Abstract Submitted
for the NMC15 Meeting of
The American Physical Society

Spatial Localization and Variation in Defect-Related Electron Traps in GaN Materials KEVIN GALIANO, DARRYL GLEASON, PRAN KRISHNA PAUL, ZENG ZHANG, DREW CARDWELL, The Ohio State University, BRIAN MCSKIMMING, JAMES SPECK, University of California Santa Barbara, AARON AREHART, STEVEN RINGEL, JONATHAN PELZ, The Ohio State University — High frequency transistors based on GaN have important applications in a variety of technologies, but can degrade due to defects of unknown origin. In particular, a class of defects with energy near 0.57 eV below the conduction band has been correlated with GaN device degradation [A. Arehart et al., Solid-State Electronics (2013)], has been observed for a wide variety of growth and processing conditions, and has been suggested to be clustered around physical defects [Z-Q Fang et al., J. Phys.: Condens. Matter (2002)]. We have used nm-scale Deep Level Transient Spectroscopy (nano-DLTS) [D. Cardwell et al., A.P.L. (2013)] on n-type GaN Schottky diodes grown by ammonia molecular beam epitaxy to confirm that these defects are indeed localized to hotspots with a density comparable to that of threading dislocations. Furthermore, our local nano-DLTS measurements reveal for the first time modest but distinct differences in trap energy and emission rate between hotspots, indicating that local conditions influence trap parameters even within a particular device. Ongoing work is directed towards determining the identity of the localized defects responsible for these detrimental traps, and what causes the trap parameters to vary with position.

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Date submitted: 28 Sep 2015 Electronic form version 1.4