

**Noise Budget Development for the LIGO 40 Meter Prototype**

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The Laser Interferometer Gravitational-wave observatory (LIGO) is an interferometric antenna designed to measure minute perturbations to the local spacetime curvature due to the passing of a gravitational wave (GW). It detects GWs from the fractional change of the lengths of its arms, the strain, induced by passing waves. To achieve the required displacement sensitivities, the noise sources affecting LIGO's data signal must be identified and understood. The process that determines the amount to which any particular noise source contributes to the output signal, noise budgeting, is routinely performed at the LIGO observatories and is needed for the Advanced LIGO 40 meter prototype, which features a more complex optical configuration and control system. A noise budget is developed by measuring the noise spectrum at its entrance to the system (volts per root Hz.), finding a transfer function between the noise input and data output (meters per volt), and multiplying these to get the noise contribution to the output signal (meters per root Hz.). This project consists of identifying a subset of potential noise sources (seismic, auxiliary control servos, etc.) and measuring their input noise spectrum, transfer function to data output, and thereby their contribution to the noise spectrum of the interferometer.