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Scaling of a compact multi-beam ion accelerator to higher beam power for plasma heating[1] QING JI, ARUN PERSAUD, PETER SEIDL, MADELINE GARSKE, GRANT GIESBERCHT, THOMAS SCHENKEL, Lawrence Berkeley National Laboratory, DI NI, SREYAM SINHA, KHURRAM AFRIDI, AMIT LAL, Cornell University — Reducing the size, power, and cost of accelerators opens new opportunities in mass spectrometry, ion implantation and ultimately plasma heating for fusion. Our technology is based on wafer-based components where beam transport is in the direction of the surface normal to the wafer. This allows stacking of these units to increase beam energy while limiting the peak applied voltage to several kilovolts. The wafer-based implementation allows us to operate multiple beamlets on a single wafer in parallel for increased current per wafer compared to a single beam with one large aperture. We've demonstrated a compact multi-beam RF ion accelerator in an array of 3x3 beams, and integration of all accelerator components (matching section, focusing elements and acceleration stages) [1], and an energy gain of 2.6 KeV per gap using a near board RF driver [2]. We now report our effort of scaling to higher beam power using an array of 112 beamlets and an energy gain of up to 10 keV per acceleration gap. We will also discuss the opportunities to scale this technology further to reach hundreds of KeV beam energy. [1] Persaud, A. et al., Rev. Sci. Instrum. 88, 063304 (2017); Seidl, P. A. et al., Rev. Sci. Instrum. 89, 053302 (2018). [2] Seidl, P. et al., https://arxiv.org/abs/1809.08525 (2018)

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Qing Ji
Lawrence Berkeley National Laboratory

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