

*Anite*



**NEMO**  
OUTDOOR

PRODUCT DESCRIPTION

**Nemo Outdoor 7.20** has an established position as a pioneer and leader in drive test measurement and optimization solutions for perfecting the air interface of wireless networks. It collects measurement results and geographical coordinates, and these measurement results further provide valuable information for **network planning, roll-out, tuning, verification, optimization, maintenance, and benchmarking purposes**. Nemo Outdoor is always among the first-to-market with support for **the very latest technologies**, currently supporting measurements on LTE, WiMAX, HSDPA, HSUPA, HSPA+, TD-SCDMA, CDMA2000, 1xEVDO (Rel. 0, Rev. A and Rev B.), TETRA, iDEN, cdmaOne, GSM, GPRS, EDGE, and WCDMA networks.

Nemo Outdoor is a centralized solution built on a single, powerful platform. Its expandable, modular structure supports not only **drive testing**, but also **QoS** and **benchmarking** measurements on every standard network technology and on **multiple simultaneous data connections**. Through its diverse set of options, Nemo Outdoor can be tailored to the specific needs of the customer. This empowers the operators to reach both optimal network performance and **time- and cost-effectiveness**.

Nemo Outdoor is extremely **easy to set up, configure and use**. Nemo Outdoor's **customizable user interface** offers the users the possibility to customize data views and workspaces for any given purpose or need that arises in use. This flexibility is further realized in the Nemo **open file format (ASCII)** which enables customers to integrate in their optimization processes the use of not only the upscale Anite's post-processing tool Nemo Analyze, but also those of third-party vendors. In addition, Nemo Outdoor's import/export feature allows for all user settings to be transferred to or from another computer.



*Cost-effective, extensive and versatile network measurement and optimization on a single, flexible platform*

Through our close cooperation with several mobile and scanner manufacturers we ensure that our customers always get to select amongst the latest test equipment. Currently Nemo Outdoor supports more than **270 test terminals and scanning receivers**, a figure which is constantly on the increase to meet the rapidly changing customer needs for optimal satisfaction.

## PLATFORM

Including:

- Measurement
- Voice phones 1 license
- Basic data (HTTP, HTTPS, HTTP/HTTPS browsing, FTP, SFTP, ping, ping trace route, iPerf for UDP/TCP, SMS)
- E-mail testing (IMAP, POP3/SMTP)
- SMS/MMS testing
- WAP testing
- GPS handler
- SIP-based VoIP calls
- VoLTE calls
- Skype calls
- Facebook testing
- PTT call testing (QChat, Kodiak InstaPoC™)

## OTHER SUPPORTED FEATURES

- Voice quality PESQ P.861, P.862, POLQA P.863
- Video streaming quality (YouTube testing)
- CS voice quality (up to 6 VQ connections)
- VoIP voice quality (1 VQ connection per CPU)
- Nemo Outdoor Multi license (up to 6 voice and up to 6 data connections)
- Indoor
- Nemo Outdoor playback including the Indoor option
- Layer 3 decoding GSM/WCDMA
- Layer 3 decoding WCDMA

## NEMO OUTDOOR SUPPORTED VENDORS AND CHIPSETS

- Altair
- Anite
- Anritsu (GSM/WCDMA scanners, DVB-H analyzer)
- Apple
- Beceem
- Digital Receiver Technology (Wimax scanner)
- EADS
- HiSilicon Balong 710
- LG
- Motorola
- PCTEL LX/EX/ EXflex/MX/PCT series
- Qualcomm
- Renesas
- Rohde & Schwarz
- RunCom
- Samsung

## TERMINALS AND SCANNERS IN NEMO OUTDOOR 7.20

### TERMINALS

#### TETRA

*EADS THR880, THR880i, TMR880, THR-9i  
Nokia THR850*

#### iDEN

*Motorola i886*

#### GSM

*Nokia N85 GSM*

#### EDGE

*Nokia 3500*

#### WCDMA

*Merlin U530  
Motorola V3X  
Nokia 6630, 6680, N80  
Qualcomm TM6200, TM6250  
Samsung ZV10, Z105, Z107, Z140, Z500, SGH-T639 terminal (T-Mobile)  
Vodafone 3G*

#### CDMA 1xRTT

*LG KX206, KX256, C676, C680*

#### CDMA2000 1xEVDO Rel. 0

*LG VX8000, VX8100, VX8300, VX8350, LHD-200E, LX570  
Motorola V3C  
Zapp Telemodem 020*

#### CDMA2000 1xEVDO Rev. A

*Audiovox PC5750  
Huawei C7600  
Kyocera DuraMax E4255  
Novatel Ovation MC727, MC760  
Pantech PX-500, UM175  
Sierra Wireless Compass 597, 598  
ZTE R516*

#### CDMA2000 1xEVDO Rev. B

*Huawei EC306, EC367*

#### HSDPA

*Huawei E169, E220  
LG KF700, TU550, P500h  
Merlin U740, U870, X950 D, Express  
Motorola RAZR V9, V9US  
Nokia 6120, 6121, N85, N85 US, N95, N95US, N96, N96US, N97, N97US  
Option GlobeTrotter 3G+, Express 7.2, GT MAX E, GT MAX 7.2 Ready, HSDPA 7.2 Ready,  
GlobeSurfer iCON 7.2  
Qualcomm TM6275, TM6280  
Samsung ZX20, Z560, Z720, A707, G800, SGH-U900 Soul, SGH-A847, Galaxy Ace  
Sierra Wireless Aircard 850, 860  
ZTE MF193, T90*

## HSUPA

*Blackberry* Torch 9810, Bold 9900  
*Huawei* E180, E270, E870 Express, U3220  
*Motorola* XT 605 (Master)  
*Nokia* C5-00, C5-00.2, C5-03, C5-03US, C5-04, C7, E7, 6720, 6720US, 21M-02, 500  
*Option* GlobeTrotter HSUPA, iCON 401, iCON452  
*Qualcomm* MSM7200 TM  
*Samsung* Omnia 7, Focus  
*Sierra Wireless* Aircard 880, 881, 885 Compass  
*Sony Ericsson* Xperia arc S  
*ZTE* MF636

## HSPA+/HSPA+ DC

*Bandrich* Bandlux C320  
*Huawei* E182E, E270+, E367, E372, E372u-8, E1820  
*Novatel* Ovation MC996D, MC545  
*Onda* MT689DC  
*Qualcomm* MDM8220 TM  
*Samsung* Galaxy S III (SGH-T999, SGH-T999V)  
*Sierra Wireless* 306, 307, 308, 309, 310U, 312U, 319U  
*ZTE* MF668A, MF683

## TD-SCDMA, GSM/TD-SCDMA

*Datang* DTM 8101, DTM 8120  
*Leadcore* LC 8130E

## WiMAX

*Beceem* BCS200  
*Beceem* BCSM250  
*Motorola* PCCW200  
*Motorola* USBw 25100  
*Ubee Interactive* U1900  
*Zyxel* MAX-100

## LTE

*Apple* iPhone 5  
*HTC* One XL  
*Huawei* E398, E392u-12, E3276s-150, E3276-861  
*LG* L1000, G7, G13, G17, P930  
*Netgear* Aircard 340U  
*Nokia* Lumia 920 (RM-821)  
*NSN* USB-lte 7210  
*Pantech* UML290  
*Qualcomm* MDM9200, 9600  
*Samsung*  
Droid Charge,  
Galaxy Rugby (SGH-I547C),  
Galaxy S II Skyrocket  
Galaxy S II (GT-I9210)  
Galaxy S II HD LTE (SHV-E120S Korean version),  
Galaxy S III (SGH-i747, GT-I9305, SCH-i535, SPH-L710),  
Galaxy S II Note (GT-N7105),  
Galaxy S4 (GT-i9505, SGH-i337, SPH-L720)  
Galaxy S4 (SGH-M919, T-Mobile)  
Galaxy S4 Plus (GT-I9506)  
Galaxy S4 LTE-A (SHV-E330S)  
Galaxy Note 3 (SM-N9005)  
Galaxy Note 3 (SM-N900T)  
Galaxy S4 Mini (GT-i9195)  
Galaxy S4 Active (GT-i9295)  
*Sierra Wireless* 313U, 320U, 330U  
*ZTE* MF820T, MF820D, MF880

## Application testing

Any voice and data-capable terminal

## Voice Quality testing (PESQ and POLQA)

Nokia 6120, 6121, 6720, 6720US, C5-00, C5-03 EU, C5-03 LAT/NAM, C5-04 AWS, C7-00, N85, N95, N96, N97, 500  
LG C676, C680, KX206, KX 256, VX 8350, VX8360  
Datang DTM 8120,  
Leadcore LC 8130E  
Samsung SGH-U800, Galaxy S III (GT-I9305)  
Sony Ericsson Xperia arc S (LT-18i)

## SCANNERS

### Anritsu

ML8720B WCDMA 2100  
ML8720C WCDMA 2100, GSM 900/1800  
ML8740A WCDMA 2100, GSM 900/1800  
ML8740B WCDMA 2100, GSM 900/1800  
MS2721B DVB-H analyzer

### DRT

4301A+ WiMAX 2300-2360, 2496-2690, 3300-3800, 5150-5825 MHz

### Nemo FSR1

GSM 850/900/1800/1900  
WCDMA 850/900/1800/1900/2100/2100 AWS  
CDMA/EVDO 850/1900/2100 AWS  
LTE FDD 700, E800, 850, 900, 1800, 1900, 2100, 2100 AWS, and 2600 (E-UTRA bands 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 19, 20, 25, 26, 28)  
LTE TDD 33 (1900-1920MHz), 35 (1850-1910MHz), 36 (1930-1990MHz), 38 (2570-2620MHz), 39 (1880-1920MHz), 40 (2300-2400MHz), and 41 (2496-2690MHz)  
Spectrum analyzer  
Band scan

### PCTEL

EX LTE Single Band Upper 700-C  
LTE Single Band Upper 700-D (E-UTRA band 14)  
LTE Dual Band Upper 700-C/AWS 2100 Mini  
LTE Dual Band Lower 700-B/C/AWS 2100 Mini  
LTE Single Band Lower 700-A/B/C Mini  
LTE Tri-Band Scanner, Lower 700-A/B/C / Upper 700-C / 2100 AWS  
LTE Single Band 1600 (E-UTRA band 24)  
LTE Dual band 1800/2600  
LTE Single Band 2100  
LTE Single Band Scanner, 2100 AWS Mini  
LTE Dual Band 2100/2600  
LTE Single Band E800 Mini  
LTE Dual Band E800/2600  
LTE Single Band 2600 Mini  
GSM 900/1800 TD-SCDMA 2000  
WiMAX 2.496-2.69 GHz  
WCDMA 850/1900, GSM 850/1900  
WCDMA 2100 AWS, GSM 850/1900  
WCDMA 900/2100, GSM 900/1800  
WCDMA 850/2100, GSM 900/1800  
WCDMA 2100 AWS, GSM 1900  
WCDMA 2100/GSM 900/1800  
CDMA/EV-DO 850/1900  
EX Mini 06110 WCDMA 2100  
EX Mini 06111 WCDMA 900/2100  
EX Mini 06112 WCDMA 850/1900  
EX Mini 06113 WCDMA AWS  
EX Mini 06116 WCDMA 850

|                            |  |
|----------------------------|--|
| <i>CX Mini 04117</i>       | WCDMA 900  |
| <i>CX Mini 04110</i>       | WCDMA 2100   |
| <i>CX Mini 04111</i>       | WCDMA 900/2100   |
| <i>MX</i>                  | LTE FDD bands: LTE 700, 800, ESMR, 850, 900, 1500, 1800, 1900, 2100, 2100 AWS and 2600 (E-UTRA bands 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 20, 21, 24, and 26)<br>LTE TDD bands: 38 (2570-2620MHz), 39 (1880-1920 MHz), 40 (2300-2400MHz), and 41 (2496-2690MHz)<br>WCDMA 850/900/1800/1900/2100/2100 (AWS), GSM 850/900/1800/1900<br>CDMA/EVDO 850/1900<br>Spectrum analyzer   |
| <i>EXflex</i>              | LTE FDD bands: LTE 700, 800, ESMR, 850, 900, 1500, 1800, 1900, 2100, 2100 AWS and 2600 (E-UTRA bands 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 20, 21, 24, and 27)<br>LTE TDD bands: 38 (2570-2620MHz), 39 (1880-1920 MHz), 40 (2300-2400MHz), and 41 (2496-2690MHz)<br>WCDMA FDD 2.1 GHz DL, 850 MHz DL, 900 MHz DL, 1800 MHz DL, 1900 MHz DL, 2100 AWS DL<br>DL<br>EGSM 900 MHz DL, GSM 850 MHz DL, 1800 MHz DL, 1900 MHz DL,<br>CDMA 450 MHz DL, 800 MHz DL, 1900 MHz DL<br>EVDO 450 MHz DL, 800 MHz DL, 1900 MHz DL                                 |
| <i>LX</i>                  | All GSM frequencies<br>WCDMA 850<br>WCDMA 900<br>WCDMA 1900<br>WCDMA 2100<br>WCDMA/GSM 850/1900<br>WCDMA 850/1900/2100/2100 (AWS)<br>WCDMA 2100, GSM 900/1800<br>1xEVDO 450<br>1xEVDO 850<br>1xEVDO 1900<br>CDMA 850/1900, EV-DO 850/1900<br>CDMA/EVDO 850   |
| <i>PCT-505</i>             | WCDMA 850/900/1800/1900/2100   |
| <i>PCT-510</i>             | GSM 850/900/1800/1900  |
| <i>PCT-520</i>             | WCDMA 2100, GSM 900/1800   |
| <b>Rohde &amp; Schwarz</b> |  |
| TSML-C                     | CDMA/EV-DO, spectrum analyzer, CW scanning   |
| TSML-G                     | GSM, spectrum analyzer, CW scanning  |
| TSML-W                     | UMTS, spectrum analyzer, CW scanning   |
| TSML-GW                    | UMTS 850/900/1900/2100/2100 AWS, spectrum analyzer, CW scanning,<br>GSM-E/-R 850/900/1800/1900   |
| TSMQ                       | GSM 850/900/1800/1900,<br>WCDMA 850/900/1900/2100/2100AWS<br>CDMA/EVDO 450/800/1900<br>Spectrum analyzer, CW scanning  |
| TSMW                       | GSM-E/-R, GSM 850/900/1800/1900<br>WCDMA 850/900/1800/1900/2100/2100 AWS<br>CDMA2000/1xEVDO 450/800/1900<br>LTE FDD bands 450, 700, E800, 850, 900, 1400, 1500, 1800, 1900, 2100, 2100 AWS, 2500, and 2600 (E-UTRA bands 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 20, 24, 25, 26, 28, 31).<br>LTE TDD bands 1900-1920MHz, 2010-2025MHz, 1850-1910MHz, 1930-1990MHz, 1910-1930MHz, 2570-2620MHz, 1880-1920MHz, 2300-2400MHz, 2496-2690MHz, 3400-3600MHz, 3600-3800MHz (E-UTRA bands 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43)<br>Spectrum analyzer |
| <b>ZTE</b>                 |  |
| TU25                       | WiMAX 2.496-2.690 GHz  |

## NEMO OUTDOOR KEY BENEFITS

- **Powerful platform-based tool** – All the latest customer needs can be met by adding options to the utterly flexible and expandable Nemo Outdoor platform
- **Comprehensive and cost-effective** – Drive testing, QoS and benchmarking measurements can all be carried out on a single platform. The Multi-Data functionality in Nemo Outdoor allows up to six concurrent data measurements to be performed simultaneously, and the Nemo Outdoor Multi option allows the simultaneous use of up to six test terminals and two scanners
- **Centralized solution** – All of the test devices among the extensive selection can be connected to a single laptop
- **Extremely easy to set up, configure and use** – The time from receiving the product to using it is only a matter of a couple of hours. Hence, the customer is able to focus on the actual task at hand
- **Latest technologies** – Nemo Outdoor is always among the first to market with support for the newest technologies
- **Fully customizable user interface** – The user is able to tailor the user interface to suit their specific needs at a given time

## NEMO OUTDOOR KEY FEATURES

- **Multiple simultaneous data transfers on a single terminal** – Nemo Outdoor enables the user to perform multiple data transfers on each test mobile in use simultaneously
- **Benchmarking for better performance** – Measurements can be carried out on multiple networks and even on multiple technologies simultaneously for ultimate network performance. The Nemo Walker and Multi Lite options offer variety in terms of size and weight, with the possibility to take them as carry-on baggage on an aircraft
- **QoS measurements** – Voice quality (PESQ and POLQA), video quality, video call quality and Psytechnics PVI video streaming quality measurements are supported
- **Extensive scripting** – With Nemo Outdoor scripting is made diverse and extensive with, for example, time- and technology-based conditional blocks, loops, multiple script synchronization groups, and more
- **Measurement file uploading** – Measurement files can be sent directly from the Nemo Outdoor user interface to an FTP server for storage
- **Automatic device detection** – Multiple devices can conveniently be added to the system in user-defined order
- **Indoor option** – It is also possible to use Nemo Outdoor with the Indoor option on a Tablet PC, and to view the results on an indoor map along with base stations. Also iBwave floorplans with BTS sites are supported.
- **Instant playback functionality** – It is possible to see the measurement results immediately after a measurement through Nemo Outdoor's playback function and user-configurable data views and work space
- **Drag and drop functionality** – Parameters can conveniently be added to data view windows without having to go into trouble with recreating, for example, a graph window
- **Grids, graphs and map windows** can be colored based on user-defined criteria, and **graphs** support multiple layers for viewing results in a single graph. Another example of the customizability of Nemo Outdoor's data views is the possibility to save a measurement route, or



*route plan*, for later use, and to follow the measurement route through waypoints in real time during measurements

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- **Extensive application testing features**, including YouTube, Facebook, Skype, Push-To-Talk (QChat, Kodiak), email, MMS, SMS, and voice call testing
- **Carrier aggregation testing**
- **User-defined parameters** from signaling messages can be searched and displayed in info view and graph side panel
- **Forcing features** – Channel/scrambling code locking, band locking, handover control, timeslot testing, airplane mode, cell barring, and AMR codec mode forcing are available in Nemo Outdoor
- **Cell testing** – The surrounding cells of a location can be tested through an automated list of test calls that are locked to a cell at a time
- **Missing neighbor detection** – Real-time missing neighbor detection can be performed with the possibility to detect both GSM/WCDMA missing neighbors at the same time
- **Pilot pollution analysis** – Nemo Outdoor enables pilot pollution analysis measurements in real time using UE or a scanning receiver. Available for WCDMA, CDMA and EVDO technologies.
- **GSM co-channel and adjacent channel interference analysis**
- **Google Earth map** – Nemo Outdoor maps can be exported to Google Earth maps

## WORKING WITH NEMO OUTDOOR

Nemo Outdoor is a comprehensive solution offering its user a broad selection of options all on the same platform. Yet Nemo Outdoor has been designed to offer the user a pleasant experience with its highly intuitive user interface. The Nemo Outdoor measurement system consists of test mobiles and/or scanning receivers and a GPS receiver with antennas, a PC or a Tablet PC with the Windows® operating system and the Nemo Outdoor measurement software, and connecting cables between the mobiles/scanners/GPS and the PC. With the compact Multi Lite option it is possible to connect up to six terminals, two scanning receivers, and a GPS receiver simultaneously to the Nemo Outdoor measurement system. Nemo Walker is a backpack-based portable multi-measurement solution for all major network technologies. Nemo Walker is a complete system consisting of a compact and convenient backpack for carrying, powering, and connecting measurement devices.

## HARDWARE AND SOFTWARE REQUIREMENTS

- PC (Lenovo or Dell recommended) with Windows 7® Professional (32/64 bit) or Windows 8® Professional (32/64 bit).
- Pentium III processor, minimum 1GHz, preferably 1.7 GHz for single mobile measurements
- For multi data measurements Intel® Core Duo processor T2500 2.00GHz or higher required
- For voice quality measurements with up to four channels with USB sound card Intel® Core Duo processor T2500 2.00GHz or higher required
- For up to six channel voice quality measurements with USB sound card Intel® Quad Core processor Q9100 2.26GHz or higher required
- 512MB RAM minimum, 1GB RAM recommended
- For multi data measurements with HSPA+ devices Intel® Quad Core processor Q9100 2.26GHz or higher required
- 100 MB of free hard disk space for installation and use; 1 GB recommended
- One USB port for copy protection module

- One USB port per mobile
- Depending on the scanner used, one USB port or serial port or RJ45 or FireWire port per scanner
- One serial port for each voice quality audio module or one USB port per sound card
- One USB port for an external GPS receiver
- Display resolution 1400 x 900 recommended
- Internet Explorer for viewing the help file

## APPLICATION TESTING

Nemo Outdoor enables network operators to test their network using *the same application protocols as their customers and, therefore, provides results that correspond with the end-user experience*. Nemo Outdoor supports the following application testing features: e-mail (SMTP, POP3, and IMAP protocols), SMS, MMS, USSD, WAP, Iperf for UDP/TCP testing, ping trace route testing, FTP, SFTP, HTTP, and HTTPS file transfers, HTTP/HTTPS browsing, HTTP streaming (YouTube), RTSP streaming, video streaming, video streaming quality, VoIP call, video call, video call quality, voice quality (ITU-T P.862.1, ITU-T P.863, WB-AMR, P862.2), ICMP ping, PTT calls (QChat and Kodiak InstaPoC™), Facebook, and Skype calls. The information provided by Nemo Outdoor assists in the verification and troubleshooting of new services reducing the time-to-market.

Application tests can be performed either manually or automatically by taking advantage of user-definable scripts. For all protocols, key performance indicators, such as data throughput, access time and success rate can be recorded simultaneously with the full radio network information.

All services are supported in a single product, Nemo Outdoor, providing an easy-to-use, consistent interface for configuring the different applications. Different applications, such as voice, SMS and packet-switched data can be launched in one measurement session to simulate end-user behavior.

Nemo Media Router (NMR) is Anite Finland Ltd's proprietary communications interface and application developed for Android-based smartphones. With the NMR interface, smartphones communicate with PC-based applications, such as, Nemo Outdoor and Nemo Invex, enabling voice quality (PESQ/POLQA) measurements on smartphones without any additional hardware. The smartphone records the received sample audio files and transfers audio files via the NMR interface to the test computer in real time. The computer calculates the PESQ/POLQA MOS scores and the values are written in the Nemo Outdoor log file. Six phones can be connected to one CPU simultaneously.

Facebook is one of the most popular social networking applications that produces significant amounts of traffic in cellular networks. With Nemo Outdoor it is possible to test the most common Facebook functions, such as, posting a status update (text or image) and retrieving the friend list. The logged Facebook-related parameters include connection and transfer attempt/success/failure statistics and success rates.

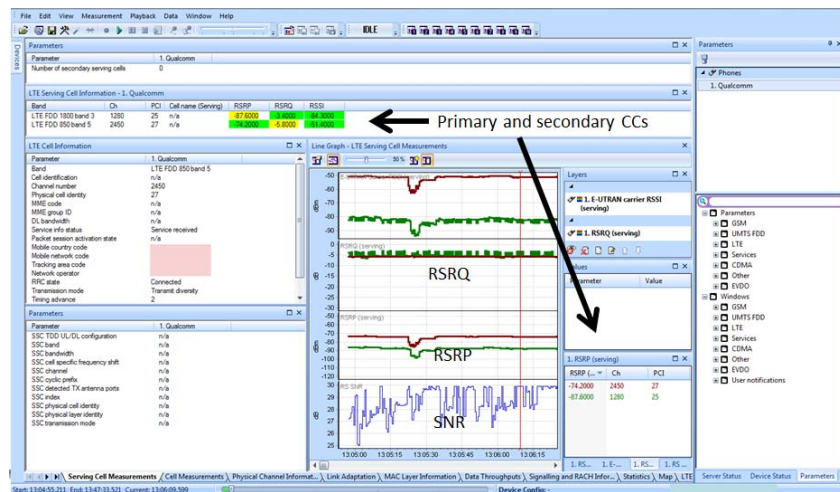
Nemo Outdoor supports single and multi (parallel) SFTP transfers and single, multi (parallel) and multi-threaded FTP transfers. In single SFTP/FTP transfer, one file is either sent or received. In multi SFTP/FTP transfer, one or more files are either sent or received or both simultaneously. In multi-threaded FTP transfer, the transferred file is split into smaller fragments. The number of threads can be defined by the user. Each thread creates a new FTP session and transfers a fragment of the file. Multi-threaded FTP transfer mode is supported in receive direction.

## CARRIER AGGREGATION TESTING

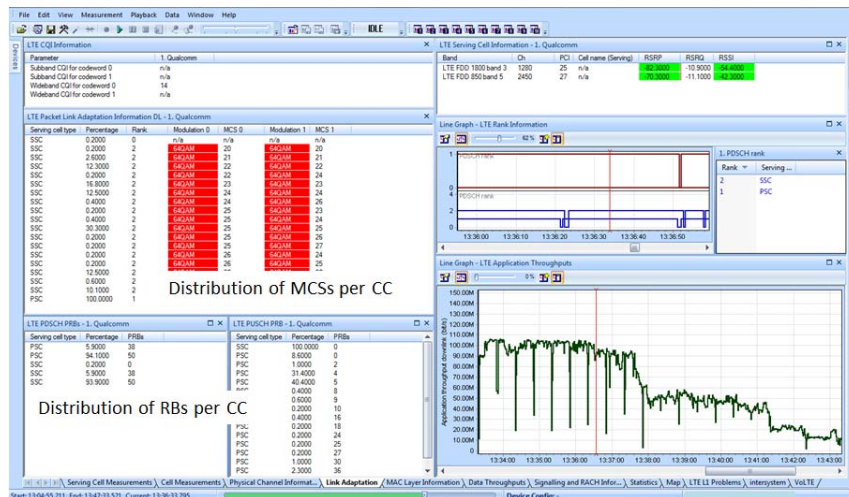
Staying ahead in a fast-changing competitive environment means being the first to deliver new functionalities and impeccable quality. LTE-A is the next stage in mobile telecommunications, which will allow operators to offer wireless services equivalent to 'fiber to your phone'. To better serve our network testing customers, Nemo Outdoor offers support for LTE-A carrier aggregation testing.

With Nemo Outdoor operators can monitor the performance and quality of their LTE-A networks. The measurements provide detailed information about the primary and secondary component carriers, including cell type, PCI, CFI, band, bandwidth, link adaptation and radio resource allocation.

The examples below show how information from two LTE carriers are presented in the Nemo Outdoor user interface.



Two LTE carrier components



Link adaptation and PRBs per carrier components (CC)

## BENCHMARKING

Anite prides itself on its impressive benchmarking solutions Nemo Invex, Nemo Walker, and Nemo Outdoor Multi Lite. Nemo Invex, Nemo Walker, and Nemo Outdoor Multi Lite benchmarking measurements can be performed on *any combination of networks and system technologies* ranging from GSM, WCDMA, 1xEVDO, and TD-SCDMA to HSPA+, WiMAX, and LTE. Nemo Invex allows **10 simultaneous voice measurements** and **up to 10 concurrent data measurements to be performed simultaneously**. In addition, it is possible to perform **up to 20 concurrent voice quality measurements**. Nemo Walker and Nemo Outdoor Multi Lite allow **six simultaneous voice measurements**, and **up to six concurrent data measurements to be performed simultaneously**. In addition, it is possible to perform **up to six concurrent voice quality measurements** with the Nemo Outdoor Multi Lite option. The network, system technology and measurement mode options also present endless possibilities for combination.

As many as **six test devices can be connected with Nemo Outdoor at once**, including Nokia, Motorola, and Qualcomm-based terminals, as well as scanning receivers from Anite, Anritsu, PCTEL, DRT, and Rohde & Schwarz. What is more, they are all conveniently connected to the same Nemo Outdoor platform running on a **single laptop**. Furthermore, combined with Nemo Server, it is also possible to carry out **long-term network performance measurements**.



*Nemo Outdoor Multi Lite*



*Nemo Invex*



*Nemo Walker*

**Nemo Walker** can be used as a standalone system without an external power source or mounted on a vehicle along with an external +12V power source. Built-in Li-Ion 19.8Ah battery packs enable long measurement campaigns (3-36 hours depending on the configuration). Nemo Walker can be equipped with up to six UEs, one scanner and a four-channel sound card for voice quality measurements. Please refer to the Nemo Walker data sheet for a more detailed description of the system.

All test devices can be connected to **Nemo Outdoor Multi Lite** through an onboard USB port while conveniently sharing a car's +12VDC power output. The Nemo Outdoor Multi Lite unit includes a built-in 2,500 mAh battery pack which makes it possible to continue measurements also during short power failures. With the high-quality Neutrik USB connectors and the professional lockable USB data cable connection the systems are extremely reliable to use, preventing loose connections between test devices and the main unit. In addition, the fixed holders in the Multi Lite casings secure the stability of the test terminals.

Nemo Outdoor Multi Lite comes in a high quality, ruggedized case which gives maximum protection for the Nemo drive test tool. Thanks to the compact size of the casing, Multi Lite can be taken inside most airlines' aircrafts as carry-on luggage.

Please refer to the Nemo Invex product description and data sheet for more detailed information on the Nemo Invex benchmarking system.

| Hardware                       | Nemo Multi Lite                                    | Nemo Invex Chassis                               |
|--------------------------------|--|--|
| Exterior dimensions            | 50.2 x 40 x 18.8 cm<br>(19.78" x 15.77" x 7.41" )  | 36.8 x 37.5 x 16.5 cm<br>(14.5" x 14.75" x 6.5") |
| Interior dimensions            | 45.9 x 32.7 x 17.1 cm<br>(18.06" x 12.89" x 6.72") | NA   |
| Weight (fully loaded)          | ~10- 12kg (22- 26lbs)                              | ~12 kg (26.4 lbs.) without test devices          |
| Input power/current            | +11.3- 12VDC<br>Max. 5.85A                         | +11- 16VDC<br>10 – 15 A (plus test device)       |
| AC/DC power supply             | No   | Yes  |
| DC power cable for vehicle use | Yes  | Yes  |
| Supported operating systems    | Win XP SP3 (32bit)/ Win7<br>(32/64bit)             | Win XP SP3 (32bit)/ Win7<br>(32/64bit)           |
| Controlling PC                 | Quad core  | Quad core  |
| Multi processors               | No   | Yes  |
| Physical connection to PC      | USB 2.0  | Ethernet   |

| Physical connection to test devices                    | USB/ Ethernet  | USB/Ethernet   |
|--|--|--|
| Carry on luggage                                       | Yes  | No   |
| Transportation luggage                                 | Yes  | Yes  |
| Max. # of UE's (voice & data)                          | 6  | 20 per chassis<br>(10 high speed data and 10 voice<br>or 20 voice)                                       |
| Max. # of voice quality channels                       | 6 (requires two commercial sound<br>cards)   | 20 per chassis<br>(sound cards integrated into<br>handset isolation modules)                             |
| Max. # of scanner receivers                            | 1 (with max. 4 UE's)   | 1 -4 depending on physical<br>interface  |
| Integrated GPS   | No   | Yes  |
| Back up battery / UPS                                  | Yes (only for minutes)   | Yes  |
| Cooling fan with filter                                | Yes (without filter)   | Yes  |
| External antenna cables                                | Yes  | Yes  |
| RF Isolation module for handset                        | No   | Yes  |
| RF Isolation module for data<br>modem                  | No   | Yes  |
| Device software reset                                  | Yes  | Yes  |
| Device hardware reset                                  | No   | Yes  |
| Automatic shutdown in case of<br>low/ high input power | No   | Yes  |
| Notifications of high temperature/<br>Alarms           | No   | Yes  |
| Operating temperature range                            | +0- 55°C   | +0- 50°C   |
| ROHS compliant   | Yes  | Yes  |
| CE approved  | Yes  | Yes  |
| Shock and vibration                                    | Careful <u>transportion</u><br>Random, shock & vibration<br>test ETSI EN 300 019-2-2<br>v2.1.2/(/1999-09/) | MIL-STD-810, Method 516.4,<br>procedures I, IV, VI<br>MIL-STD-810E, Method 514.4,<br>categories 1 and 10 |

| <b>Applications/Features</b>   | <b>Nemo Multi Lite</b>   | <b>Nemo Invex Chassis</b>                        |
|--|--|--|
| Multi data testing   | Yes (requires own source IP address for each connection)               | Yes (Same source IP address for each connection) |
| CS and PS data measurements  | Yes  | Yes  |
| Voice and voice quality measurements (ITU-T P862.1 & 862.2, P863 coming Q4/2011) | Yes  | Yes  |
| Video call and video call quality testing  | Yes  | Yes  |
| Video streaming and video streaming quality measurements                         | One connection at the time   | Yes  |
| SMS/ MMS/ WAP testing  | Yes  | Yes  |
| FTP/ SFTP/ HTTP/ IPERF UDP & TCP testing   | Yes  | Yes  |
| HTTP browser testing   | Partially supported (content from several IP addresses not downloaded) | Full support                                     |
| VoiP testing   | Yes. One connection at the time  | Yes  |
| IP packet capturing/ playback  | Yes  | Yes  |
| Real time GSM co- channel/ adjacent channel interference analysis                | Yes  | Yes  |
| Real time CDMA/ WCDMA pilot pollution analysis                                   | Yes  | Yes  |
| Real time GSM/ CDMA/ WCDMA missing neighbor detection                            | Yes  | Yes  |

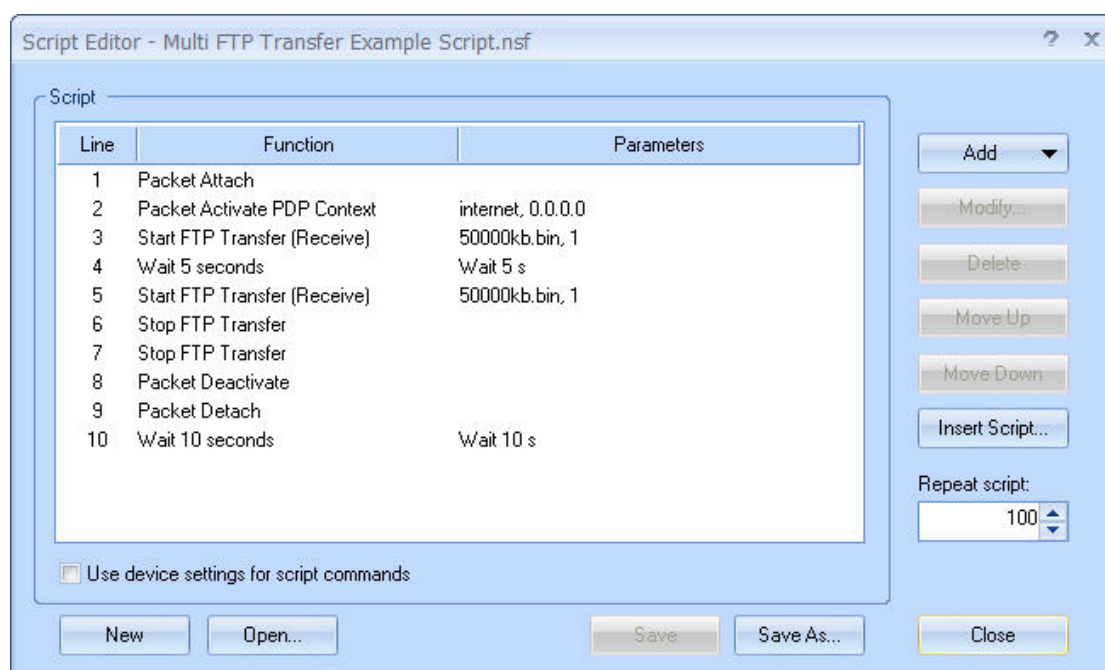


## SCRIPTS AND MEASUREMENT LISTS

In Nemo Outdoor measurement *automation* is enhanced through scripting. By creating and editing script files with Nemo Outdoor's built-in script editor, Nemo Outdoor makes voice and video calls, HTTP/HTTPS/FTP packet data uploads/downloads, HTML/WAP browsing, SMS/MMS messages, emails, and ping measurements according to the user's needs and for their purposes.

The more advanced scripting features include loops, conditions and waits. The Condition script command can be used, for instance, to create scripts where the type of the detected packet technology determines how the script proceeds. The Loop script command enables scripts where a portion of the script is repeated a number of times before proceeding with the rest of the script. With the Wait script command, the user can create scripts that are not activated before a certain system or bandwidth is active.

Nemo Outdoor's *script group functionality* enables the user to synchronize script files and/or certain lines in the script file for specific devices. Both synchronization methods can be used together or separately depending on the needs of the user.

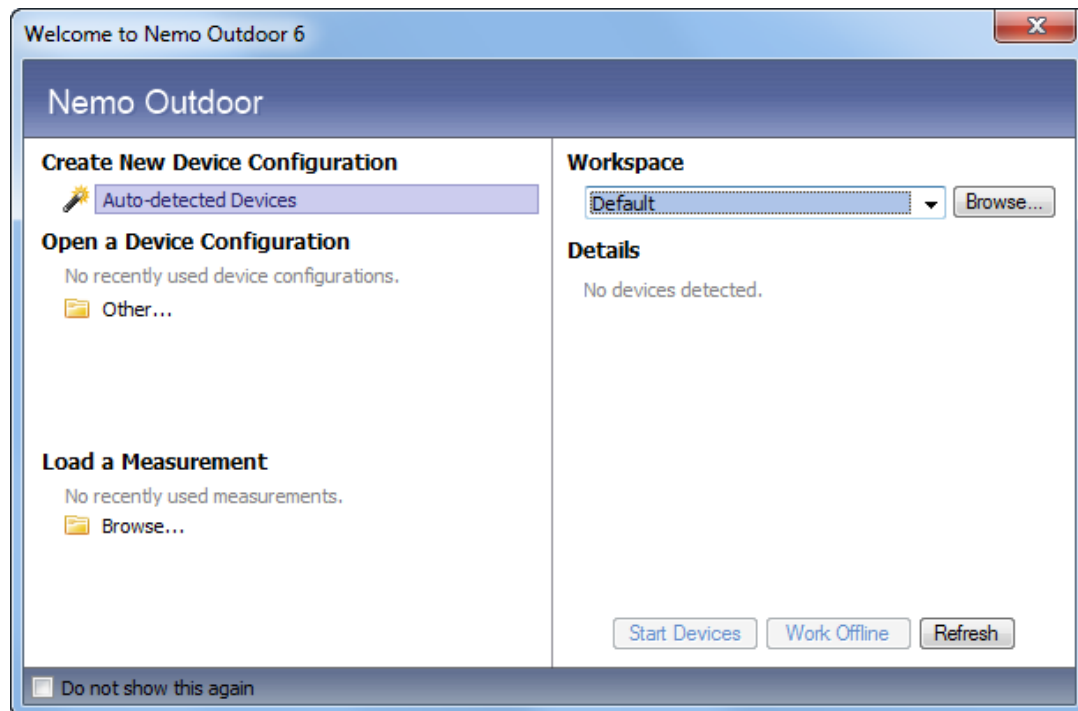


*Nemo Outdoor comes with several script examples*

**Measurement lists** are one level higher individual scripts, enabling even larger-scale measurement campaigns for increasing measurement automatization. Measurement lists, which can be loaded and saved, enable you to run automated measurements with several devices combining multiple scripts. What is more, you can use measurement lists with just one device to run several scripts one after another. However, each measurement is recorded in a separate file. You are also able use measurement lists without scripts.

## AUTOMATIC DEVICE DETECTION

Nemo Outdoor has a flexible and user-friendly user interface which allows users from different levels of experience to have an *easy and smooth access to the system*. The automatic device detection functionality, accessed both through the Welcome page and the menu bar, automatically detects devices connected to the PC and assigns the appropriate, previously created COM port and dial-up information to them. For example, when trying to add a Qualcomm device, the application adds the device and recognizes the necessary ports of the device automatically, which is very user convenient. The order of added devices can also be determined by the user, and the user can set the devices to start automatically upon setup. The benefits of this function include, for example, that the reassignment of COM ports to the devices will no longer cause confusion for the user. In addition, the user does not need to spend time on manually going through the procedure, saving valuable time and optimizing the experience of the easy and intuitive Nemo Outdoor UI.

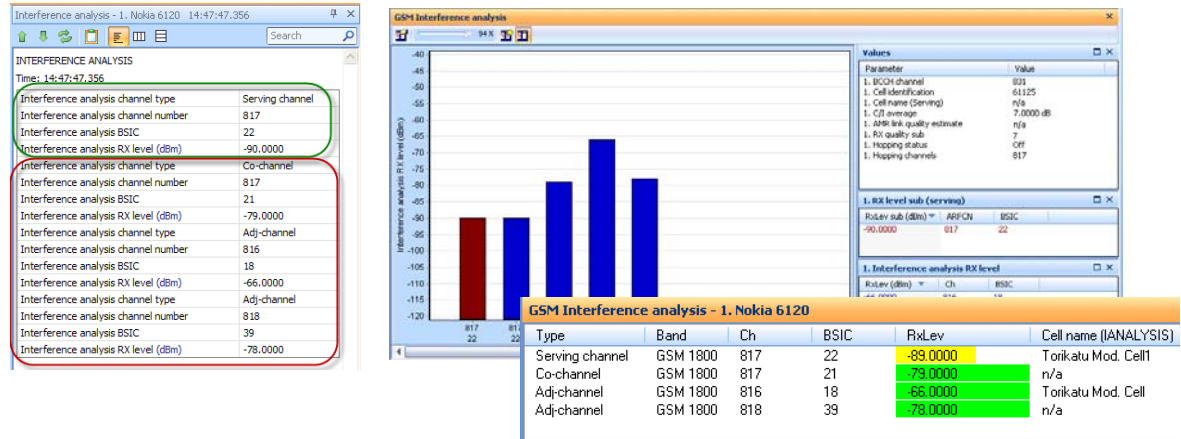


*The automatic device detection functionality makes Nemo Outdoor easy to set up and use*

## TROUBLESHOOTING

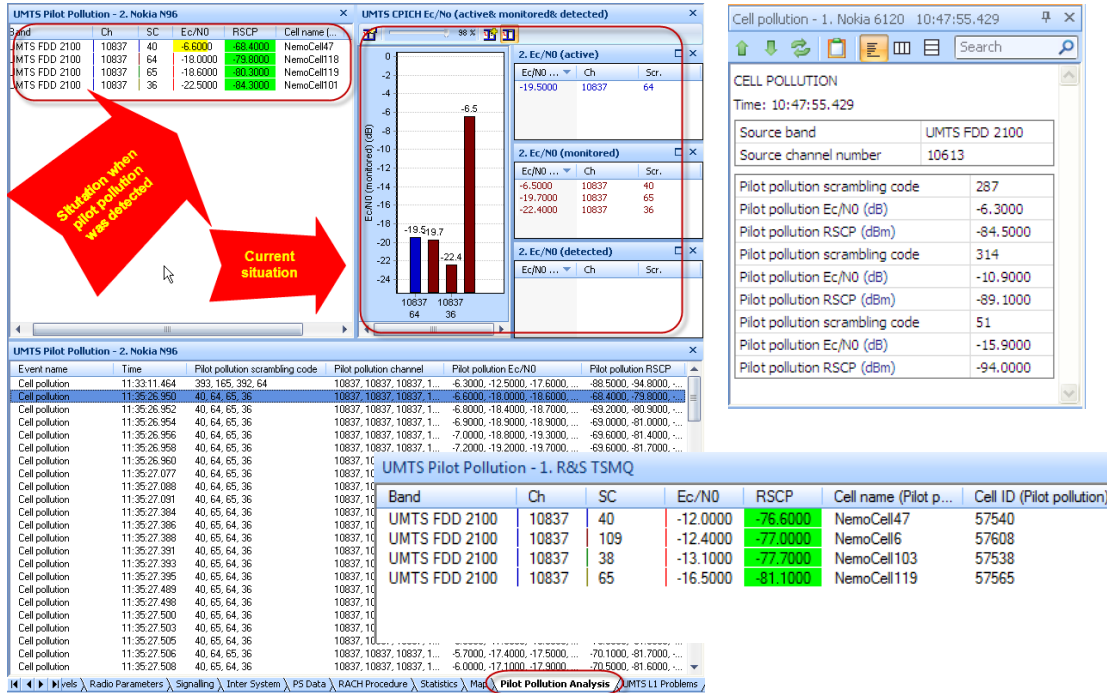
### GSM INTERFERENCE ANALYSIS

In GSM mobile communication networks, system capacity is often limited by co-channel interference. This is because of the surrounding cells using the same carrier frequency, or adjacent channel interference when surrounding cells use a channel too close to the serving cell used by a terminal. GSM co-channel and adjacent channel analysis is done in real time during a measurement and playback with Nemo Outdoor. Interference detection is done based on GSM terminal and GSM scanner measurements and these measurements are combined together.

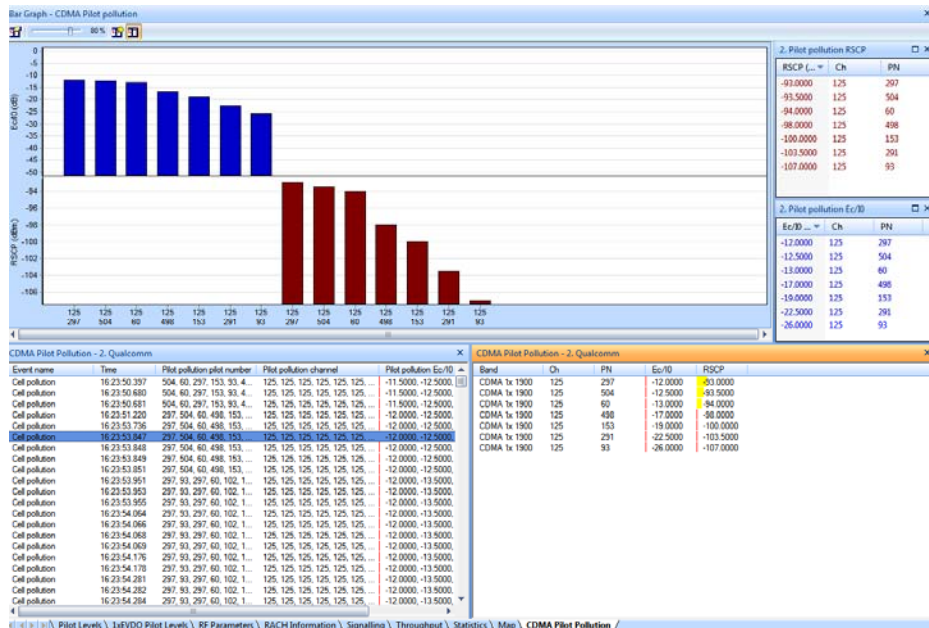


## PILOT POLLUTION ANALYSIS

Available for WCDMA, CDMA and EVDO networks, Pilot Pollution Analysis measurements can be performed in real time with Nemo Outdoor by using test terminals or a scanning receiver. In a pilot pollution situation there are more active/monitored pilots than a handset can measure, or there is no clear dominance for any pilots in the area. The pilot signal is used to distinguish cells in the network from one another. Pilot pollution analysis is done based on CELL MEASUREMENT events, and analysis is always active. The user can define thresholds for pilot pollution analysis via Nemo Outdoor user interface.

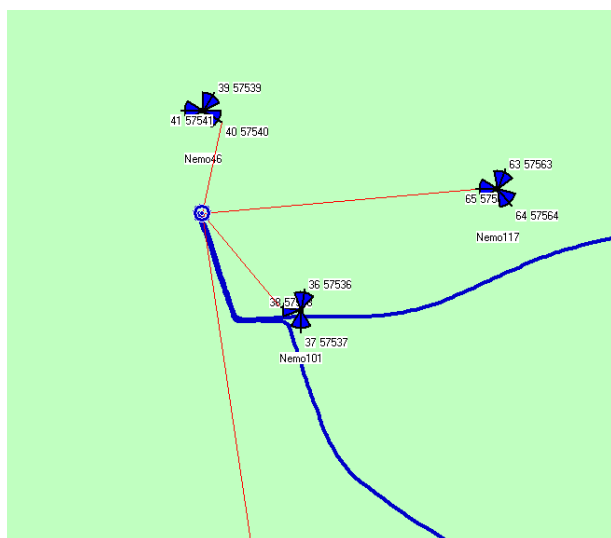


WCDMA pilot pollution data



CDMA pilot pollution data

Pilot pollution situations detected with WCDMA scanners and terminals and GSM co-channel/adjacent channel interferer situations can be displayed on a map. A line from the current location is drawn to interfering cell(s). A BTS file with WCDMA scanners and terminals can be used to display cell names for cells causing pilot pollution. Cell names can be displayed in different views.



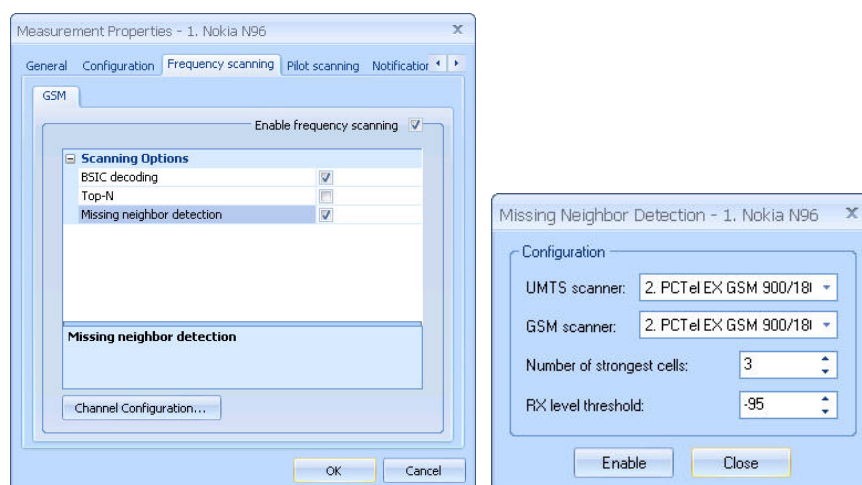
Map view with lines drawn to interfering cells

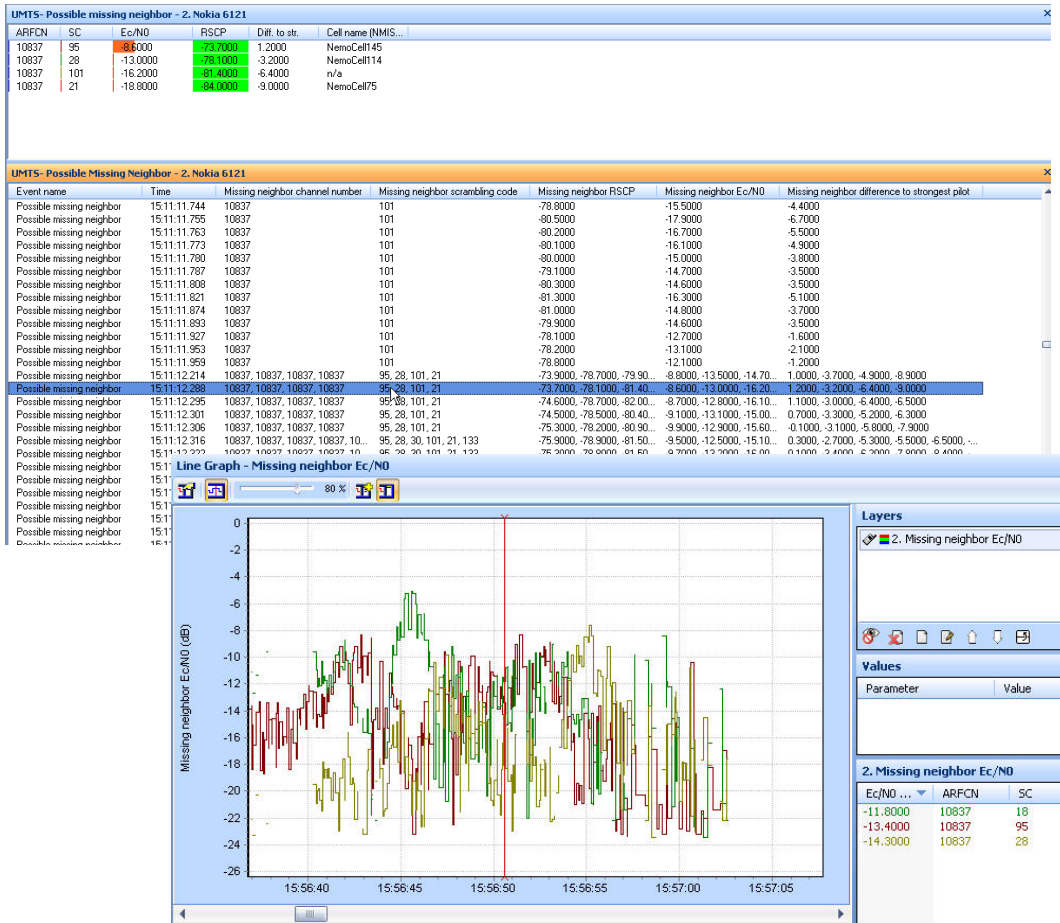
## MISSING NEIGHBOR DETECTION

With Nemo Outdoor you can perform real-time missing neighbor detection. You have three options in which to perform missing neighbor detection:

- with a mobile terminal supporting missing neighbor detection,
- a GSM/UMTS scanner, or
- GSM/UMTS scanner and a GSM/UMTS mobile.

Each cell has list of neighboring intra-frequency, inter-frequency, and inter-system cells. A terminal sees/measures only cells in the neighbor list, whereas a scanner measures all available cells. Missing neighbor detection is based on comparing scanner measurements with the neighbor list of the mobile. Hence, a possible missing neighbor refers to a cell that is not in the neighbor list of the mobile at a given time, but is detected/measured by the scanner. Missing neighbor detection can also be done using only Nokia test terminals that include the scanning functionality.





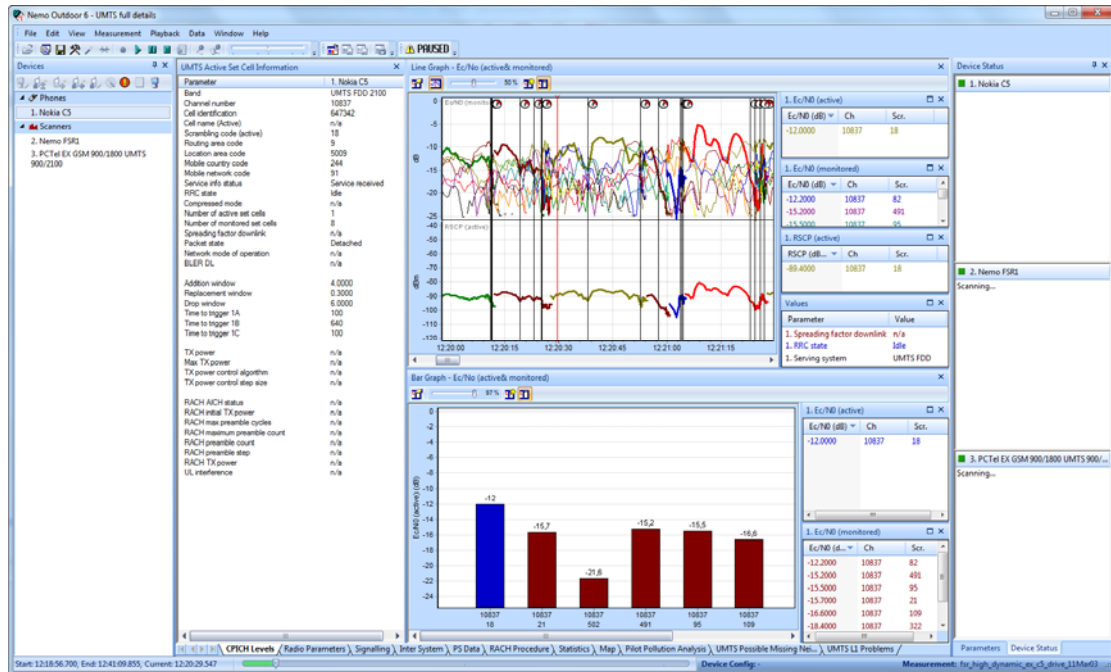
Missing neighbor detection data

## IP PACKET CAPTURING

With IP packet capturing, network packets sent between IP addresses are stored in log files and can be post-processed with a third party application such as Ethereal®. A separate log file is generated for each test terminal making data transfers. IP packet capturing is especially useful in problems related to TCP/IP communication which do not necessarily appear in measurement logs.

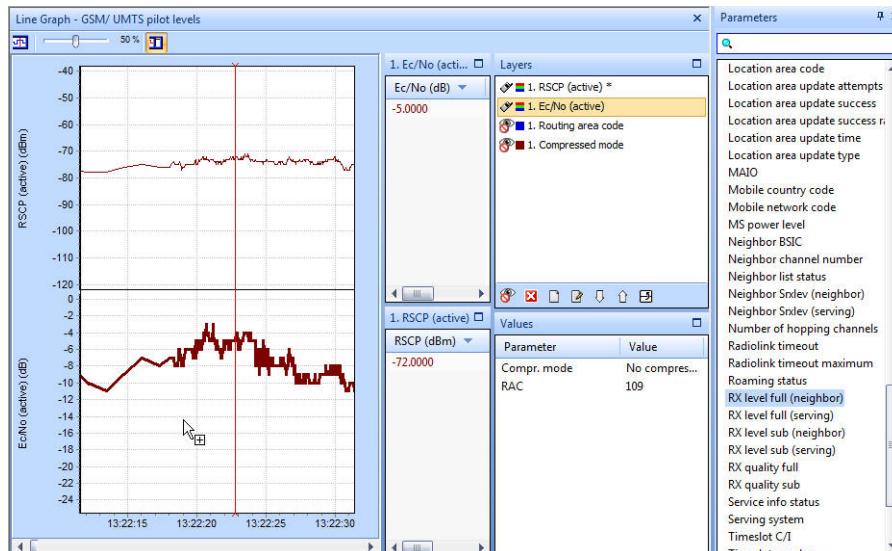
## DATA VIEWS AND USER INTERFACE

Nemo Outdoor's flexibility is best displayed and experienced through its class-leading user interface. It is arranged into control and data windows which can further be arranged and adjusted depending on the user's needs.



*The Nemo Outdoor user interface is extremely flexible*

The drag and drop functionality in Nemo Outdoor is one example of convenient organization possibilities in the Nemo Outdoor user interface.



*You can drag and drop parameters in graphs, grids, and maps*

The Nemo Outdoor user interface is compatible with common Windows® standards. During measurement, users can easily monitor the results and the progress of the measurement process. Through the Nemo Outdoor main window users will easily access all relevant functions. After the initial device setups and configurations the user can save all device-related settings to a hardware configuration file and load the same configuration later on. The Nemo Outdoor user interface is first and foremost flexible and organizable to suit each user's specific needs. **Measurement windows** display useful information during the measurement process and during playback. **View groups** allow the organization of measurement windows into different tabs for easier viewing. This is especially useful when there are several graphs and maps open at once in the Nemo Outdoor main window.

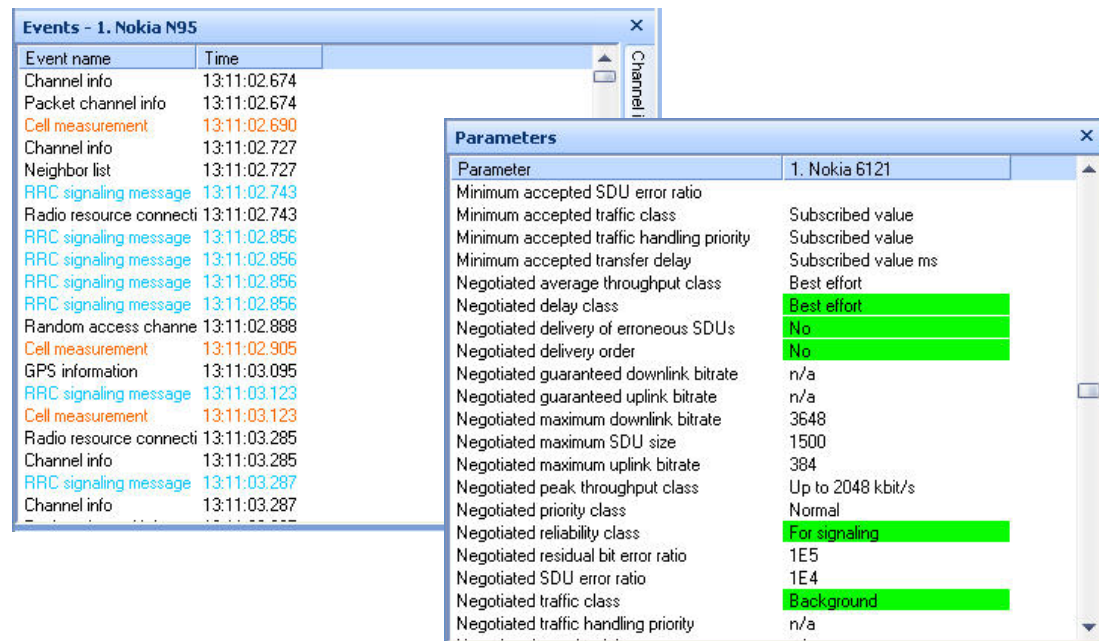
Nemo Outdoor offers several methods for viewing measurement results. With graphs the user is able to view any parameter, and the multi-layer capability of Nemo Outdoor makes it possible to view multiple results in a single graph. However, line graphs are best suited for viewing parameters for which historical (past) values need to be seen, such as serving cell RSSI value. Vertical and horizontal bar graphs work especially well with multiple parameters which need to be compared with each other, e.g., RSSI levels for neighboring cells. You can also configure graph colors based on the parameter value, or using fixed or algorithmic color sets.



Different graph types in Nemo Outdoor



**Grids** offer more detailed information on the measurement data. **Events grids** list, by default, all measurement events and messages, but the user can configure the view so that only events that are of special interest are displayed. **Parameters grids** display selected network parameters. **Table grids** provide an easy way of simultaneously displaying the same parameter values for multiple instances. For example, the neighbor list of a serving cell can be displayed in a table grid so that each row represents one neighbor and each column represents a parameter value (e.g., system, carrier, scrambling code, etc.). **Packet decoder grids** enable you to view and decode packet capture information on data transfers in playback mode.



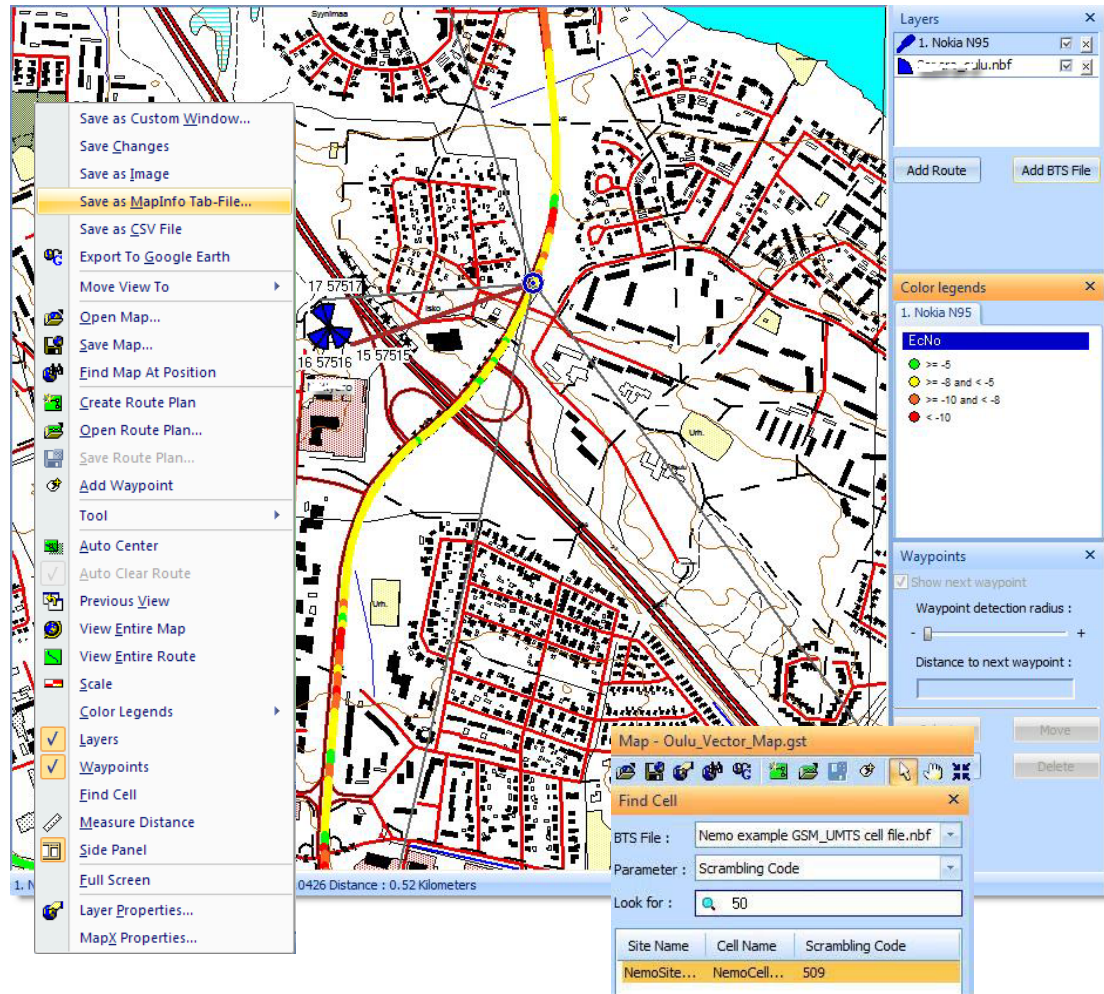
Furthermore, it is possible to copy grid data, such as signaling messages, and export (paste) the data to MS Excel, MS Word, etc. for further analysis. Signaling data can be copied in non-decoded or in decoded format. You can also save the event grid as an image or text file, or export event grid data into CSV and MapInfo .tab format, and export and import user parameters that are decoded from signaling messages.

The **User Parameters** function offers more options for advanced users. Any user-defined string can be searched from decoded messages. The function retrieves the value following the searched string and displays it in the info view and in the graph side panel. To avoid losing these user-defined parameters when updating Nemo Outdoor, it is possible to save them in an .xml configuration file, *Parameters.xml*.

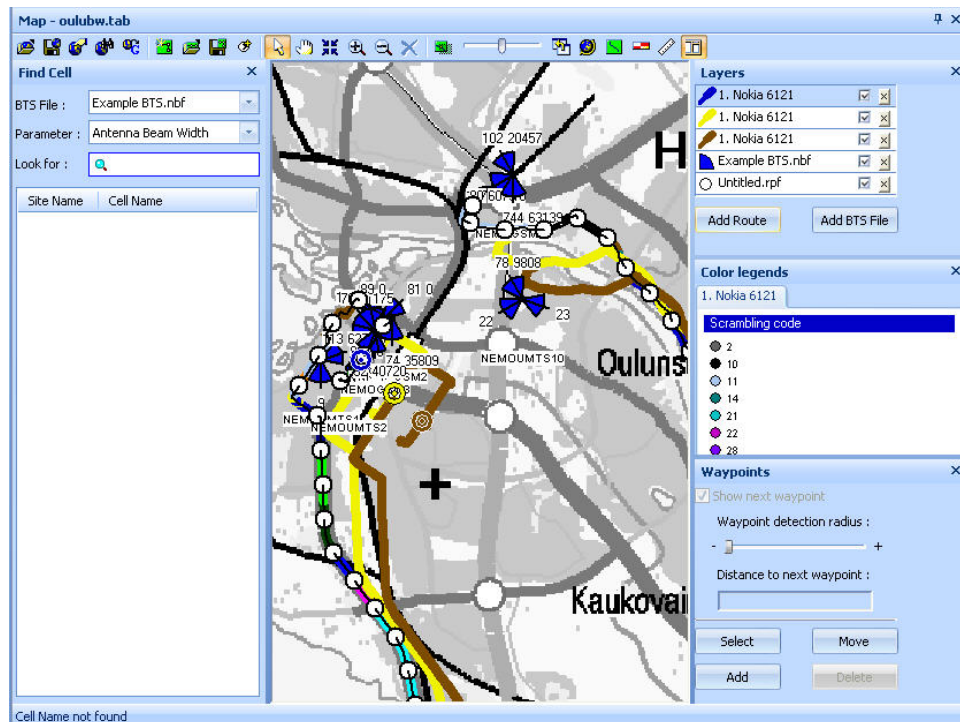
**Maps** on Nemo Outdoor provide the user with a better understanding of the measurement route and results through visualization. When Nemo Outdoor is used with a GPS receiver and positioning coordinates are collected, the measurement route is drawn on a map and the user can easily correlate events to location coordinates. Most of the time drive testing is performed using regular GPS receivers that give exact coordinate information in normal situations. Once the GPS fix is lost, coordinates cannot be updated correctly anymore. Especially in areas where there are a lot of tunnels or other obstacles causing the loss of GPS signal, it can be problematic to post-process data correctly. With Nemo Outdoor it is possible to modify GPS coordinates during playback. With the *Modify Route* tool users can correct measurement route drawing, for example, when the route is missing because the test vehicle drove through a tunnel.

Nemo Outdoor offers **parameter-based route coloring**, which means that users can observe the values of certain network parameters from the route coloring on the map. Users can define which color refers to which parameter value. This way it is easy to spot the problem areas on a map. To

make analysis even simpler, the same route can be drawn several times on the map and different route coloring can be applied to each of them. Also certain events can be shown as icons on the map.



*Nemo Outdoor maps can be exported to Google Earth*



*On a map you can view, for example, base station icons and a route plan*

Nemo Outdoor maps and floor plans can also display a base station overlay. With a user-defined BTS file, the map shows the location of each base station, the defined antennas with antenna directions, and even antenna apertures and cell identifying parameters. Furthermore, all this information can be edited directly in Nemo Outdoor. During drive testing or playback, a line connecting the current location to the serving and/or neighbor cell (sector) will be drawn automatically (in CDMA systems, even multiple lines can be drawn to active sectors). This provides a highly visual impression of the network operation. For example, it can be instantly seen if a call is connected to a non-optimal cell. Also missing neighbors can be viewed on a map.

Nemo Outdoor supports MapInfo®, OpenStreetMap, and iBwave map formats. It also supports MapX Geoset files (.gst) which enable the user to open several layers on a map and then save them all in a .gst file to be opened later on. All user-defined map settings, such as, the order of the different map layers and the zoom factor are stored in the .gst file. Nemo Outdoor maps can also be exported to [Google Earth](#) maps. Furthermore, Google Earth can be used to create KMZ files, georegistered raster images of floorplans, that can be used as indoor maps in Nemo Outdoor.

## DECODING

In events and messages grids, the data can be analyzed even more in-depth by *decoding* the individual events and messages simply by double-clicking the event in question. The user can define both the background and text color in event and message grids. This color coding can be done based on a certain message, sub channel or decoded message.

## NOTIFICATIONS

Notifications enable the user to add another dimension to the measurement process. Audio prompts help the user during drive testing to immediately notice when something special happens. Nemo Outdoor can be configured to play audio notifications or voice prompts whenever a certain event occurs. The voice prompts are Windows .wav files, and in Nemo Outdoor both female and male default notification sounds are available. However, you can record and use your own voice notifications instead of the default files as well. Custom notifications can also prove useful when

creating a script file. For example, the user can set a video call to start only when it is supported by a cellular technology. Nemo Outdoor's advanced exporting functionality also enables you to export individual custom-made notifications.

## **NEMO OPEN FILE FORMAT**

Nemo Outdoor produces measurement files in an open ASCII file format. Files can be directly utilized in Nemo Analyze as well as in various third party post-processing/analysis tools. This is accomplished without any separate conversion or parsing of the files. Furthermore, measurement files from multiple test drives can be opened in Nemo Analyze as individual files and shown side by side, delta plotted, or used with statistical quality survey report generator without the trouble of combining all measurements into one big and cumbersome file.

A detailed description of the file format is included in the Nemo Analyze product documentation. The file format description contains all recorded events and the related parameters.

## NEMO TOOLS

Anite offers a complete product portfolio for all wireless network measuring and analyzing needs.

### FOR DATA COLLECTION

- Nemo Autonomous** Nemo Autonomous is the first practical lightweight solution for performing fully automated large-scale measurements on the air interface of GSM, CDMA, EVDO, WCDMA, HSDPA, HSUPA, HSPA+, LTE, and WiFi (HetNet) wireless networks. Nemo Autonomous streamlines your network measurement, troubleshooting, statistical reporting, and benchmarking processes, maximizes your awareness of what is happening in the network, and makes achieving all this considerably easier and more cost efficient.
- Nemo Outdoor** A portable engineering tool for measuring and monitoring the air interface of TETRA, GSM, WCDMA, TDMA (IS-136), AMPS, cdmaOne, CDMA 2000, HSDPA, HSUPA, HSPA+, TD-SCDMA, WiMAX, and LTE wireless networks.
- Nemo Handy-A** Nemo Handy-A is a lightweight, Android smartphone-based air interface measurement tool for GSM, GPRS, EDGE, WCDMA, HSPA, and LTE wireless networks.
- Nemo CEM** Nemo CEM solution is a powerful, flexible, and scalable set of tools for monitoring wireless network performance and services from the end user point of view.
- Nemo Walker Air** Nemo Walker Air is a portable tool for indoor measurements and benchmarking. Nemo Walker Air enables conducting multi-technology measurements on the air interface of GSM, CDMA, EVDO, WCDMA, HSDPA, HSUPA, HSPA+, LTE/ LTE Cat. 4, and WiFi (HetNet) networks.
- Nemo Invex** Nemo Invex is a chassis-based benchmarking tool for wireless network measurements. Nemo Invex supports measurements on all major network technologies, including GSM, CDMA2000, EVDO, TD-SCDMA, WCDMA, HSDPA, HSUPA, HSPA+, WiMAX, and LTE.
- Nemo FSR1** Nemo FSR1 is a revolutionary, modular digital scanning receiver that provides accurate, reliable high-speed RF measurements of wireless networks across multiple bands and technologies. Nemo FSR1 supports measurements on LTE, WCDMA, HSDPA, GSM, CDMA, and EVDO networks.

### FOR ANALYSIS AND REPORTING

- Nemo Analyze** Nemo Analyze is a powerful and versatile, cutting-edge analysis tool for performing benchmarking, troubleshooting and statistical reporting based on drive test data. The system scales from a standalone tool to an enterprise-level client/server solution and incorporates an innovative, low-maintenance database engine that has been designed and optimized specifically for high-performance post-processing of drive test data.

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