1 Tsubono Group

Research Subjects: Experimental Relativity, Experimental Gravitation, Gravitational Wave Physics, Laser Interferometer

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The detection of gravitational waves is expected to open a new window into the universe and brings us a new type of information about catastrophic events such as supernovae or coalescing binary neutron stars; these information can not be obtained by other means such as optics, radio-waves or X-ray. Worldwide efforts are being continued in order to construct detectors with sufficient sensitivity to catch possible gravitational waves. Now the detection of the gravitational waves is one of the biggest challenges in the field of physics and astronomy.

TAMA300 is a 300-m baseline laser interferometric gravitational wave detector constructed in Mitaka. We started the operation of the detector in 2000. The achieved sensitivity, $h \sim 5 \times 10^{-21}/\sqrt{\mathrm{Hz}}$ at 700Hz to 1.5kHz, is sufficient to catch possible gravitational wave events in our galaxy. We can operate the detector for over 10 hours stably and continuously. Last summer we performed 2-week data taking run and collected 160 hours data. We are now analyzing the obtained data searching for the gravitational waves from coalescing binaries using matched filtering technique with templates of chirping signal.

We summarize the subjects being studied in our group.

- Laser interferometric gravitational wave detectors
  - TAMA project
  - Diagnosis of the TAMA detector
  - Suspension point interferometer for vibration isolation
  - Study of the next generation laser interferometer
  - GEO600 project
- Experimental study of the relativity
  - Test of the space isotropy
- Study of thermal noise
  - Study of the thermal noise due to the inhomogeniously distributed loss
  - Measurement of the intrinsic Q of low-loss materials
- Study of the precise measurement
  - Development of the low-frequency vibration isolation system (SAS)

references

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