

YEMEN MOBILE Company
Technical Committee

Network Engineering Tools

Tools Components & Technical Specification

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Introduction:-

Radio network optimization & Planning play a very important role in network construction and growth. RNP responsibility is to make best design to the radio network and the RNO adjust the planning and design reasonably, improve the network coverage, increase the network capacity and improve the network service quality, resource utilization ratio. Make the network operation more stable, and provide excellent service. Data collection is the necessary resource of analysis and adjustment. Planning & Optimization data include Capacity, Coverage prediction, Driving test data (DT) , Call quality test data (CQT) , Interference detection test, OMC performance data, Customer's complains, Alarm data, signaling data and other data.

There are many professional network optimization test software tools developed by specialist companies to help the engineers to do the test ,analysis, locate network problem and evaluate network quality and capacity, constitute the optimization solution.

YEMEN MOBILE required many tools for Network Engineering Administration, belong to Radio network optimization & Planning work, which are divided to four sets bidder. Two sets tools will be upgraded from current tools and the other two sets are new requirement tools as following:-

Set1: Atoll Upgrade and Additional Licenses

Item	Available dongle license	Upgrading
Atoll (Supply, Installation, Commissioning & Upgrading)	2	Multi-user Based-Server Mode at least 6 user

Set2: WindCatcher Upgrade and Additional Licenses

Item	Available license	Add license	Total upgrading
WindCatcher Upgrading	2	7	9

Set3: ZXPOS CNT Coverage data collection

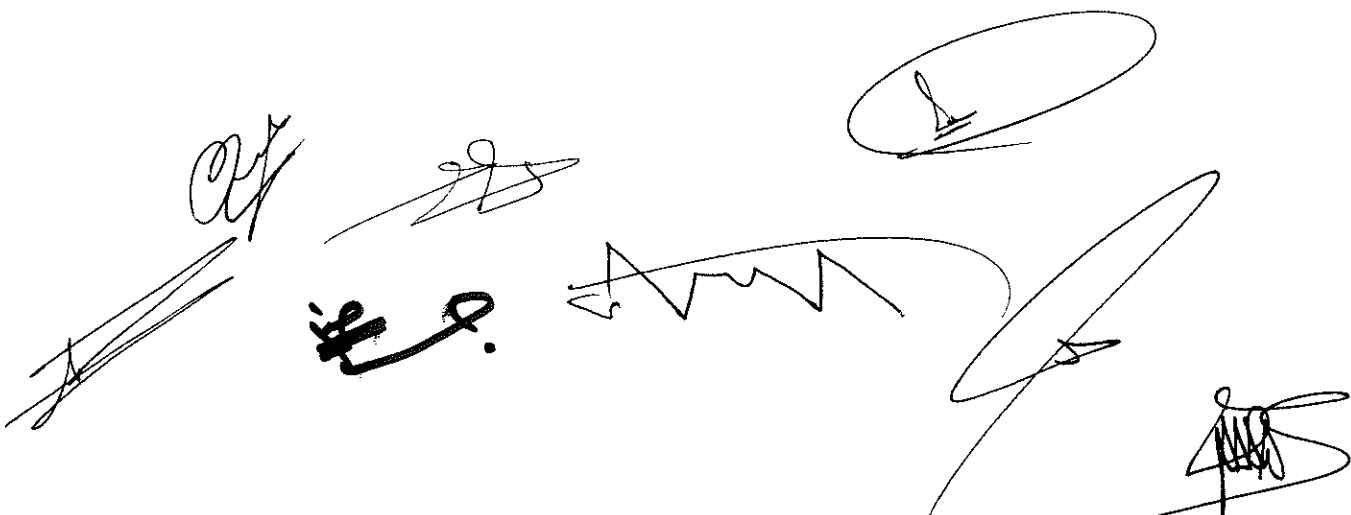
Item	Available dongle license	Add dongle license
ZXPOS CNT	0	9

Set4: Spectrum Analyzer MS2720T 9 kHz to 32 GHz

Item	Available tool	Add Tool
Spectrum Analyzer MS2720T 9 kHz to 32 GHz	0	2

Chapter 1

Atoll Upgrading Technical Specifications

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Atoll Upgrading

Introduction:-

As you know, Yemen Mobile already has 2 licenses of Atoll 2.8 which support most features related to CDMA2000 1X&EVDO module, and shown in the next page. However, we would like to get new features that FORSK has developed in Atoll last new versions such as full support of EVDO RevA migration from CDMA 1x and EVDO to LTE, CDMA and users' distribution modeling and some other requirements listed below

Set1:- Atoll Upgrade and Additional Licenses Requirement

Item	Available license	Upgrading
Atoll (Supply, Installation, Commissioning &Upgrading)	2 dongle	Multi-user Mode for 6 user

- 1- YEMEN Mobile already have 2 Licenses with all 1x&EVDO futures, so the additional cost for new futures upgrading like LTE&MW features
- 2- The New multi User licenses will include the old features and the new features
- 3- All the specification, features &functions mentioned in Atoll Upgrading specification Chapter are mandatory in our requirement
- 4- The warranty, support& maintenance not less than 2 years
- 5- The whole System tools will be ownership for ever to YEMEN MOBILE Company, so the requirement multi-user system tools and software tool are unlimited by specific date licenses fee (will putted in the contract).

Supported Technologies Module:

- CDMA2000 1X&EVDO RevA
- LTE Advance 3GPP2 Release10+
- Microwave Links
-

Multi User License (Based-Server mode)

Atoll will work as multi-user networked configuration, a database server can be used. Please introduce the recommended configuration (technical & Financial in the offer) Atoll also can installed on a Windows or Linux server running Citrix. In this case, Atoll will run on the server and will displayed on the clients. Please introduce the recommended configuration (technical & Financial in the offer)

Client Operation System Supported:

User Client that will connect to the server support all kind of operation System not less than the following:

- Windows 7 (x32, x64),
- Windows 8 (x32, x64),
- Windows Vista (x32, x64),
- Windows XP (x32),
- MAC OSX 10.7.5+

- Linux

High Performance GIS

Atoll incorporates a high-performance built-in geographic information system (GIS) exclusively designed for radio network planning and optimisation. Atoll's 64-bit GIS engine allows working with high-resolution and large-scale geo data while delivering high performance in data manipulation and display.

Atoll supports web map services, online map servers (Google, Bing, etc.), and industry-standard formats including BIL, TIF, BMP, Vertical Mapper, ArcView, MapInfo, etc. Atoll smoothly interfaces with commonly used desktop GIS such as MapInfo and ArcView.

GIS Features

- Optimised cartographic data management features with support of digital elevation models, clutter data (type and height), 3D building data (vector/raster), traffic data, scanned maps, vector data, population, and climate data
- Integrated cartography editor (vector/raster)
- Interface with GIS tools: MapInfo, ArcView, Google Earth
- Support for Web Map Services (WMS) and online maps (Google, Bing, etc.)

Propagation Modelling

- Comprehensive integrated propagation model library
- Full support for multi-resolution prediction plots
- Automatic propagation model tuning using CW and drive test data
- Path loss matrix adjustment using prediction/drive test interpolation
- High-performance CrossWave propagation model (option)
- Integration of external propagation models through an API and a C++ development kit

User and Database Management (server Mode)

- Flexible database structure allowing integration of user-defined parameters and custom fields
- Multi-user support including database consistency management, data synchronisation, and user disconnection/reconnection from/to the database
- Support for standalone, centralised, distributed configurations
- Advanced import/export features allowing quick data migration from other radio planning software

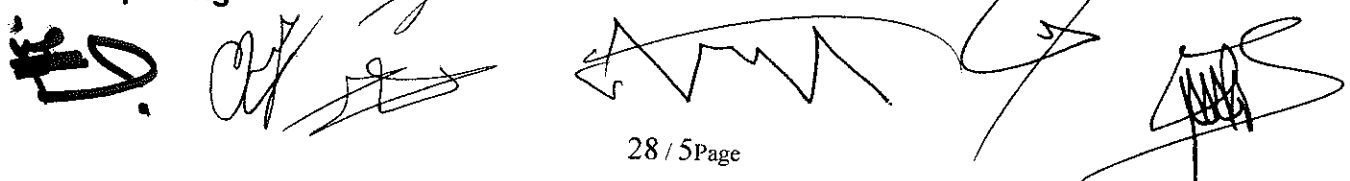
Task Automation

- Scripting language allowing integration of user-defined macros
- User-defined calculation batch based on macros and scripts

Distributed Computing and Multi-threading

- Multi-threading/parallel computing on multi-core systems
- Distributed computing on networked workstations and servers

Reporting



- Flexible report generator including traffic, population, and clutter-based statistics
- User-defined reports based on macros
- Export of reports and prediction plots to other software

Measurements Module

- Drive Test Data
 - Import, display, and analysis of drive test data
 - Call events display and analysis
 - Automatic propagation model tuning
 - Path loss matrix adjustment using prediction/drive test interpolation

1.1 CDMA2000 1xRTT/EV-DO Module

Note: as you know Yemen Mobile have 2 licenses of Atoll 2.8 which support most features related to CDMA2000 1X&EVDO module, so those feature should be excluded from your financial offer.

Supports integrated network planning for CDMA2000/LTE radio access technologies. It features a multi-technology network database, a unified traffic model, a new combined CDMA2000/LTE Monte Carlo simulator, and ACP (Automatic Cell Planning) module, as well as support for the latest technology trends such as HetNets and Wi-Fi offloading.

Network Modelling

- Support for multiple carriers and frequency bands
- Radio configuration and channel modeling
- Radio Resource Management (RRM)
- Carrier type modelling (1xEV-DO, 1xRTT)
- EV-DO Rev.B multi-carrier operation (RRM & frequency diversity gain)
- Full 1xRTT, EV-DO Rel.0, Rev.A, Rev.B physical channel management
- Forward/reverse Rev.A, Rev.B radio bearer modelling
- Hybrid-ARQ modelling

Traffic Modelling

- Modelling of voice and data services
- Multi-service 2D & 3D traffic demand maps generated from multiple sources: vector, raster, and live traffic data

Simulation and Analysis

- State-of-the-art Monte Carlo CDMA simulator including RRM, rate downgrading, and multi-carrier allocation algorithms
- **Adding CDMA Subscribers to a Subscriber List Using the Mouse**

CDMA users distribution modeling by creating new list of subscribers and distributing them randomly on the

- Modelling of mixed 1xRTT/1xEV-DO traffic

- Generation of prediction plots, based on simulations or on user-defined cell load figures, including:
 - Ec/Io pilot prediction plots
 - Forward and reverse link Eb/Nt prediction plots
 - Forward and reverse link 1xRTT SCH rate prediction plots
 - Forward and reverse link 1xEV-DO (Rev.0, Rev.A and Rev.B) data rate prediction plots
 - Service areas (pilot & forward and reverse link traffic)
 - Handoff status prediction plots
 - Number of servers
 - Pilot pollution prediction plots
 - Total forward link noise and noise rise prediction plots

Multi-RAT Network Planning

- Integrated planning and optimisation for 3GPP2 (CDMA/LTE) technologies:
 - Unified network databases with site and antenna sharing
 - Unified multi-service traffic model
 - Simultaneous display and analysis of network layers
- Inter-technology handover modelling
- Inter-technology interference analysis

Neighbour and PN-offset Planning

- Manual and automatic neighbour planning
- Multi-carrier neighbour planning
- Automatic PN-offset allocation
- PN-offset allocation analysis

1.2 LTE Module

Atoll upgrading to plan evolution towards LTE and LTE-Advanced. It allows planning and analysing integrated GSM/UMTS/LTE and CDMA2000/LTE networks. Atoll includes unified multi-technology GSM/UMTS/LTE (3GPP) and CDMA/LTE (3GPP2) traffic models.

Network Modelling

- Support of all E-UTRA frequency bands and carrier configurations
- Comprehensive support of FD- and TD-LTE
- Support for multi-layer HetNet deployment scenarios
- Support of intra- and inter-band carrier aggregation
- Support of multiple modulation types and coding schemes
- MIMO: transmit/receive diversity, SU-MIMO, MU-MIMO, adaptive MIMO switching (AMS)
- Beamforming smart antenna modelling

Traffic Modelling

- Modelling of voice and data services with different QCIs
- Modelling of UE categories
- Multi-service 2D & 3D traffic demand maps generated from multiple sources: vector, raster, and live traffic data
- Fixed subscriber traffic modelling

Simulation and Analysis

- LTE Monte Carlo simulator including power control, IoT control and advanced RRM and scheduling algorithms
- Support of carrier aggregation and multi-layer (HetNet) traffic balancing
- Support of frequency-domain as well as time-domain inter-cell interference coordination (ICIC): FFR, SFR, eICIC, etc.
- Generation of prediction plots, based on simulation results or on user-defined cell load figures including:
 - Cell and network coverage analysis
 - Effective service area analysis
 - Uplink and downlink interference analysis
 - Uplink and downlink bearer coverage predictions
 - Uplink and downlink throughput coverage predictions
 - Uplink and downlink quality indicator prediction plot
 - Aggregate throughput prediction plot
 - Physical cell ID, PSS ID, SSS ID collision plot
- Network capacity planning considering S1 interface (backhaul) constraints

Neighbour Planning

- Manual and automatic neighbour planning
- Inter-frequency and intra-frequency neighbor planning

Multi-RAT Network Planning

- Integrated planning and optimisation for 3GPP (GSM/UMTS/LTE) and 3GPP2 (CDMA/LTE) technologies:
 - Unified network databases with site and antenna sharing
 - Unified multi-service traffic model
 - Combined Monte Carlo simulator
 - Simultaneous display and analysis of network layers
- Inter-technology handover modelling
- Inter-technology interference analysis

Automatic Frequency Planning – AFP

- Generation, import, edition, storage, and use of interference matrices
- User-definable constraints and editable cost function
 - Allocation of carriers and fractional frequency planning (FFP)
 - Automatic physical cell ID planning considering PSS, SSS, RS, UL DMRS, and PCFICH collisions

Automatic Cell Planning – ACP

- Automatic optimisation of network parameters to increase coverage and capacity
- Site selection and activation for greenfield and densification scenarios
- Antenna selection and parameter optimization (height, azimuth & tilt)

CDMA/FD-LTE Co-planning

- Site sharing
- Simultaneous display and analysis of CDMA and FD-LTE networks
- Inter-technology handover modelling

LTE AFP

- Full and fractional automatic frequency planning
- Interference-based frequency plan optimisation target (cost function)
 - Interference matrices
 - Neighbours, neighbours of neighbours, co-neighbours
 - Reuse distance
- User-definable constraints and editable cost function
- Generation, import, edition, storage, and use of interference matrices
- Support for multi-carrier and multi-band networks
- Automatic physical cell ID planning considering PSS, SSS, RS, UL DMRS, and PCFICH collisions

1.3 Automatic Cell Planning (ACP)

Atoll includes advanced multi-technology Automatic Cell Planning (ACP) modules implemented as integrated functions available from the standard Atoll user interface. All ACP data and results are stored in the Atoll project files and databases.

The seamless integration of the radio planning and optimisation features provides a direct return on investment from using the Atoll ACP. Atoll ACP is available for GSM, UMTS, LTE, CDMA2000, WiMAX, and Wi-Fi.

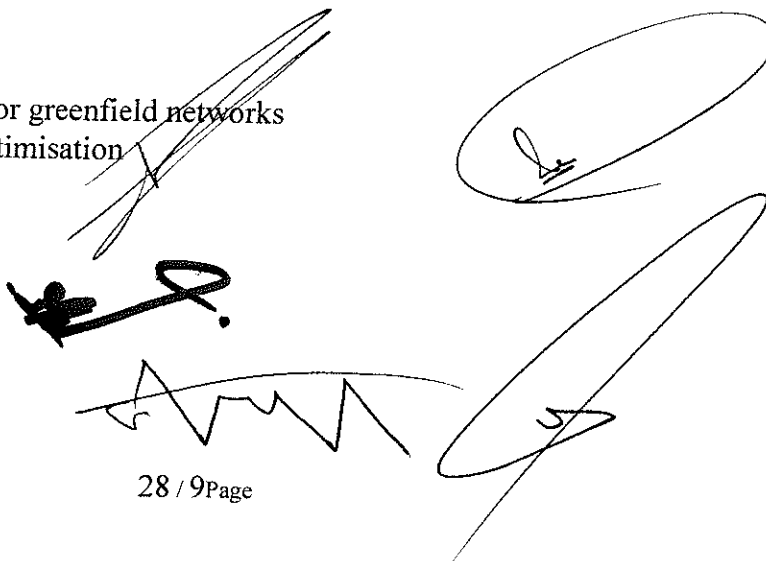
It supports combined GSM/UMTS/LTE and CDMA2000/LTE optimisation.

Optimisation Parameters

- Antenna type
- Antenna height
- Antenna azimuth and tilt
- Transmit power
- Candidate site selection
- Automatic site placement for greenfield networks
- In-building multi-storey optimisation

Optimisation Objectives

- Coverage
- Interference
- Capacity



- Service quality
- EMF (Electromagnetic Field) exposure

Optimisation Control

- User-defined cost function including criteria weighting
- Parameter change vs. implementation cost optimisation
- Flexible multi-technology objective definition
- User-defined combination of clutter dependent and area dependent thresholds
- Combined multi-layer KPI optimisation using traffic maps

Optimisation Results

- Implementation changes ranked by potential network improvement
- Complete set of prediction plots for change and improvement analysis
- Storage of multiple optimisation plans for simultaneous analysis

Combined CDMA2000/LTE Optimisation

- Combined CDMA/LTE optimisation objectives
- Multi-technology cost function
- Simultaneous display and analysis of CDMA2000/LTE optimisation results

Propagation conditions

- Vertical diffraction
- Horizontal guided propagation (micro-cells)
- Reflections on mountains

Specifications

- All technologies are supported (eg. GSM, CDMA, LTE...)
- Frequency Range 200 MHz to 5 GHz
- Reflections on mountains
- All types of situations: macro, mini and micro-cells
- All environments: rural, suburban, urban, dense urban
- Support of all Atoll raster formats
- Support of 3D building data

Configuration & calibration

- Support of multi-threading and distributed computing
- Pre-calibration based on Orange Lab experience of various countries and propagation conditions
- Automatic calibration using CW measurements

1.4 Microwave Links Planning Module

Atoll Microwave upgrading to allows designing large microwave link networks, according to ITU recommendations, industry standards, and operator-specific design guidelines.

Atoll Microwave is based on the leading Atoll platform which includes a high performance GIS and advanced data and user management features. Atoll Microwave can share the site database with Atoll radio planning and optimisation modules allowing easy data consistency management across the operator organisation.

GIS Features

- Optimised cartographic data management features with support of digital elevation models, clutter data (type and height), 3D building data (vector/raster), traffic data, scanned maps, vector data, population, and climate data
- Integrated cartography editor (vector/raster)
- Interface with GIS tools: MapInfo, ArcView, Google Earth
- Support for Web Map Services (WMS) and online maps (Google, Bing, Open Street Maps, etc.)

User and Database Management

- Advanced administration module supporting data access and user privilege management
- Flexible database structure allowing integration of user-defined parameters and custom fields
- Multi-user support including database consistency management, data synchronisation, and user disconnection/reconnection from/to the database
- Support for standalone, centralised, distributed configurations
- Advanced import/export features allowing quick data migration from other radio planning software

Task Automation

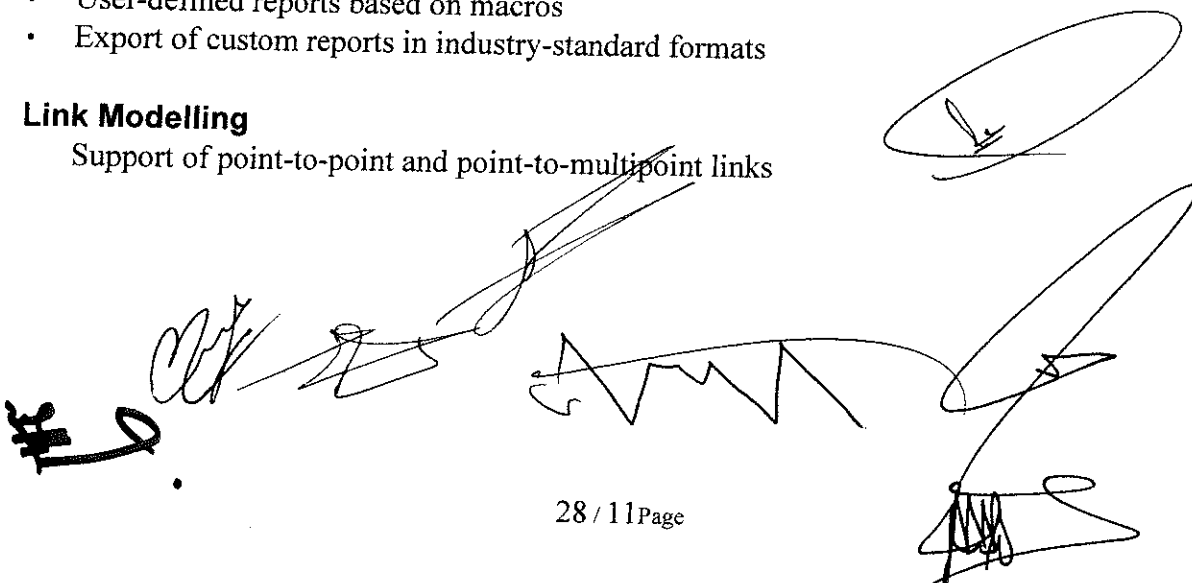
- Scripting language allowing integration of user-defined macros
- User-defined calculation batch based on macros and scripts

Reporting

- Flexible report generator
- User-defined reports based on macros
- Export of custom reports in industry-standard formats

Link Modelling

Support of point-to-point and point-to-multipoint links



Modelling of microwave and wired transmission technologies: optical, copper links etc.
Support of ITU standard and user-defined frequency bands, high-low configurations, and channelisation plans

- Equipment modelling: vendor parameters, IRF, signatures, etc.
- Antenna modelling: vendor parameters including co- and cross-polarisation, radoms, etc. □
Support for repeaters
- Support for space and frequency diversity
- Support for dual polarisation
- Support for ATPC
- Support for adaptive modulation

Link Design

- LOS and inter-visibility plots
- Path profile analysis including Fresnel zone clearance with multiple K factors
- Propagation and link budget analysis
- Automatic antenna height optimisation
- Reflection point analysis and repeater design

Quality and Availability Objectives

- Performance objectives based on ITU G-821, G-826, and G-828 recommendations
- User-defined performance objectives and parameters

Link Performance Analysis

- Based on ITU-R 530-8, 530-10, 530-11, 530-12, and 530-13 recommendations
- Support for Crane, Vigants, and K-Q models
- User-defined and ITU standard geoclimatic parameters
- User-definable reports including multipath, rain, and obstruction fading
- User-definable propagation model
- End-to-end multi-hop link analysis

Interference Analysis and Frequency Planning

- Based on ITU 452-11 and 452-12 recommendations
- Detailed interference analysis including interferer ranking
- Semi-automatic channel-to-link allocation
- Analysis of low/high conflicts
- Integration of interference impact into link reliability report
- Evaluation of link quality vs. performance objectives

Backhaul Capacity Planning (option)

- Modelling of backhaul network topologies and traffic routing
- Backhaul network capacity planning and dimensioning
- Failure scenario analysis and audit

1.5 Atoll Development Tools



Atoll is an open platform and includes development tools that allow operators or 3rd party developers to customise their working environment and easily integrate Atoll with other applications. This key feature provides flexibility and a capacity to quickly add customised modules that no other radio planning and optimisation software delivers.

- **Atoll Scripting Language**

Atoll includes a powerful VBScript-based macro language that allows automation and scheduling tasks such as nation-wide coverage predictions and reporting, propagation calculation automation and

monitoring, etc. The Atoll macro language also enables administrators to implement data management rules and controls, such as naming conventions and consistency checks.



Chapter 2

WindCatcher Upgrading Technical Specifications



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Set2:- Windcatcher Upgrade and Additional Licenses Requirements

Item	Available license	Add license	Total upgrading
WindCatcher Upgrading	2	7	9

From above table

- 1- YEMEN Mobile already have 2 Licenses with all 1x&EVDO futures and functions capability so the additional cost for new futures upgrading like LTE features
- 2- The additional 7 licenses will include the old features and new features
- 3- All the specification, features & functions in the attachment WindCatcher specification Chapter beside the specification, features & functions in the exceed Company web site related to 1x, EVDO& LTE are mandatory in our requirement
- 4- The warranty, support& maintenance not less than 2 years
- 5- The whole System tools will be ownership for ever to YEMEN MOBILE Company, so the requirement multi-user system tools and software tool are unlimited by specific date licenses fee (will putted in the contract).

WindCatcher Functions and Features

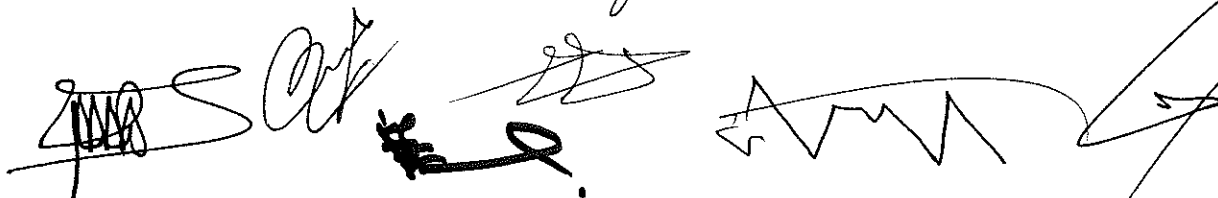
WindCatcher is a PC-based, drive-test post-processing tool it will use to provide a complete solution to post-process, analyze and report data, and brings several advanced analysis and productivity features and functionalities to the engineer, packaged in a user-interface that is both powerful and intuitive.

Multiple data files from multiple phones, multiple frequencies and multiple sources (including reverse link) may be processed together in one step and saved as datasets to be recalled later. This adds great efficiency because all data files need only be processed once. Tremendous efficiency gains are also achieved with value-added productivity features such as batch printing (which includes PN batch printing).

WindCatcher will provides multiple views like maps, charts, tables, phone data, event and message browsers for detailed drill-down analysis of problem areas. These views are fully synchronized to maximize the effectiveness and coherency of the data presented. Complementing these views are additional, advanced features like automated event analysis, problem area identification queries, delta plots and PN analysis that greatly reduce the time taken to identify and analyze problem areas and events.

The functionality of WindCatcher is designed to maximize the productivity and efficiency of engineers in their day-to-day work of evaluating drive test data, isolating problems and recommending solutions to network problems.

WindCatcher will provides a comprehensive list of all problems seen on the drive. Intelligent algorithms and innovative metrics are applied to these problems to arrive at suggested root causes and ideas for possible fixes.



Easy-to-Use

- Powerful, intuitive interface
- Fully synchronized maps and browsers
- Engineering oriented

Superior Speed and Accuracy

- Significant processing speed
- Processes large volumes of data with ease
- Data set creation allows for one-time processing

Unmatched Performance and Efficiency

- Automated device and log files management, pre- and post-merging of data for analysis
- Project Management Console
- Numerous productivity features include batch printing, single-step analysis and more

Flexible In-depth Analysis

- Fully customizable event definition and analysis
- Root cause, analysis
- Neighbor-list optimization
- Link to bin
- One-step throughput analysis
- User defined metrics and reports
- User definable queries
- Comprehensive and well-categorized events
- Layer 3 drill down analysis
- Wireshark compatibility
- Google and Bing map support

Supported Technologies:

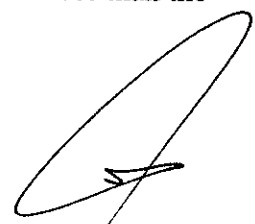
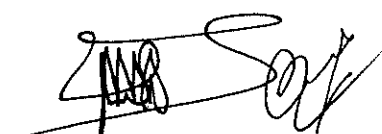
The following Technology's should supported in Upgrading WindCatcher:

- CDMA2000 1X&EVDO RevA
- LTE Advance 3GPP2 Release10+
- Voice over LTE (VoLTE)

Operation System Supported:

WindCatcher should run on any PC with all kind of operation System not less than the following:

- Windows 7 (x32, x64),
- Windows 8 (x32, x64),
- Windows Vista (x32, x64),
- Windows XP (x32),
- MAC OSX 10.7.5+



- Linux

2. Supported Drive Test Formats

The following drive test formats should supported in Upgrading WindCatcher:

- 1- ZTE ZXPOS-CNT (.APT)
- 2- Dingli Pioneer (.RCU)
- 3- Agilent SD5
- 4- Agilent AOD
- 5- Agilent MDB
- 6- Andrew Invex
- 7- ASCOM
- 8- Comarco Seven.Five
- 9- Comarco Symphony
- 10- Ericsson TEMS
- 11- Nemo
- 12- PCTel Insite
- 13- PCTel SeeGull
- 14- PCTel Clarify
- 15- PCTel EX DataPro
- 16- Qualcomm DM
- 17- Qualcomm ISF (QXDM)
- 18- Qualcomm MobileView
- 19- Rhode & Schwartz Romes
- 20- SBS Reverse Link files for sd5 format
- 21- Spirent UDM
- 22- Swissqual
- 23- ZK Celltest

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Chapter 3

ZXPOS CNT Technical Specifications



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Set3:- ZXPOS CNT Coverage data collection Requirement

Item	Available dongle license	Add dongle license	Note
ZXPOS CNT	0	9	

- 1- All the specification, features & functions in the attachment ZXPOS CNT specification Chapter are mandatory in our requirement
- 2- The warranty, support & maintenance not less than 2 years
- 3- The whole System tools will be ownership for ever to YEMEN MOBILE Company, so the requirement multi-user system tools and software tool are unlimited by specific date licenses fee (will putted in the contract).

Definition and Features

ZXPOS CNT is professional test software for 2G/3G wireless network, which can be used to test wireless network performance, to optimize wireless network on-site, and to test the quality of base stations and terminals. With ZXPOS CNT, users can observe wireless network parameters in real time. The collected test data not only can be replayed for analysis, but also can be outputted to post processing software for further analysis.

CNT should has features as list below:

1. Multi-technology network test ability

ZXPOS CNT supports multi-technology wireless networks including CDMA IS95A/B, cdma2000 (RLS 0 ~ A), 1x EV-DO, and FDD& TDD LTE communication system. It can be used for handoff test between networks of different systems, with the support of multi-mode terminals.

2. Diversified voice and data service test functions

The software provides these service test functions: voice service, Data service, gpsOne, PPP, FTP, HTTP, EMAIL, MMS, WAP, Video Streaming, TCP/UDP and PING. It also provides sniffer function to record PPP and TCP/IP data packets.

3. A large number of test parameters

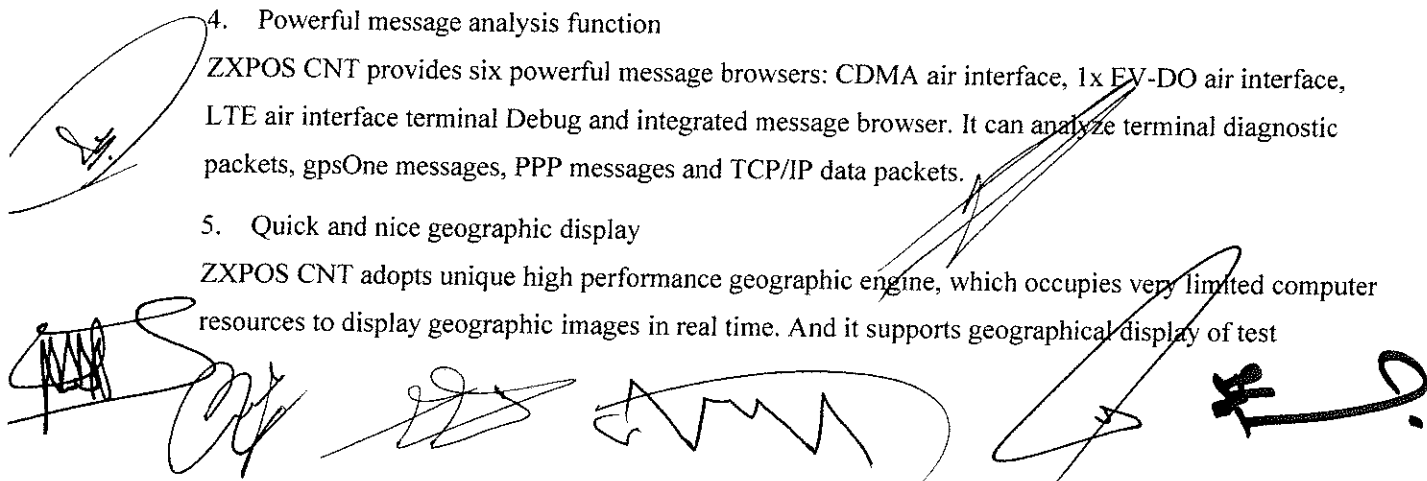
With high performance data sampling and processing engines, ZXPOS CNT collects data with high precision and handles a large number of data.

4. Powerful message analysis function

ZXPOS CNT provides six powerful message browsers: CDMA air interface, 1x EV-DO air interface, LTE air interface terminal Debug and integrated message browser. It can analyze terminal diagnostic packets, gpsOne messages, PPP messages and TCP/IP data packets.

5. Quick and nice geographic display

ZXPOS CNT adopts unique high performance geographic engine, which occupies very limited computer resources to display geographic images in real time. And it supports geographical display of test



parameters, cellsite information, neighbouring connections and event icons. The MapInfo® map format is also supported.

6. Multiple test terminals supporting ability

ZXPOS CNT supports up to 128 test terminals simultaneously with each terminal has its own performance parameter display window and control window. It is extremely powerful to perform such test tasks as simultaneous test for voice and data services, comparison test for different system networks, mass traffic test, multi-carrier test, and performance comparative test of multiple terminals.

7. Intelligent identification of device and fault recovery

ZXPOS CNT can identify devices intelligently, and automatically configure device parameters. It supports test-time-equipment-replacement.

8. PNScanner supporting ability

With a scanner connected, CNT supports PN Scan, supports channel power, spectrum and CW power measurement, supports Ec/Io, propagation delay, finger and Walsh code power analysis.

9. Convenient indoor test

ZXPOS CNT should provides four indoor locating modes: Pre-defined route mode, manual locating, combination of Pre-defined route mode, manual locating mode and auto virtual routing mode. It supports indoor layout in both JPG and BMP formats, KML Google Earth.

Supported Technologies:

The following Technology's should supported in Upgrading ZXPOS CNT:

- CDMA2000 1X&EVDO RevA
- LTE Advance 3GPP2 Release10+ (FDD&TDD)
- Voice over LTE (VoLTE)
- UMTS\HSDPA (optional)

One Terminal Test Supported Technologies:

The following Technology's should supported in one Terminal Test of ZXPOS CNT:

- CDMA2000 1X&EVDO RevA
- LTE Advance 3GPP2 Release10+ (FDD&TDD)
- Voice over LTE (VoLTE) (if available)
- UMTS\HSDPA (optional) (if available)

Operation System Supported :

ZXPOS CNT and teminaltest should run on any PC with all kind of operation System not less than the following:

- Windows 7 (x32, x64),
- Windows 8 (x32, x64),

- Windows Vista (x32, x64),
- Windows XP (x32),
- MAC OSX 10.7.5+
- Linux

Additional Features

1. Support Video Streaming test.
2. Support Debug Message display in Diagnostic Message View and Diagnostic Message Summary View.
3. Video Telephony test function by supporting accurate call setup delay analysis and audio/video end-end RTP delay analysis.
4. support for CDMA 1x&DO Rev A & LTE advanced air interface message.
5. Logs& Displays for all technologys(1x, DO & LTE):

Forward Link Packet Header Info

Finger Data

Air Link Summary

Buffer Metrics

T2P Resource

RMAC4 Packet Information

Carrier Power

Carrier Reverse Link Gains

Carrier Reverse Link Metrics

Carrier RAB Update Information

Carrier Pilot Set

Carrier Single-User Packet Forward statistics

Carrier Multi-User Packet Forward statistics

Multilink Multi-flow RLP Forward Statistics

Multilink Multi-flow RLP Reverse Statistics

Multilink Multi-flow RLP RX Packet

Multilink Multi-flow RLP TX Packet

Multilink Multi-flow RLP RX Processing

Carrier Forward Link User Packet Throughput

Carrier Reverse Link Packet Status

Carrier Equalizer Metrics

Carrier Finger Data

Carrier Pilot Sets

Carrier Reverse Link Metrics

Carrier Single User Packet Forward Statistics

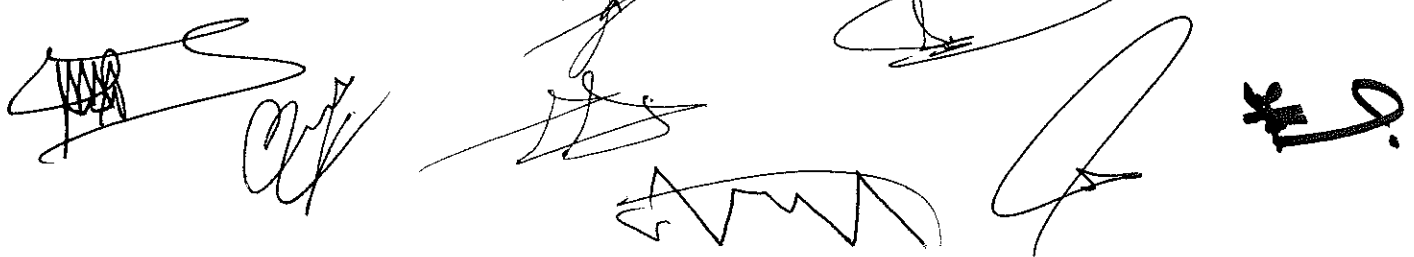
Multi-Flow RLP Forward Statistics

Multi-Flow RLP Reverse Statistics

Carrier Air Link Summary

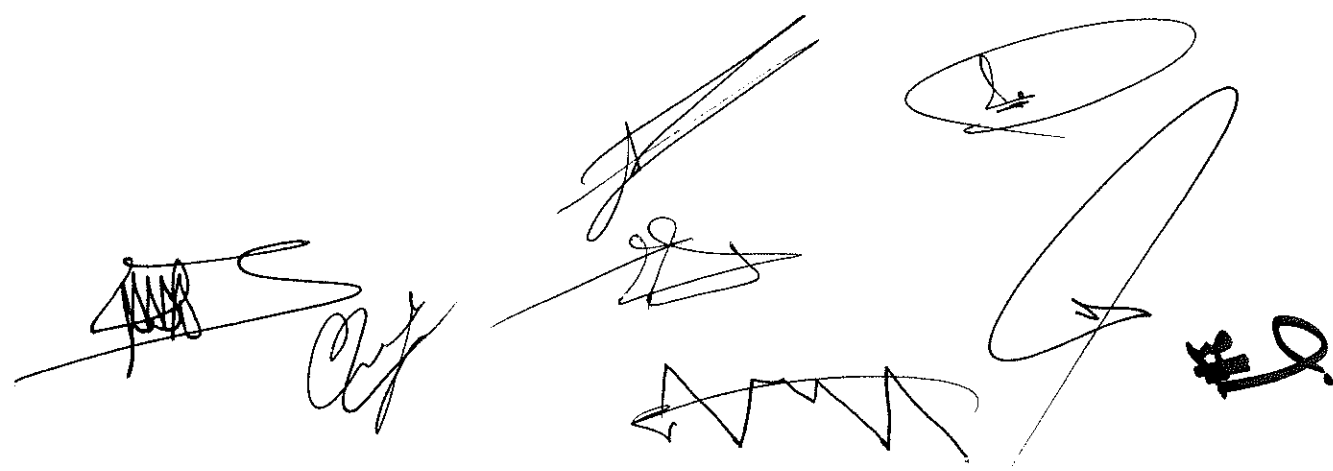
Carrier Power
Carrier DRC-DSC-ARQ Buffer Metrics
Multi-Flow RLP Forward Throughput
Multi-Flow RLP Reverse Throughput

6. Support PPP Extractor function (Extract PPP Logs from .APT file to files in the PPP dump format).
7. Support Outo Save and Support huge file (file size larger than 2G) loading.
8. Enhance MOS test function by supporting detailed test results presentation.
9. Support to show attribute name rather than attribute ID in DO air interface decoding.
10. Support DO RLP retransmission rate statistics.
11. Support integrated presentation of data rates in all layers of 1X&DO Rev A & LTE.
12. Support message find function in "Diagnostic Message Summary".
13. Improve the usability of Message View including "1X Message", "DO Message" and "Diagnostic Message (Summary)".
14. Enhance voice test by supporting test parameters retrieve in replay mode.
15. Support to show 1X&DO call fail and call drop event markers in map.
 16. Support to show LTE events markers in map.
17. Support Video Telephony test.
18. Support Comarco PN Scanner.
19. Support Extended Debug message.
20. Support Generalized Searcher diagnostic log packets.
21. FTP test function, especially upload performance.
22. Idle-to-Activate (Reactivate) test function.
23. Support to show DO messages' SLP-D information.
24. Support & Export DM, APM & text file format.
25. Support data test types, such as Idle, Email, WAP, MMS.
26. Support data events, such as FTP Start, FTP Success, FTP Failure.
27. Enhance DO Rev A views by fixing all related bugs.
28. Improve the usability and data accuracy of FTP, Ping and PPP test.
29. Enhance voice test by supporting auto answer, subsystem phone state request and better power/EcIo algorithm.
30. Support PCTEL scanner for CDMA.
31. Support NV item read-write.
32. Support HRPD(3GPP2 C.S2004-A) air interface V3.0 and AIRCELL air interface.
 33. Multiple test terminals supporting ability ZXPOS CNT supports commercial terminals please describe in list all the commercial terminals handset that supported by ZXPOS CNT in all technologie



Chapter 4

Spectrum Analyzer MS2720T Technical Specifications



Set4:- Spectrum Analyzer MS2720T 9 kHz to 32 GHz Requirement

Item	Avialble tool	Add Tool	Total upgrading
Spectrum Analyzer MS2720T 9 kHz to 32 GHz	0	2	

From above table

- 1- All the specification, features & functions in the attachment **Spectrum Analyzer MS2720T** specification Chapter beside the specification, features & functions in the Anratsiu Company web site related to `1x, EVDO, LTE & Interference Analyzer are mandatory in our requirement
- 2- The warranty, support & maintenance not less than 2 years
- 3- The whole System tools will be ownership for ever to YEMEN MOBILE Company, so the requirement multi-user system tools and software tool are unlimited by specific date licenses fee (will putted in the contract).

Spectrum and Interference Analyzer Highlights

- Measure: Occupied Bandwidth, Channel Power, ACPR, C/I, Field Strength, Spectral Emissions
- Measure Interference: Spectrogram, Signal Strength, RSSI
- Dynamic Range: > 106 dB in 1 Hz RBW
- DANL: -163 dBm in 1 Hz RBW
- Phase Noise: -112 dBc/Hz @ 10 kHz offset at 1 GHz
- Resolution Bandwidth (RBW): 1 Hz to 10 MHz
- Full-band Tracking Generators: 9, 13, 20 GHz
- Full-band Preamplifiers: included at no charge
- Channel Scanner: scan up to 20 channels at once
- Burst Detect™ Sweep Mode: Sweep 1000x in 15 MHz span
- Coverage Mapping: plot RSSI on on-screen map
- Interference Mapping: on-screen mapping with triangulation
- Operation to +55 °C: full performance on AC or battery

Capabilities and Functional

Wireless Measurements

- LTE FDD/TDD
- CDMA/EV-DO
- Zero-span IF Output
- I/Q Waveform Capture
- Gated Sweep
- High Accuracy Power Meter up to 26 GHz USB Sensors
- Remote Access Tool
- More than Three Hour Battery

Measurements

Smart Measurements

Field Strength (dBm/m², dBW/m², V/m, A/m, Watt/m², Watt/cm², or dBmV/m)
 Occupied Bandwidth (measures 99 % to 1 % power channel of a signal)
 Channel Power (measures the total power in a specified bandwidth)
 ACPR (adjacent channel power ratio)
 AM/FM/SSB Demodulation (AM, wide/narrow FM, upper/lower SSB), (audio out only) C/I (carrier-to-interference ratio)
 Emission Mask (recall limit lines as emission mask)

Setup Parameters

Frequency
 Amplitude

Center/Start/Stop, Span, Frequency Step, Frequency Offset, Signal Standard, Channel #
 Reference Level (RL), Scale, Attenuation Auto/Level, RL Offset, Pre-Amp On/Off, Detection

Span	Span, Span Up/Down (1-2-5), Full Span, Zero Span, Last Span
Bandwidth	RBW, Auto RBW, VBW, Auto VBW, RBW/VBW Ratio, Span/RBW Ratio
Sweep Functions	Single/Continuous, Manual Trigger, Reset, Detection, Minimum Sweep Time, Trigger Type
Sweep	
Sweep Mode	Fast (100x Performance), Performance, No FFT, Burst Detect (1000x Fast in 15 MHz span)
Detection	Peak, RMS/Avg, Negative, Sample, Quasi-peak
Triggers	Free Run, External, Video, Manual, IF Power
Trigger Position	Delay, Level, Slope, Hysteresis, Holdoff, Force Trigger Once
Trace Functions	Up to three Traces (A, B, C), View/Blank, Write/Hold, Trace A/B/C Operations
Traces	
Trace A Operations	Normal, Max Hold, Min Hold, Average, # of Averages, (always the live trace)
Trace B Operations	A → B, B ↔ C, Max Hold, Min Hold
Trace C Operations	A → C, B ↔ C, Max Hold, Min Hold, A - B → C, B - A → C, Relative Reference (dB), Scale
Marker Functions	6+ Markers with a Delta Marker, or Marker 1 Reference with Six Delta Markers, Marker Table (On/Off/Large), All Markers Off
Markers	
Marker Types	Style (Fixed/Tracking), Noise Marker, Frequency Counter Marker
Marker Auto-Position	Peak Search, Next Peak (Right/Left), Peak Threshold %, Set Marker to Channel, Marker Frequency to Center, Delta Marker to Span, Marker to Reference Level
Marker Table	6+ markers frequency and amplitude, plus delta markers frequency offset and amplitude
Limit Line Functions	Upper/Lower, On/Off, Edit, Move, Envelope, Advanced, Limit Alarm, Default Limit
Limit Lines	
Limit Line Edit	Frequency, Amplitude, Add Point, Add Vertical, Delete Point, Next Point Left/Right
Limit Line Move	To Current Center Frequency, By dB or Hz, To Marker 1, Offset from Marker 1
Limit Line Envelope	Create Envelope, Update Amplitude, Number of Points (41), Offset, Shape Square/Slope
Limit Line Advanced	Type (Absolute/Relative), Mirror, Save/Recall

Frequency

Frequency Range
MS2720T-0732
Tuning Resolution
Frequency Reference

9 kHz to 32 GHz
1 Hz
Aging: ± 1.0 ppm/10 years
Accuracy: ± 0.3 ppm (25 °C ± 25 °C) + aging

Auto-sensing External Frequency Reference (MHz)

1, 1.2288, 1.544, 2.048, 2.4576, 4.8, 4.9152, 5, 9.8304, 10, 13, 19.6608

Sweep Time 10 μ s to 600 s in zero span
Sweep Time Accuracy $\pm 2\%$ in zero span

Bandwidth

Resolution Bandwidth (RBW) 1 Hz to 10 MHz in 1-3 sequence $\pm 10\%$ (-3 dB bandwidth)
Video Bandwidth (VBW) 1 Hz to 10 MHz in 1-3 sequence (-3 dB bandwidth)
RBW with Quasi-Peak Detection 200 Hz, 9 KHz, 120 kHz (-6 dB bandwidth)
VBW with Quasi-Peak Detection Auto VBW is On, RBW/VBW = 1
VBW/Average Type Linear/Log

Amplitude Ranges

Dynamic Range >106 dB minimum at 2.4 GHz, 2/3 (TOI-DANL) in 1 Hz RBW DANL to +30 dBm
Measurement Range 1 to 15 dB/div in 1 dB steps, ten divisions displayed
Display Range -120 dBm to +30 dBm
Reference Level Range 0 to 65 dB, 5.0 dB steps
Attenuator Resolution Log Scale Modes: dBm, dBV, dBmV, dB μ V
Amplitude Units Linear Scale Modes: nV, μ V, mV, V, kV, nW, μ W, mW, W, kW +30 dBm Peak typical, ± 50 VDC (≥ 10 dB Attenuation) +23 dBm Peak typical, ± 50 VDC (< 10 dB Attenuation)
Maximum Continuous Input +13 dBm Peak typical, ± 50 VDC (Preamp = ON)

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Interference Analyzer Function

Channel Scanner Function

Coverage Mapping Function

GPS Receiver Function

Gated Sweep Function

Zero Span IF Output Function

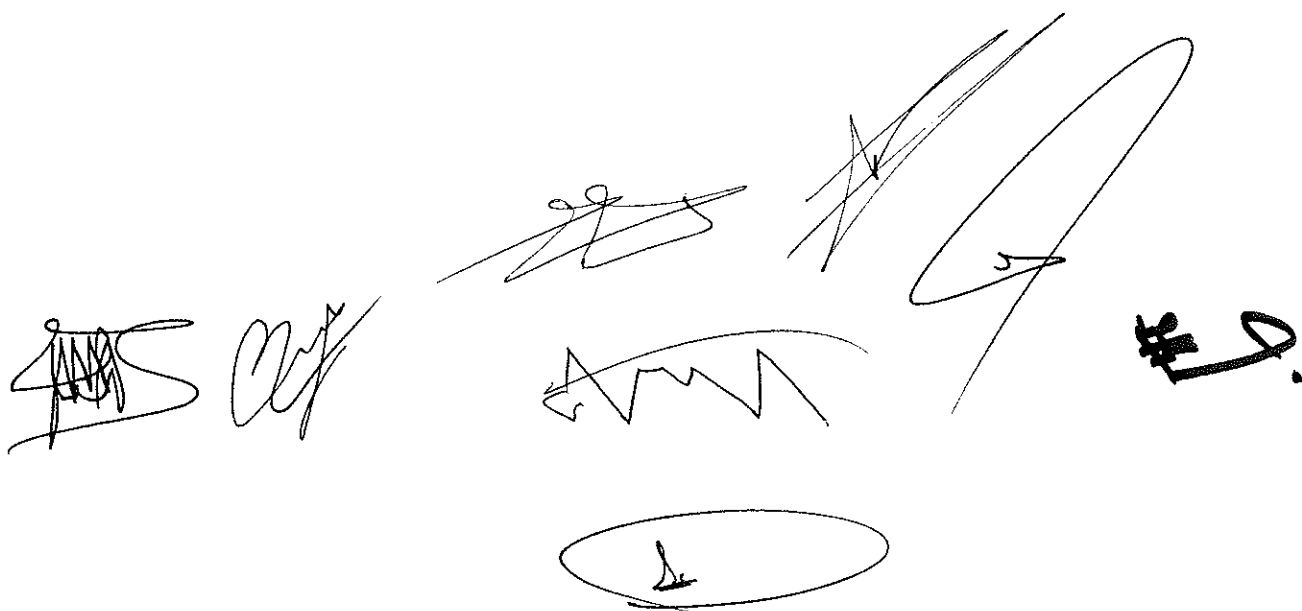
I/Q Waveform Capture Function

CDMA/EV-DO Measurements (full functionality)

LTE FDD/TDD Measurements (full functionality)

Accessories

Handheld Instruments, Documentation Disc, Master Software Tools (MST) Disc, Soft Carrying Case, High Capacity Li-Ion Battery, AC/DC Power Supply, Automotive Cigarette Lighter 12VDC Adapter, Ethernet Cable, 7ft/213cm, USB A-mini B Cable, 10ft/305cm & Certificate of Calibration and Conformance, GPS Antennas, Direction YAGI Antenna (with accessories), Portable Antenna (with accessories), Mag Mount Broadband Antenna (with accessories), Bandpass Filters (variable), Adapters, Precision Adapters, Attenuators (Variable), Miscellaneous Accessories, Backpack and Transit Case.



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