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Potential roughness suppression in microwave chip traps[1] SHUANGLI DU, ANDREW ROTUNNO, KAMERON SULLIVAN, SETH AUBIN, College of William Mary — We present the results of a theoretical study comparing trapping potential roughness of DC micromagnetic chip traps and microwave chip traps. The AC Zeeman potential produced by a microwave near-field can be used for spin-specific trapping of ultracold atoms and are an alternative to DC magnetic forces. Notably, magnetic chip traps suffer from potential roughness due to the imperfections in chip wires, which has limited their application in physics experiments, including atom interferometry. Our numerical study finds that AC Zeeman potential can be expected to significantly suppress this roughness with respect to their DC counterpart. In a first approach, we simplify the trace to a thin wire with small current distortions and then compare the AC and DC Zeeman potentials produced by the same magnetic near-field. In a second approach, we investigate the AC skin effect by simulating the near-field of a microstrip transmission line with a localized conductivity defect. In both approaches, we find that the microwave trap suppresses the roughness from wire imperfections significantly.

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