$3.0\,\mathrm{m\,s^{-1}}$ of constant OPL change, the acquisition time for the entire frame would need to be less than $\sim$2 ns which would require an extremely complex system and still require averaging. Of course, this becomes more of a challenge if a higher accuracy is required and for high resolution systems, but is offset by higher averaging (which can bring in its own problems). The MLC can be scaled up to for higher resolutions without any problems as the vibration immunity of the system does not depend on the acquisition speed, and still retains the ability for averaging (for removal of tilt or noise).

The ultrastable system presented can be useful for many different applications where accuracy over time is important. As seen in Fig. 3(a) and Fig. 4(a), even in steady conditions, environmental factors can affect unstabilised interferometers. The combination of the integrated camera with the ultrastable setup is ideal for medical, industrial and academic applications where subject characterisation is the emphasis.

Table 1. Table summarising the immunity to vibration for the ultrastable interferometer. The right hand columns indicate the amplitude of sinusoidal vibration at various frequencies.

	V_{vib}	$A_{0.5\mathrm{Hz}}$	$A_{10\mathrm{Hz}}$	$A_{62\mathrm{Hz}}$	$A_{1\mathrm{kHz}}$
Measured	$85.0\,\mathrm{mm\,s^{-1}}$	27 mm	1.3 mm	220 μm	14 μm
Simulated	$3.1\,\mathrm{m\,s^{-1}}$	1 m	50 mm	8 mm	0.5 mm
Theoretical	$9.4\,\mathrm{m\,s^{-1}}$	3 m	150 mm	24 mm	1.5 mm

ISO2631 guidelines state that the maximum vibration ampltidue should be 6.4um and 12.7um for of?cse and a workshos respectively. Large seismic shocks from earthquakes have peak amplitudes at 0.5 Hz [19, 20] and can reach amplitudes of 1 m, which is still within the simulated stability limit of this interferometer.

Table 1 summarises the limits of immunity to piston phase change for the current system. For comparison, typical vibration for ambient and shock vibrations in buildings displacements at 10 Hz are around 25 μm and 253 μm respectively [16], and for a moving car (30 kph) is around 220 μm [17]. ISO2631 guidelines state that the maximum vibration ampltidue should be 6.4 μm and 12.7 μm (at 10 Hz) for an office and a workshop respectively [18]. Large seismic shocks from earthquakes have peak amplitudes at 0.5 Hz [19, 20] and can reach amplitudes of $\sim$1 m, which is still within the simulated stability limit of the interferometer.

It might be assumed that at low frequencies (lower than the frame rate of the camera used to capture the interferogram) that conventional interferometers might be operated by just taking quick snapshots faster than the period of vibration. However at high amplitudes of vibration, the relevant time-scale is λ/V_{vib} (or the time taken for the path length change by approximately one wavelength). For the examples above correspond to microseconds or less, requiring extremely high frame rates. The ultrastable interferometer presented here has no such requirement on the frame rate for piston phase changes.

This shows that the system is practically immune to most levels of vibration normally encountered and makes this system suitable for operation in applications or environments not normally consider ideal for interferometers such as workshops, offices, factories or operating theatres.

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