

SignalShark - Preliminary Datasheet*

**SUBJECT
TO CHANGE!**

SignalShark

Real-Time Handheld Analyzer

Real-Time Handheld Analyzer for Detection, Analysis, Classification and Localization of RF Signals between 9 kHz and 8 GHz. Applicable for mobile and stationary use.

It supports Narda directional and full automatic direction finding antennas as well as user defined antennas.

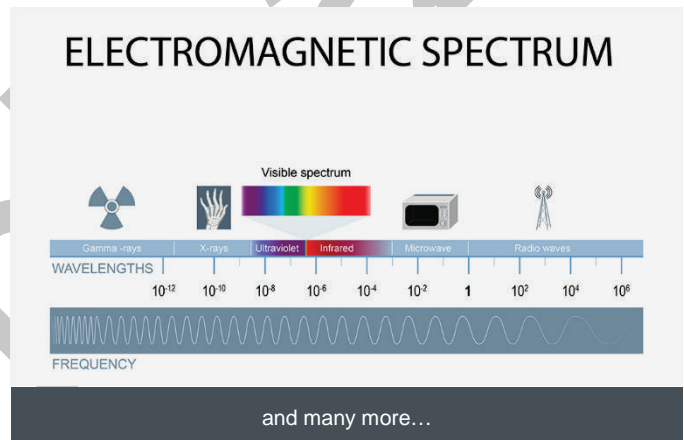
- › Extremely high Sweep Rate of up to 40 GHz/s
- › 40 MHz Real-Time instantaneous bandwidth
- › Powerful, live persistence spectrum to find hidden signals
- › Full automatic Direction Finding
- › High Dynamic Range (HDR) Receiver



***All parameters are target values and subject to change!**

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Take on the frequency spectrum challenges of today and tomorrow



Seven Senses for Signals

Description

Like a Shark, that highly efficient hunter in the ocean, Narda SignalShark derives its success in measurement from the interplay of its highly developed senses.

Its 40 MHz real-time bandwidth captures the spectrum of even very short pulsed signals of $3.125\mu\text{s}$ with a POI of 100 %. This guarantees a consistent awareness of all spectrum events.

Due to its distinguished analysis functions like real-time spectrum, spectrogram, persistence and channel analysis and its large integrated I/Q recorder, measured signals are analyzed with a very high frequency and time resolution.

SignalShark supports manual bearing with field proven Narda directional antennas as well as full automatic direction finding in combination with the Narda automatic direction finding antennas. A live map view shows the current position, bearings and localizations.

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Applications

More and more devices have to share the available frequency ranges because of the rapid development in new technologies such as the Internet of Things (IoT), machine to machine (M2M) or car to car (C2C) communications and expanding 4G/5G mobile networks.

Whether making a wideband measurement of an entire frequency range, detecting hidden signals, reliably capturing very short impulses or localizing interference signals, SignalShark provides comprehensive measurement solutions for the increasingly complex RF spectrum.

Some example applications of SignalShark:

- › Analyze RF signals and RF emissions in the field, to accelerate the development of mobile technologies
- › Locate interference sources
- › Finding jammers
- › Check DECT signals
- › ISR-Missions

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Operating Modes

Narda SignalShark has two basic operating modes:

Scan Mode

This mode supports measuring the spectrum with full frequency span of 9 kHz up to 8 GHz within one measurement and a maximum measurement speed of 40 GHz/s.

Real-Time (Fixed Frequency) Mode

The Fixed Frequency Mode enables real-time spectrum measurements with a frequency span of up to 40 MHz. This frequency span will be acquired simultaneously in frequency and also gapless in time with 75% of overlapping of the FFT frames. For frequency spans ≤ 20 MHz the overlapping of the FFT frames increases to 87.5 %. At the same time a second digital down converter is used for analyzing and demodulating the I/Q data of a separate channel with selectable frequency and bandwidth within the 40 MHz real-time bandwidth.

Tasks

Pre-defined measurement tasks are stored in the SignalShark in advance, facilitating consistent, effective and reliable measurements for both beginners and experts alike. Measurement tasks are represented by a tab on the screen, like a web site within a web browser. You can add up to six measurement visualizations (Views) to a task, to adapt it to your needs. SignalShark is supplied with several predefined tasks, so you can immediately begin making measurements.

Views

Measurements are visualized within different kind of views. You can look at the frequency domain and time domain at the same time for example by adding a spectrum view and a time domain view to a measurement task.

- › **Spectrum** (scanned or real-time)
Shows level over frequency.
- › **Peak Table** (of Spectrum)
List of relevant signal peaks in the measured spectrum.
- › **Spectrogram**
Visual representation of recorded spectra over time. Colors represent the signal level. The smallest selectable time resolution is 31.25 μ s. Detectors are used to compress the high speed real time spectra to the selected time resolution.
- › **Level Meter** (& Compass)
Shows channel level as bar graph and compass values.
- › **I/Q** (vs. Time) ^{a)}
Displays measurement data as I (in-phase demodulated signal) and Q (quadrature demodulated signal) components vs. time for determining modulation type and interference.
- › **HTR Magnitude** (High Time Resolution) ^{a)}
Displays signal power vs. time
- › **HTR Spectrogram** (High Time Resolution) ^{a)}
Displays signal as a spectrogram with an arbitrary high time resolution. Colors represent the signal level.
- › **Persistence** (of real time Spectrum)
Displays spectra as level versus frequency.
Color indicates rate of occurrence. Sporadic signals are detected easily.
- › **Bearing** (& Level Meter)
Shows azimuth and level of an automatic DF antenna
- › **Horizontal Scan** ^{a)}
Shows the signal level over azimuth angle in a polar diagram.
- › **Map view**
Visualizes the current position, bearings, located transmitters and selectable measurement data within a geographical map.

a) Available in later firmware version.

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Preliminary Specifications^{b)}

Basic Unit SignalShark

RF Parameters			
Frequency Range	9 kHz – 8 GHz		
Sweep Rate	40 GHz/s (RBW ≥ 100 kHz)		
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 noise figure and IP2/IP3 values stated below are valid at the same time because no special “low distortion mode” or “low noise mode” is required!		
DANL (Noise Figure) @ attenuator = 0 dB, Preamp Off	2 MHz < f < 20 MHz:	-162 dBm/Hz (12 dB)	
	20 MHz < f < 3 GHz:	-162 dBm/Hz (12 dB)	
2 nd and 3 rd order intermodulation (IP2/IP3) @ attenuator = 0 dB, Preamp Off	3 MHz < f < 30 MHz:	60 dBm IP2, 20 dBm IP3	
	30 MHz < f < 3 GHz:	40 dBm IP2, 10 dBm IP3	
Phase noise (SSB)	f_c	df = 10 kHz	df = 100 kHz
	10 MHz	-110 dBc/Hz	-130 dBc/Hz
	1 GHz	-100 dBc/Hz	-105 dBc/Hz
Probability of intercept – POI	100 % for signals longer than 3.125 μs (in real-time spectrum)		
Real Time Spectrum Rate	1.6 million spectra / s		

RF input	
Type (switchable)	1 x N-connector, 50 Ω, female 3 x SMA-connector, 50 Ω, female
RF destruction limit	20 dBm
Max. nominal RF level	10 dBm
Maximum DC voltage	25 V
Return loss ('S11')	9.54 dB

General Specifications	
Attenuator	0 ... 25 dB (0.5 dB Steps)
Digitizer	16 Bit
Internal Memory	SSD, mSATA (not replaceable by customer)
Removable memory	microSD / USB
External power supply:	Base device DC input: 9 to 48 VDC Adapter 12VDC, 5.5A, 100V-240VAC
Battery	2 x Lithium-ion rechargeable battery pack, hot-swappable during operation Operating time: approx. 3 hours (typical, with both batteries) Charging time: approx. 4.2 hours (nominal, with both batteries charging in base device) Charging time: approx. 3 hours (nominal, with external charger)
<i>In many countries the battery is available from several public distributors.</i>	
Dimensions (H x W x D)	230 mm x 335 mm x 85 mm (9.06" x 13.19" x 3.35")
Weight	Approx. 4.2 kg / 9.26 lbs (with both batteries)
Country of origin	Germany

^{b)} RF data apply in the temperature range of 20°C to 26°C and a relative humidity between 25 % and 75 %.

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Interfaces	
10 MHz Reference input	1 x SMA-connector, 50 Ω, female
PPS/Trigger input	1 x SMA, 50 Ω, female
GNSS Antenna Input <i>(for additional, external GNSS antenna)</i>	1 x SMA, 50 Ω, female (DC voltage for active antennas is supplied)
Display Size and Resolution:	10.4", 1024 x 768 pixels (resistive touch)
Video	1 x Display Port
Audio	1 x 3.5 mm headphone jack Built-in loudspeaker Built-in microphone
Ethernet	1 x GigE
USB (Host)	1 x USB 3.0, 1 x USB.2.0
SD card slot	1 x microSD-card

Remote control and streaming	
Remote Control Protocol	SCPI
I/Q Streaming	VITA 49 ^{c)}
PC Software	Configuration Software Remote Measurement Software ^{c)}
Driver	LabView ^{c)}

Environmental conditions		
MIL-STD-810G, MIL-PRF-28800F Class 2	Temperature	
	Humidity	
	Vibration	
	Functional Shock	
Altitude – operating	4,600 m or 15,000 ft	
Temperature – operating	- 10 °C to + 55 °C with battery	
	- 10 °C to + 55 °C with external power supply	
	0 °C to + 40 °C with external power supply when charging batteries	
Humidity	< 29 g/m ³ (< 93 % RH at +30°C), non-condensing	
Climatic	Storage	1K3 (IEC 60721-3) extended to - 20 °C to + 70 °C (batteries removed)
	Transport	2K4 (IEC 60721-3) restricted - 20 °C to + 70 °C due to display
	Operating	7K2 (IEC 60721-3) extended to - 10 °C to + 55 °C
Mechanical	Storage	1M3 (IEC 60721-3)
	Transport	2M3 (IEC 60721-3)
	Operating	7M3 (IEC 60721-3)
Ingress Protection	IP 52 (with antenna attached and interface protectors closed) IP 67 (stored in the hardcase)	
EMC Immunity	100 V/m (limited by the max. permissible field for the antennas)	

c) Will be available at a later stage.

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Specifications of Directional Antennas

General Specifications – Antenna Handle and Directional Antennas				
Environmental	Operating temperature	- 10 °C to + 55 °C		
	Humidity	< 29 g/m ³ (< 93 % RH at + 30 °C), non-condensing		
Compliance	Climatic	Storage	1K3 (IEC 60721-3) extended to - 20 °C to + 70 °C	
		Transport	2K4 (IEC 60721-3) extended to - 20 °C to + 70 °C	
		Operating	7K2 (IEC 60721-3) extended to - 10 °C to + 55 °C	
	Mechanical	Storage	1M3 (IEC 60721-3)	
		Transport	2M3 (IEC 60721-3)	
		Operating	7M3 (IEC 60721-3)	
	EMC	European Union	Complies with EMC Directive 2014/30/EU and IEC/EN 61326 -1: 2013	
		Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11 Complete set tested up to 100 V/m (limited by the max. permissible field for the antennas)	
		Emissions	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			
Dimensions (L x W x H), Weight (size without cable)	Handle:	165 mm x 165 mm x 43 mm (6.5" x 6.5" x 1.7"),	470 g / 1.04 lbs	
	Dir. Antenna 1:	325 mm x 255 mm x 80 mm (12.8" x 10.0" x 3.1"),	400 g / 0.88 lbs	
	Dir. Antenna 2:	285 mm x 410 mm x 43 mm (11.2" x 16.1" x 1.7"),	300 g / 0.66 lbs	
	Dir. Antenna 3:	478 mm x 332 mm x 50 mm (18.8" x 13.1" x 2.0"),	350 g / 0.77 lbs	
	Loop antenna			
	3100/14:	430 mm x 370 mm x 42 mm (16.9" x 14.6" x 1.7"),	380 g / 0.84 lbs	
Country of origin	Germany			
Automatic frequency response correction	Typical antenna factor correction is applied automatically when used in conjunction with the SignalShark basic unit and Narda Active Antenna Handle			

Active Antenna Handle - with Electronic Compass and Preamplifier



Frequency range	9 kHz to 8 GHz Automatic frequency response correction
Preamplifier	Built-in, can be switched off Amplification typ. 16 dB, noise figure < 6 dB
Compass	Embedded electronic compass
Compass uncertainty (typ.)	Azimuth uncertainty < 1.5° RMS for tilt < 15° Pitch and roll uncertainty < 3° RMS in the range of +/- 30° (RMS means the standard deviation of the specified error)
Connection cable to IDA basic unit	RF cable and control cable combined in a flexible tube, length 1 m
RF connector to basic unit	SMA-connector, male, 50 Ω (N-connector adapter included)
RF connector to Narda directional antennas	BMA 50 Ω (female on handle side)
Antenna connectivity	Horizontal or vertical polarization, type and polarization detected automatically
Power supply	From basic unit
Mounting	Connecting thread at the underside of the handle for tripod mounting

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Directional Antenna 1



Frequency range	20 MHz to 250 MHz
Antenna type	Loop antenna
Antenna factor	21 dB (1/m) typical @ 200 MHz (passive mode)

Directional Antenna 2



Frequency range	200 MHz to 500 MHz
Antenna type	Dipole antenna
Antenna factor	21 dB (1/m) typical @ 350 MHz (passive mode)

Directional Antenna



Frequency range	400 MHz to 8 GHz
Antenna type	Log-periodic antenna
Antenna factor	18.5 dB (1/m) typical @ 500 MHz (passive mode)

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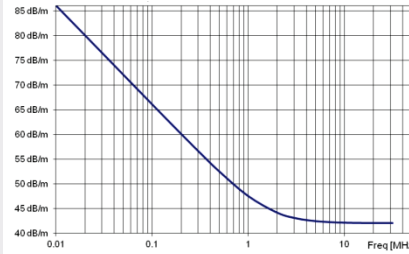
Loop Antenna, H-FIELD



Frequency range 9 kHz to 30 MHz

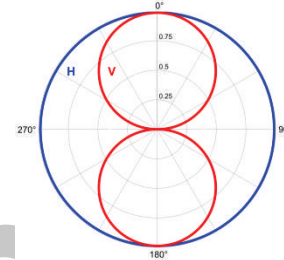
Antenna type Shielded loop antenna

Antenna factor / Radiation pattern



Passive mode (preamp. off):
66.0 dB (1/m) typical @ 100 kHz
47.5 dB (1/m) typical @ 1 MHz
42.0 dB (1/m) typical @ f > 10 MHz

Antenna (Loop) 9 kHz to 30 MHz



Radiation pattern (typ.) for a horizontal scan and vertical polarization (V) or horizontal polarization (H)

Antenna Adapter, N Male



Description

With an adapter the internal 3D compass, built-in switchable preamplifier, and automatic polarization detection can be used with third-party antennas.

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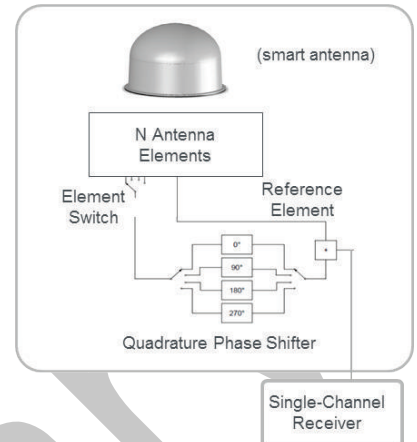
Overview automatic DF antennas

SignalShark can be connected to an automatic DF antenna. The antenna translates signals from several antenna segments into a single channel DF signal. The antenna is controlled by SignalShark, which automatically calculates bearings out of the single channel DF signal.


The antenna can be mounted to an antenna mast or can be attached to the rooftop of a vehicle via a magnetic mount adapter.

The measurement results contain bearings, as well as omnidirectional level and spectrum values.


In its omnidirectional mode the antenna can be used for real-time measurements too.



ADFA Mobile

	
Frequency range	200 MHz to 2.7 GHz
Antenna type	Single channel, automatic direction finding antenna.
DF method	Correlative interferometer
Compass	Embedded electronic compass
Bearing accuracy	$\leq 2^\circ$ RMS (in reflection-free test terrain, depending on frequency)
Diameter	460 mm (18.11")
Automatic frequency response correction	Typical antenna factor correction is applied automatically when used in conjunction with the SignalShark basic unit.

ADFA Wideband

	
Frequency range	10 MHz to 8 GHz
Antenna type	Single channel, automatic direction finding antenna.
DF method	Watson-Watt , correlative interferometer
Compass	Embedded electronic compass
Bearing accuracy	$\leq 2^\circ$ RMS (in reflection-free test terrain, depending on frequency)
Diameter	460 mm (18.11")
Automatic frequency response correction	Typical antenna factor correction is applied automatically when used in conjunction with the SignalShark basic unit.

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