7

Ordering Supplies

Introduction

This chapter lists the part number of the materials measurement manual and other materials measurement literature.

Table 7-1. Orderable Material Measurements Items

HP Part Number	Qty	Description
85071-90004	1	user's manual

Literature

A variety of materials measurement literature exists. This list is by no means complete but should prove helpful in providing directions for further reading. It is divided in two sections: Hewlett-Packard literature and public technical papers.

Hewlett-Packard Literature

To order HP literature, contact your nearest Hewlett-Packard office.

- "Basics of Measuring the Dielectric Properties of Materials," application note 1217-1, part number 5091-3300E, March 1992.
- "HP 16451B Dielectric Test Fixture," data sheet, part number 5950-2368, May 1989.
- "LCR Meters, Impedance Analyzers, and Test Fixtures," selection guide, part number 5952-1430, January 1990.
- "Using the HP 16451B Dielectric Test Fixture," application note 380-1, part number 5950-2390, October 1989.
- "Characteristic Impedance Measurement of PC Board Circuit Patterns," application note 339-2, part number 5950-2908, June 1986.
- "Measuring the Dielectric Constant of Solid Materials," application note 339-13, part number 5950-2935, December 1987.
- "Measuring the Dielectric Constant of Solids with the HP 8510 Network Analyzer," product note 8510-3, part number 5954-1535, August 1985.
- "Measuring Complex Permittivity and Permeability at RF and Microwave Frequencies," RF & Microwave Symposium paper, September 1989, available from Microwave Instruments Division, Santa Rosa, CA.

Public Technical Papers

To obtain copies of these papers, contact the organization or publisher listed.

- M. Afsar et al; "Measurement of the Properties of Materials"; proceedings of the IEEE, volume 74, number 1, January 1986. This is an excellent short survey of many methods. Taken together, the methods span a wide frequency range. With its 187 references, it is a good starting point for beginners.
- H. M. Altschuler; "Dielectric Constant"; chapter 9 of *Handbook of Microwave Measurements* by M. Sucher and J. Fox; Wiley, 1963. This is a good technical reference covering high frequency techniques. It contains detailed procedures and equations (but using a slotted line instead of a network analyzer).
- ASTM; "Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials"; Standard D-150-87; American Society for Testing and Materials, Philadelphia, PA 19103. The US authority on testing methods features great technical depth on parallel-plate capacitor methods for low frequencies.
- Richard G. Geyer; "Electrodynamics of Materials for Dielectric Measurement Standardization"; proceedings of the IEEE, IM-TC, January 1990. A review of measurement concerns, standards, and traceability with examples of state-of-the-art measurements including NIST X-band cavity and the first public reference to Baker-Jarvis enhancement to S-parameter technique.
- Richard G. Geyer; "Dielectric Characterization and Reference Materials," NIST Technical Note 1338.
- Baker-Jarvis; "Transmission/Reflection and Short-Circuit Line Methods," NIST Technical Note 1341.
- Baker-Jarvis; "Transmission/Reflection and Short-Circuit Line Methods for Measuring Permittivity and Permeability," NIST Technical Note 1355.
- Deepak K. Ghodgaonkar et al; "Free Space Method for Measurement of Dielectric Constants and Loss Tangents at Microwave Frequencies"; IEEE Transactions on IM volume 37 number 3, June 1989. This describes the work at Penn State's Center for Engineering of Electronic/Acoustic Materials. The topic is the free-space method using spot-focusing antennas with an HP 8510B and TRL calibration.
- Arthur R. von Hippel, ed; *Dielectric Materials and Applications*; MIT Press, 1954. This book is slmost 40 years old, but still the bible on dielectrics and measurements; a good introduction to basics.