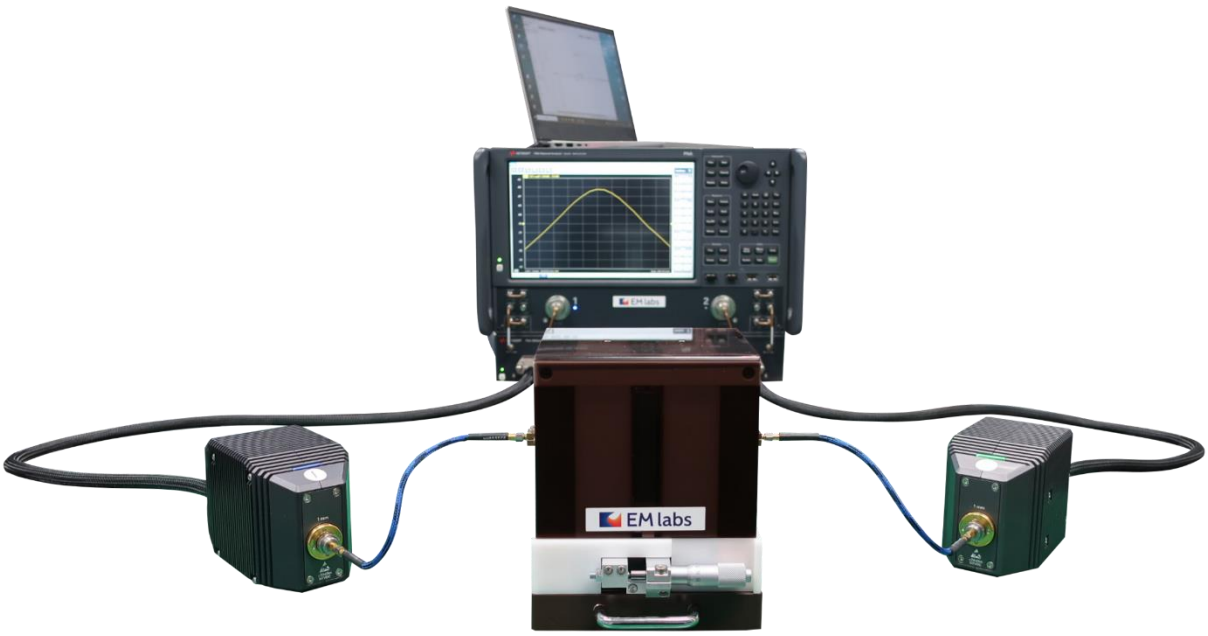
# N1501AFP Fabry-Perot Resonator 25 – 330 GHz

6G ready, low-loss dielectric material test solution

## Remarkably Easy and Repeatable Measurements from 25 GHz to 330 GHz

- Ideal for evaluating low-loss dielectric materials with tan δ < 0.01 over a wide frequency range.
- Extremely fast: 2.5 GHz step sweep measurements in 4 sec/point.
- Polarized signal allows in-plane anisotropy evaluation.
- Easy to install: Normal laboratory environment is sufficient.

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# Measurement Examples

Consistent over a wide frequency range, even with very low loss materials such as COP

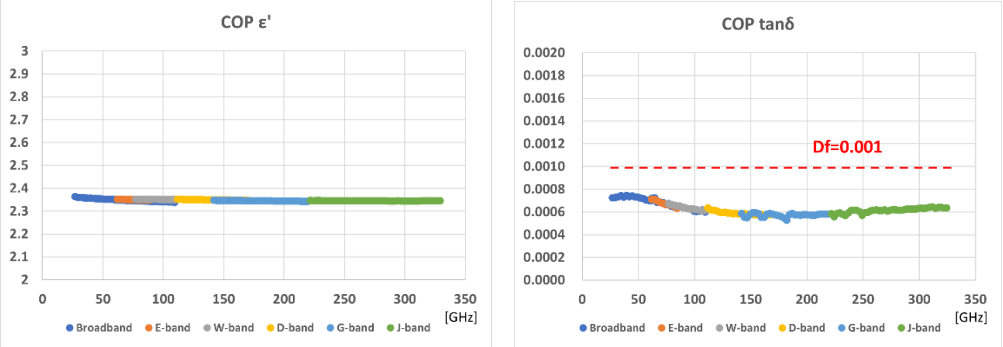



**Figure 2.** COP measurements with the N1501AFP110/12/10/06/05/03 Fabry-Perot resonators broadband (BB) / E- / W- / D- / G- / J-band

Excellent repeatability, even > 100 GHz

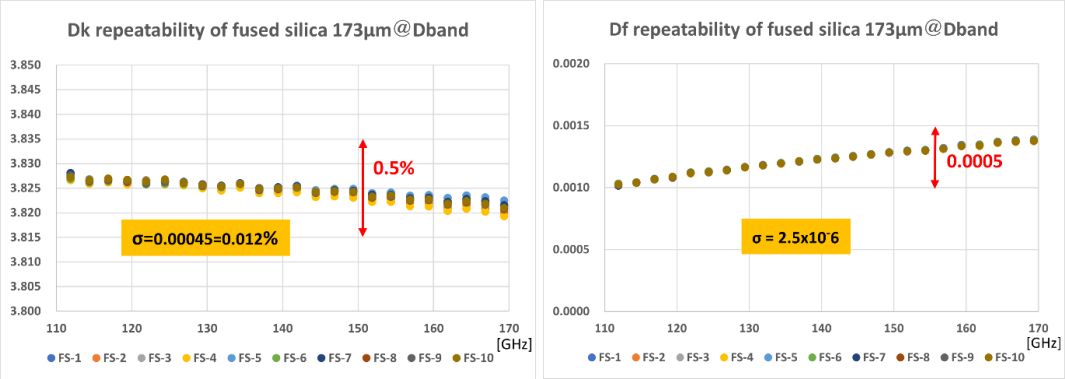



**Figure 3.** Fused silica 10 times measurements with the N1501AFP06 Fabry-Perot resonator D band (110 – 170 GHz)

Extremely Precise low loss (Df < 0.001) evaluation, even > 100 GHz

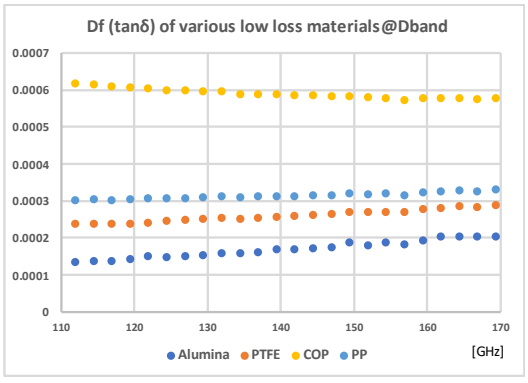



**Figure 4.** Low loss materials (Alumina, PTFE, COP, PP) measured with the N1501AFP06 Fabry-Perot resonator D band (110 – 170 GHz)

# Product Line-Up with Key Characteristics

| Model | Description | Resonance mode | Q factor | Connectors |
|---|---|---|---|---|
| N1501AFP110 | Fabry-Perot Resonator broadband 25 - 110 GHz | TEM[1] | >100,000 | 1 mm (f) |
| N1501AFP12 | Fabry-Perot Resonator E-band 60 - 90 GHz | | | WR12 |
| N1501AFP10 | Fabry-Perot Resonator W-band 75 - 110 GHz | | | WR10 |
| N1501AFP06 | Fabry-Perot Resonator D-band 110 - 170 GHz | | | WR6.5 |
| N1501AFP05 | Fabry-Perot Resonator G-band 140 - 220 GHz | | | WR5.1 |
| N1501AFP03 | Fabry-Perot Resonator J-band 220 - 330 GHz | | | WR3.4 |

[1] The electric field is vertical and parallel (in plane) to the test sample

# Other Characteristics

| Model | Operating temperature | Dimensions [mm] | Weight [kg] |
|---|---|---|---|
| N1501AFP110 | 0 to 40 °C | 130 x 150 x 175 | 8.8 |
| N1501AFP others | | 110 x 150 x 135 | 3.8 |

# Software and Accessories

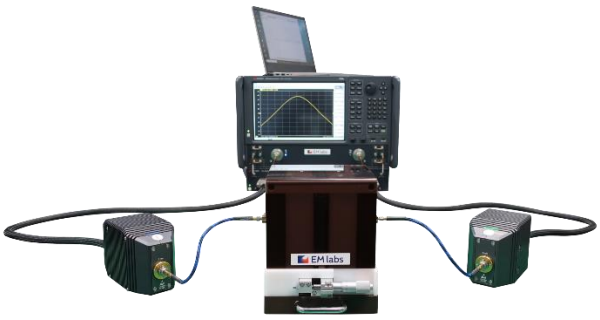
| Model | Description |
|---|---|
| N1501AFPSW | Fabry-Perot Resonator software.<br>See Test software in this document for system requirements. |
| N1501AFPTB | Tables and waveguide clamps 2 each set for Fabry-Perot Resonator.<br>Designed to use with N5262BWxx TxRx Mini Module from VDI. |

# Configuration

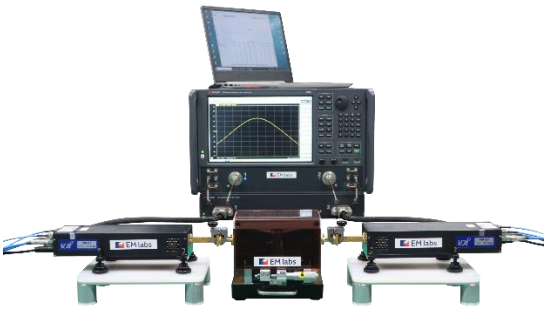
N1501AFPSW materials measurement software x 1 and a control PC are required. For N1501AFP110, two RF cables for network analyzer connection are required. Other models require N1501AFPTB x 1, two sets of tables and waveguide clamps, for the N5262BWxx frequency extender modules connection.

Supported VNA: Keysight's N52xxB PNA series

Connection example:



N1501AFP110 with N5290A

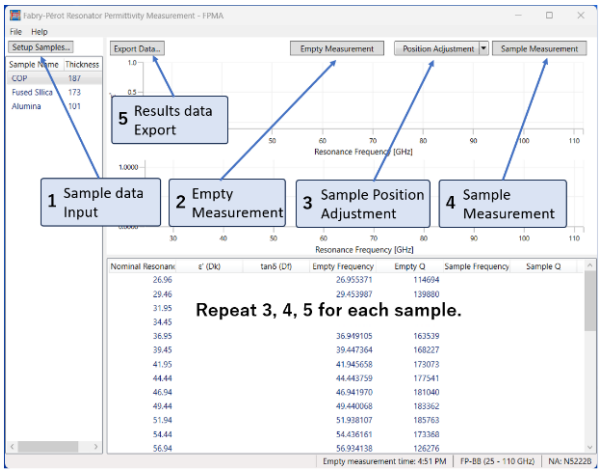


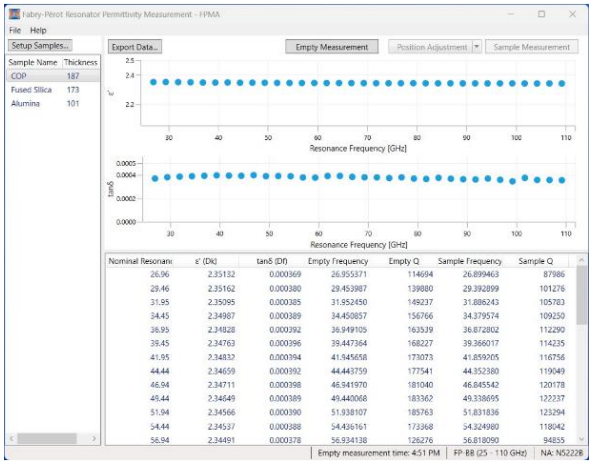
N1501AFPxx with N1501AFPTB for N5262BWxx

# Test Software

N1501AFPSW permittivity measurement software is available for efficient measurement. It controls the Keysight Technologies network analyzer and automatically acquires the necessary parameters, then outputs the complex relative permittivity in 2.5G Hz steps.

System requirements: Windows 10/11. Keysight's IO Libraries Suite, USB-GPIB(82357B), or USB, LAN



# Test Sample Requirements

A thin flat plate sample is required for Fabry-Perot measurements.

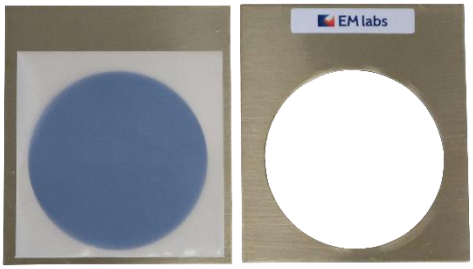
### Size

Recommendation for accurate measurement and easy handling:

Broadband: 65 x 65 mm, E/W/D/G/J band: 50 x 50 mm

### Thickness

We recommend a thickness of about 100 µm. The typical maximum thickness is shown in the chart below. In the case of relatively high loss materials, tan δ > 0.01 for example, a sample may need to be significantly thinner than the limit in the chart.



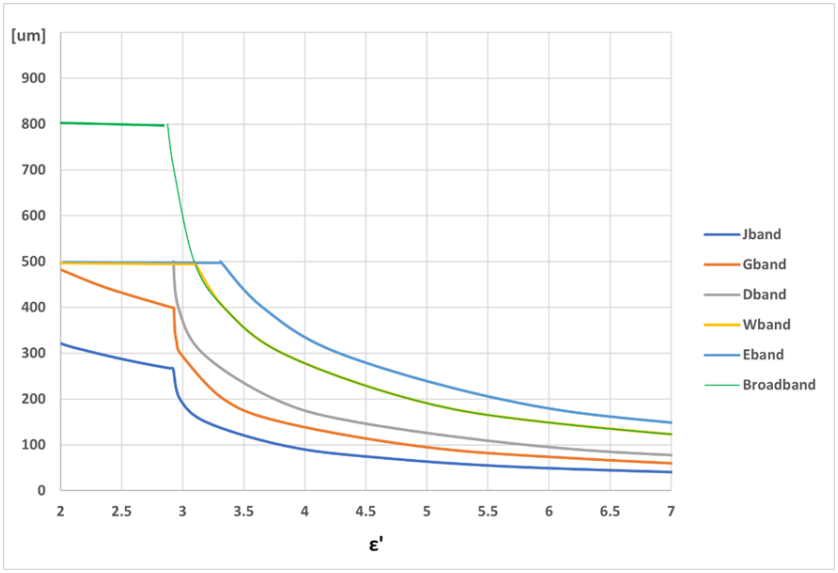




**Figure 5.** Typical maximum thickness vs Dk and frequency model

# Ordering Information

- Choose one or more Fabry-Perot resonators
  - N1501AFP110 broadband 25 - 110 GHz
  - N1501AFP12 E-band 60 - 90 GHz
  - N1501AFP10 W-band 75 - 110 GHz
  - N1501AFP06 D-band 110 - 170 GHz
  - N1501AFP05 G-band 140 - 220 GHz
  - N1501AFP03 J-band 220 - 330 GHz

- Order one N1501AFPSW Fabry_Perot resonator material measurement software
- Order one N1501AAFPTB for the N5262BWxx frequency extender modules connection when using N1501AFP12/10/06/05/03.
- Prepare a PC and a 2-port millimeter wave network analyzer system with correspond connector interface (two 1mm (m) RF cables for N1501AFP110, or N5262BWxx waveguide) for your using Fabry_Perot resonators.
  - For N52xxB PNA/PNA-X series network analyzer mmWave configuration, please refer to the following documents
    - N5290A/91A Millimeter Wave Network Analyzers configuration guide (5992-2179EN)
    - Banded Milimeter Wave Network Analysis Technical Overview (5992-2177EN)