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Phase sensitivity and noise reduction in a two-pump four-wave mixing process[1] ERIN KNUTSON, Tulane Univ — We show a new multi-pump four-wave mixing configuration, with a potentially useful phase-dependence. We find that, for certain phase values of the input probes, the intensity noise of any output mode can be lower than that of its phase-insensitive counterpart. This lower-noise amplification has been demonstrated previously in atomic four wave mixing, but only with the use of significantly more complex experimental configurations, e.g. dual homodyne detection or cascaded vapor cells. Additionally, our method naturally results in four beams that can be squeezed or quantum correlated with one another. This result has obvious applications in the simplification of quantum optical experiments that involve the generation or amplification of more than two correlated modes. We describe how our findings may further be employed in a "touchless" or interaction-free SU(1,1) interferometry scheme, wherein a phase measurement may be made remotely on a pair of modes without introducing loss or destroying any squeezing between them.

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