

## 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



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<br>0.05dB < 10kHz<br>0.1dB + 0.001dB/kHz               |
| Magnitude accuracy                      | <1KHz: 0.05% rmg + 0.05% rdg + 50uV.<br><10KHz: 0.05% rmg+0.05% rdg +0.01%/KHz + 50uV.<br><5MHz: 0.05% rmg+0.25% rdg +0.001%/KHz + 50uV. | Generator waveforms           | sinewave, square, triangle, white noise   |                    |  |  |  |
| Inputs (Unbalanced) Type & Connection   | differentially isolated & isolated BNC   | Frequency accuracy            | ±5ppm over all temperature range  | Trigger:           | auto, normal or single shot  | Phase Accuracy °   | 0.02° < 10kHz<br>0.02° + 0.003°/kHz                                  |
|   |  | Magnitude accuracy            | ± 1% ± 1%/MHz   |                    |  |  |  |
| Bandwidth settings                      | 3, 25, 100, 1.95k, 3.1kHz & wideband   | Frequency Setting             | 5Hz or better up to 999.999Hz in 1mHz steps<br>1kHz to 999.999kHz in 100mHz steps<br>1MHz to 5MHz in 1Hz steps                                      | Pretrigger:        | none, 25%, 50%, 75%  | GENERAL SPECIFICATIONS   |  |
| Measurement Units                       | V, dBm, dBu, dB0 (Traditionally referred to as dB in PLCC applications)  |                               |   |                    |  |  |  |
| 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:<br>Low Output -40dB(m) to +24dB(m)<br>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<br>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)   |                    |  |  |  |
| 50Ω input                               |  | output impedance              | 50Ω ±2%<br>75Ω ±2% (Option)   | VSWR METER         |  | Interface  | USB, RS232, LAN  |
| Max input                               | 10W (22V rms)  | Low Level Output              |   |                    |  | Real time clock  | Time and Date Stamp for data stores                                  |
| Input impedance                         | 50Ω ±1% // 30pF  |                               |   |                    |  | Data Storage   | Internal 1Gb flash, external USB pen port                            |
| 75Ω input                               |  |                               |   |                    |  | Display Type   | 5.7" ¼VGA colour high brightness backlight                           |
| Max input                               | 10W (28V rms)  |                               |   | Display Resolution | 6 digit freq, 5 digit voltage, 4 digit dBm   |  |  |
| Input impedance                         | 75Ω ±1% // 30pF  | Frequency range               | 5Hz to 5MHz   | Accuracy           | 1% of reading up to 1MHz<br>5% of reading above 1MHz to 5MHz for power measurements (forward and reflected) at VSWR = 3. | Size   | approx 305 x 230 x 45mm "tablet" style                               |
| Low level input                         |  | output level                  | 5V rms into high impedance  |                    |  | Weight   | 2.3Kg  |
| Max input                               | ±10V peak  | output impedance              | 50Ω +/-2% +24dBm<br>75Ω +/-2% +22dBm<br>600Ω +/-2% +15dBm   |                    |  | Power source   | 9 – 18V @ 3A<br>AC adapter or 12V dc from car or external batteries  |
| Input impedance                         | 50Ω ±1% // 30pF<br>120Ω ±1% // 30pF<br>600Ω ±1% // 30pF<br>1MΩ ±5% // 30pF   | Frequency Shift Delay Timer   | 0 to 1s (1ms steps)   |                    |  | Battery type and Battery life                                    | Re-Chargeable Lithium-Ion<br>Minimum 4 Hours                         |
|   |  | IMPEDANCE ANALYZER            |   | Features           | Forward Power, Reflected Power, % Reflected Power, & Frequency under test visible on one screen.                         | Newtons4th Ltd<br>1 Bede Island Road<br>Leicester<br>LE2 7EA, UK |  |
|   |  | Impedance range               | 100 milli Ohm to 100 kilo Ohm   |                    |  |  |  |
| Input (Balanced)                        |  | Accuracy                      | <10KHz: 1% rdg.<br><1MHz: 1% rdg + 0.005%/KHz + 50uV.<br><5MHz: 5% rdg + 0.002%/KHz + 50uV.   |                    |  |  |  |
| Max input                               | ±10V peak  | Features                      | LCR Measurements (Inductance, Capacitance, Resistance, tan delta, QF)<br>Lead compensation (zero lead function)<br>Impedance versus Frequency Curve |                    |  |  |  |
| Input impedance                         | As Low level input   |                               |   |                    |  |  |  |
| Input type                              | differential   |                               |   |                    |  |  |  |
| Input connection                        | 3 x 4mm connectors - positive, negative, and ground  |                               |   |                    |  |  |  |