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# **Virgo Detector characterization**

## **status report**

**Florent Robinet for the Virgo detector group**

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## Advanced Virgo noise characterization

- characterize Adv. Virgo sub-systems (noise, environment...)
- interaction with commissioning

## Data monitoring

- monitor the detector
- provide monitoring tools for the collaboration

## Transient noise investigation

- study detector's glitches
- provide data quality input for searches

## Spectral noise investigation

- study spectral features
- provide data quality input for searches

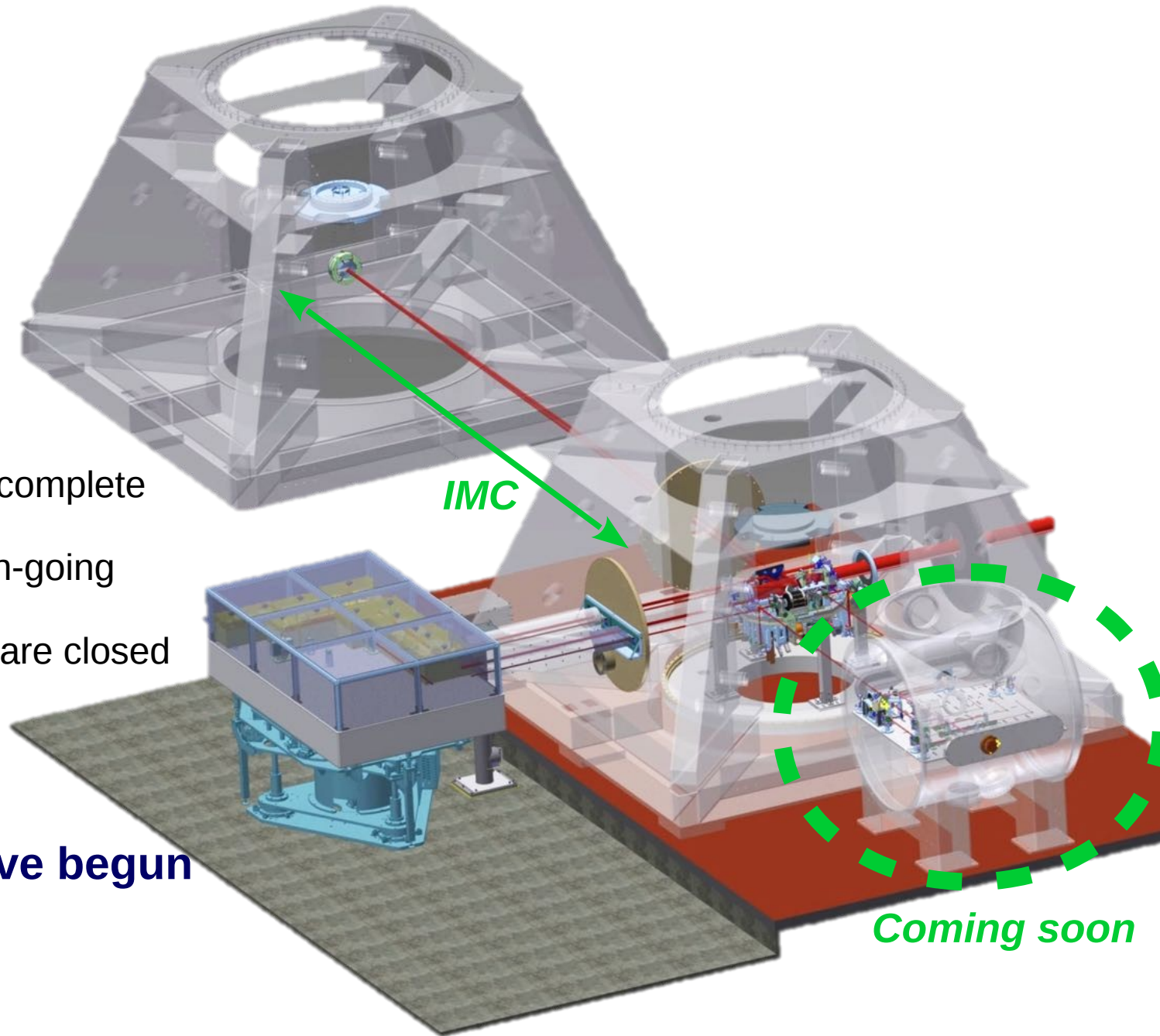
## Scientific run data quality

- data-quality shifts
- data-quality checks for high-confidence GW events / GW alerts

**PRIORITY!**

- Injection system almost complete
- IMC commissioning is on-going
- IMC is locked / all loops are closed
- See Eric Genin's talk

**Detchar activities have begun**



01 02 03 04 05 06 07  
 08 09 10 11 12 13 14  
 15 16 17 18 19 20 21  
 22 23 24 25 26 27 28  
 29 30

**October 2014**  
 01 02 03 04 05 06 07  
 08 09 10 11 12 13 14  
 15 16 17 18 19 20 21  
 22 23 24 25 26 27 28  
 29 30 31

**November 2014**  
 01 02 03 04 05 06 07  
 08 09 10 11 12 13 14  
 15 16 17 18 19 20 21  
 22 23 24 25 26 27 28  
 29 30

**December 2014**  
 01 02 03 04 05 06 07  
 08 09 10 11 12 13 14  
 15 16 17 18 19 20 21  
 22 23 24 25 26 27 28  
 29 30 31

**January 2015**  
 01 02 03 04 05 06 07  
 08 09 10 11 12 13 14  
 15 16 17 18 19 20 21  
 22 23 24 25 26 27 28  
 29 30 31

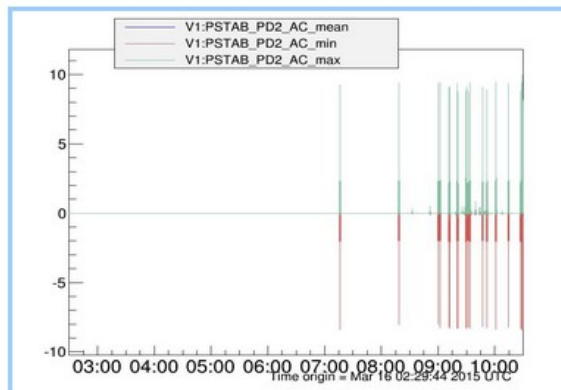
**February 2015**  
 01 02 03 04 05 06 07  
 08 09 10 11 12 13 14  
 15 16 17 18 19 20 21  
 22 23 24 25 26 27 28

**March 2015**  
 01 02 03 04 05 06 07  
 08 09 10 11 12 13 14  
 15 16 17 18 19 20 21  
 22 23 24 25 26 27 28  
 29 30 31

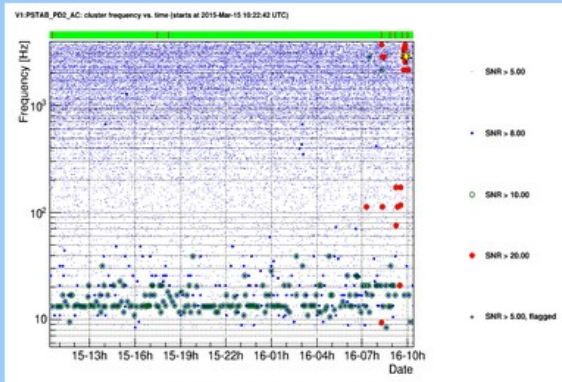
Hours of the day : [00](#) [01](#) [02](#) [03](#) [04](#) [05](#) [06](#) [07](#) [08](#) [09](#) [10](#) [11](#) [12](#) [13](#) [14](#) [15](#) [16](#) [17](#) [18](#) [19](#) [20](#) [21](#) [22](#) [23](#)

## Summary plots

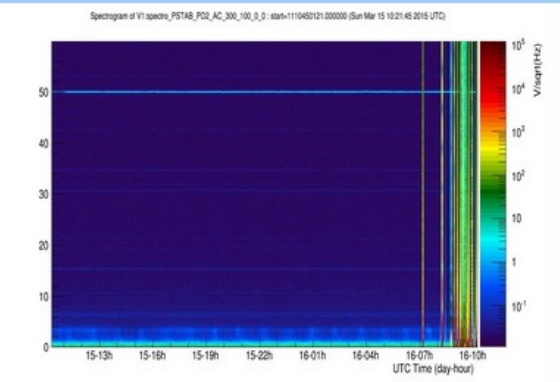
[Last 7 days](#)
[Last day](#)
[Last hour](#)
[Short archive](#)



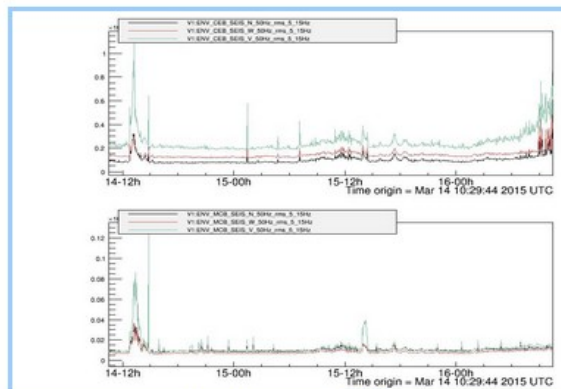
[Injection status](#)



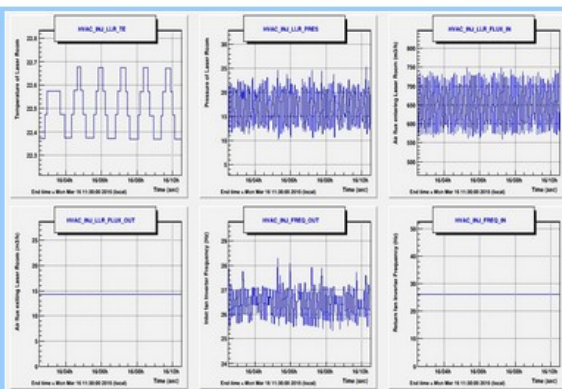
[Glitches summary](#)



[Spectrograms summary](#)



[Environment status](#)

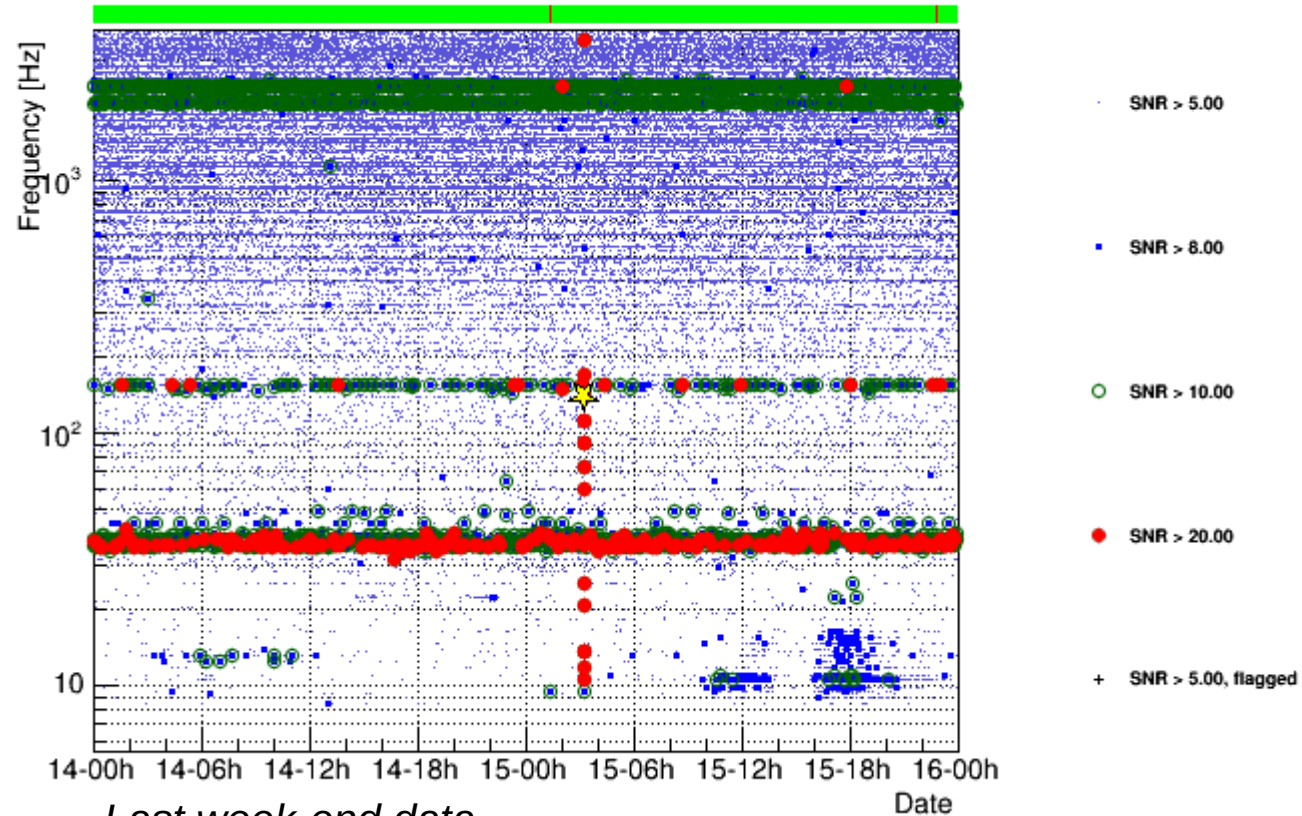


[Infrastructure status](#)

- The Virgo subsystems and environment are continuously monitored by “MonitoringWeb” (~ summary pages + ligo\_dv)
- Glitches, spectrograms, trend data, flags, band-RMS...

## Omicron glitches in the Error signal used to control the reference cavity

V1:INJ\_RFC\_REFL\_I: cluster frequency vs. time (starts at 2015-Mar-14 00:00:00 UTC)



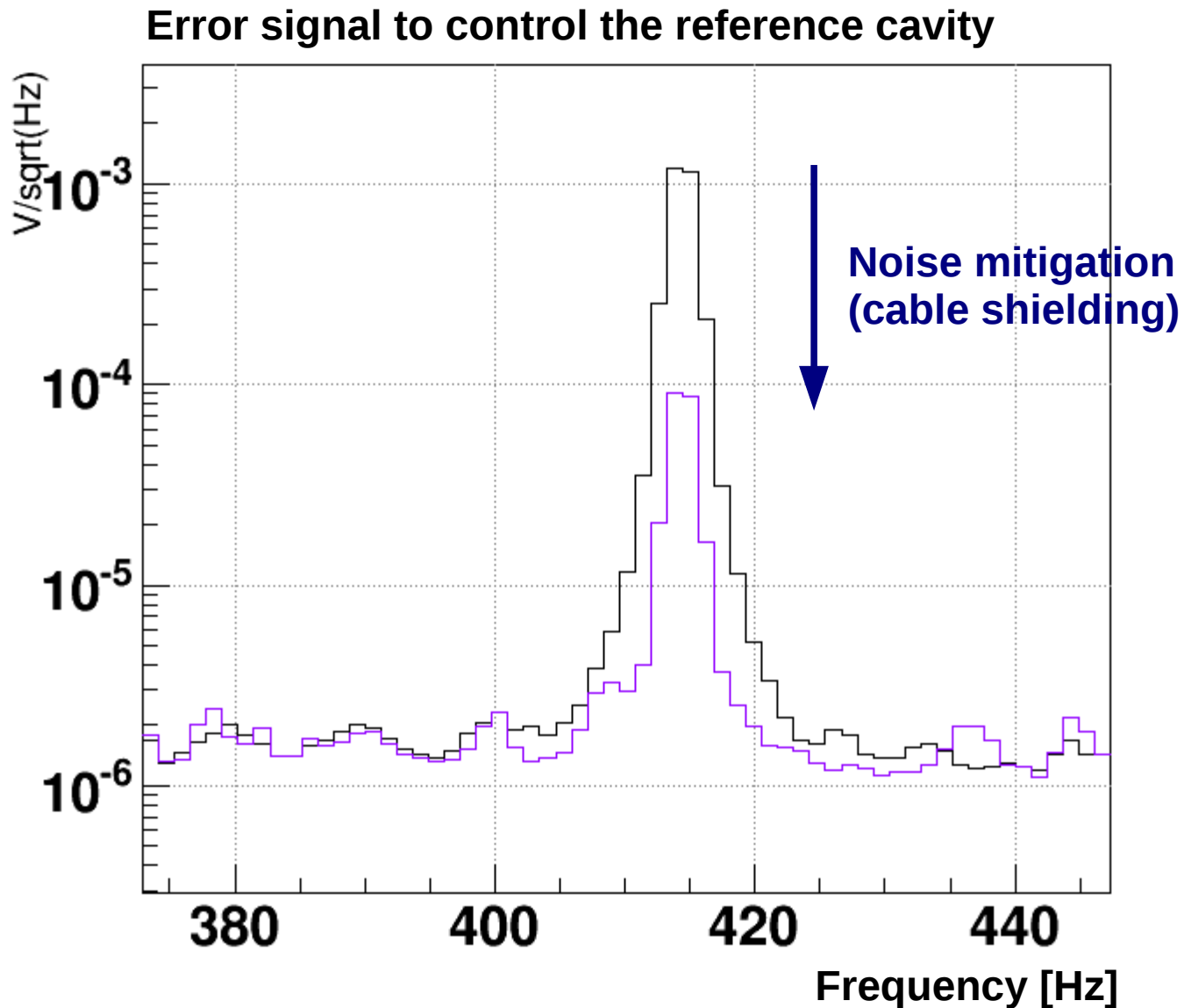
*Last week-end data  
(IMC is locked)*

**Current investigations:**  
 → Laser power stabilization  
 → Laser frequency stabilization

Detchar tools are used to isolate correlations with other channels

## On-site noise investigations

RF noise injection → identify noise entry points (cables...)



- Support to the commissioning effort: data should be systematically scrutinized.
- Virgo detchar cannot afford a “sub-system lead” organization *a la LIGO*
- Some detchar shifts will begin at the end of this month:
  - a team of 2 shifters (glitch/spectral) will investigate data quality for one week
  - continuous noise investigation
  - run detchar investigation tools
  - interaction with commissioning
  - weekly report
- Keep up with the installation of new sub-systems
- First, detchar experts, then, open to the collaboration
- Documentation effort, user-friendly tools
- This shift system will evolve towards shifts for the future Virgo science runs

## The Virgo approach:

**Simplify, simplify, simplify! Optimize, optimize, optimize!**

## Transient noise policy

- Limit the use of generic vetoes:
  - 1 search = 1 set of vetoes
  - vetoes should be designed specifically to a search using background triggers
  
- Get rid of the veto definer file. 2 inputs:
  - time segments you should run over
  - time segments you should veto
  
- Input for online searches in the frames:
  - a state vector
  - a veto channel/pipeline (@100Hz)
  
- Input for offline searches:
  - valid science segments (DQSEGDB)
  - a detchar toolkit to build your own vetoes + guidance

## Spectral noise policy

- mostly unchanged: Line DB



## Channel database

- new database to save channel parameters (description, sampling etc...) in preparation

## DQSEGDB

- Virgo sub-system status flags will soon be uploaded

## New release of dataDisplay

- the Virgo interactive data viewer has been re-written (faster, more flexible)
- useful for commissioning, noise studies and GW event follow-up

## Online noise budget

- standardize the parameter storage/access
- development of a framework to produce a low-latency noise budget