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Phase camera development for gravitational wave detectors

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We will report a study of the phase camera, which is a wave-front sensor of laser. This sensor is utilized for observing phase-modulated laser in an interferometer of gravitational wave (GW) detectors. The GW detectors are well sophisticated apparatus that need accurate position controls for mirrors. The laser modulation/demodulation is used for readout of the mirror displacement in such accurate control. Laser sideband signals created by phase modulation become very important not only for the control but also sensitivity of detector because the quality of controls affect a noise level. We are preparing this phase camera for VIRGO, which is a GW detector placed in Pisa. The sideband signals in power recycling cavity are easily degraded by mirror aberrations in VIRGO. In order to correct such mirror aberrations, CO₂ laser and compensation plates will be prepared, and then, our phase camera will be used to see mirror aberrations through the state of sidebands. Hence, this phase camera can contribute to VIRGO for making high performance controls.

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