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Preparing to analyze Advanced LIGO data: from detectors to first observations

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Direct observation of gravitational waves (GWs) will open a new window to the Universe, directly probing the dynamics of high-energy astrophysical events. The US-based Advanced Laser Interferometer Gravitational-wave Observatory (aLIGO) detectors are now online, with the first observing runs commencing next year. The improved instrumentation pushes the frontiers of detector technology and increases the likelihood of GW observation over previous searches. This talk reviews ongoing efforts for testing instrumentation and software infrastructure in preparation for the search of GW transients in the advanced detector era. Particular emphasis will be placed on non-Gaussian noise artifacts and how new technologies and hardware are expected to improve the sensitivity of GW searches. I will outline current plans for the mitigation of predicted and undiscovered noise sources in the new Advanced LIGO instruments, and our progress toward readiness for rapid, confident gravitational wave detections.