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# Mode mismatch destroys squeezed light: experimental demonstration and implications for ET

Mode mismatch is expected to have strong impact on the sensitivity of the detector. It is especially damaging to squeezed light, although the precise impact is not yet known. Coherent modal loss originates from mismatches between optical modes at different interfaces within the detector. Coherent coupling of squeezed light into the high-order spatial mode, and then back, with some phase offset, leads to a severe loss of coherence, up to turning squeezed state into a thermal state.

We experimentally demonstrate this effect, observing a total loss of 6dB of squeezed light, resulting in a thermal state that is 2dB above the shot noise level with just 15% mode mismatch. This effect has significant implications for the Einstein Telescope, particularly regarding its sensitivity, design, and the technologies required.

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