Virgo status
and
ENV team activities

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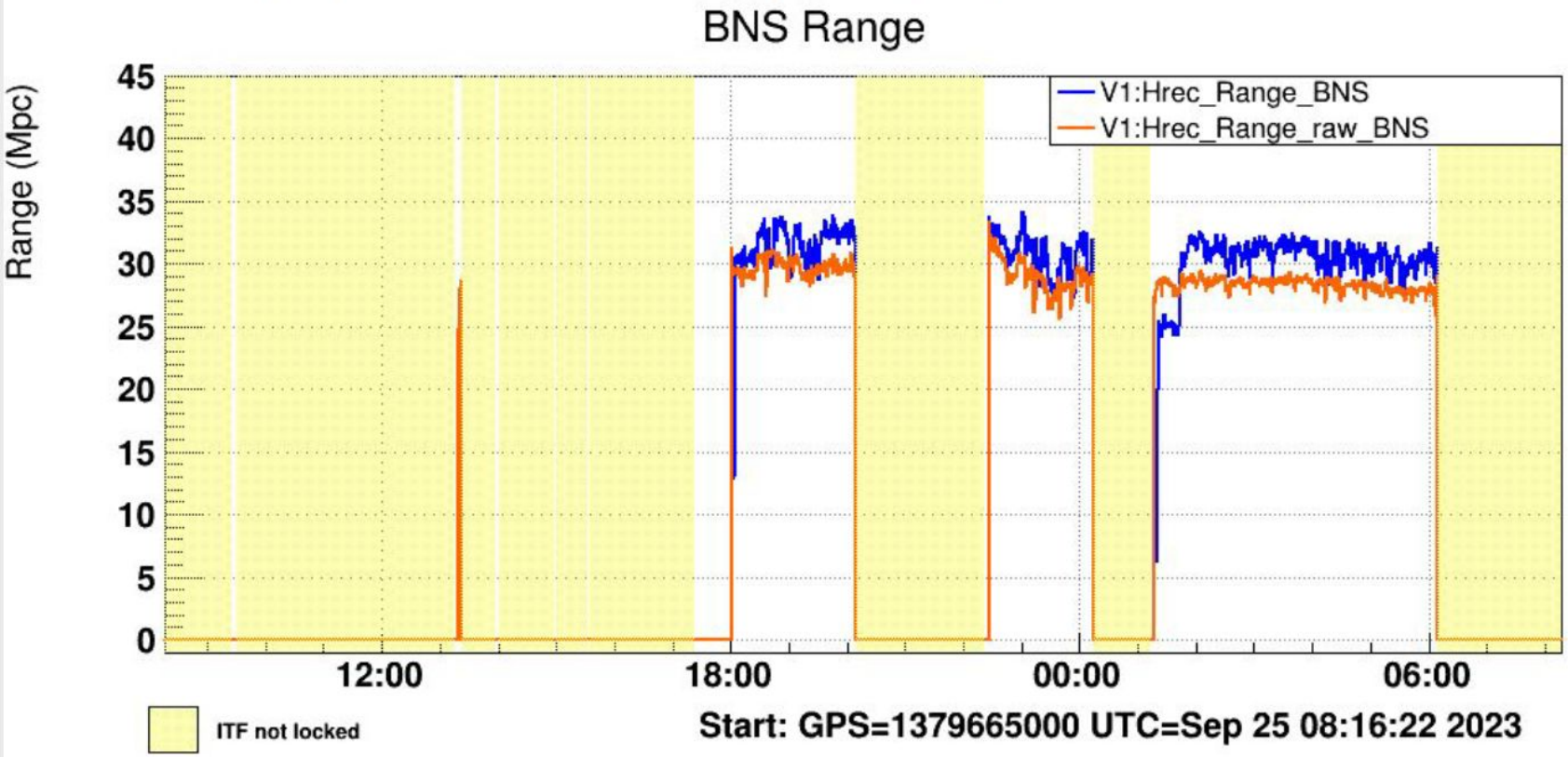
Kagra PEM meeting - 28 sept 2023

Current status

Fiodor Sorrentino's talk - Comm.Meet
VIR-0860A-23

Sensitivity

- BNS Range up to ~34 MPc, above 30 Mpc during long locks

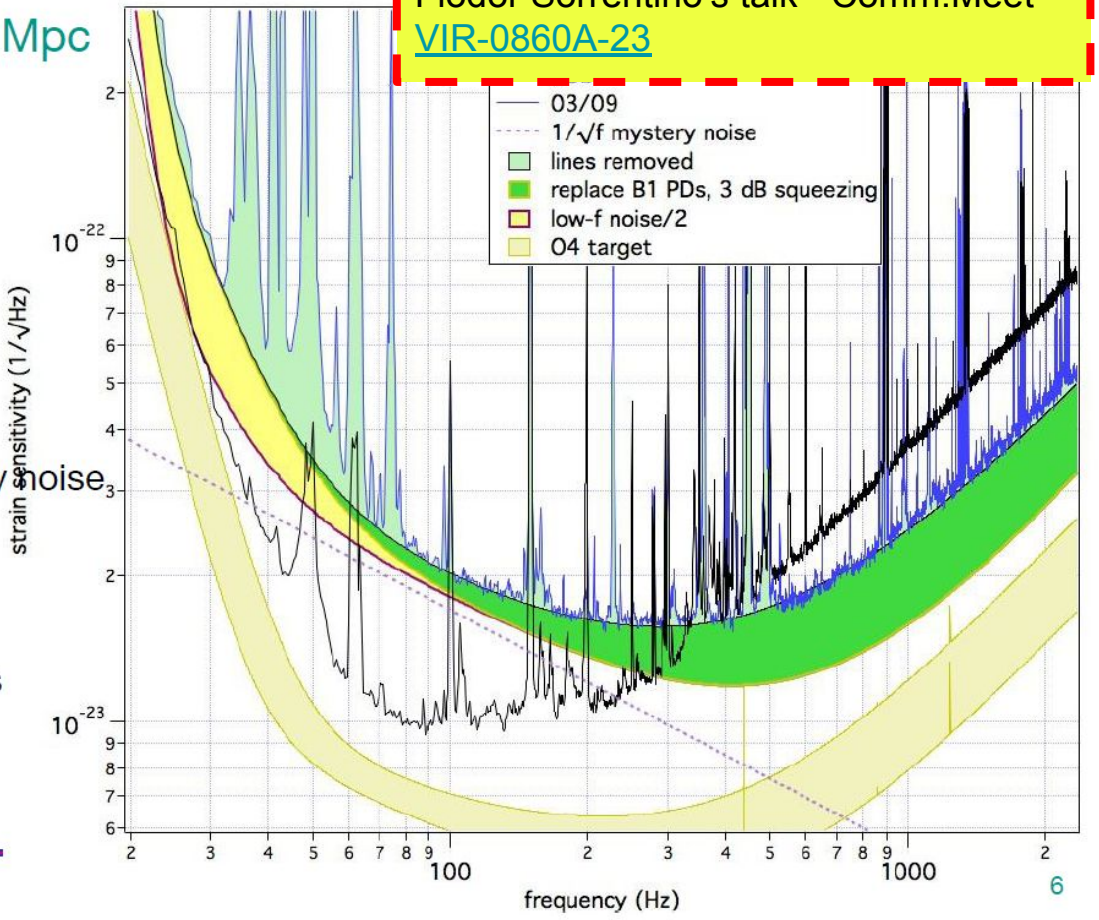


Rationale of plan to join O4 in 5÷6 months

Fiodor Sorrentino's talk - Comm.Meet
VIR-0860A-23

Address known noises to reach 40÷45 Mpc

- Remove/minimise most lines
  - » calibration & control lines
  - » external noise sources
  - » bilinear modulation
- Frequency independent squeezing
- Reduce control noises by ~2
  - » SRCL loop filter
  - » Nonlinear noise subtraction
- Improve control of frequency and intensity noise couplings
  - » thermal tuning
  - » reduce angular fluctuations
- Reduce amplitude noise on RF sidebands
- Subtract nonlinear noise couplings



ENV team activities

Noise characterization

- Acoustic injections/tappings
- Magnetic injections

Noise hunting

- 48 Hz peaks

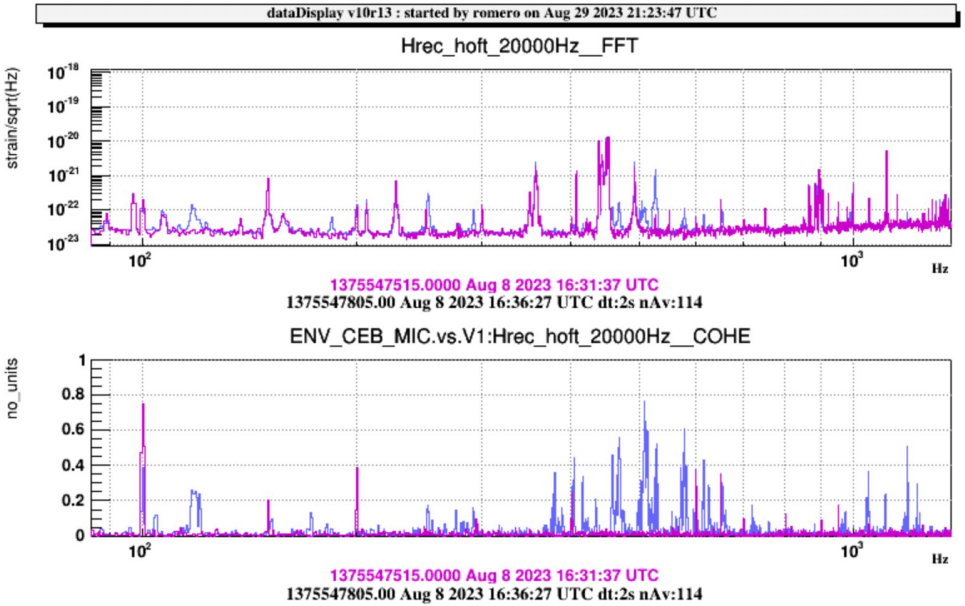
ENV studies

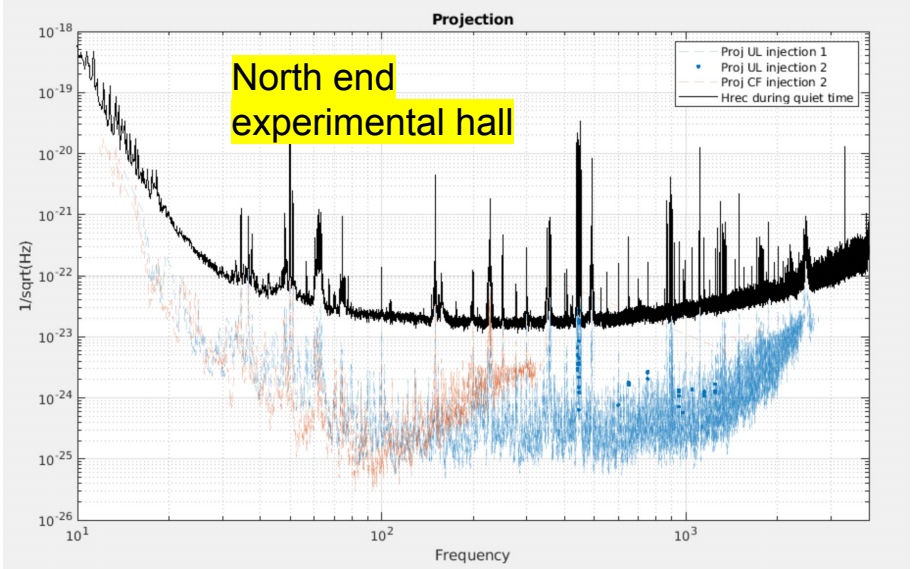
- Trains noise

Acoustic injections

Central experimental hall

- Same structures excited by tapping onto SDB1 (output bench) chamber
- Close to limit the sensitivity
- Suspect scattering noise
- Planned extensive tapping campaign to localize scatterers





Magnetic injections

Global injections (big coil) - **sweeps**

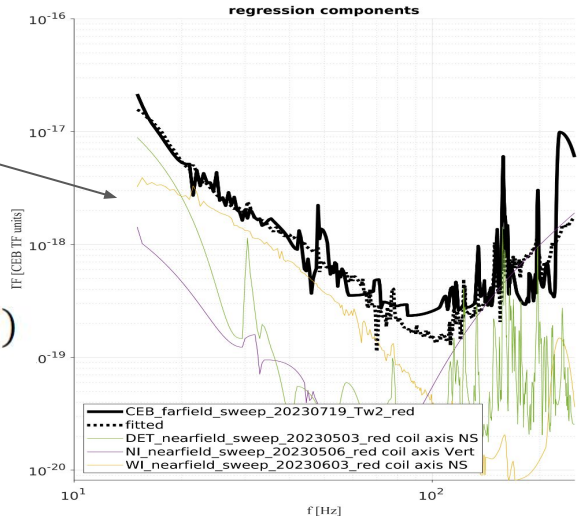
Coupling is not uniform inside the hall

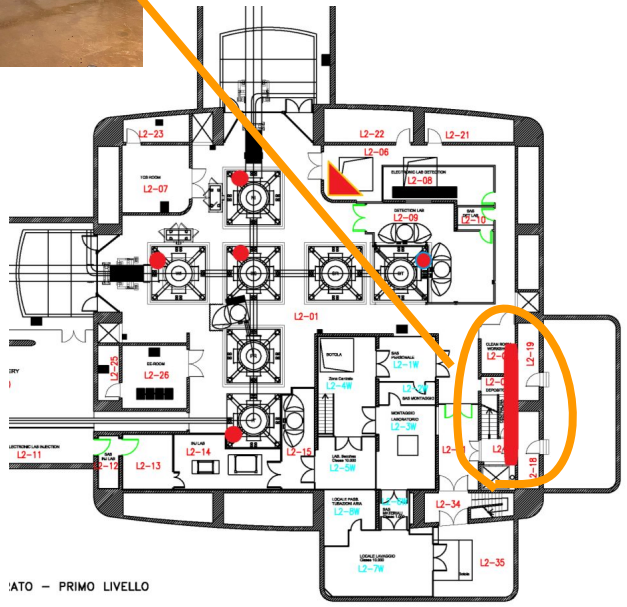
Need Local injections (small coil) close to TMs, INJ, DET to measure shapes of local couplings

Fit local CF to global CF to extract weights and perform projection

$$CF_{BigCoil}(f) = \sum_j \alpha_j CF_j(f)$$

$$h_{magnetic}(f) = \sum_j \alpha_j CF_j(f)\, S_{mag}(j, f)$$





Noise hunting

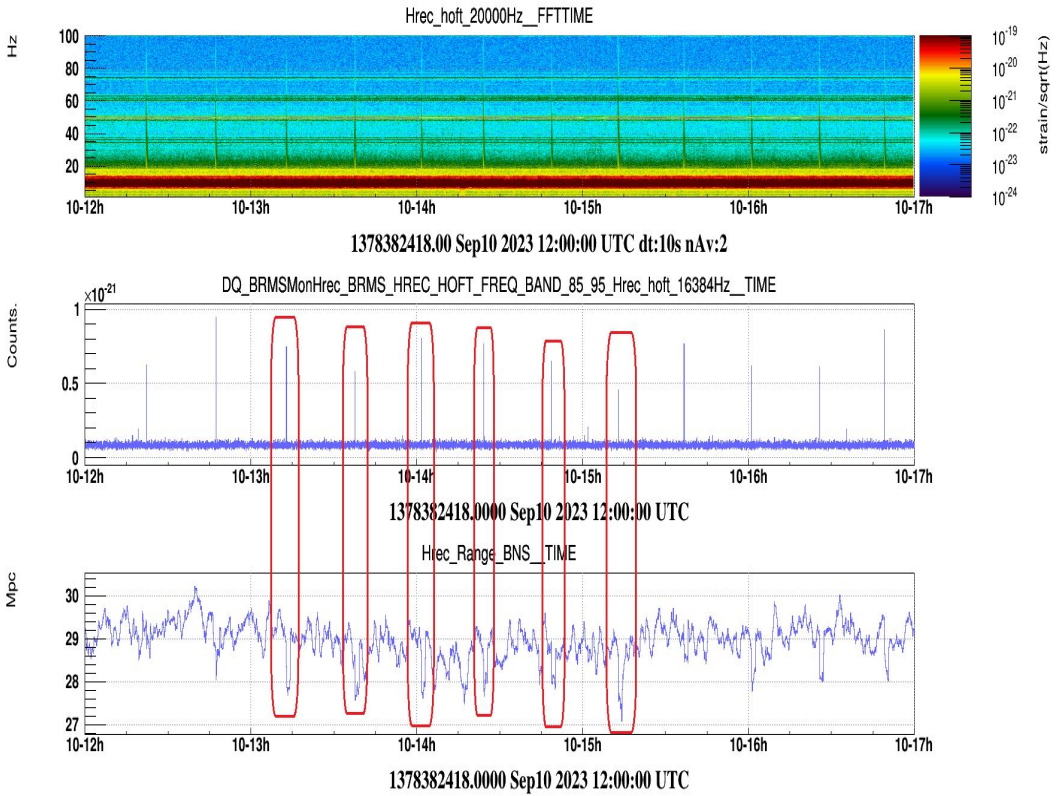
Issue: ~30 minutes glitches (loud).

Since the start of AdV+ commissioning.

No clues so far from DetChar tools: no coherence with ENV or AUX channels, no correlations

We “sniffed” with Magnetic probes several locations.

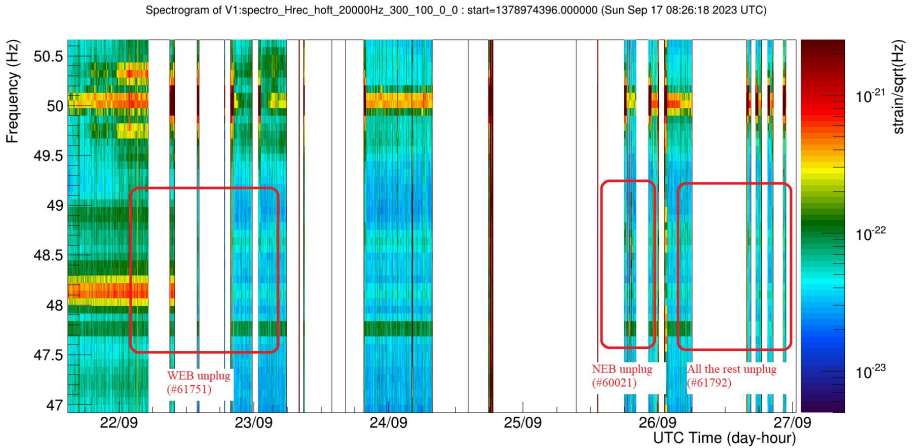
Still searching …

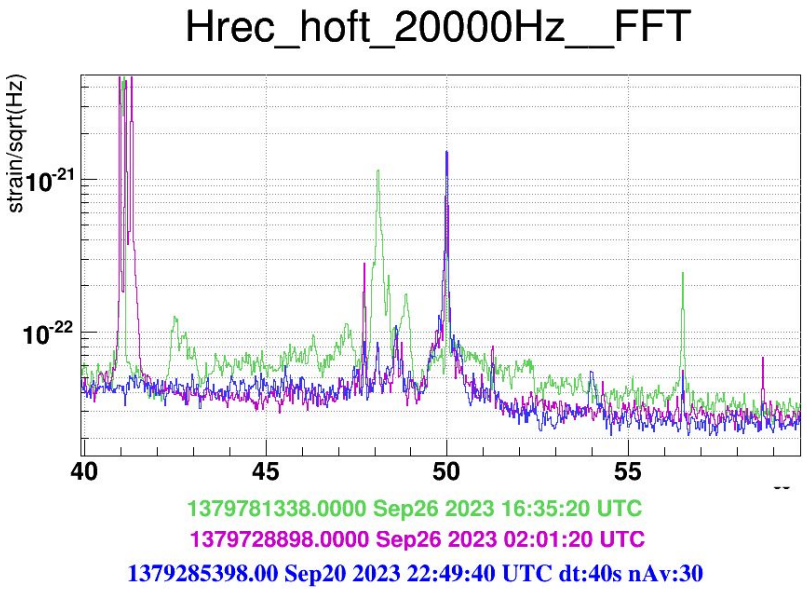


Noise hunting

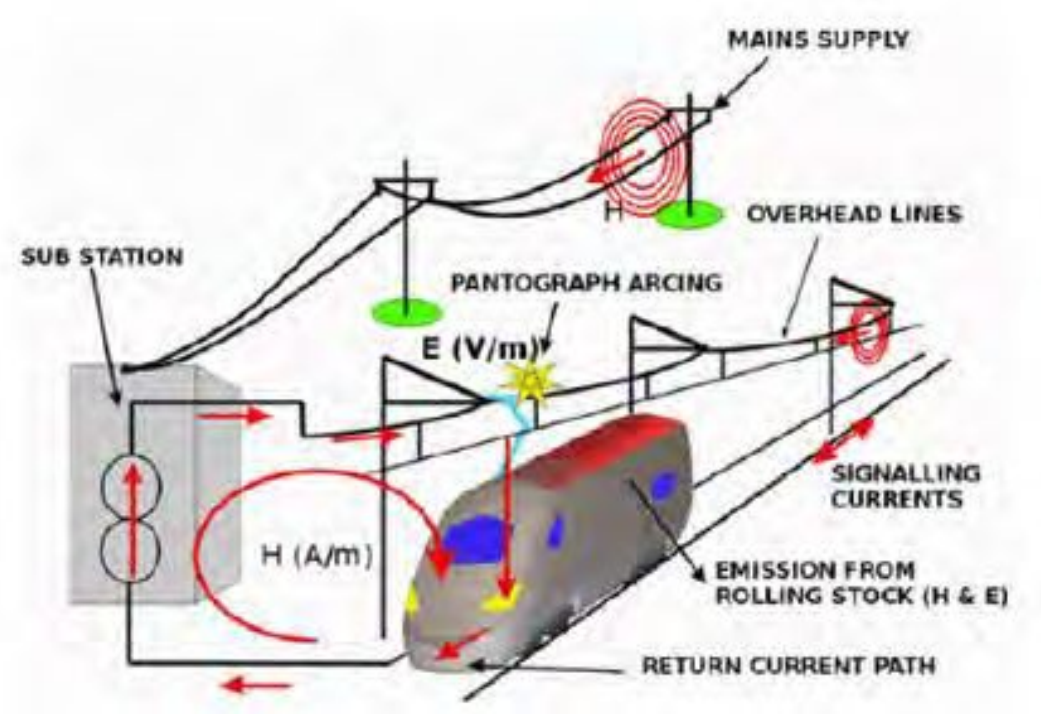
Issue: ~48 Hz peaks = known mechanical mode of F7 crossbar (WE,NE,WI,NI).

- Amplitude reduced by unplugging stepper motor crates.
- Residual excitation to be investigated





Trains noise

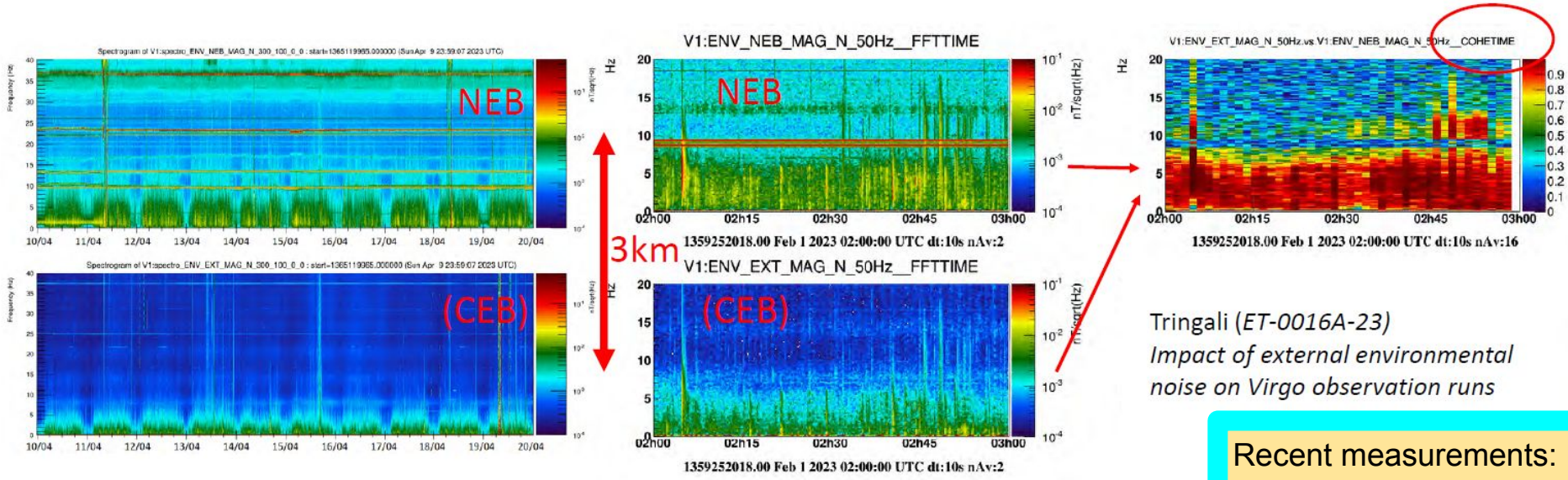


Magnetic noise in Virgo site

Federico Paoletti's talk - ET symposium
ET-0163A-23

We found site-wide low-frequency glitches correlated among distant magnetometers

- Clear a recurring daily pattern, but not weekly or holidays.
- It is anthropic but is not vehicles traffic.



Tringali (*ET-0016A-23*)
Impact of external environmental noise on Virgo observation runs

This triggered an (ongoing) analysis on the trains magnetic noise

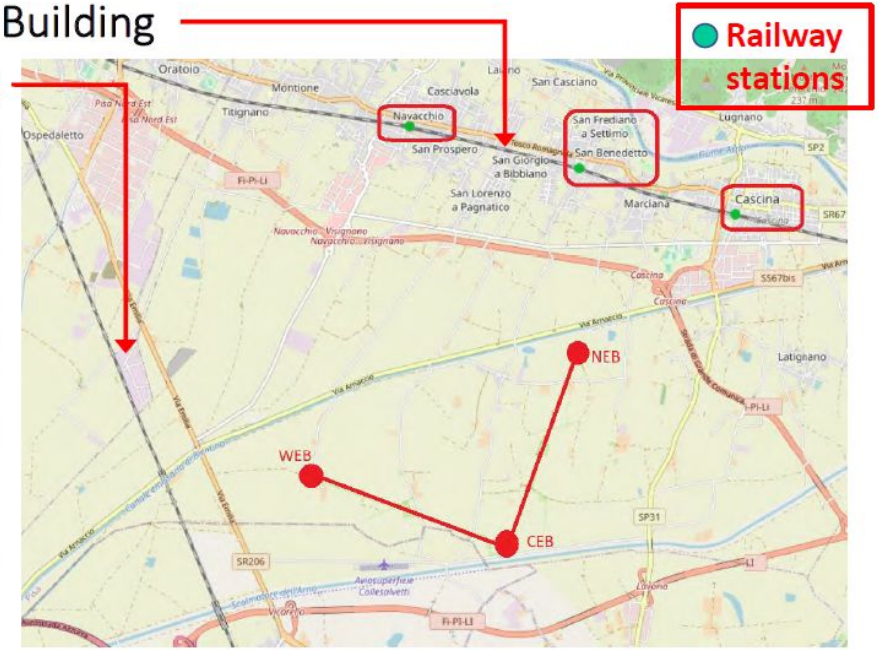
- we decided to put a magnetic sensor at the nearest *railway station*

Recent measurements: this noise is amplified closeby arms vac tube

Railways close to Virgo site

Virgo has two Electric Railways (ERW) close to terminal buildings:

- Passenger + freight 2km from **North End Building**
- Freight only 2km from **West End Building**



Available information (time-table) are on passenger trains only.
No info about freight trains.

Catching trains noise

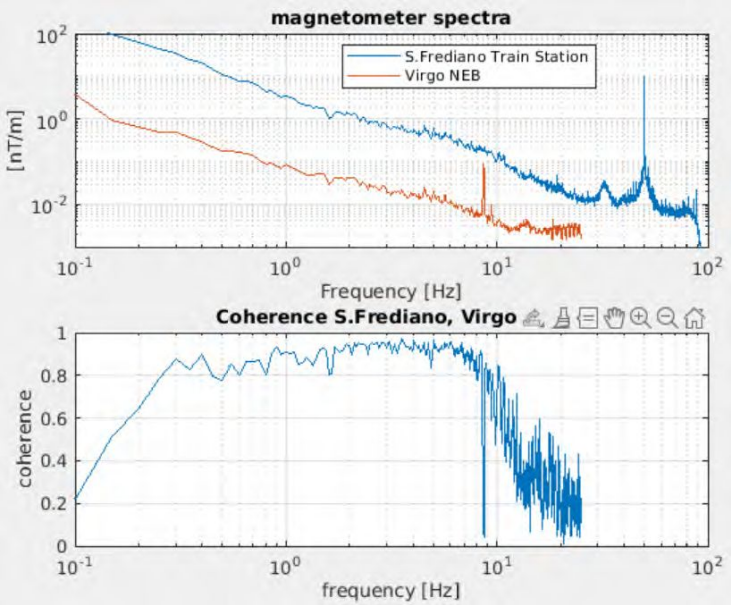
Measuring setup at S.Frediano and Cascina train stations: Trillium C20 and Magnetometer

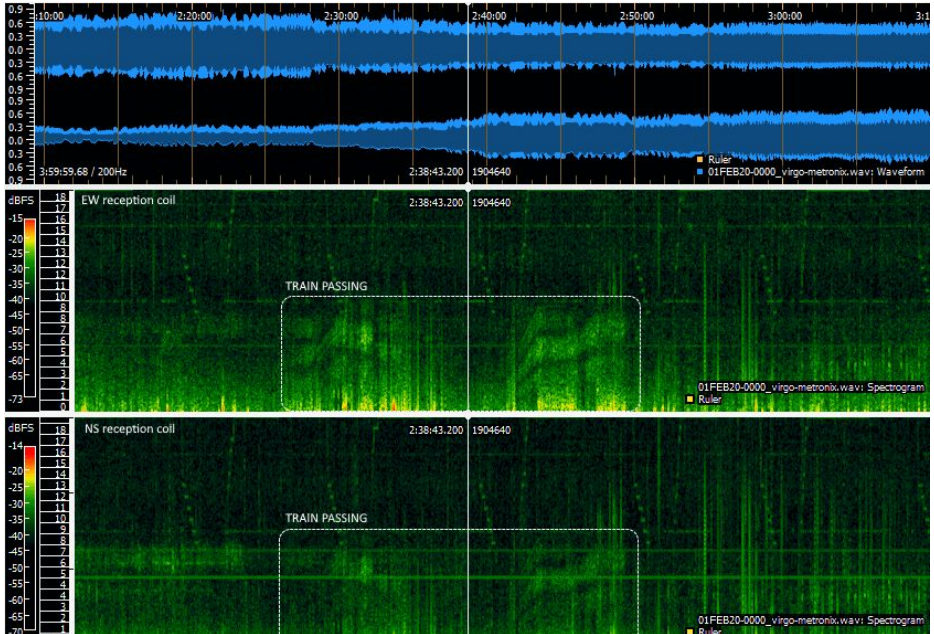
Recorded several trains passages: different models, some transits, some stop/start

Catching trains noise

Found correlation with Virgo sensors, magnetic and seismic

Understanding peculiar characteristics of the observed signals (work in progress)





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Thank you!

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