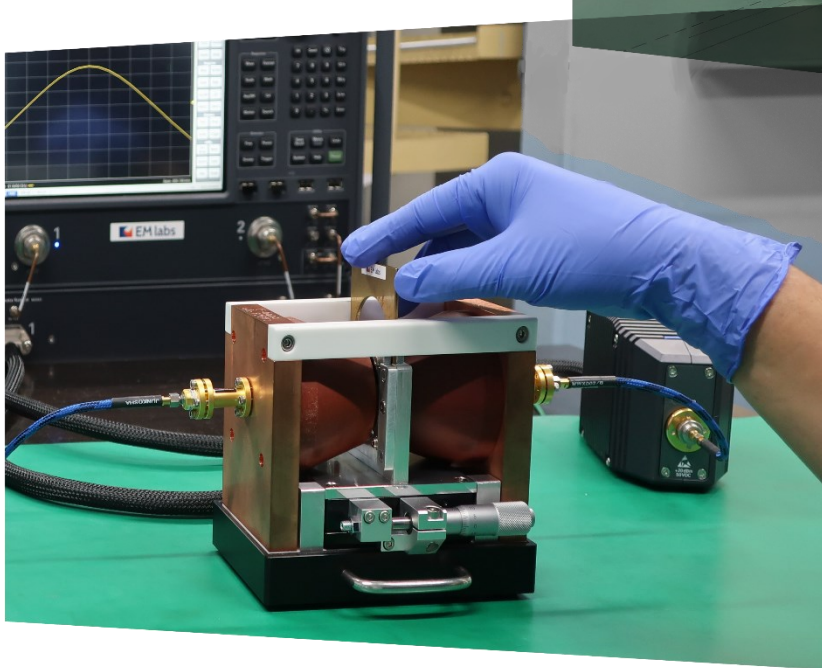
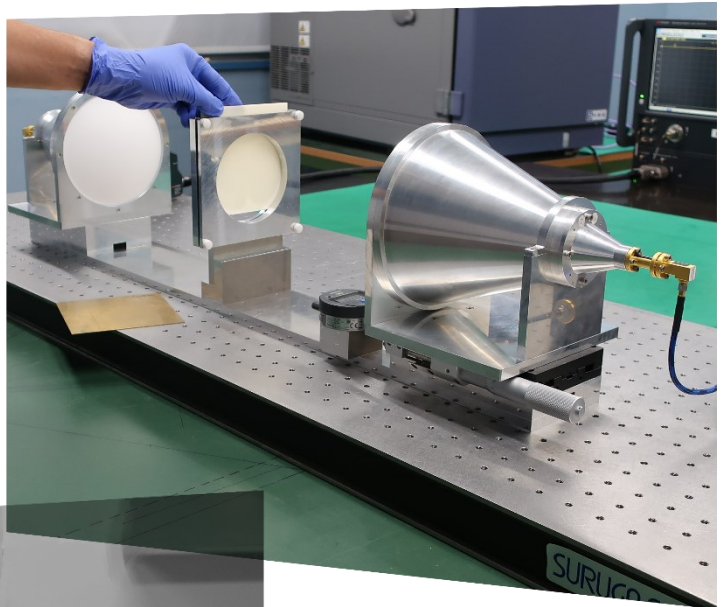


Permittivity/Permeability
measurement
microwave - mm wave



Solutions Catalog

Measurement examples to show what you really get

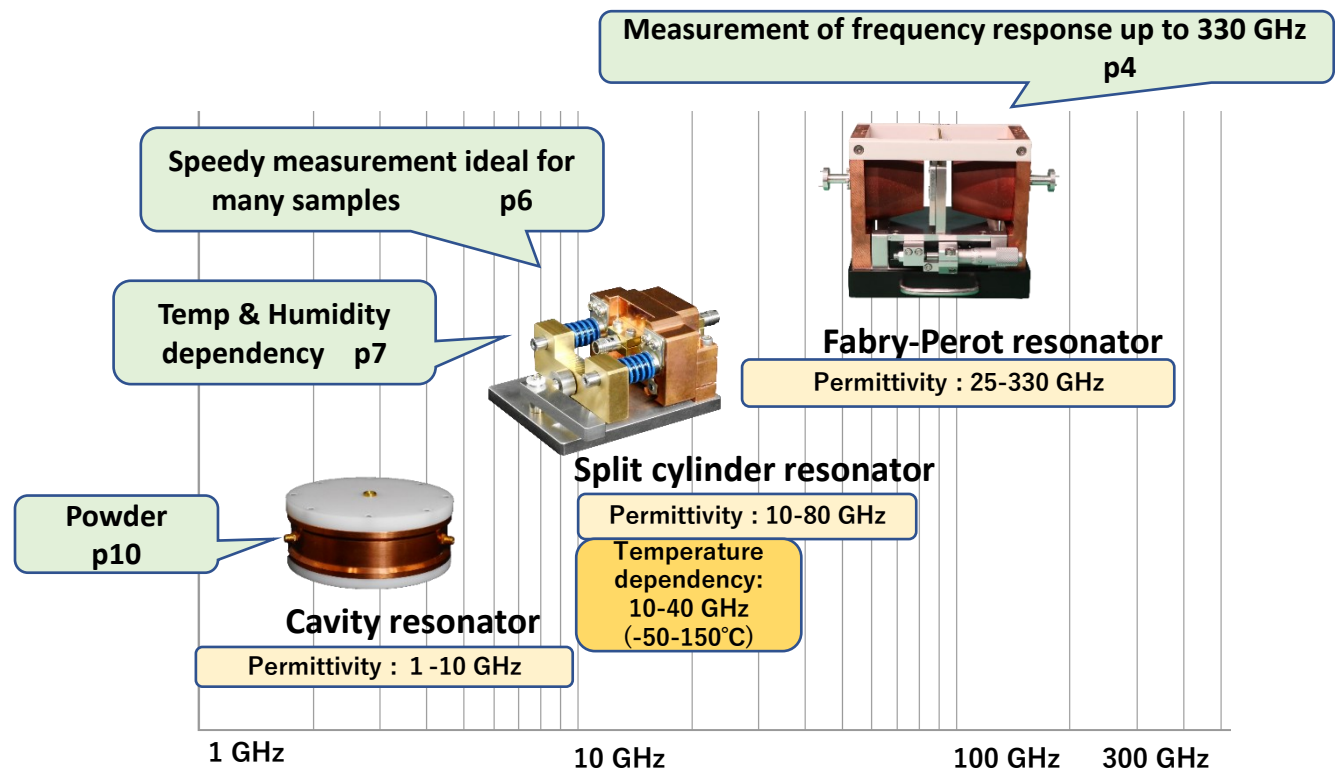
For more information about the products, please visit our website.



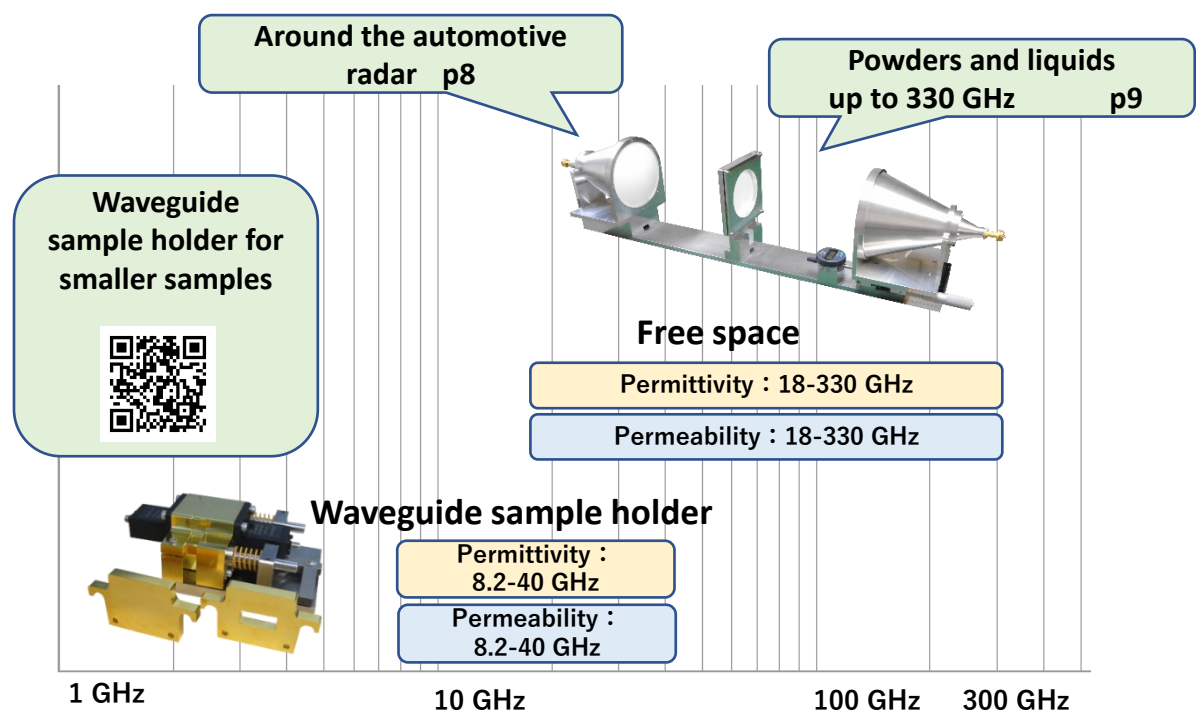
The right way for accurate permittivity and permeability measurement

EM Labs offers a variety of solutions and featured applications to help your business succeed.

Resonator method High-accuracy, Ideal for evaluation of low-loss materials



S-parameter method Wide-range measurement of reflection/transmission, dielectric constant and magnetic permeability



Tailor measurement methods to the material and geometry

Material

	Free space	Split cylinder	Fabry-Perot resonator	Cavity resonator	Wave-guide sample holder
Low-loss material					
Medium to high loss material					
Magnetic material					
Shield material					

geometry

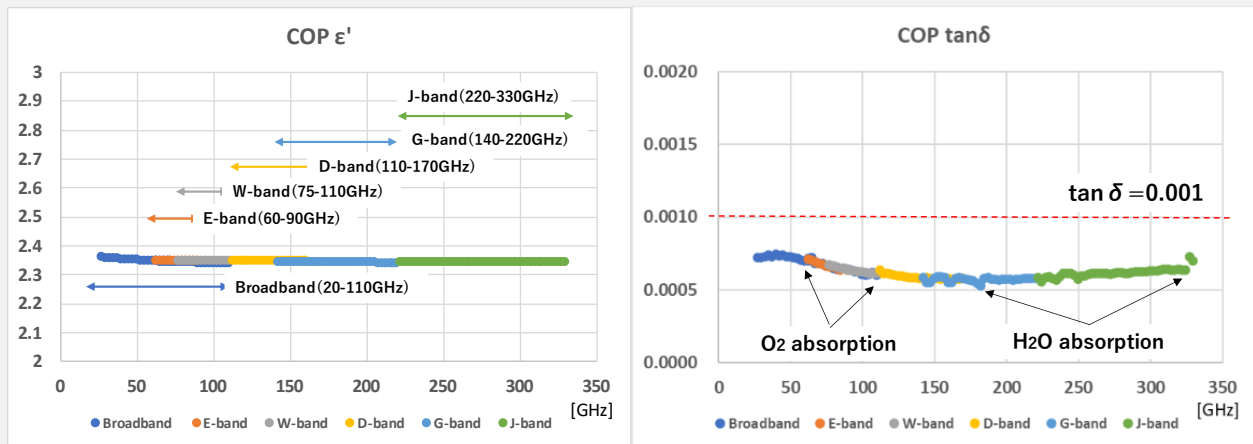
	Free space	Split cylinder	Fabry-Perot resonator	Cavity resonator	Wave-guide sample holder
Plate					
Film					
Rod					
Block					
Powder					
Liquid					
Gel					

Best	Most recommended method.
Good	Can be used in many cases
Possible	Can be used in some cases, with some limitations such as narrow measurement range.
N/A	Cannot be used.

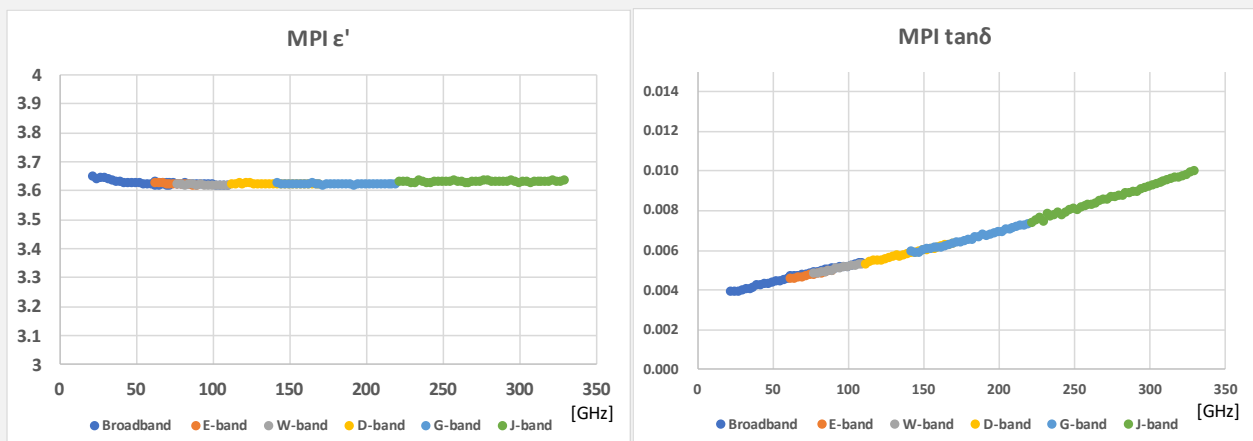
Frequency characterization of low-loss materials up to 330 GHz

- Automatic measurement 25 - 330 GHz by 2.5 GHz
- Accurate evaluation of low-loss materials
- Anisotropic evaluation is possible

Example : COP 187 μm @ 25 – 330 GHz

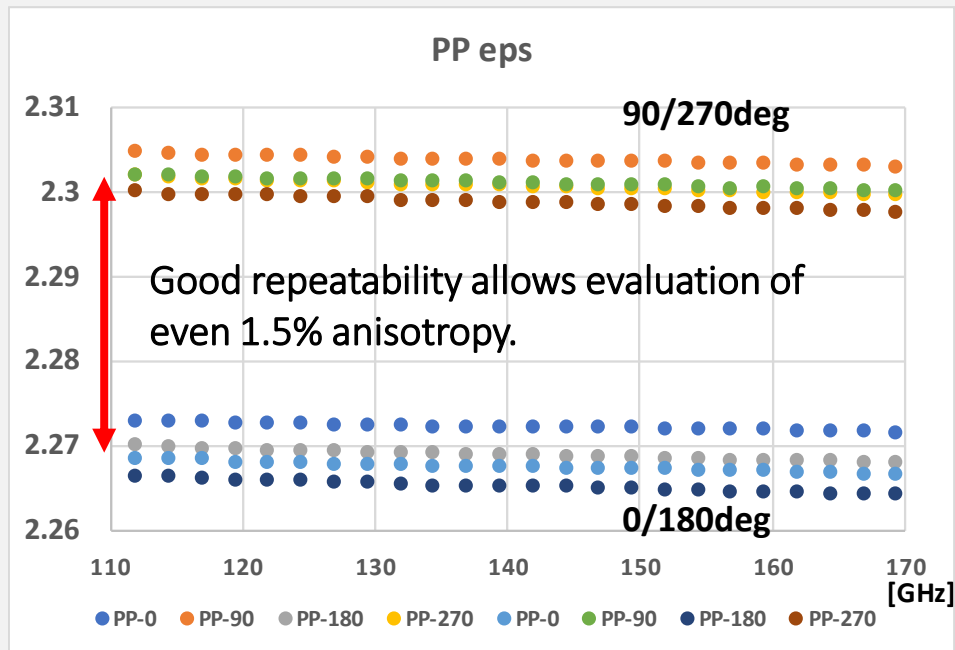
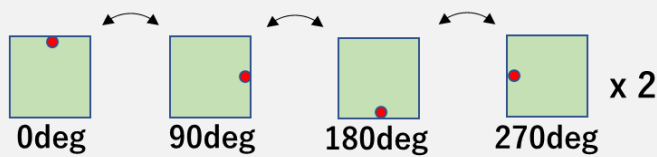


Example : MPI 50 μm @ 25 – 330 GHz

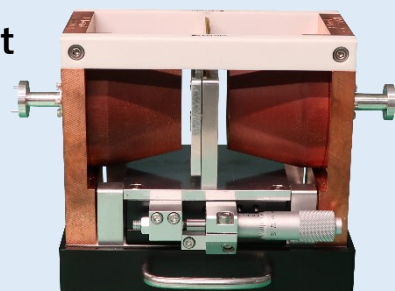


Example : PP 38 μm @ 110 – 170 GHz

A total of 8 measurements were performed while changing the orientation.



Fabry-Perot resonator for permittivity measurement product line-up

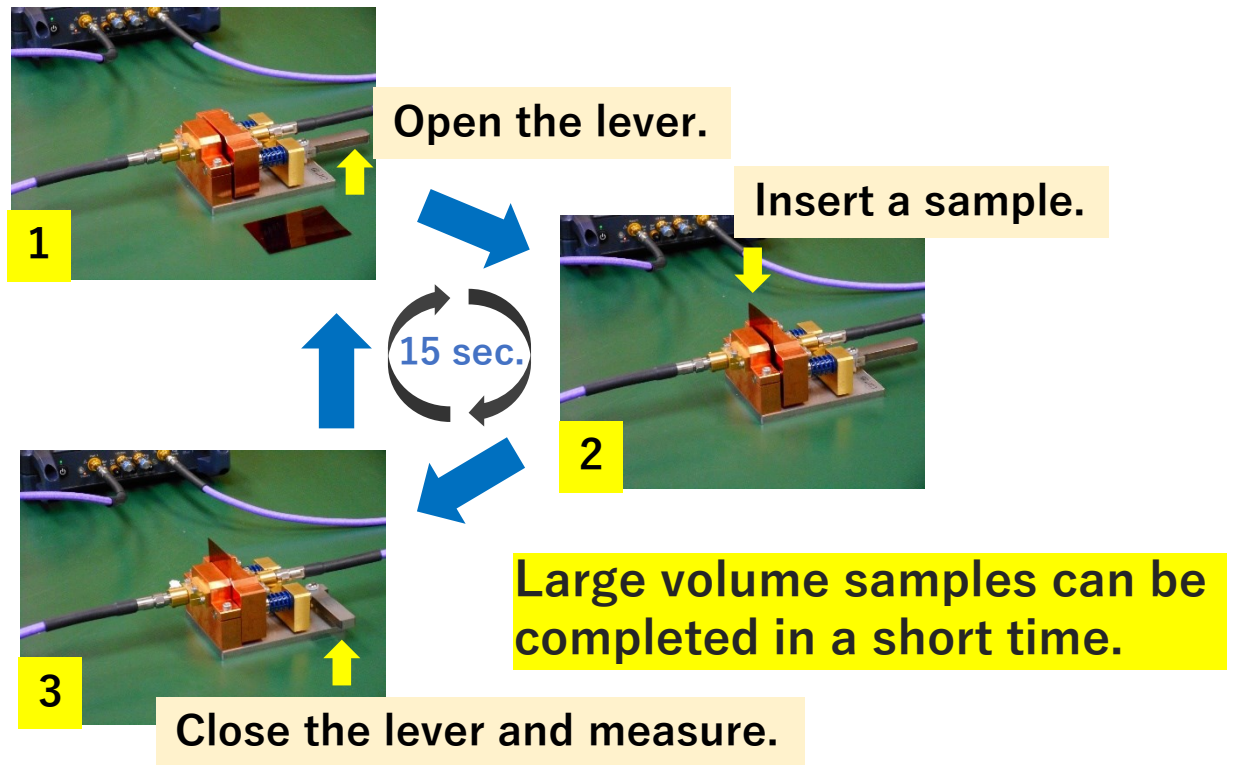


FP-BB Fabry-Perot Resonator Broad band 25 - 110 GHz
 FP-E Fabry-Perot Resonator E-band 60 – 90 GHz
 FP-W Fabry-Perot Resonator W-band 75 – 110 GHz
 FP-D Fabry-Perot Resonator D-band 110 – 170 GHz
 FP-G Fabry-Perot Resonator G-band 140 – 220 GHz
 FP-J Fabry-Perot Resonator J-band 220 – 330 GHz



Split Cylinder : Only 15 seconds per sample. Ideal for repeated measurements of large sample volumes.

Example : COP 187 μm @ 28 GHz, 40 GHz



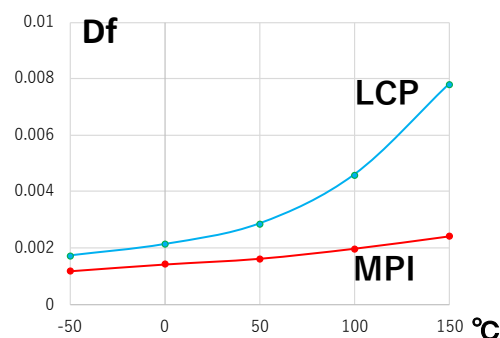
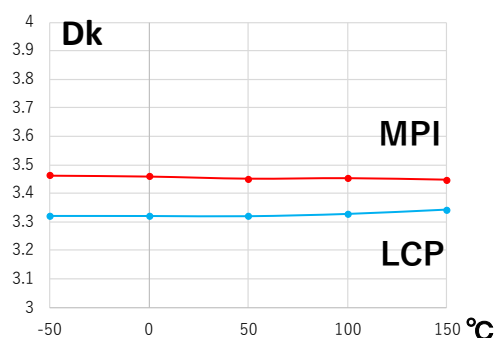
Repeatability check: Measuring a sample 10 times while changing the orientation.

Count	28GHz		40GHz	
	Dk	Df	Dk	Df
1	2.370730	0.000722	2.354508	0.000755
2	2.372300	0.000719	2.354861	0.000751
3	2.372472	0.000722	2.354397	0.000753
4	2.372257	0.000718	2.354659	0.000748
5	2.371915	0.000718	2.353814	0.000752
6	2.372233	0.000719	2.353760	0.000753
7	2.372208	0.000722	2.353669	0.000752
8	2.372390	0.000720	2.354123	0.000760
9	2.372347	0.000723	2.353822	0.000755
10	2.372939	0.000722	2.354197	0.000754
average	2.372179	0.000721	2.354181	0.000753
st dev.	0.000570	0.000002	0.000415	0.000003

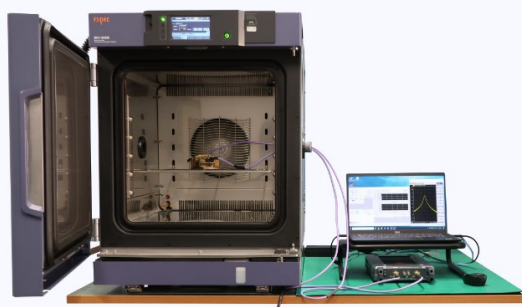
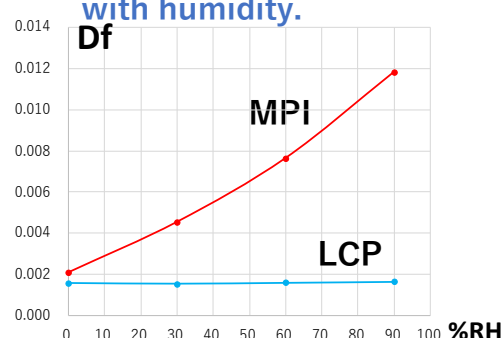
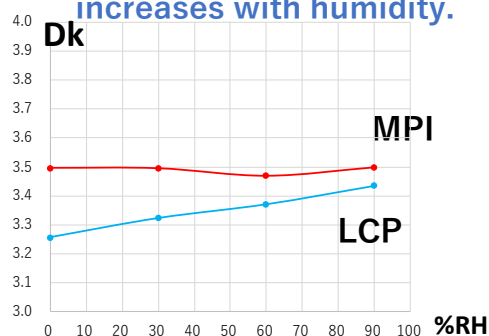
Split cylinder for temperature and humidity test

Example : MPI 50 μm , LCP 50 μm @ 28 GHz

- Test 1 : Temperature dependency : -50°C to 150°C
 Small variation Dk with temp LCP Df increase with temp

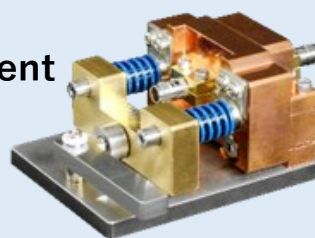


- Test 2 : Humidity dependency : 25°C 30%, 60%, 90%RH
 LCP Dk significantly increases with humidity.
 MPI Df significantly increases with humidity.



*Temperature and humidity test is available only as the measurement service (page 11).

**Split cylinder resonator
for permittivity measurement
product line-up**



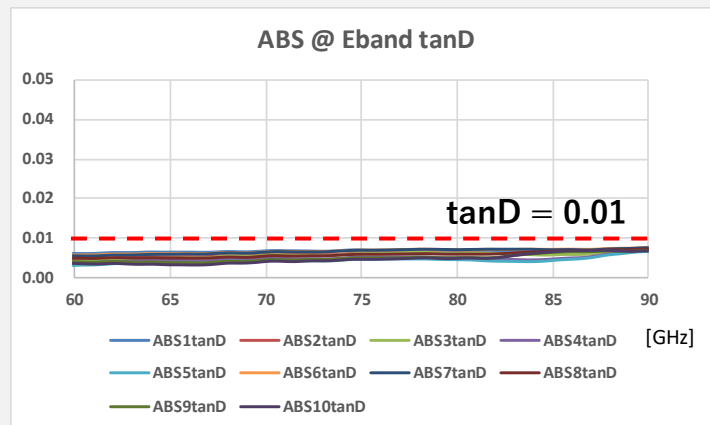
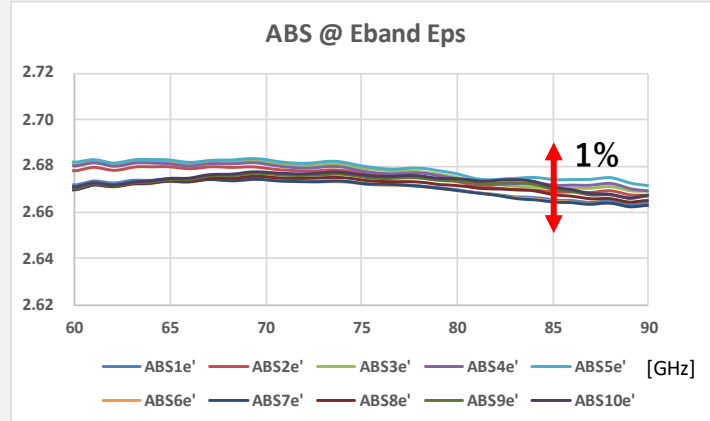
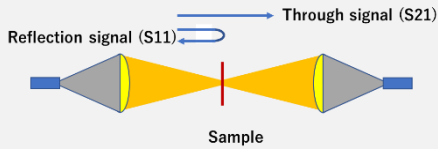
CR-7xx Split Cylinder Resonator: 10, 20, 24, 28, 35, 40, 50, 60, 80 GHz
 CR-MA Permittivity measurement software



Free Space for automotive related materials evaluation

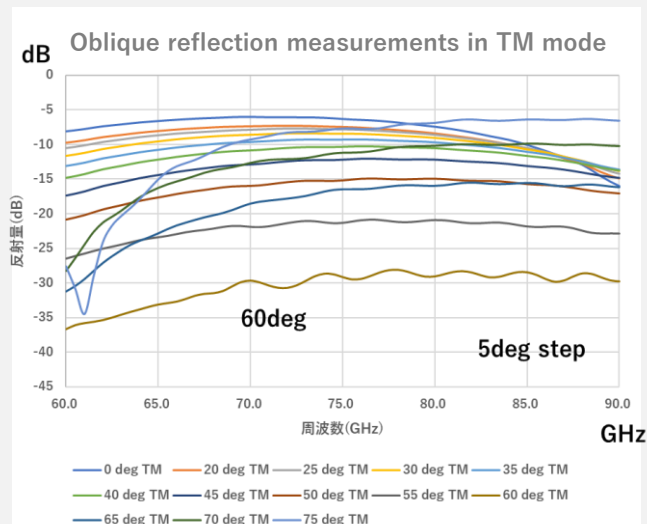
Example : ABS 2 mm Dk @ 60 – 90 GHz

Test the sample 10 times, changing the front and back, to check the repeatability of the fixture.

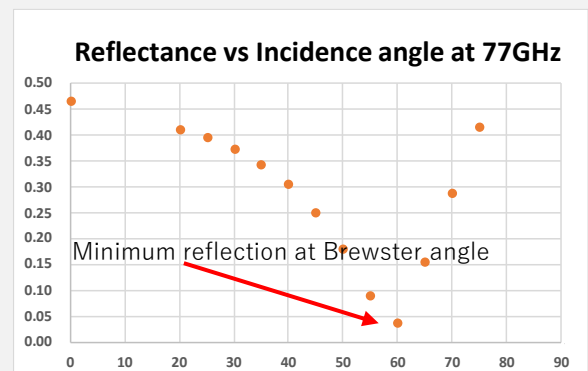
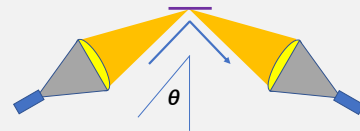


Example : Polycarbonate 2 mm oblique incidence 60 - 90 GHz

Reflection measurements at different incident angles from 20 to 75 degrees

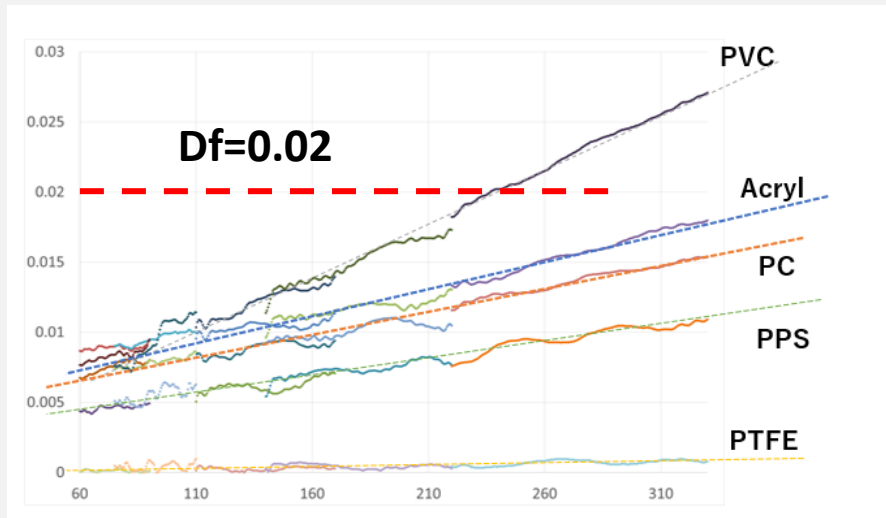


Check reflectance vs. angle at 77 GHz

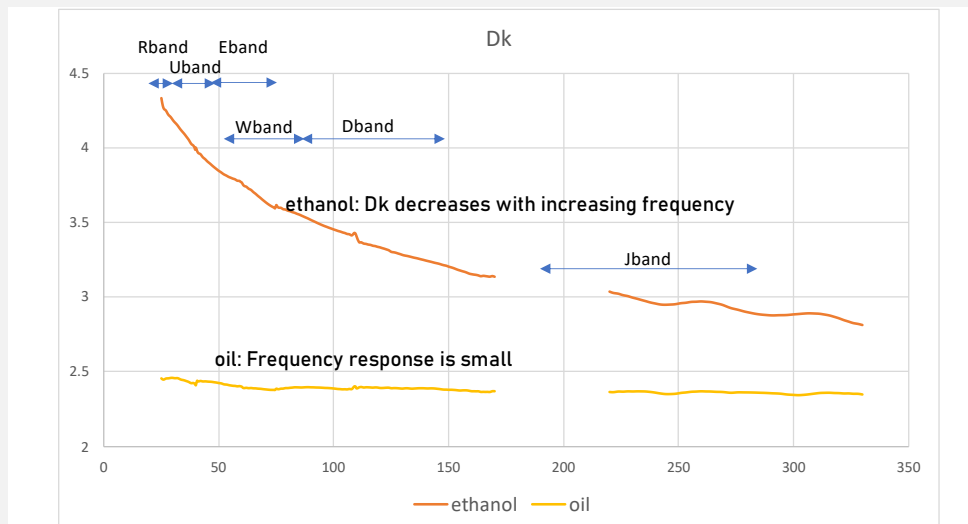


Plates, powders and liquids up to 330 GHz

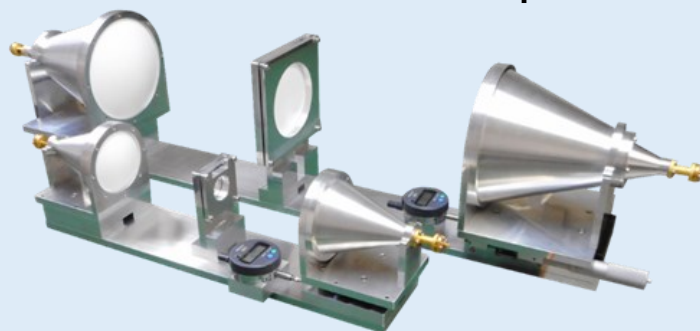
Example: Df of various resin sheets, 60-330 GHz



Example: Liquid Dk evaluation, 26.5 - 330 GHz



Free space Material Measurement Solutions product line-up

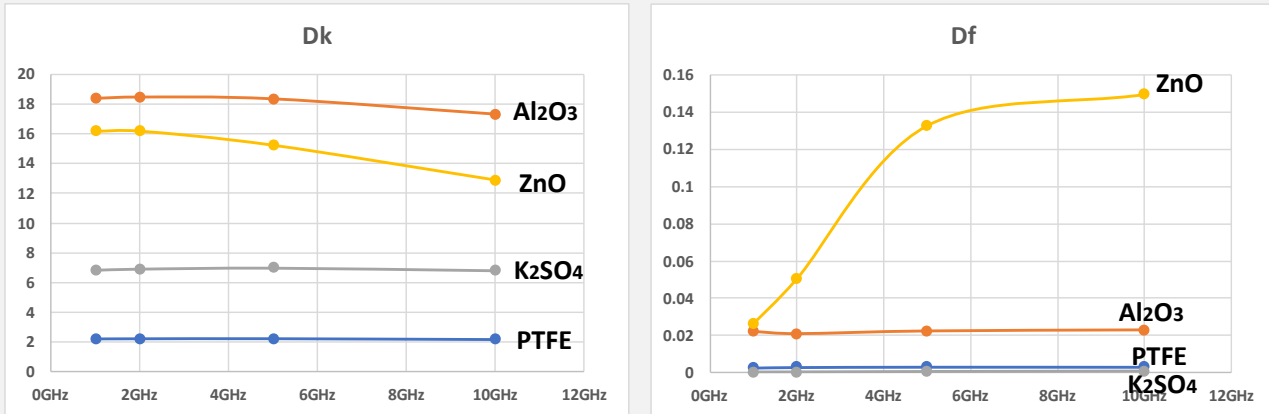


FS-330 Free space 18-330 GHz
FS-Eband Free space 60-90 GHz

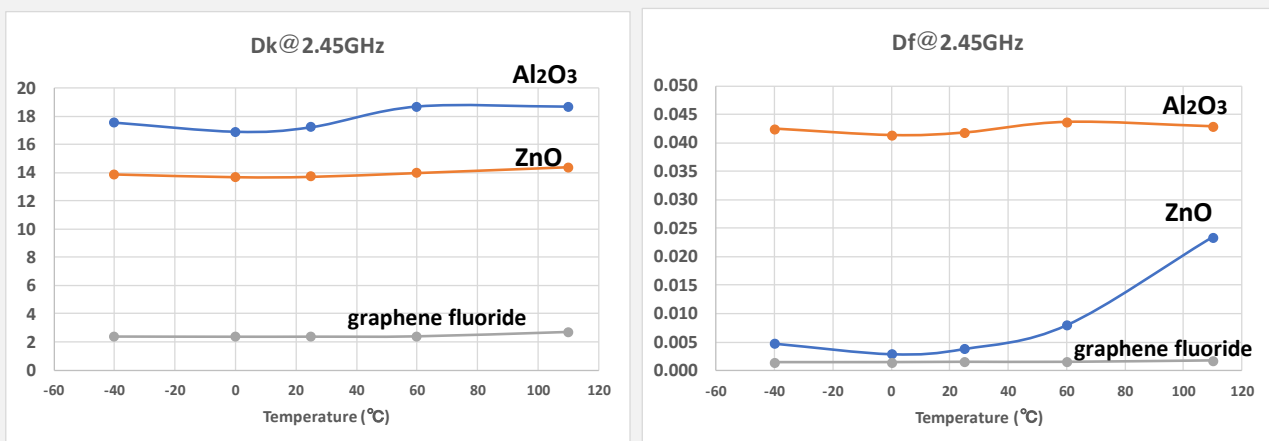


Measuring powder dielectric constants reproducibly with the cavity resonator

Example: DkDf frequency characteristics of powders, 1-10 GHz

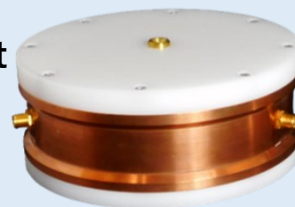


Example: DkDf temp characteristics of powders, -40 to 110°C, 2.45 GHz



Evaluation of temperature characteristics of powders is available only as the measurement service (page 11).

Cavity resonator for permittivity measurement product line-up



CP-xxx Cavity resonator : 1, 2, 2.45, 3, 5, 5.8, 10 GHz
CP-MA Permittivity measurement software



Measurement service of dielectric constant and magnetic permeability

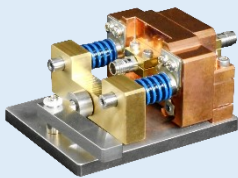
Need a material evaluation now? We'd be happy to help.

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- Equipped with leading edge test systems up to 330 GHz
- Reliable measurements by experts

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email : mido@emlabs.jp

A wide variety of measurements

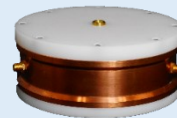


Split cylinder resonator

Permittivity: 10 - 80 GHz

Temp characteristics (-50 to 150°C)

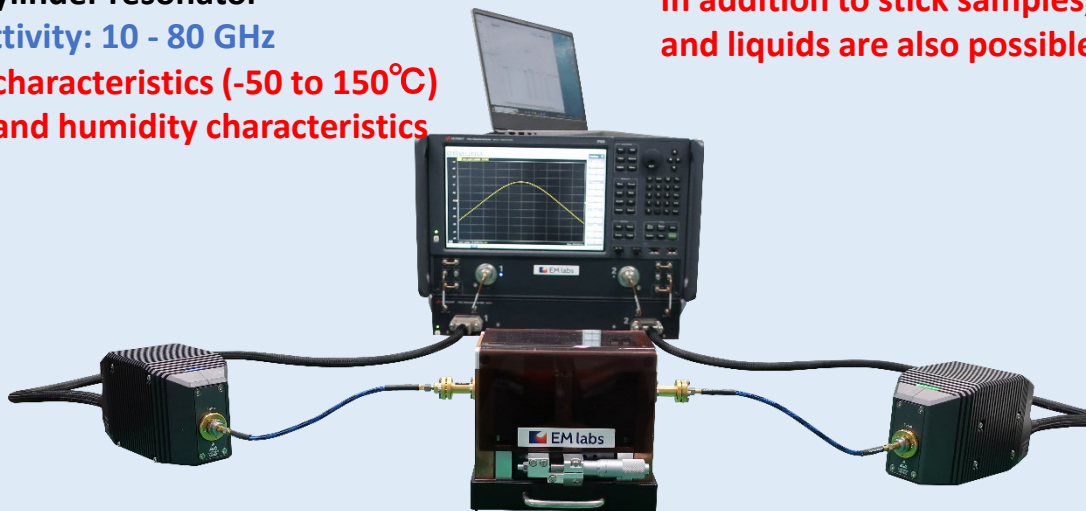
Temp and humidity characteristics



Cavity resonator

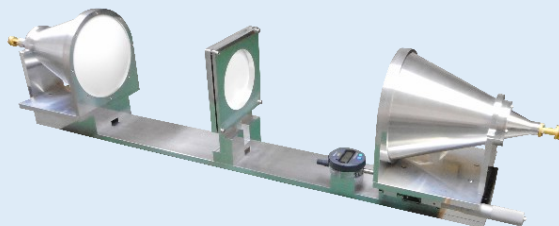
Permittivity: 1 - 10 GHz

In addition to stick samples, powders and liquids are also possible.



Fabry-Perot Resonator

Permittivity: 25 - 330 GHz (Except 170-220 GHz)



Free space

Permittivity, permeability, reflection transmission: 18 - 330 GHz (except 170-220 GHz) Powders and liquids are also possible.



Solution partner

The items listed are subject to change. Please confirm when placing an order.