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Targeted Sub-threshold Search for Strongly-lensed Gravitational-wave Events ALVIN KA YUE LI, RICO KA LOK LO, LIGO Laboratory, Caltech, SURABHI SACHDEV, Department of Physics, The Pennsylvania State University, CHUN LUNG CHAN, Department of Physics, The Chinese University of Hong Kong, EN-TZU LIN, Department of Physics, National Tsing-Hua University, TJONNIE GUANG FENG LI, Department of Physics, The Chinese University of Hong Kong, ALAN WEINSTEIN, LIGO Laboratory, Caltech — Strong gravitational lensing of gravitational waves can produce duplicate signals that are separated in time with different amplitudes. We consider the case in which strong lensing produces identifiable gravitational-wave events together with weaker sub-threshold signals that are hidden in the noise background. We present a search method for the sub-threshold signals using reduced template banks targeting specific confirmed gravitational-wave events. We apply the method to an event from Advanced LIGO's first observing run O1, GW150914. We show that the method is effective in reducing the noise background and hence raising the significance of (near-) sub-threshold triggers. In the case of GW150914, we are able to improve the sensitive distance by 2.0% – 14.8%. Finally, we present a list of possible lensed candidates for O1/O2 events with significant sky location overlap with the original events.

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