Abstract Submitted
for the APR20 Meeting of
The American Physical Society

Search for ultralight bosons in Cygnus X-1 with Advanced LIGO
LING SUN, LIGO Laboratory, Caltech, RICHARD BRITO, Sapienza Universita di Roma, MAXIMILIANO ISI, LIGO Laboratory, MIT — Ultralight scalar boson particles, if they exist as theorized, could form clouds around rapidly rotating black holes. Such clouds are expected to emit continuous, quasimonochromatic gravitational waves that could be detected by ground-based detectors like LIGO and Virgo. Here we present the first constraints on the boson mass obtained from a gravitational-wave search directed at a known black hole in the nearby X-ray binary, Cygnus X-1, using data from Advanced LIGO's second observing run. Without finding evidence of gravitational-wave signals in this search, the constraints are derived for two scenarios with or without considering boson self-interactions. In this talk, we present a brief theoretical overview of the signal model and source properties, describe the search method and challenges, and show results from this analysis. Applications of this method to other sources in future observing runs will yield improved constraints and possibly a detection.

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Date submitted: 08 Jan 2020 Electronic form version 1.4