majority of the SCIENCE segments the Sc\_IB\_SSFS\_Corr signal saturates 2 seconds before the end of the segment and then comes back to 0 at the last second. That features generates "fake" SSFS\_CORR\_SAT segment.

**Flag:** **SSFS\_CORR\_SAT**  
**Investigator:** **Marie-Anne Bizouard (mabizoua\_at\_lal.in2p3.fr)**  
**Category:** **II**

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*Marie-Anne Bizouard*  
Last modified: Thu Oct 11 19:30:32 CEST 2007

# *More informations*

**<https://virgo.pg.infn.it/VDB/main.php>**

**<http://wwwcascina/virgo.infn.it/DataAnalysis/VDBdoc>**

**[http://wwwcascina.virgo.infn.it/DataAnalysis/Burst/VSR1/DQSTUDIES/DQ\\_Q/DQ.html](http://wwwcascina.virgo.infn.it/DataAnalysis/Burst/VSR1/DQSTUDIES/DQ_Q/DQ.html)**

**<http://wwwcascina.virgo.infn.it/DataAnalysis/Segments/VSR1>**

**<http://wwwcascina.virgo.infn.it/DataAnalysis/Quality>**

**<http://wwwcascina.virgo.infn.it/DataAnalysis/Calibration/hrec.html>**