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RESEARCH ARTICLE · PHYSICS

Quantum Metrology with Squeezed-Vacuum-Enhanced Mach-Zehnder Interferometers

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ABSTRACT

We demonstrate a 7.2 dB phase sensitivity improvement over the shot-noise limit using a squeezed-vacuum-enhanced Mach-Zehnder interferometer operating at telecommunication wavelengths. The squeezed source is generated via a periodically poled lithium niobate waveguide pumped at 775 nm, and is injected into the unused port of the interferometer. Stability over 72 hours of continuous operation is reported, with a duty cycle of 88%. The system is compatible with existing fibre-optic sensor networks and points toward practical quantum-enhanced measurement in geophysical and inertial sensing applications.

Keywords: *quantum metrology, squeezed light, Mach-Zehnder, quantum sensing, fibre optics*

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Abstract

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1. Introduction

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2. Methods

Methodological detail is preserved verbatim from the accepted manuscript. The production service has rendered this HTML, PDF, and JATS galley using Pandoc 3.1.11.1 and WeasyPrint with the journal's house CSS template.

3. Results

The findings, figures, and tables of the original submission are reproduced here. Readers should consult the PDF galley for the authoritative typeset version.

4. Discussion

2 dB phase sensitivity improvement over the shot-noise limit using a squeezed-vacuum-enhanced Mach-Zehnder interferometer operating at telecommunication wavelengths

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2. Patel, M. et al. (2023). Strain engineering in 2D materials. *Nature Reviews Physics*, 5, 412–429.

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