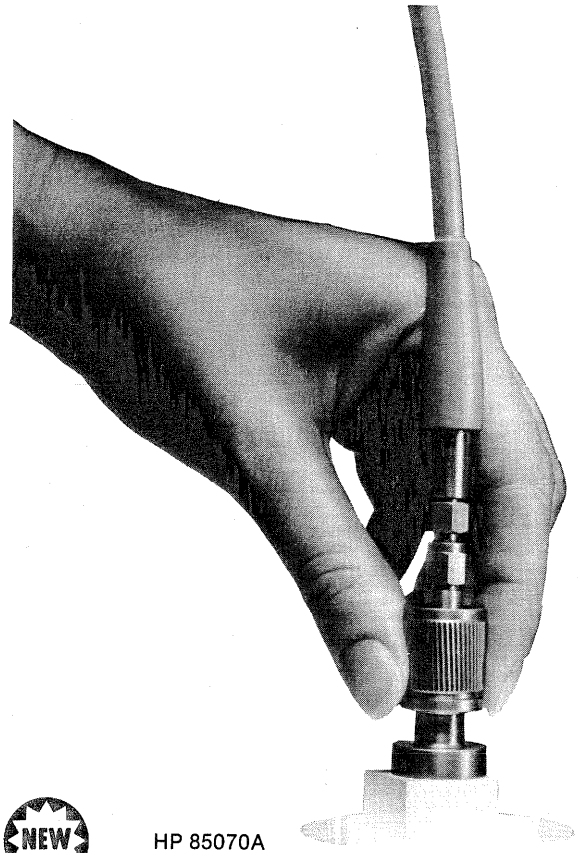
NETWORK ANALYZERS
Materials Measurement Systems
HP 85070A, 85071A, 85075A

- Two accessories to complete a turnkey system for characterizing materials
- Determines permittivity (dielectric constant) or permeability
- Fast, convenient, wide frequency range
- Compatible with most RF and microwave network analyzers



NEW HP 85070A

Materials Measurements

Materials have two properties that determine how they interact with electromagnetic fields:

- permittivity or dielectric constant (including loss factor)
- permeability (including magnetic losses)

There are several reasons for measuring these properties at high frequencies:

Materials are used in state-of-the-art RF/microwave components, such as substrates, capacitors, ferrites, insulators, resonators/filters, radomes, absorbers, shielding, etc. Materials should be characterized or inspected to achieve best performance while minimizing scrap.

High-power microwave processing offers unique advantages over conventional heating. The material's dielectric loss factor should be determined in order to correctly apply and optimize dielectric heating processes.

Dielectric measurements are useful analysis tools, since dielectric properties correlate directly to other material properties, such as: moisture content, phase transitions, molecular structure, polarizability, and relaxation constants.

HP 85070A Dielectric Probe Kit

Measure dielectric properties of materials quickly and conveniently, with the HP 85070A dielectric probe kit. The measurement is nondestructive and requires no sample preparation — saving you time, trouble, and material. Dip the probe into liquids and semi-solids; there is no need for special containers. For solid materials, press the probe against a single flat face.

The system yields permittivity, dielectric constant, loss factor, loss tangent, or Cole-Cole diagrams — versus frequency — from 200 MHz to 20 GHz (depending on network analyzer and material). Accuracy is typically 5%.

HP 85071A Materials Measurements Software

The HP 85071A software calculates materials properties from S-parameter measurements of samples loaded in a transmission line. This fixture can be either coaxial (inherently broadband) or rectangular waveguide (banded, but with simpler sample shapes).

Choose from several different models in the software to suit your material:

- Traditional method (described in Product Note 8510-3) measures both dielectric and magnetic materials (such as ferrites and absorbers), and yields both ϵ_r* and μ_r*.
- Other methods determine ϵ_r* of nonmagnetic materials, but do not give spurious data at periodic frequencies. One is also insensitive to the location of the sample in the fixture, so you do not need to know or carefully control position.
- Simpler 1-port method, to measure ϵ_r* using only reflection data.

The method yields 1-2% accuracy (typical) from 100 MHz to 110 GHz, depending on the material, fixture, and network analyzer.

Complete Systems

A complete broad-band system includes the HP 85070A or 85071A, with a network analyzer and controller. (The HP 85071A also requires a fixture, in coax or waveguide.)

Both the HP 85070A and 85071A are compatible with all of the leading RF/microwave network analyzers: HP 8752, 8753, 8719, 8720, and 8510B. Choose the analyzer to match your frequency range needs and budget.

The software from both is available for either HP Vectra PCs (or other 100%-compatible PC-AT computers with MS-DOS), or HP 9000 series 300 BASIC controllers (with Option 300).

Other Solutions

Many other techniques, based on RF or microwave network analyzers, offer unique advantages. For example, free space methods are non-contacting and suitable to temperature extremes.

Resonator (cavity) methods provide the highest accuracy and sensitivity to low-loss materials. Contact HP with your special needs.

At frequencies below 15 MHz, the HP 16451B dielectric test fixture (coupled with an LCR meter or impedance analyzer) provides accurate measurements of materials.

Ordering Information

HP 85070A dielectric probe kit
Opt 300 substitute HP BASIC software
HP 85071A materials measurement software
Opt 300 substitute HP BASIC software
HP 85075A extra probe