

OSIRIS

Optimal SiC substrates for Integrated Microwave Circuits

III-V Lab

The OSIRIS project is a Research and Innovation Action (RIA) aiming at improving substantially the cost effectiveness and performance of GaN based millimetre wave components. The project relies on a complete shift in the currently used substrate / epi-wafer technology; it proposes to grow high thermal conductivity (+30%) semi-insulating SiC on top of low cost semi-conducting SiC substrates (used by the power electronics and LED industries). This proposed project will demonstrate significantly more reliable and higher efficiency devices through an innovative solution by producing the GaN HEMT devices using isotope-enriched, semi-insulating (SI) silicon carbide (SiC) substrates that exhibit higher thermal conductivity. It is expected to bring the technology from a TRL of 3 at the project commencement to a TRL of 5 at its achievement.

It is estimated that the 4" SI SiC substrate price using the innovative "isotopic" approach could be decreased from US \$4000 down to about US \$2200 thanks to the use of lower cost SiC substrates as handle. It is worth mentioning that +30% higher thermal conductivity SiC could also be interesting to power electronics and LED domains, but the extra thermal performance will have to be associated to a slight substrate price increase. The SiC wafer market is expected to grow from \$59m in 2013 to \$553m in 2020, covering all electronics applications. Led by III-V Lab, the leading European lab in the field of GaN technology, the Consortium includes Classic, which is developing a challenging isotopic SiC approach relying on recent demonstration and long expertise of the University of Linköping, and UMS which is currently the largest III-V component manufacturer in Europe for microwave application. By nature, the Consortium is strongly committed in exploiting the project results.