Press release

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[Short version]

SignalShark – Tracks down hidden interference with its top grade dynamic range

Pfullingen, February 20, 2018 – Narda Safety Test Solutions presents the SignalShark, the ideal monitoring receiver. Powerful, portable and versatile, and eminently suitable for upcoming requirements for both mobile and fixed applications, it perfectly combines minimal noise with high intermodulation immunity. The engineers at Narda, the RF measurement technology specialist, have designed their latest development specifically for rapid and reliable detection and analysis, classification and localization of RF emissions between 8 kHz and 8 GHz. One of the commonest tasks in telecommunications measurements is an examination of signal levels versus frequency. Here, users benefit from the extraordinarily high dynamic range of the SignalShark. High Dynamic Range (HDR) in this context means the ability of the SignalShark to reliably capture low-level signals in the presence of higher-level signals without problems. HDR necessitates a difficult balancing act between high sensitivity for low levels and maximum insensitivity to saturation due to high levels in the direct vicinity.

In practice, measurement engineers are often faced with the tricky situation when they need to make high sensitivity measurements at locations close to VHF antennas or base stations in order to trace unknown interference that is present at much lower levels. Narda's development team had to invest a huge amount of time and effort to solve this herculean task. The result is a system that is as complex as it is ingenious. The SignalShark's so-called preselector makes it possible for it to suppress frequency ranges that would interfere with the measurement. The preamplifier and first mixer stage define the low intrinsic noise (displayed average noise level or DANL). The excellent dynamic range of the SignalShark is the result of the ideal combination of DANL with the "insensitivity parameters", that is the second and third order intermodulation intercept points (IP2 and IP3).

In its "Handbook of Spectrum Monitoring", the International Telecommunication Union (ITU) describes how the ideal receiver should look from their point of view: minimal noise and insensitive to intermodulation – expressed by the three parameters DANL, IP2, and IP3 (between 20 MHz and 3 GHz). The values for the SignalShark for frequencies between 20 MHz and 3 GHz are as follows: DANL = -159 dB (mW/Hz), IP2 = +30/+40 dBm and IP3 = +12 dBm. A direct comparison using a graph with two superimposed triangles makes it clear that Narda's specifications are practically identical to the theoretical ideal values determined

by the ITU. This is an impressive and independent, neutral confirmation of the HDR qualities of the SignalShark, which are unique for this class of device anywhere in its field.

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[Long version]

SignalShark – Tracks down hidden interference with its top grade dynamic range

Where common spectrum analyzers have long given up looking for interference, the SignalShark is just getting started: surrounded by dominant, high levels, it can reliably and securely capture much smaller signals that would otherwise be completely swamped, thanks to its top notch dynamic range values.

Pfullingen, February 20, 2018 – Narda Safety Test Solutions presents the SignalShark, the ideal monitoring receiver. Powerful, portable and versatile, and eminently suitable for upcoming requirements for both mobile and fixed applications, it perfectly combines minimal noise with high intermodulation immunity. The RF measurement technology specialist engineers from Pfullingen have designed their latest development specifically for rapid and reliable detection and analysis, classification and localization of RF emissions between 8 kHz and 8 GHz. In one of the commonest tasks in telecommunications measurements, the examination of signal levels versus frequency, users benefit especially from the extraordinarily high dynamic range of the SignalShark. High Dynamic Range (HDR) in this context means the ability of the SignalShark to without problems reliably capture low-level signals that would otherwise easily be swamped in the presence of higher-level signals. HDR necessitates a difficult balancing act between high sensitivity for low levels and maximum insensitivity to saturation due to high levels in the direct vicinity. Together with its high real time bandwidth of 40 MHz, the dynamic range of the SignalShark is yet another highlight of this handheld device that has made the industry sit up and take notice.

Although the comparison is misleading …

A look at the idea of HDR in other contexts may help to give a clearer picture of the actual problem that is associated with the term “dynamic range”. HDR is an abbreviation used in photography or acoustics, for example. Photographs may be called high dynamic range images if they show a high degree of detail despite great differences in brightness. Contours can still be clearly seen in the darker areas, while brighter areas such as clouds in bright sunshine still show enough detail, i.e. they are not over exposed or “burnt out”. A comparison of HDR in RF measurement with acoustics might be represented by being able to hear clearly the fine tones of a flute right next to a pneumatic drill going at full power. Although the

comparison is a bit misleading, at least it gives you a qualitative idea of just how powerful the SignalShark is.

Looking for interference – measuring low levels without hindrance

In practice, measurement engineers are often faced with the tricky situation when they need to make high sensitivity measurements at locations close to VHF antennas or base stations in order to trace unknown interference that is present at much lower levels. Whereas in mobile telecommunications the focus these days is mainly on ensuring communication and convenience, it is safety aspects that are the priority in areas such as air traffic control or radar. For example, with regard to air traffic control – the radio traffic between airliners and the control tower – users will need to make very sensitive measurements relating to safety in the range around 120 MHz. But at the same time, the scanning radar will be transmitting pulses in the megawatt range at around 2.4 GHz from the top of the same control tower. A conventional spectrum analyzer quickly reaches its limits here, since it usually does not have either a high dynamic range or a so-called preselector, in contrast with the SignalShark. A preselector makes it possible for the measuring device to suppress frequency ranges that interfere with the measurement, 2.4 GHz in the example. This ensures that the user always gets realistic measurement results regardless of the signal level situation in the immediate vicinity.

High-quality components in an ingenious concept

Narda's developers had to devote a great deal of time and effort to achieve a conceptual solution to this herculean task. Years of intensive development work have resulted in a system that is as complex as it is ingenious: A brilliant interplay between a clever circuit design concept and high-quality components. The preamplifier and low-noise first mixer stage determine the low intrinsic noise (displayed average noise level or DANL) of the SignalShark. High sensitivity is an absolute must for tracing interference. If this is impaired, the fault is impossible to correct later on. Yet it is only the ideal combination of DANL with the "insensitivity parameters", i.e. the second and third order intermodulation intercept points (IP2 and IP3), its quasi opponents, that ultimately results in the excellent dynamic range of the SignalShark. This allows the device to easily prevent the higher levels from swamping the smaller ones, which would otherwise render them "invisible" to it.

Recommendation: The ideal receiver according to ITU

In its "Handbook of Spectrum Monitoring", the International Telecommunication Union (ITU) describes how the ideal receiver should look from their point of view: minimal noise and insensitive to intermodulation – expressed by the three parameters DANL, IP2, and IP3 (between 20 MHz and 3 GHz). In other words, this is the benchmark for these three strongly interdependent factors. It is important that these three factors are always specified for the same device setting, as they vary considerably according to the setting. The values for the SignalShark for frequencies between 20 MHz and 3 GHz are as follows: DANL = -159 dB (mW/Hz), IP2 = +30/+40 dBm and IP3 = +12 dBm. A comparison of the Narda STS

specifications with the theoretical ideal values determined by the ITU makes it clear that they are almost identical. Whereas a DANL von -174 dB (mW/Hz) is the physical limit for an analyzer at room temperature, the desirable value according to the ITU is -162 dB (mW/Hz). The other values for the harmonics and intermodulation are congruent. This comparison of the Narda data sheet values with the ideal values specified by the ITU, particularly their high degree of congruence, is an impressive and independent, neutral confirmation of the HDR qualities of the SignalShark, which are unique for this class of device anywhere in its field.

Summary

Universal strengths normally mean that some penalties are suffered in specific niche applications, particularly when covering extreme differences in terrain. Put another way, there is a tradeoff between an acceptable compromise and justifiable cost. However, the SignalShark, with its use of high quality components and particularly with its ingenious concept, is a notable exception to this. Regardless of the task for which this new development is used, the SignalShark without doubt represents the state of the art as an ideal monitoring receiver with top grade values for intrinsic noise and insensitivity to intermodulation. No less convincing to industry and research RF experts even now are its excellent specifications and capabilities as a real time handheld analyzer and as a direction finding and localization system. They make the SignalShark into the perfect instrument for current and future mobile and fixed applications in RF measurements. In this regard, its versatility, flexibility and particularly user-friendly operating concept based on its touch screen and portability are all points that deserve emphasis, as are its technical parameters, especially its frequency range from 8 kHz to 8 GHz, its extremely high sweep rate of 40 GHz/s, and its real time bandwidth of 40 MHz, unprecedented in a handheld device.

This quantum leap in development is especially noticeable in connection with its extremely high dynamic range. With regard to HDR, the device combines two properties that are diametrically opposed in principle: sensitivity and insensitivity. How successful the huge efforts made by the developers have been in this respect can be most impressively seen in the almost perfect match of its HDR parameters with the theoretical ideal values proposed by the ITU. General advances in technology along with the latest methods and high quality components no doubt all play a part in this more than remarkable development. But these concrete qualities are also the result of the manufacturer’s many years of experience in the field as well as their detailed knowledge of the market and the needs of its stakeholders. All of this has been incorporated into the SignalShark.

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Figure 1: It is often necessary to make measurements in the range of a few picowatts when on a rooftop surrounded by antennas transmitting at levels of several hundred watts. This is where the high dynamic range of the SignalShark shows its strength. It needs less input attenuation, so it can capture and measure much more.

Figure 2: A common situation when tracking down hidden interference: The measuring device must be capable of reliably capturing low-level unknown interference signals, quite often in the direct vicinity of an antenna that is emitting a much higher signal level. The SignalShark with its high dynamic range stands out here, since it can reliably measure small levels in such difficult situations.

Figure 3: Graphic representation of the ideal receiver from the ITU recommendation superimposed on the specified data sheet values for the "High Dynamic Range" of the SignalShark. The comparison shows an almost perfect match of the two diagrams, giving independent, neutral confirmation for this class of device of the preeminent HDR qualities of the new monitoring receiver from Narda STS.

Narda is a leading supplier of measuring equipment for RF testing, RF safety and EMC. The RF testing range includes analyzers and devices for measuring and identifying wireless sources. The RF safety product spectrum includes wideband and frequency-selective measuring devices, and monitors for wide area coverage or that can be worn on the body for personal protection. The EMC range, marketed under the PMM brand name, comprises instruments for measuring the electromagnetic compatibility of devices. The range of services includes servicing, calibration, and training programs. The company operates a management system complying with ISO 9001/2008 and ISO/IEC 17025.

Narda has development and production facilities at three locations: Hauppauge, Long Island / USA, Pfullingen / Germany and Cisano / Italy and has its own representative in Beijing / China. A worldwide network of representatives guarantees closeness to customers.

Narda is part of **L3 Technologies**, New York.

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