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**A high-power incoherent light source for ultra-precise optical trapping** ROBERT SCHITTKO, ANTON MAZURENKO, MARKUS GREINER, Harvard University — The ability to engineer arbitrary optical potentials using spatial light modulation has opened up exciting possibilities in ultracold quantum gas experiments. Yet, despite the high trap quality currently achievable, interference-induced distortions caused by scattering along the optical path continue to impede more sensitive measurements. We present a design of a high-power, spatially and temporally incoherent light source that dramatically reduces the impact of such distortions. The device is based on an array of non-lasing semiconductor emitters mounted on a single chip, whose optical output is coupled into a multi-mode fiber. The fiber is used to populate a large number of transverse modes, each of which experiences a different optical path length. This effect, combined with the small coherence length of the light, dramatically reduces the spatial coherence of the output. In addition to theoretical calculations showcasing the feasibility of this approach, we present various experimental measurements verifying the low degree of spatial coherence exhibited by the source, including a detailed analysis of the speckle contrast at the fiber end.

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