

## S<sup>2</sup>MARTS “Coming Soon” Opportunity (22-06)

### Technology for Nitrogen-Polar Gallium Nitride: Epiwafers & Substrates (ECLIPSE)

***PLEASE NOTE: Companies interested in providing a solution will be required to be Joint Certification Program (JCP) Certified to view the Request For Solutions and propose on this effort.***

The Office of the Undersecretary of Defense, Research & Engineering (OUSDR&E)'s Trusted & Assured Microelectronics program is seeking prototypes that (1) mature the manufacturing of 100mm and 150mm N-Polar GaN epiwafers and off-axis semi-insulating SiC substrates, (2) capture foundry requirements for N-Polar GaN transistors and inform N-Polar GaN material maturation specifications, and (3) author and begin execution of N-Polar transistor and MMIC maturation plans. Key program objectives are as follows: (1) ensure repeatability and reproducibility, (2) understand and improve yield, and (3) exercise N-Polar GaN supply chain segments for substrates, epiwafers, and device fabrication

State-of-the-art (SOTA) radio frequency (RF) material is a key technological enabler for millimeter wave (mmW) applications, such as fifth generation (5G) communications, satellite communications (satcom), electronic warfare (EW), and radio detection and ranging (radar). In order to maintain leadership in RF microelectronics, the United States (US) Department of Defense (DoD) and Defense Industrial Base (DIB) requires access to mature domestic sources of superior semiconductor materials. The following are examples emerging high frequency RF requirements:

- 5G commercial platforms require high-band frequencies (e.g., 26, 28, 40, 50, and 66 GHz) to service areas with very high traffic density and extreme peak data rates.
- SATCOM requires Ku-Band (12 to 18 GHz) through Ka-Band (26.5 to 40GHz) frequencies to support of high throughput satellites and very small aperture terminals. Very high throughput satellite communication systems have much higher frequency requirements within V-, E-, and W-Bands.
- EW and RADAR platforms need to address today's threats in X-Band (8 to 12GHz) through Ka-Band (26.5 to 40GHz) as well as future threats up into W-Band (75 to 110 GHz).

Nitrogen-Polar (N-Polar) RF Gallium Nitride (GaN) material demonstrates overmatch performance in mmW applications in comparison to state-of-the-practice (SOTP) RF material presently employed by the DoD and DIB. In order to accelerate adoption by domestic foundries, an onshore, large-diameter material source must demonstrate Technology for Nitrogen-Polar Gallium Nitride: Epiwafers & Substrates (ECLIPSE).

The ECLIPSE Other Transaction Authority (OTA) prototype project is anticipated to be released and to be executed within a 72-month period of performance.