thinkRF™ R5550

Real-Time Spectrum Analyzer

9 kHz to 8 GHz / 27 GHz

COMPACT & LIGHT DESIGN

257.3 x 193.7 x 60 mm
(10.13” x 7.63” x 2.36“)
2.54 kg (5.6 lbs)

SILENT

Fanless design for quite operation

NETWORKING CAPABILITY

Designed for remote deployment

OVERVIEW

R5550
Real-Time Spectrum Analyzer

Compact, fanless, networked and remote deployable real-time spectrum analyzers

1

9 kHz to 8 or 27 GHz

2

0.1 / 10 / 40 / 100 / 160 MHz*
Real-time bandwidth (RTBW)

3

Up to 28 GHz/s @ 10 kHz RBW
Sweep Rate

4

17 W (408) - 23 W (427) @
12V input power consumption

5

257.3 x 193.7 x 60 mm
(10.13" x 7.63" x 2.36")
Compact

6

2.54 kg (5.6 lbs)
Light

The performance of traditional lab-grade spectrum analyzers at a fraction of the cost, size, weight and power consumption.

thinkRF™ makes the cost-effective testing and monitoring of billions of wireless devices possible. Built on innovative software-defined radio technologies, the thinkRF R5550 Real-Time Spectrum Analyzer has the performance of a traditional lab-grade spectrum analyzer at a fraction of the cost, size, weight and power consumption.

Designed for distributed deployment in the lab, in the field, or in a vehicle, the portable, fanless thinkRF R5550 provides the benefits of a high-performance software-defined RF receiver, digitizer and analyzer.

The R5550 analyzer is silent, lightweight, and offers improved spectral performance in a more rugged form factor.

Based on an optimized software-defined radio receiver architecture coupled with real-time digitization and digital signal processing. This enables wide bandwidth, deep dynamic range and 27 GHz frequency range in a small, stylish one-box platform.

On top of this market disruptive platform, thinkRF provides a rich set of standard APIs and programming environments for easy and quick use with existing or new test and monitoring applications.

* WBIQ Product (R5550-xxx) models supports bandwidths up to 160Mhz. Requires external digitizer.

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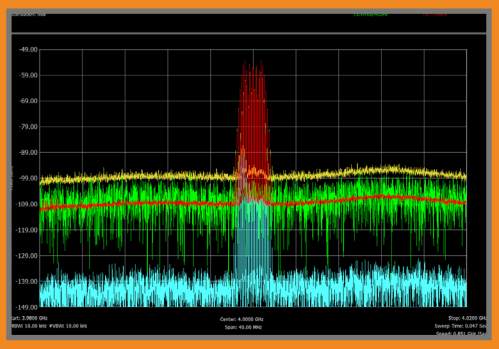
PERFORMANCE

R5550 Real-Time Spectrum Analyzer (RTSA)

1 LARGE FREQUENCY RANGE

The frequencies and bandwidths of commercial wireless systems have been increasing steadily to accommodate the growing demand for larger data rates. The R5550 supports frequency ranges from 9 kHz up to 27 GHz which enables testing of modern systems including tests such as third-order intercept.



2 WIDE INSTANTANEOUS BANDWIDTH

Modern waveforms such as 802.11ac standard utilize waveforms that occupy up to 80 MHz in bandwidth and LTE-Advanced aims to utilize bandwidths of up to 100 MHz. The R5550 provides up to 100 MHz of instantaneous bandwidth in its direct conversion mode.

3 DEEP DYNAMIC RANGE

RF measurements for characterizing IP3 generally require a dynamic range of around 100 dB. The R5550 supports multiple ADCs thereby providing wide IBW with 70 dB dynamic range and a narrow IBW with 100 dB dynamic range.

4 REAL-TIME ACQUISITION MEMORY AND TRIGGER CAPABILITY

Modern waveforms such as those associated with the wireless LAN standards utilize packet-based signaling techniques. The R5550 enables real-time capture of multiple data packets by providing real-time hardware-based frequency domain triggering capability in conjunction with real-time memory storage of up to 64 million samples.

5 FAST SCAN SPEED

Scan speed determines how fast the analyzer can jump from analyzing one set of frequencies to another set. The R5550 has fast setup times and provides sophisticated capture control.

6 SMALL SIZE, WEIGHT, AND POWER

The R5550 has a length and width less than a sheet of paper, weighs less than 3 kg and consumes 17W (408), 23W (427) of power making it a fraction of the size, weight and power of traditional lab-grade spectrum analyzers.

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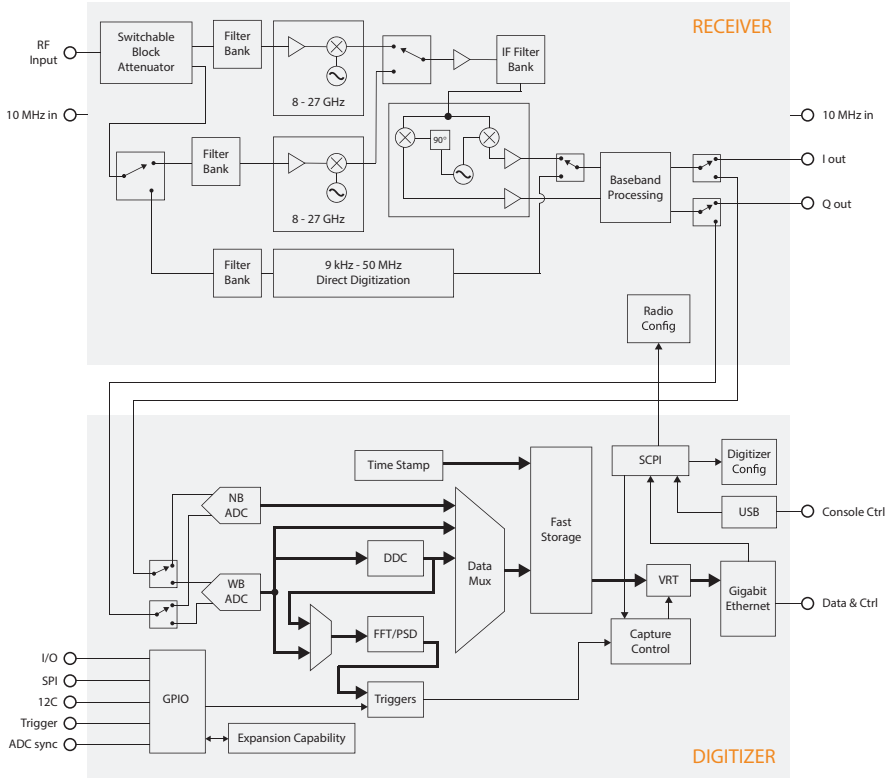
ARCHITECTURE

R5550 Real-Time Spectrum Analyzer (RTSA)

The Receiver Front End

The R5550 has a patented hybrid receiver consisting of a super-heterodyne front-end with a backend that utilizes an I/Q mixer similar to that in a direct-conversion receiver. Depending on the frequency of the signals being analyzed, one of three receiver signal processing paths is selected. Signals in the frequency range 9 kHz to 50 MHz are directly digitized, while all other signals are translated to the frequencies of the first IF block via one of the two signal processing paths. The IF block consists of a bank of multiple IF filters. Depending on the mode of operation, i.e. super-heterodyne or Zero-IF, either one or both outputs are utilized to process either 40 MHz or 100 MHz instantaneously. The IF analog outputs are digitized using one of two ADCs: a 125 MS/s sampling rate with a typical* dynamic range of 70 dB; or a 300 kS/s sampling rate with a typical* dynamic range in excess of 100 dB.



The Digitizer

The digitized signal is continuously processed in. The R5550 provides digital signal processing including optional digital down conversion; optional frequency domain triggering; sophisticated capture controlled; and optionally stored in fast local memory for subsequent forwarding or streaming across the Ethernet. User configurable sophisticated capture control combined with fast deep caching enables fast signal searches, sweeps, triggering and captures of only the signals of interest.

The R5550 digitizer has a dual-core embedded microprocessor with operating system, control, management and remote maintenance application. It supports the SCPI standard for user control and VITA VRT for data path.

* thinkRF expects this performance by design in 90% of the units produced. Variability is possible from unit to unit.

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ARCHITECTURE

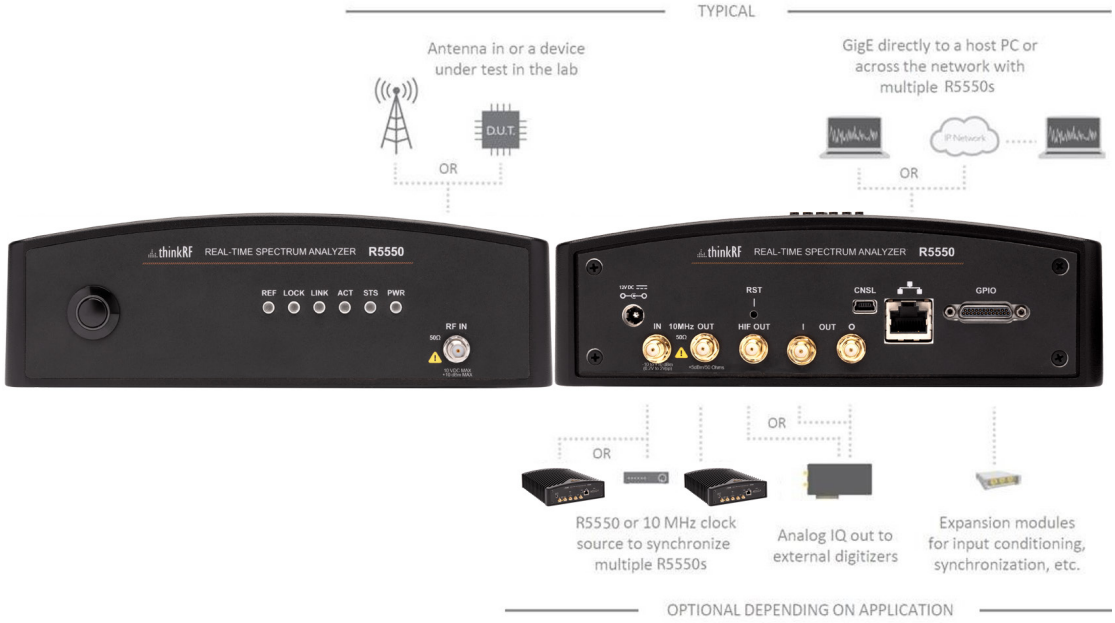
R5550 Real-Time Spectrum Analyzer (RTSA)

The R5550 hardware largely consists of:

- a hybrid super-heterodyne, direct-conversion and direct-digitization RF receiver front-end (RFE)
- 10 MHz input and output clock references for multi-unit synchronization
- Analog I/Q and HIF outputs enable OEM high speed digitizers
- a 125 MSamples/sec 14-bit wideband (WB) ADC with a dynamic range of greater than 70 dB
- a 325 kSamples/sec 24-bit narrowband (NB) ADC with a dynamic range in excess of 100 dB
- an FPGA with built-in dual-core ARM®-based processor and embedded digital signal processing (DSP) logic
- GPIO for external triggers and sweep synchronization
- 10/100/1G Ethernet port for control and network interface
- +12 V DC power input allowing automobile sources and personal mobility with an external battery
- External support for 80 MHz and 160 MHz RTBW (Optional - WBIQ Option)

Extensible Hardware Interfaces

Whether you're looking for a flexible receiver to integrate with your existing digitizer solution or you need powerful, cost-effective spectrum analyzer hardware to pair with your software, the R5550 Real-Time Spectrum Analyzer is a universal and versatile platform designed for use across wireless industries and applications.



WBIQ Product Models

When Bandwidths of greater than 100 Mhz are required the WBIQ product variant of the R5550-xxx can extend the Bandwidth range up to 160 MHz. The WBIQ product is intended for use with external digitizers (via the analog IF output).

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APPLICATIONS

R5550 Real-Time Spectrum Analyzer (RTSA)

S1000 Spectraware Real-Time Spectrum Analysis Application Software

The thinkRF™ S1000 Spectraware software harnesses the power of the thinkRF Real-Time Spectrum Analyzers to provide all the visualization capabilities you'd expect, while still being cost-effective and easy to use. The intuitive graphical user interface (GUI) has been designed with the end-user in mind, focusing on center, span, start and stop coupled mode rather than on RFE mode as its primary control model, simplifying the user experience and keeping the view of the spectrum front and center.

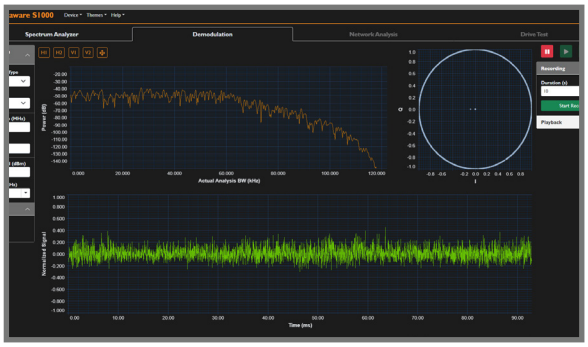
AUTOMATIC MEASUREMENTS

The S1000 supports two standard measurements that are critically important for users analyzing modern devices and signals such as Wi-Fi, Bluetooth, and cellular standards such as 3G/4G/5G/LTE.

The Channel Power measurement determines the power contained within a channel bandwidth. The Occupied Bandwidth measurement determines the bandwidth which contains a percentage of the total integrated power of the signal, centered on the assigned channel frequency.

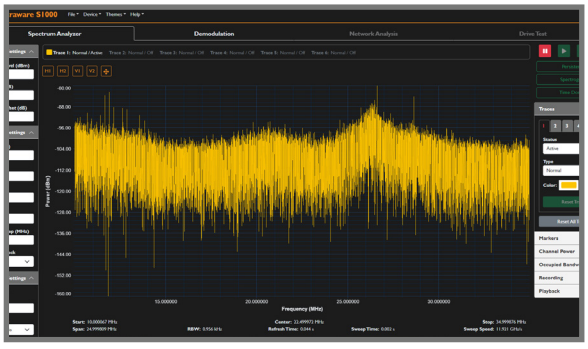
DEMODULATION FOR DEEPER SIGNAL ANALYSIS

Conduct both spectrum and signal analysis and extract the original information-bearing signal from the carrier wave with demodulation capabilities. Gapless streaming allows seamless playback of demodulated audio which can be amplified from 0% - 300%. View Constellation, Frequency Domain, and Time Domain graphs in the clean, professional interface and record and play back streams with full demodulation and graphing support.



PERFORMANCE YOU NEED

All functions have been made easily accessible in an intuitive soft menu on the right-hand side of the display. Commonly used settings including Amplitude, Frequency and Bandwidth, are presented on the left and are always available to the user.



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APIS - PROGRAMMING ENVIRONMENTS

R5550 Real-Time Spectrum Analyzer (RTSA)

By supporting a rich set of industry-leading standard protocols, the R5550 can easily integrate into your new or existing applications.

Python™ and PyRF development framework

PyRF enables rapid development of powerful applications that leverage the new generation of measurement-grade software-defined radio technology. It is built on the Python Programming Language and includes feature-rich libraries, example applications and source code and is openly available, allowing commercialization of solutions through BSD open licensing.

NI LabVIEW®

Easily and quickly integrate the R5550 into your existing or new NI LabVIEW® based acquisition, measurement, automated test and validation systems.

MATLAB®

thinkRF provides MATLAB® APIs for connecting to thinkRF's R5550 Real-Time Spectrum Analyzers and MATLAB® program code examples to get you started towards developing your own.

C/C++ APIs and DLL

Underneath our rich set of APIs and programming environments is the C/C++ API and DLL which abstracts the SCPI command and VITA VRT dataflow from the R5550.

STANDARD PROTOCOLS

Compliance with standard protocols provides you both multi-vendor independence and device interoperability.

SCPI and VITA VRT

The R5550 supports the Standard Commands for Programmable Instruments (SCPI) for control and the VITA-49 Radio Transport (VRT) protocol for data flow.

thinkRF provides extensive documentation and examples for programming and interfacing at the SCPI and VITA-49 VRT level.

HiSLIP

The R5550, with firmware 1.6.1 or higher, supports HiSLIP, which is an industry standard TCP/IP-based protocol for remote instrument control of LAN-based test and measurement instruments.

RF and Digitization Specifications

Frequency

Frequency Ranges	9 kHz to 8 / 27 GHz	
Frequency Reference	±1.0 ppm ±1.0 ppm 0°C to 55°C ±1.0 ppm per year	Accuracy at room temperature Stability over temperature Aging
Real-Time Bandwidth (RTBW)	0.1 / 10 / 40 / 100 MHz	
Spurious Free Dynamic Range (SFDR)	60 dBc (typical*) 70 dBc (typical*) 100 dBc (typical*)	100 MHz RTBW 10 / 40 MHz RTBW 0.1 MHz RTBW

Amplitude

Amplitude Accuracy (25 °C ± 5 °C)	± 2.00 dB typical*	50 MHz to 27 GHz
Attenuator Range	0 to 30 dB in 10 dB steps	
Maximum Safe RF Input Level	+10 dBm, Max DC: 10 V	

Displayed Average Noise Level (DANL | at 25 °C ± 5 °C, typical*)

Frequency (GHz)	8 GHz (typical*)	27 GHz (typical*)
0.1 GHz	- 157 dBm/Hz	- 160 dBm/Hz
0.5 GHz	- 155 dBm/Hz	- 159 dBm/Hz
1 GHz	- 156 dBm/Hz	- 159 dBm/Hz
2 GHz	- 154 dBm/Hz	- 153 dBm/Hz
3 GHz	- 152 dBm/Hz	- 157 dBm/Hz
4 GHz	- 151 dBm/Hz	- 162 dBm/Hz
5 GHz	- 150 dBm/Hz	- 158 dBm/Hz
6 GHz	- 149 dBm/Hz	- 157 dBm/Hz
7 GHz	- 150 dBm/Hz	- 155 dBm/Hz
8 GHz	- 144 dBm/Hz	- 161 dBm/Hz
9 GHz		- 161 dBm/Hz
10 GHz		- 161 dBm/Hz
11 GHz		- 160 dBm/Hz
12 GHz		- 157 dBm/Hz
13 GHz		- 157 dBm/Hz
14 GHz		- 154 dBm/Hz
15 GHz		- 157 dBm/Hz
16 GHz		- 157 dBm/Hz
17 GHz		- 156 dBm/Hz
18 GHz		- 156 dBm/Hz
19 GHz		- 149 dBm/Hz
20 GHz		- 154 dBm/Hz

* thinkRF expects this performance by design in 90% of the units produced. Variability is possible from unit to unit.

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RF and Digitization Specifications

Displayed Average Noise Level (DANL | at 25 °C ± 5 °C, typical*)

Frequency (GHz)	8 GHz (typical*)	27 GHz (typical*)
21 GHz		- 153 dBm/Hz
22 GHz		- 152 dBm/Hz
23 GHz		- 153 dBm/Hz
24 GHz		- 155 dBm/Hz
25 GHz		- 153 dBm/Hz
26 GHz		- 150 dBm/Hz
27 GHz		- 148 dBm/Hz

Third Order Intercept (TOI) at max gain	+12 dBm, typical*	At 1 GHz (R5550-408 only)

Spectral Purity

SSB Phase Noise	Offset	
25°C ± 5°C	100 Hz	-90 dBc/Hz
At 1GHz, measured with	1 kHz	-93 dBc/Hz
external oscillator not	10 kHz	-98 dBc/Hz
present	100 kHz	-106 dBc/Hz
	1 MHz	-120 dBc/Hz

Digitization

Data Sampling Rate and Resolution	125 MS/s,14 bit 300 kS/s, 24 bit	10 / 40 / 100 MHz RTBW 0.1 MHz RTBW
Sweep Rate	Up to 37 GHz/s @ 10 kHz RBW	40 MHz IBW
Stream Rate	Up to 555 Mbit/s	

General Specifications

Connectors

RF In	SMA female, 50 Ω
10 MHz Reference In and Out	SMA female, 50 Ω
Analog I and Q Out	SMA female, 50 Ω
HIF Out	SMA female, 50 Ω
10/100/1000 Ethernet	RJ45
USB Console	Type B mini
GPIO	25-pin male D-Subminiature
Power	Coaxial Type A: 5.5 mm OD, 2.5 mm ID

Status Indicators

PLL Lock / 10 MHz reference clock status Ethernet Link and Activity Status CPU and Power Status	Refer to the R5550 User Manual

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General Specifications

Power		
Physical Power Supply	Use AC Wall Power Adaptor provided	Input AC 120V-240V / Output +12V
Power Consumption	23W with Power Adaptor provided (427) 17W with Power Adaptor provided (408)	At room temperature
Physical		
Operating Temperature Range	0°C to +50°C	
Storage Temperature Range	-40°C to +85°C	
Warm up time	30 minutes	
Dimensions	257.3 x 193.7 x 66 mm (10.13" x 7.63" x 2.61") 257.3 x 193.7 x 60 mm (10.13" x 7.63" x 2.36")	With mounting feet Without mounting feet
Weight	2.54 kg (5.6 lbs) 2.72 kg (6 lbs)	408 427
Security	Kensington Security Slot	Located on back end-plate
Regulatory Compliance		
RoHS Compliance	RoHS	
Marks	CE	European Union
EMC Directive 2014/30/EU	EN 61326-1:2013	Electromagnetic Compatibility
Low Voltage Directive 2006/95/EC	EN 61010-1:2010 Class 1	Safety
FCC		
Environmental		
Humidity & Temperature	MIL-STD-PRF-28800 Class 2	
Shock & Vibration	MIL-STD-PRF-28800 Class 2 MIL-STD-PRF-28800 Class 3	
S1000 Real-Time Spectrum Analysis Software		
Resolution Bandwidth (RBW) Range Windowing	1 Hz to 488.28 kHz Hanning	
Traces	6	Clear/Write, Trace Average, Max Hold, Min Hold
Markers Modes Marker Frequency Resolution	12 Normal (Tracking), Delta, Fixed 0.01 Hz	 Peak Search, Next Peak, Next Left/Right, Center
GNSS Tracking Display (R5750 only)	Real time GPS data, updates every second	
Save/Load Data Configurations	Power Spectral Data with Time Stamp, Context Save/Load Settings	CSV format, optional saving duration Save settings for easy recall

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General Specifications

S1000 Real-Time Spectrum Analysis Software		
Export Data	CSV	Comma Separated Values
Demodulation Audio Signal Displays	FM 0%-300% IQ Constellation Frequency Domain Time Domain	With Record/Playback Host PC sound card

APIs and Protocols	
Python™	PyRF RTSA
LabVIEW	LabVIEW Base Development System for Windows (version 2014 and up)
MATLAB®	MATLAB® Release 2014b - 2019b
C/C++	ISO/IEC 14882:2011
SCPI	IEEE 488.2 - Standard Commands for Programmable Instruments
VRT	VITA-49 Radio Transport
HiSLIP	IVI TCP/IP-based protocol v1.0

Recommended PC	
Operating System	Windows 10 (32 or 64)
Minimum RAM Size	4 GB
Minimum Free Hard Disk Space	2 GB
Ethernet Port	1 GigE
Display Resolution	1920 x 1080

Ordering Information

Base Units	Part Number	Description
8 GHz RTSA	R5550-408	9 kHz to 8 GHz, RTBW up to 100 MHz
27 GHz RTSA	R5550-427	9 kHz to 27 GHz, RTBW up to 100 MHz

R5550 Power Plug Options	Description
0	North American power plug (115 V, 60 Hz)
1	Universal Euro power plug (220 V, 50 Hz)
2	United Kingdom power plug (240 V, 50 Hz)
3	Australia power plug (240 V, 50 Hz)
4	Switzerland power plug (220 V, 50 Hz)
5	Japan power plug (100 V, 50/60 Hz)
6	China power plug (50 Hz)
7	India power plug (50 Hz)

Accessories		
Software Included	S1000	Real-Time Spectrum Analysis Software
	APIs	
Rack Shelf	R5550-RACK-SHELF	19” rack shelf supports two horizontally mounted R5550s or WSA5000s

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CONTACT US TODAY
FOR A FREE DEMO!

thinkRF™ R5550

Real-Time Spectrum Analyzer

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Intellectual Property - Patents
The thinkRF R5550 product line is protected by patents, (US8,675,781, US9,197,260, US9,350,404, US8,886,794) in the United States. This information is provided to satisfy the patent marking provisions including, but not limited to, the patent marking provisions of the America Invents Act (AIA) and is intended to serve as notice under 35 U.S.C. § 287(a), as amended by Section 16 of the AIA. Additional patents may be pending in the United States and/or elsewhere.

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