

# Field Portable Power Line Communications Analysis



## Instrument Functions

- Single and Dual Frequency Selective Level Meter
- Impedance Analyzer (LCR Measurements)
- Frequency Response Analyzer
- VSWR Meter
- Signal Generator
- Oscilloscope

## Applications

- Power Line Carrier Alignment & Maintenance
- Line Trap Alignment & Test
- Line Tuner Alignment & Test
- PLC Transmitter & Receiver Test & Set-up
- Audio Tone Protective Relay Channel Test & Set-up
- FSK Telemetry Testing



## Summary

The SLM3505 was designed to provide a single instrument solution for the Electric Utility System Protection Engineer and Relay/Communications Technician responsible for the alignment and maintenance of Power Line Carrier, Audio Tone and FSK Communications Systems. This multifunction instrument replaces all 4 existing Power Line Carrier Instruments in one for a fraction of the cost, all in a compact lightweight package.

# Featured Application Highlights

## LINE TRAP TESTING

The SLM3505's Impedance Analyzer provides an impedance versus frequency plot directly on the display. A technician can therefore view a curve representing the resonant frequency and adjust a trap and tuning pack while viewing the changes in a real time environment, without having to adjust the meter. Since the SLM3505 is a true LCR Meter with the ability to zero out cable impedance, test lead length and separation is no longer a concern. Now the technician can attach long leads to a mounted trap and perform testing while still on the ground, by simply zeroing the capacitance in the leads.

## TRANSMITTER/RECEIVER TESTING

The SLM3505's wide frequency range (5Hz to 5MHz) is ideal for setting transmitters and receivers on Power Line Carrier, Audio Tone or Analogue Baseband Microwave systems. Unlike many conventional selective level meters, the SLM3505 scans the required frequency range then centres automatically on the largest peak or two largest peaks. The high level output provides up to 2 watts into 50 Ohms for Power Line Carrier applications, while the low level output is ideal for work on audio tone and microwave systems. For the Power Line Carrier user, a high level, high impedance input capable of up to 300V peak can handle any standard transmitter output in the field today without the need for an external attenuator.

## DATA & EVENT RECORDING

Many of the SLM3505's test functions will provide the technician invaluable information that can be used for future reference in verifying the state in which the equipment was tested and aligned. An internal 1 Gigabyte of storage, external USB memory stick compatibility and an RJ45 input connection

## LINE TUNER TESTING

The SLM3505 provides a single instrument solution for adjusting a Tuner's Series inductor and Impedance Matching transformer for minimum reflected power. The 3505 achieves this either with a conventional directional coupler technique or by an innovative impedance comparison technique that achieves the same measurement results without the need for any additional hardware. Using either technique in VSWR mode, a single screen displays the frequency under test, the forward power level, the reflected power level and the % reflected power.

for laptop connectivity provides the user a versatile solution for storing and retrieving field data.

Internal time and date stamping used in conjunction with simple comma separated data storage will help your company document the characteristics of your individual Power Line Carrier elements system wide.

## FIELD INSTRUMENT

Designed for the substation environment, the SLM3505 is manufactured in a rugged aluminium housing with an adjustable carrying handle plus a separate nylon shoulder strap for convenient field use. The SLM3505 uses a state of the art 5.7" Colour Display to maximize visibility in all conditions, including full sunlight. A welcome alternative to the present multi-unit bulky solutions, the SLM3505's tablet size (305x230x45mm) and relatively light weight (2.3Kg) provides a compact solution that can become the technician's primary diagnostic tool. In addition to operating off internal rechargeable batteries and an AC adapter, the SLM3505 is also designed to operate off from an external supply or 12V vehicle battery standard.

# Technical Specification

SELECTIVE LEVEL METER		SIGNAL GENERATOR		OSCILLOSCOPE		FREQUENCY RESPONSE ANALYZER			
Frequency range	5Hz to 5MHz	Generator type	Direct Digital Synthesis (DDS), single frequency or sweep	Sample rate:	5 Msamples/s	Frequency range	5Hz to 5MHz		
Frequency accuracy	±5ppm over all temperature range			Timebase:	5us/div to 5s/div	Gain Accuracy dB	0.02dB < 1kHz 0.05dB < 10kHz 0.1dB + 0.001dB/kHz		
High Accuracy Option F	<±2ppm over all temperature range	Generator waveforms	sinewave, square, triangle, white noise						
Magnitude accuracy	<1KHz: 0.05% rmg + 0.05% rdg + 50uV. <10KHz: 0.05%rmg+0.05% rdg +0.01%/KHz + 50uV. <5MHz: 0.05%rmg+0.25% rdg +0.001%/KHz + 50uV.			Frequency accuracy	±5ppm over all temperature range	Trigger:	auto, normal or single shot	Phase Accuracy °	0.02° < 10kHz 0.02° + 0.003°/kHz
Inputs (Unbalanced) Type & Connection	differentially isolated & isolated BNC	High Accuracy Option F	<±2ppm over all temperature range						
Bandwidth settings	3, 25, 100, 1.95k, 3.1kHz & wideband	Magnitude accuracy	± 1% ± 1%/MHz	Pretrigger:	none, 25%, 50%, 75%	GENERAL SPECIFICATIONS			
Measurement Units	V, dBm, dBu, dB0 (Traditionally referred to as dB in PLCC applications)	Frequency Setting	5Hz or better up to 999.999Hz in 1mHz steps 1kHz to 999.999kHz in 100mHz steps 1MHz to 5MHz in 1Hz steps						
Accuracy of Level Measurement at 0dB(m)	± 0.3 dB(m)	Resolution	6 Digits						
		Output Level Range for 0dB(m)	Selectable in 0.001dB(m) steps between: Low Output -40dB(m) to +24dB(m) High Output -7dB(m) to +35dB(m)						
High voltage input		Hi level output		Inputs ranges:	as Selective Level Meter	Sweep Steps	Up to 2000 steps in all sweep functions		
Max input	±300V peak	Frequency range	10kHz to 5MHz	Second Input	±10V peak 1MΩ ±5% // 30pF	Set-up and Data Storage	Up to 1000 analyzer setups, readings and sweep results can be stored		
Input impedance	1MΩ ±5% // 30pF	output level	2W into 50Ω (10V rms)	VSWR METER		Interface	USB, RS232, LAN		
50Ω input		output impedance	50Ω ±2% 75Ω ±2% (Option)			Accuracy	1% of reading up to 1MHz 5% of reading above 1MHz to 5MHz for power measurements (forward and reflected) at VSWR = 3.	Real time clock	Time and Date Stamp for data stores
Max input	10W (22V rms)	Low Level Output						Data Storage	Internal 1Gb flash, external USB pen port
Input impedance	50Ω ±1% // 30pF							Display Type	5.7" VGA colour high brightness backlight
75Ω input		Frequency range	5Hz to 5MHz	Features	Forward Power, Reflected Power, % Reflected Power, & Frequency under test visible on one screen.			Display Resolution	6 digit freq, 5 digit voltage, 4 digit dBm
Max input	10W (28V rms)	output level	5V rms into high impedance			Size	approx 305 x 230 x 45mm "tablet" style		
Input impedance	75Ω ±1% // 30pF	output impedance	50Ω +/-2% +24dBm 75Ω +/-2% +22dBm 600Ω +/-2% +15dBm	Weight	2.3Kg	Power source	9 – 18V @ 3A AC adapter or 12V dc from car or external batteries		
Low level input		Frequency Shift Delay Timer	0 to 1s (1ms steps)	Battery type and Battery life	Re-Chargeable Lithium-Ion Up to 5 Hours	Temperature range	-5 to +50°C		
Input impedance	50Ω ±1% // 30pF 75Ω ±1% // 30pF 600Ω ±1% // 30pF 1MΩ ±5% // 30pF	IMPEDANCE ANALYZER							
Input (Balanced)		Impedance range	100 milli Ohm to 100 kilo Ohm						
Max input	±10V peak	Accuracy	<10KHz: 1% rdg. <1MHz: 1% rdg + 0.005%/KHz + 50uV. <5MHz: 5% rdg + 0.002%/KHz + 50uV.						
Input impedance	As Low level input	Features	LCR Measurements (Inductance, Capacitance, Resistance, tan delta, QF) Lead compensation (zero lead function) Impedance versus Frequency Curve						
Input type	differential								
Input connection	3 x 4mm connectors - positive, negative, and ground								

