UMS GAAS IN QFN PRODUCT: SPACE PROCUREMENT FLOW FOR NEWS SPACE APPLICATIONS

ACCEDE 2025,

Benoit Lambert,

26th of March

United Monolithic Semiconductors

Content

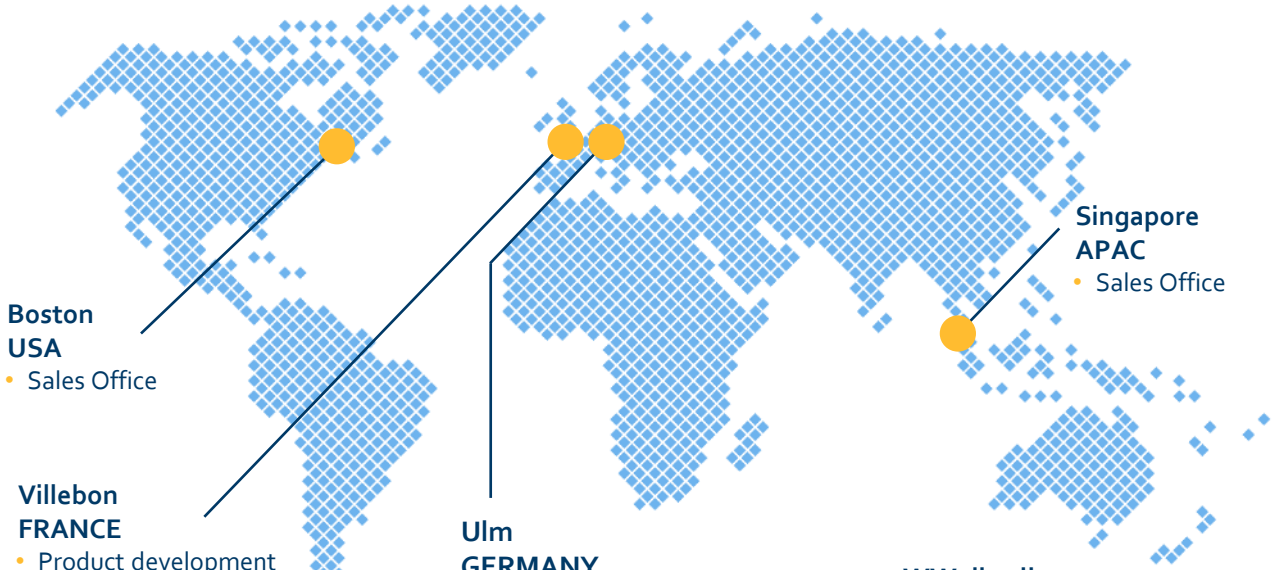
- UMS presentation
- News space business challenge
- Space procurement flow overview
- UMS Front end / Radiation hardness
- UMS QFN plateform
- Commercial space flow description
  - Screening
- Conclusions

ABOUT UMS

We are a leading **European supplier** of RF MMIC solutions, **GaAs and GaN technology and foundry services**, supplying best-in-class innovation to some of the most demanding customers in the world, such as **Space and Defence, Automotive, Telecommunication** and any other **Industries** in need of cutting—edge radio-frequency semiconductor solutions.

UMS in some key numbers:

- 2023 Sales: **75M€**
- **2** production sites,
  2 sales offices &
  a **world-wide** network of representatives & distributor
- **420+** dedicated team members at our customers' service
- **28** years of experience
- **>220** products in our catalogue
- **50/50** Joint Venture
  Thales - Airbus



OUR OFFER

Foundry Solutions

- Wafers & services
- Packaging services
- Known good die and packages

Product Solutions

- RF MMICs ASICs & standard products
- Die and packaged products
- Mulit-chip modules

Technology Platform

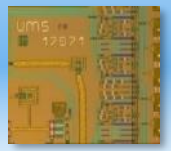
INTERNAL FOUNDRY
- European, ITAR free
- GaAs & GaN technology
- Specialized

EXTERNAL FOUNDRY
- GaAs & SiGe/Si technology
- High volume needs
- Commercial applications

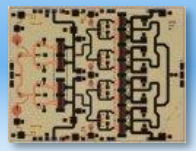
PACKAGING
- Internal specialized
- High volume QFN
- Hermetic and power

COMPETENCE NETWORK
- Analysis capability
- R&D institutes
- Partnerships

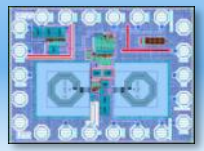
GaAs



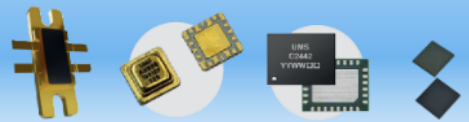
GaN



SiGe/Si



Plastic & Hermetic packages



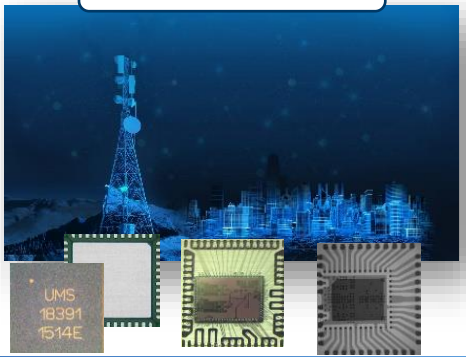
European leader for III-V HiRel applications

Satcom

Space

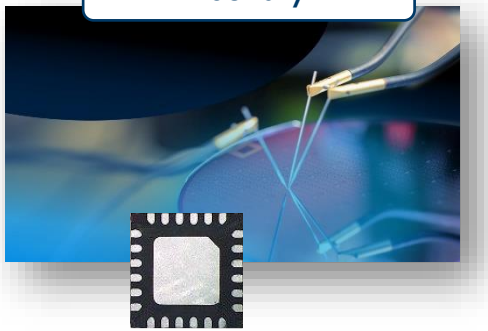
Automotive

Telecom



Defense

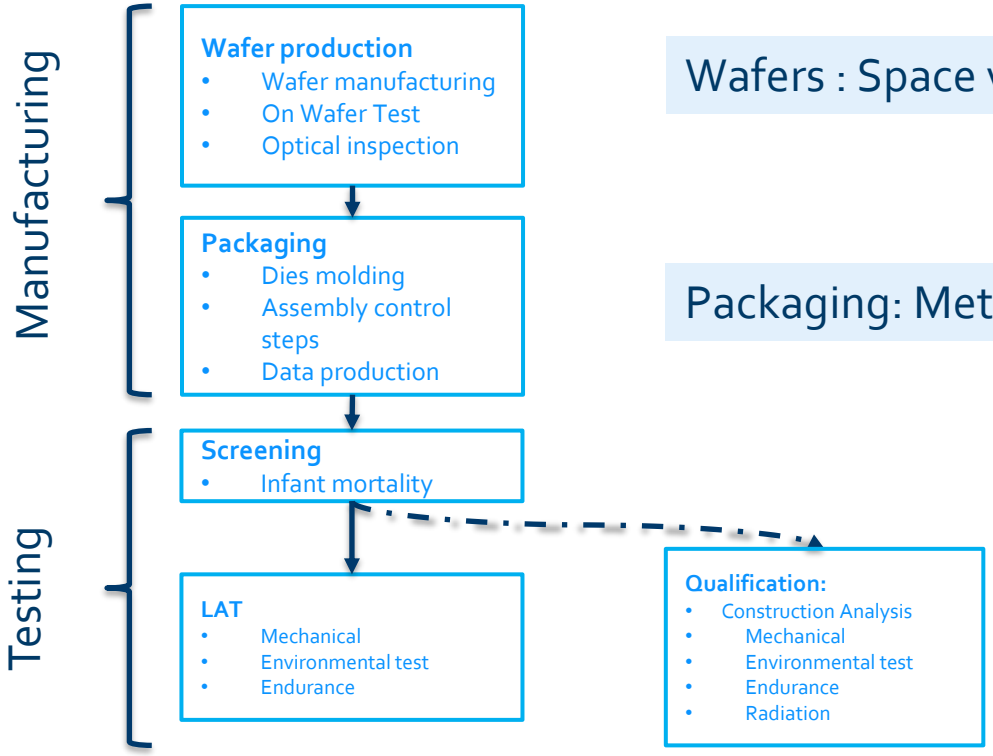
Foundry



NewSpace - Challenge

- "New Space" business ~ LEO constellations :
  - Hundreds or thousands of satellites
  - Reduced Lifetime (5 to now 7years or more)
  - Low cost: COTS approach. Satellite are small and not expensive
- UMS product portfolio cover active function from L to Q frequency band
  - Amplifier, Attenuator, detector, mixer, down converter, VGA
- Main Challenge : **COST vs QUALITY**
  - Manufacturing grade (die + assembly)
  - Testing flow

Space procurement flows



Wafers : Space vs **Commercial grade**

Packaging: Metal ceramic vs **Plastic QFN**

How much testing?
Assess the **right risk**!!

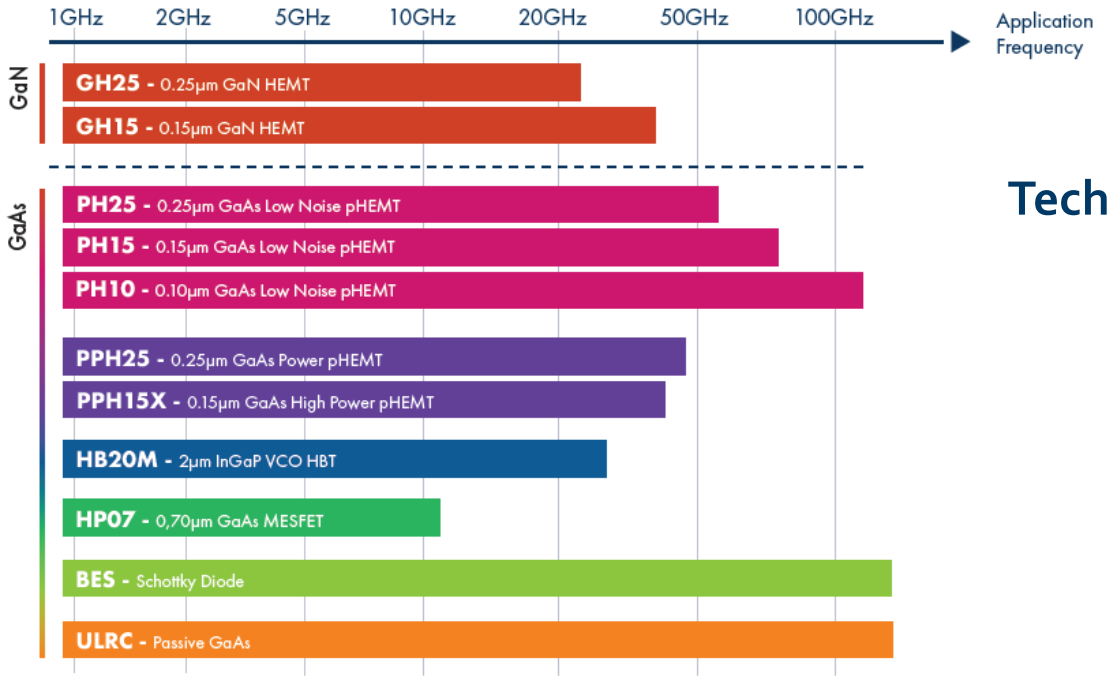
UMS Space procurement Flows Offers

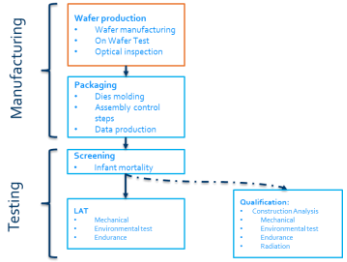
Step	COTS	Commercial space	Full space (in accordance to ECSS_Q_ST_60_13)
Wafer Production	Commercial	Commercial	Space
Packaging	Commercial	Re-inforced Control Plan	Re-inforced Control Plan
Screening	No	TC+CSAM+Elec+Optical at 100%	Full
Lot acceptance test	No	endurance test on request only	Full
Qualification Test	Generic data	Product Qualification plan for Space application	Product Qualification plan for Space application

- Commercial Space: Adjusted procurement flow for New Space business

Cost effective with high quality level solution

UMS front end technologies





Technologies listed in ESA/EPPL

ESCC

Catalogue Products benefit of a long heritage in space applications

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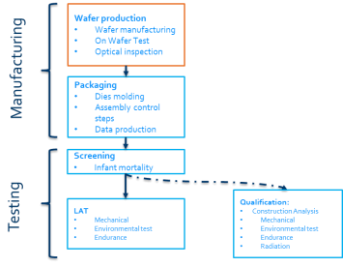
UMS front end technologies

GaAs technologies Radiation Hardness

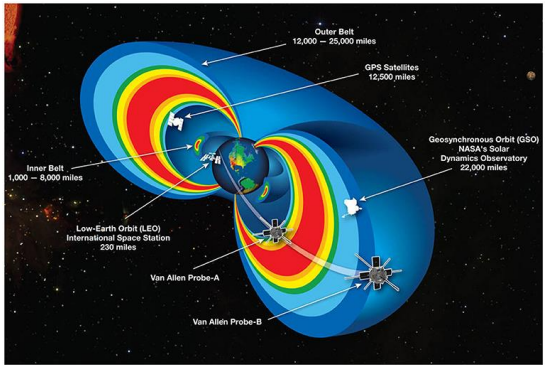


Total Ionisation Dose

- No sensitivity up to ***300krad***
- ***No lot to lot sensitivity*** : No need to qualify manufacturing lot vs TID sensitivity

Single Event effect

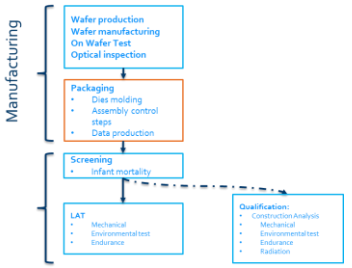
- Safe Operating Area define for operation up to 10^7 #/cm² with LET of 62,5 MeV/(mg/cm²) « Si »
- No dose effect observed
- Design Analysis Services to comply with space derating rules



Displacement Damage

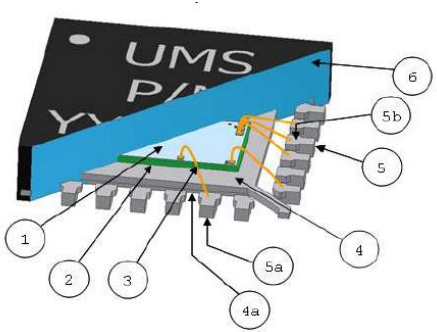
- Proto – 51,7MeV Fluency : >10^{11} #/cm² : **successful**

QFN packages assembly line for commercial space



QFN Platform qualified since 2008 for GaAs technologies

- **High volume production: Automotive, telecom, defense**
  - Size : 3x3mm to 8x8mm
  - Frequency : 40GHz
  - GaAs, GaN, SiGe die technologies



No.	Name
1	MMIC
2	Die attach
3	Bonding Wire
4	Frame
4a	Frame external Sn finish
5	Lead
5a	Lead external Sn finish
5b	Lead bond pad Ag finish
6	Mold Resin

UMS commercial QFN platform with re-inforce control plan

100% optical inspection at key steps

Commercial space flow

Screening steps

Step	Commercial space	Full space
Traceability	Assembly date code vs wafer lot	Assembly date code vs wafer lot
Thermal Cycling (10 cycles)	100%	100%
C-SAM	100%	100%
DC/RF measurement	100%	100%
Power Burn-in	no	100%
DC/RF measurement	na	100%
External visual Inspection	100%	100%

Thermal Cycling
to reveal infant mortality

CSAM
to detect infant mortality

Medium Volume
QFN test station

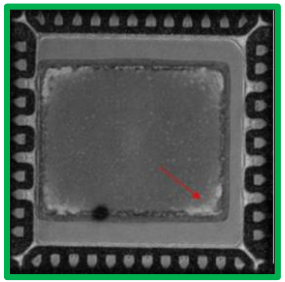
Mass-prod QFN
test station

Industrial flow in place at UMS

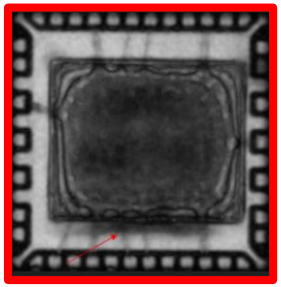
Commercial space flow

CSAM inspection KEY tool to screen early failed

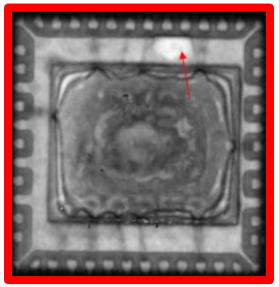
- UMS develop a defect catalogue adapted to our technologies



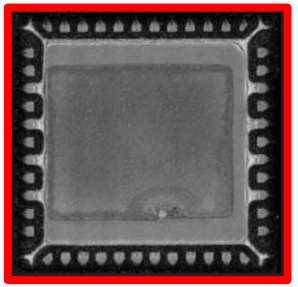
Glue delamination
no evolution after TC



Crack in the molding



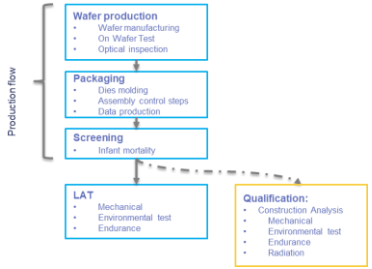
Delamination EMC/

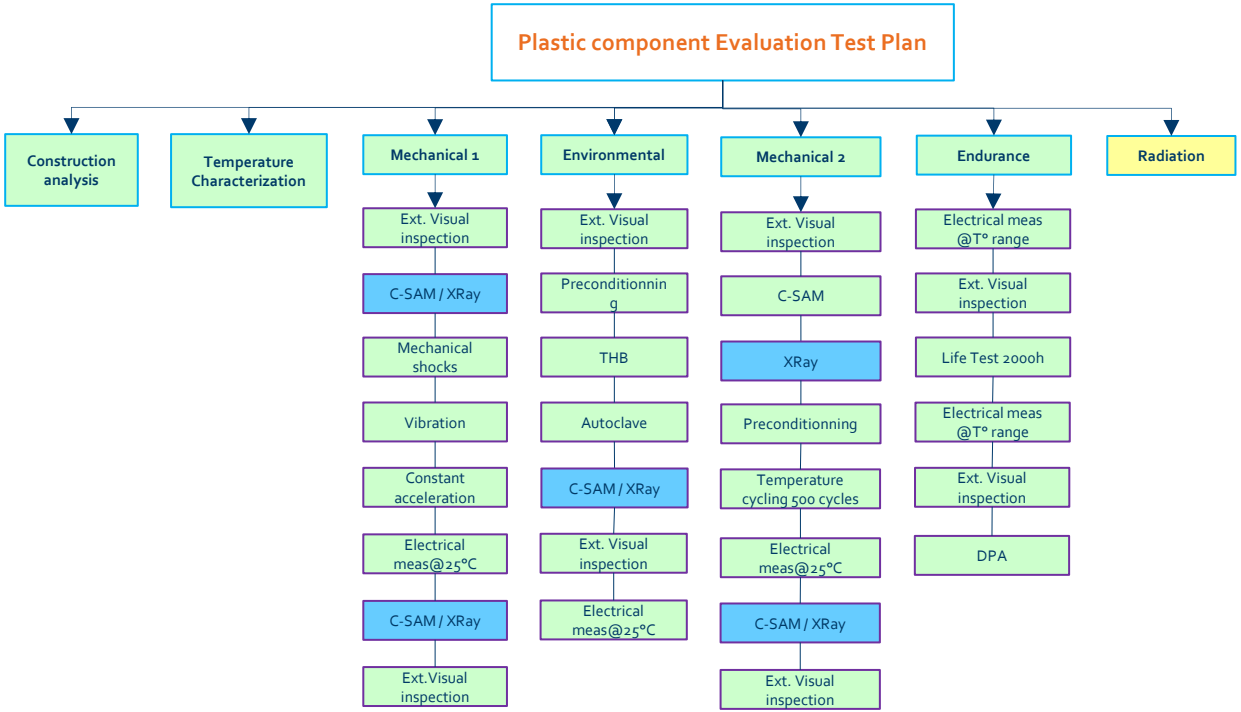


Defect in the glue

- Meanwhile, standardized (norm) criteria remain unclear

Qualification flow





ECSS-Q-ST-60-13C

UMS internal qualification data

In addition

Similar to the ECSS-Q-ST-60-13C + some add on

Conclusions

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Cost effective and high quality level solution

Based on long heritage of GaAs and QFN technologies


THANK YOU
United Monolithic
Semiconductors