

Question: *Interference.*

A ideal laser produces a coherent plane wave of light at a single frequency and wavevector (to a first approximation). However, nothing determines the phase of this wave – it is randomly chosen each time the laser is turned on. Since interference patterns come from well-defined phase differences, and there is no preferred phase, on symmetry grounds it might seem that no interference pattern could be produced from two lasers. Yet you would indeed observe such a pattern if you were to interfere two of these idealized lasers. *Why?*

In fact, an analogous phenomenon occurs in BECs: a BEC is a matter wave with well-defined phase, but one that is random for each experimental shot. Nevertheless, if one produces two BECs independently, one sees an interference pattern.