/K option – Materials Test

6500B Series Precision Impedance Analyzer
6500P Series High Frequency LCR Meter

The /K Material Test firmware option allows the parameters associated with two types of the dielectric properties of material testing to be calculated.

1. The Complex Relative Permittivity, ε^*_r, of the Material Under Test (MUT) can be calculated using 6500 measurements and user-entered MUT dimensions. Both the Contacting Electrode Method and the Non-contacting Electrode Method can be used with a Wayne Kerr 1J1020 Material Test Fixture (or equivalent).
2. The Complex Permeability, μ^*, of the Material Under Test (MUT) can be calculated using 6500 measurements and user-entered MUT dimensions.

Permeability tests involve comparing results from an air-cored toroidal core with those for the same coil when wound onto a core.

COMPLEX PERMITTIVITY METHOD

Contacting Method

The Material-Under-Test (MUT) is placed between two parallel plates, one of which consists a guarded electrode surrounded by a guard electrode. From standard impedance measurements and the material/fixture dimensions the complex relative permittivity ε_r, can be calculated

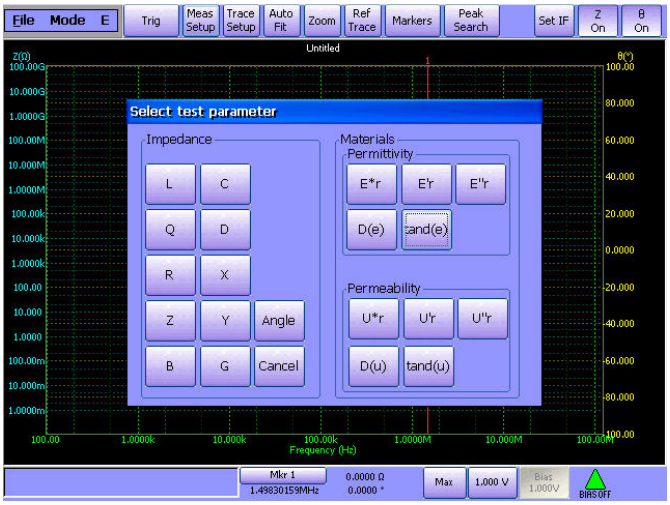
Non-contacting Method

The two parallel plates of the test fixture are set to a gap greater than the thickness of the MUT. The capacitance of the air-gap C_g is measured. The MUT is then positioned in the fixture and a second capacitance reading C_m is taken. From these measurements and the material/fixture dimensions the complex relative permittivity ε_r, can be calculated.

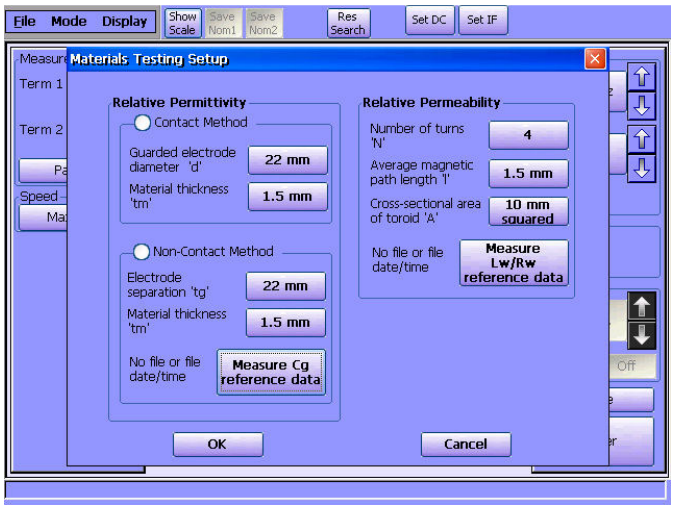
A reading consists of two separate measurements, C_g and C_m. The measurement of C_g can be treated as a 'calibration', i.e. the user sets the gap and performs a calibration (this measures C across the frequency range and stores the data in a file. The values obtained during this process can then be used for all successive measurements as the value of C_g, as long as the gap is not changed.

COMPLEX RELATIVE PERMEABILITY METHOD

The permeability of a material can be found by comparing the inductance/resistance of an air-cored toroidal coil with the inductance/resistance of the same coil when wound on a toroidal core made from the MUT. One reading therefore consists of two separate measurements. As with the non-contacting method above, the user will perform a reference/calibration measurement across the frequency range on the air-cored coil, the results of which will be stored in a file. These results will then be used as the values for R_w and L_w in all subsequent measurements (or until the user changes the air-cored coil).



Test Parameter Selection Screen



Test Setup Screen

Specification

Permittivity Parameters		Permeability Parameters	
ε^*_r	Complex Relative Permittivity	μ^*_r	Complex Relative Permeability
ε'_r	Real part of Complex Relative Permittivity	μ'_r	Real part of Complex Relative Permeability
ε''_r	Imaginary part of Complex Relative Permittivity	μ''_r	Imaginary part of Complex Relative Permeability
tan δ	Dissipation Factor	tan δ	Dissipation Factor
D	Dissipation Factor	D	Dissipation Factor

Installation

This option can be installed on a unit at the time of manufacture, or by the customer after a licence has been emailed to them.