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Nm-Scale Surface Potential Transient Measurements of the E_C-0.57eV Trap in an AlGaN/GaN High Electron Mobility Transistor D. CARDWELL, A.R. AREHART, S.A. RINGEL, J.P. PELZ, Ohio State University — AlGaN/GaN high electron mobility transistors (HEMTs) are intrinsically ideal for high frequency and high power applications, but have degraded performance due to charge trapping. A suspected virtual gate-related trap at E_C-0.57eV (with ∼30 ms emission time constant at 300 K) has been shown to have a significant impact on HEMT performance and reliability [1]. Using scanning Kelvin probe microscopy, we report on nm-scale measurements of surface potential transients consistent with the E_C-0.57 eV level at different locations across the surface of an AlGaN/GaN HEMT immediately after bias switching. We find that the amplitude of this surface potential transient is largest at locations close to the drain side of the gate, consistent with the "virtual gate model" where charge leaks and is stored near the gate edge in the drain –gate access region. Comparison of nm-scale measurements and electrostatic simulations will be discussed, to quantify the spatial distribution of this ∼30ms trap as a function of gate- and drain-biasing. Work supported by ONR-DRIFT (P. Maki).

[1] A.R. Arehart, S.A. Ringel, et al., IEEE International Electron Devices Meeting(IEDM), 2010, 20.1.

Drew Cardwell

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