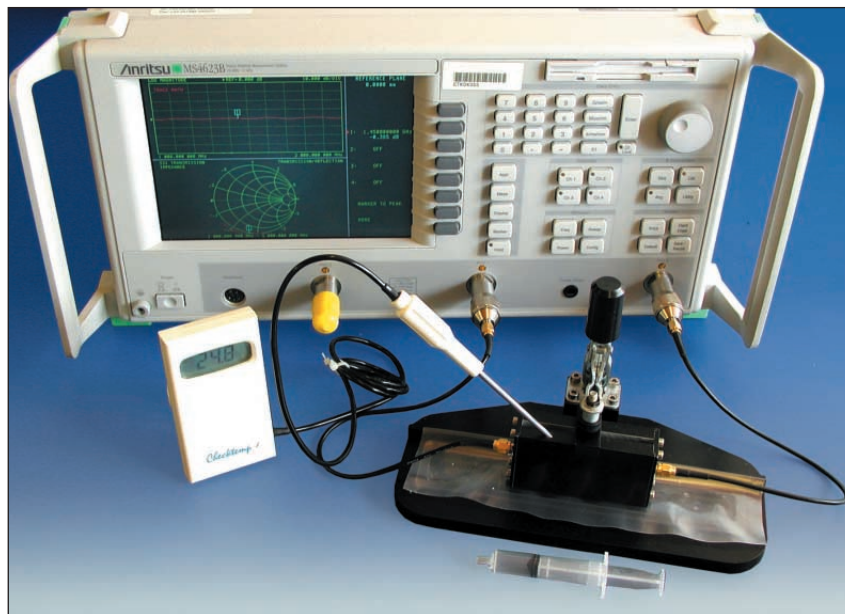




# 'Di-Line'- SAR Dielectric Property Measuring System

Stripline technique measures Conductivity and Relative Permittivity of liquids and gels with improved accuracy over co-axial sensors

- For use manually with any vector network analyser (No other specialist equipment required). Automatic operation with most popular network analysers.
- High Accuracy
- Based on method [1] referenced in CENELEC EN50361 and draft IEEE1528 SAR measurement standards
- Wide frequency range covered
- Reduced uncertainties minimise overall SAR measurement uncertainty



The transmission technique employed is capable of improved accuracy compared with reflection measurements made using open-ended coaxial line sensors. The Indexsar hardware is designed to make the measurement process as simple as possible whilst software features enable flexible processing of measurement data and comparison (in percentage terms) with target values for simulant liquids properties or comparison with reference liquids for checking the accuracy of the method.

A vector network analyzer is used to determine the change in transmission loss and phase of a strip line sensor when filled with the liquid under test. Three different lengths of sensor are provided to account for the variation of loss with frequency for a range of different liquids.

Applications include the routine measurement of tissue-simulant liquids and gels used for Specific Absorption Rate (SAR) testing. Probes can be used with most models of Vector Network Analysers - with S parameter measuring facilities.



Specification	
Frequency Range	200MHz - 3GHz
Temperature Range	-10°C to 100°C
Sensor	Transmission Line active lengths 60, 80 and 160mm
Accuracy	typically $\pm 1\%$ for relative permittivity and $\pm 2\%$ for conductivity
System Requirements	
	PC and Vector Network Analyser (VNA) - (Thermometer supplied)

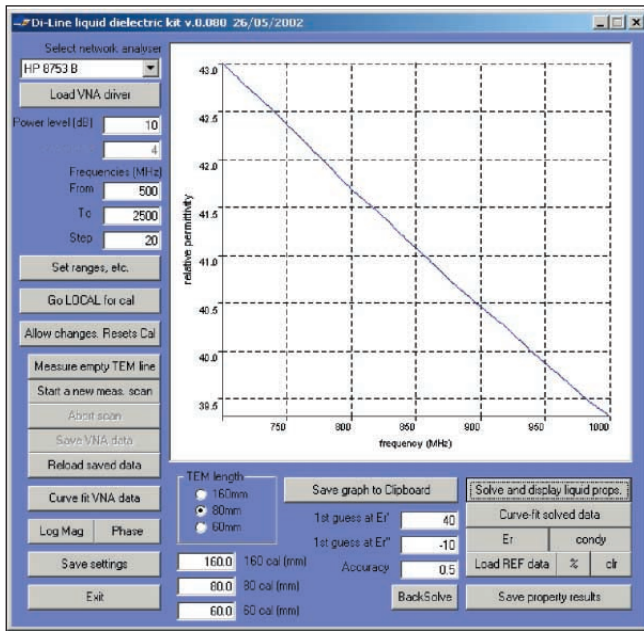
### Advantages

- Easy to use Windows control software with data processing and graphics options
- Easy to validate test set-up and results
- Validation of the technique has used standard reference materials eg Acetone, Ethanol, Methanol, DMS, Water

### Stripline

- Transparent base for checking removal of air bubbles
- Dimensions optimised for SAR liquids
- Detachable base for easy cleaning after use
- High measurement volume for consistent results

## Dedicated Software



### Automatic mode:

Takes data from Vector Network Analyser and calculates conductivity and permittivity directly

### Manual mode:

When the VNA is not under PC control manual measurements can still be entered in a text file or spreadsheet and processed using the software supplied.

### Liquid Property Reference Data:

Results computed from measured data can be quickly compared with standard data sets or target values. The performance of certain reference liquids may be recalled by pressing 'Load REF data'. This enables direct comparisons of dielectric properties. The comparison between the two selected data sets may be made in percentage terms by pressing the % button. All results can be saved.

Drivers available for most commonly used network analysers including:

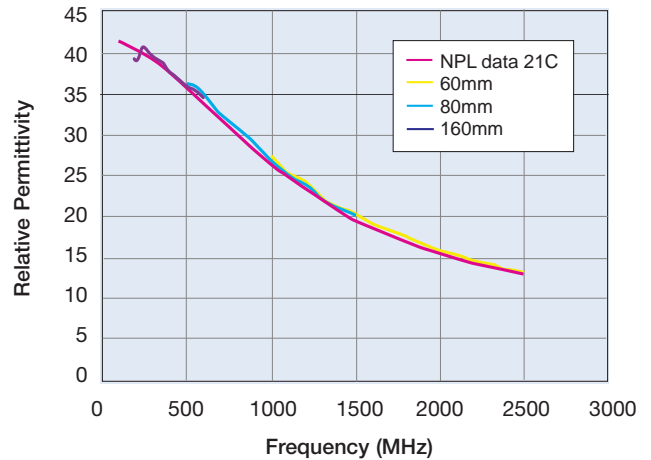
HP/Agilent	Anritsu
8753A/B/C/ES	MS4622
8712ES	MS4623
8714ES	
	R&S
	ZVC Series

### Reference

[1] A.Toropainen et al. Electronics Letters **36** (1) 2000, pp 32-34

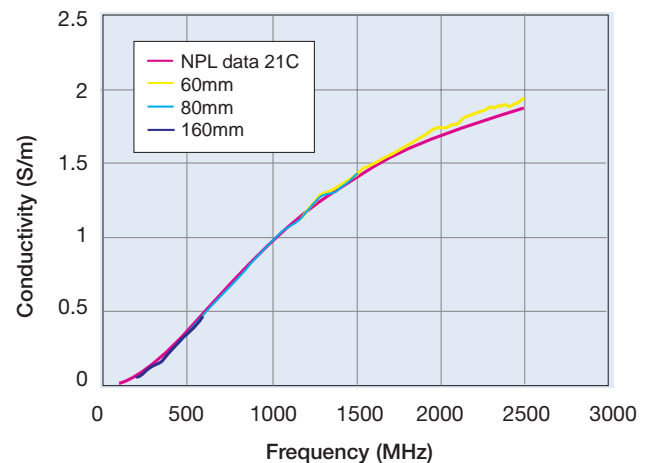
## Permittivity

Ethanediol comparisons with UK National Physical Laboratory (NPL) data



## Conductivity

Ethanediol comparisons with UK National Physical Laboratory (NPL) data



### 'DiLine' Dielectric Property Measuring System

Supplied complete with handy carry case with connecting cables. Digital thermometer included.



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