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The missing link in gravitational-wave astronomy: exploring the decihertz spectrum CHRISTOPHER BERRY, Northwestern University, MANUEL ARCA SEDDA, Universitt Heidelberg, KARAN JANI, Vanderbilt University, LISA CONSORTIUM 2050 TASK FORCE TEAM — Now ground-based gravitational-wave detectors observe high frequency ($\sim$ 100 Hz) gravitational waves; in the 2030s the space-borne LISA will observe low frequency ($\sim$ 1 mHz) gravitational waves. Between the two, in the decihertz range, lies the opportunity for future discovery, and the potential to make mulitband gravitational-wave observations. A Decihertz Observatory is uniquely suited to the detection of intermediate-mass ($\sim 10^2$–$10^4 M_\odot$) black holes; it would enable the detection of stellar-mass binaries days to years before they are observed by ground-based instruments, and it also serves as a new laboratory for fundamental physics, permitting unique tests of general relativity and the Standard Model. We review how a Decihertz Observatory will answer key questions about how black holes form and evolve across cosmic time, open new avenues for multimessenger astronomy, and advance our understanding of gravitation, particle physics and cosmology.

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