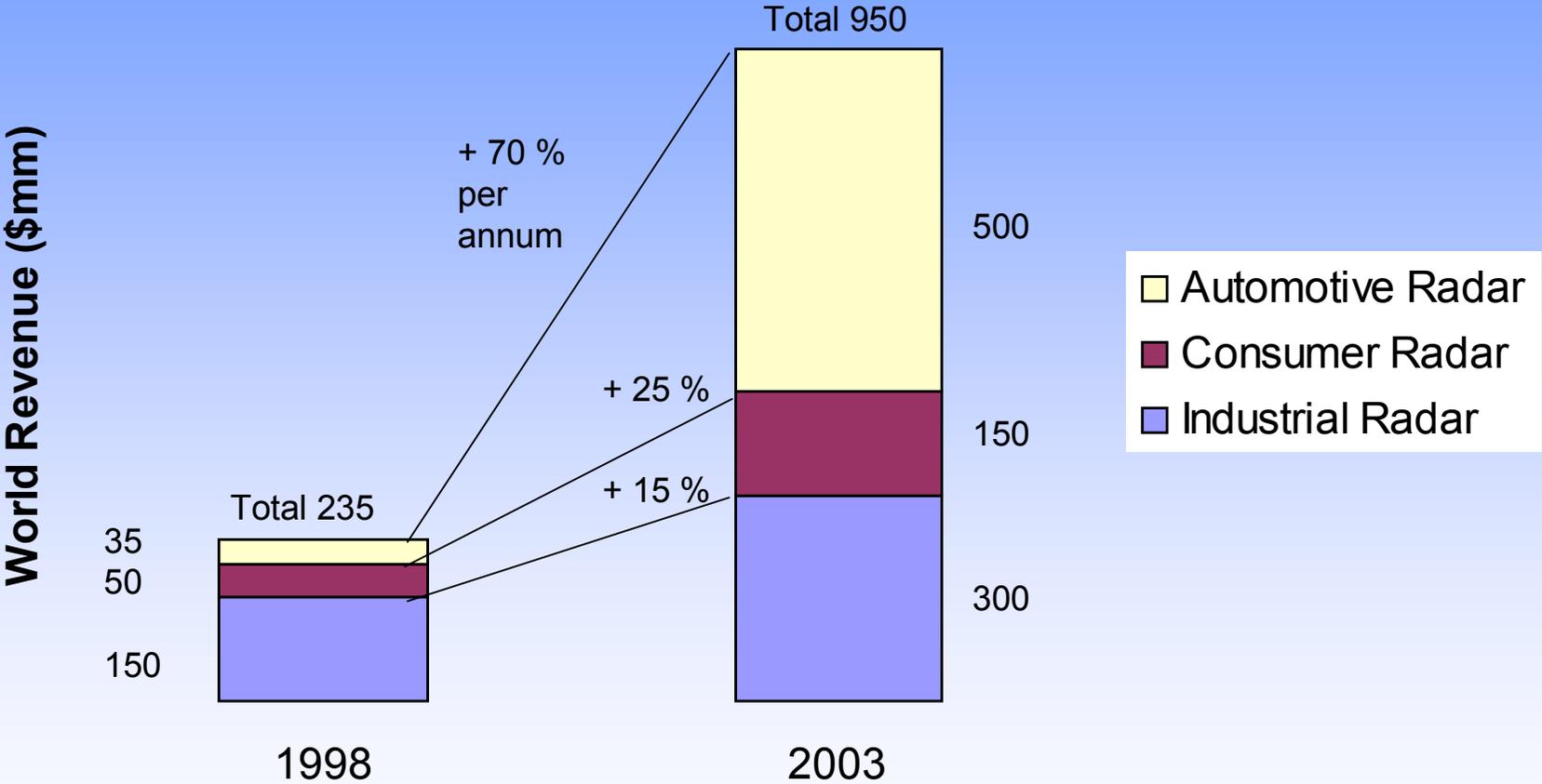


***Cost-Effective
Microwave Solutions
- also suitable for HDI***

ICBF 99, Maastricht - 29th September 1999

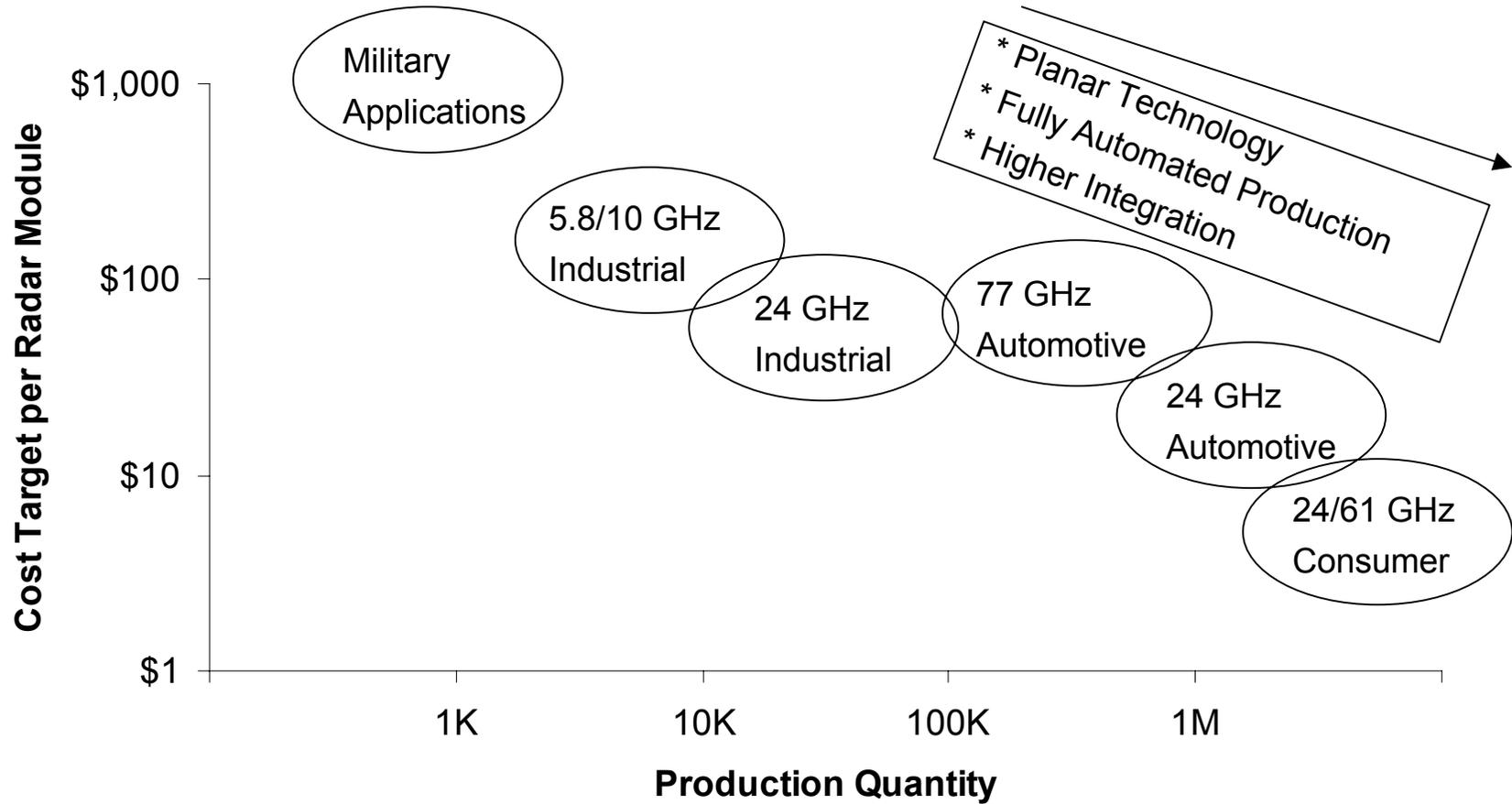
**Manfred Huschka
General Manager
Taconic ADD**

Commercial Radar Market Forecast



Data acc. to Frost & Sullivan

Road Map of Microwave Sensor Products



**“We do not use Teflon® base materials,
because they are difficult to process ...”**

**“Teflon® laminate ...
... is too expensive ...
... can't be purchased locally ...
... has far too long lead times ...”**

KILLER PHRASES

“If Teflon® base material could be processed like FR4, then ... “

OF THE PAST

**“The surface preparation of Teflon® base material is ...
... too complicated ...
... too expensive ...
... too awkward to handle ...
... too ...”**

Processability PTFE vs. Thermoset Laminates

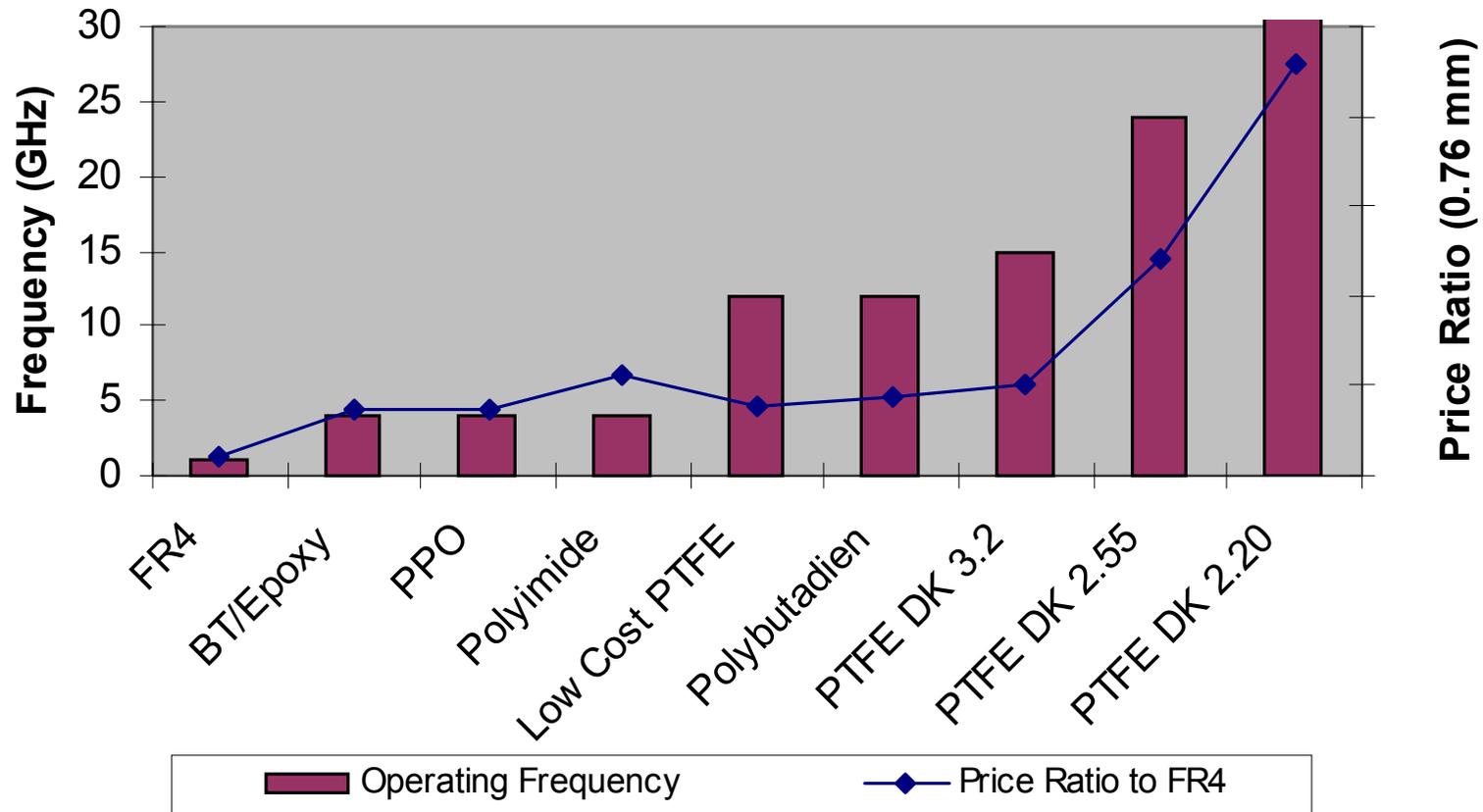
Process	Low Cost PTFE	Thermoset
Drilling	almost FR4 parameter higher stack height (0.5 oz)	almost FR4 parameter
Photomech	same	same
Hole Wall Prep.	Plasma	Permanganate
PTH	same	same
Etching	same	same
Solder Mask	same	same
HASL	same	same
Ni/Au	same	same
Routing	same (almost FR4)	same (almost FR4)

Availability of PTFE Base Materials

Example of a leading PTFE base material manufacturer

	10 Years ago	Today
Price	very expensive	competitive (low cost PTFE) - expensive (very low DK material)
Lead Time	several weeks	5 days ex works
Source	USA only	ISO9002 approved European Manufacturer; US plant as guaranteed 2nd source
Quality	intermittent	excellent (state-of-the-art treater; vacuum press
Product Range	DK 2.20, 2.50, 2.55	DK 2.17, 2.20, 2.30, 2.45, 2.50, 2.55, 3.0, 3.20, 3.50, 10
Sheet/Panel Size	36 x 48" (914 x 1220 mm) 16 x 36" (406 x 914 mm); 10 x 10" (250 x 250 mm) (specialities)	36 x 48" (914 x 1220 mm) or any panel size thereof for all laminate grades; 36 x 60", 36 x 76", 36 x 106" for specialities

Pricing PTFE vs. Thermoset Laminates



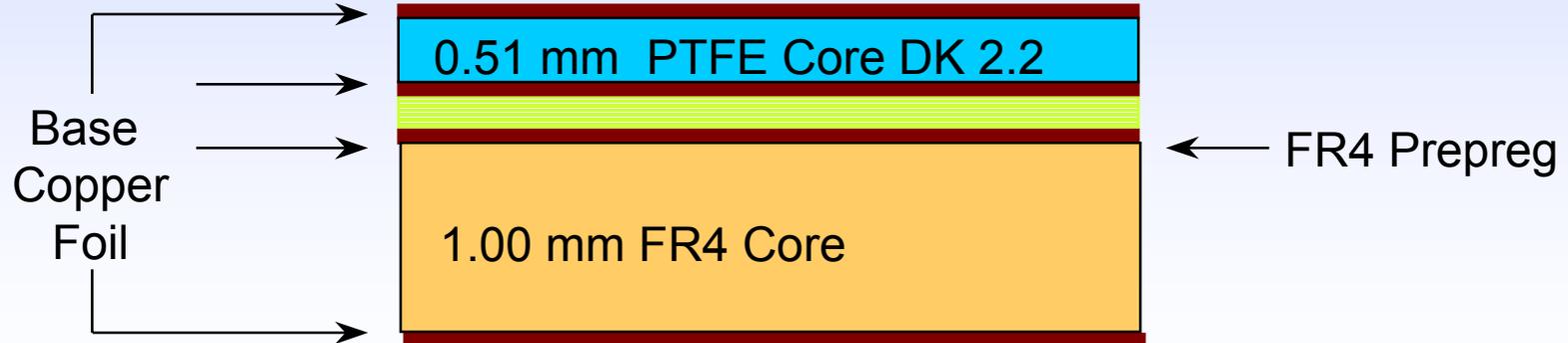
PTFE/FR4 Hybrid Multilayer

PTFE/FR4 Hybrid Multilayer

A) Economical Solution



B) Engineered Solution



**TacLam -
Controlled thickness, low-loss material for HDI**

TacLam - Controlled thickness, low-loss material for HDI

Copper Foil (9 μ m,18 μ m)

PTFE

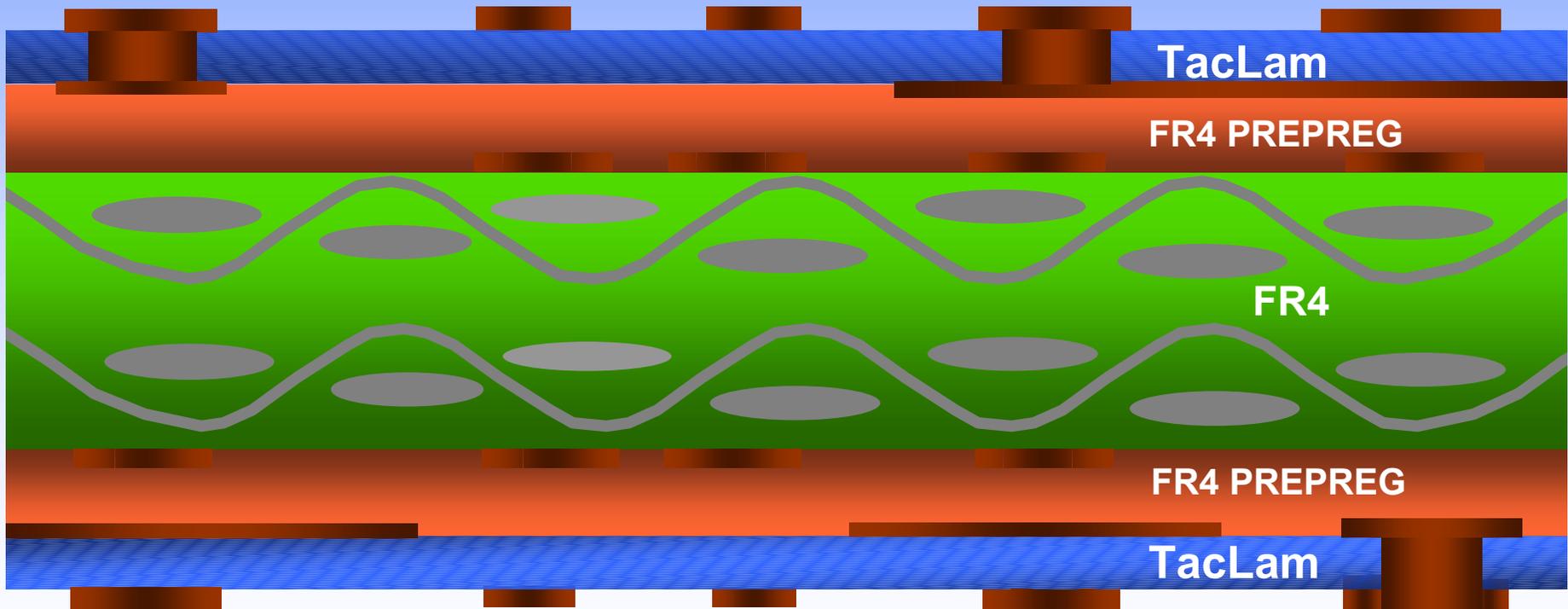
Copper Foil (9 μ m,18 μ m)

Dielectric Thickness: 50 micron (2 mil) = standard for HDI multilayer

Copper Thickness: 3/8 oz, 0.5 oz Copper

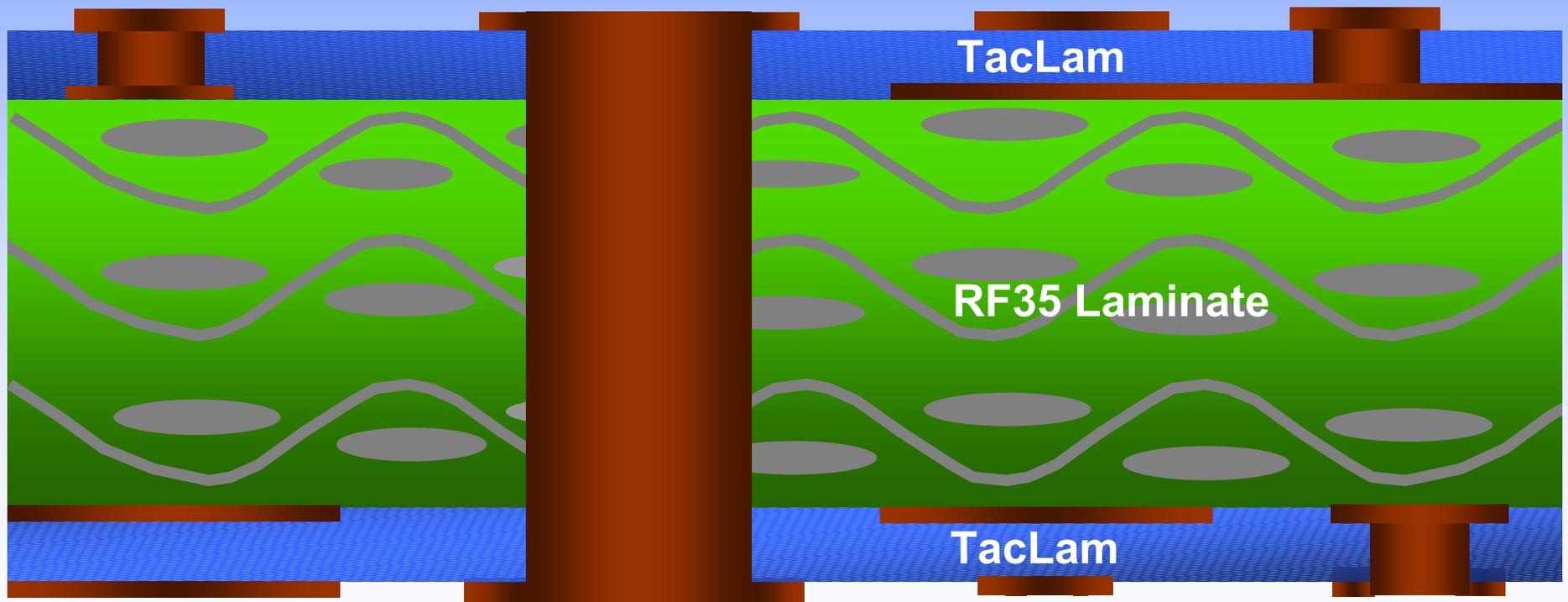
TacLam - Controlled thickness, low-loss material for HDI

Mass Via Concept - Approach 1



TacLam - Controlled thickness, low-loss material for HDI

Mass Via Concept - Approach 2



4 Lyr o/a thickness 0.8mm; material content ~ 11 cents/in²

TacLam - Controlled thickness, low-loss material for HDI

	TacLam	RCC®	MultiFoil®
DK (@ 1 MHz)	2.1	3.43	3.70
DK (@ 10 GHz)	2.1	3.1	3.4
DK (@ 40 GHz)	2.1	?	?
DF (@ 1 MHz)		0.0257	0.0396
DF (@ 10 GHz)	0.0009	0.02	0.026
DF (@ 40 GHz)	0.0009	?	?
Tg (°C)	> 260	160	112
Water Absorption (%)	< 0.02	1.04	2.17

Based on feedback, PTFE base material with resin-content > 95% can also be used in applications with frequencies > 70GHz. The DK remains constant.

TacLam - Controlled thickness, low-loss material for HDI

Value to the Marketplace

Features

- Glass-free dielectric
- Low profile copper
- Surface smoothness/ no weave print-through
- Lowest dielectric constant and tightest tolerance up to very high GHz range

Benefits

- Very thin multilayer constructions
- Enabler for mass via formation
- Superior insulation resistance
- Very fine line technology
- Improved etching yields of fine lines and spaces
- Higher electrical performance
- Higher clocking speeds (high-speed digital)

PTFE Prepregs for Multilayers

PTFE Prepregs for All-RF Multilayers (Mass-Lam Approach)

