Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Characterization of Quasi-Metallic Tunnel-Field-Effect-Transistors ABDULRAHMAN ALHUSSAIN, FADHEL ALSAFFAR, King Abdulaziz City for Science and Technology, STEPHEN CRONIN, University of Southern California, MOH AMER, King Abdulaziz City for Science and Technology, KING ABDULAZIZ CITY FOR SCIENCE AND TECHNOLOGY TEAM, UNIVERSITY OF SOUTHERN CALIFORNIA COLLABORATION — Band-to-band tunneling mechanism has proven to be a promising alternative to thermionic diffusion for ultra-fast switching applications. Tunneling Field-Effect-Transistors (TFETs), which primarily operate based on tunneling current, can offer low turn-on voltage with low sub-threshold swing[1]. Here, we demonstrate TFETs based on suspended, ultra-clean, quasi-metallic carbon nanotube pn devices. These devices exhibit a subthreshold swing as low as 2mV/decade, with a current Ion/Ioff ratio in the order of 105 at cryogenic temperatures. At room temperature, however, the current is dominated by the diffusion of carriers, which degrades the Ion/Ioff ratio and the subthreshold swing. We also explore the effect of the schottky contacts on the tunneling current by adding two back-to-back diodes to the tunneling current model. Our results provide evidence that the effect of the schottky contacts can be significant when quasi-metallic nanotubes exhibit band-to-band tunneling. Our results show that quasi-metallic carbon nanotubes can be potential candidates for future nanoelectronics. References: [1] A. M. Ionescu and H. Riel, "Tunnel field-effect transistors as energy-efficient electronic switches," Nature, vol. 479, pp. 329-337, 2011.

Abdulrahman Alhussain
KACST

Date submitted: 06 Nov 2015 Electronic form version 1.4