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Gravitational Waves: A New Tool for Understanding the Universe

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Next-generation gravitational wave observatories like the Einstein Telescope and Cosmic Explorer will open new windows into cosmology. On one hand Gravitational Waves can trace the large-scale structure of the universe, working alongside traditional galaxy surveys to enhance our ability to test and refine cosmological models. On the other hand, as standard sirens, gravitational wave sources provide an independent method to measure cosmic distances, enabling tests of key assumptions in the Λ CDM model when combined with electromagnetic probes. An important test case is the distance duality relation (DDR), whose violation could signal new physics beyond the standard cosmological framework.

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