

## **B. Logan Hancock**

Logan Hancock is currently pursuing a PhD in the Materials Science, Engineering, and Commercialization program at Texas State University. He earned his Master of Science in Physics from Texas Tech University in Lubbock, TX and his Bachelor of Science in Applied Physics from Angelo State University in San Angelo, TX. His current research involves spectroscopy and the study of optical properties in semiconductors, specifically III-nitrides electronic materials and devices.

### **Investigation of Thermal Effects in III-Nitride Semiconductor Materials and Devices**

Advances in high-power and high-frequency electronic applications have seen a recent increase in the employment of wide-bandgap materials. This is due to the higher output power densities, increased mobility, and enhanced breakdown voltages when compared to existing silicon and arsenide technologies. In particular, devices based on gallium nitride (GaN) and other III-nitride compounds have become preferable in research efforts as the direct bandgap and higher electron velocities satisfy superior requirements for applications ranging from advanced lighting to wireless communications. Self-heating in these devices becomes a significant concern as the technology progresses, as it represents a major degradation mechanism. Of particular widespread interest is thermal management in High Brightness LEDs and GaN-based High Electron Mobility Transistors (HEMTs). Several non-invasive characterization techniques will be presented for identifying and characterizing the thermal effects in these III-nitride materials and devices, including micro-Raman, time-integrated and time-resolved photoluminescence (PL), electroluminescence (EL), and electrical characterization.