

Mechanical loss measurement of sapphire for interferometric cryogenic gravitational wave detectors

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One of noises of KAGRA, a Japanese interferometric cryogenic gravitational wave detector, is thermal noise of its sapphire mirrors and sapphire fibers. To research this thermal noise, I collaborated with research groups in Glasgow University, UK and Jena University, Germany under the title “Mechanical loss measurement of sapphire for interferometric cryogenic gravitational wave detectors.”

First, I stayed in Glasgow from 15 October to 11 November, 2012. I visited Prof. Sheila Rowan in Institute for Gravitational Research (IGR), Glasgow University. Mechanical loss of sapphire disks, and their coatings has been measured. The result at room temperature was consistent with the previous research. They will be measured at cryogenic temperature in future.

Next, I stayed in Jena from 11 November to 20 December, 2012. I visited Ronny Nawrodt in institute for solid physics (photograph), Jena University. Mechanical loss of the sapphire fibers made by Moltech (German company) has been measured. The result of the first bending mode (390 Hz) above around 70 K was consistent with calculation of thermoelastic damping. The result at 6 K was comparable with another result, which KAGRA is designed on the basis of. Although it satisfies requirement of KAGRA, it is better to reduce the loss in future.

