



Extended Data Fig. 2. | The interference fringes evolution in tr-DFXM. At 1 ps, no clear evidence of lattice distortion is observed. Distortion-induced contrast emerges at 2 ps, and the interference fringes become fully developed at approximately 5 ps. Time intervals were chosen to capture both the initial fringe formation (1–6 ps) and the slower contrast decay (10–1000 ps). After 6 ps, the formation of the pattern remains unchanged, however, its total intensity gradually diminishes. The number is in picoseconds and the black vertical scale bar indicates 50 μm .