

Duration: 14:20 to 18:10

Room 243



WS05

GaN technology for space applications

Organisers

Paolo Colantonio, University of Roma Tor Vergata, Italy
Francisco de Arriba, TTI, Spain

Abstract

With the increased usage of satellite communication systems, high efficiency and high output power amplifiers have also been required for satellite transponders and will be demanded in the future.

In this context, solid-state power amplifier (SSPA) based on GaN technology is considered a promising optimum solution to replace the actual travelling wave tube amplifiers (TWTA) which needs extremely high voltages (thousands of volts) and whose reliability is critical due to hot electrons in vacuum tube.

Currently, power GaN technology began to be used in terrestrial commercial application for telecommunication, being high power and high efficiency technology a key factor for base stations. The advantage of GaN is the wider frequency bandwidth, the better thermal budget (suitable for CW mode application), the integration (compact module for radar) and the higher cut-off frequency.

The exploitation of GaN technology for space applications is the basis for addressing the space market and developing future business opportunities.

The aim of this workshop is to present significant contributions related to activities and scientific results performed for the space qualification of GaN technologies in Europe

Programme

14:20 - 14:30 Welcome

14:30 - 15:00 **A 230W complete SSPA for Galileo Satellite System Exploiting GaN European Technology: the SLOGAN Project**

Francisco de Arriba, and Rocco Giofrè, TTI, Spain, and Univ. Roma Tor Vergata, Italy

[→ Abstract](#)

15:00 - 15:30 **Towards the realization of a single-chip front-end in GaN technology**

Ernesto Limiti, University of Roma Tor Vergata, Italy

[→ Abstract](#)

15:30 - 16:00 **GaN-based DC-DC converters in space**

Rudiger Quay, Fraunhofer IAF, Freiburg, Germany

[→ Abstract](#)

16:00 - 16:40 Coffee Break

16:40 - 17:10 **Selex ES GaN Technology for Space Application**

Claudio Lanzieri, Selex-ES, Italy

[→ Abstract](#)

17:10 - 17:40 **P-band High Power GaN SSPA**

Hans Harbers, TNO, Netherland, *Pier Giorgio Arpesi*, Selex-ES, Italy

[→ Abstract](#)

17:40 - 18:10 **In Orbit Demonstration of European GaN technology - first results and lessons learned**

Andrew Barnes, ESA-ESTEC, Netherland

[→ Abstract](#)

18:10 - 18:20 Discussion

WORKSHOPS AND SHORT COURSES

14:30 - 15:00 A 230W complete SSPA for Galileo Satellite System Exploiting GaN European Technology: the SLOGAN Project

Francisco de Arriba, TTI, Spain, Rocco Giofrè, Univ. Roma Tor Vergata, Italy

[Abstract](#)

The talk includes all aspects on the design, development and implementation of a GaN SSPA Engineering Qualification Model (EQM) for the next generation of Galileo satellites. The talk will summarise all the activities and the available results towards the realization of a GaN SSPA ready to replace the current TWTAs at high power, lower mass and volume as well as lower consumption, employing as much as possible European technology.

15:00 - 15:30 Towards the realization of a single-chip front-end in GaN technology

Ernesto Limiti, University of Roma Tor Vergata, Italy

[Abstract](#)

The talk summarizes the activities performed towards the realization of a Single-Chip Front-End (SCFE) operating in C Band, integrating the High Power, Low Noise amplification and switching functionalities to be provided in modern T/R modules' Front-Ends for space SAR applications. United Monolithic Semiconductors (UMS) and Selex Electronic Systems (SLX), the GH25 0.25 μm gate length and the GaN technology featured by 0.5 μm gate length for UMS and SLX, respectively, provide the technologies adopted in this project.

15:30 - 16:00 GaN-based DC-DC converters in space

Rudiger, Quay, IAF, Germany

[Abstract](#)

Gallium Nitride on silicon substrate is a very viable alternative for robust and compact converter and inverter structures for space born power conversion. The fast switching and the good ruggedness of these devices make them ideal candidates for efficient power conversion and power switching.

This talk is devoted to the advancements of the technology with respect to epitaxy, processing, dynamic characterization and converter design.

Crucial remaining aspects of high-voltage reliability and space testing will be addressed to contribute to an overall picture of the usefulness of this technology.

16:40 - 17:10 Selex ES GaN Technology for Space Application

Claudio Lanzieri, Selex-ES, Italy

[Abstract](#)

For the next future a large demand of modules operating in C and X Band should be required for different RADAR application, as for example new Sentinel and the Cosmo 2nd Gen constellations.

This talk focuses on the experience of Selex ES Foundry in the development of 0.5 and 0.25 μm Gate Length GaN process and results achieved in the realization of MMICs

17:10 - 17:40 P-band High Power GaN SSPA

Hans Harbers, TNO, Netherland, Pier Giorgio Arpesi, Selex-ES, Italy

[Abstract](#)

This talk focuses on the results of the developments performed by the European industry for the SSPA technology intended to be used on board of the future Synthetic Aperture Radar (SAR) of the BIOMASS satellite, the next ESA Earth Explorer mission. High efficiency 150 W amplifiers at P-band (435 MHz) based on GaN devices are presented.

17:40 - 18:10 In Orbit Demonstration of European GaN technology - first results and lessons learned

Andrew Barnes, ESA-ESTEC, Netherland

[Abstract](#)

European GaN technology has been used for the first time to realise an X-band telemetry transmitter on the ESA PROBA V satellite. The satellite was successfully launched in orbit May 2013 and the GaN based transmitter has been used to download several terabytes of image data for the mission. An overview on the transmitter development, qualification flow and in-orbit data obtained to-date shall be presented