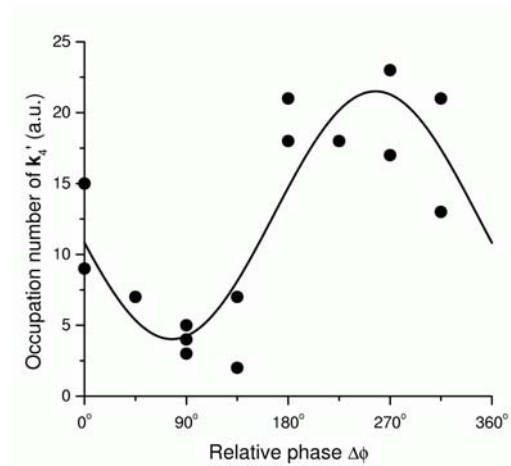


## Coherent Collisions between Bose-Einstein Condensates

Four-wave mixing of atoms was implemented by colliding two condensates and seeding them with a third wave. Amplification of the third wave and generation of a fourth conjugate wave was observed. The coherence of the amplified waves was shown by observing high contrast interference with a reference wave and by reversing the amplification process [1]. This demonstrates the coherent nature of elastic collisions.

Since our experiments also placed limits on all known sources of decoherence, we inferred that relative number squeezing is most likely present between the amplified modes.



Coherence of the conjugate wave. Shown is the interference of the conjugate wave with a reference wave. The relative phase shift was introduced by shifting the phase of the rf-wave, which drove one of the acousto-optic modulators generating the Bragg beams.

1. J.M. Vogels, J.K. Chin, and W. Ketterle, *Coherent Collisions between Bose-Einstein Condensates*, Phys. Rev. Lett. **90**, 030403 (2003).