

A Supporting information

Table A1: Summary of parameters used to generate synthetic images for processing parameter optimisation

Image Parameter	Value
Bit depth	10
Pitch size, p (mm)	0.337
Grid sampling (pixels)	7
Grey level noise (% of dyn. range)	0.30
Mean grid contrast (% of dyn. range)	37
Grid contrast amplitude (full) (% of dyn. range)	26

Table A2: Grid method processing parameters and measurement performance

Displacement calculation	
Pitch size, p (mm)	0.337
Grid sampling (pixels)	7
Analysis window	Bi-triangular
Analysis window size, $2p-1$ (pixels, mm)	13, 0.626
Edge data reconstruction [26]	Linear fit over 7 pixels
Strain calculation	
Calculation method	Central difference
Smoothing window	Gaussian
Window width, standard deviation σ (pixels, mm)	6, 0.29
Virtual strain gauge size ($4\sigma + 1 + 2p$) (pixels, mm)	25, 1.20
Acceleration calculation	
Calculation method	Double central difference
Smoothing window	3rd-order Savitsky-Golay
Window size (frames)	5
Measurement uncertainties*	
Displacement (μm)	0.4
(pixel)	0.008
(pitch)	$p/850$
Strain ($\mu\text{m}\cdot\text{m}^{-1}$)	75
Acceleration ($\times 10^5 \text{ m} \cdot \text{s}^{-2}$)	5.8

*: Note that uncertainty calculated as standard deviation of the kinematic quantity calculated from two static images