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Development and application of cryogenic displacement sensors towards the damping control of KAGRA cryogenic payloads

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We developed a cryogenic displacement sensor for KAGRA cryogenic payloads. The cryogenic payload is the suspension system to cool down a sapphire mirror at 20 K in KAGRA. And, the sapphire mirror is suspended the suspension called Type A suspension which height is about 13.5 meter including the cryogenic payload. The cryogenic payload has four stages called platform and marionette and intermediate mass and sapphire mirror. These last three stages are collectively called main chain. And also, the cryogenic payload has another three stages called recoil mass chain corresponding the main chain to control the vibration.

The developed cryogenic displacement sensors are installed on the cryogenic payload and monitors the relative distance between the main chain and the recoil mass chain. And, they are used the damping control to damp the resonance of the cryogenic payload. In this session, we will report the status of the cryogenic displacement sensor and the application towards the damping control of KAGRA cryogenic payloads.

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