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Ultra Low Leakage Probes & Cables For Fine Pitch Probe Cards

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Agenda

- **Introduction**
- **Need for superior quality coated probes**
- **Advantages of MEXCEL electro-deposited polyimide coatings**
- **Need for super-fine coaxial cable products**
- **Advantages of Mitsubishi ultra miniature coaxial cables**
- **Summary**

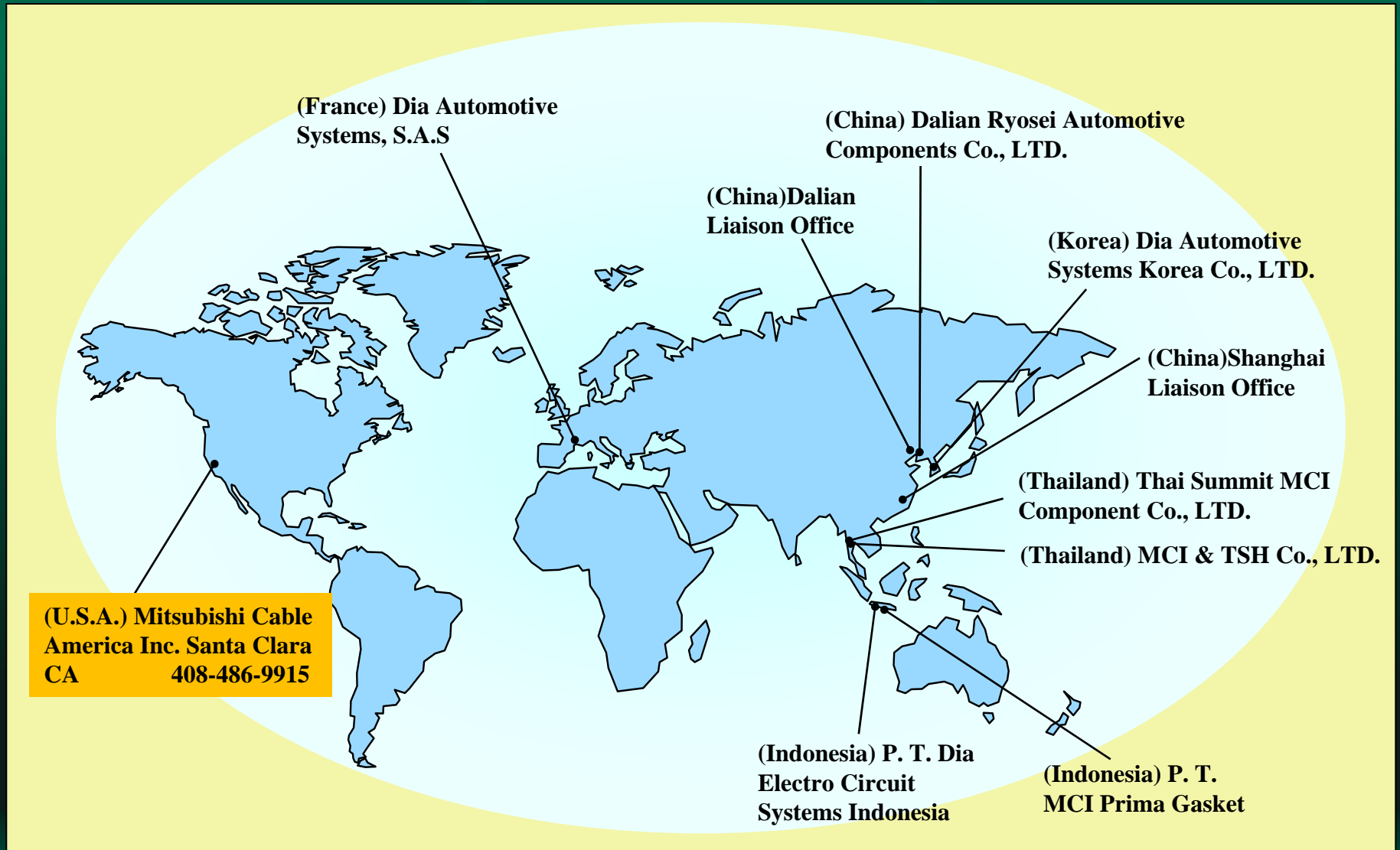


Mitsubishi Product Divisions

- **Cable Division**
 - Electric wires and cables, high frequency cables
- **Instrument Components Division**
 - Seals, rubber products, engineering plastic products, metal products, OA equipment, electromagnetic wave absorbers, MEXCEL products.
- **Car Electronics and Optics Division**
 - Automotive wire harnesses, connectors, gaskets, data link and optic devices, optic fiber bundles, optical large core fibers



World Network



PART 1

- **This section features the MEXCEL coating process developed by Mitsubishi's Instrument Components Division**
- **This process can be used to advance performance of fine-pitch coated probes.**



Need for Superior Quality Coated Probes

- High resistance for low leakage applications
- High breakdown for high voltage applications
- Coating must be tough, peel resistant, and withstand high temperatures
- Coating must be thin for tight pitch applications and free of pin hole defects
- Barrier to corrosion, chemicals & Moisture

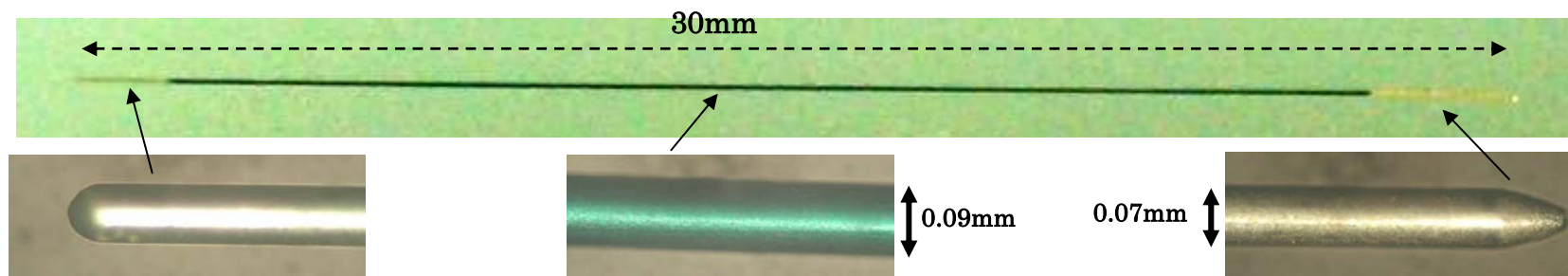
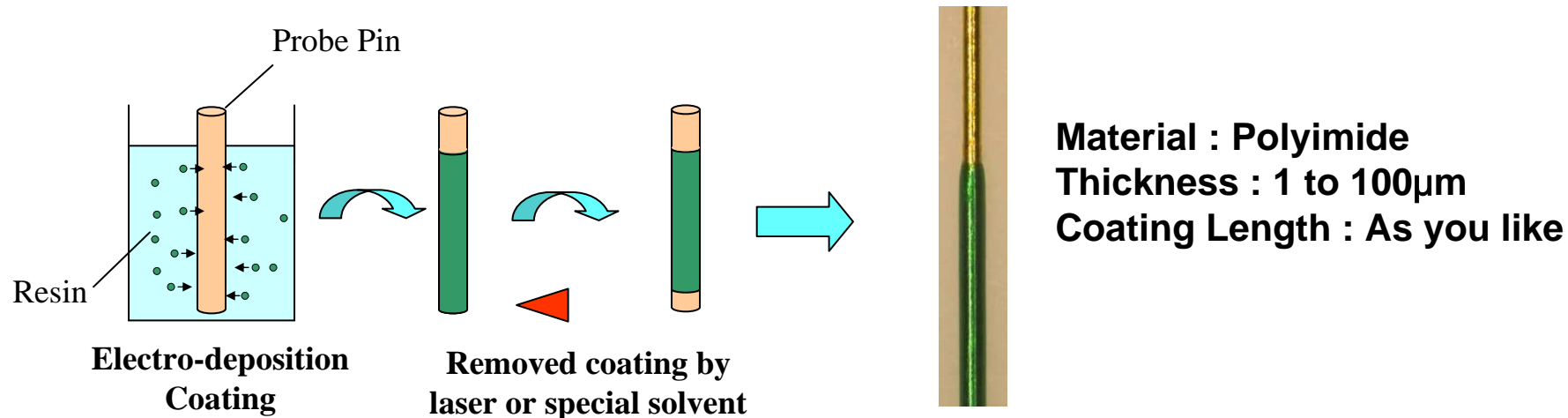


The MEXCEL Coated Probe

- **Polyimide is applied by a patented electro-deposition process**
- **Much superior to dip-coatings or the use of polyimide “sleeving”**
- **Tight control over thickness and uniformity**
 - Coatings from 1 micron to 100 microns thick
 - Uniformity better than 5%
 - Free of bubbling and pin holes



MEXCEL Manufacturing Method



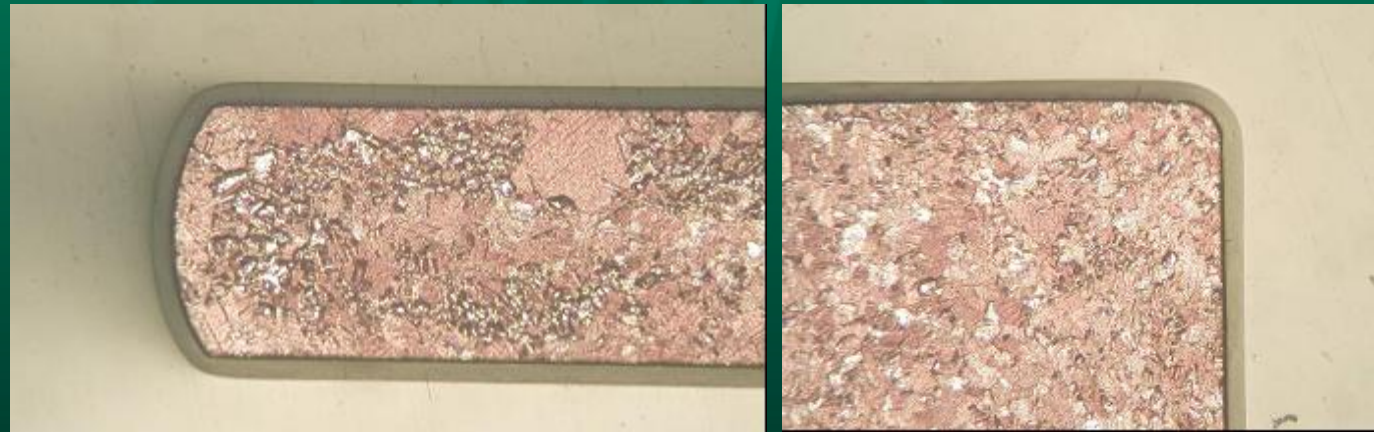
Example of coated probe pin

Thickness is Tightly Controlled

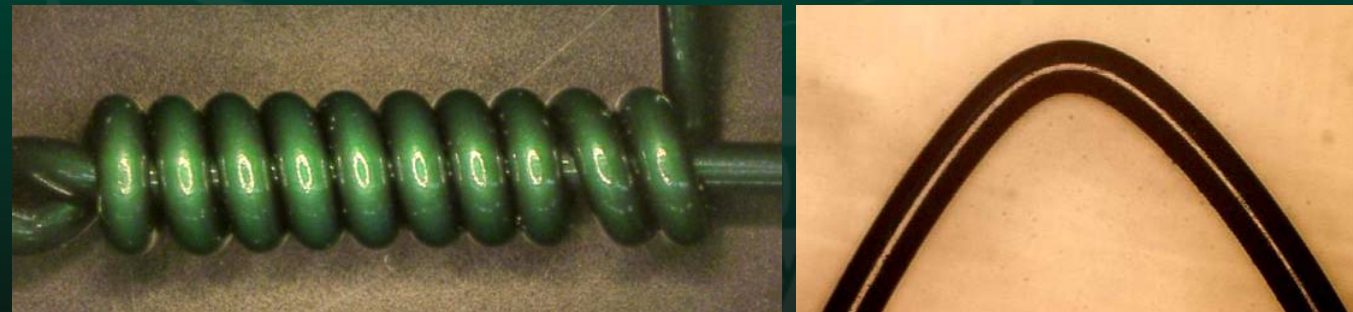


MEXCEL Cross-section & Flexibility

Cross-section



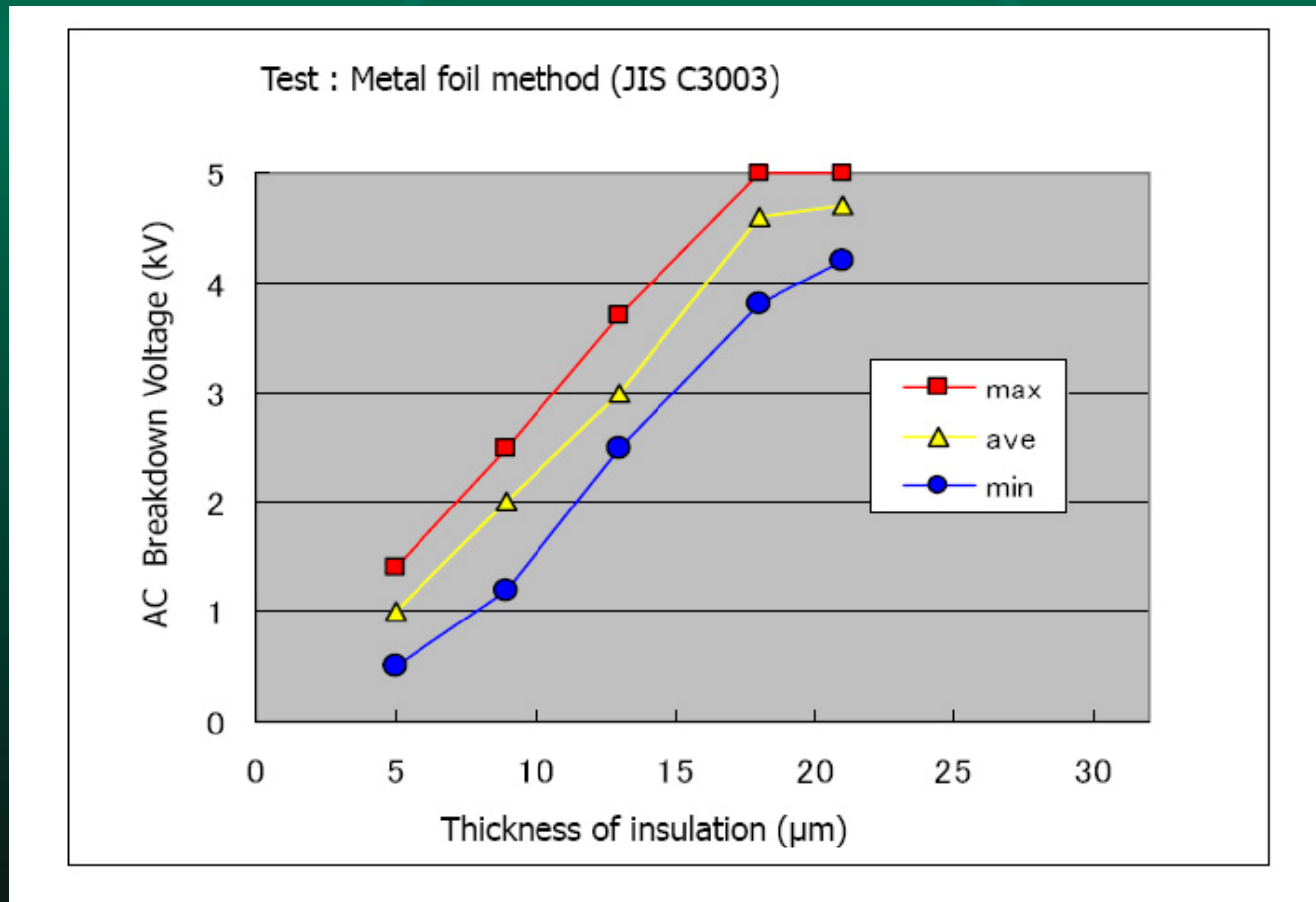
Flexibility



The uniformity of the coating and ability to withstand extreme flexing and bending is ideally suited for the abuse probe needles experience.



MEXCEL Coating Breakdown Voltage



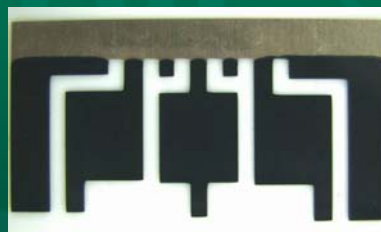
**A 10 micron coating reliably exceeds 1KV AC breakdown.
For fast pulse ESD applications the expected breakdown is 4x higher.**



Other Applications



Thermistor



Lead Frame



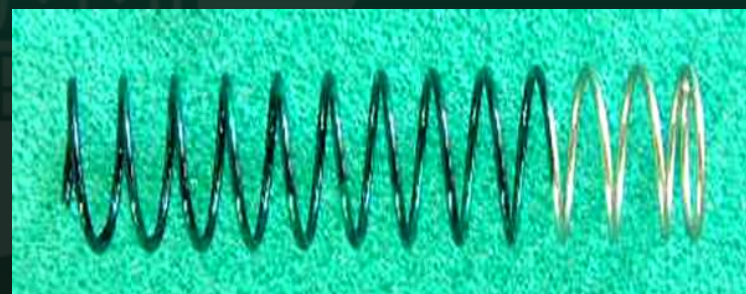
Planar Transformer



Pipe



**High Inductance
Planar Coil**



Spring



PART 2

- **The section features ultra miniature coaxial cable developed by Mitsubishi's Cable Division.**
- **Original developed to advance miniaturization of mobile products, these cable are well suited for use in many probe card applications.**

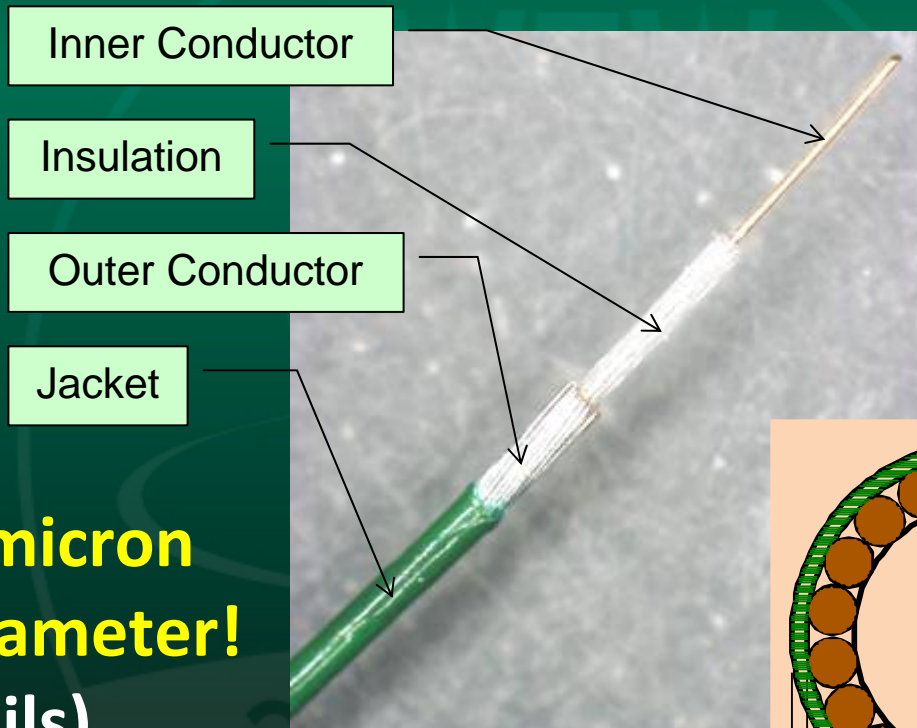


Need for Super-Fine Coaxial Cable Products

- **Ultra low leakage DC applications**
 - Driven guard eliminates probe capacitance allowing much faster settling time fA-level measurements
- **Controlled impedance RF applications**
 - Miniature 50-ohm flexible probes are possible using tungsten wire as the inner conductor.
 - These can help solve routing problems in tight pitch applications where flexibility is an issue

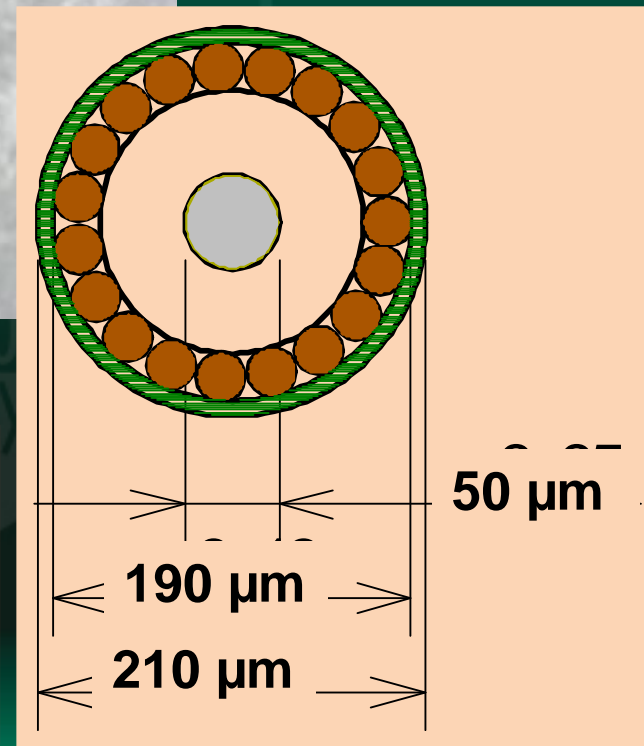


Construction of Ultra Miniature Coaxial Cable

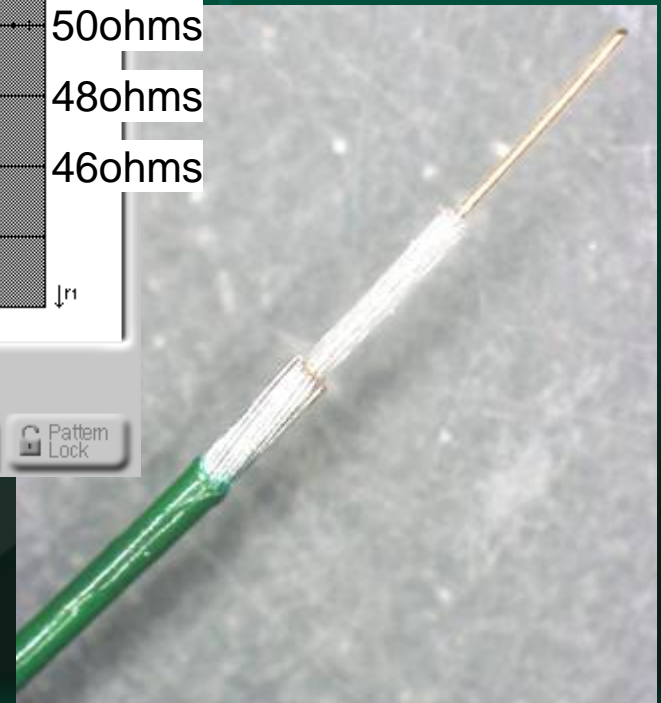
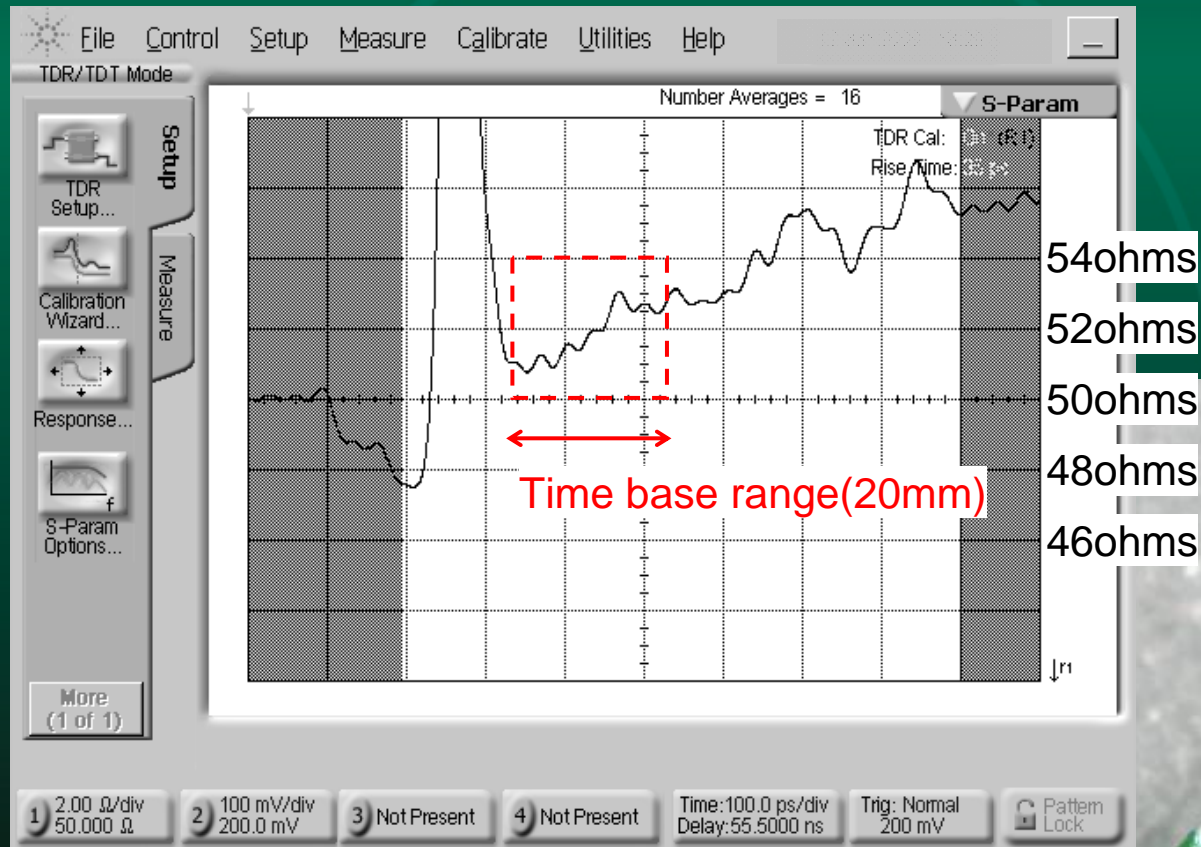


**Only 210 micron
outside diameter!
(8.3 mils)**

Item	Construction	O.D (μm)
Inner Conductor	Gold plated tungsten	50
Insulation	Fluororesin	-
Outer Conductor	Tin plated copper alloy	190
Jacket	Polyester	210



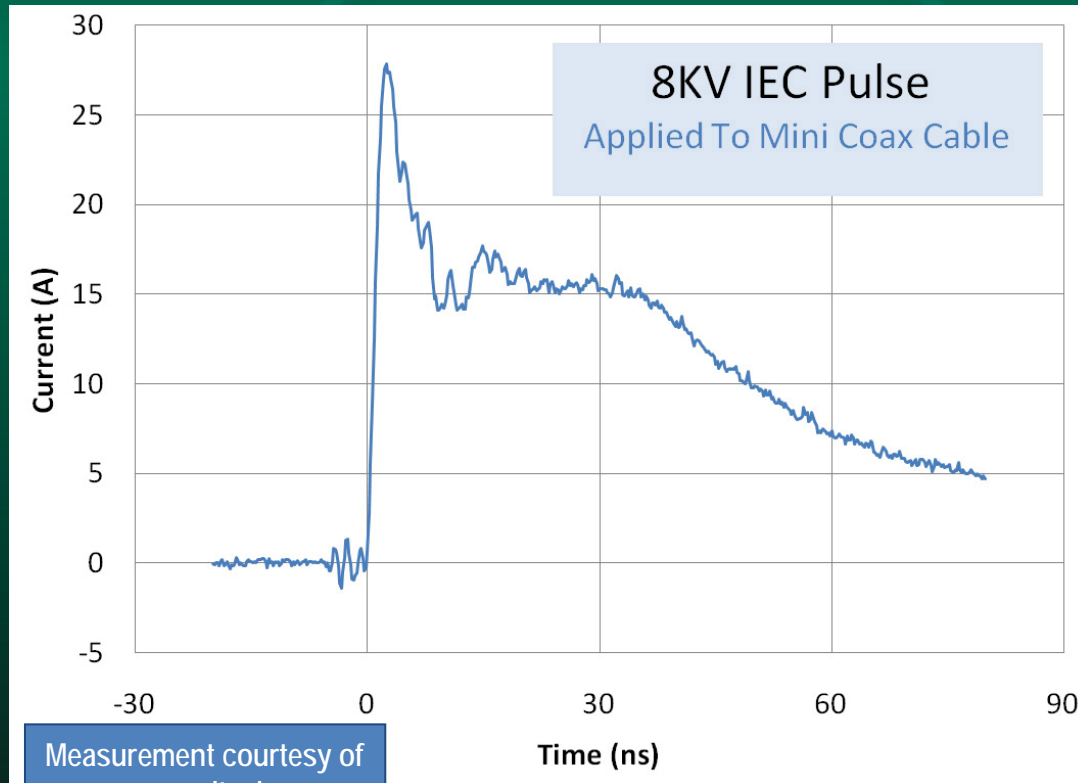
Impedance of Ultra Miniature Coaxial Cable



**Characteristic impedance (TDR)
of 50 ± 3 ohms can be achieved
with $210 \mu\text{m}$ in overall diameter.**

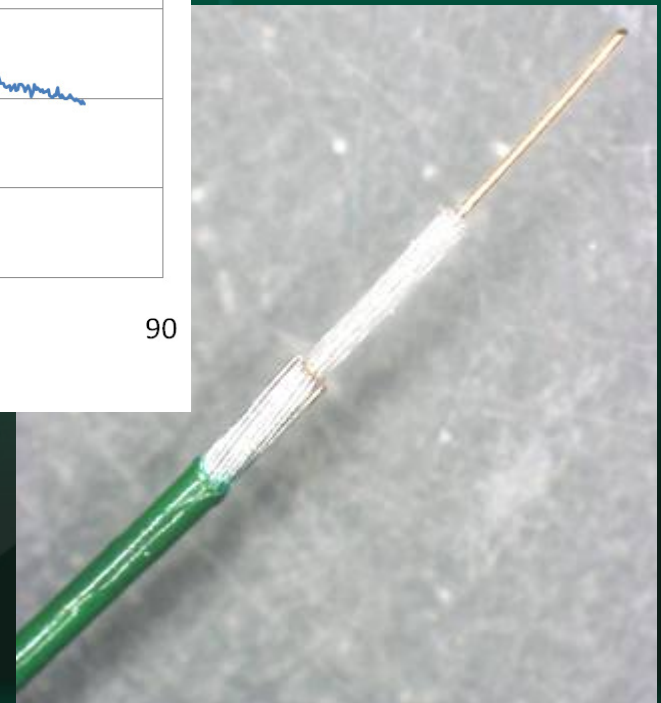


Ultra Miniature Coaxial Cable Handles 8KV ESD Pulse

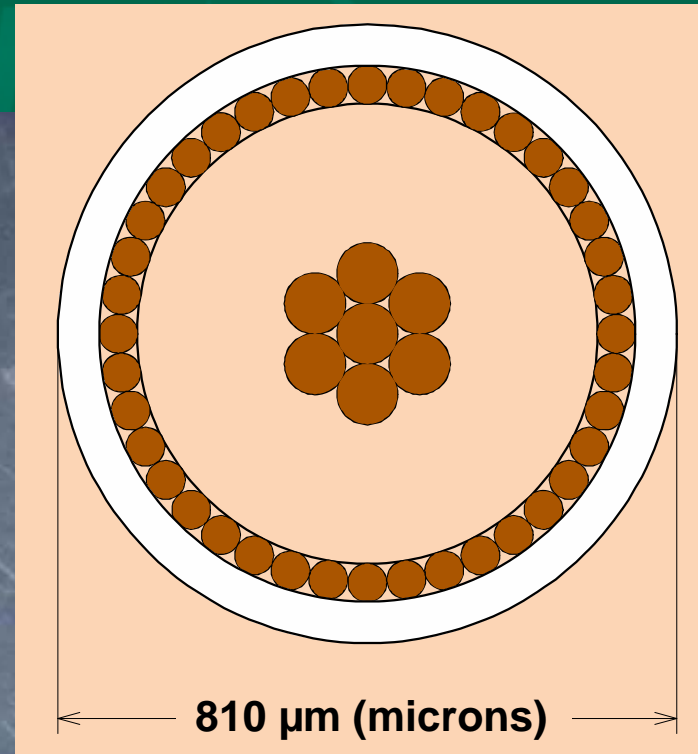
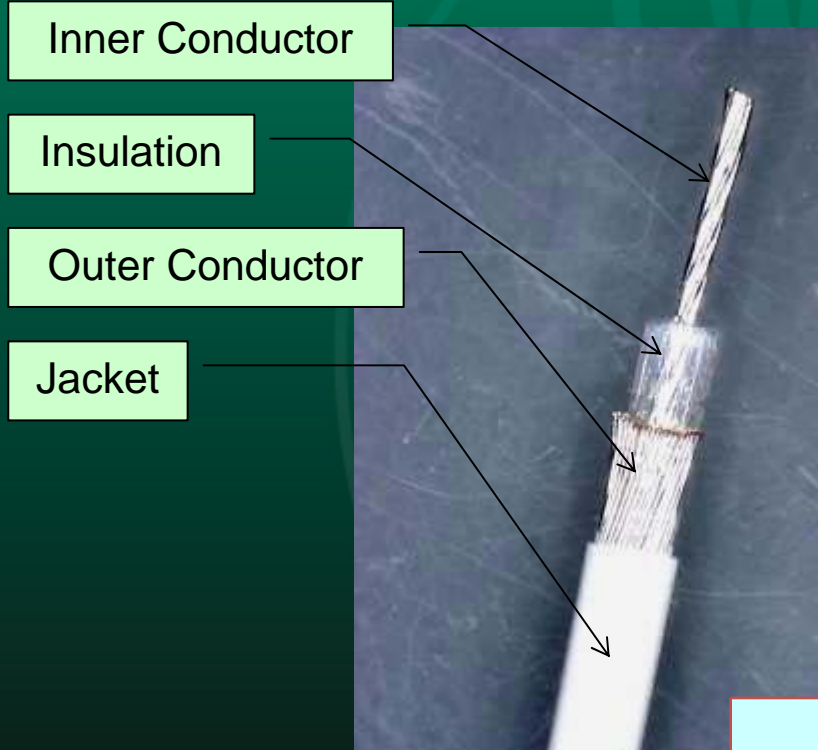


Measurement courtesy of
www.grundtech.com

This cable/probe allows flexible routing of ESD pulse waveforms in fine pitch applications.



Construction of Mini Low-Loss Cable

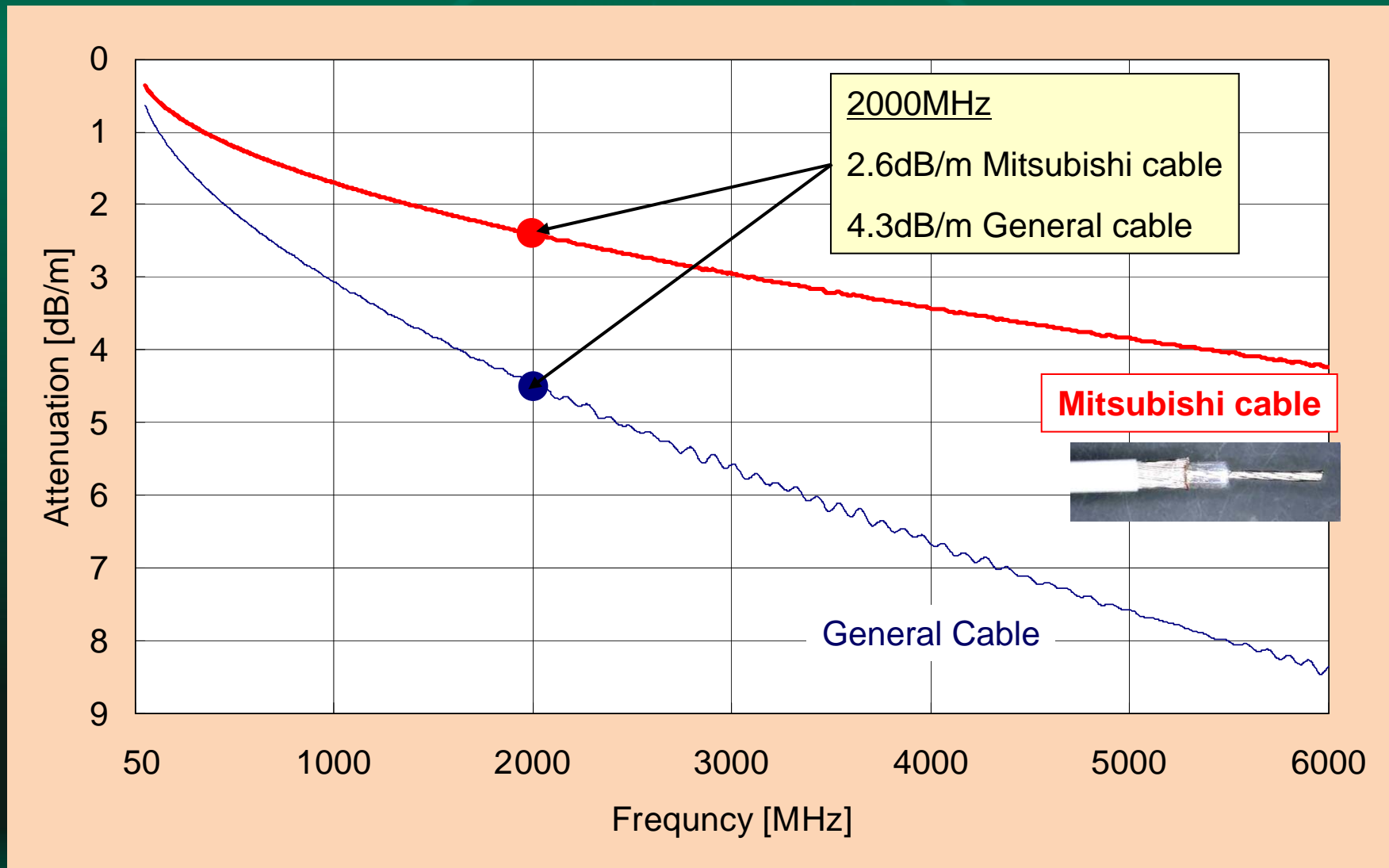


**Flexible low-loss
cable is 810 μm O.D.
(31.9 mils)**

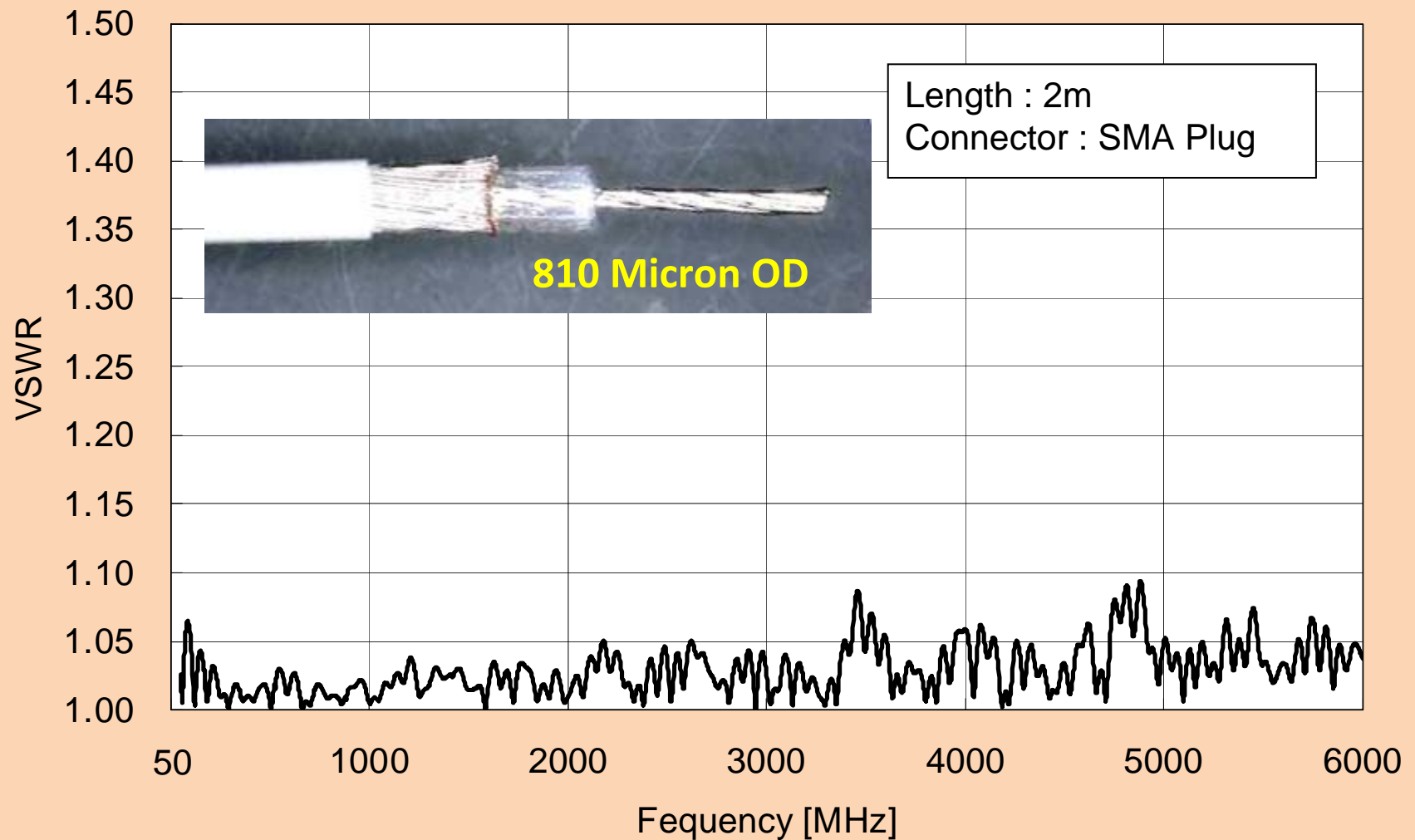
Item	Construction	O.D (μm)
Inner Conductor	Silver plated copper	240
Insulation	Fluororesin	-
Outer Conductor	Silver plated copper alloy	710
Jacket	Fluororesin	810



Attenuation of Mini Low-Loss Cable

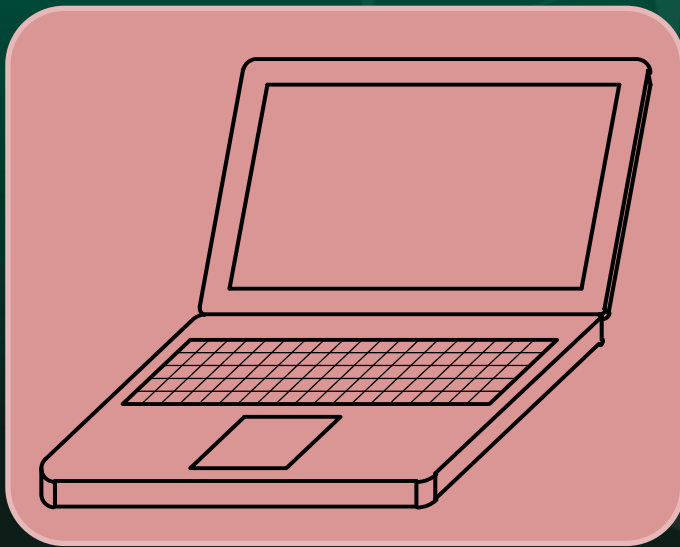


VSWR of Mini Low-Loss Cable

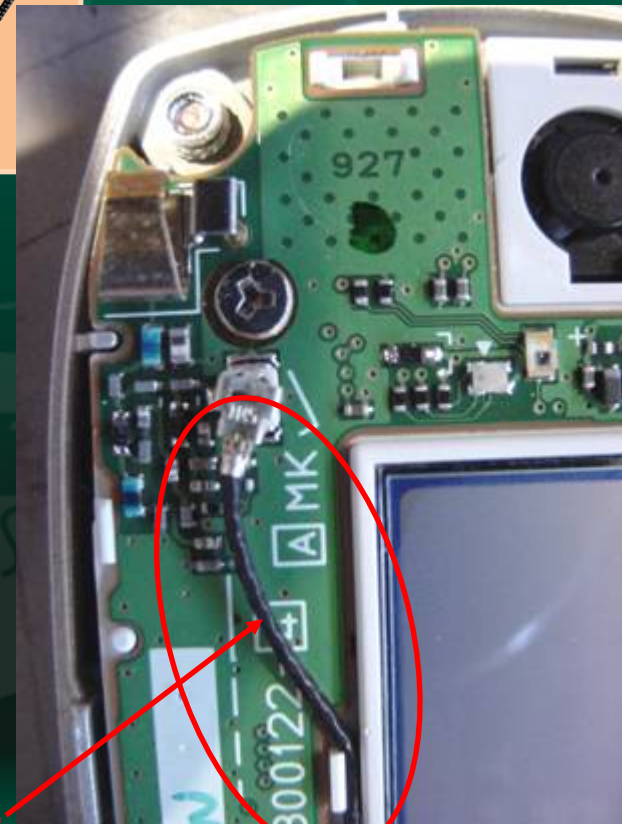


Other Mini Low-Loss Cable Applications

Mobile PC



Mobile Phone



Coax Cable

Summary

- **Electro-deposition produces superior coated probes**
 - MEXCEL coatings can advance tight pitch probing application
 - They extend probing at high temperatures and voltages
- **New miniature coax cable advances signal technology**
 - Cross sections in 200 micron are now possible
 - Wide bandwidth, temperature, and voltages are achievable



Next Step

- **These advance technologies require partnerships**
 - Mitsubishi Cable Industries wishes to partner with probe card vendors and/or end users to provide custom solutions for the semiconductor wafer test industry.
- **Custom probe coatings and cables**
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