

# Summary of Virgo and ENV activities status

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KAGRA-PEM meeting

22 Jan. 2021

# What is happening in Virgo

- AdV+ upgrades installation is almost concluded (no major delay from covid pandemic)
  - Auxiliary Laser System (green beam) installation completed
  - MC mirror replaced
  - Scattered light mitigation (baffles) in detection benches, and also new OMC, done
  - Squeezer bench modifications , better seismic and acoustic isolation (ongoing)
  - 300m Frequency Dependent Squeezer (ongoing)

# What is happening in Virgo

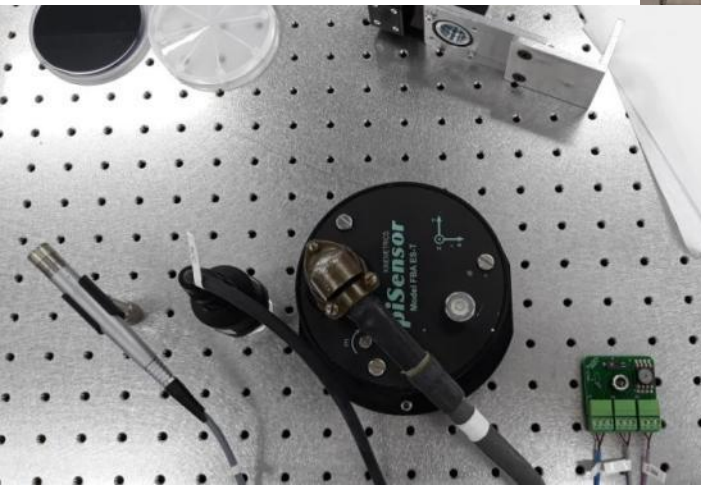
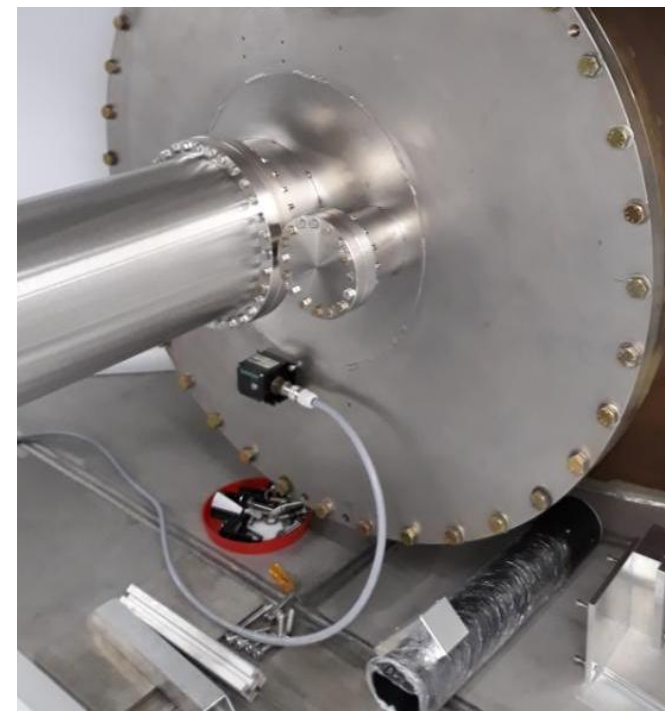
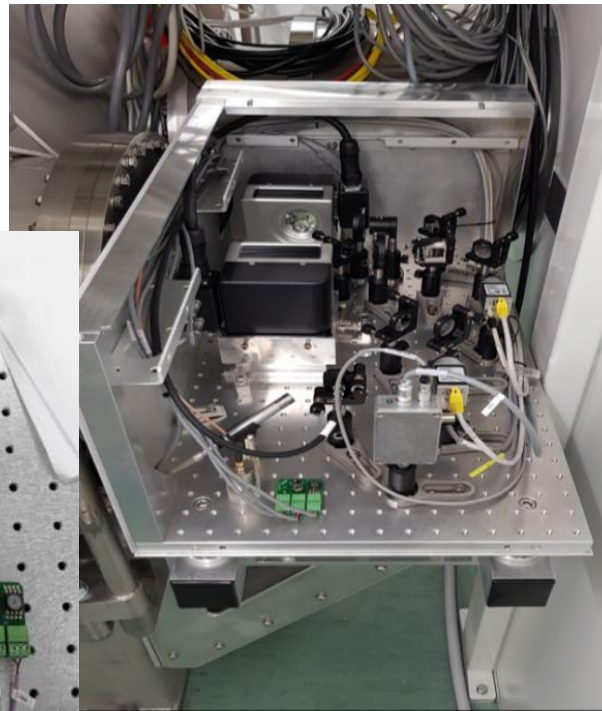
- **Commissioning phase started Jan. 1<sup>st</sup> 2021**
  - Pre commissioning of Auxiliary Laser System and Interferometer Control System
    - locking with green laser achieved
  - Pre commissioning of Squeezing and Frequency Dependent Squeezing
  - **June 2021**– Full interferometer commissioning. Start noise hunting activity
- **O4 run start – “not before June 2022”**
- New “ENV” system structure
  - Now including: Vacuum, Infrastructure, EnvSensors, and NN
  - Coordinator is Roberto Passaquieti (INFN-Pisa)

# ENV team activities

- **Several new sensors installed:**

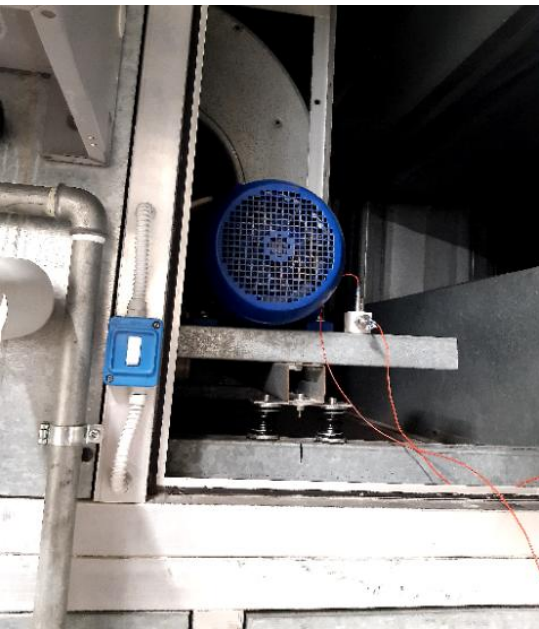
- ENV monitors of ALS benches
- Tri-axial seism. on VAC chambers
- Current sensors on Main Electrical Boards
- Replaced broken Weather station and lightning sensor

External magnetometers  
still being repaired ...



# ENV team activities

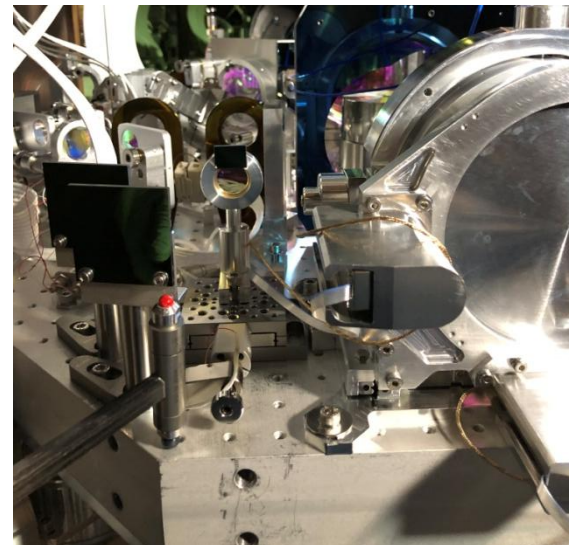
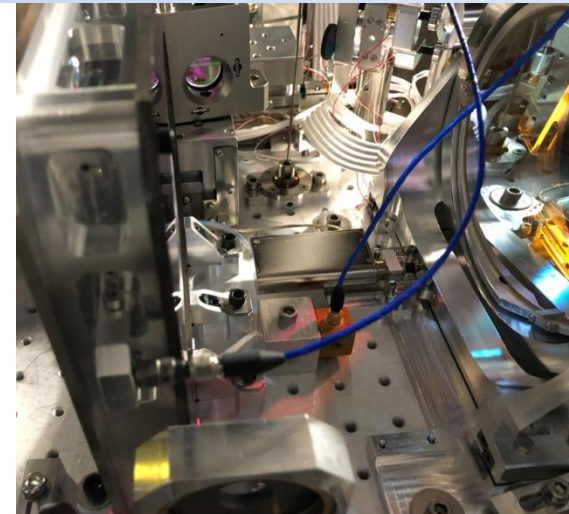
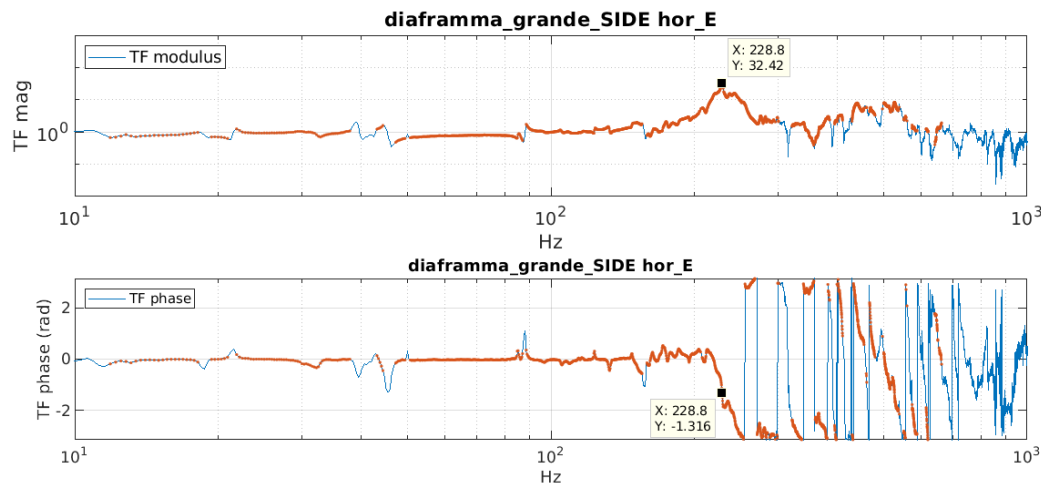
- HVAC noise assessment and mitigation
  - Air conditioning systems cannot be stopped, so only non-invasive and focused activities.
  - Several actions: seismic isolation of Fan enclosures, water Pumps, pipes
  - Several tests to find out sources and major noise paths
  - Several lessons learned from successful and also not successful actions
  - Internal review is in February (can give you a more detailed report after that date)





# ENV team activities

- Mechanical characterization of critical mounts that might do back-scattering
- Mechanical damper of laser bench



# ENV - DetChar activities

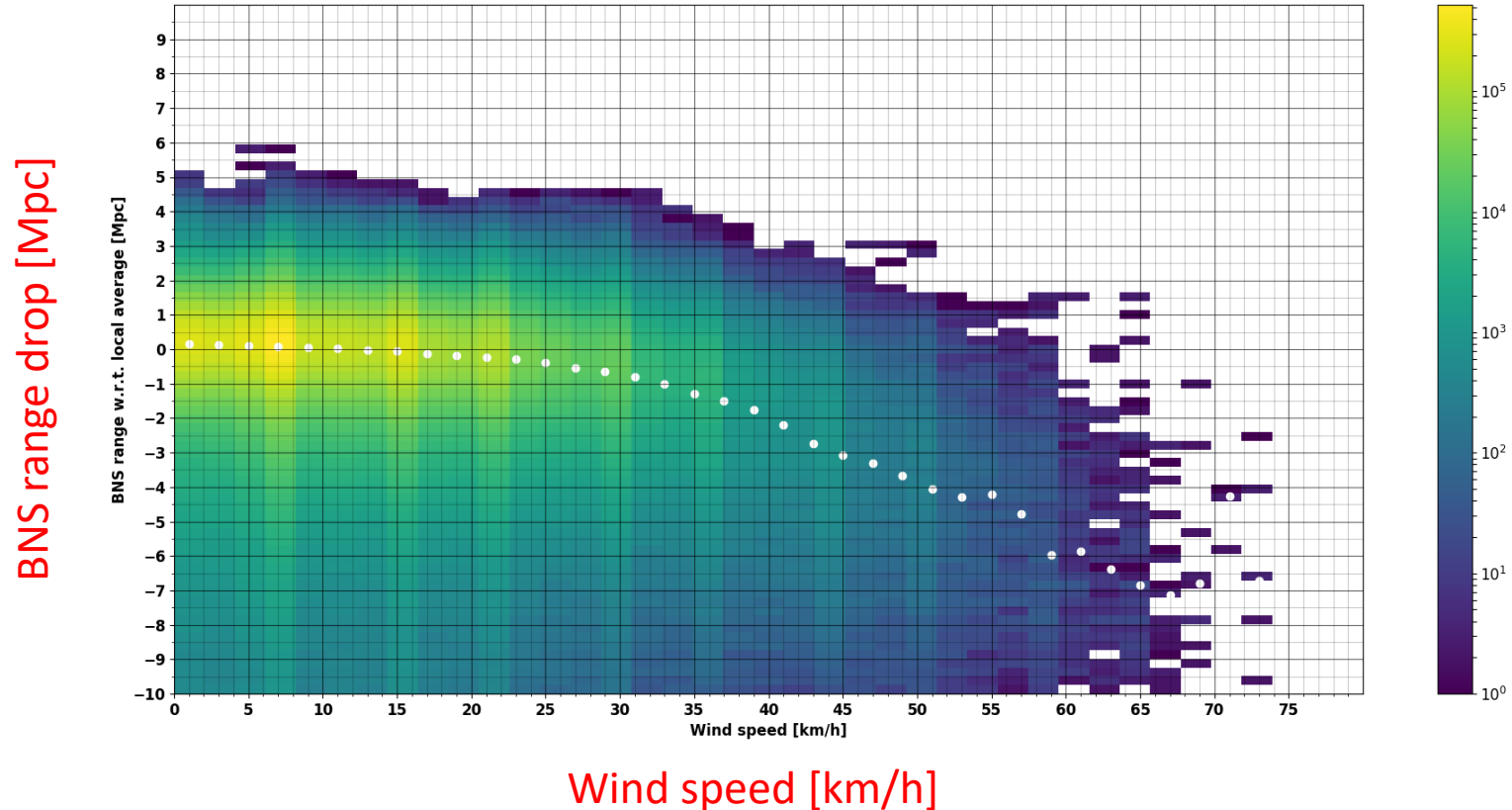
- Study of impact of external noise on O3 sensitivity
  - Seismic sources: Wind, Sea, Earthquakes, on-site
  - Scopes:
    - make quantitative assessment of Virgo robustness against external noise (duty-cycle and sensitivity drops)
    - Discuss strategies to improve its weaknesses

Just two examples (can have a dedicated discussion in a future meeting)

# ENV - DetChar activities

- How BNS range is affected by WIND

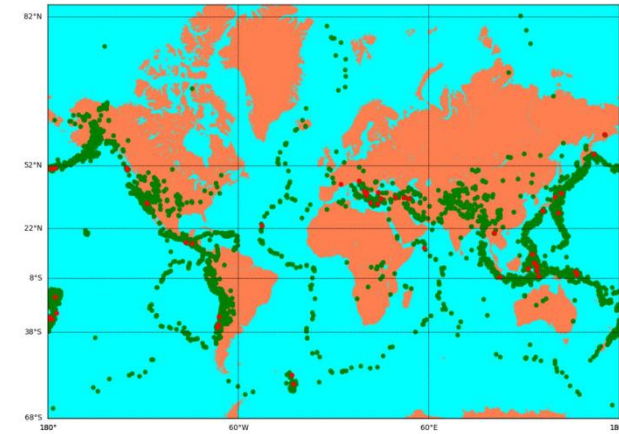
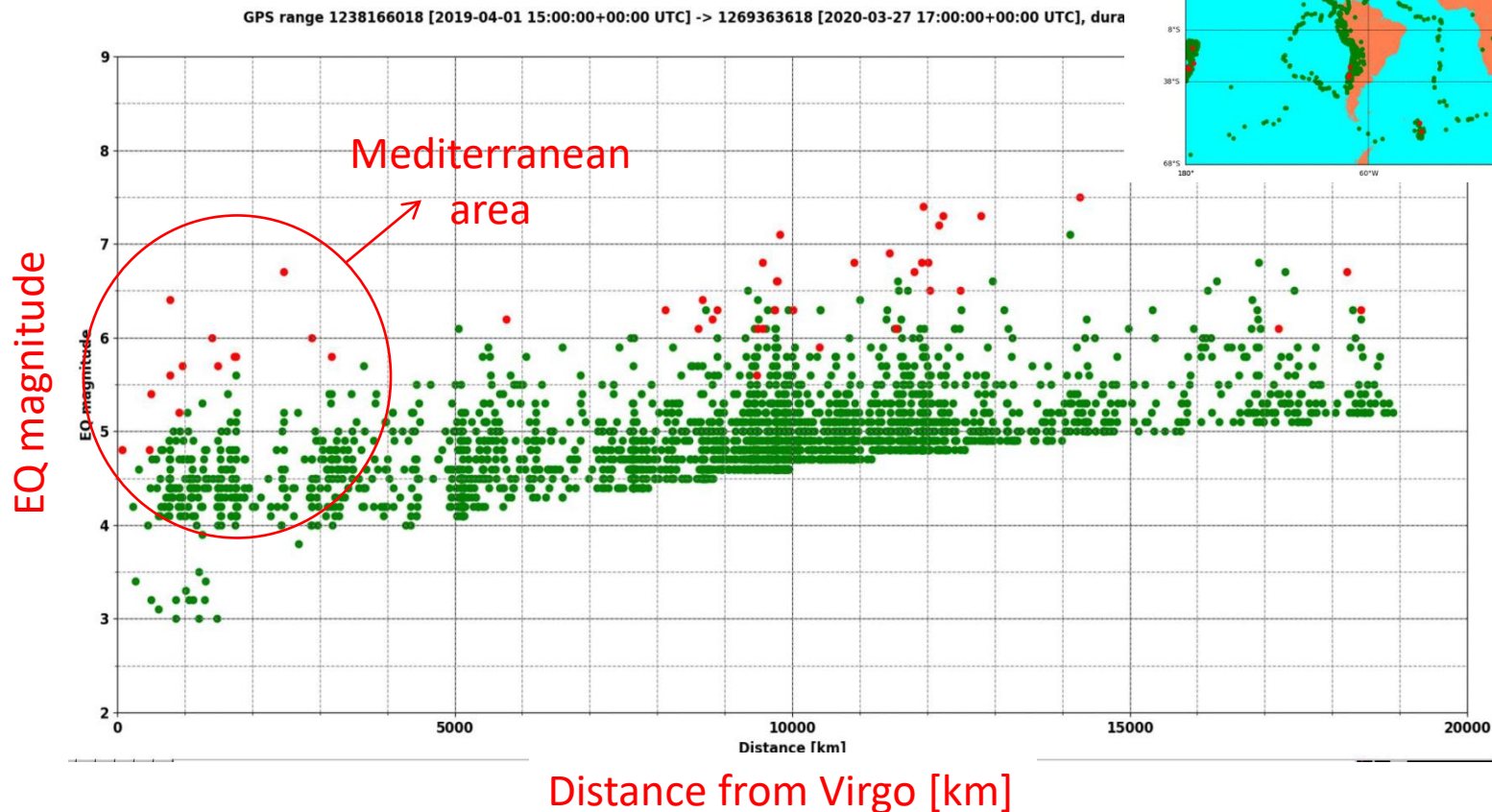
GPS range 1238166018 [2019-04-01 15:00:00+00:00 UTC] -> 1269363618 [2020-03-27 17:00:00+00:00 UTC], duration = 31197600 s





# ENV – DetChar activities

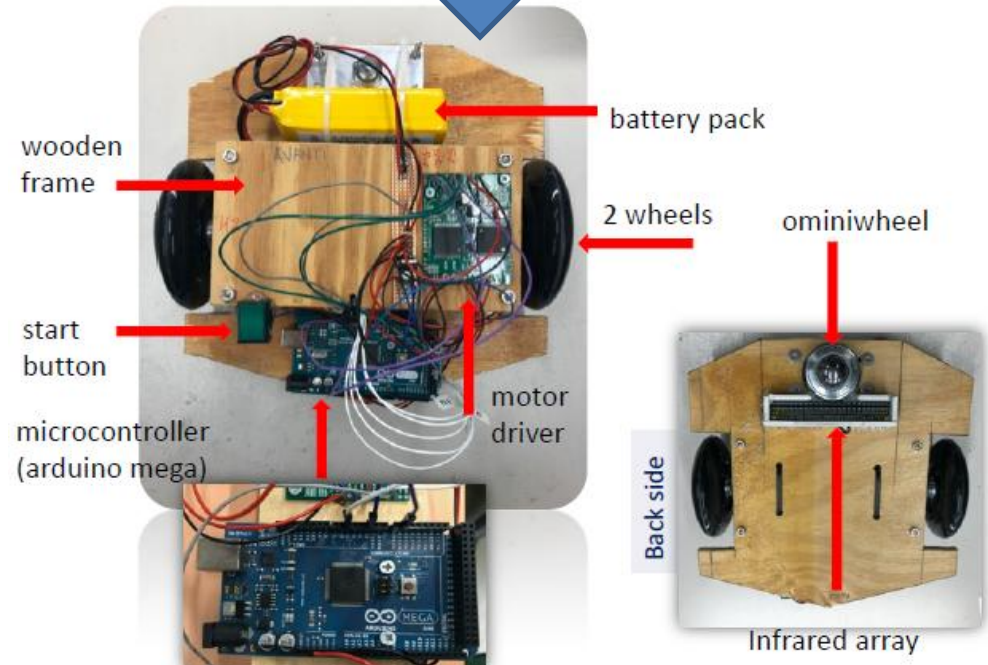
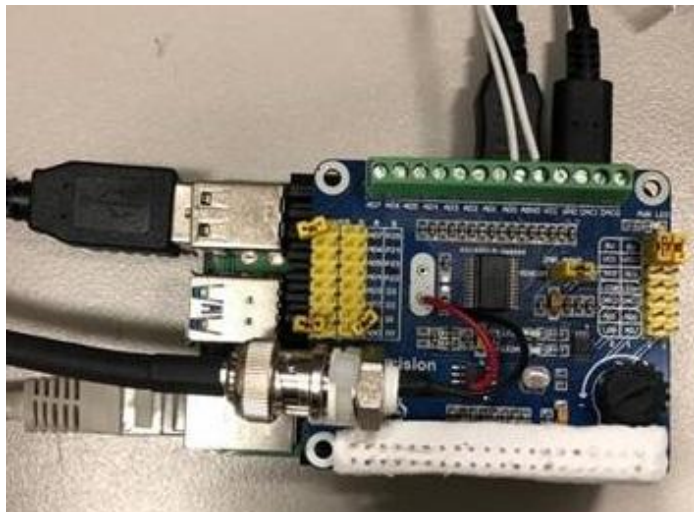
- Earthquakes causing DELOCK



# The Robot project

- Part of EU financed project AHEAD-2020 (duration is 3yrs)
- Robotic platform with seismic and other environmental sensors.
- Scope: movable array (10 robots) for NN subtraction

Initial stage developing: RaspberryPI – ADC and mobile robot



# Paper works

- O3 ENV commissioning paper (with help of KAGRA PEM members) published, DOI: [10.3390/galaxies8040082](https://doi.org/10.3390/galaxies8040082)
- General review of ENV noise paper (now under review) <https://tds.virgo-gw.eu/ql/?c=15983> (Virgo TDS)
- DetChar O3 paper – (in progress, ENV team only slightly involved)
- External noise O3 paper (starting now)