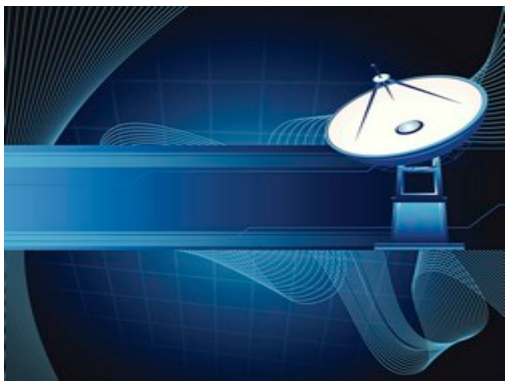
AlGaN and InAlN based microwave components

Results in Brief

Wide-bandgap semiconductors for space applications

Wide-bandgap (WBG) semiconductors hold the potential to revolutionise the electronics world, in much the same way that silicon (Si) enabled the modern computer era. Smaller, faster and more efficient than their Si-based counterparts, gallium nitride (GaN) devices offer greater reliability in tough operating conditions.

ENERGY



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Given the harsh environment in which they operate, ever-more demanding satellite applications call for new technologies that provide maximum power and long lifetime with minimum size and weight. The WBG semiconductor GaN is an ideal candidate for radio frequency and microwave systems.

GaN has emerged as the front-running solution to the slowdown of Si in high power and high temperatures. With almost 10 times better conduction and switching properties than Si, this WBG material is a natural fit for power electronics for satellite equipment applications.

The EU-funded research project AL-IN-WON (AlGaN and InAlN based microwave components) looked to develop a new generation of GaN technology and electronic devices. Development in this field has been dominated until now by Japan and the

United States, with European research being fragmented.

Project partners developed collaborations between ministries of defence, space agencies and technology manufacturers to enable Europe to lead innovation in GaN technology. Together, they worked to develop, optimise and test GaN materials and incorporate them into electronic devices.

The AL-IN-WON team was successful in demonstrating a number of major breakthroughs offered by GaN-based technologies. These include highly reliable and robust Ku-band high-power amplifiers as well as low-noise amplifiers that meet spaceborne system requirements.

Specifically, GaN enabled higher performance for high-electron-mobility transistors and monolithic microwave integrated circuits for both microwave and radio frequency systems and lower gate capacitance, which translates to higher speeds and greater bandwidth.

AL-IN-WON innovations will also enable new architectures for Earth observation, navigation and telecommunications equipment. In particular, project results form part of the foreground of new research dedicated to the industrialisation and further development of GaN technology for Ka-band satellite communications.

Keywords

Wide-bandgap semiconductors, gallium nitride, satellite, power electronics, AL-IN-WON

Project Information

AL-IN-WON

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Project website

Project closed

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