PIDEA+ 05-165
High Frequency Advanced 3 D Packaging
HIFAP

Microwave Organic Packaging State-Of-the-Art

Compared to ceramic packaging:

- Polymeric multilayer structure: low-cost / fast prototyping manufacture,
- High compatibility with printed circuit boards substrates (no or reduced thermal expansion mismatch)
- Possibility to embed passive components in SMT packages
- Automatic bonding on boards possible

→ improvement of global system electrical performance and interconnection efficiency.

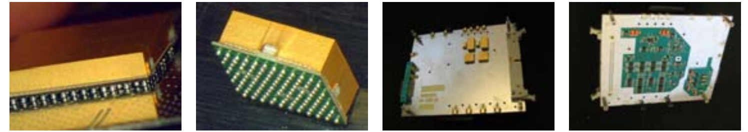
Drawbacks:

- It is necessary to manage non hermeticity
- Low integration density that limits high frequency applications

Applications

The applications which can be addressed by the technology under study are numerous:

- Space applications (telecommunications , television, earth observation…) : beam forming networks, TM/TC antennas, synthetic antenna radar (SAR) phased array antenna,
- Ground based radio-communications and telecommunication (telephone, wireless LAN,..): base stations, RF front ends for mobile phones, DPAs …
- Automotive: RF front-ends for GPS, radio communication, traffic control, sensors, collision avoidance radars
- Civilian phased array radars: air traffic control, airport control, meteorology radar,…



HIFAP Objectives

48 months project stated in 2006.

Follow-up of PIDEA MICROSM Project completed in 2005

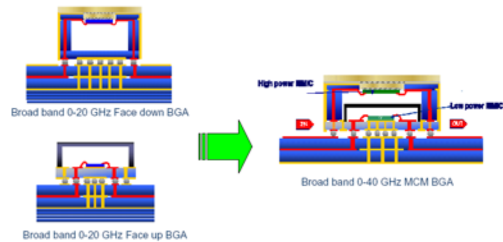
To expand microwave organic packaging potential

Proposed technological work:

- 3D organic microwave packaging:
  - Package design (construction/transition design)
  - Manufacture technique selection,
  - Test vehicle manufacture
  - Characterisation
  - Optimization and demonstrator realisation
- Organic Embedded capacitors for MMICs decoupling
- MMIC protection

HIFAP Innovation

MICROSM Developments



HIFAP Partnership

THALES Airborne Systems (F): co-ordination, SMT microwave packages design,and demonstrator realisation,

LITHOS (F): development of packages using the new materials from ROGERS NV,

IMS (F): microwave characterisation of the materials and packages developed,

OMICRON (S): development of packages using the new materials from ROGERS NV,

SELEX (I): SMT microwave packages design, demonstrators realisation and manufacturability study.

Project Status

Packaging Development:

Base materials selection (ROGERS RO4003 and Ultralam 3000, Arlon 25N) and characterisation within the 0-40 GHz frequency band (still on-going)

MMIC Protection experiments conducted using epoxy resins

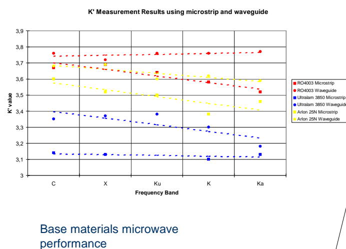
0-40 GHz 3D Package design done and currently under manufacture

Embedded Passives

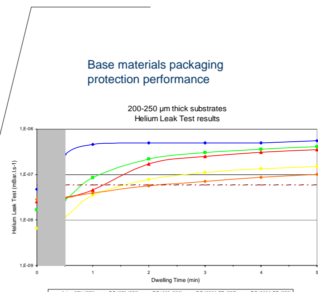
Modelling Study conducted in respect to MMIC decoupling at high frequency

Capacitive materials survey/procurement and characterisation: selection of a capacitive laminate solution for real MMIC decoupling experiments (on-going)

Outcome



Base materials microwave performance



THALES Airborne Systems planned demonstrator

ANSOFT HFSS modelling

Glob top experiment vehicle

Integrated capacitance - S21

Embedded capacitors from 1 to 172pF with a cut-off frequency over 20 GHz (decoupling effect under -80dB within the [2-20]GHz frequency band

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