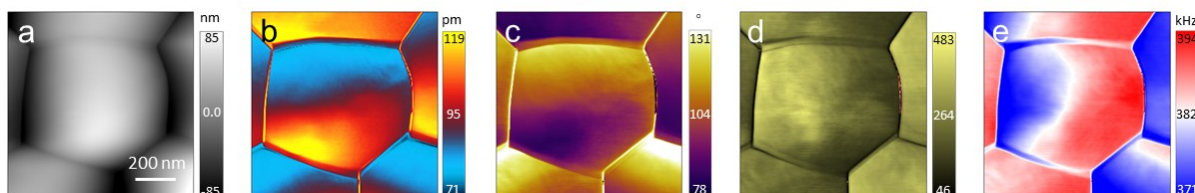
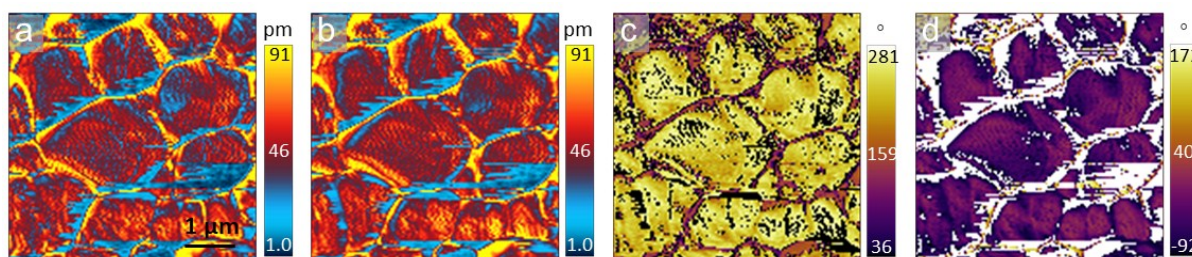


## High-throughput Sequential Excitation for Nanoscale Mapping of Electrochemical Strain in Granular Ceria

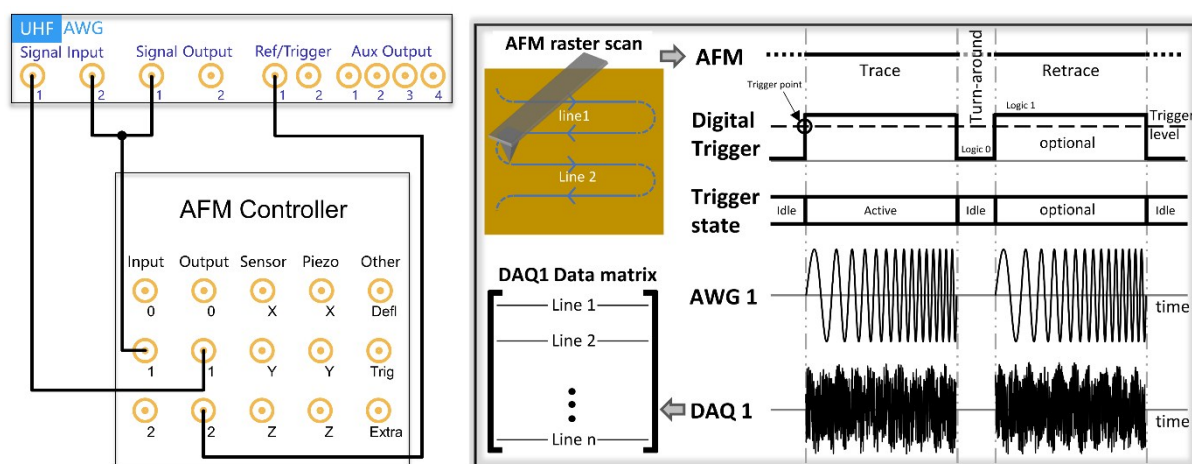
### Supplementary Information



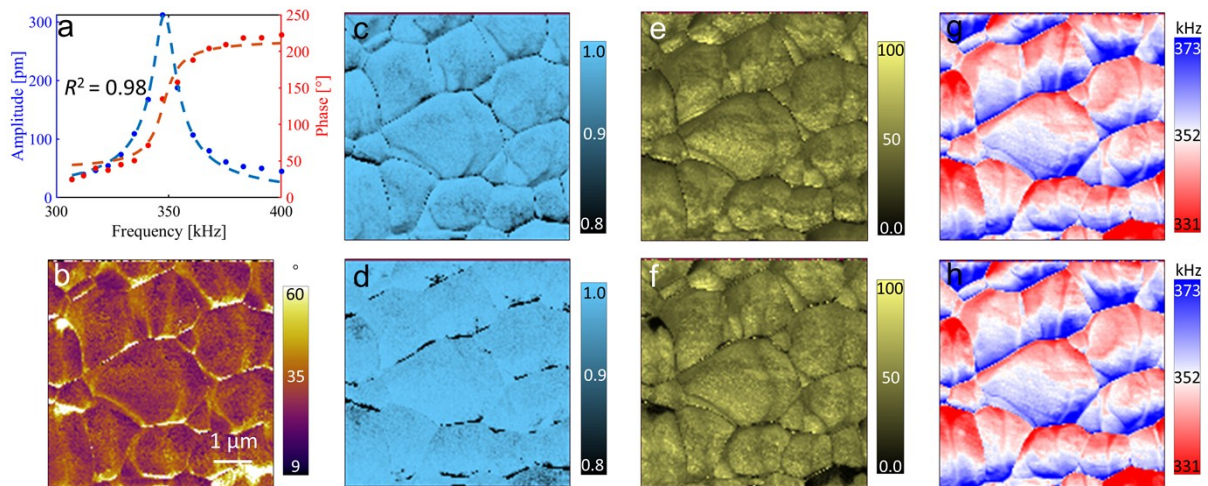
**Fig. S1** (a) Topography. Corrected maps: (b) Amplitude, (c) Phase, (d) Quality factor and (e) Frequency.



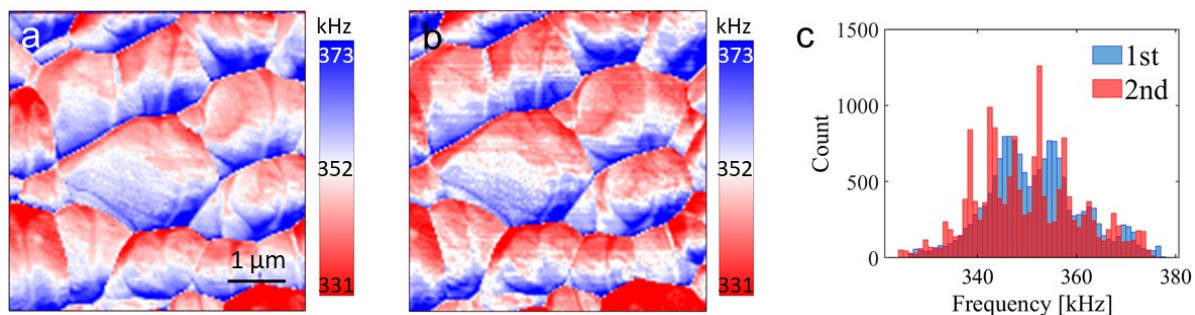
**Fig. S2** Raw maps of DART: (ab) Amplitude 1 and 2, (cd) Phase 1 and 2.



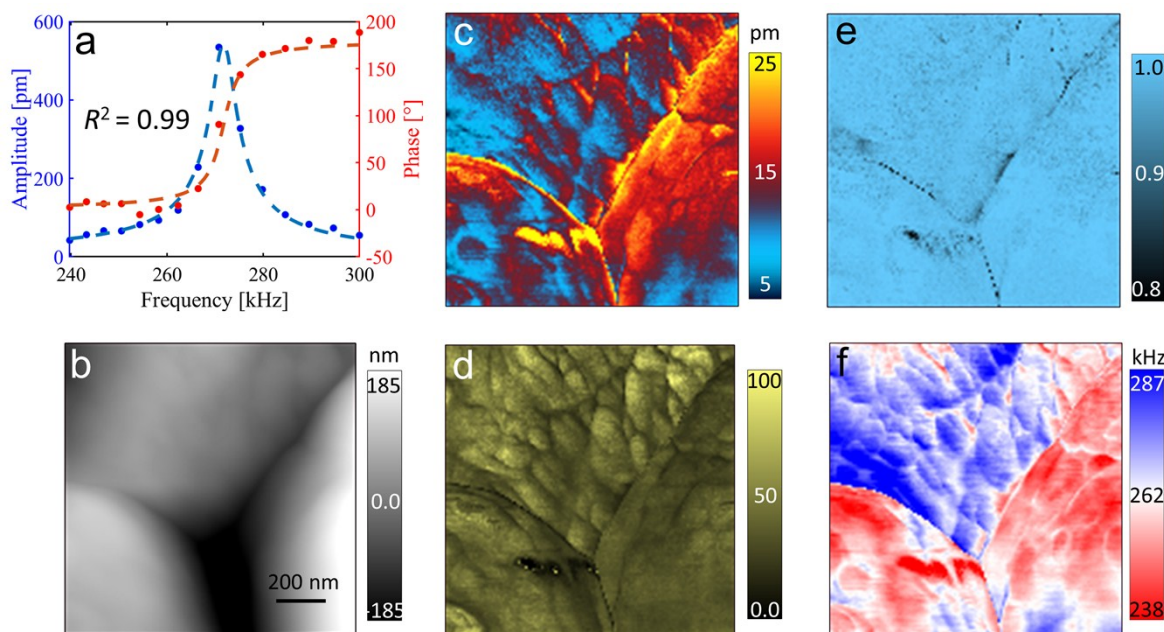
**Fig. S3** (a) Hardware implementation. (b) Signaling and synchronization;



**Fig. S4** (a) DHO fitting of a representative pixel. (b) Phase map. Comparison between maps fitted with sequential amplitude data (the 1<sup>st</sup> row) and phase data (the 2<sup>nd</sup> row): (cd)  $R^2$ , (ef) Quality factor and (gh) Frequency.



**Fig. S5** Comparison between frequency maps fitted with 1<sup>st</sup> harmonic amplitude data (a), 2<sup>nd</sup> harmonic amplitude data (b), and their histogram (c).



**Fig. S6** SE-ESM mappings of LATP at 115°C: (a) DHO fitting of a representative pixel, (b) Topography, (c) Amplitude, (d) Quality factor, (e)  $R^2$  and (f) Frequency.