SignalShark

SignalShark 3330 Outdoor Unit

Real-Time Remote Analyzer SignalShark® 3330, for the Detection, Analysis, Classification and Localization of RF Signals between 8 kHz and 8 GHz.

Supports automatic direction finding and localization via AoA and TDOA.

Solves complex measurement and analysis tasks reliably and quickly with outstanding RF performance.

Embedded Windows 10-based open platform for third-party applications.

› IP65-rated robust and weatherproof die-cast aluminum housing
› Available in two versions
  › In combination with existing infrastructure with a PoE connection
  › Stand-alone operation with LTE modem and DC power supply
› Low power consumption
› Open platform
  › Third party applications can also be hosted on the Windows 10-based device with Intel quad-core processor.
› Frequency range 8 kHz to 8 GHz
› Wideband frequency monitoring with an extremely fast scan rate of up to 50 GHz/s
› Covers whole frequency bands with a 40 MHz real-time instantaneous bandwidth and a very high frequency resolution
  › FFT overlap at least 75 %
  › FFT size: up to 16 384
› Reliable signal detection due to signal duration with 100 % POI
  › > 3.125 µs without attenuation and spectral growth
  › > 2 ns with attenuation proportional to the spectral growth
› Measures weak signals in the presence of strong transmitters with a receiver based High Dynamic Range (HDR)
› ITU-compliant measurements and applications
› Two independent FFT and receiver path allowing signal visualization as well as signal analysis and demodulation at a time.
› Common used SCPI standard for remote control
› VITA 49 streaming (sample rate up to 25.6 MHz) allowing storage and post processing of the signal raw data.
› VITA 49 FFT streaming span up to 40 MHz for overview display

The Compact Monitoring Station for All Situations

Seven Senses for Signals

Description

The "SignalShark 3330 Outdoor Unit" series is characterized by a robust and weatherproof die-cast aluminum housing with IP65 protection class, which is also used as a heat sink. The compact size allows the receiver to be mounted close to the antennas, keeping the antenna cables short and the resulting sensitivity high.

In addition to an outstanding dynamic range, the device offers three switchable antenna inputs, an integrated GNSS receiver and the option of using automatic Narda DF antennas for direction finding and localization.

The device is designed as an "open platform". The Windows10 operating system allows the use of additional 3rd party software on the device. Despite a maximum power consumption of 40 W, an efficient Intel quad-core processor provides the necessary performance.

SignalShark 3330 versions

The different versions of the SignalShark 3330 series cover a wide range of applications:

3330/101 SignalShark Outdoor Unit PoE Basic Set:
Data communication and power supply are provided via a single Gigabit Ethernet connection (PoE++). This allows the use of standard lightning protection components.

This product version is particularly suitable for the extension and modernization of existing infrastructure.

3330/102 SignalShark Outdoor Unit Modem R1 Basic Set
The data communication takes place via a mobile radio modem integrated in the device, which offers a direct VPN connection setup.

Additional monitoring software on the device allows data to be collected and, if necessary, compressed for transmission in the event of an incident.

For the power supply, a DC voltage source of 10 VDC to 30 VDC, such as a solar panel with rechargeable battery, can be used. This variant offers the greatest possible flexibility. For special events, an "ad hoc" monitoring network can be set up in a very short time.

From mounting on a lamppost to self-sufficient installation at the "green border" - without the need for additional infrastructure - a wide range of applications is covered.

Different versions of the "SignalShark Outdoor Unit Modem" are available depending on the region in which the device is to be used, taking into account the respective mobile radio frequency range. Your local Narda sales representative will be happy to assist you in the selection of the right version.

Fig. 1. The SignalShark Outdoor Unit and Automatic DF antenna for AoA and TDOA.

Tasks and Views

Customer applications have formed the basis for the design of the SignalShark family and the layout of the graphical user interface (GUI). This is most clearly seen in the concept of Tasks and Views.

All SignalShark devices are supporting the same GUI. The devices can be accessed with remote desktop software via a network.

Tasks

Measurements often consist of a workflow of several steps, such as locating a signal in the spectrum, measuring its level and analyzing its behavior. This involves switching between different measurement modes and settings in each mode when a general-purpose analyzer is used.

However, with the SignalShark, the entire measurement workflow is handled by one or more measurement tasks. These tasks are shown as screen tabs, just like the web pages displayed by a web browser. Each task encapsulates all the measurement parameters and the underlying measurement engine mode. All the measurements in a task are performed at the same time. Up to six measurement visualizations (Views) can be added to adapt a task as required.

The SignalShark provides several task modes to support a wide variety of measurement applications.

Spectrum (Scan) Task

This task supports measurement of the spectrum over the full frequency span of 8 kHz to 8 GHz in a single measurement at a maximum measurement speed of 50 GHz/s.

Real-Time Spectrum Task

Real-Time Spectrum task enables spectrum measurements with a frequency span of up to 40 MHz in real-time. All frequencies within the frequency span are acquired simultaneously with no time gaps and with a FFT frame overlap of 75%. The FFT frame overlap increases to 87.5% for frequency spans of 20 MHz or less. A second digital down converter is used at the same time for analyzing and demodulating the IQ data of a separate channel within the 40 MHz real-time bandwidth. The frequency and bandwidth of this channel are selectable.

Auto DF Task

This task supports the use of the Narda Automatic DF Antenna (ADFA). Each bearing cycle can be as short as 1.2 ms and even the bearings of pulsed signals can be reliably determined as long as the minimum pulse and gap durations are somewhat longer than 2 cycle times. The optional available map and localization functionality, which is integrated into the SignalShark GUI, allows the reliable localization of transmitters. The sophisticated state of the art algorithm based on the bearing statistics
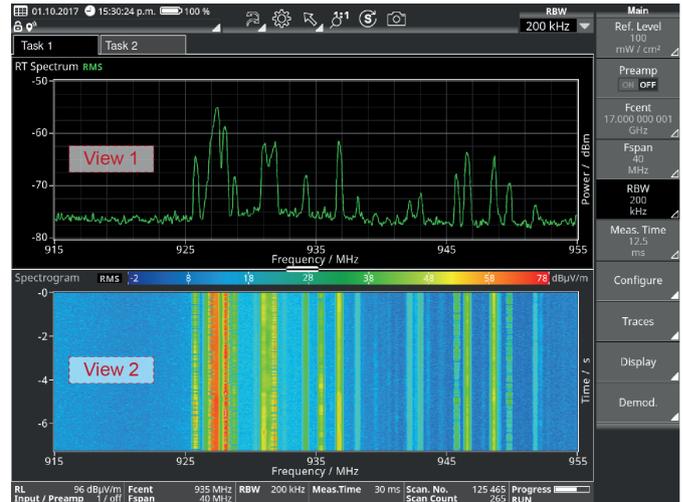

Fig. 2.   RT Spectrum view (View 1) and Spectrogram view (View 1) in a task (Task 2)

reliably eliminates the influence of false bearings on the localization result, as long as there are enough line of sight bearings available from enough locations.

Real-Time Streaming Task

IQ data can be streamed at sample rates of up to 25.6 MHz using the VITA 49 protocol (option). The stream sink can be an external device connected via the LAN interface or a third party application running on the SignalShark itself for deeper analysis or decoding of signals.

IQ Analyzer Task

IQ Analyzer with 1.6 GB ring buffer, real-time trigger, time domain analysis and spectrograms with time resolution down to nanoseconds. Up to 1.6 GB of IQ data can be continuously recorded in a ring buffer. This allows recording of a 40 MHz channel over 5 seconds. Narrower channels can be recorded for a correspondingly longer time. Short-term or sporadic signals can be detected via various trigger functions.

The recorded values can be displayed simultaneously as a IQ Spectrum View, IQ Spectrogram View, and a IQ Magnitude View. The special feature here is that it is possible to switch between a high time resolution and a high frequency resolution even after the measurement. This allows a signal to be analyzed in its entire depth. Up to eight markers support the determination of signal parameters.

Views

Measurements are visualized by means of different views. The frequency domain and channel level can be viewed at the same time, for example, by adding a spectrum view and a level meter view to a measurement task. Up to six views can be added to a task. As default each new task opens with a Spectrum view.
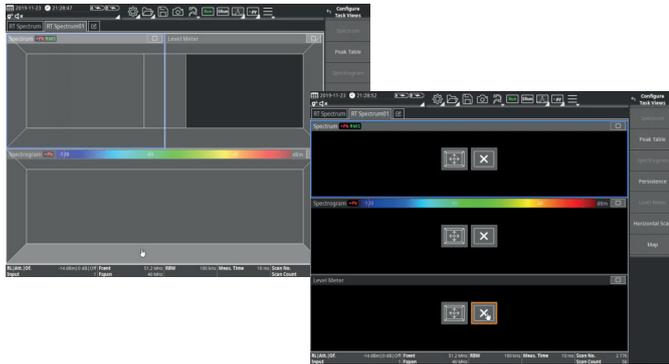
The currently selected view is marked by a blue border. The content and layout of the "Button Bar" to the right, and the "Measurement Information Bar" at the bottom, depends on the currently selected view.

The type, arrangement and size of a view can be adapted by the user. It is possible to save the current configuration and arrangement of Tasks and Views into setup files.

Tasks and Views

View		Measurement Engine or Task Mode				
		Spectrum (Scan)	RT (Real-Time) Spectrum	Auto DF	RT Streaming	IQ Analyzer
	Spectrum	✓	RT	✓		✓
	Peak Table (of Spectrum)	✓	RT	✓		
	Spectrogram	✓	RT			
	Level Meter		✓			
	Persistence		RT			
	Map	✓	✓	✓		
	Bearing			✓		
	Horizontal Scan		✓			
	IQ Magnitude (zero span, scope)					✓
	IQ Spectrum					✓
	IQ Spectrogram					✓
	VITA 49 FFT Streaming				✓	
	VITA 49 IQ Streaming				✓	

Device Features

Options (Views) and Scripts

An extensive set of equipment comprising frequency scanner/receiver, transmitter detector, spectrum analyzer, signal analyzer, directional antennas, amplifier, compass, triangulation software and maps was usually necessary in order to reliably detect, analyze and localize RF signals and interference. The SignalShark combines all these functions in one device.

Options (Views)

40 MHz real-time Spectrum, Marker and Peak Table (included in all Basic Sets)
A Panorama scan display that provides extremely fast scanning over the entire frequency range and is ideal for detecting, monitoring and analyzing any kind of signal.
An ideal complement: Mark suspect signals in the spectrum and save them in a transmitter table with relevant parameters such as center frequency, bandwidth, antenna type, and polarization. This table can then be recalled and worked through successively at each measurement location and in every operating mode of the instrument.
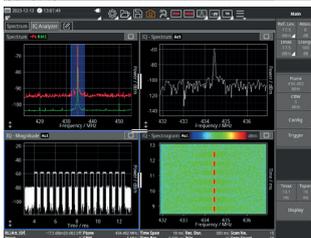
IQ Analyzer, Recorder, Trigger, Magn. View [option]
The IQ Analyzer is optimal when it comes to detection, analysis and documentations of hopping signals as well as of interference signals caused by faulty oscillator, welding systems, defective relays or lamps, jammers etc. It trigger on short pulsed signals down to ns and has a high time resolution analysis in IQ Spectrogram View and IQ Magnitude View.

› Time Res. IQ Magnitude down to 20 ns (CBW 20 MHz, Oversampling On)
› Time Res. IQ Spectrogram down to 320 ns (CBW 20 MHz, Oversampling On, RBW 766.2 kHz, 87.5 % Overlap)
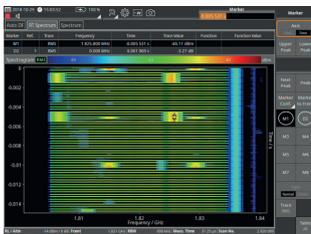
Spectrogram [option]
The Waterfall diagram is ideal for long term monitoring of the RF spectrum and for detecting permanent, sporadic or frequency hopping signals. Transmitters with variable output power and/or bandwidth can also be identified.
Visual representation of the recorded spectrums versus time. Colors represent the signal level. The smallest selectable time resolution is 31.25 µs. The high resolution makes it possible to display even the frame structures from for services like UMTS, LTE 5G.
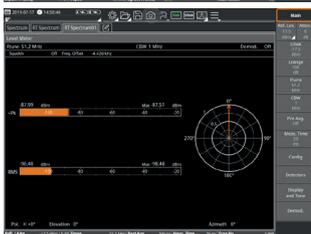
### Level Meter incl. Compass values [option]
The option allows you to make selective measurements at a defined frequency (Fcent) e.g. for monitoring the field strength of a communications channel. The measurement is in real-time and there are no time gaps.
The results are shown from an independent receiver path with steep channel filters for clean separation of even closely spaced frequencies and has a CBW range from 25 Hz to 40 MHz for detection and evaluation of pulsed signals (radar) as well as broadband signals.
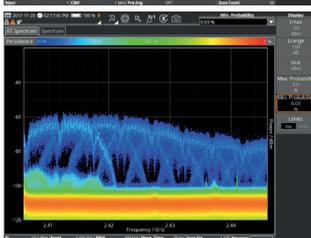
Persistence (of real-time Spectrum) [option]
The Polychrome spectrum displays spectra as level versus frequency where color indicates rate of occurrence. Persistence allows sporadic to CW (continuous waveform) signals to be detected easily. It can also be described as a visual detection of signal under signal, e.g. a detection of interferers/jammers hidden under a signal.
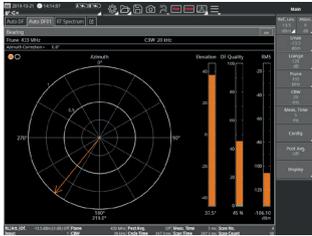
Automatic DF Antenna Control, Bearing View [option]

A view for Direction finding, showing azimuth, elevation, DF quality, and omnidirectional RMS level derived from the Narda automatic DF antenna (ADFA). The ADFA elevation is calibrated between +40° und -20°.

Mapping and Localization [option]

SignalShark simplifies localization of transmitters by autonomously evaluating all the available bearing results and plotting them on a map. It uses a statistical distribution of bearing lines that represents the uncertainty in the bearing. The result is a map on which the possible locations of the transmitter are plotted and color-coded according to their probability.

Make a drive test using a vehicle mount-adapter, combine bearings from more than 2 SignalSharks (NSL Remote DF) or mount the ADFA 2 180° upside down. There are many features developed to facilitate and broaden the possibilities for most individual cases.

Analog Demodulation [option]

for signal identification and decoding. AM, Pulse, CW, ISB, USB, LSB, FM, PM, or IQ signals can be demodulated with squelch and AGC function. The demodulated signal can be stored as WAV-file.
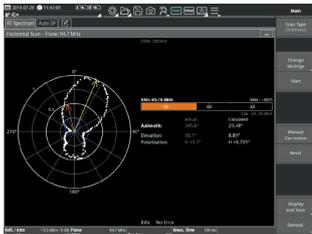
Horizontal Scan [option]

plots the signal strength versus the angle of incidence on a polar diagram. The display allows you to more easily see the difference between the received signal and the reflections that occur. The SignalShark automatically calculates the bearing of the signal source based on the horizontally measured values.

SCPI Remote Control [option]

SCPI (Standard Commands for Programmable Instruments) is a language that makes it possible to control the SignalShark using standard syntax, command structure and data interchange format. All remote commands are described in Command reference guide for SignalShark

The SCPI Remote Control allows the Narda Script Launcher to be installed.

VITA 49 [option]

is a packet-based exchange protocol for RF devices. The Vita49 standard provides a communications format that is hardware and supplier-independent

Shows the basic measurement parameter settings while streaming IQ data according to the Vita 49 standard

IQ Data stream can be used for classification, decoding (3rd party SW) of signals.

Narda Python Scripts

NSL (NardaScriptLauncher) is a free software from Narda that allows SignalShark users to select and run Python scripts from within the SignalShark application

› Automate routine tasks
› Provide guided measurements for novices using message boxes or wizards
› Add new measurement evaluation functions
› Provide complete measurement automation
› New scripts constantly released to be downloaded for free
› Possibility to write programs or additions via Python, using a Narda template, customized for specific needs
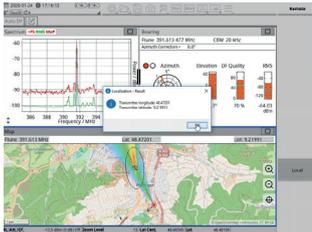
NSL Remote DF (NSL Net DF)

makes it possible to create a localization with several SignalShark devices in a network.
The user can scan the network to obtain information on all available SignalShark devices, synchronize all devices with configuration settings of the master device, monitor spectrum reception on all devices simultaneously, and use the bearing information to perform localization on the master SignalShark device.
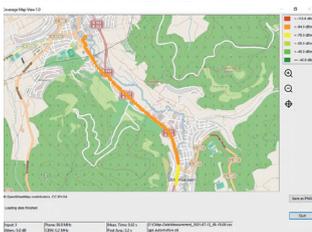
NSL Coverage Map

The user can configure settings for the coverage map and take location-dependent level measurements with distinct color-coding.

Drive test for coverage, field strength correlated to color scheme

NSL DF Autopilot

The function allows the SignalShark to be connected to a navigation system. The coordinates determined by the SignalShark heatmap localization are set as target in the navigation system, thus *There is no need to look at the heatmap while driving and only one person is needed*.
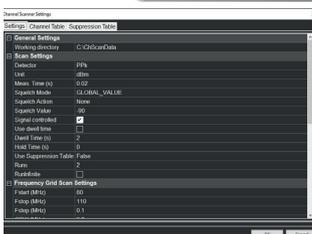
NSL Channel Scanner

A memory/frequency scan that makes it possible to monitor predefined channels in the spectrum. It is comparable to a channel scan on a radio. If one of the monitored channels exceeds a definable level value, an action ("Action") previously defined by the user can be executed.
It is also possible, to scan a frequency grid. This can be used to create a channel table.
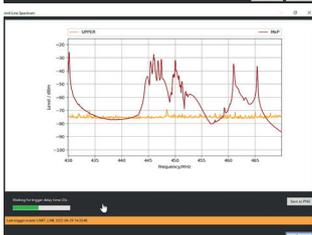
NSL Limit Line

enables triggering on signals in the spectrum. The trigger level can be defined by a horizontal line or by a trigger mask. The trigger mask can be created and edited in the settings editor in various ways.
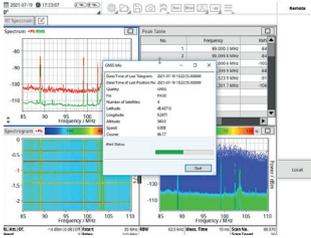
NSL GNSS

displays information about the current GNSS reception and issues a warning message if the quality of the GNSS reception falls below a certain level.
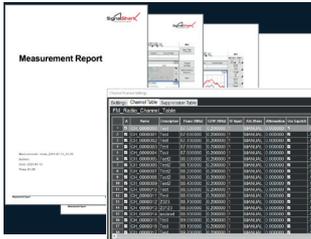
NSL MS Word

takes a Word (.docx) template file as the basis for a measurement report. It reads all settings from the current measurement, makes a screenshot of each view and generates a measurement report as MS Word document

NSL Tools

› NSL Copy Settings, copies selectable parameters such as Fcent, RBW and Attenuator from one task to another task.
› NSL Go 2 desktop, emulates the Windows-Key + "D-Key" keytroke to go to the Windows desktop
› NSL Save Peak Table, allows to save the information of a peak table in CSV format.
› NSL IQ Stream Control, allows to configure and start an IQ stream easily.
› NSL Peak trigger, uses the peak table view of SignalShark to stop the measurement when reaching or exceeding a user defined level.
› NSL SignalShark WOL, allows to switch on a network connected SignalShark via WakeOn-LAN.

NSL Converter

› Convert SignalShark Spectrum Data (from HDF5 (.h5) file format to csv file format)
› Convert SignalShark Spectrogram Data (from HDF5 (.h5) file format to csv file format)
› Convert IDA (csv-based transmitter tables) to SignalShark (xml-based tansmitter tables)
› Convert SRM (csv-based transmitter tables) to SignalShark (xml-based transmitter tables)
› Convert a Template Generated CSV Table (from csv-based transmitter tables to xml-based transmitter tables)

NSL IQ Recorder settings

enables the recording of IQ data in WAV format.
Allows the user to setup and start/record the IQ streams by using SignalShark SCPI commands and save them as an IQ WAV file. The WAV file format is a universal format supported by many monitoring software products and SDR programs.

Definitions and Conditions

Conditions
Unless otherwise noted, specifications apply after 30 minutes warm-up time within the specified environmental conditions.

Specifications with limits
These describe product performance for the given parameter covered by warranty. Specifications with limits (shown as <, ≤, >, ≥, ±, max., min.) apply under the given conditions for the product and are tested during production, considering measurement uncertainty.

Specifications without limits
These describe product performance for the given parameter covered by warranty. Specifications without limits represent values with negligible deviations, which are ensured by design (e.g. dimensions or resolution of a setting parameter).

Typical values (typ.)
These characterize product performance for the given parameter that is not covered by warranty. When stated as a range or as a limit (shown as <, ≤, >, ≥, ±, max., min.), they represent the performance met by approximately 80% of the instruments. Otherwise, they represent the mean value. The measurement uncertainty is not taken into account.

Nominal values (nom.)
These characterize expected product performance for the given parameter that is not covered by warranty. Nominal values are verified during product development but are not tested during production.

Uncertainties
These characterize the dispersion of the values attributed to the measurands with an estimated confidence level of approximately 95%. Uncertainty is stated as the standard uncertainty multiplied by the coverage factor k=2 based on the normal distribution. The evaluation has been carried out in accordance with the rules of the "Guide to the Expression of Uncertainty in Measurement" (GUM).

Specifications[a]

SignalShark Outdoor Unit

Frequency					
Frequency range	8 kHz to 8 GHz				
Scan rate	> 50 GHz/s		@ RBW = 1.6 MHz (resolution 800 kHz)		
(basic unit, full span)	30 GHz/s (typ.)		@ RBW = 100 kHz (resolution 50 kHz)		
RBW (RT Spectrum)	1 Hz to 800 kHz				
RBW (Scan Spectrum)	1 Hz to 6.25 MHz				
CBW (Level Meter)	25 Hz to 40 MHz				
EMC filter bandwidth (Spectrum and Level Meter)	10 Hz, 100 Hz, 200 Hz, 1 kHz, 9 kHz, 10 kHz, 100 kHz, 120 kHz and 1 MHz				
Detectors (Spectrum and Level Meter)	+Pk, RMS, -Pk, Avg and Sample				
CISPR Detectors (Level Meter)	Cpeak (quasi-peak), CRMS & CAvg (EMC filter with CISPR bandwidth must be selected				
SSB phase noise f_c	**df = 1 kHz**	**df = 10 kHz**	**df = 100 kHz**	**df = 1 MHz**	**df = 10 MHz**
10 MHz	< -120 dBc (1/Hz)	< -130 dBc (1/Hz)	< -135 dBc (1/Hz)		
1 GHz	< -90 dBc (1/Hz)	< -101 dBc (1/Hz)	< -101 dBc (1/Hz)	< -112 dBc (1/Hz)	< -132 dBc (1/Hz)
Internal reference frequency	Deviations: < 1 ppm				
	(includes initial deviation, aging within the first 2 years, and temperature response)				

Amplitude			
HDR (High Dynamic Range)	SignalShark can detect low level signals even in the presence of very strong signals. It does this by combining high sensitivity with a wide intermodulation-free dynamic range. The DANL and IP2 / IP3 values stated below are valid at the same setting.		
	DANL (Noise Figure) @ attenuator = 0 dB, no preamp	1 MHz ≤ f ≤ 44 MHz	< - 160 dB (mW/Hz) (resultant noise figure < 14 dB)
		44 MHz < f ≤ 3 GHz	< - 159 dB (mW/Hz) (resultant noise figure < 15 dB)
		44 MHz < f ≤ 3 GHz	- 162 dB (mW/Hz) (typ.) (resultant noise figure 12 dB)
		3 GHz < f ≤ 8 GHz	< - 152 dB (mW/Hz) (resultant noise figure < 22 dB)
	2nd order intercept point (IP2, 2 tones) @ attenuator = 0 dB, no preamp	4 MHz ≤ f < 42 MHz[b]	> 60 dBm
		42 MHz ≤ f ≤ 8 GHz	40 dBm (typ.)
	3rd order intercept point (IP3, 2 tones) @ attenuator = 0 dB, no preamp	3 MHz < f ≤ 44 MHz	> 20 dBm
		3 MHz < f ≤ 44 MHz	26 dBm (typ.)
		44 MHz < f ≤ 630 MHz	> 4 dBm
		630 MHz < f ≤ 3 GHz	> 6 dBm
		44 MHz < f ≤ 3 GHz	14 dBm (typ.)
		3 GHz < f ≤ 8 GHz	> 5 dBm
		3 GHz < f ≤ 8 GHz	12 dBm (typ.)
Level uncertainty	9 kHz ≤ f ≤ 8 GHz	< ± 2 dB	
Residual spurs[c] @ attenuator = 0 dB	8 kHz ≤ f ≤ 44 MHz	< -120 dBm	exceptions < -100 dBm
	44 MHz < f ≤ 3 GHz	< -115 dBm	exceptions < -100 dBm
	3 GHz < f ≤ 6 GHz	< -110 dBm	exceptions < -95 dBm
	6 GHz < f ≤ 8 GHz	< -105 dBm	exceptions < -85 dBm
IF rejection	> 80 dB		
Image rejection	> 80 dB		

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a   *RF data apply in the temperature range 20 °C to 26 °C at a relative humidity of between 25 and 75 %*

b   *Component at f1 + f2 is measured in the direct band (Fcent ≤ 64 MHz in real-time mode)*

c   *Typically with only few exceptions. These are documented in the calibration certificate*

Real-Time Spectrum		
Signal duration for 100 % POI	@ RBW = 800 kHz	> 3.125 µs without attenuation and spectral growth
		> 2 ns with attenuation proportional to the spectral growth
Spectrum rate	1.6 million spectra / s	@ RBW = 800 kHz and 75 % FFT Overlap
FFT overlap	Fspan > 20 MHz	75 %
	Fspan ≤ 20 MHz, RBW ≤ 400 kHz	87.5 %

RF Input		
Type (switchable)	3 x N-connector, 50 Ω (female)	
RF destruction limit	20 dBm	
Max. nominal RF level	15 dBm	
Maximum DC voltage	25 V	
Return loss (VSWR)	12 kHz ≤ f ≤ 3 MHz	> 9.54 dB	(VSWR < 2.00)
	3 GHz < f ≤ 6 GHz	12 dB (typ.)	(VSWR = 1.67 (typ.))
	6 GHz < f ≤ 8 GHz	10 dB (typ.)	(VSWR = 1.93 (typ.))
Isolation between used and unused inputs	8 kHz ≤ f ≤ 1 GHz	60 dB (nom.)
	3 GHz	50 dB (nom.)
	8 GHz	35 dB (nom.)

General Specifications 3330/01, PoE	
Attenuator	0 to 30 dB (0.5 dB steps)
Digitizer	16 bit
GNSS	Embedded receiver (GPS / QZSS, GLONASS, BeiDou, Galileo) Coordinates representation as decimal degree (DegDec - ddd.ddddd)
Internal non-removable memory	ssD, mSATA 30 GB system partition 28 GB configuration settings and user data
GNSS antenna input (for additional, external GNSS antenna)	1 x SMA, 50 Ω (female) (DC voltage for active antennas is supplied)
Ethernet	1 x GigE (10/100/1000Base-T), RJ45 (protective housing for connector: CNLINKO, BD-24-RJ45-P02)
External power supply	PoE++, 60 W Plug type: RJ45 with waterproof housing
Passive cooling	Fanless design for low maintenance operation.
Dimensions[d] (H x W x D) (incl housing, without connectors)	151 mm x 356 mm x 353 mm (5.94'' x 14.02'' x 13.90'')
Weight	Approx. 13 kg / 28.66 lb (with ice creation the weight can increase significantly)
Country of origin	Germany

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d   Without antennas, stand or accessories

General Specifications 3330/02-3, Modem R[n]		
Attenuator	0 to 30 dB (0.5 dB steps)	
Digitizer	16 bit	
GNSS	Embedded receiver (GPS / QZSS, GLONASS, BeiDou, Galileo) Coordinates representation as decimal degree (DegDec - ddd.ddddd)	
Internal non-removable memory	ssD, mSATA	30 GB system partition 28 GB configuration settings and user data
GNSS antenna input (for additional, external GNSS antenna)	1 x SMA, 50 Ω (female) (DC voltage for active antennas is supplied)	
LTE antenna connector (LTE antenna incl. in Set 3330/102)	1 x SMA, 50 Ω (female)	
External power supply (not incl.)	Basic unit, DC input: 10 to 30 VDC, ≥ 45 W	
	Plug type: 3-pin with waterproof housing (CNLINKO: BD-24-C03PE-01-002)	
Passive cooling	Fanless design for low maintenance operation.	
Dimensions[e] (H x W x D) (incl. housing, without connectors)	151 mm x 356 mm x 353 mm (5.94" x 14.02" x 13.90")	
Weight	Approx. 13 kg / 28.66 lb (with ice creation the weight can increase significantly)	
Country of origin	Germany	

Specifications 3330/02, Modem R1		
R[n][f] Frequencies		Region 1: Europe[g], The Middle East, Africa 4G (LTE-FDD): B1, B3, B5, B7, B8, B20 4G (LTE-TDD): B40 3G: B1, B5, B8 2G: B3, B8
RUT241	RF technologies	2G, 3G, 4G
	Max RF power	33 dBm @GSM, 24 dBm @WCDMA, 23 dBm @LTE
	Transmission rates	4G (LTE) – Cat 4 up to 150 Mbps, 3G – Up to 42 Mbps, 2G – Up to 236.8 kbps

RUT241 router must be used in compliance with any and all applicable national and international laws and with any special restrictions regulating the utilization of the communication module in prescribed applications and environments.

External antennas used with RUT241 must be installed to provide a separating distance of at least 20 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter.

Any external antenna gain must meet RF exposure and maximum radiated output power limits of the applicable rule section.

Failure to observe these instructions could result in your RF exposure exceeding the relevant guideline limits.

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e   Without antennas, stand or accessories

f   R[n]: Respective region in which the installed LTE router can be used.

g   Regional availability - excluding Russia & Belarus.

Remote Control and Streaming	
Remote control protocol	SCPI
FFT streaming	VITA49 compliant
IQ streaming	VITA49 IQ streaming, sample rate up to 25.6 MHz[h, i]
Remote Software	Remote Desktop for PC, Tablet and Smartphone (Windows, Android, IOS)

Additional Functions	
Noise power density measurement	Can be measured with up to eight markers at a time.
Channel power measurement	Can be measured with up to eight markers at a time.
Occupied bandwidth measurement	According to ITU-R SM.443-4, with additional automatic center frequency and channel power measurement. Can be measured with up to eight markers at a time.
Field strength measurement	According to ITU-R SM.378-7
CISPR Detectors	Cpeak (quasi-peak), CRMS & CAvg (EMC filter with CISPR bandwidth must be selected)
Modulation detectors	AM, FM and PM. Up to 4 different detectors are available simultaneously
Frequency offset measurement	For CBW ≤ 1 MHz (using modulation detectors)
Analog demodulation and recording	AM, Pulse, CW, ISB, USB, LSB, FM, PM, or IQ signals can be demodulated with squelch and AGC function. The demodulated signal can be stored as WAV-file.
Tone search	The level of one of the detectors modulates the pitch of an audible tone.
Automatic DF	Automatic bearing of transmitters using a Narda Automatic DF Antenna.
Automatic transmitter localization (Heatmap)	Automatic calculation of the transmitter location.
TDOA localization[j]	Integrated GPS with high-accuracy timestamp for TDOA applications. With additionally available software package

Environmental Conditions		
MIL-PRF-28800F Class 2		Operating temperature[k]
		Storage temperature
		Operating humidity
		Random vibration
		Functional shock
		Transit drop
Operating temperature		-20 °C to + 55 °C
Humidity		< 29 g/m³ (< 93 % RH at +30 °C)
IP class		IP 65
Climate	Storage	1K3 (IEC 60721-3) extended to - 40 °C to + 70 °C
	Transport	2K4 (IEC 60721-3) restricted to - 40 °C to + 70 °C
	Operating	7K2 (IEC 60721-3) extended to - 20 °C to + 55 °C
Mechanical	Storage	1M3 (IEC 60721-3)
	Transport	2M3 (IEC 60721-3)
	Operating	7M3 (IEC 60721-3)

| Compliance		
EMC	European Union	Complies with RED Directive 2014/53/EU and EN 301 489-1 V2.2.3, EN 301 489-52 V1.2.1, EN 301 511 V12.5.1, EN 301 908-2 V13.1.1, EN 301 908-13 V13.2.1, EN 301 908-1 V15.1.1, EN 61326-1:2021
	Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11
	Emission	IEC/EN: 61000-3-2, 61000-3-3, IEC/EN 55011 (CISPR 11) Class B
Safety		Complies with European Low Voltage Directive 2014/35/EU and IEC/EN 61010-1:2010
Material		Complies with European RoHS Directive 2011/65/EU, (EU)2015/863 and EN 63000:2018

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h   Applies for integrated 1 Gbit Ethernet interface.

i   25.6 MHz IQ data streaming is not possible due to bandwidth limitation caused by the modem and/or 100 Mbit LAN.

j   Requires additional software

k   For low-maintenance operation, the system is passively cooled and therefore requires no fan. Protection against direct sunlight must be provided!

Drawing - SignalShark 3330/xx
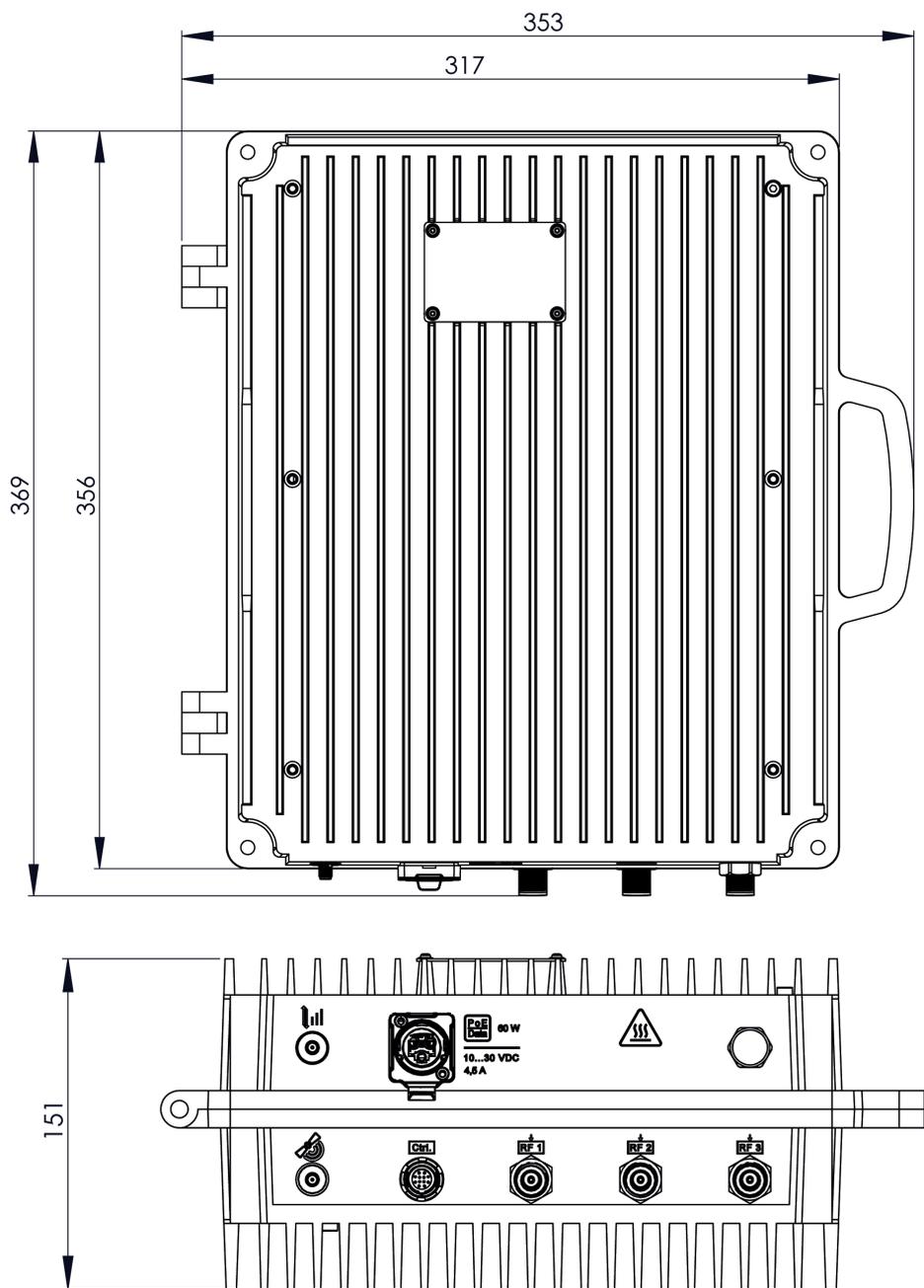
All dimensions are given in mm.
The actual connectors depend on the selected device version.

Also consider the space needed for mounting adapters, wall mount adapter or mast mount adapter
For low-maintenance operation, the system is passively cooled and therefore requires no fan.
Protection against direct sunlight must be provided!

Ordering Information

The SignalShark Outdoor Unit is included in the Basic Sets. Application Packages as well as Software Options and Accessories that provide additional signal analysis capabilities are also available.

Your local Narda sales representative can provide information about all the possible options and will be pleased to offer advice.

Basic Unit Sets

SignalShark Outdoor Unit PoE Basic Set	Part number
The Basic set contains the "SignalShark Outdoor Unit, PoE", as well as basic accessories and supports 40 MHz real-time spectrum analysis, marker, peak table and SCPI remote control functions. **Includes:** › SignalShark Outdoor Unit, PoE › RJ-45-Plug waterproof › PoE++ Injector, 60 W › Wall Mount Bracket for SignalShark 3330 › Option, SCPI Remote Control › USB Stick: SW and Manuals, ordered options › SignalShark 3330 - Quick Start and Safety Instructions	**3330/101**

SignalShark Outdoor Unit Modem R1 Basic Set*	Part number
The Basic set contains the "SignalShark Outdoor Unit, Modem R1", as well as basic accessories and supports 40 MHz real-time spectrum analysis, marker, peak table and SCPI remote control functions. **Includes:** › SignalShark Outdoor Unit, Modem R1 › DC-Plug waterproof › LTE Antenna › Wall Mount Bracket for SignalShark 3330 › Option, SCPI Remote Control › USB Stick: SW and Manuals, ordered options › SignalShark 3330 - Quick Start and Safety Instructions	**3330/102** (only available in countries with corresponding radio approval)

* Europe only (Regional availability - excluding Russia & Belarus.).

For other regions, please contact your local Narda sales representative for further information.

Application Packages

The application packages make it easy to adapt SignalShark to your requirements. Each package typically consists of application-dependent hardware accessories and/or firmware options, and costs less than purchasing the items individually. Additional packages can be purchased as and when required.

Your local Narda sales representative will be happy to assist you in the selection of the right packages for your applications.

App. Package, Receiver	Part number
The Receiver Application Package guarantees situational awareness by providing gapless analysis of entire signal bands. It also enables demodulation of AM, FM, LSB, USB, and CW signals. **Includes:** › Option, Spectrogram (3310/95.002) › Option, Level Meter incl. Compass values (3310/95.003) › Option, Analog Demodulation (3310/95.007)	**3310/94.01**

App. Package, Automatic DF 2, 10 MHz to 8 GHz *	Part number
This Application Package provides basic equipment and options for vehicle based, automatic direction finding (bearing). **Includes:** › Automatic DF-Antenna 2 (3361/01) › USB Stick: Software and Manuals, ordered Options (3310/93.01) › RF-Cable, DC to 8 GHz, N to SMA, 50 Ohm, 5 m (3603/02) › Option, Automatic DF Antenna Control, Bearing View (3310/95.005) › Tool, Allen Wrench 3 mm (3300/90.19) › ADFA Vehicle Mounting Kit for autom. DF Antenna (3300/90.04) incl. the "Automatic DF-Antenna Handling and Safety Instructions" multilingual (3360/98.12) › Shipping Carton with Inlet for autom. DF-Antenna	**3310/94.06**

*Additional option 3310/95.006 "Mapping and Localization" is recommended for Open Street Map based visualization and heatmap localization.

App. Package, Automatic DF 2, 10 MHz to 8 GHz, Hardcase *	Part number
This Application Package provides basic equipment and options for vehicle based, automatic direction finding (bearing). **Includes:** › Automatic DF-Antenna 2 (3361/01) › USB Stick: Software and Manuals, ordered Options (3310/93.01) › RF-Cable, DC to 8 GHz, N to SMA, 50 Ohm, 5 m (3603/02) › Option, Automatic DF Antenna Control, Bearing View (3310/95.005) › Tool, Allen Wrench 3 mm (3300/90.19) › ADFA Vehicle Mounting Kit for autom. DF Antenna (3300/90.04) incl. the "Automatic DF-Antenna Handling and Safety Instructions" multilingual (3360/98.12) › Hardcase for Automatic DF Antenna (3360/90.01)	**3310/94.12**

*Additional option 3310/95.006 "Mapping and Localization" is recommended for Open Street Map based visualization and heatmap localization.

Software Options

Software options allows the adaption of the device feature set to your needs.

Description	Part number
40 MHz real-time Spectrum, Marker and Peak Table (included in SignalShark 3330 Basic Set). Via the "*Spectrum (Scan)*"-, "*RT (Real-Time) Spectrum*"- "*Auto DF*"-, and "*IQ Analyzer*"-Tasks, the following View(s) can be accessed: › Spectrum View › Peak Table (of Spectrum) View	**Included in Basic Set**
Option, Spectrogram Via the "*Spectrum (Scan)*"- and "*RT (Real-Time) Spectrum*"-Tasks, the following View(s) can be accessed: › Spectrogram View	**3310/95.002**
Option, Level Meter incl. Compass values Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Level Meter View	**3310/95.003**
Option, Persistence (of real-time Spectrum) Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Persistence View	**3310/95.004**
Option, Automatic DF Antenna Control, Bearing View Via the "*Auto DF*"-Task, the following View(s) can be accessed: › Bearing View	**3310/95.005**
Option, Mapping and Localization Via the "*Spectrum (Scan)*"-, "*RT (Real-Time) Spectrum*"-, and "*Auto DF*"-Tasks, the following View(s) can be accessed: › Map View	**3310/95.006**
Option, Analog Demodulation Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Spectrum View › Level meter View	**3310/95.007**
Option, Horizontal Scan Via the "*RT (Real-Time) Spectrum*"-Task, the following View(s) can be accessed: › Horizontal Scan View	**3310/95.011**
Option, SCPI Remote Control (included in SignalShark 3330 Basic Set)	**3310/95.12** **Included in Basic Set**
Option, VITA 49[I] Via the "*RT Streaming*"-Task, the following View(s) can be accessed: › VITA 49 FFT Streaming View › VITA 49 IQ Streaming View	**3310/95.014**
Option, IQ Analyzer, Recorder, Trigger, Magn. View Via the "*IQ Analyzer*"-Task, the following View(s) can be accessed: › IQ Magnitude View › IQ Spectrum View › IQ Spectrogram View	**3310/95.018**

I   *Requires Option 3310/95.012 "Option, SCPI Remote Control"*

Accessories

Accessory Description	Part number
PoE++ Injector, 60W (please select country specific power cord).	**3330/90.01**
Universal Surge Arrester for GBit Ethernet (DEHN 929 221)	**3330/90.06**
RF Adapter, N Male to SMA Female, 50 Ohm	**3330/90.13**
GNSS Antenna, Screw Mounting, Active	**3330/90.04**
LTE Antenna	**3330/90.05**
Mast Mounting Adapter for 3330/XX, D: 48mm to 200 mm	**3330/90.07**
Recovery media for SignalShark Quad Core	**3310/90.25**
RF and Control-Cable for Automatic DF-antennas, DC to 8 GHz, N to SMA, 50 Ohm, 5 m	**3603/02**
RF and Control-Cable for Automatic DF-antennas, DC to 8 GHz, N to SMA, 50 Ohm, 15 m	**3603/03**
RF and Control-Cable for Automatic DF-antennas, DC to 8 GHz, N to SMA, 50 Ohm, 10 m	**3603/07**
Tripod, Non-Conductive, 1.65m, reinforced, 3/8"-16 UNC (for ADFA 2 only)	**3300/90.16**
Tripod Quick-Release Coupling, 3/8"-16 UNC (for 3300/90.16)	**3300/90.17**
ADFA Non-Conductive Antenna Mast Mounting Kit	**3300/90.23**

Antennas*	Part number
Automatic DF-Antenna 2 Basic Set, 10 MHz to 8 GHz[m]	**3361/101**

*There is a separate DF antenna datasheet, which provides detailed information about the direction-finding antennas available from Narda.

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m   *Requires Option 3310/95.005 "Option, Automatic DF Antenna Control, Bearing View"*

SignalShark Family

There are several different instrument types in the SignalShark family:
SignalShark Handheld, SignalShark Remote Unit, SignalShark Outdoor Unit Modem R[n] Basic Set and SignalShark EMF Monitoring System, R[n].
For more information, please visit our website www.narda-sts.com

SignalShark Handheld

SignalShark Remote Unit

SignalShark Outdoor Unit

SignalShark EMF

Narda DF Antennas Datasheet

SignalShark Command Reference Guide

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