IDA 2
Dive deep into interference analysis
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1. Introducing Narda
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- Narda is the market leader for field strength test & measurement equipment and components
- Narda Test Solutions is part of the L-3 Communications Group
1. Introducing Narda

- L-3 Communications
  - Established 1997
  - 75 Business Units worldwide
  - Annual sales $13 billion in 2012
  - More than 50,000 employees

- Narda Group
  - 10 Divisions
  - 80 years in business
  - 2,800 employees
  - Core competence in
    - Microwave components
    - Antennas
    - Satellite communications

- Narda Test Solutions
  - 4 facilities
  - 90 employees
  - Specialized in
    - Spectrum analyzers
    - EMC receivers
    - Broadband RF meters
    - Remote monitoring stations

- Narda Satellite
- Narda East
- Narda West

- USA
- Germany
- Italy
- China
2. IDA 2 – Highlights
IDA 2
2. IDA 2 – Highlights

Outstanding features

IDA 2 is a top class handheld directional analyzer

› Extremely fast with a sweep rate of 12 GHz/s
› One of the lightest in its class with a weight of less than 3 kg
› Impressively sensitive with a noise figure of 7 dB
› Interference localization with smartDF®
› I/Q analyzer with real time display, spectrogram with 1 μs resolution, and persistence display
Outstanding features

I/Q analyzer – First-time in a handheld OTA tester
Offering in-situ test without need to carry 20 kg lab instruments

Analyze gapless real-time I/Q data with various views:
› ‘Raw’ I/Q signal
› Magnitude vs Time
› HiRes Spectrogram Full
› HiRes Spectrogram Zoom
› Persistence Spectrum

Only I/Q analysis offers detection of sporadic/intermittent signals, hidden interferers and correlation of disturbing and useful signal in frequency & time
3. IDA 2 – Basics
IDA 2 is an “Interference and Direction Analyzer” available as a complete set covering frequencies up to 6 GHz.
IDA 2 is a handheld direction finder for measuring electromagnetic signals, outdoors as well as indoors:

- Light weight
- Battery operated
- Built-in GPS and compass
- Frequency domain as well as time domain analysis modes
IDA 2 has several operating modes that allow you to detect, analyze and locate signals in many different situations:

› Direction Finding
› Spectrum
› Level Meter
› Time Domain (Scope)
› I/Q Analyzer
› Multi-Channel Power
4. IDA 2 in 3 steps

Step 1: Detect
Step 2: Analyze
Step 3: Locate
Step 1: Detect

There are several modes available for the first step in the search for an interferer:
Detect

Spectrum mode

Scan speed of 12 GHz/s:
› IDA 2 gives you a quick overview of what the spectrum looks like
› Sporadic interferers can also be detected

Noise figure of 7 dB:
› Even small peaks below -100 dBm can be detected
› The antenna can give an additional 10 dB sensitivity compared with other providers
› Note: 6 dB better noise figure doubles your measurement range!
Detect

I/Q Analyzer mode  →  HiRes Spectrograms

Gapless presentation:
› You can detect and monitor short pulses like bursts and radar

Time resolution of 1 µs:
› 1 µs resolution means 1 million spectra per second!
› Short pulses down to 100 ns can be displayed over a frequency span of 22 MHz, such as frequency hopping signals or emitter oscillations
Detect

I/Q Analyzer mode → Persistence

› The persistence view is a “3D view” where the rate at which an amplitude value occurs at each frequency is displayed by means of different colors.

› You can visualize infrequent signals or “signals under signals” e.g. a FM signal hidden under GSM traffic.
Detect

Multi-channel power

› A user defined channel table
› Up to 500 channels that can be monitored simultaneously and shown at a glance
› The multi-channel power view can directly show you which channels are occupied
With IDA 2 you can detect an interferer using:

› **Spectrum mode**: 12 GHz/s scan speed and a noise figure of 7 dB

› **I/Q Analyzer mode → HiRes Spectrograms**: gapless presentation of recorded I/Q snapshot and 1 μs time resolution

› **I/Q Analyzer mode → Persistence**: for detecting signals hidden under other signals or hopping signals

› **Multi-channel power**: simultaneous monitoring of channels defined by the user
Step 2: Analyze

Once the interferer is detected, the next step is to analyze the signal to find out what it is:
Analyze

Spectrum mode

Bandwidth from 10 Hz up to 20 MHz:

› A wide bandwidth up to 20 MHz can capture a whole signal, such as LTE

› The ability to set such a small bandwidth combined with top class phase noise performance means that even closely spaced signals can be separated and analyzed
Analyze

Time domain (Scope)

› You can analyze and identify signals in real time in time domain mode
› The observation time can be up to 24 h
› The time resolution can be as small as 32 ns, which makes it possible to see even a single radar pulse
Analyze

Demodulation

› AM, FM, LSB/USB and CW demodulation are available in several modes

› You can directly analyze the detected signal using the audio demodulator by tuning to a frequency by setting a marker – and view a snapshot of the spectrum at the same time
IDA 2
4. IDA 2 in 3 steps - Analyze

Analyze

I/Q Analyzer

› The I/Q data is displayed in real time
› Up to 250,000 I/Q data pairs can be recorded and analyzed in various views
› All data can be post processed and exported
IDA 2
4. IDA 2 in 3 steps - Analyze

Analyze - Summary

With IDA 2 you can analyze a signal using:

› **Spectrum mode**: bandwidth from 10 Hz up to 20 MHz
› **Time domain (Scope)**: zero span with a bandwidth from 100 Hz up to 32 MHz
› **Demodulation**: AM, FM, LSB/USB and CW
› **I/Q Analyzer**: displayed directly on the instrument or analyzed after exporting
Step 3: Locate

The last task in direction finding is to locate the detected and analyzed signal.
Locate

**Direction finding ➔ Horizontal scan**

› The horizontal scan view presents the result as a polar diagram

› The polar diagram allows you to see and reject misleading measurements, e.g. those created by reflections
4. IDA 2 in 3 steps - Locate

Locate

Direction finding → Manual bearing

› The manual bearing result is presented as a bar graph
› With the tone search switched on, you can search for and find the maximum without having to look at the screen at the same time
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4. IDA 2 in 3 steps - Locate

Locate

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Triangulation

› The IDA 2 can calculate the location of a signal source from a minimum of two bearings
› The IDA 2 can also easily exchange bearings between instruments
› Bearings can be excluded from the calculations, both automatically and manually
4. IDA 2 in 3 steps - Locate

Map view

› You can download suitable maps from the Internet free with the Narda MapTools PC software

› Maps in Slippy format, such as OpenStreet maps, can be directly imported into the IDA 2

› You can convert most other available map formats to Slippy map format using commercially available tools such as Global Mapper™ and use them on the IDA 2 (www.globalmapper.com)
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4. IDA 2 in 3 steps - Locate

Locate - Summary

With IDA 2 you can locate a detected signal using:

› Direction finding → Horizontal scan
› Direction finding → Manual bearing
› Triangulation
› Map view
5. I/Q Analyzer
What is the I/Q Analyzer?

› With the I/Q Analyzer, you can make a snapshot in the time domain and save it as I/Q data

› The saved data is comparable with raw data and can still give the full information and completely reproduce the signal

› The saved I/Q data can be analyzed in the I/Q Analyzer and displayed in various views:

 › I/Q
 › Magnitude
 › HiRes Spectrogram Full
 › HiRes Spectrogram Zoom
 › Persistence Spectrum
View: Magnitude

(High resolution time domain view)

› The display of the square of the magnitude of the I/Q data allows you to view the signal in the time domain

› This allows you to analyze and classify the time related parameters of the signal, such as the pulse length and pause time
Frequency domain views

› The I/Q data is transformed from the time domain to the frequency domain by means of a FFT (Fast Fourier Transformation)

› The frequency domain views available are HiRes Spectrograms and Persistence Spectrum
5. I/Q Analyzer
View: HiRes Spectrogram Full

› The spectrogram shows the frequency over time
› The color scale reflects the signal level
› This display gives you an overview of the whole sequence of the detected signal
› Up to 8000 spectra are compressed into one image
Impulses in the nanosecond range are displayed – **without gaps** – in the close up (or zoom) view.
View: HiRes Spectrogram: Marker/Spectrum

You can view and analyze each individual spectrum using the marker function.
5. I/Q Analyzer

![3D plot of I/Q Analyzer](image)
Persistence Spectrum

› The persistence spectrum view uses different colors to show the rate at which an amplitude value occurs at each frequency.

› Sporadic interferers can be detected by displaying the occurrence (digital afterglow).

› Interferers that are hidden under other signals in the same frequency range in other views can be distinguished by the color representation in the persistence view.
Some application examples

› DAB Radio: Signal under signal
› LTE: In band interferer
› GSM: Pulse interferer within frequency hopping traffic channels
DAB Radio: Signal under signal

Traditional spectrum

Traditional spectrogram

Time analysis (Scope)
DAB Radio: Signal under signal

HiRes Spectrogram without interferer

HiRes Spectrogram with interferer

Persistence Spectrum with interferer
LTE: in band interferer

Traditional spectrum

- The time resolution in the HiRes Spectrogram is more than 1000 times higher than the traditional spectrogram
- You can now measure the length of the pulse to gain information about its origin

Traditional spectrogram

HiRes Spectrogram with interferer
GSM: Pulse interferer within frequency hopping traffic channels

- The time resolution in the HiRes Spectrogram is more than 1000 times higher than the traditional spectrogram
- You can now measure the length of the pulse to gain information about its origin

Traditional spectrogram

HiRes Spectrogram

HiRes Spectrogram with interferer
6. Summary

Remember!
6. Summary

What improvements are there in the IDA 2 compared with the current IDA?

IDA 2

› … has a real time I/Q Analyzer with even more views
  › The HiRes Spectrogram Full/Zoom views and the Persistence Spectrum view allows you to display even sporadic or hidden interferers
› … has a new RF module
  › The receiver quality defines a new class of measurement instruments: Low phase noise and low spurious signal level, top class
› … has a LAN connection
  › The LAN connection can be used to configure and remotely control the instrument. I/Q streaming is also supported (optional)
6. Summary

What improvements are there in the IDA 2 compared with the current IDA?

IDA 2:

› … has a new GPS module
  › The IDA 2 supports more satellite systems and the new GPS module makes positioning even faster
› … has a universal antenna adapter
  › The antenna adapter makes it possible to also connect antennas from other suppliers to the antenna handle
› … has an optional rubber protection cover
  › The rubber cover increases the already high stability in highly demanding environments
What makes IDA 2 a top class handheld directional analyzer?

The key to success is to combine the essential feature in a top class instrument at a price that is still reasonable.
What makes IDA 2 a top class handheld directional analyzer?

› Extremely fast frequency scan with a speed of 12 GHz/s
› One of the lightest in its class with a weight of less than 3 kg
  › The directional antennas are also some of the lightest in their class, each weighs less than 0.5 kg
› Extremely sensitive with a noise figure of 7 dB
› Persistence spectrum view for detecting signals under signals
› Gapless high resolution spectrogram display with a time resolution down to 1 μs (I/Q analyzer)
› Narrow resolution bandwidth combined with top class phase noise performance gives excellent “close-to-carrier” detection
› Shielded up to 200 V/m