GWADW2021

Summary Session

Summary of Low-Frequency Workshop

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Low-Frequency Workshop 1

Low frequency workshop #1 (Tuesday, 18 May)
Newtonian Noise Mitigation and Related Topics

• Newtonian-noise cancellation
  Jan Harms (GSGC)

• Development Update for the TorPeDO Experiment
  - A Newtonian Noise Sensor for 3G Observatories
    Nathan Holland (The Australian National University)

• The Current Status of TOBA
  Satoru Takano (The University of Tokyo)

• Low-frequency ground deformation observed
  by the geophysics interferometer (GIF) in the KAGRA tunnel
  Akito Araya (Earthquake Research Institute, U-Tokyo)

• Update on Cryogenic Silicon Suspension Activities at Glasgow
  Graeme Eddolls (University of Glasgow)
Concept and results of Newtonian noise cancellation using seismometer array were presented.

- Optimization study of the sensor array at VIRGO site.
- Optimal liner filtering.
- Experimental results at the LIGO Hanford site.
- ET Newtonian noise model, cancellation concept, and Numerical simulation.
Recent update of TorPeDO development was presented.

- Motivation of Newtonian noise mitigation using gravity gradiometer.
- Mechanical, Interferometer sensors, control design.
- Current sensitivity.
- Upgrade activities:
  Seismic isolation chain, Local sensors, quadrupole Newtonian noise generator.
Recent update of TOBA development was presented.

- Motivation for development of gravity gradiometer.
- Design, Requirement and target sensitivity.
- Results of cryogenic operation and active vibration isolation system.
- Upgrade activities: Optical sensor, Silicon test mass and monolithic bench
Results by laser strain meter at the KAGRA site were presented.

- Overview of 1,500m laser strain meter placed at the KAGRA site.
- Low-frequency strain variations.
- Earth tides and Topographic effects
- Barometric response at the site.
- Long-term strain drifts caused by rain, snow, and tectonic motion.
- Feed forward control of arm-length of the KAGRA interferometer.
Recent updates of cryogenic Silicon suspension development were presented.

- Motivation for cryogenic Silicon suspension.
- Design and assemble procedure of the suspension.
- Overview of the cryogenic system.
- Hanging results and interpretations.
- Lessons learned and future Prospects.
Summary of Session #1

- Newtonian-noise cancellation using array of seismometers is tested at the 2G detectors and being considered for the 3rd generation detectors.
- Sensitive gravity-gradiometers for direct measurement of Newtonian noise are being developed: TorPrDO and TOBA.
- Knowledge on environment is also important for long-term stability of the cancellation. Results obtained at the KAGRA site results are presented.
- As a related technology, recent results of cryogenic Silicon suspension is also presented in the session.