DEFENCE AND SPACE

Low-mass high-power GaN amplification hybrids for X-band multi-beam active antennas

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hisdeSAT

Airbus Proprietary and Confidential

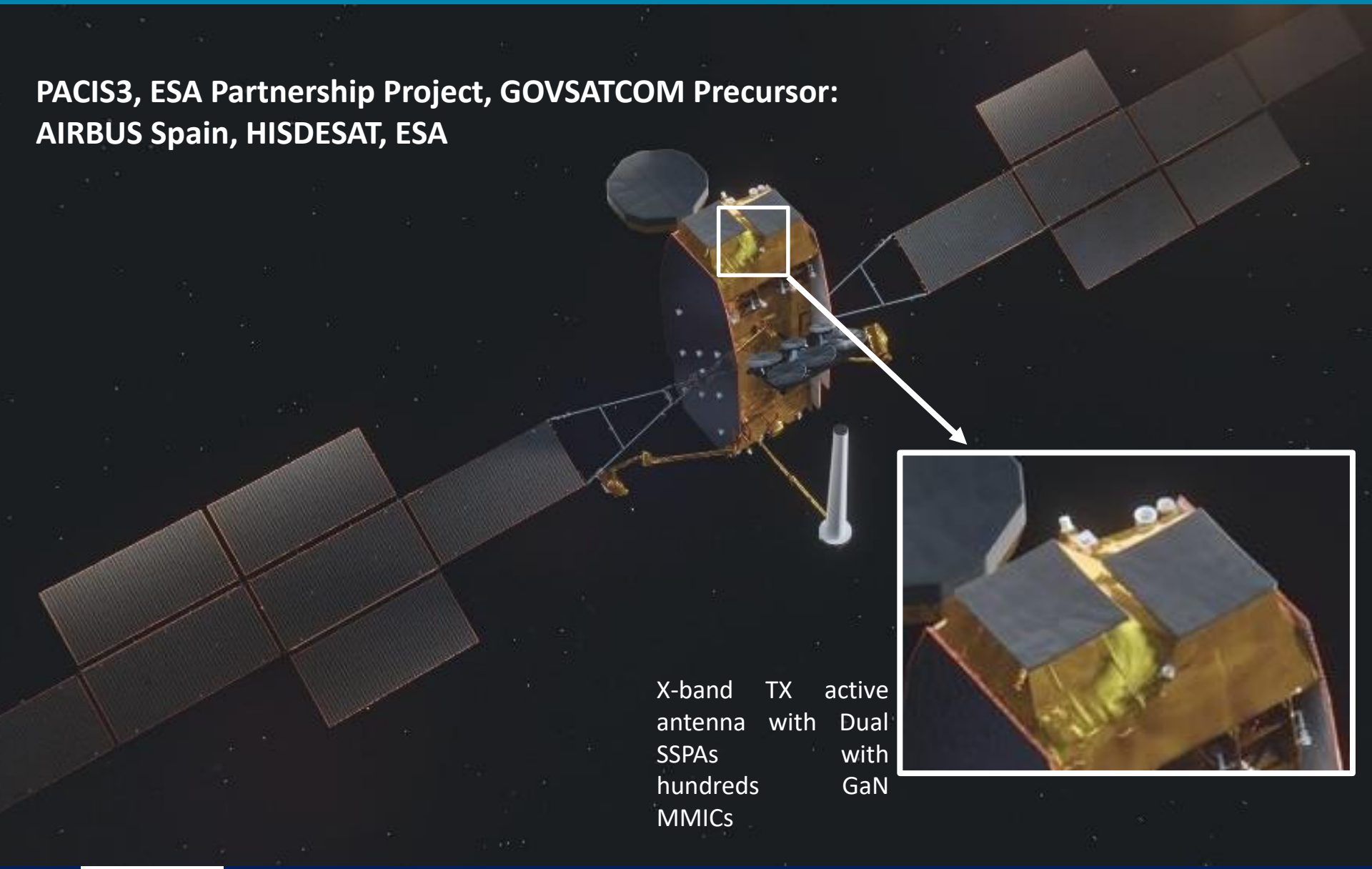
AIRBUS

Agenda

1) Introduction
2) Hybrid design & architecture
3) Qualification flows
4) Main performances
5) Conclusions

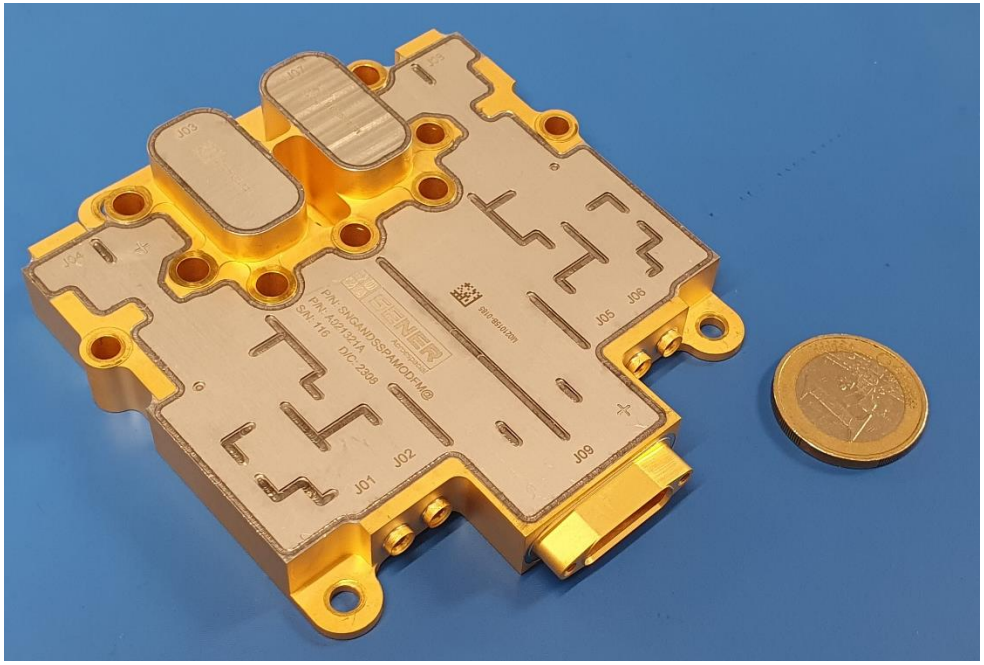
Introduction

PACIS3, ESA Partnership Project, GOVSATCOM Precursor:
AIRBUS Spain, HISDESAT, ESA

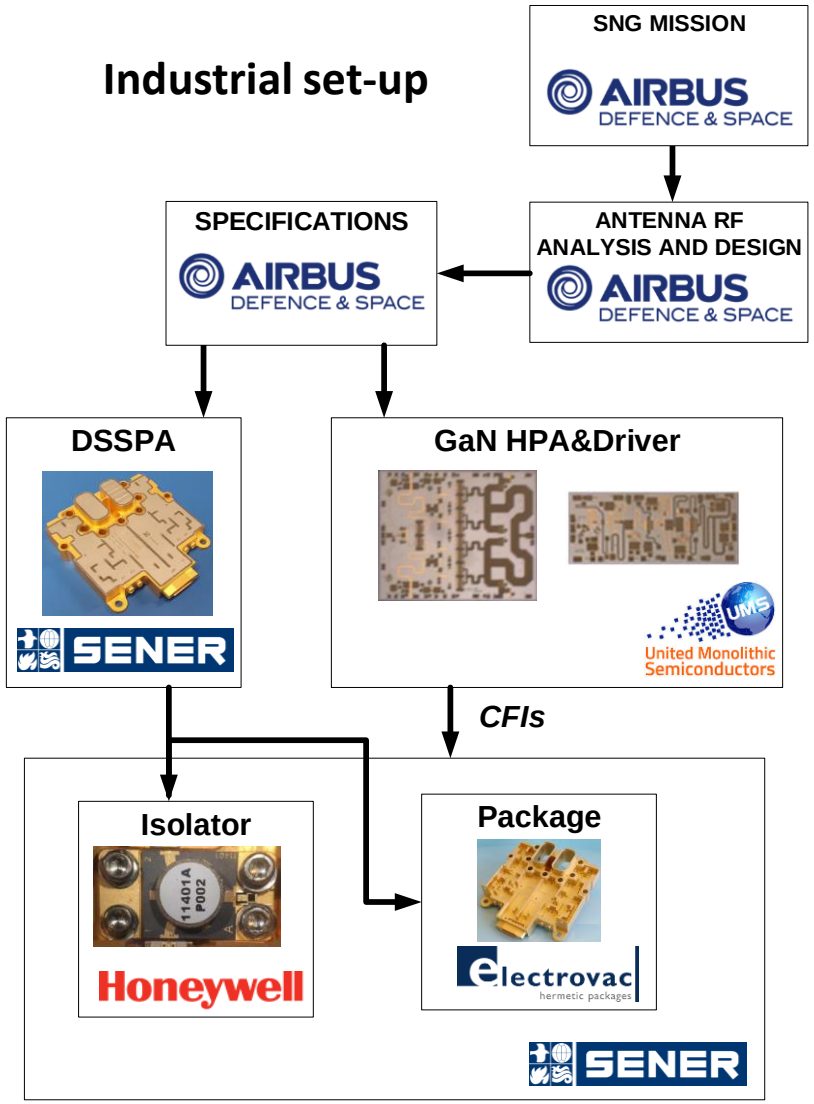


X-band TX active antenna with Dual SSPAs with hundreds GaN MMICs

Introduction



Industrial set-up



Development logic status:

- DONE EM validation
- DONE Qualification flows (DSSPA & GaN MMICs)
- DONE Flight set 1 delivery
- DONE LAT1
- IN PROGRESS Flight set 2 delivery
- LAT2

Hybrid design & architecture

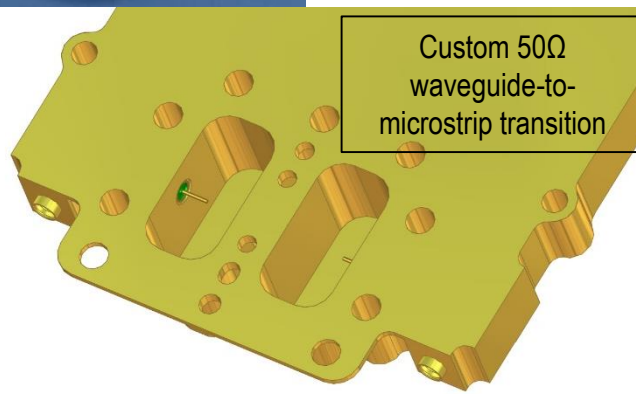
Mass < 150g
Volume 80x100x11 mm³

Hermetically soldered
GTMS
Temperature resistant
from -55°C – +125°

EN-AW-6082 Aluminum
Alloy
Electroless Nickel plating

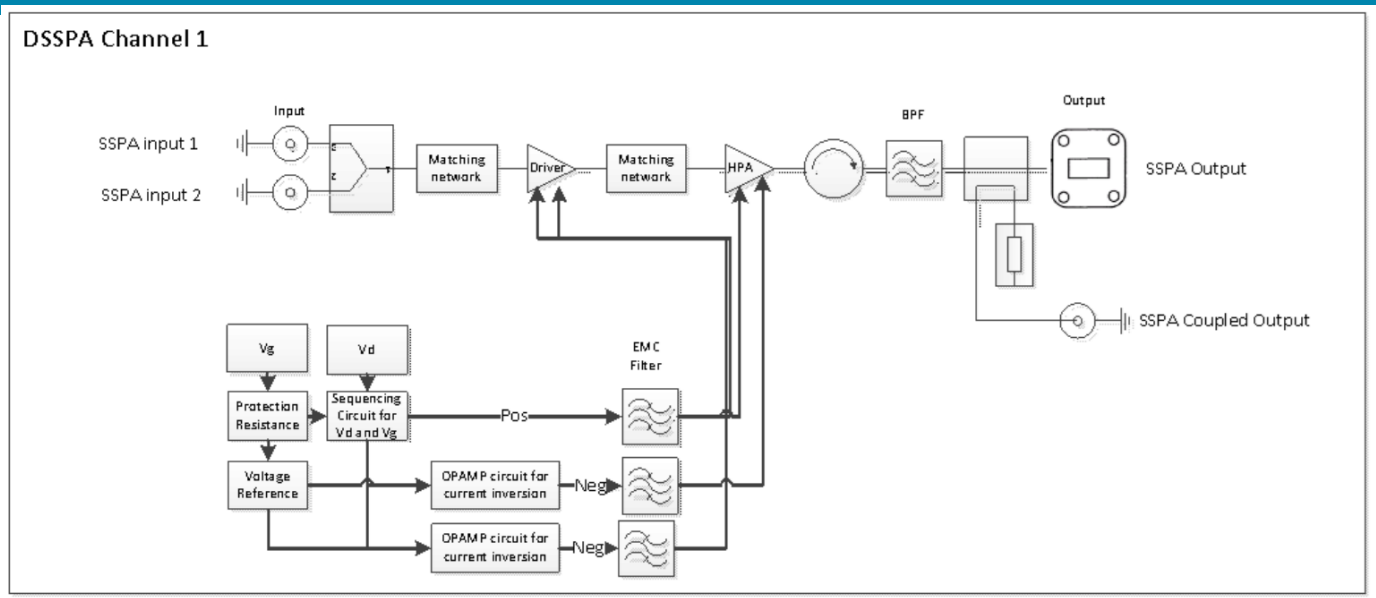
6x Full Detent
SMT connectors

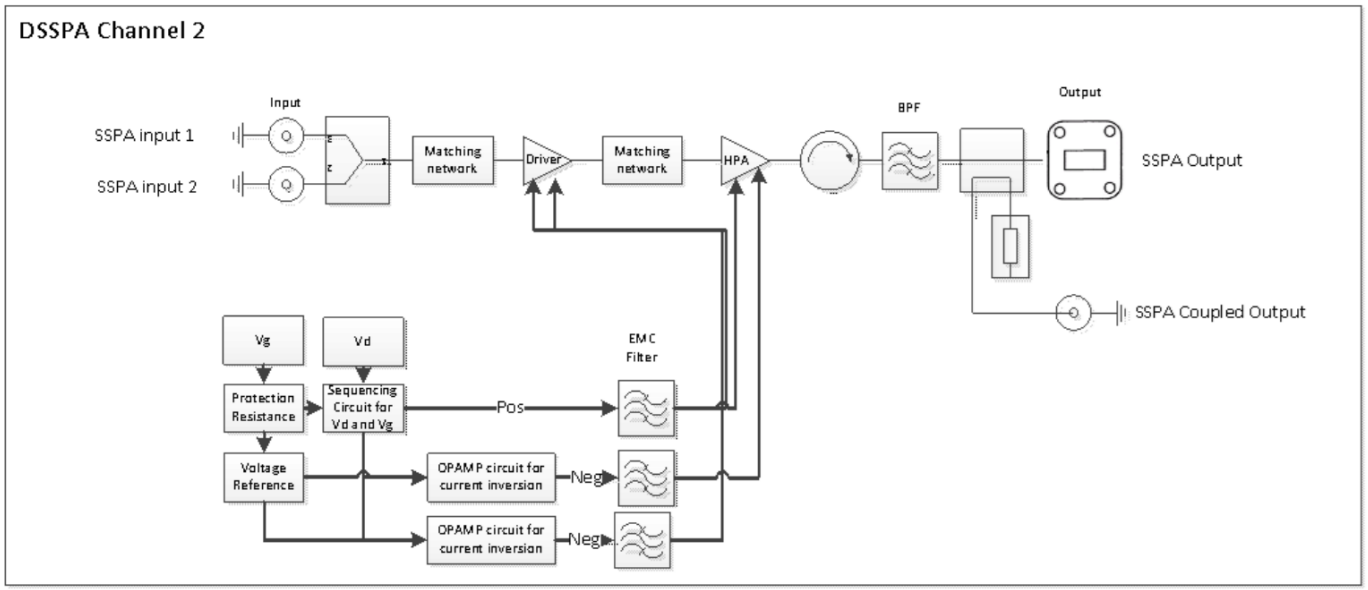
Customized 16-
Pin Micro-D



Custom 50Ω
waveguide-to-
microstrip transition

Hybrid design & architecture





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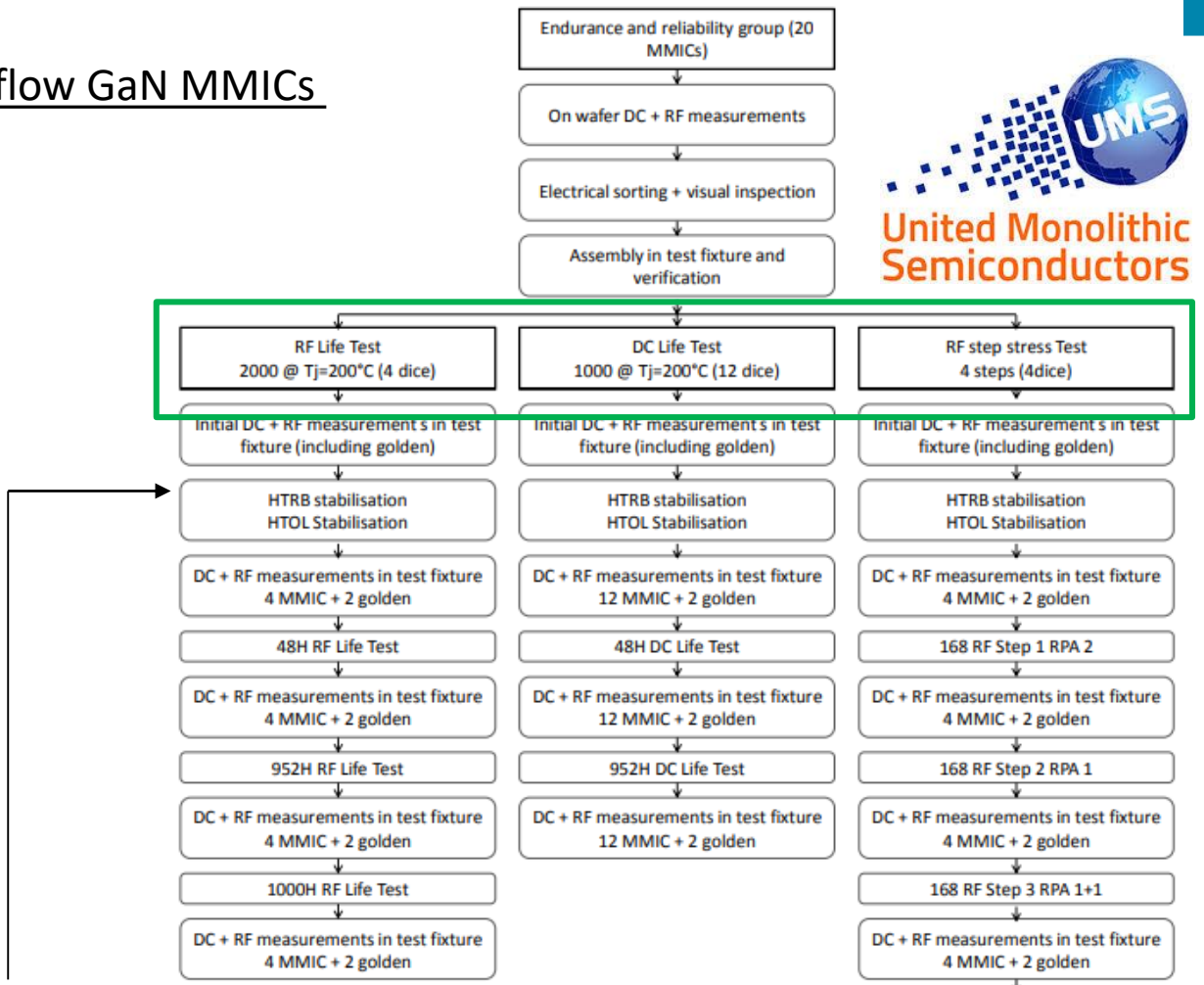
Qualification flows

Qualification flow GaN MMICs



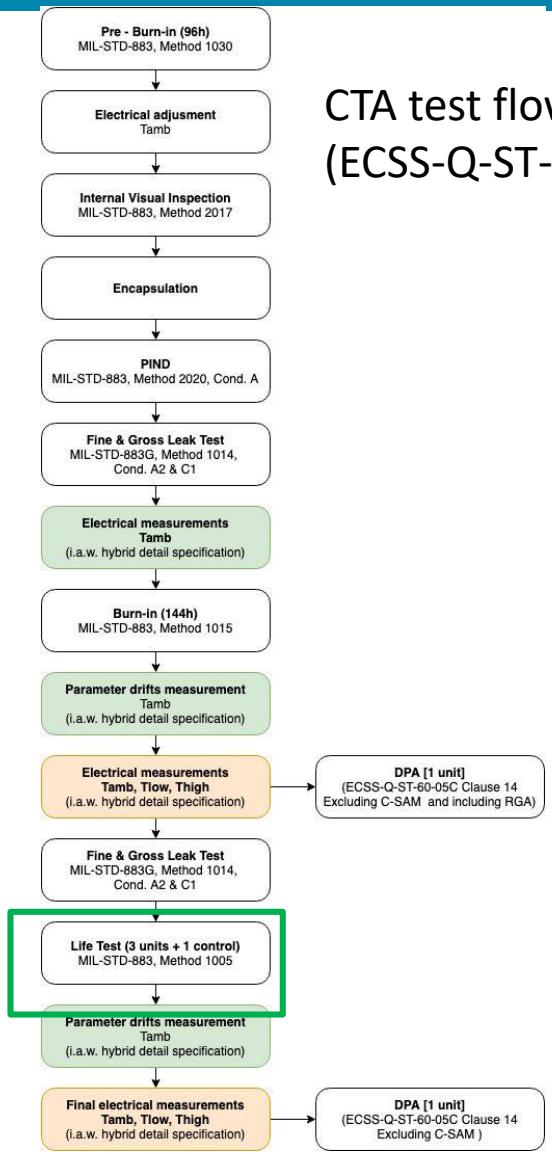
United Monolithic Semiconductors

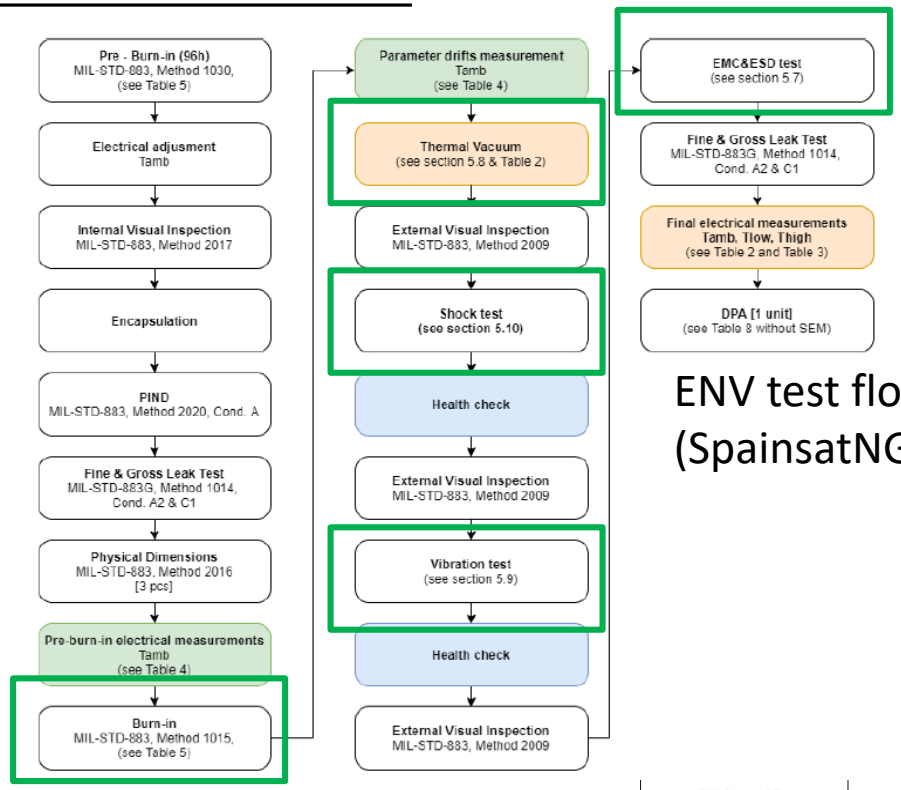
V.Valenta, G. Loughnane, C. Espana, J. Latti, A. Barnes, J.P. Roux, O. del Rio, G. Rubio-Cidre, M. Ramirez-Torres, V. Serru, L. Caille, **"Stabilisation and burn-in of X-band GaN HPA MMICs for space applications",** European Microwave Week 2022, 2022

Qualification flows

Qualification flow DSSPAs

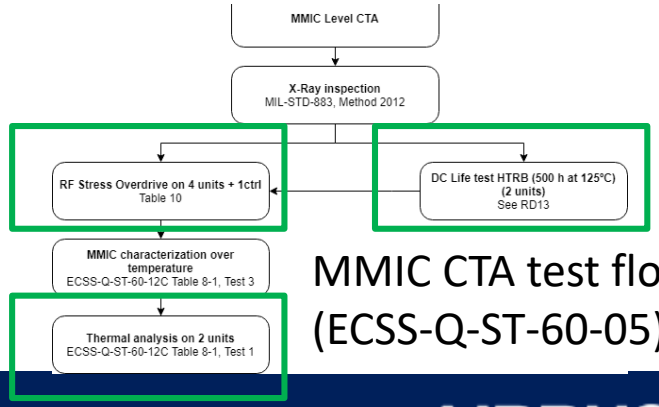
CTA test flow
(ECSS-Q-ST-60-05)





ENV test flow
(SpainsatNG mission)

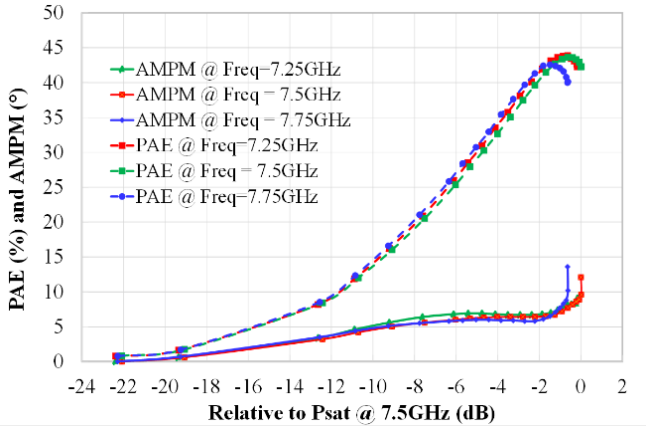
SENER

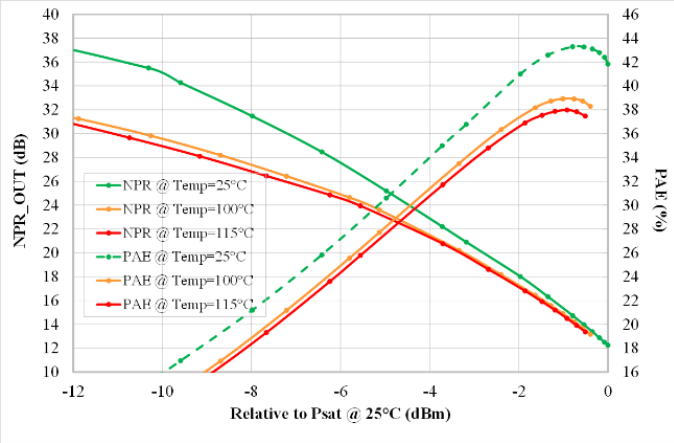


MMIC CTA test flow
(ECSS-Q-ST-60-05)

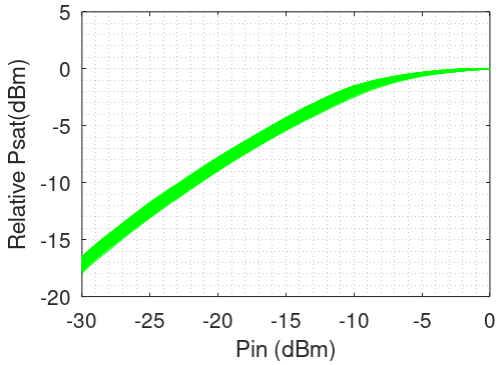
Main performances

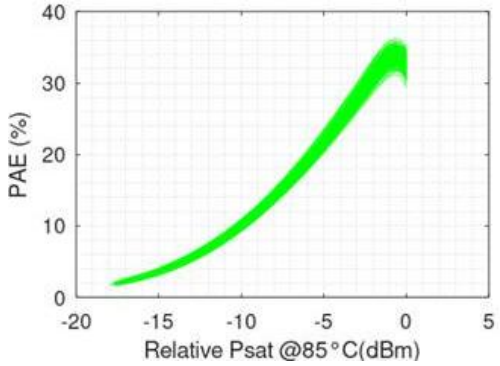
HPA test-jigs tests @100ºC chip backside

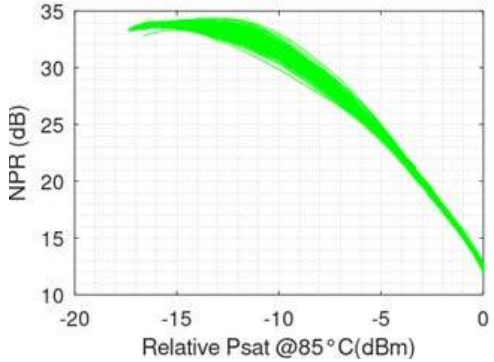




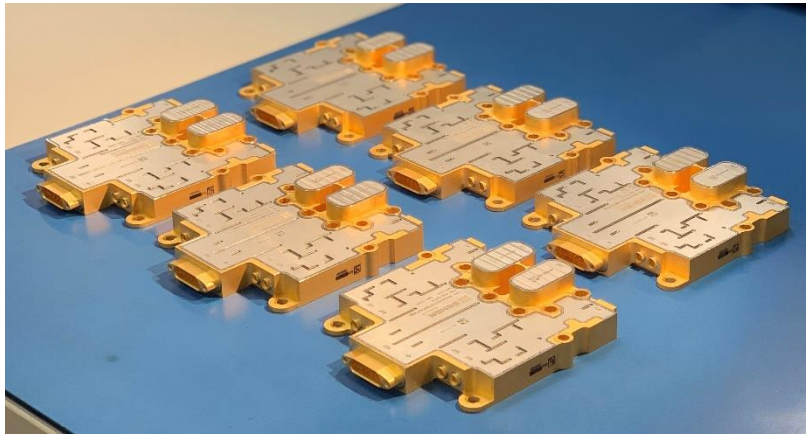
DSSPA tests @85ºC baseplate







Conclusions



- Design concept offers a lightweight, compact, and high-performance hardware solution that meets industrialization objectives and transmit antenna demands.
- Custom GaN MMICs for both satellites were delivered beginning of 2022 and have been fully qualified since mid-2020, confirming excellent stability of the selected space-evaluated process.
- The DSSPA qualification review and Lot Acceptance Test (LAT) were declared successful after a thorough test campaign, and the flight manufacturing phase is now running, with an expected end date of mid-2023.
- The performance dispersion of the critical parameters, including output power, gain, and linearity, among delivered modules, aligns with the antenna requirements. Currently, the transmit active antenna is being integrated with excellent results. The launch is scheduled for 2024.

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Thank you to the whole PACIS3 team!

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