Supplementary Information for

Parallel 3D laser microfabrication using axial focal spot shift tailored by laser beam divergence angle

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Table 3. Comparison of our technique and the other existing methods used to shift the focal spot in terms of the working principle, advantages, and drawbacks of each approach.

Method	Working principle	Axial shift	Advantages	Shortcomings
Divergence Focus Control (DFC) *	divergence modification based on Beam Expander approach	900 µm	- reduced cost - compact system design - high power applications - long term stability - no calibration required	- low speed - induce optical aberration at high magnifications - limited control of the wavefront
Diffractive Optical Element (DOE)-(Alvarez lens, Alvarez-Lohmann) Moiré diffractive optical elements	i) shifting two complementary cubic phase plates in opposite direction	86 µm[49] 114 µm [22] 140 µm [41]	- compact systems with large field of view and aperture [50] - high efficiency tuning [51] - ultra-fast focal tuning with galvo-mirror angular scanning [52]	- wavelength dependence [53] - sensitive to alignment and positioning [54] - high optical complexity required to correct beam walk-off - the resolution limit to low numerical apertures [52]
Deformable mirrors (DM)	actuators deform the mirror surface when voltages are applied	53 µm [42] 85 µm [43] 100 µm [44] 120 µm [55] 240 µm [45]	- can operate at kHz rates - wave front real-time correction [56] - closed-loop adaptive control	- actuator crosstalk- one actuator affects neighboring actuators - coating dependent - calibration required - the phase modulation that DM can reproduce is limited compared to SLM[56] - hysteresis movement[44]
Electrically tunable lens (ETL)	electrically controlling the curvature of a flexible membrane filled with liquid	350 µm[46]	- high-speed (up to 1 kHz) - few ms response time[46] - compact design[46]	- some lenses show hysteresis, affecting repeatability[57]
Spatial light modulators (SLM)/ Adaptive optics (AO)	liquid crystal layer controlled by electric field	100 µm[58] 160 µm[21] 400 µm[21] 500 µm[47] 300 µm[59] 800 µm[21]	- high resolution dynamic phase modulation[60] - high-speed refresh rates (ms)[61] - generate multiple focal spots simultaneously[62]	- high cost - increased system complexity - residual signal[21] - resolution degradation without AO correction[21] - temperature-induced drift in local phase shifts[63] - pixel cross-talk limiting the phase gradient[64] - pixelation leading to pulse replicas[65]
Tunable Acoustic Gradient lens (TAG)	acoustic waves induce refractive index oscillations of an optical fluid	4 µm[66] 23.5 µm[25] 120 µm[67] 135 µm[68] 600 µm[48]	- compact system design MHz-scale modulation, - fast depth scanning[56] - no step artifacts - pixelation-free[24]	- continuous scanning focal position (cannot hold a fixed focal plane)[25] - limited lateral shaping capability[56] - lower resolution and degree of optical control than SLM[24]