

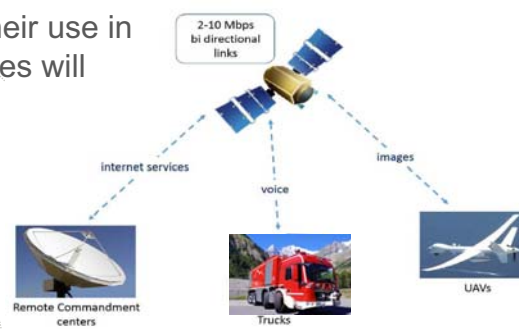
GaN Transceivers for Satellite Comms

Background and challenges

GaN technology is seen as a key element for the space industry. Their use in the **power amplification and low noise receiving stages** of satellites will represent a *significant progress versus actual designs*

Significant challenges are addressed:

- **Enhanced robustness** of radio transceivers at **K/Ka bands**
- **Space qualification and packaging** of **GaN MMICs**
- **Multi-beam active TX/RX antenna array**
- High-efficiency high-linearity **PA and LNA devices**

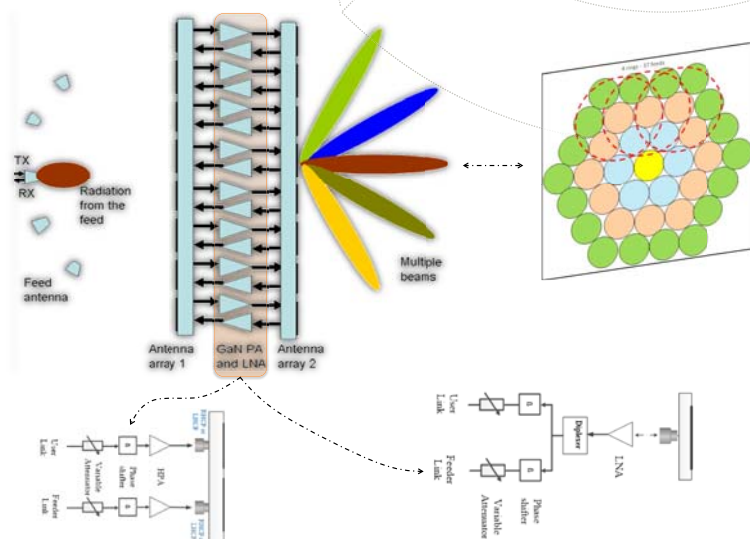


Description and main innovation

Project Description

The idea is based on a **spatial power combiner preceded by an active array of MMICs**

IT is the project technical coordinator and is focused on the **GaN PA and LNA design**



Main Innovations

This concept shows the following benefits:

- Transmitter **based on a SSPA** reduces the **overall weight and size** of the satellite. *Might be a good substitute for TWTAs*
- Proposed approach for spatially power combining will **increase** the overall **efficiency**
- New **European GaN process** will be available for **K/Ka bands** (20 and 30 GHz)
- Novel **GaN library** will be available for CAD/CAE design
- **Low cost small satellites** can be achievable with this technology, reaching high power and high bandwidth

Achievements

- R. Emrick, **P. Cruz**, N. Carvalho, S. Gao, R. Quay, P. Waltereit, "The Sky's the Limit: Key Technology and Market Trends in Satellite Communications," *IEEE Microwave Magazine*, vol. 15, no. 2, pp. 65-78, April 2014 [\[http://dx.doi.org/10.1109/MMM.2013.2296212\]](http://dx.doi.org/10.1109/MMM.2013.2296212)
- S. Pires, W. Jang, **P. Cruz**, N. Carvalho, et al., "GaN K/Ka-band High-Efficiency Multi-Beam Transceivers for Satellites," *ESA Workshop*, Amsterdam, November 2014
- Process design of GaN PA and LNA at X-band is validated and **K/Ka bands** is currently underway with foreseen **performances of 5W (30% eff.) per single transistor**

