

Abstract Submitted
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Quantum Technologies for LIGO ANTONIOS KONTOS, LIGO, Massachusetts Institute of Technology, Cambridge 02139, USA, MIT LIGO LABORATORY¹, MIT, EUGENE S. POTZIK, Niels Bohr Institute, Danish Quantum Optics Center QUANTOP, Copenhagen University, Copenhagen, Denmark, FARID Y. KHALILI, Faculty of Physics, Lomonosov Moscow State University, Moscow 119991, Russia — In the near future, the sensitivity of Advanced LIGO will be limited by quantum noise at all frequency bands. Advanced LIGO is already limited by shot noise above 100 Hz. As the laser power is increased, quantum radiation pressure noise will dominate the noise budget at frequencies below 100 Hz. Advanced LIGO will then be a truly quantum limited experiment. The quest to map out the gravitational wave sky is an endeavor that requires us to push the standard limit of quantum measurement. The first quantum technology that will be implemented is the injection of squeezed vacuum, where the vacuum state of the electromagnetic field is manipulated in order to reduce phase noise at the antisymmetric port of the interferometer. Proof of principle experiments have shown that we can reduce shot noise by up to 15 dB! Frequency-dependent squeezing can allow for broadband improvement at all frequencies, where shot noise or radiation pressure noise dominate. Alternative back-action evasion approaches are also being studied, with an eye toward ease of implementation, cost effectiveness, and even better noise performance. In this talk, I will describe some approaches to mitigate quantum noise, and present the status of experiments for testing these ideas.

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