

## **SESSION 5b: GaN RELIABILITY**

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Compound semiconductor manufacturing success depends on technology qualification through reliability analysis. With GaAs and SiC reliability fairly established, this session focuses on efforts to better understand GaN reliability and present techniques to potentially improve reliability. The session opens with a generic look at how to assess reliability risks of manufacturing anomalies, independent of semiconductor technology, presented by TriQuint Semiconductor. A systematic methodology is given and applied in case studies to show the power of the approach. Next, the European Space Research and Technology Centre presents their latest reliability data from accelerated RF life tests on European GaN HEMTs. Electrical characterization and physical analysis of failed L-band and X-band GaN MMICs are presented to describe the failure mechanisms. The subsequent presentation from the University of Padova details the GaN HEMT degradation below the critical gate-to-drain voltage. A model developed to explain the time-dependent degradation is shown along with experimental data. Next, self-heating of GaN HEMT power devices is addressed using empirical and physical modeling in a presentation from the University of Parma. In this presentation, finite element modeling is used to evaluate different lumped element modeling approaches for a practical solution to modeling complex structures. The final talk of the reliability session also focuses on GaN HEMT power devices and shows the advantages of replacing gold with copper interconnects. The presentation from Chang Gung University give credence that the thermal conductivity advantages of copper result in better experimental device performance, which should improve reliability.