

Base Material Solutions for mm Wave Automotive Applications

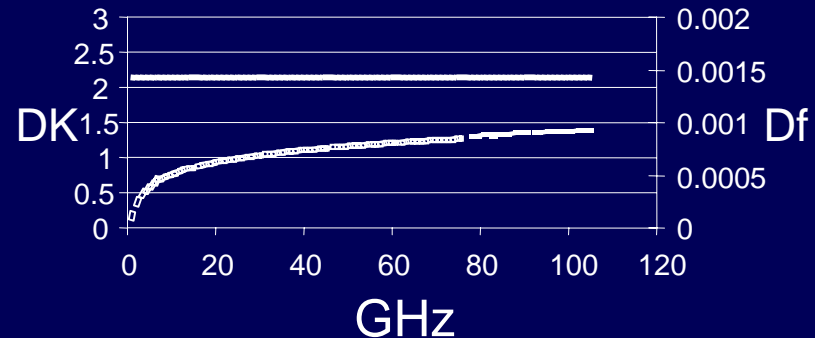
Manfred Huschka
General Manager Europe
Taconic Advanced Dielectric Division
Mullingar (Ireland)

IWPC Millimeterwave Automotive Radars, RF Sensors
and Communications Equipment Workshop;
October 18-21, 2004 Stuttgart, Germany,



Why Use PTFE as PCB Substrate?

PTFE DK & Df



- Lowest loss
- Best dielectric consistency
- Lowest moisture absorption: 0.02 %
- Best copper adhesion (like FR4)
- Highest temperature stability (UL MOT 180 °C)
- Thermal-cycling reliability
- Excellent chemical resistance



Taclamplus* for HDI Applications



0.05 – 0.15 mm

1.0 – 3.0 mm

Brass or Copper backed Taclamplus laminate

- Mechanical support during assembly; provides excellent dimensional stability
- Thermal dissipation
- Sound electrical grounding
- Flat surface
- Controlled XY CTE for GaAs matching

* Patent Pending

Processing Taclamplus



Brass or Copper backed Taclamplus laminate

Process Steps:

- Laser ablate / mechanical drill vias & form pth
- Etch layer 2 circuitry
- Laminate Taclamplus & copper foil
- Laser ablate / mechanical-drill vias & form pth
- Machine or chemical-mill apertures
- Etch layer 1 circuitry

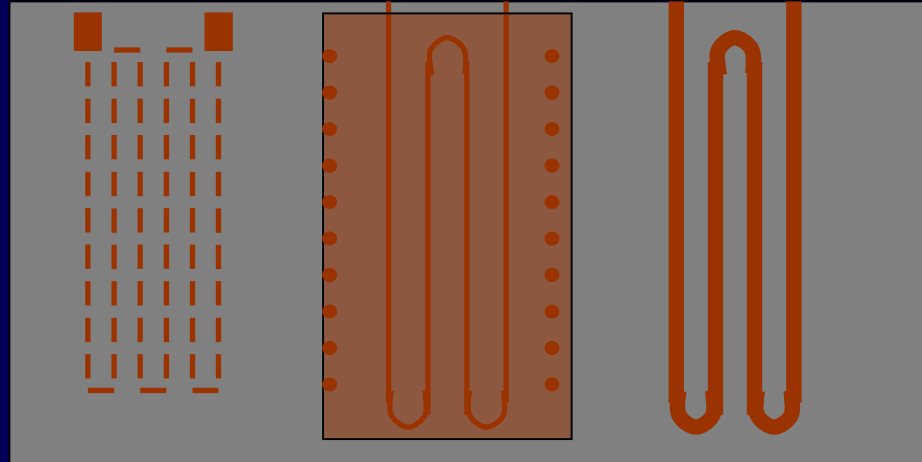
Taclamplus Main Advantages

- Low Loss: $D_f \sim 0.0055$ @ 50GHz
- Insertion loss 0.04 dB/mm @ 50GHz (150 μ m Taclamplus)
- Consistent DK : 2.17 +/- 0.02
- Low cost
- Laser ablatable
- Supports sequential lamination
- Excellent copper peel strength (≥ 2.16 N/mm for 18 μ m)
- Fine-feature resolution (9 μ m copper cladding available)
- Exceptional surface flatness – zero wavyness
- Taclamplus available thicknesses:
0.05 mm, 0.10 mm, 0.15 mm

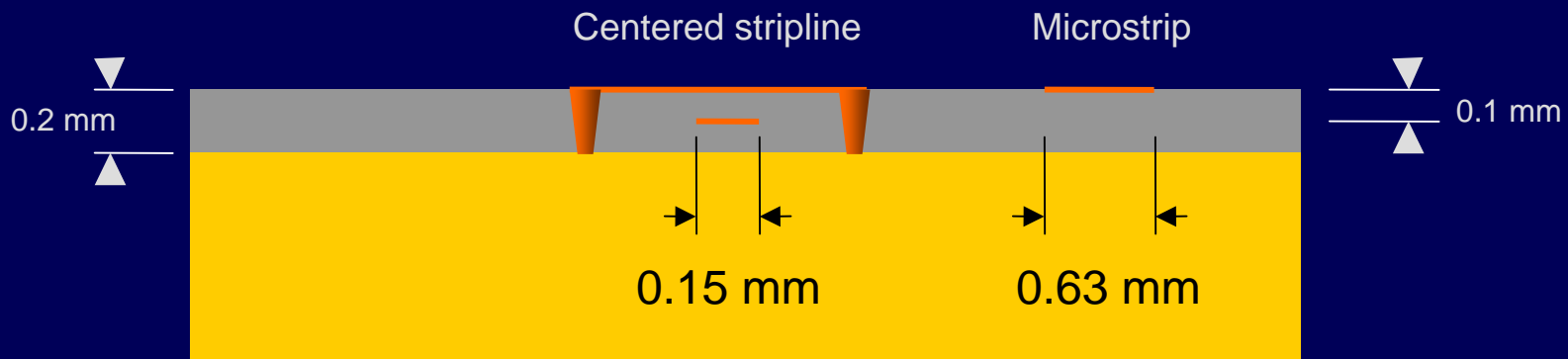


Taclamplus Demonstrator

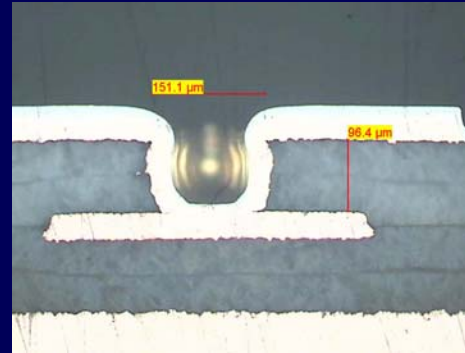
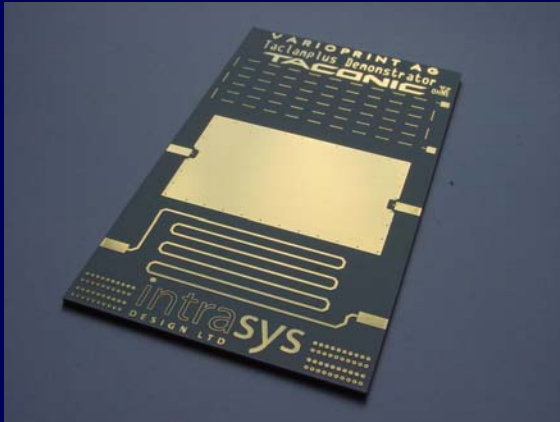
54 x 85.7 mm
(credit card size)



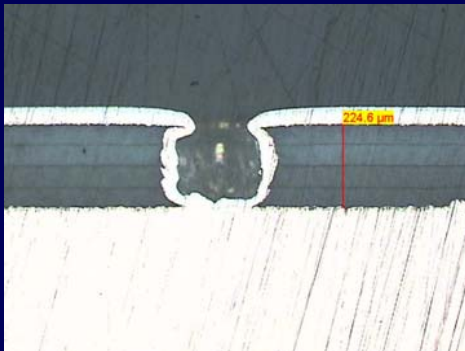
Calculated line widths:



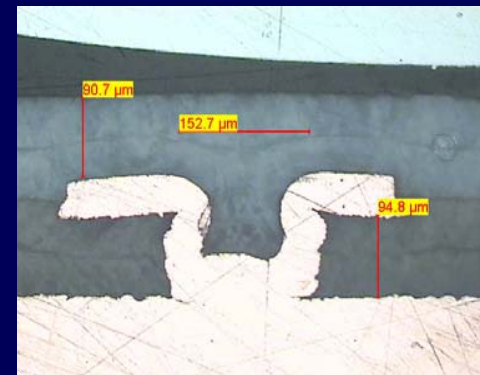
Taclamplus Demonstrator Results



Layer 1 to 2
150 μm laser-
drilled via



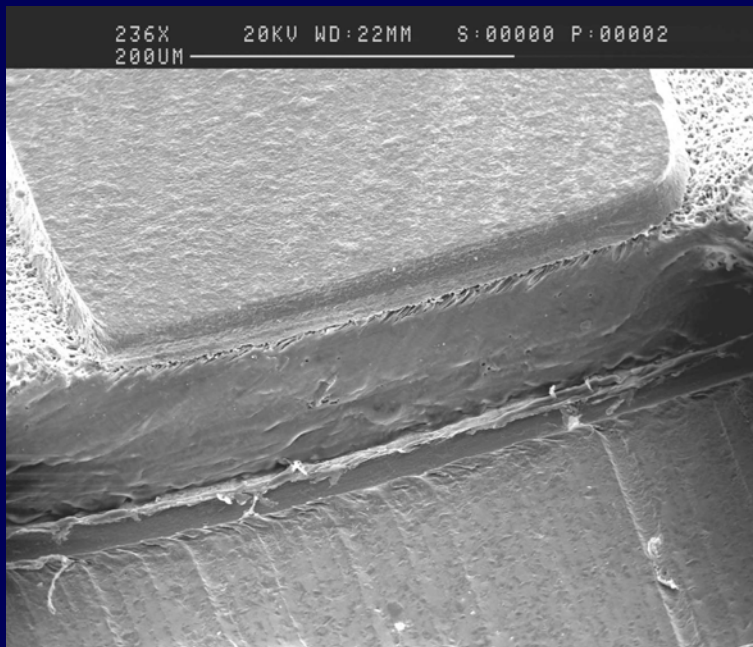
Layer 1 to 3
(grnd.)
200 μm laser-
drilled via



Layer 2 to 3
(grnd.)
150 μm laser-
drilled via

Photographs courtesy of Varioprint AG

Laser Ablated Cavities for MMICs



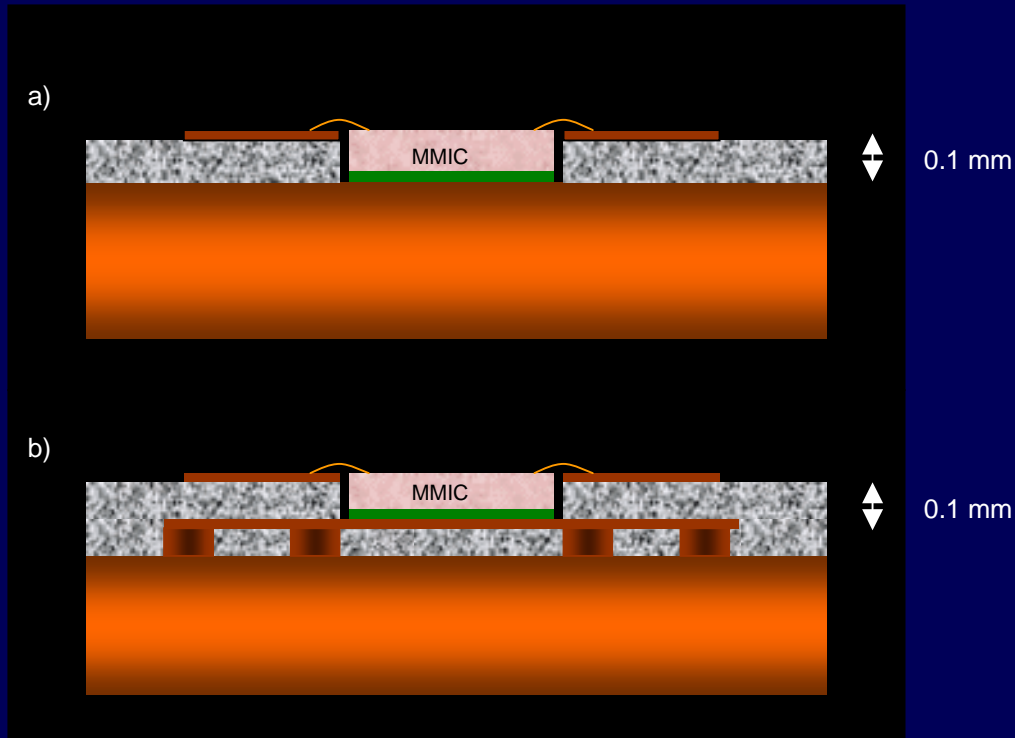
Laser ablated cavity in Taclamplus adjacent to terminated RF-in (or -out) track

Positioning Accuracy of Laser:

$\pm 0.001''$ [$\pm 25 \mu\text{m}$]
across 24x30''

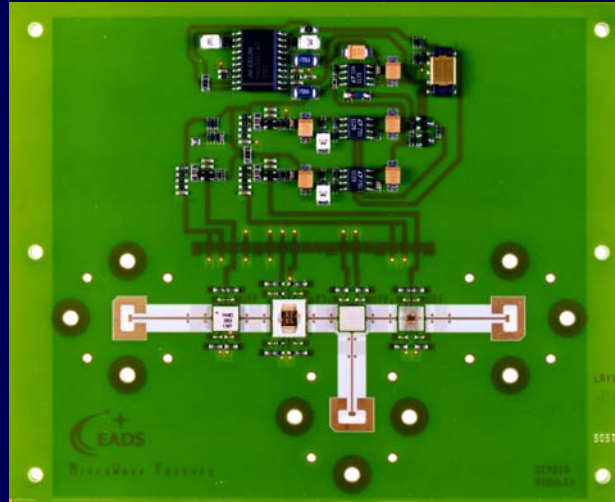
$< 0.0004''$ [$< 10 \mu\text{m}$]
within cavity

Flush MMIC Placement



- a) 1 dielectric layer structure with a 0.1mm deep cavity to accommodate a 0.1mm thick MMIC
- b) multilayer structures with buried vias and “grounded” platform

Just to show that it really works ...



42 GHz LMDS radio module
PROKOSMOS, EUREKA project E! 2448

Photograph courtesy of EADS Deutschland GmbH,
Systems & Defence Electronics, Microwave Factory

“Halogen-free” Base Materials

- Should read “bromine-free” base materials
 - Concern about PCBs, PBBs and PBDEs gave rise to “halogen-free”
 - PTFE – Polytetrafluoroethylene based laminates
 - Never mentioned in WEEE directive
 - Compliant with RoHS
- No current legal threat to use of PTFE-based laminates

Taconic's base materials are bromine-free!



Taconic Solutions for mmWave

- Cost-effective
- Environmentally friendly
- Innovative

We are looking forward to your application!

