

PRO

High-performance Spectrum Analyzer



HIGHLIGHTS:

- 9 kHz to 43 GHz frequency range
- Continuous frequency support for FR1 & FR2 5G NR bands
- Ideal for field use due to its high performance, ruggedized design and long battery operating time
- Support Over-the-air measurement for 5G NR and LTE signal analysis
- Optimal performance for field use with full touch operation
- 3-yr standard warranty



DESCRIPTION

The INNO's PRO high-performance spectrum analyzer is rugged, handy and designed for use in the field; it can be used for maintaining or installing cell site transmitter systems, checking and assessing wireless telecommunications signal quality and service for outdoor applications;

HIGH PERFORMANCE HANDHELD SPECTRUM ANALYZER

The PRO high-performance mmWave Spectrum Analyzer is the industry's most advanced and versatile handheld instrument for base station deployment and troubleshooting. Its excellent RF performance of DANL -160 dBm, the PRO is designed to suit for indoor and outdoor environments for locating, identifying, recording, and solving cell sites problems without sacrificing measurement accuracy.

OPTIMAL TOOL FOR 5G SPECTRUM ANALYSIS

Continuous frequency coverage, 9 kHz to 43 GHz for sub-6 GHz and mmWave 5G NR measurements provides the cell-site maintenance professional the best performance need for a large number of applications from the legacy technologies and the most demanding measurements for 5G testing (FR1 & FR2 frequency bands)

HIGHLY EFFECTIVE SIGNAL ANALYSIS SOLUTION

Combine with persistent display in Real-time Spectrum Analysis capabilities, the PRO high-performance spectrum analyzer's sophisticated software enables efficient measurement for 5G NR RF and demodulation analysis per 5G NR standards. This saves effort, time and cost for mobile operators working to eliminate operating problems and maximize productivity and network Quality of Services.

KEY FEATURES

- Spectrum Analyzer 9 kHz to 43 GHz
- Real-time Spectrum Analyzer 50 MHz and 100 MHz bandwidth
- 5G NR Signal Analysis include transmitter spurious measurement to 12.75 GHz with Over-The-Air transmitter testing
- Continuous frequency support for 5G NR FR1 & FR2 bands
- LTE / LTE-A FDD Signal Analysis
- LTE / LTE-A TDD Signal Analysis



DEFINITIONS

All specifications apply at 23 °C (± 5 °C), unless otherwise stated, and 90 minutes after the instrument has been turned on. Specifications include guard bands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

Typical (typ.) describes performance that will be met by a minimum of 80% of all products. It is not guaranteed by the product warranty.

Nominal (nom.) a general, descriptive term or design parameter. It is not tested, and not covered by the product warranty.

GENERAL SPECIFICATION

ITEM	SPECIFICATIONS	CONDITIONS
CALIBRATION CYCLE	1 year	<i>Recommended</i>
WARRANTY	3 years	
WARM-UP TIME	No warm-up required	
WEIGHT	≤ 3.9 kg	
SIZE	306 (W) x 222 (H) x 90 (D) mm	
DISPLAY	10.1" transfective LCD with anti-glare coating	
TEMPERATURE		
OPERATING, AC POWER	-10 to 55 °C	
OPERATING, BATTERY	-10 to 50 °C	
STORAGE	-51 to 71 °C	
ENVIRONMENTAL		
HUMIDITY	95 % RH (non-condensing)	
ALTITUDE	4,600 m	
ELECTROMAGNETIC COMPATIBILITY	European Union: CE Mark, EMC Directive 2014/30/EU Interference: EN 61326-1 Emissions: EN 55011 Immunity: EN 61000-4-2/3/4/5/11 Australia and New Zealand: RSM South Korea: KCC	
SAFETY	EN 61010-1:2010, IEC 60950-1	
MECHANICAL RESISTANCE		
EXPLOSIVE ENVIRONMENT	Vibration: MIL-PRF-28800F Class 3 Shock: MIL-PRF-28800F 1-4/MIL-PRF-28800F Bench handling: MIL-PRF-28800F Class 3 Transit drop: MIL-PRF-28800F Class 2	<i>Non-Operating Operating/Non-Operating Operating Non-operating</i>
POWER SUPPLY		
EXTERNAL DC INPUT	19 Vdc INNO adaptor Input: AC 100 – 240 V, 50/60 Hz Output: DC 19 V, 3.42 A	
BATTERY		
LITHIUM ION	7,800 mAh	
OPERATING TIME	≥ 3 hours	
CHARGE TIME	A fully discharged battery takes about 2 hours to 80 % recharge	
DISCHARGE TEMPERATURE	-10 to 60 °C, < 85% RH	
CHARGE TEMPERATURE	0 to 45 °C, < 85% RH	<i>80 % charge for 2hrs</i>
STORAGE TEMPERATURE	-20 to 50 °C, < 85% RH	
CONNECTIVITY	2 x USB 2.0, 1 mini USB, LAN 1000/100/10 Base-T	

GENERAL SPECIFICATION (cont'd)

ITEM	SPECIFICATIONS	CONDITIONS
DATA STORAGE		
INTERNAL STORAGE	Internal Minimum: 4 GB	
EXTERNAL	Supports USB 2.0 compatible memory devices	
DATA TYPES	Trace, Trace+State, Image(png), Data (csv)	
CONNECTOR		
RF IN	9 kHz to 40 GHz: 2.92 mm (m) 40 GHz to 43 GHz: 2.4 mm (m)	<i>without adapter</i>
REFERENCE OUT	BNC (f), 10 MHz, 0 dBm	
REFERENCE IN/TRIGGER IN (EXTERNAL TRIGGER)	BNC (f), 10 MHz, 13 MHz, 15 MHz (TTL level), Max +15 dBm External Trigger Max +6 V	
GPS	BNC (f)	
HEADSET JACK	3.5 pi Audio Jack	
IF OUT	BNC (f), 50 Ω, 276.48 MHz (nominal)	
SYSTEMS		
DISPLAY / SOUND / DATE / TIME	Sleep Time, Display Mode, LCD Brightness, Date and Time, Sound	
NETWORK SETTINGS	Remote Interface, Wi-Fi Configuration, GPS	
SELF-TEST	Quick diagnostics	
UPGRADE	USB Firmware update	

SPECTRUM ANALYZER SPECIFICATION

ITEMS	SPECIFICATIONS	CONDITIONS
FREQUENCY		
FREQUENCY RANGE	9 kHz to 43 GHz	
FREQUENCY SPAN	100 MHz real-time 9 kHz - 43 GHz swept	
FREQUENCY SPAN ACCURACY	≤ ±1.2 %	
FREQUENCY RESOLUTION	1 Hz	
FREQUENCY REFERENCE		
ACCURACY	Aging: ±0.5 ppm/year Accuracy: ±0.1 ppm (25 °C)+ aging Temperature drift: : ±0.3 ppm	
ACCURACY WITH GPS	±10 ppb ±25 ppb	GPS Lock Hold over (24 hrs, after 30 mins of GPS lock)
FREQUENCY READOUT ACCURACY	±(readout frequency x frequency reference accuracy + 1.2 % x SPAN + RBW centering + 0.5 x horizontal resolution) Horizontal resolution = frequency span / (trace points – 1) RBW centering: 16 % x RBW,	
MARKER FREQUENCY COUNTER	±(marker frequency x frequency reference accuracy + counter resolution)	1 Hz
SWEEP TIME		
SWEEP TIME	0.31 GHz @100 kHz RBW 424 GHz @5 MHz RBW 270 GHz @3 MHz RBW 43 GHz @1 MHz RBW 2.8 GHz @300 kHz RBW	Sweep mode
TRACE UPDATE	≥ 17 trace/sec	
ACQUISITION		
IF BANDWIDTH	100 MHz	
FFT LENGTHS	16,384 (max)	
MAXIMUM ACQUISITION TIME	6.35 s	
PROBABILITY OF INTERCEPT (POI)	≥ 9.3 us @Span=100 MHz ≥ 18.6 us @Span=50 MHz	
BANDWIDTHS		
RESOLUTION BW	1 Hz to 5 MHz (1-3-10 Sequence)	
RESOLUTION BW ACCURACY	±5 %	
VIDEO BW	1 Hz to 5 MHz (1-3-10 Sequence), ±5 %	

SPECTRUM ANALYZER SPECIFICATION (cont'd)

ITEM	SPECIFICATIONS	CONDITIONS
AMPLITUDE		
MEASUREMENT RANGE	DANL to +20 dBm	
ATTENUATOR RANGE	0 to 50 dB in 5 dB steps	
PREAMPLIFIER	9 kHz to 43 GHz: +20 dB	
MAX RF INPUT OPERATING LEVEL	+20 dBm, ±50 VDC	
MAXI RF INPUT LEVEL WITHOUT DAMAGE	+27 dBm, ±50 VDC	<i>Max continuous input</i>
DISPLAY RANGE	1 to 20 dB/Div in 1 dB step	<i>10 divisions display</i>
LOG SCALE AND UNITS	dBm, dBV, dBmV, dBμV, dBW, dBmW, dBμW, dBA, dBmA, dBμA nV, μV, mV, V, kV, nW, μW, mW, W, kW, fA, pA, nA, μA, mA, A	
AMPLITUDE ACCURACY	+23 ± 5 °C 9 kHz to 2 MHz: ±1.3 dB (±0.6 dB typical) > 2 MHz to 15 GHz: ±1.0 dB (±0.5 dB typical) > 15 GHz to 23 GHz: ±1.1 dB (±0.6 dB typical) > 23 GHz to 40 GHz: ±1.8 dB (±0.8 dB typical) > 40 GHz to 43 GHz: ±2.5 dB (±1.0 dB typical)	<i>-30 dBm input, 10 dB attenuation, preamplifier off, 300 Hz RBW, auto-coupled, after 30 minutes of warm-up</i>
REFERENCE LEVEL	-180 dBm to +30 dBm	
INPUT VSWR		
VSWR	9 kHz to 20 GHz: 1.7 : 1 (nominal) 20 GHz to 43 GHz: 2.0 : 1 (nominal)	<i>0 dB attenuation</i>
TRACES		
DETECTORS	Normal, Positive peak, Negative peak, Sample, Average (RMS)	
STATES	Clear/write, Max Hold, Min Hold, Capture, Load	
AVERAGE	1 to 10,000	
NUMBER	6, all six can be active simultaneously and in different states	
POINT	801 <i>(arbitrary 2 to 10,001 settable through SCPI)</i>	
MARKER		
NUMBER OF MARKER	6	
TYPE	Normal, delta, delta pair, marker table	
FUNCTIONS	Noise Marker, Frequency Counter Marker	
MARKER TO	Peak Search, Next Peak, Next Peak Left/Right, Marker > Center/start/stop	

SPECTRUM ANALYZER SPECIFICATION (cont'd)

ITEM	SPECIFICATIONS	CONDITIONS
DYNAMIC RANGE		
DISPLAYED AVERAGE NOISE LEVEL (DANL) PREAMP OFF	23 ± 5 °C 9 kHz to 2 MHz: -135 dBm, -139 dBm (typical) > 2 MHz to 2.6 GHz: -144 dBm, -148 dBm (typical) > 2.6 to 7.5 GHz: -142 dBm, -146 dBm (typical) > 7.5 to 18 GHz: -140 dBm, -144 dBm (typical) > 18 to 29 GHz: -134 dBm, -140 dBm (typical) > 29 to 38 GHz: -133 dBm, -135 dBm (typical) > 38 to 43 GHz: -132 dBm, -134 dBm (typical)	<i>Input terminated, RMS detector, log averaging, 0 dB attenuation, reference level -50 dBm, normalized to 1 Hz RBW</i>
DISPLAYED AVERAGE NOISE LEVEL (DANL) PREMAP ON	23 ± 5 °C 9 kHz to 2 MHz: -135 dBm, -139 dBm (typical) > 2 MHz to 2.6 GHz: -162 dBm, -166 dBm (typical) > 2.6 to 7.5 GHz: -160 dBm, -163 dBm (typical) > 7.5 to 18 GHz: -159 dBm, -160 dBm (typical) > 18 to 29 GHz: -151 dBm, -155 dBm (typical) > 29 to 38 GHz: -148 dBm, -150 dBm (typical) > 38 to 43 GHz: -145 dBm, -148 dBm (typical)	<i>Input terminated, RMS detection, log averaging, 0 dB attenuation, reference level -50 dBm, normalized to 1 Hz RBW</i>
INHERENT RESIDUAL RESPONSE	100 kHz to 10 MHz: -95 dBm > 10 MHz to 1 GHz: -100 dBm > 1 GHz to 30 GHz: -100 dBm > 30 GHz to 43 GHz: -100 dBm	<i>Input terminated, preamp off, 0 dB attenuation</i>
INPUT RELATED SPURIOUS SPURIOUS FREE DYNAMIC RANGE (SFDR)	< -75 dBc	
THIRD ORDER INTERCEPT (TOI)	50 MHz to 4 GHz: +19 dBm (typical) 4 GHz to 13 GHz: +13 dBm (typical) 13 GHz to 43 GHz: +11.5 dBm (typical)	
SECOND HARMONIC DISTORTION	< -75 dBc	
DYNAMIC RANGE	>102 dB @ 2 GHz 2/3 (TOI-DANL) in 1 Hz RBW	
SSB PHASE NOISE	-106 dBc/Hz @ 10 kHz offset (typical) -112 dBc/Hz @ 100 kHz offset (typical) -118 dBc/Hz @ 1 MHz offset (typical) -120 dBc/Hz @ 10 MHz offset (typical)	<i>CF= 1 GHz @ -10 to 55 °C</i>
TRIGGER (FOR ZERO SPAN AND FFT)		
TRIGGER TYPE (SOURCE)	Free Run, Video, Periodic, External, GPS	<i>FMT (Frequency Mask Trigger) in RTSA Mode</i>
TRIGGER SLOPE	Rise and Fall	
TRIGGER DELAY	0 to 20 s	
AUTO TRIGGER	Periodic Trigger	
GATED SWEEP		
TRIGGER	Periodic, External GPS	
POLARITY	Rising, Falling	
IF TRIGGER LEVEL	-80 dBm to +20 dBm	
GATED DELAY	0 to 20 s	
GATED LENGTH	100 ns to 20 s	

SPECTRUM ANALYZER SPECIFICATION (CONT'D)

MEASUREMENTS	ITEMS
CHANNEL POWER	Total Channel Power (dBm), Bandwidth (MHz), PSD (dBm/Hz), Limit Test (Pass/Fail test)
OCCUPIED BANDWIDTH	Occupied Power (%), Total Power (dBm), Occupied Bandwidth (MHz), x dB Power (dB), x dB Bandwidth (MHz), Limit Test (Pass/Fail test)
ACP	Main / Adjacent / Alternate Channel Power (Absolute (dBm) / Relative (dBc)), Main / Adjacent / Alternate Channel Bandwidth (MHz)
SPECTRUM EMISSION MASK	Pre-defined Mask Setting, Limit Test (Pass/Fail test)
SPURIOUS EMISSIONS	Frequency Range, Peak Power (dBm), Peak Frequency (MHz), Limit Test (Pass/Fail test),
GATED SWEEP	Gate Delay, Gate Length, Trigger Source, Time View

5G NR SPECIFICATIONS

MEASUREMENTS	ITEMS
5G NR RF CHANNEL POWER	Total Channel Power, Peak to Average Power Ratio
	Total PSD
	Limit Test
5G NR RF OCCUPIED BANDWIDTH	Occupied Bandwidth, Peak to Average Power Ratio
	Total Power
	X dB Bandwidth
5G NR DEMODULATION BEAM ANALYSIS	Limit Test
	Multi Beam: Physical Cell ID, Sector ID, Cell Group, Frequency Error, Time Offset, SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB), Sync and Demodulation Status Indicators, Power (dBm)
	Single Beam: Physical Cell ID, Sector ID, Cell Group, Frequency Error, Time Offset, SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB), Sync and Demodulation Status Indicators, Average EVM, Peak EVM (@subcarrier/symbol), Power (dBm)
5G NR EIRP	PCI Scanner: Multiple PCI, Beam Index, SS-RSRP, SS-RSRQ, SS-SINR, SS-EVM of each Beam
	Rx Antenna Gain, Rx Cable Loss, Distance, Path Loss, Max Hold Count, Channel Bandwidth, EIRP, Max EIRP
	Limit Test

5G NR DEMODULATOR

ITEM	SPECIFICATIONS	CONDITIONS
5G NR DEMODULATION		
FREQUENCY RANGE	10 MHz to 43 GHz	5G NR FR1 & FR2 Bands
INPUT SIGNAL RANGE	-75 dBm to +20 dBm	
CHANNEL POWER ACCURACY	±1.0 dBm typical	
FREQUENCY ERROR	≤ 10 Hz + time base error, typical	
RESIDUAL EVM (RMS)	±2.0 % typical (PBCH)	
BANDWIDTH	5 MHz, 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz	

LTE FDD SPECIFICATIONS

MEASUREMENTS	ITEMS
LTE FDD DEMODULATION	Constellation: RSRP, EVM RMS / Peak, Data EVM (QPSK,16QAM, 64QAM, 256QAM), Frequency Offset (Hz, ppm), Time Offset (ns)
	Data Channel: RB Power Diagram, Constellation, Modulation Type, RB Power, EVM RMS / Peak, IQ Offset (dB)
	Control Channel: P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS Power (dBm), EMV (%), Modulation Type, Frequency Offset
	Power vs. Time Frame Analysis: Frame Average Power (dBm), Frequency Offset (Hz), OFDM Symbol Power (dBm), IQ Offset (dB), EVM RMS / Peak, Data EVM RMS / Peak
LTE FDD OTA	Channel Scanner, ID Scanner, Control Channel, Datagram
LTE FDD CARRIER AGGREGATION	Frequency, Bandwidth, Channel Power, RS Power, RS Delta Power, S-SS Power, EVM RMS / Peak, Frequency Offset, Time Error, Cell ID of each Carrier Component
LTE FDD RF ANALYSIS	Channel Power, Occupied Bandwidth, Spectrum Emission Mask (SEM), Adjacent Channel Leakage power Ratio (ACLR)

LTE FDD DEMODULATOR

ITEM	SPECIFICATIONS	CONDITIONS
LTE FDD DEMODULATION		
FREQUENCY RANGE	E-UTRA Bands 1 to 14, 17 to 21, 23 to 32, 66A	
INPUT SIGNAL RANGE	-60 to +20 dBm	
CHANNEL POWER ACCURACY	±1.0 dBm typical	
FREQUENCY ERROR	≤ 10 Hz + time base error, typical	
RESIDUAL EVM (RMS)	±2.0 % typical	
BANDWIDTH	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, and 20 MHz	

LTE TDD SPECIFICATIONS

MEASUREMENTS	ITEMS
LTE TDD DEMODULATION	Constellation: RSRP, EVM RMS / Peak, Data EVM (QPSK,16QAM, 64QAM, 256QAM), Frequency Offset (Hz, ppm), Time Offset (ns)
	Data Channel: RB Power Diagram, Constellation, Modulation Type, RB Power, EVM RMS / Peak, IQ Offset (dB)
	Control Channel: P-SS, S-SS, PBCH, PCFICH, PHICH, PDCCH, RS Power (dBm), EMV (%), Modulation Type, Frequency Offset
	Power vs. Time Frame and Slot Analysis: Frame Average Power (dBm), Frequency Offset (Hz), OFDM Symbol Power (dBm), IQ Offset (dB), EVM RMS / Peak, Data EVM RMS / Peak
LTE TDD OTA	Channel Scanner, ID Scanner, Control Channel, Datagram
LTE TDD CARRIER AGGREGATION	Frequency, Bandwidth, Channel Power, RS Power, RS Delta Power, S-SS Power, EVM RMS / Peak, Frequency Offset, Time Error, Cell ID of each Carrier Component
LTE TDD RF ANALYSIS	Channel Power, Occupied Bandwidth, Spectrum Emission Mask (SEM), Adjacent Channel Leakage power Ratio (ACLR)

LTE TDD DEMODULATOR

ITEM	SPECIFICATIONS	CONDITIONS
LTE TDD DEMODULATION		
FREQUENCY RANGE	E-UTRA Bands 1 to 14, 17 to 21, 23 to 32, 66A	
INPUT SIGNAL RANGE	-60 to +20 dBm	
CHANNEL POWER ACCURACY	±1.0 dBm typical	
FREQUENCY ERROR	≤ 10 Hz + time base error, typical	
RESIDUAL EVM (RMS)	±2.0 % typical	
BANDWIDTH	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, and 20 MHz	

ORDERING INFORMATION

PART NUMBER	OPTION	DESCRIPTION
TM04300001	Base platform	Spectrum Analyzer, base platform (Must be ordered with ONE frequency option)
TM04300015	Spectrum Analyzer, 15 GHz frequency option	5G SMART Spectrum Analyzer, 9 kHz to 15 GHz frequency
TM04300043	Spectrum Analyzer, 43 GHz frequency option	5G PRO Spectrum Analyzer, 9 kHz to 43 GHz frequency
TM04300010	Real time spectrum analyzer	Real time spectrum analyzer
TM04300011	Gated sweep	Gated sweep to capture time-varying signal and display it onto time-domain (gate delay, gate length, gate period, etc)
TM04300013	5G NR signal analyzer	5G NR signal analyzer include RF analysis, Beam analysis, and EIRP
TM04300014	LTE/LTE-A FDD analyzer	LTE/LTE-A FDD demodulation include RF analysis, Modulation analysis, OTA analysis, and Carrier Aggregation
TM04300015	LTE/LTE-A TDD analyzer	LTE/LTE-A FDD demodulation include RF analysis, Modulation analysis, OTA analysis, and Carrier Aggregation
TM04300018	100 MHz analysis bandwidth	100 MHz analysis bandwidth
TM04300GPS	GPS receiver and antenna	GPS receiver and screw-mount antenna
TM04300100	Warranty Extension of 1yr for Asia and North America	Warranty Extension of 1yr for Asia and North America
TM04300101	Warranty Extension of 1yr for Latin America and EMEA	Warranty Extension of 1yr for Latin America and EMEA
TM04300200	Calibration Services for Asia and North America	Calibration Services for Asia and North America
TM04300201	Calibration Services for Latin America and EMEA	Calibration Services for Latin America and EMEA
TM04300300	Soft Carrying Case	Soft carrying case for 5G-series spectrum analyzer
TM04300301	Backpack	Backpack for 5G-series spectrum analyzer
TM04300302	Hard Carrying Case	Hard carrying case for 5G-series spectrum analyzer
TM04300400	Li-ion Battery	Li-ion battery, 7800 mAh
TM04300700	RF cable SMA(m) to SMA(f) x 10 m	RF cable SMA (m) to SMA (f) x 10 m, 3.5 GHz @ Attenuation 5 dB or less
TM04300701	RF cable Type N(m) to Type N(m) x 2 m	RF cable Type N(m) to Type N(m) x 2 m, DC to 15 GHz
TM04300702	RF cable 2.4 mm(f) to 2.92 mm(m) x 2 m	RF cable 2.4 mm(f) to 2.92 mm(m) x 2 m, DC to 46 GHz
TM04300800	Adapter, SMA(f) to BNC(m)	Adapter, SMA(f) to BNC(m)
TM04300801	Adapter, 2.4 mm(f) to 2.92 mm(m)	Adapter, 2.4 mm(f) to 2.92 mm(m)

**) Standard Accessories*

1. AC/DC Adapter
2. Lithium-Ion Battery
3. Soft carrying case
4. Hand Strap
5. Shoulder Strap
6. Stylus Pen
7. Cross LAN Cable, 1.8 m
8. USB Memory Stick

www.innoinstrument.com



Visit us at www.innoinstrument.com

You dream,
WE DESIGN

Copyright ©2019 INNO Instrument Inc. All rights reserved.
E-22F, 30, Songdomirae-ro, Yeonsu-gu, Incheon 21990, Republic of Korea
tel 82 32 837 5600 fax 82 32 837 5601

5G PRO Spectrum Analyzer Technical Datasheet Rev. 1.6
Product specifications and descriptions in this document subject to change without notice