1 Tsubono Group

Research Subjects: Experimental Relativity, 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 1999. The achieved sensitivity, $h \sim 3 \times 10^{-21}/\sqrt{\mathrm{Hz}}$ at 700Hz to 1.5kHz, is sufficient to catch possible gravitational wave events in our galaxy. We can operate the detector for over 24 hours stably and continuously. Last year, we performed 2-month data taking run and collected over 1,000 hours data. We are now analyzing the obtained data searching for the gravitational waves from coalescing binaries, supernovae and pulsars.

We summarize the subjects being studied in our group.

- Laser interferometric gravitational wave detectors
  - TAMA project
  - Search for burst gravitational waves
  - Search for gravitational waves from SN1987A
  - Suspension point interferometer for vibration isolation
  - Study of the next-generation laser interferometer
  - Space laser interferometer DECIGO
- Study of thermal noise
  - Direct measurement of the thermal noise
  - Thermal noise caused by the inhomogeniously distributed loss
- Study of the precise measurement
  - Development of the low-frequency vibration isolation system (SAS)
  - New vibration isolation system using magnetic levitation

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