Modal Control for KAGRA Suspension - First Step for Optimal Control KACRA Masahide TAMAKI (D1, Miyoki Lab.) Imaki83@icrr.u-tokyo.ac.jp tamaki83@icrr.u-tokyo.ac.jp ICRR Master & Doctor Thesis Workshop Abstract Low frequency (~ 60 Hz) band of ground-based gravitational wave detector like KAGRA has many important scientific case. However, this frequency region is limitted by suspension control noise. This poster shows how we can solve this problem and the current status.



01. Introduction

- Ground-based GW detector like KAGRA uses multi-stage pendulum
 (Fig1) to suspend the mirror for high vibration isolation ratio.
- However, control noise of suspension limits low-frequency (~ 60 Hz) sensitivity (Fig2).
- Low-frequency has strong scientific case for GW study[1], so we want to improve this.

02. Modal Damping











damping each mode separately

Frequency [Hz]



Fig5. Modal damping loop with state estimator

04. Discussion & Outlook
Simulation result is good, and new control should improve the noise performance.
We plan to test this simulation result with a dummy payload which is

currently being prepared.

Reference [1] B. Sathyapra Kash et, al., Classical and Quantum Gravity., 29, 124013, (2012)