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**Reliability of III-V electronic devices – the defects that cause the trouble<sup>1</sup>**

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Degradation of electronic devices by hot electrons is universally attributed to the generation of defects, but the mechanisms for defect generation and the specific nature of the pertinent defects are not known for most systems. Here we describe three recent case studies [1] in III-V high-electron-mobility transistors that illustrate the power of combining density functional calculations and experimental data to identify the pertinent defects and associated degradation mechanisms. In all cases, benign pre-existing defects are either de-passivated (irreversible degradation) or transformed to a metastable state (reversible degradation). This work was done in collaboration with R.D. Schrimpf, D.M. Fleetwood, Y. Puzyrev, X. Shen, T. Roy, S. DasGupta, and B.R. Tuttle. Devices were provided by D.F. Brown, J. Speck and U. Mishra, and by J. Bergman and B. Brar.

[1] Y. S. Puzyrev et al., Appl. Phys. Lett. **96**, 053505 (2010); T. Roy et al., Appl. Phys. Lett. **96**, 133503 (2010); X. Shen et al., J. Appl. Phys. **108**, 114505 (2010).

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