Abstract Submitted
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Operating a Josephson parametric amplifier for optimal squeezing in a dark matter axion search MAXIME MALNOU, DANIEL PALKEN, WILLIAM KINDEL, JILA, Univ of Colorado - Boulder, LEILA VALE, GENE HILTON, National Institute of Standards and Technology - Boulder, KONRAD LEHNERT, JILA, Univ of Colorado - Boulder — Microwave squeezing, as produced by a Josephson parametric amplifier (JPA), can accelerate a search for axionic dark matter [1]. In order to generate a squeezed state, the nonlinear SQUID inductance in a JPA resonant circuit may be pumped in three distinct ways: with a single tone near resonance [2], with a pair of tones symmetrically detuned from resonance [3], or with a flux tone near twice resonance [4]. In this talk, we present experimental comparisons among these different methods of generating a strong squeezed state, with particular attention given to the repercussions of each choice as regards the subsequent transport and measurement of the state. We additionally discuss the fundamental limitations upon squeezed state generation. [1] Zheng, H. et al. Preprint at https://arxiv.org/abs/1607.02529 (2016). [2] Mallet, F. et al. Quantum state tomography of an itinerant squeezed microwave field. Phys. Rev. Lett. 106, 220502 (2011). [3] Kamal, A. et al. Signal-to-pump back action and self-oscillation in double-pump Josephson parametric amplifier. Phys. Rev. B 79, 184301 (2009). [4] Yamamoto, T. et al. Flux-driven Josephson parametric amplifier. App. Phys. Lett. 93, 042510 (2008).

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