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Gravitational wave searches for ultralight bosons with LIGO and LISA EMANUELE BERTI, Univ of Mississippi, ENRICO BARAUSSE, Institut d'Astrophysique de Paris, RICHARD BRITO, Albert Einstein Institute Golm, VITOR CARDOSO, Instituto Superior Tecnico, Lisbon, IRINA DVORKIN, Institut d'Astrophysique de Paris, SHROBANA GHOSH, University of Mississippi, ANTOINE KLEIN, Institut d'Astrophysique de Paris, PAOLO PANI, Sapienza University Rome — Ultralight bosons can induce superradiant instabilities in spinning black holes, tapping their rotational energy to trigger the growth of a bosonic condensate. Possible observational imprints of these boson clouds include (i) direct detection of the nearly monochromatic (resolvable or stochastic) gravitational waves emitted by the condensate, and (ii) statistically significant evidence for the formation of "holes" at large spins in the spin versus mass plane (sometimes also referred to as "Regge plane") of astrophysical black holes. LIGO could observe a stochastic background of gravitational radiation in the range $m_s \in [2\times10^{-13}, 10^{-12}]$ eV, and up to 10^4 resolvable events in a 4-year search if $m_s \sim 3\times10^{-13}$ eV. LISA could observe a stochastic background for boson masses in the range $m_s \in [5\times10^{-19}, 5\times10^{-16}]$, and up to $\sim 10^3$ resolvable events in a 4-year search if $m_s \sim 10^{-17}$ eV. LISA could further measure spins for massive black-hole binaries, either ruling out scalar fields in the mass range $\sim [4\times10^{-18}, 10^{-14}]$ eV, or measuring m_s with ten percent accuracy if light scalars in the mass range $\sim [10^{-17}, 10^{-13}]$ eV exist.

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