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Reduction of quantum noise for gravitational wave detector KAGRA (II)

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In KAGRA, a ponderomotive squeezing technique with a homodyne detection is going to be used for reducing radiation pressure noise. For demonstrating the reduction technique, at first, radiation pressure noise should be observed in wide frequency range. For that purpose, the high finesse Fabry-Perot cavity with a suspended tiny mirror is used for enhancing radiation pressure noise. However, when the intracavity power increases, an angular instability generated by radiation pressure can occur in the cavity depending on the geometry of the cavity. For circumventing the angular instability of the cavity, an angular control system using radiation pressure itself was invented. It was confirmed experimentally that the cavity consisting a suspended 23-mg mirror was unstable without the angular control system under high intracavity power condition. Moreover, with the same intracavity power condition, it was also proved that, using the angular control system, the cavity could be operated stably.

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