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Coherent Quantum-Noise Cancellation by a four-wave mixer in hot Rubidium Vapor JIETAI JING, JUN XIN, HAILONG WANG, JIA KONG, WEIPING ZHANG, State Key Lab of Precision Spectroscopy, East China Normal University — The study of quantum noise plays a significant role for achieving quantum precision measurement and developing quantum information protocol by properly generating desired quantum states. Here we present our experimental results of coherent quantum noise cancellation of the quantum correlated twin beams by four-wave mixing in a hot rubidium vapor. The twin beams are prepared from the first four-wave mixer, and each beam has a quantum amplified noise which is well above the corresponding shot noise limit. By simultaneously seeding the twin beams into a second four-wave mixer and using two sets of balanced homodyne detection systems, we found that the noise of the new output beams can be largely suppressed and can be close to their corresponding shot noise limits by coherent quantum noise cancellation due to quantum destructive interference. We also studied the loss effect on the efficiency of quantum noise cancellation. Based on these results, we also experimentally realized a quantum nonlinear SU(1,1) interferometer which achieved about 4dB signal to noise ratio enhancement compared to the traditional Mach-Zender interferometer.

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