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High-frequency performance of scaled carbon nanotube array field-effect transistors RALPH KRUPKE, Karlsruhe Institute of Technology, MATHIAS STEINER, IBM Thomas J. Watson Research Center, MICHAEL ENGEL, Karlsruhe Institute of Technology, YU-MING LIN, YANGING WU, KEITH JENKINS, DAMON FARMER, IBM Thomas J. Watson Research Center, JEFFORD HUMES, NATHAN YODER, Nanointegris Inc., JUNG-WOO SEO, ALEXANDER GREEN, MARK HERSAM, Northwestern University, PHAEDON AVOURIS, IBM Thomas J. Watson Research Center — We report the radio-frequency performance of carbon nanotube array transistors that have been realized through the aligned assembly of highly separated, semiconducting carbon nanotubes on a fully scalable device platform. At a gate length of 100 nm, we observe output current saturation and obtain as-measured, extrinsic current gain and power gain cut-off frequencies, respectively, of 7 GHz and 15GHz. While the extrinsic current gain is comparable to the state-of-the-art, the extrinsic power gain is improved. The de-embedded, intrinsic current gain and power gain cut-off frequencies of 153 GHz and 30 GHz are the highest values experimentally achieved to date. We analyze the consistency of DC and AC performance parameters and discuss the requirements for future applications of carbon nanotube array transistors in high-frequency electronics.

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