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Advanced LIGO: Development and Status

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The proposed Advanced Laser Interferometer Gravitational-wave Observatory (Advanced LIGO) should make the detection of gravitational waves from astrophysical sources a weekly event and usher in a new era of gravitational wave astronomy. The planned observatory will be a significant upgrade to the Initial LIGO observatory, which is now operational. Advanced LIGO will comprise a set of three nominally identical interferometric detectors at the two existing LIGO installations. At the most sensitive frequency, they should be more than an order of magnitude more sensitive to gravitational wave strain than Initial LIGO, and the detection band will be extended down to 10 Hz. We describe the technology for these detectors, which includes 180 watt lasers, advanced seismic isolation systems, and quadruple pendulum suspension systems. The pendulums support 40 kg test masses and employ very high quality optical materials and coatings. The interferometers will use both power and signal recycling, allowing the detectors to be tuned with a broad-band or narrow-band response. The current schedule predicts that the first Advanced LIGO detector will begin to search for gravitational waves in 2014.

¹For the LIGO Scientific Collaboration