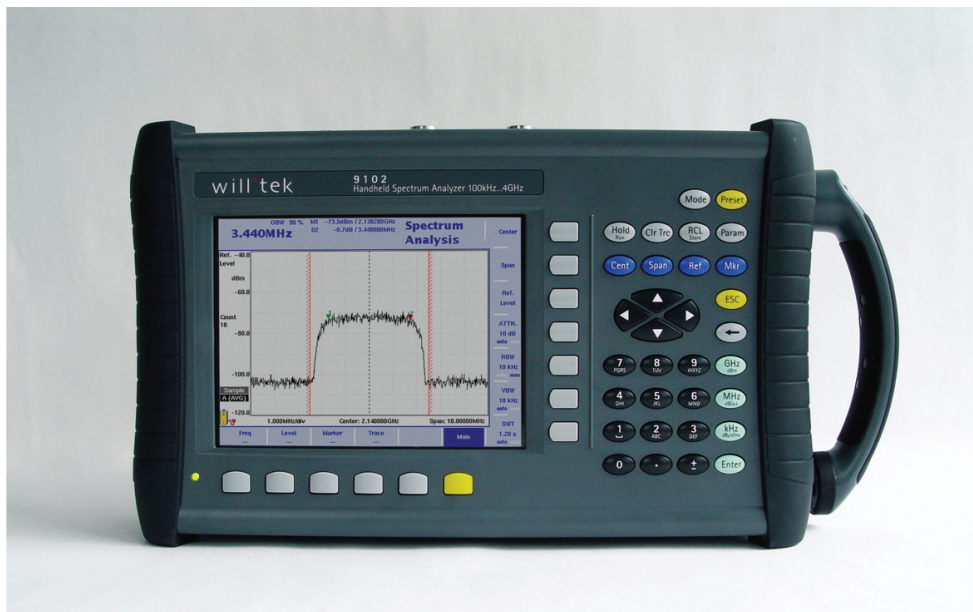


## 9102 Handheld Spectrum Analyzer



boosting wireless efficiency

# Willtek 9102

## Handheld Spectrum Analyzer

The 9102 Handheld Spectrum Analyzer provides RF engineers and service technicians with the excellent performance of a workbench analyzer in a handheld form, at a competitive price.

### One instrument for all your needs

- Installation troubleshooting, repair and maintenance.
- Acceptance and installation troubleshooting of antenna and cable installations.
- Assessment and verification of electromagnetic radiation to verify measures against EMI.
- Production test and alignment of the output of RF modules.
- Field measurements and verification of base station emissions.
- Used to detect and locate faulty mobile phone parts and components.

Typical measurements with the 9102 Handheld Spectrum Analyzer include transmitter testing, alignment of modulators and measuring switch breakthrough. Additional options such as a tracking generator, the 9160 VSWR/DTF Bridge and the 9130 VSWR/DTF Reflection Measurement Option expand the capabilities of the 9102. This full-featured analyzer is fully controllable via the front panel or by remote control from a PC.

For base station installation or maintenance engineers, the 9102 offers the full scope of common performance measurements of BTS antenna systems: Return Loss (Reflection), Tower-Mounted Amplifier (Transmission) and Distance to Fault measurement with a standard resolution of 501 points in one lightweight device.

Measurement results and instrument settings can easily be transferred to a PC for presentation or post-processing. This rugged portable instrument is suitable for indoor and outdoor use, and with its excellent technical data and extensive feature set meets many application needs.

### Highlights

Covering all applications in a frequency range up to 4 GHz

Supporting radiation measurements at base stations and broadcast transmitters

Ideal for cable and antenna test and mobile service and repair

Applicable for commissioning, installation, maintenance and manufacturing

### 9102 – a companion with a rugged design for field and lab applications

We have tested the 9102 Handheld Spectrum Analyzer according to all relevant and applicable standards for bench and portable field measurement equipment against RF radiation, conduction, static discharge (EN 55022, IEC 61000-4) and shock steadiness (EN 60068).

# Wide frequency band covers 3G, Wireless LAN and GPS

## Comprehensive feature set in single-button measurement

With its clear and easy operation, the 9102 Handheld Spectrum Analyzer presents all measurement functions required to quickly and precisely resolve measurement tasks. The user-friendly interface with logical softkeys enhances operation.

## Frequencies are increasing ... needn't break the budget

The wide frequency range from 100 kHz to 4 GHz enables testing in RF systems and modules such as modern wireless local oscillators.

This frequency coverage also captures the higher harmonics from amplifier or oscillator modules, plus any spurious signals that can mix and break through into the pass-band. Its complete coverage of carrier, IF stages and audio frequencies provides the performance needed.

## Manual or automatic control made simple

Controlling the 9102 from a PC is easy and convenient with the built-in RS-232 interface and Ethernet port. All functions of the spectrum analyzer can be controlled via the industrial standard remote control SCPI command set.

## Convenience

No time is wasted in setting up the instrument or hand-copying settings from one instrument to the other. The 9100 Data Exchange Software, which comes with the 9102, supports enhanced manage and transfer functions.

Channel systems, limit templates, settings and correction tables can be easily set up and maintained on a PC. Building new limit templates and correcting tables is child's play, using the PC's mouse.

A live trace can be continuously downloaded from the instrument using optional software. An easy export to standard graphic formats such as BMP and JPG supports the need for quick documentation of measurement data. Likewise, stored traces can be uploaded to set the unit to the previous measurement settings.



Channel power measurements at a UMTS Node B

## Easy-to-read screen facilitates signal tracing

The high-resolution colour VGA display (640 x 480 pixels) is excellent for finding misleading spurs or aligning modulators. Multiple colours facilitate the comparison of measurement traces on the screen. The extra bright 6.5" TFT display has a superb 140° viewing angle and thanks to its high luminous intensity, is ideally suited for outdoor applications. 500 measuring points in a trace allow the comprehensive evaluation of a complex frequency spectrum at a glance.

## Markers assist in precise reading of signals

Up to six markers allow for exact reading of complex signals. The transmitter performance can be checked, spurious signals can be detected and sideband levels can be established, using the six markers with their flexibility and clear on-screen display. By pressing Delta Marker, second and third harmonic levels can easily be checked. Power level and frequency are displayed in relation to a reference point.

## Pass/fail verdict with limit templates

Limit lines simplify assessment of complex displayed signals, allowing users to decide whether the signal passes or fails. These limit templates can be set up with 30 segments. Simultaneously, it can be established if the signal exceeds an upper and/or lower limit or not.

## High-precision frequency measurement

The 9102's integrated frequency counter expands the range of applications to high-precision frequency measurements, required for many tasks, such as mobile phone repair. These can now be performed with the 9102. For high-precision frequency measurements, users no longer need to utilize expensive spectrum analyzers or additional frequency counters.

## Meets future requirements

With the Multi Port, the 9102 is designed to meet future requirements. The 9102 automatically detects external options designed for this highly flexible spectrum analyzer, provides access to special measurement functions and applies the corresponding correction values.

## Get more out of digitally modulated signals through channel power measurement functions

The 9102 offers Channel Power, Adjacent Channel Power Ratio (ACPR) and Occupied Bandwidth (OBW) measurement capabilities.

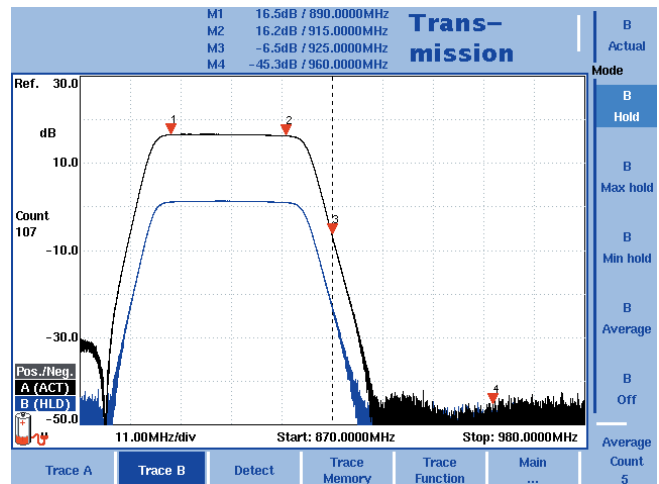
ACPR enables measurements of the leakage power from a modulated communication channel into an adjacent channel.

The occupied bandwidth measurement represents the part of the transmitted power that lies in a specified bandwidth.

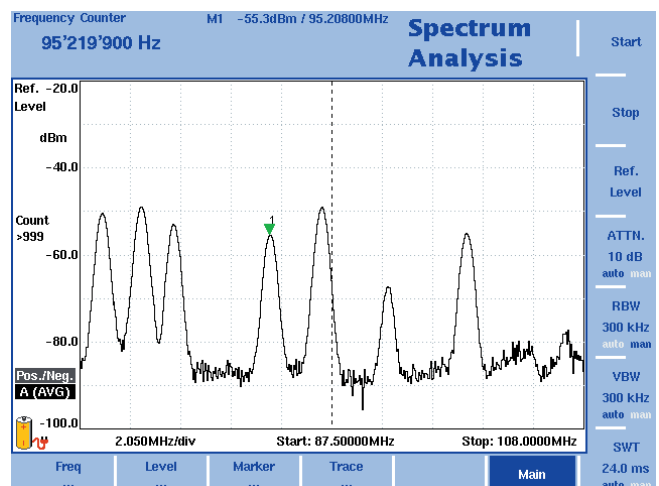
This measurement function can supply useful qualitative information about the used bandwidth, e.g. give useful insight into transmitter operation.

This single-button function allows rapid measurement delivering information on the characteristics of the specified communication channel. All significant values are displayed at a glance.

Additionally, channel power measurement, ACPR and OBW are implemented into the spectrum analysis mode. In contrast to the single-button operation, an experienced user can set measuring range, resolution and sweep time freely according to individual needs. In this way, measurements can easily be set up when pre defined communication systems cannot be used.



Measuring the amplifier characteristics with the 9150 Tracking Generator Option



Checking the exact frequency with the built-in frequency counter

## Accurate measurements in different RF environments

When making accurate amplitude measurements with a spectrum analyzer, it is necessary to correct any effects, while measuring, that alter the signal of interest between the device under test (DUT) and the analyzer. External devices such as cables, amplifiers, antennas and additional attenuators can influence the signal level. In the instrument software, built-in amplitude correction is realized. The external device compensation function takes a list of frequency and amplitude pairs.

Connected linearly, these points offset the input signal accordingly. It is easy to set up this correction table using the "9100 Data Exchange Software".

## Easy adjustment to different impedance situations

While an impedance of 50  $\Omega$  is most common in most RF environments, cable TV systems apply 75  $\Omega$ . The 9102 supports this standard as well. When switching between impedances, the corresponding correction table will automatically be loaded to ensure correct measurements. An optional matching pad is available to correctly terminate the cable.

## AM and FM demodulation

The presence of audio signals can be checked by demodulation of AM or FM signals using Zero Span mode or demodulation at the marker position and listening via the built-in loud-speaker.

## Digital signal processing with reloadable digital IF

RF signals are digitally processed by microprocessor and field-programmable gate arrays (FPGA) to ensure both superb accuracy and repeatability as well as flexibility for future requirements.

## Small and portable

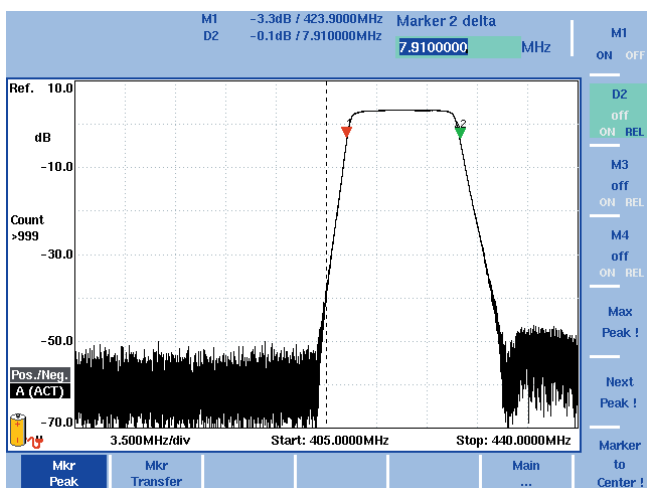
With its minimal footprint, the 9102 is suitable for usage both on the bench and in the field. The low weight makes it a highly portable instrument in the lab and supports mobile applications in the field that seemed impossible before. With the Willtek 1500 Battery Charger, additional battery modules can be re-charged outside of the 9102. The batteries are easy to exchange, preparing the instrument for many hours of independent operation in the field.

## 9132 RMS Detector Option

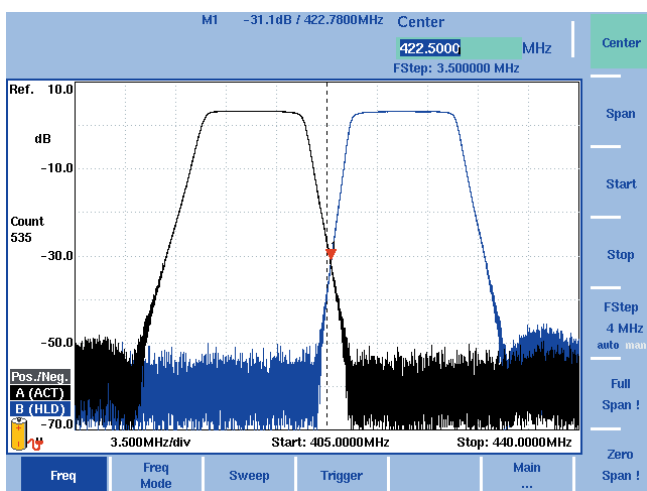
The 9132 RMS Detector helps to get more out of digitally modulated signals. It adds high precision to the 9102's channel power measurements. Broadband and narrowband signals can be measured alike with superb accuracy, as the new detector is capable of analyzing signals that are similar to noise on the spectrum display. Such signals are smoothed and displayed with the precise RMS level.

## Tracking Option

The tracking generator with its output frequency range from 1 MHz to 4 GHz expands the application range of the 9102 Handheld Spectrum Analyzer into areas which require a tracking generator, Distance-to-Fault (DTF) and reflection measurement (VSWR) capabilities. The level of the tracking generator is adjustable from -10 to -30 dBm; this allows adaptation of the output signal to the demands of passive and active devices under test.



Typical measurements tasks: cut-off frequencies in the pass-band ...



... and isolation between receive and transmit stages



# 9130 VSWR/DTF Reflection Measurement Option, 9160 VSWR/DTF Bridge

The 9130 VSWR/DTF Reflection Measurement Option, in conjunction with the 9160 VSWR/DTF Bridge, turns the 9102 into a full-featured reflection test set.

Today's complex antenna installations include tower mounted amplifiers, cross polarised antennas and long cable feeds.

Measuring the antenna impedance match is the state-of-the-art method to analyze the antenna system performance.

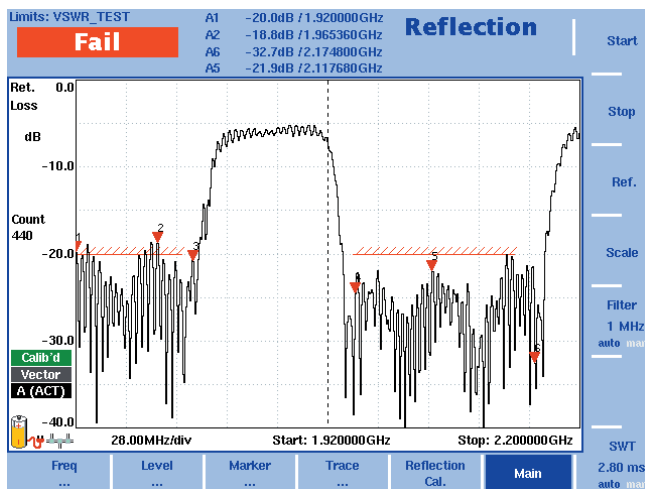
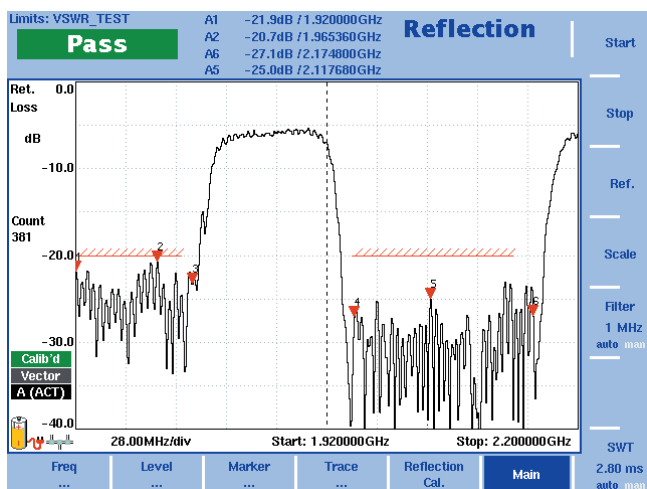
With the 9102 and the 9130 VSWR/DTF Reflection Measurement Option, measurement technicians are ready for all the test challenges involved.

Using the reflection measurement mode, all the relevant functional parameters are available on a glance. With the 9102 limit line capability results can easily be compared with the limits specified by the network operator.

Depending on user preference, the device displays the measured value either as a return loss or in other custom units such as standing wave ratio (VSWR), reflection coefficient ( $\rho$ ) or reflected power ratio.

## Vector analysis for accurate reflection measurements

Modern antenna systems for professional applications are characterised by a low reflection and a good match. The high performance is validated for field acceptance and maintenance using precise instruments. The 9130 VSWR/DTF Reflection Measurement Option provides high precision because it performs vector measurements on the reflected wave. This type of measurement warrants advanced accuracy and highly reliable results even at low reflected signal levels beyond  $-20$  dB of return loss.



Using Limit Lines, the antenna system can be approved with one view focusing on the return loss in the uplink and downlink.

## DTF measurements for cable performance testing

Antenna installations are never complete without distance-to-fault (DTF) measurements. The 9130 VSWR/DTF Reflection Measurement Option provides this type of test, based on FDR (Frequency Domain Reflectometry) technology. This system option supports a detailed analysis of the antenna feeder cable with a total length of up to 1000 m. Weak connectors, cable kinks, water ingress or other cable related problems can be easily detected and located. The high measurement resolution of 501 points ensures quick and efficient troubleshooting by detecting even small reflections; these result in a displayed distance to fault.

## Prepared for all cable types

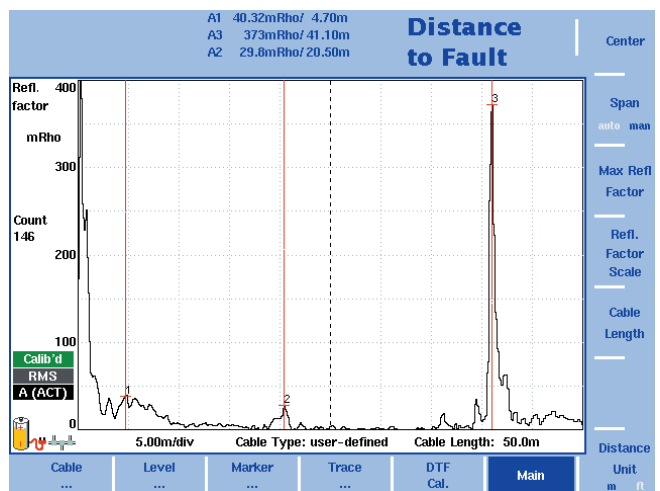
Willtek provides predefined cable parameter files for most known coaxial cables used for installations. They can easily be uploaded to the 9102; the parameters for rare cable types can be determined step by step on the instrument. The user decides whether he wants to set the measurement range in the frequency or location domain, manually or automatically.

## One port cable loss measurement

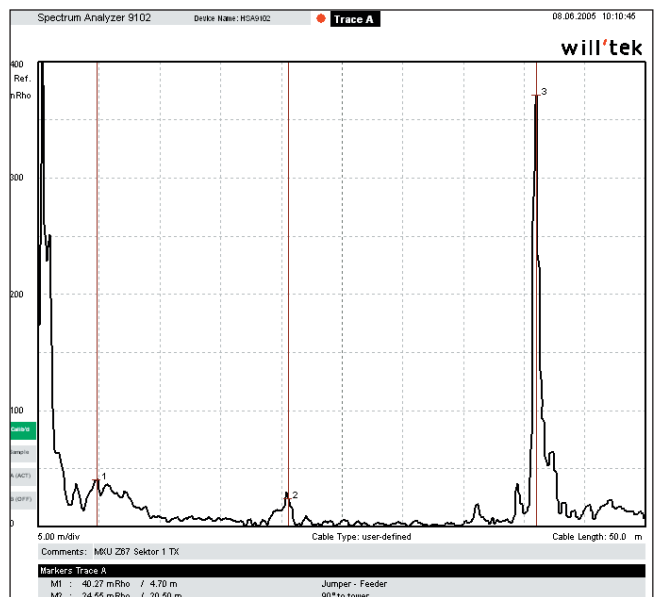
Measuring cable loss is easy only as long as both ends of a cable are accessible. However, for cables which are either reeled or already installed, this does not apply. The one port cable loss measurement mode helps to test from one end of the cable while the other end is either shorted or left open. After defining the applicable frequency range for the measurement, the average attenuation can be read from the result field, while the screen shows the frequency response of the cable.

## 9160 VSWR/DTF Bridge – just plug and go!

A measurement bridge is the necessary tool for reflection measurements. Willtek offers such a tool, tailor made for the 9102 Handheld Spectrum Analyzer: The 9160 VSWR/DTF Bridge covers the full frequency range and fits perfectly to the RF connectors of the 9102. High directivity is the basis for the precision achieved in the return loss measurement. The 9102 provides calibration data and supply voltage through its Multi Port. Just plug in the bridge and it is ready for a full set of new features!



Precise detection and location of even smallest cable faults on site with the DTF mode...



...and easy and time-saving documentation of the installer's work quality in the office with the Data Exchange Software.

# Radiation Measurements with the 9131 EMF Measurement Option

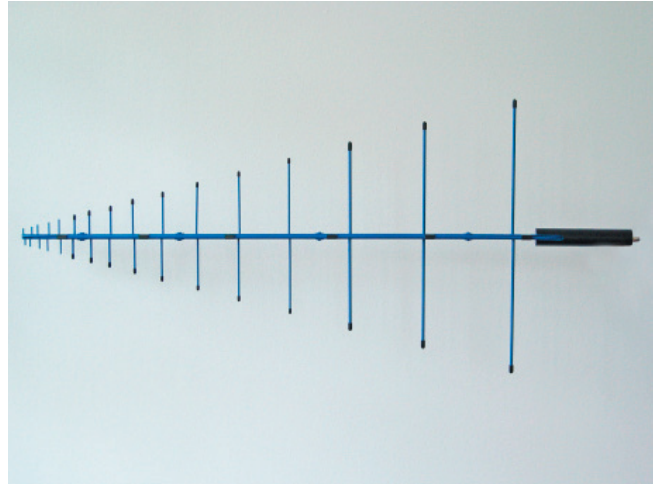
Radiation from base stations and broadcast stations can be measured easily with the 9102 and its 9131 EMF Measurement Option. The 9102 takes measurements of the electromagnetic field over a user-definable frequency range and displays the field strength (in V/m) or the power flux density (ni W/m<sup>2</sup>).

The option also allows selecting one of two additional filters (9 and 120 kHz resolution bandwidth) which are typically used for radiation measurements.

## Radiation emission ...

With these measurements, operators of cellular networks and broadcast stations fulfill a requirement from the regulator; many countries stipulate a proof that the radiation of the installed transmitter is within specified limits. A directional antenna helps to measure the emitted radiation. Willtek offers two antennas accomodating different frequency ranges: the 9172 Directional Antenna, 80 to 1000 MHz and the 9173 Directional Antenna, 300 to 3000 MHz.

Only two pieces of equipment are needed to perform these emission measurements to ICNIRP standard. The 9102 Handheld Spectrum Analyzer equipped with the 9131 EMF Measurement Option and the directional antenna perform the measurement task, providing a handheld solution that is easy to carry, easy to read even at daylight, and easy to convert into a solution to another test task such as antenna system measurements.



The Directional Antenna is the perfect fit for emission measurements



Immission measurements are easy to perform with the Isotropic Antenna



## ... and immission

Engineering offices and regulatory bodies are interested in the radiation exposure in a particular place. The 9102 with the 9131 EMF Measurement Option and an appropriate antenna catches the electromagnetic waves from all directions; the bright display of the 9102 displays the overall field strength in the desired frequency range. The lightweight, hand-portable spectrum analyzer eases measurements in the field, and the user enjoys the clear reading from the bright display.

Cyclic measurements of the interference are easily possible with the integrated support for remote control. Two interfaces – an RS-232 and a LAN connector – leave the choice for controlling the instruments over a modem or a local network.

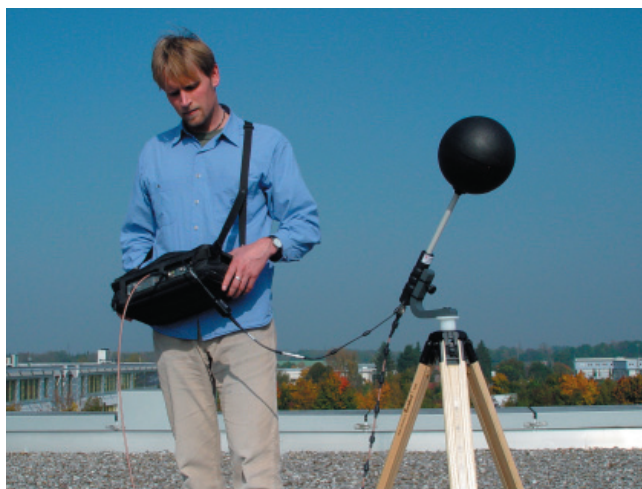
Willtek offers two antennas for immission measurements: the 9170 Biconical Antenna and the 9171 Isotropic Antenna. Both support measurements in all directions, but use different ways to accomplish the goal.

By manually turning the dipole antenna element of the 9170 Biconical Antenna, the same antenna pair can be used to take measurements in different directions. This helps to keep variations in the results to a minimum. The 9102 Handheld Spectrum Analyzer supports consecutive measurements in three axes and calculates the resulting field strength.

The 9171 Isotropic Antenna includes six antenna elements. The 9102 measures the signal from each pair of antenna elements one after another; it controls the signals by way of an additional cable that connects to the Multi Port of the 9102. With this cable connected to the 9102, the analyzer automatically detects the antenna and loads a set of individual calibration values from the antenna into the 9102 for even higher accuracy of the measurement results.



Measurement with 9170 Biconical Antenna



Measurement with 9102 Handheld Spectrum Analyzer and 9171 Isotropic Antenna

## Specifications

Specifications apply for 9102B series devices with serial number 0604001 and higher

Specifications valid after 30 minutes warm-up time at ambient temperature, specified environmental conditions and typical measurement range, within a period of one year after calibration.

## Frequency

### Frequency range

Measurement range	100 kHz to 4 GHz
Resolution	1 kHz

### Reference frequency

Temperature stability	$\pm 2$ ppm
Aging	$\pm 1.5$ ppm
Frequency uncertainty	$\pm 1.5$ ppm

### Frequency counter

Resolution	1 Hz, 10 Hz, 100 Hz
Min. required input level	-90 dBm

### Frequency span

Setting range	0 Hz, 10 kHz to 4 GHz
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### Sweep time

Span $\geq$ 10 kHz	1 ms to 250 s
Span = 0 Hz	1 ms to 250 s

### Resolution bandwidth (RBW)

RBW selection	manual or automatic
RBW (-3 dB) range	100 Hz to 1 MHz
Steps	1, 3, 10

### Video bandwidth (VBW)

VBW selection	manual or automatic
VBW range (-3 dB)	10 Hz to 1 MHz
Steps	1, 3, 10

### SSB noise

$f = 2$ GHz, $\Delta f = 100$ kHz,	$< -80$ dBc/Hz
RBW = 10 kHz, VBW = 1 kHz	typ. $< -83$ dBc/Hz

## Amplitude

Maximum safe DC voltage at RF-in	$\pm 50$ V
Maximum safe input power	30 dBm
Display units	dBm, dB $\mu$ V, dBmV, dBV, dB, V, mV, $\mu$ V, mW, $\mu$ W

### Measurement range

in automatic mode	average noise floor to 20 dBm
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### Displayed average noise level (DANL)

(RBW = 100 Hz, attenuation = 0 dB)	
10 MHz to 1 GHz	$< -127$ dBm
	typ. $-130$ dBm
1 GHz to 4 GHz	$< -130$ dBm
	typ. $-135$ dBm

### Input attenuation

User-defined by direct entry or step keys. 0 dB only selectable by direct entry to protect the first mixer.	
Setting range	(0) 10 to 50 dB
Attenuation steps	10 dB

### Dynamic range

Range	$> 70$ dB
Max. measurable input level (attenuation = 40 dB)	20 dBm
Min. measurable input level	$-130$ dBm

### Level accuracy

(Input attenuation = 10 dB, ambient temperature from $+20^{\circ}\text{C}$ to $+26^{\circ}\text{C}$ )	
10 MHz to 3.6 GHz	$\pm 1$ dB

### RF input match

(input attenuation = 10 dB, 10 MHz to 4 GHz)	
VSWR	$< 1.6$
	typ. $< 1.5$
Return loss	$< -12$ dB
	$< -14$ dB typ.

### Reference level

Reference level setting by keyboard entry or step keys	
Setting range	$-100$ to $+30$ dBm
Resolution	0.1 dB

### Spurious response

Image rejection ( $f = 1$ GHz)	$> 80$ dB
Spurious level (attenuation = 0 dB)	$< -90$ dBm
LO breakthrough (attenuation = 10 dB)	$< -77$ dBm
Intermodulation-free range (input level $-30$ dBm, $f_1 = 990$ MHz, $f_2 = 992$ MHz)	$> 63$ dB

## Functions

### Detector & sweep

Detector types	pos./neg. peak, pos. peak neg. peak, sample, (RMS optional)
Sweep processing	actual, average, max. hold, min. hold

## Trace

Max. displayed traces	2
Trace points	2 x 501 <sup>1</sup>
Trace functions	A + B $\rightarrow$ A, A - B $\rightarrow$ A, copy a>b, copy b>a
Trace A	colour selectable (default is black)
Trace B	colour selectable (default is blue)

## Marker

Max. markers	6
Delta markers	5
Marker functions	max. peak, next peak
Transfer functions	M $\rightarrow$ centre frequency M $\rightarrow$ ref. level M $\rightarrow$ f step

## Limit check

Max. no. of limit templates	99
Limit functions	upper, lower, upper and lower
Max. no. of limit segments	30

## Power measurement

Max. no. of channel systems	99
Measurement functions	Channel Power, ACPR, OBW
Default systems	GSM, WCDMA, DECT, WLAN

## Demodulation

Min. input level	$-50$ dBm
AM/FM	on marker/permanent/on multi marker

## Keyboard

Key type	silicon click
Parameters shortcut keys	Cent, Span, Ref
Quick setting keys	Preset, Hold/Run, Clr Trc, RCL/Store, PARAM, MODE, MKR

## General

### Display (TFT)

Size	6.5"
Resolution	640 x 480
Colours	256
Brightness	300 cd
Measurement result points	2 x 501 <sup>1</sup>

### Power supply

DC voltage, external	11 to 15 V / max. 28 W
Internal battery	Li-Ion
Operating time, battery fully charged, full brightness, Tracking Generator on	min. 2.0 h

### Memory

Type	Flash disk
Capacity (setups and traces)	257

### Dimensions

(W x H x D)	355 x 190 x 91 [mm]
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<sup>1</sup> Two independent traces are available (min. hold, max. hold at the same time)



## Weight

With battery and Tracking Generator	3.2 kg (7 lbs)
Power supply only	0.32 kg (0.7 lbs)

## Environmental conditions

(unless otherwise specified)	MIL-PRF28800F class 2C
Operating temperature	0 to +45°C
Storage temperature	-10 to +50°C
Rel. humidity (non-condensing)	80%

## Connectors

### RF in

Connector	type N (female)
Impedance	50 Ω

### Multi Port

Connector	7-pin ODU
DC voltage	10 V, 300 mA
Short-circuit protected	active
Switched control bus	I <sup>2</sup> C

### DC in

Connector	2.1 mm dia. barrel jack socket
Max. current	3 A

### Headphone

Headphones output	3.5 mm mini jack
Loudspeaker	

### Serial interface

For software updates and remote control	
Connector	DB-9 (male)
Speed	57.6 kbit/s
Required cable	null modem cable

### LAN (TCP/IP)

For software updates and remote control	
Connector	RJ-45
Speed	10 Mbit/s

## Options

### Tracking Generator

Output frequency range	1 MHz to 4 GHz
Output level setting range	-10 to -30 dBm
1 MHz to 4 GHz	adjustable in 1 dB steps

Output level uncertainty	
1 MHz to 4 GHz	< ±2 dB
Harmonics at -10 dBm	
1 MHz to 4 GHz	< -20 dBc
Spurious level offset at -10 dBm	
1 MHz to 10 MHz	< -63 dBc
SSB - phase noise	
Δf = 100 kHz	< -73 dBc/Hz
Frequency stability	

	according to reference frequency
Connector	type N, female
Output impedance	50 Ω

### 9160 VSWR/DTF Bridge

Frequency range	1 MHz to 4 GHz
Directivity	10 MHz to 3 GHz, typ. 35 dB
Insertion loss	10 MHz to 3 GHz
RF in to DUT	< typ. 11 dB
RF out to DUT	< typ. 9 dB
Impedance	50 Ω
Weight	410 g
Connectors	N-type
Maximum input power	+20 dBm

### 9130 VSWR/DTF Reflection Measurement Option

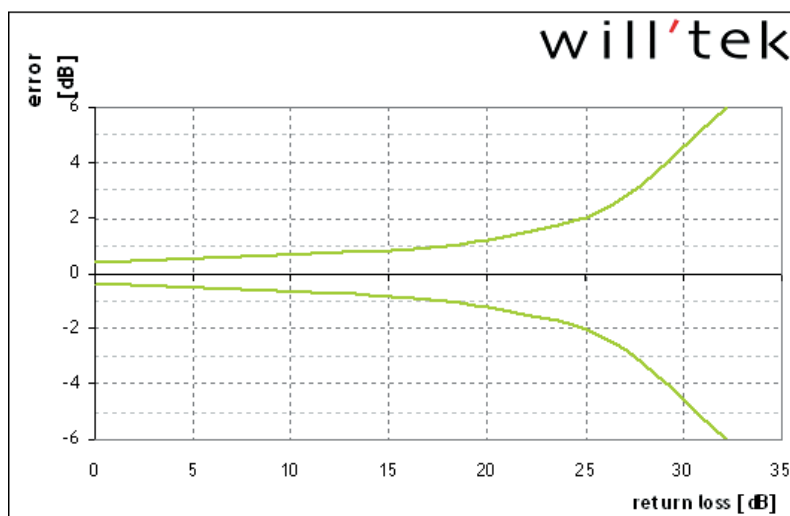
Return loss measurement range	70 dB
Reflection measurement units	dB, VSWR, mRho
Reflection measurement	vector, scalar
DTF sweep setting	automatic or manual
DTF resolution	501 points
DTF max. cable length	
	1000 m, depending on cable attenuation

### 9131 EMF Measurement Option

Measurement range	1 mV/m to 200 V/m
Measurement units	dBV/m, V/m, dBm/m <sup>2</sup> , W/m <sup>2</sup>
RBW (-6 dB) range	9 kHz, 120 kHz

## Standard delivery

Power supply (90 to 240 V, 50 to 60 Hz)  
Getting started manual  
User's guide on CD  
9100 Data Exchange Software (1 license)  
Cross-link Ethernet communication cable



Maximum error chart for the return loss measurement with the 9160 VSWR/DTF Measurement Option

## Ordering information

### Product packages

9102 Handheld Spectrum Analyzer Bench Edition	M 100 412
9102 Handheld Spectrum Analyzer Field Edition	M 248 806
9102 Handheld Spectrum Analyzer Tracking Edition	M 248 801
9102 Handheld Spectrum Analyzer VSWR/DTF Edition	M 248 802

### Options

9130 VSWR/DTF Reflection Measurement Option	M 897 261
9131 EMF Measurement Option	M 897 274
9132 RMS Detector Option	M 897 275
9160 VSWR/DTF Bridge	M 248 966
9102 Tracking Generator Upgrade	M 248 804

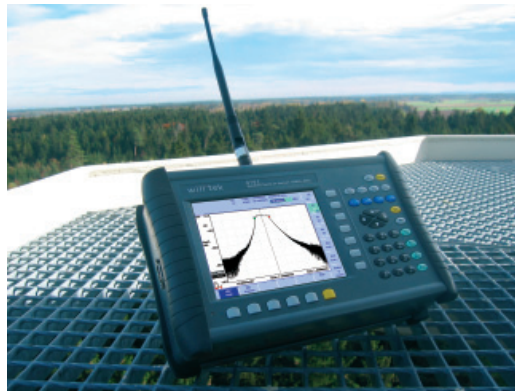
### Accessories

9100 Battery module, 7.2 Ah	M 205 012
9100 Outdoor backpack	M 241 015
9100 Soft carrying bag	M 241 013
1500 Battery charger	M 204 097
9100 Power supply	M 248 328
9100 12 V car adapter	M 860 389
9100 Safety lock	M 867 037
9100 Data Exchange Software	M 897 137
9100 Serial communication cable	M 860 388
9100 Ethernet cross-link cable	M 880 629
1205 RF Probe 20 dB	M 248 640
Frequency range 100 kHz to 4 GHz RF attenuation (nominal at 50 $\Omega$ ) 20 dB including adapter N (male), BNC (female)	
1207 Inductive Probe Frequency range 4 MHz to 6 GHz 30 dB amplifier	M 248 971
9170 Biconical Antenna	M 860 368
9171 Isotropic Antenna	M 248 809
9172 Directional Antenna, 80 to 1000 MHz	M 860 158
9173 Directional Antenna, 300 to 3000 MHz	M 860 159
Antenna 400 MHz band (TNC)	M 860 264
Antenna 900 MHz band (TNC)	M 860 261
Antenna 1800 MHz band (TNC)	M 860 262
Antenna 1880 MHz band (BNC)	M 860 260
Antenna 2400 MHz band (TNC)	M 860 146
Adapter N – TNC	M 886 098
Adapter N – BNC	M 886 097
Adaptor N (f) – 7/16" (m)	M 886 334
Adaptor N (m) – 7/16" (f)	M 886 332
Adaptor N (m) – 7/16" (m)	M 886 333
Adaptor N (f) – 7/16" (f)	M 886 331
Matching pad N 50 $\Omega$ to N 75 $\Omega$	M 886 205
Matching pad N 50 $\Omega$ to F 75 $\Omega$	M 886 204
Attenuator 18 GHz, 6 dB	M 874 061

Calibration Set Open/Short/Load, Type DIN 7/16 inch male	M 860 548
Calibration Set Open/Short/Load, Type N male	M 860 549
Composite cable 10 m for 9171	M 860 396
Antenna Tripod	M 860 256
Bag for Antenna Tripod	M 860 395

### Related products

9101 Handheld Spectrum Analyzer Bench Edition	M 100 411
9101 Handheld Spectrum Analyzer Field Edition	M 248 800



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