Datasheet

Fabry-Perot Resonators

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General:

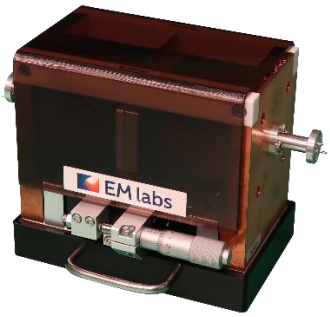
EM labs' FP Series Fabry-Perot resonators with a network analyzer provides the capability of measuring the complex relative permittivity of dielectric materials. To ensure accurate measurement of low-permittivity and low-loss materials, the resonators are engineered and manufactured with exceptionally low loss. By following the instructions provided by the permittivity measurement software, you can efficiently capture frequency characteristics of your sample within the specified band.

Note: EM labs' software only works with Keysight Vector Networks Analyzers

Models:

Six models of Fabry-Perot resonators are available, covering the frequency range from 25GHz to 330GHz. Permittivity is measured approximately at every 2.5GHz.

Moder number	description	Frequency	Connector
N1501AFP110	FP-BB	25GHz ~ 110GHz	1mm(f)
N1501AFP12	FP-E	60GHz ~ 90GHz	1mm(f)
N1501AFP10	FP-W	75GHz ~ 110GHz	1mm(f)
N1501AFP06	FP-D	110GHz ~ 170GHz	WR-6.5
N1501AFP05	FP-G	140GHz ~ 220GHz	WR-5.1
N1501AFP03	FP-J	220GHz ~ 330GHz	WR-3.4



FP-E,W,D,G and J
E and W are with 1mm(f) connectors

FP-BB

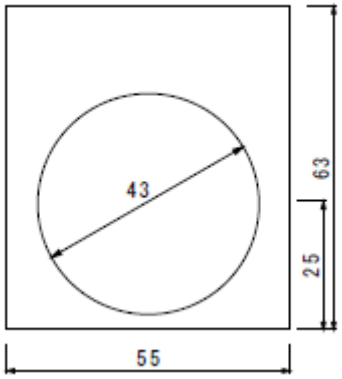
Sample size:

Recommended sample sizes are listed in the table below;

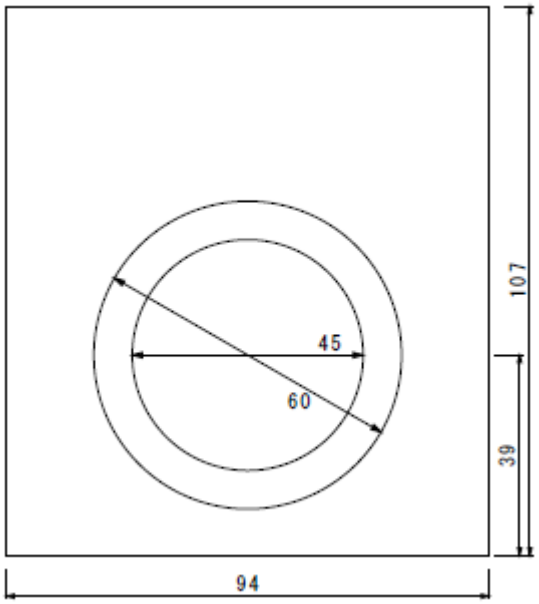
Frequency	Easy-to-use size
FP-BB Full (25~110GHz)	70mm x 70mm
FP-BB High (55-110GHz) FP-E,W,D,G and J	50mm x 50mm

Note: FP-BB can be used within the limited frequency range of 55 ~110GHz if the sample size cannot reach 70mm x 70mm.

A sample is held between two sample plates with the following shape. A sample is considered sufficiently large if it covers the center hole, even if it is smaller than the size specified in the table above. However, a sample should not exceed the dimensions of rectangular sample holder.



Sample plate size for
E,W,D,G and J bands

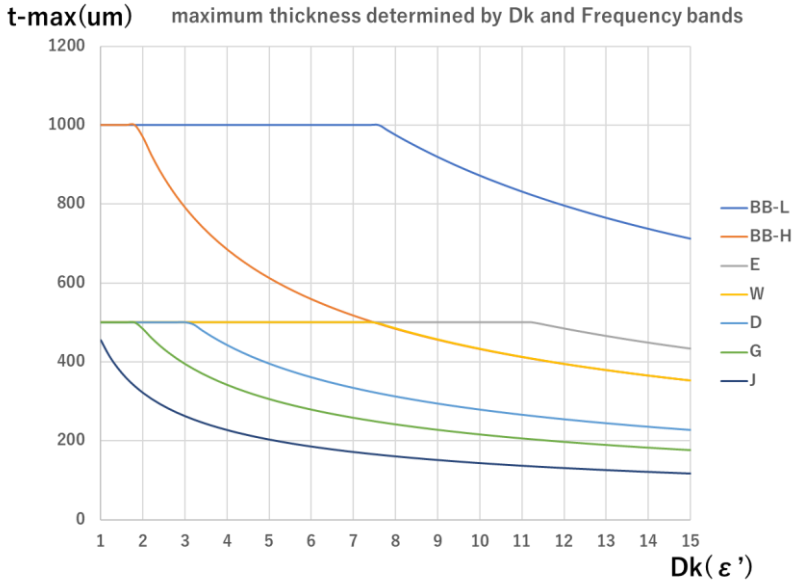


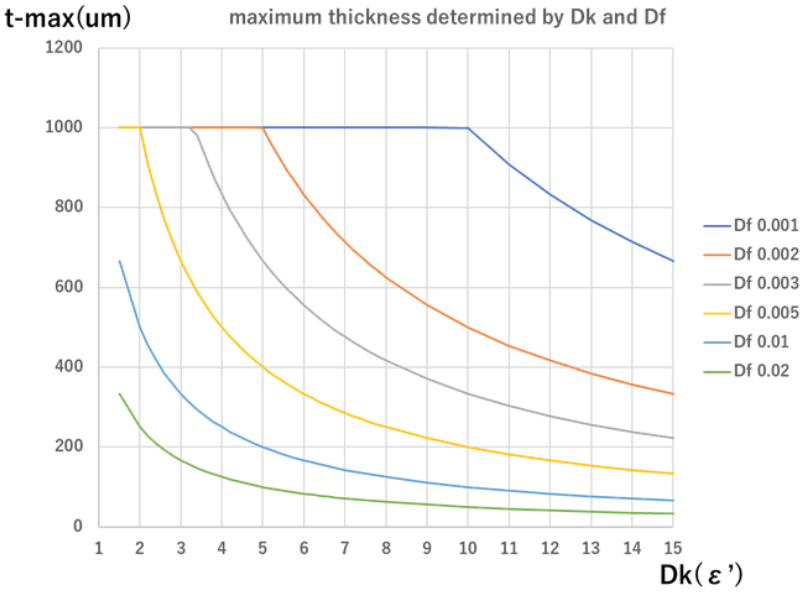
Sample plate size for
BB full(60mm) and BB high(45mm)

Sample thickness:

The upper limit of the sample thickness is determined by the frequency range, as well as the sample's Dk and Df values. The smaller one of the two t-max values obtained from the following two charts represents the maximum measurable sample thickness. Note that even in the measurable range, there may be some frequency points where an unwanted resonance overlaps the desired resonance, causing a large measurement error.

The lower limit of the sample thickness is primarily determined by ease of handling. As long as the sample can be properly inserted into the resonator, it can be measured.





Reference sample:

A reference COP(cyclo-olefin polymer) sheet(~187um) with pre-measured permittivity values is provided for verification and maintenance purposes.

Reference COP has Dk of approximately 2.37 and Df of approximately 0.0007.

Note: COP is chosen because of its stable permittivity over temperature and humidity.

Measurement accuracy:

- Dk error < 0.005 (0.2%)
- Df error < 0.00005

Measurement accuracy is defined only as the deviation from the specified values of the reference COP.

Note: Absolute accuracy cannot be specified due to the absence of an absolute standard.

Repeatability:

- Dk standard deviation < 0.1%
- Df standard deviation < 0.00002

Repeatability is defined as the standard deviation of ten measurements of the reference COP sheet, with the sheet being removed, flipped, and reinserted into the resonator before each measurement.

Operating temperature:

- 10 to 40°C (no condensation)

Size/Weight:

- FP-BB: 180mmW x 180mmD x 180mmH / 9.3kg
- FP-E,W,D,G and J: 200mmW x 125mmD x 130mmH / 3.7kg