Investigating Phase and Amplitude Noise in MEMS VCSEL-Based OCT Systems

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1. **Abstract**
This research focuses on identifying and mitigating noise in Optical Coherence Tomography (OCT) A-scans when using Micro-Electro-Mechanical Systems (MEMS) Vertical-Cavity Surface-Emitting Lasers (VCSELs). OCT is an essential imaging technology in medical diagnostics, but its performance can be compromised by noise from the laser source [1, 2]. MEMS VCSELs are valued for their rapid wavelength tuning and extended coherence lengths [3]. However, the tiny moving mirror in MEMS VCSELs introduces phase and amplitude noise that can degrade image quality [4]. This study involves simulating a comprehensive swept-source OCT system, deliberately introducing various noise to mimic the noise produce by the MEMS VCSEL and assessing their effects on the interferometric signal. By conducting detailed simulations and experiments, the aim is to develop effective strategies for noise reduction, ultimately enhancing the accuracy and reliability of OCT A-scans in medical diagnostics.

2. **Results**
Results will be added later

3. **Funding**
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