Congratulations! You purchased the – Probe PI-SH. Please, read this manual to get the most benefits from this innovative probe.

Serial Number: ____________________________

PI-SH 1 Rev. 1
Disclaimer

- Use of Probe PI-SH for cell phone power evaluation is meaningful only for the models operating in the same broadcast standard. Evaluation of the SAR (specific absorption rate) requires special techniques, see www.fcc.gov.
- Probe PI-SH is not intended to be used for critical RF safety and medical type applications. Manufacturer doesn’t assume any responsibilities for the results and their consequences.

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1. **Description of Probe PI-SH**

Probe PI-SH (FCC or ICNIRP) is an isotropic electric field probe with shaped frequency response meeting the FCC or ICNIRP RF safety standards for occupational and general public (partially, see the specified frequency ranges below) exposure limits. Meter readings are shown in % of the STD - standard reference level, eliminating the need to know the source frequency. Probe output is proportional to RF power density in the whole specified power range, producing the correct RF power measurements in single and multi-signal environments, typically present at multiple antenna sites.

Probe PI-SH consists of probe head with integrated handle. Probe sensor uses 3 probe antennas positioned normal to each other. Signals from antennas are combined to allow output signal of probe PI-SH to be spatially nearly constant (isotropic), regardless of the electromagnetic field direction. Probe handle contains the RF isolation network reducing the effects of the probe cable and meter body on probe reading. The output of the probe connects to the RFP-05M meter performing the display, data storage and PC connectivity functions.

2. **Probe Selection**

There are two different PI-SH probes: PI-SH-FCC and PI-SH-ICNIRP. Selection of the right probe is done on screen menu of the RFP-05M meter according to the following sequence: Menu->Setup->Probe->PRB: Select Probe2 (FCC) or Probe4 (ICNIRP)-> Back->Menu-> Measure.

Measure screen also allows selection of the standard type by toggling the STD button: Occupational/ General Population (FCC) or Occupational/General Public (ICNIRP).

3. **Probe Frequency and Power Density Response**

Every Probe PI-SH-FCC has frequency shaped response meeting the FCC 1997 exposure limits for occupational environment. Every Probe PI-SH-ICNIRP has frequency shaped response meeting the ICNIRP 1998 exposure limits for occupational environment.

According to the above standards, the meter display reading is presented in % of the RF field power density reference level (in W/m² or mW/cm²) according to the following frequency plots:
Every probe comes with measured frequency response, documented in Calibration Report supplied with every unit. The deviation from the standard is noted and can be taken into account to increase the accuracy in cases when the frequency of the dominant RF signal is known. Probe output signal is proportional to the RF field power density in the whole specified probe power range. To increase the accuracy at very high power density levels (100-1000%) meter performs the additional linearization. It is done automatically and requires no user interaction. Probe linearity plots are also provided as part of the Calibration Report.

4. Tripod Mounting

Probe handle can be mounted on non-metal table tripod supplied with system. This gives to the user a possibility to position the Probe PI-SH in various orientations to secure it at a distance in order to reduce measurement errors caused by the effects of the conductive objects or operators body.

To install the probe handle on tripod - use the nylon clip supplied with system. Remove the stock black screw from the tripod, install the supplied thumbwheel screw and secure the probe in clip with nut.

In order to get an accurate field strength reading – keep all conductive parts (including cable, operator hands, etc.) away from the probe head.

For field or lab use when probe must be positioned at certain height - order the optional variable height non-metal tripod.
5. Handling and Maintenance

In spite of the rugged design this probe requires gentle and responsible handling. Please, use the following practices when using this instrument:

- **Use only when Probe PI-SH is completely dry.**
- Do not immerse into water, neither leave under the rain or snow uncovered. If wet – allow instrument to dry for 24 hours in dry ventilated place before use.
- **Do not attempt to open the probe head - there are no user serviceable parts inside.**
- Instrument is supplied in hard case with padded insert – use it for storage and transportation.
- **When connecting or disconnecting the probe handle - apply gentle force. Do not over-tighten the connectors.**
- **Do not use the instrument near AC lines or high voltage sources due to a safety risk for the operator (!).**
- **Do not connect meter metal case to any AC power lines or other unspecified metal objects due to the risk of electric shock (!).**
- To clean the Probe PI-SH use soft tissue wetted with mild household glass cleaner (weak ammonia solution). Do not use the solvents that may damage plastic parts.
- If there is ever a need to clean the connectors – use cotton swab wetted with alcohol. Let it dry before use.

6. Measurement Hints

Operation of the Probe PI-SH requires the user to be trained and certified for proper RF safety test techniques. For the best accuracy of measurements few things should be noted:

- **Keep unit calibrated.** Calibrate once a year in our UK NPL traceable EMC Test Lab.
- Every probe has its maximum field limit. Probe will tolerate the higher fields but in the case of severe overload probe may be damaged.
- In the presence of very high electromagnetic fields - connect probe to the meter with supplied cable and keep the meter away (and stay away) from high field strength area.
- The power density is displayed as % of the standard reference level which is for Occupational standards 10 W/m²=1 mW/cm² @100 MHz and is 5 times smaller for General Population/Public ones. At other frequencies the value of the standard reference level changes according the frequency response specified by the standards.
- The relationship between field strength (V/m) and power density (W/m²) for far field plane waves having wave impedance of 377 Ohms, is \( S=E^2/377 \).

7. External AC Fields

PI-SH probe is designed to be immune to the external AC fields of the 50/60 Hz. In case of harsh environment with strong fields outside of the frequency range of the instrument the following tips will reduce the measurement errors:

- **Use FOLK-02 fiber optic link kit when connecting meter to a PC.**
- **Do not operate with AC power supply connected – use battery power.**

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8. System Specification of Probe PI-SH

- **Probe variants:** PI-SH-ICNIRP and PI-SH-FCC
- **Frequency range:**
  - 100KHz-8 GHz (Occupational exposure)
  - 10 MHz-8 GHz (General public: ICNIRP)
  - 3 MHz-8 GHz (General population: FCC)
- **Diode based:** 3-Axial isotropic sensor, composite output.
- **Power density range:** 0.5-1000% of STD.
- **Probe power nonlinearity:** Less than 3 dB (0.5-1000%).
- **Readout power nonlinearity:** Less than 1 dB (0.5-1000%).
- **Maximum displayed power density:** 2000%
- **Probe damage power density:** >10,000%
- **Rotational isotropicity:** +/-1dB (0.1 MHz-1GHz), +/-3dB(1-8GHz)
- **Proportionresponse:** Per STD, deviation - less than 3 dB (documented).
- **Calibration accuracy:** 1 dB (@100 MHz).
- **Temperature:** 0-50°C,
- **Humidity:** RH 10-90%, non-condensing.
- **Temperature error:** <0.05 dB/°C
- **Calibration:** UK NPL (UK National Physics Lab) traceable.
- **Small size:** LxD: 9.0x2.25 inch, 230x58 mm.
- **Weight:** 0.2 lb, 100 g.
- **Supporting equipment:** RFP-05M meter.
- **Country of origin:** Designed and made in the USA

**Note:** This Specification may be changed without notice due to continuous improvement of the design and manufacturing process.
9. Operation of the Meter RFP-05M with Probe PI-SH

- Measure screen shows the reading in % of STD power density.
- Readings can be from 0.1% to 2000%.
- For signals producing less than 0.1% of STD value, display shows <0.1%, for signals exceeding 2000%, display shows >2K% indicating the overload.
- Above the number in the center of the Measure screen there are two lines showing the selected probe standard (FCC or ICNIRP) and standard type (Occupational or General Population/Public), changeable by STD key.
- Lower left key AVG toggles between averaged and non-averaged operation. Occupational standards (both FCC and ICNIRP) require 6 min averaging that is set by default. General Population FCC standard requires 6 min averaging; General Public ICNIRP standard requires 30 min averaging. The averaging time can be changed by lower left key Mode.
- The RFP-05M meter uses “sliding power density averaging” algorithm.
- In NORD display mode (Normal Display) center reading is always an instant one. To see the averaged reading (when enabled) push MAXD display key at bottom right.
- To start the measurements with averaging press STRT key.
- The number above MAXD key represents the maximum averaged reading.
- There is also a red horizontal bar indicating the lapsed time during which the averaging was done. After achieving the 6 min or 30 min mark (as selected) there is a beep indicating that the required averaging time has been achieved. Unit will continue averaging indefinitely to allow the number above MAXD to reflect the maximum averaged value over the greater time if desired.
- To stop the reading push STRT key again. This will reset the bar and the number above the MAXD.
- Other functions of the meter (Alarm, Data Logging, etc.) are not different from other probes, see RFP-05M Users Manual.
10. Limited Warranty

The manufacturer (EMC Test Design, LLC) warrants the product to be free from defects in material and workmanship under normal use and service for the period of 1 (one) year from the date of purchase. This warranty extends only to the original buyer or end use customer of a manufacturer-authorized distributor.

Manufacturer’s warranty obligation is limited, at manufacturer’s option, to refund of the purchase price, or free of charge repair or replacement of a defective product, which is returned to an authorized distributor or manufacturer within the warranty period.

To obtain the warranty service, contact your authorized distributor. Buyer pays for the insured shipping of the unit to be returned or serviced. Manufacturer doesn’t assume any risk for damage in transit. Following the warranty repair, the product will be returned to the buyer, transportation prepaid. Manufacturer authorized distributors have no authority to extend the warranty on behalf of the manufacturer.

If manufacturer determines that the failure was caused by misuse, negligence, accident or abnormal condition of operation and handling, manufacturer will provide an estimate of the repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the buyer, transportation prepaid, after customer has paid for the repair and return transportation charges.

The typical examples of product abuse which void the warranty are: broken probe head or probe handle connector, damaged cable, damaged electronics due to misuse or negligence, etc. We will void the warranty if product has been opened, altered or repaired by unauthorized personnel.

This warranty is purchaser’s sole and exclusive remedy and is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability or fitness for a particular purpose.

EMC Test Design shall not be liable for any special, indirect, incidental or consequential damages or losses, including loss of data, whether arising from breach of warranty or based on contract, tort, reliance or any other theory.

The limitations and exclusions of the warranty may not be applicable to every buyer depending on the laws of the land of residence.

Buyer has the rights to return the unit within 14 (fourteen) days from the date of purchase using the insured prepaid carrier, in mint condition in undamaged original package with all accessories and documentation for replacement or refund. In case of refund the restocking fee of $10% will be charged.
11. Declaration of Conformity

We, the offerer: EMC Test Design, LLC
P.O. Box. 600532, Newton, MA 02460, USA
acknowledge our sole responsibility, that the product:
Kind of equipment: Electronic Test Instrument
Type designation: Probe PI-SH

in accordance with EMC Directive 2004/108/EC is in compliance with the following norms and documents:

EN 61326-1: 2006, specifically:
EN 55011: 2007, Class B,
IEC 61000-4-2: 2001,
IEC 61000-4-3: 2006.

Test laboratory: EMC Test Design, LLC
P.O. Box 600532, Newton, MA 02460, USA

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in accordance with Low Voltage Directive 2006/95/EC,
is in compliance with the following norms and documents:

IEC 61010-1: 2001-2,

Test laboratory: EMC Test Design, LLC
P.O. Box 600532, Newton, MA 02460, USA

Technical File is kept at the company's headquarter:

EMC Test Design, LLC
P.O. Box 600532, Newton, MA 02460, USA

June 2011, 2011
President of EMC Test Design, LLC
12. About EMC Test Design, LLC

EMC Test Design, LLC is a company created and driven by professionals with background in RF, Analog and Digital Electronics with particular expertise in Electromagnetic Compatibility (EMC). We design electronic products for EMC testing and offer custom solutions for in-house EMC testing and prequalification. We served the EMC needs of our customers since 1992. Our newest product addition to Smart Fieldmeter® line of products is

Frequency Shaped Probe PI-SH.

This probe was designed as a response to our customer requests for EM isotropic frequency shaped field probe capable of assessing the RF safety of the various environments per FCC and ICNIRP standards. Probe PI-SH is designed and manufactured in Boston, MA and we are proud of it. Our office is located in Newton, MA, USA.
This Page is left for Calibration Report.