



5G

Pilot Pioneer V10.5

Product Overview

DingLi Corporation Limited



CONTENTS

1. Overview
2. Standard Product Features
3. New Features
4. Main Features
5. Conclusion



/01

Overview

5G



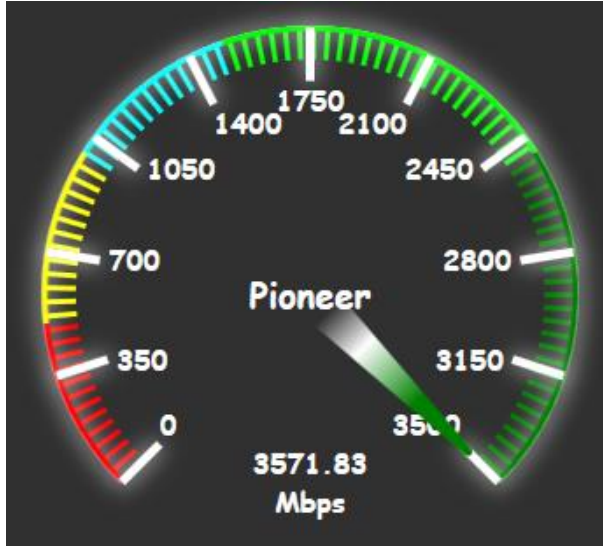
Advanced Multi-Technology Drive Test Solution



Drive Test Solution for Mobile Network Test and Measurement

Pilot Pioneer is DingLi's multi-technology mobile network field test solution for directed measurement and troubleshooting. It is an integrated solution that can be used for both indoor and outdoor environment. Various voice and data services tests are supported with the latest test terminals.

Pilot Pioneer test and measurement is applicable throughout the network development lifecycle, therefore allowing network and service provider to fully leverage on their investment. The collected data reflects subscriber's perceptions and experience, enabling network operators to fine tune the network and services to maximize subscriber's satisfaction.



Various Test Scenarios

- Outdoor Drive test
- Indoor test
- Scanner spectrum clearance, coverage, resource block (RB) , CW and spectrum analysis
- Single site verification
- 5G coverage, access, peak performance, perception, and delay test
- Manual GPS position compensation
- Application test from user's perception

Highly-Integrated Service Tests

- 5G NR registration test
- VoNR, VoLTE, EPS FB, CSFB, and voice quality testing
- FTP, Ping, iPerf and other data tests
- Application tests for HTTPs, video and e-mail
- Automatic tests for OTT apps (e.g. Skype, Wechat)

DL1105PV



Compatible Test Solution with Advanced Network Features

- 5G peak performance (eMBB)
- 5G low-latency performance (uRLLC)
- 5G Carrier Aggregation
- VoNR/EPS FB/VoLTE
- ViLTE from user's perception
- Enhanced Voice Services (EVS)
- NB-IoT/eMTC
- 5G NR frequency scan functions

Automatic tests

- Automatic command-based test scripts
 - Dedicated SA/NSA/VoNR/EPS FB/5G CA measurement windows
 - Automatic device configuration
 - Intuitive user interface
 - Easy interface operation
 - Short learning curve
- Powering Network Experience

Multi-technology and Multiple Chipsets support

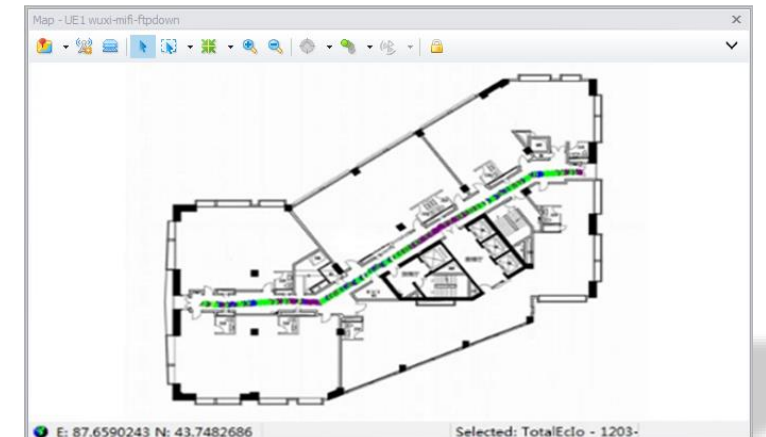
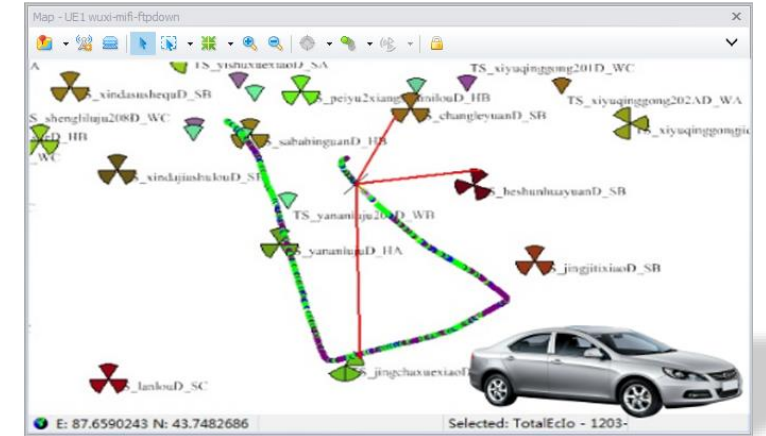
- 5G NR/NB-IoT/eMTC/LTE-A/LTE-A Pro/LTE/TDS/WCDMA/CDMA/GSM air interface messages collection
- Qualcomm and HiSilicon 5G chipset based terminal measurement
- 5G test terminals, such as handsets, modules, CPE, industrial gateway
- Collect subframe information
- Collect data from service, coverage, interference, resource scheduling and BLER
- TCP/IP data service messages analysis

Outdoor and Drive Test

- Applicable to various outdoor test environments such as highways, high-speed rail, public hotspots, etc. and data analysis.
- Multiple online/offline map formats supported, e.g. Google Maps/Satellite Maps, Bing Map, Baidu Map, Gaode Map and MapInfo
- Multi-layer information management: GPS-based test routes, Beam information, measurement routes, cell sites, maps, events, and alarms
- Multiple cell site display modes on the Map, comprehensive cell site information management, search, and quick positioning functions
- Multiple map-based analysis under Map window, e.g. cell coverage analysis, TopN cell analysis, and spectrum clearance analysis
- Measurement coverage on background map in grey/simplified map without location name to highlight the network exceptions

Indoor Test Scenarios

- Applicable to various indoor test environments such as any in-building scenarios, elevators, airports, stations, etc. and data analysis.
- Multiple map sources, e.g. iBwave, standard floor plans, and floor images in the *.jpg, *.png, *.bmp, *.tab formats.
- Pre-pinpoint and pinpoint with walk test to ensure the positioning accuracy
- Indoor test management and test data storage based on building floors
- Specialized Report for indoor test



/02

Standard Product Features

5G

All Radio Access Network Technologies

- ✓ Supports multiple technologies, including 5G NR/LTE-IoT/LTE-A Pro/LTE-A/LTE/WCDMA/TD-SCDMA/GSM/CDMA
- ✓ Network measurement information display, e.g. radio parameters, network events, service events, KPIs and Layer 1/2/3 signaling messages



Main Functions(1)



Various Terminals and Scanners Support

- ✓ Commercial smartphone devices
- ✓ Test modules, CPE, industrial gateway.
- ✓ R&S scanners



Forcing Functions with Commercial Terminals

- ✓ Commercial terminals configured with some technologies (e.g. root configuration, ROM re-installation, etc.) for network measurement
- ✓ Reduce test costs by not having to invest on specialized test devices
- ✓ Service test from users' perspective



VoNR/EPS FB/VoLTE/CSFB Smart Analysis and Data Test Exceptions Analysis

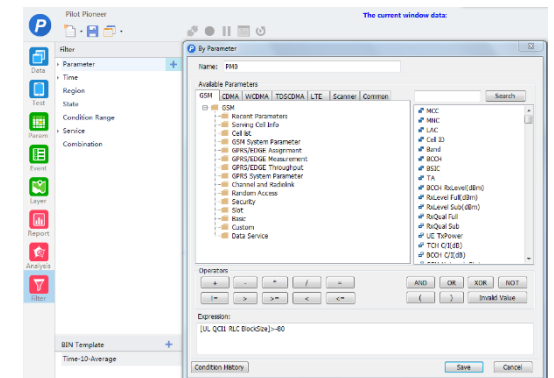
- ✓ Smart analysis allows more accurate and quicker data analysis for users
- ✓ Display time, location, possible reasons and processing suggestion for abnormal events in every phase of VoNR/ EPS FB/VoLTE/CSFB test.
- ✓ Custom statistic reports

01. Data Insight and Smart Analysis

- ✓ Integrated Analysis with the features of smart analysis and data mining
- ✓ Automatically locate and analyze possible problems in test data
- ✓ Big data analysis to improve the efficiency to identify and troubleshoot mobile network problems
- ✓ Analysis results may be displayed in various mode. Automatically synchronize the information in map, parameter and event windows.

02. Custom Analysis-Filter

- ✓ Built-in Filter with conditions for data processing
- ✓ Filter by parameter, time, region, state, condition range, service and Bin.
- ✓ Comprehensive data filtering based on combined conditions, e.g. Parameter + Time + Service.
- ✓ Data displayed in the map window, log files partition, data statistics and analysis based on data filtering.
- ✓ Meet the requirements of custom data capture, statistics reports and specialized analysis.



Main Functions(2)



License Query and Online Update

- ✓ License query, including terminals, RAT, services, analysis, reports, etc.
- ✓ Displays soft/hard dongle serial number, expiration date.
- ✓ Online update: Users may update the patches with designated version of license client in an intelligent way or install a new software version

License Query interface showing Key ID: 1829563234, Expiration Date: 2021/04/26, and License: Perpetual. An Online Upgrade button is visible. Below is a table of supported features:

Terminals	RATs	Services	Functions	Reports	Analysis
CMCC 5G Hub	NR	App YiXin	RCU MergeDivide	5G NR Report	Data Insight
Genuine iOS iPho	NB-IoT	Attach	Report Admin	5G NR Voice Report	Measurement Over Dist
Genuine iOS iPho	CAT.M	Call	Lock Cell	CMCC 5G NR Reports	Parameter Quadrant A
Genuine iOS iPho	LTE 4T4R	DNS Lookup	POLQA	CTCC 5G NR Reports	Overshooting Analysis
Genuine iOS iPho	LTE 256QAM	eLTE UDP	DTLog Data	CUCC 5G NR Reports	Extended Coverage An
Genuine iOS iPho	LTE 700M	FTP Download	CTI Data	NB-IoT Reports	Coverage Rate Analysis
Genuine iOS iPho	LTE 800M	FTP Upload	DCF Data	Data Service Reports	Overlapping Coverage
HiSilicon Balong 5	LTE 900M	HTTP Download	CU Data	Voice Service Reports	Antenna Feeder Revers
HiSilicon Balong 5	LTE	HTTP Page	HDF and DLF Data	IOT Report	Mod3 Analysis
HiSilicon CPE	LTE-TDD	HTTP Upload	HSR Test Route Offs	Scanner Cell Statistics	Pilot Pollution Analysis
HiSilicon CPE B59	LTE-FDD	IDT Test	Route Download	ChinaMobile Reports	No Main Service Cell Ar
HTC 10	LTE-FDD CA	IDT	HSR real-time GPS C	ChinaTelecom Report	Cell Coverage Analysis
HTC M8	LTE-TDD CA	iPerf	Single Cell Verificati	ChinaUnicom Report	Cell Statistics and Analy
HTC M9u	LTE-TDD VoLTE	LTE Power	KPI Statistics	Ericsson Reports	NeighborCell Analysis
HTC U-3w	LTE-FDD VoLTE	Manual MOS	NR L1 L2 Message D	Specialized Reports	MO/MT Union Analysis
Huawei 5G CPE	LTE-TDD VoLTE Vi	MMS		Custom Reports	CSFB Exception Analysis
Huawei 8800	LTE-FDD VoLTE Vi	MOS		Single Site Reports	Delay Analysis
Huawei Boudica	LTE-TDD CA 3Carr	MOS Self-Check			VoLTE Abnormal Analy
Huawei Boudica 1	LTE-TDD CA 2Carr	MOS Self-Loop			Custom Analysis
Huawei Mate10	LTE-FDD CA 3Carr	MTC Test			LTE Data Exception Anz
Huawei Mate20X	LTE-FDD CA 2Carr	Multi Ftp Downloa			Optimal Coverage Anal
Huawei Mate30	TD-SCDMA	Multi Ftp Upload			Spectrum Analysis
Huawei Mate30 Ph	TD-SCDMA HSDP	NR Registration			
Huawei Mate40	TD-SCDMA HSUP	PBM			
Huawei Mate40 Ph	WCDMA	PDP			



A More Flexible Mode to Detect the Parameters

- ✓ For those parameters which are not listed in the Table, users may drag the parameters from **Message Details** to **Table** to conveniently view any measurement updates
- ✓ Customize the parameters, and save as template
- ✓ Drag and drop message details to display table, or export through **Data Export** function.

Table - UE1 MFI-FTP Test and Scanner Test_UE1

No.	PC Time	RSRP	q-RxLevMin
169223	11:10:31.962	-120.37	
169224	11:10:31.962	-120.37	
169225	11:10:31.972	-120.37	
169226	11:10:31.972	-120.37	
169227	11:10:31.982	-120.37	-64
169228	11:10:31.982	-120.37	
169229	11:10:31.992	-120.37	
169230	11:10:31.992	-120.37	
169231	11:10:31.992	-120.37	
169232	11:10:31.992	-120.37	
169233	11:10:32.002	-120.37	
169234	11:10:32.012	-120.37	
169235	11:10:32.052	-110.50 (*)	
169236	11:10:32.062	-110.50	
169237	11:10:32.072	-110.50	
169238	11:10:32.072	-110.50	
169239	11:10:32.212	-110.50	
169240	11:10:32.212	-110.50	
169241	11:10:32.222	-110.50	
169242	11:10:32.222	-110.50	

Message Details - UE1 MFI-FTP Test and Scanner Test_UE1

```

MCC-MNC-Digit = 0
  mnc
    MCC-MNC-Digit = 0
    MCC-MNC-Digit = 0
    cellReservedForOperatorUse = notRese
    trackingAreaCode = 0110001000010010
    cellIdentity = 010100100000100001110000000
    cellBarred = notBarred
    intraFreqReselection = allowed
    csg-Indication = false
  cellSelectionInfo
    q-RxLevMin = -64
    freqBandIndicator = 39
  schedulingInfoList
    schedulingInfo
      si-Periodicity = rf16
      sib-MappingInfo = sibType3
  tdd-Config
    subframeAssignment = sa2
    specialSubframePatterns = ssp5
  si-WindowLength = ms40
  systemInfoValueTag = 19
  
```

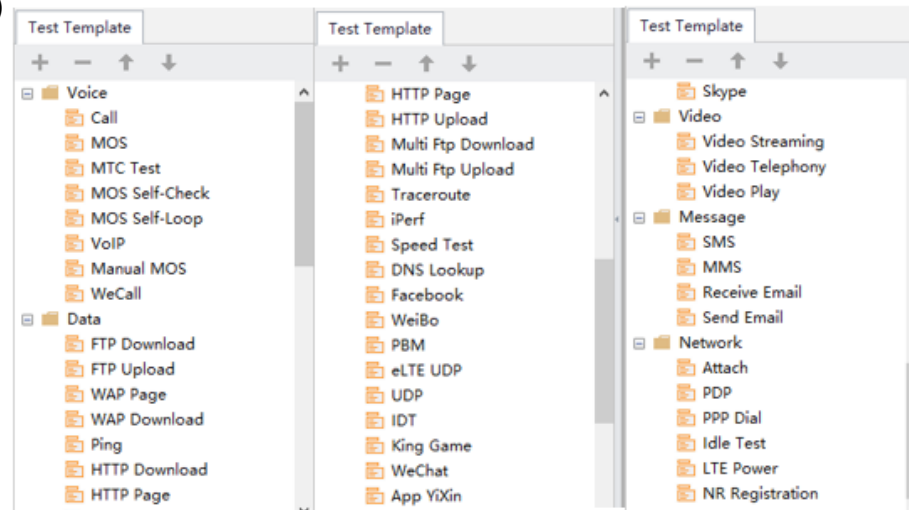
01 Bandwidth Measurement under LTE Network

- ✓ PBM (Pulse-Sampling Bandwidth Measurement) solution
- ✓ Bandwidth measurement with high accuracy (test result is in accordance with that of FTP test)
- ✓ Low network traffic to reduce test cost (one tenth of FTP test)
- ✓ Minimum network resource utilization with little impact on common users

03 Various Service Tests

- ✓ LTE-IoT test: Ping and UDP through AT command, Ping and UDP over PPP
- ✓ Network performance test, e.g. FTP, Multi-FTP, Ping, Attach, Registration
- ✓ Service test from user's perspective, e.g. HTTP, Email
- ✓ Video quality measurement with Youtube, Facebook and other video streaming services used in China mainland (e.g. YouKu, iQIYI, Tencent, iTudou, etc.)
- ✓ Control of test process and voice quality evaluation with MOS (PESQ and POLQA), applicable to all commercial terminals.
- ✓ TCP/IP data collection for data analysis

@DingLi (3/26/2020)



04 Voice Call

- ✓ Voice test, e.g. 2G/3G/4G/5G, Mobile to Mobile POLQA and PESQ audio quality MOS test

02

Voice Test

- Call
- MOS
- MTC Test
- MOS Self-Check
- MOS Self-Loop
- VoIP
- Manual MOS
- WeCall

Data Service Tests

- FTP Download
- FTP Upload
- WAP Page
- WAP Download
- Ping
- HTTP Download
- HTTP Page
- HTTP Upload
- Multi FTP Download
- Multi FTP Upload
- Traceroute
- iPerf
- Speed Test
- DNS Lookup
- Facebook
- PBM
- eLTE UDP
- UDP
- Skype
- IDT

Network Test

- Attach
- PDP
- PPP Dial
- Idle Test
- LTE Power
- NR Registration

Video Test

- Video Streaming
- Video Telephony
- Video Play

Message Test

- SMS
- MMS
- Receive Email
- Send Email

Flexible Analysis and Statistics Reports

Analysis

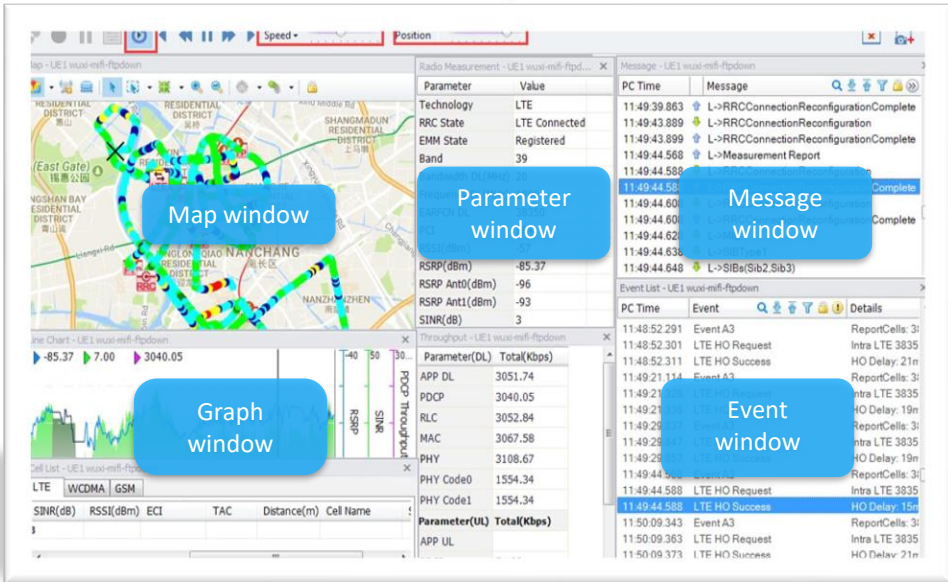
Powerful Data Analysis Capability

- ✓ Supports data replay and synchronization to reflect the actual network status.
- ✓ Supports to Run the replay button, slide (left or right) the speed toolbar and position toolbar to synchronize the information in Map window, Event window and Parameter window.
- ✓ Multiple display modes, e.g. tables, bar charts, distribution maps and trend chart
- ✓ Easily exports log file to multiple third-party formats, capable of higher storage performance and flexible scalability
- ✓ Multiple and professional data analysis
 - Coverage Analysis
 - Interference Analysis
 - Cell Analysis
 - Service Analysis
 - Delay Analysis
- ✓ Users may set analysis conditions, including parameters, KPIs, etc., as required, to meet demanding analysis requirements

Reports

Custom Statistics Report

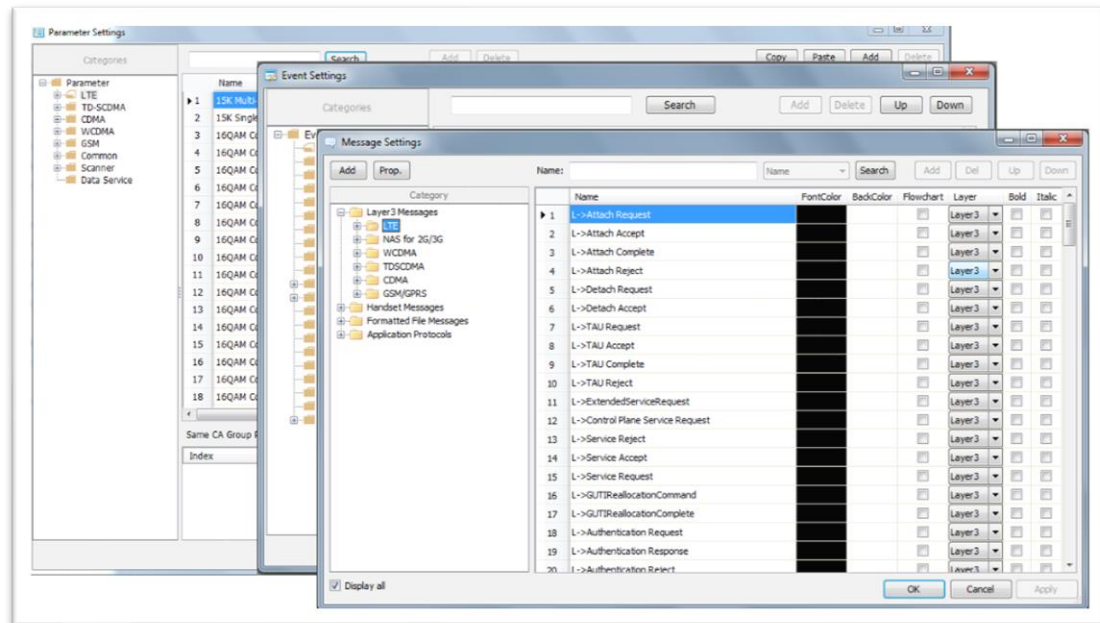
- ✓ Provides flexible custom reports.
- ✓ This function meets various statistics requirements.
- ✓ Users may predefine analysis conditions, e.g. parameters, KPIs, events
- ✓ Built-in Filter with conditions for data processing
- ✓ Multiple display modes, e.g. Excel, Word, etc.
- ✓ Various statistics templates



Outgoing Call Statistic				FTP Download Statistic						
Outgoing Blocked Call Count	Outgoing Dropped Call Count	Originating CSFB Request Count	Originating CSFB Failure Count	WCDMA RLC Throughput DL(kbps)	LTE RLC Throughput DL(kbps)	FTP Download Avg. throughput(kbps)	FTP Download Attempt Count	FTP Download Success Count	FTP Download Failure Count	FTP Download Drop Count
0	25	0	0		1759.96	2940.92	38	36	0	2

Custom Events/Parameters

- ✓ Provides flexible custom events and parameters
- ✓ The function of user-defined events, alarms and parameters caters to actual test scenarios.
- ✓ Statistics on custom events and parameters.



Templates Import/Export

- ✓ The templates that can be imported/exported include: report templates, analysis templates, filter templates and parameters templates.
- ✓ It is convenient for sharing templates between multiple Pilot Pioneer Expert users, or between different versions of Pilot Pioneer Expert.
- ✓ It is easy to import user-defined templates to the updated version or to different computers.

Easy Test Management

- ✓ Automatically detect and connect test devices
- ✓ One-click backup and restoring of project configuration
- ✓ Custom test scenarios, and movable windows in the Workspace for better data view
- ✓ Multiple shortcut buttons for test management in a more convenient way.
- ✓ Assistant data display modes, e.g. freeze screen, capture screen, and export data files
- ✓ Network measurement assistant information display, e.g. test progress, real-time statistics KPIs, device alarm and KPI alarm
- ✓ Switching among multiple workspaces and multiple terminals' information display

Supported 5G Terminals

Chipsets		Handsets	
Qualcomm	Hisilicon	Samsung	S20 G9810
Scanners		Huawei	Mate 20X, Mate 30, Mate30 Pro, P40, P40 Pro, Mate 40, Mate 40 Pro
R&S	TSME, TSMW, TSMA, TSME6	Others	MI 10, MI 11, VIVO IQOO3, ViVo IQOO7
Please refer to Offered Pilot Pioneer Devices document for more details		Modules	SIM8300G, Lierda MH5000

NB-IoT Test Modules Supported by Pilot Pioneer V10.5

Device Model	Chipset	NB-IoT/eMTC	Band	Services	Forcing Functions
Remo1526/1601	Qualcomm9206	NB-IoT & eMTC	Band1/3/5/8/20/39	VoLTE/Attach/Ping/AT UDP/ iPerf/FTP/Cell Reselection	Basic forcing functions (e.g. power on, power off, attach, detach, APN settings, etc.), scrambling code settings, PSM settings, eDRX settings, network locking, band locking, frequency locking, cell locking, etc.
LongsunA9500	Qualcomm9206	NB-IoT & eMTC	Band1/3/5/8/20/39	VoLTE/Attach/Ping/iPerf/FTP/Cell Reselection	Basic forcing functions (e.g. power on, power off, attach, detach, APN settings, etc.), scrambling code settings, PSM settings, eDRX settings, network locking, band locking, cell locking, etc.
SIM7000	Qualcomm9206	NB-IoT & eMTC	Band1/3/5/8/20/39	VoLTE/Attach/Ping/iPerf/FTP/Cell Reselection	Basic forcing functions (e.g. power on, power off, attach, detach, APN settings, etc.), scrambling code settings, PSM settings, eDRX settings, network locking, band locking, cell locking, etc.
Lierda	HiSilicon	NB-IoT	Band5/8/20	Attach/Ping/AT UDP/ iPerf/FTP/Cell Reselection	Basic forcing functions (e.g. power on, power off, attach, detach, APN settings, etc.), scrambling code settings, PSM settings, eDRX settings, etc.
Quectel test module	HiSilicon	NB-IoT	Band5/8/20	Attach/Ping/AT UDP/ iPerf/FTP/Cell Reselection	Basic forcing functions (e.g. power on, power off, attach, detach, APN settings, etc.), scrambling code settings, PSM settings, eDRX settings, etc.

/03

New Features

5G

Voice Quality Testing without Phone Audio Port

As many vendors have adapted to design their 5G mobile phones without the audio port, DingLi has developed a new voice quality testing feature that does not require the audio port to cater for such circumstances. The is to ensure DingLi is aligned with new market trends, and test and measurement requirements.

- Simulates user perception of voice quality with supported test phones and Pilot Pioneer V10.5.
- Test phones with USB 3.0 port
- Non-audio port test phones: Huawei Mate series and Huawei P series



5G Carrier Aggregation (CA) Test

NR Throughput - UE1 mmWave 8CC Test									
DL Thr(Mbps)	Total	PCell	SCell1	SCell2	SCell3	SCell4	SCell5	SCell6	SCell7
APP									
SDAP									
PDCP	3475.128								
RLC	3484.373								
MAC	3500.707	492.983	493.098	492.496	492.718	493.540	289.519	347.151	399.202
PHY	3619.232	493.778	493.816	493.775	493.901	493.941	322.433	385.550	442.040
UL Thr(Mbps)	Total	PCell	SCell1	SCell2	SCell3	SCell4	SCell5	SCell6	SCell7
APP									
SDAP									
PDCP	115.123								
RLC	115.951								
MAC	116.710	116.669	0.040	0.000	0.000	0.000	0.000	0.000	0.000
PHY	121.567	121.365	0.202	0.000	0.000	0.000	0.000	0.000	0.000

Pilot Pioneer 10.5 supports 5G CA test with the Qualcomm and HiSilicon 5G chipset based test phone terminals



Features:

- Real-time monitoring of CA measurement, network resource allocation, network quality, data rate, etc.
- Real-time monitoring of key events, such as secondary component carrier (CC) configuration, secondary CC activation, and CA handover
- Upto 8CC CA over millimeter waves



Benefits

- Verify CA performance improvement:
- higher data throughput
 - coverage and capacity expansion



Handsets:

- Huawei Mate 40
- Huawei Mate 40 Pro
- Please see more handset support in *Offered Pilot Pioneer Devices* documentation.

VoNR Voice Quality Testing

Param	Value	Param	Value
Network Type	NR	SS-RSRP	-70.63
Network State	NR Idle	SS-SINR	34.50
MCC\MNC\TAC	460\00\11796	PDSCH DM-RSRP	
Band	41	PDSCH DM-SINR	36
NCI	47268139120	Avg CQI	15
gNodeB\Sector ID	11540073\112	PUSCH TxPower	
SSB ARFCN\PCI	504990\726	Most Modul DL/s	
Bandwidth(MHz\RB)	100\273	Most Modul UL/s	
SC Spacing	30kHz	MCS Avg DL	
Serv SSB Index	1	MCS Avg UL	
Grant Count DL/s	0	PDSCH BLER(%)	0
Grant Count UL/s	11	PUSCH BLER(%)	0
DL AMRCodec	EVS-Primary 2	POLQA MOS SWB	

Param	Value	Param	Value
Network Type	NR	SS-RSRP	-67.06
Network State	NR Connected	SS-SINR	34.50
MCC\MNC\TAC		PDSCH DM-RSRP	
Band		PDSCH DM-SINR	34
NCI		Avg CQI	15
gNodeB\Sector ID		PUSCH TxPower	
SSB ARFCN\PCI	504990\726	Most Modul DL/s	
Bandwidth(MHz\RB)		Most Modul UL/s	
SC Spacing		MCS Avg DL	
Serv SSB Index	1	MCS Avg UL	
Grant Count DL/s	0	PDSCH BLER(%)	0
Grant Count UL/s	12	PUSCH BLER(%)	0
DL AMRCodec	EVS-Primary 2	POLQA MOS SWB	

PC Time	Event	Details
21:26:18.190	Voice Dial	Dial Time: 30
21:26:18.596	Outgoing Call Attempt	Voice Type: V
21:26:19.690	Outgoing Call Setup	Delay: 1123(r
21:26:20.800	Outgoing Call Established	
21:27:00.763	POLQA Result	4.049 21:26:4
21:27:20.797	POLQA Result	4.519 21:27:0
21:27:40.811	POLQA Result	4.548 21:27:2
21:28:00.821	POLQA Result	4.532 21:27:4
21:28:20.830	POLQA Result	4.472 21:28:0
21:28:40.813	POLQA Result	4.153 21:28:2
21:29:00.841	POLQA Result	4.550 21:28:4
21:29:20.877	POLQA Result	4.241 21:29:0
21:29:40.885	POLQA Result	4.473 21:29:2
21:30:00.910	POLQA Result	4.214 21:29:4
21:30:20.938	POLQA Result	4.492 21:30:0
21:30:40.972	POLQA Result	4.515 21:30:2

PC Time	Event	Details
21:26:18.190	Voice Dialed	Dialed Time: 3
21:26:19.259	Incoming Call Attempt	Voice Type: Vc
21:26:19.818	Incoming Call Setup	Delay: 557(ms
21:26:20.980	Incoming Call Established	
21:27:10.707	POLQA Result	4.154 21:26:4
21:27:30.716	POLQA Result	4.562 21:27:0
21:27:50.761	POLQA Result	4.511 21:27:2
21:28:10.760	POLQA Result	4.499 21:27:4
21:28:30.823	POLQA Result	4.422 21:28:0
21:28:50.797	POLQA Result	4.298 21:28:2
21:29:10.804	POLQA Result	4.493 21:28:4
21:29:30.767	POLQA Result	4.448 21:29:0
21:29:50.864	POLQA Result	3.601 21:29:2
21:30:10.854	POLQA Result	4.510 21:29:4

PC Time	Message
21:26:59.924	NR->SIBs(Sib5)
21:26:18.596	NR->Service request
21:26:18.596	NR->RRCSetupRequest
21:26:18.596	NR->RRCSetup
21:26:18.596	NR->CellGroupConfig
21:26:18.596	NR->RRCSetupComplete
21:26:18.596	NR->SecurityModeCommand
21:26:18.596	NR->SecurityModeComplete
21:26:18.596	NR->RRCReconfiguration
21:26:18.596	NR->CellGroupConfig
21:26:18.596	NR->RRCReconfigurationComplete
21:26:18.596	NR->Service accept
21:26:18.596	NR->RRCReconfiguration
21:26:18.596	NR->CellGroupConfig
21:26:18.596	NR->RRCReconfigurationComplete
21:26:18.596	IMS SIP INVITE->Request

PC Time	Message
21:26:18.144	NR->MeasurementReport
21:26:19.259	NR->Paging
21:26:19.259	NR->Paging
21:26:19.259	IMS_SIP_INVITE->Request
21:26:19.259	IMS_SIP_INVITE->Trying 100
21:26:19.259	IMS_SIP_INVITE 183
21:26:19.259	NR->RRCReconfiguration
21:26:19.259	NR->CellGroupConfig
21:26:19.259	NR->RRCReconfigurationComplete
21:26:19.259	NR->DL NAS transport
21:26:19.259	NR->PDU session modification commar
21:26:19.259	NR->PDU session modification complet
21:26:19.259	NR->UL NAS transport
21:26:19.259	NR->ULInformation Transfer

VoNR with POLQA/PESQ voice quality testing standard (EVS 24.4kbit/s) is supported with the following features and benefits:

- 01 Features:**
- Real-time RTP (Real-time Transport Protocol) packet data
 - Real-time display of POLQA/PESQ voice quality testing score
 - Real-time display of uplink and downlink AMR voice codec information

- 02 Handset Support:**
- Huawei Mate 30
 - Huawei P40
 - Huawei P40 Pro
 - Please see more handset support in *Offered Pilot Pioneer Devices* documentation.

NR Registration

NR Registration

Test Plan Name: NR Registration

General Apply to other devices

Test Options

Baud Rate: 56000

Interval (s): 10

Timeout(s): 60

Wait Time(s): 5

Duration (s): 15

Cycle Count: 10 Infinite

Test Mode: Attach & Detach

PC Time	Event	Details
22:48:43.760	Send Cmd	Type: NR Deregister
22:48:44.880	NR RRC Setup Request	
22:48:44.880	NR Cell PRACH Request	RA_Reason: CONNECTION_REQUEST
22:48:44.880	NR Cell PRACH Success	Include Msg: Msg1, Msg2, Msg3, Msg4
22:48:44.880	NR RRC Setup Success	Delay: 28(ms)
22:48:44.880	NR Deregister Start	Delay: 1120(ms)
22:48:48.700	Send Cmd	Type: NR Register
22:48:50.883	NR RRC Setup Request	
22:48:50.883	NR Cell PRACH Request	RA_Reason: CONNECTION_REQUEST
22:48:50.883	NR Cell PRACH Success	Include Msg: Msg1, Msg2, Msg3, Msg4
22:48:50.883	NR RRC Setup Success	Delay: 26(ms)
22:48:50.883	NR Register Start	Type: NR Register...
22:48:51.430	PDU Session Establish Request	
22:48:51.430	PDU Session Establish Accept	
22:48:51.430	PDU Session Establish Request	
22:48:51.430	NR Register Success	Delay: 546(ms)
22:48:51.977	PDU Session Establish Accept	
22:48:51.977	PDU Session Release Request	
22:48:51.977	PDU Session Release Command	
22:48:51.977	PDU Session Release Complete	
22:48:57.425	PDU Session Establish Request	
22:48:57.425	PDU Session Establish Accept	

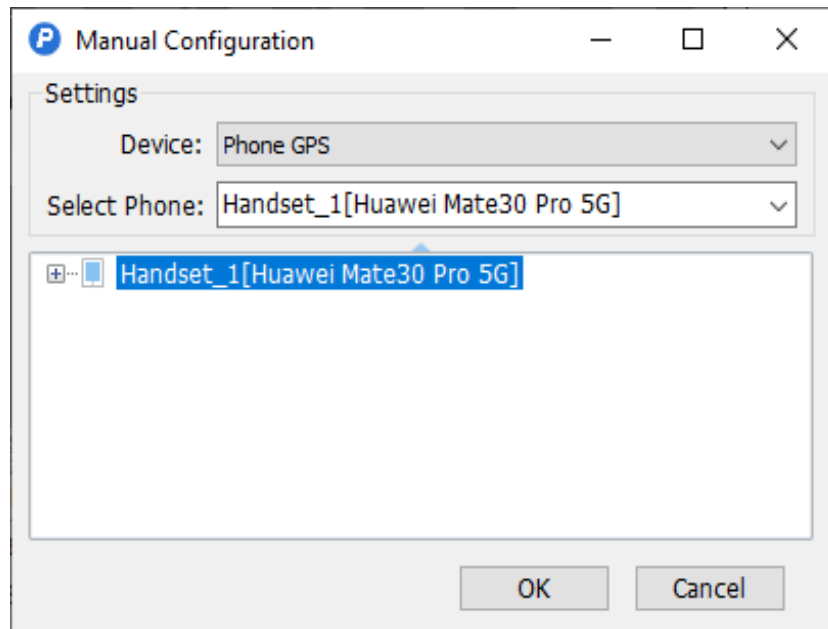
The new test service NR Registration allows the UE (based on test plan configuration) to:

- automatically send registration request
- complete NR registration
- access to 5G NR network

Pilot Pioneer will monitor the NR registration process and display the network performance in real time, such as the delay, success rate.



Drive Test with the Test Phone GPS

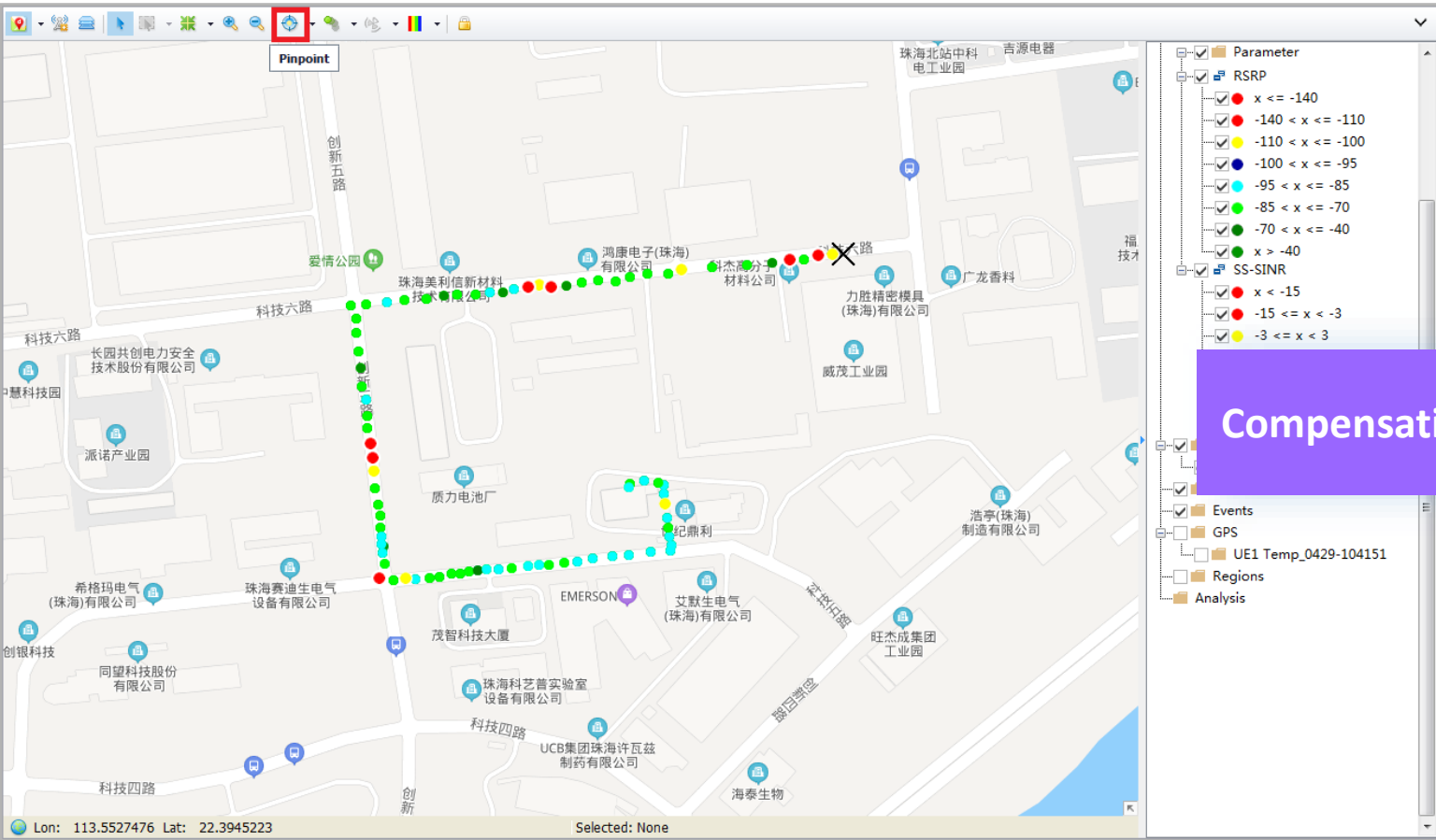


Users may perform drive test with Pilot Pioneer V10.5 onwards using the test phone GPS function.

- The test phone needs to be installed with Pioneer Tools.
- Select **Phone GPS** for **Device** and select a handset model for **Export Device**.



Manual GPS Positioning Compensation



Environment:

- No GPS signal due to multipath
- No GPS signal due to signal blocking
- No GPS signal with high speed travel

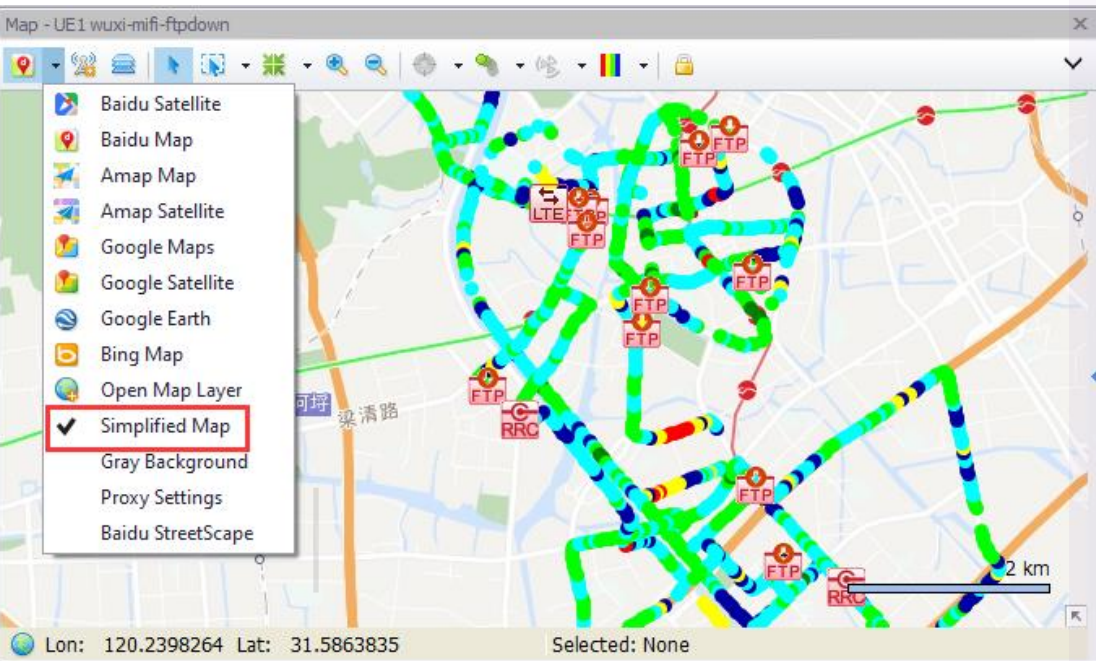
Benefits

More positioning accuracy of the measurement plot

Note

The function is available only when there is no GPS signal received

Multiple Online Map Format



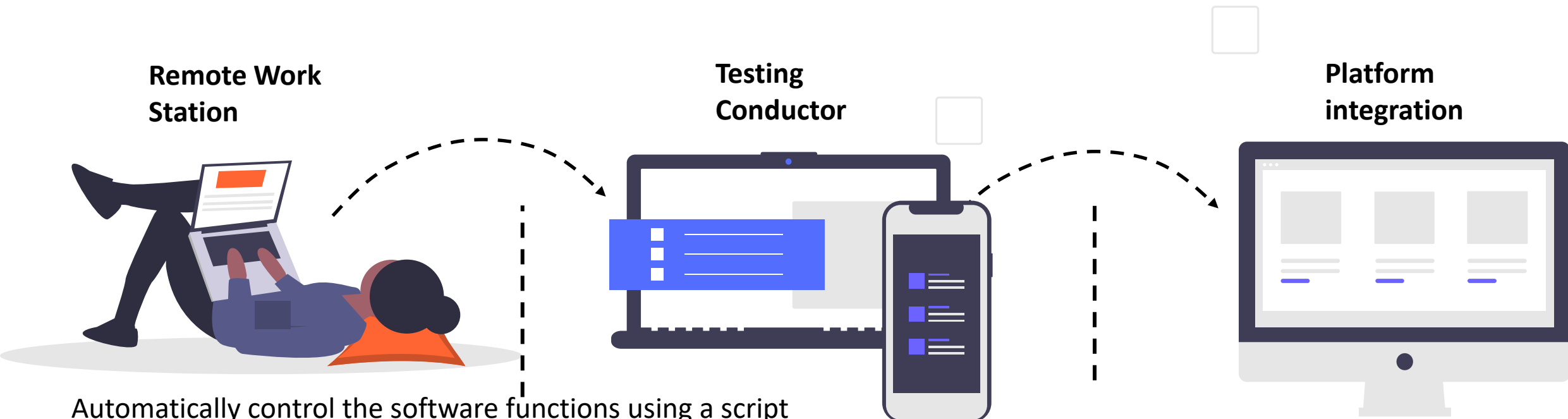
New map types:

- Baidu satellite
- Google map
- Google satellite
- Simplified map.

Simplified map is the one that all the location and building names except the road names are removed from the map.

Benefits: It presents a legible and intuitive view for test information or test route.

RCI- Remote Control Interface



Automatically control the software functions using a script through socket connection. This script is command-based scripting. The API is provided by DingLi, which is called as “Test Automation API” or “RCI (Remote Control Interface)”

This includes:

- *Device connect/disconnect*
- *Start/ Stop testing*
- *Query UE status*
- *Excute/ release forcing code*

Push the customized measurement information to other platforms in real time:

- *RSRP*
- *SINR*
- *Throughput*

/04

Main Features

5G



Param	Value	Param	Value
Work Mode	TDD	RSRP	-82.31
Band	39	RSRQ	-8.62
DL Frequency	1895	SINR	14.60
DL EARFCN	38400	TxPower(PUSCH)	4
PCI	207	BLER	0
DL AMRCodec	STD	POLQA MOS SWB	4.15

Param	Value	Param	Value
Work Mode	TDD	RSRP	-87.81
Band	38	RSRQ	-5
DL Frequency	2604.80	SINR	27.80
DL EARFCN	38098	TxPower(PUSCH)	0
PCI	183	BLER	0
DL AMRCodec	AMR-WB 23.8	POLQA MOS SWB	3.79

Supported services

VoNR/EPS FB/VoLTE/ViLTE test

Automatic test

Voice and video test:: the voice or video app control test automatically

Supported terminals

- Qualcomm chipset: all common 4/5G commercial handsets
- HiSilicon chipset: Huawei Mate and P series
- Samsung chipset.

Voice quality testing evaluation

- Real-time audio quality measurement with PESQ/POLQA voice quality testing
- Sampling rate switching among 8K, 16K and 48K; sound recording and playback tests for outgoing and incoming calls
- Mobile to mobile (connected to different computers) voice quality test to simulate real usage scenario.
- Supports multi-channel/signal-channel voice quality test.
- POLQA voice quality testing V1.1 and V2.4 algorithm
- AMR/EVS

Test plan/KPI

Quick and easy test plan and test reports generation with a single click.

VoNR with POLQA Voice Quality Testing Standard - Real-Time Measurement

Param	Value	Param	Value
Network Type	NR	SS-RSRP	-75.19
Network State	NR Connected	SS-SINR	15.25
MCC\MNC\TAC	460\00\22534	PDSCH DM-RSRP	
Band	41	PDSCH DM-SINR	30
NCI	47258484849	Avg CQI	12.44
gNodeB\Sector ID	11537716\113	PUSCH TxPower	18
SSB ARFCN\PCI	504990\260	Most Modul DL/s	QPSK
Bandwidth(MHz\RB)	100\273	Most Modul UL/s	64QAM
SC Spacing	30kHz	MCS Avg DL	1
Serv SSB Index	4	MCS Avg UL	24.92
Grant Count DL/s	7	PDSCH BLER(%)	0
Grant Count UL/s	206	PUSCH BLER(%)	2.91
DL AMRCodec	SID	POLQA MOS SWB	4.18

Param	Value	Param	Value
Network Type	NR	SS-RSRP	-77.19
Network State	NR Connected	SS-SINR	14.69
MCC\MNC\TAC	460\00\22534	PDSCH DM-RSRP	
Band	41	PDSCH DM-SINR	32
NCI	47258484849	Avg CQI	12.76
gNodeB\Sector ID	11537716\113	PUSCH TxPower	19
SSB ARFCN\PCI	504990\260	Most Modul DL/s	QPSK
Bandwidth(MHz\RB)	100\273	Most Modul UL/s	64QAM
SC Spacing	30kHz	MCS Avg DL	1
Serv SSB Index	4	MCS Avg UL	25.42
Grant Count DL/s	6	PDSCH BLER(%)	0
Grant Count UL/s	210	PUSCH BLER(%)	4.76
DL AMRCodec	SID	POLQA MOS SWB	

PC Time	Event	Details
16:32:38.558	Voice Hangup	Reason: Normal
16:32:48.793	Voice Dialed	Dialed Time: 90(s)...
16:32:49.817	Incoming Call Attempt	Voice Type: VoNR
16:32:50.529	Incoming Call Setup	Delay: 694(ms)
16:32:51.547	Incoming Call Established	
16:33:10.210	POLQA Result	4.181 16:33:00.542->16:
16:33:26.469	POLQA Result	4.060 16:33:16.775->16:
16:33:42.670	POLQA Result	3.766 16:33:33.007->16:
16:33:58.919	POLQA Result	4.193 16:33:49.246->16:
16:34:15.145	POLQA Result	4.157 16:34:05.469->16:
16:34:22.379	Incoming Call End	Delay: 5(ms)
16:34:22.427	Voice Hangup	Reason: Normal
16:34:32.637	Voice Dialed	Dialed Time: 90(s)...
16:34:33.364	Incoming Call Attempt	Voice Type: VoNR
16:34:34.381	SIP Register Request	
16:34:34.483	SIP Register Success	

PC Time	Event	Details
16:32:06.729	POLQA Result	4.236 16:31:57.039->16:
16:32:23.032	POLQA Result	4.044 16:32:13.290->16:
16:32:38.255	Voice Hangup	Reason: Normal
16:32:38.428	Outgoing Call End	Delay: 102(ms)
16:32:48.793	Voice Dial	Dial Time: 90(s)...
16:32:49.003	Outgoing Call Attempt	Voice Type: VoNR
16:32:51.038	Outgoing Call Setup	Delay: 1987(ms)
16:32:52.055	Outgoing Call Established	
16:33:17.866	POLQA Result	4.274 16:33:08.686->16:
16:33:34.583	POLQA Result	4.014 16:33:24.912->16:
16:33:50.802	POLQA Result	4.192 16:33:41.134->16:
16:34:06.533	POLQA Result	4.311 16:33:57.360->16:
16:34:22.225	Voice Hangup	Reason: Normal
16:34:22.379	Outgoing Call End	Delay: 85(ms)
16:34:32.637	Voice Dial	Dial Time: 90(s)...
16:34:32.754	Outgoing Call Attempt	Voice Type: VoNR

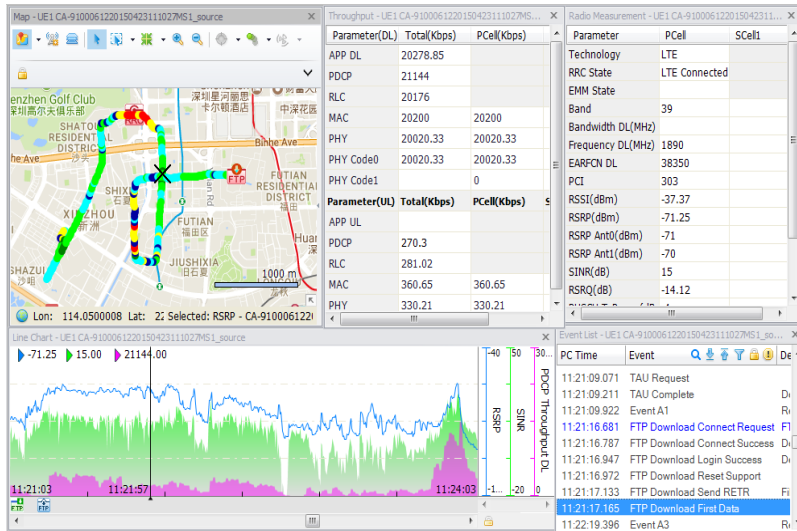
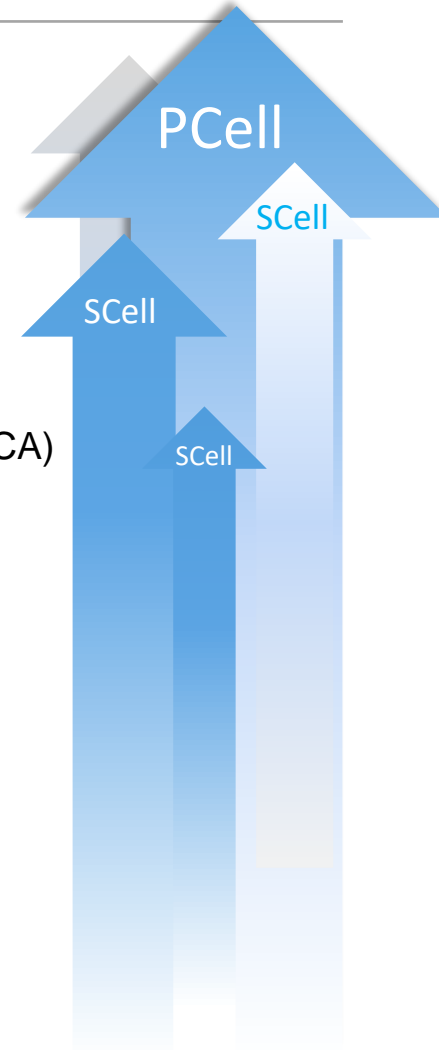
PC Time	Message
16:33:06.089	NR->DLInformationTransfer
16:33:06.089	NR->DL NAS transport
16:33:06.089	NR->PDU session modification command
16:33:06.089	NR->PDU session modification complete
16:33:06.089	NR->UL NAS transport
16:33:06.089	NR->ULInformationTransfer
16:33:20.733	NR->MeasurementReport
16:33:20.733	NR->RRCReconfiguration
16:33:20.733	NR->CellGroupConfig
16:33:20.733	NR->RRCReconfigurationComplete
16:33:20.733	NR->MIB
16:33:20.733	NR->RRCReconfiguration
16:33:20.733	NR->CellGroupConfig
16:33:20.733	NR->SIBType1
16:33:20.733	NR->RRCReconfigurationComplete
16:33:20.733	NR->SIBType1

PC Time	Message
16:32:56.937	NR->SIBs(Sib2)
16:32:57.038	NR->SIBs(Sib5)
16:33:02.427	NR->Service request
16:33:02.427	NR->ULInformationTransfer
16:33:02.529	NR->RRCReconfiguration
16:33:02.529	NR->CellGroupConfig
16:33:02.529	NR->RRCReconfigurationComplete
16:33:02.529	NR->Service accept
16:33:25.311	NR->MeasurementReport
16:33:25.311	NR->RRCReconfiguration
16:33:25.311	NR->CellGroupConfig
16:33:25.311	NR->RRCReconfigurationComplete
16:33:25.311	NR->MIB
16:33:25.311	NR->RRCReconfiguration
16:33:25.311	NR->CellGroupConfig
16:33:25.311	NR->SIBType1

KPIs	Description	KPIs	Description
Library Version	POLQA algorithm library version	Level Reference (dBov)	Audio amplitude level of full reference signal (full audio with sound and pause)
P863 Version	ITU protocol version	Level Degraded (dBov)	Audio amplitude level of full degraded signal (full audio with sound and pause)
Processing Mode	Two algorithm modes for POLQA: Narrowband and Super Wideband Different algorithm modes have different score range	ASL Reference (dBov)	Avg. audio amplitude level of reference signal during audio activation (P.56)
Sample Rate (Hz)	Reference audio signal sampling frequency, 8KHz for NB, and 48KHz for SWB	ASL Degraded (dBov)	Avg. audio amplitude level of degraded signal during audio activation (P.56)
POLQA Score	The scoring results by P.863 standard, NB(1-4.5), SWB (1-4.75)	Pause Level Reference (dBov)	Avg. audio amplitude level of reference signal during audio pause (P.56)
Mean Delay(ms)	Average delay of degraded signal compared with reference signal	Pause Level Degraded (dBov)	Avg. audio amplitude level of degraded signal during audio pause (P.56)
Min Delay(ms)	Min. delay of degraded signal compared with reference signal	SNR Reference (dB)	Signal-to-noise ratio of reference signal
Max Delay(ms)	Max. delay of degraded signal compared with reference signal	SNR Degraded (dB)	Signal-to-noise ratio of degraded signal
Delay Jitter	Jitter of delay of degraded signal compared with reference signal	ASR Reference	Active speech ratio of reference signal, i.e. ratio of audio activated duration to total audio duration
Attenuation (dB)	Attenuation between degraded signal and reference signal	ASR Degraded	Active speech ratio of degraded signal, i.e. ratio of audio activated duration to total audio duration
R Value (E-Model)	Score value when mapping to G.107 scoring standard	Pitch Reference (Hz)	Avg. pitch of reference signal
Estimated Sample Rate	Sampling rate of degraded signal by POLQA algorithm	Pitch Degraded (Hz)	Avg. pitch of degraded signal
Resampling Applied	If the sampling rate difference between reference signal and degraded signal is more than 0.5%, POLQA will slow down the signal with high sampling rate, and Resample Applied will be set to 1 (Yes)	Record File	Audio file with degraded signal, the storage path and name
Direction	Uplink or downlink. If downlink, the current terminal is used for audio transmission	Reference File	Audio file with reference signal, the storage path and name

Carrier Aggregation (CA) Test

Carrier Aggregation (CA) test solution where users can quickly configure PCell and SCell CA parameters supports key CA technologies and Release 9/10/11/12/13. During CA test, events, messages and various KPIs of PCell and SCell can be displayed in real time.



- Multiple FDD-LTE and TDD-LTE CA modes supported (2CC/3CC/4CC CA)
- FDD+FDD and FDD+TDD 4CC Carrier Aggregation
- 5G CA test with upto 8CC CA over millimeter waves
- Qualcomm and Hisilicon chipset-based CA test
- High speed download for data services
- Real-time multi-terminals monitoring of CA measurement, network resource allocation, network quality, data rate, etc.
- Real-time monitoring of key events, such as secondary component carrier (CC) modification, CA handover, and secondary CC activation
- Customized CA statistics report

Carrier Aggregation (CA) Test---Real Time Interface

Parameter	PCell	SCell1	SCell2	SCell3
Technology	LTE-CA			
RRC State	LTE Connected			
EMM State				
Band	3	46	46	46
Bandwidth DL(MHz)				
Frequency DL(MHz)	1822.5	5746	5765.10	5784.90
EARFCN DL	1375	52740	52941	53139

Radio Measurement

DL MCS Ratio/s	Total	PCell	SCell1
QPSK	1 (0.03%)	1 (0.05%)	0 (0.00%)
16QAM	0 (0.00%)	0 (0.00%)	0 (0.00%)
64QAM	3867 (99.97%)	1934 (99.95%)	1933 (100.00%)
QPSK Code0	1 (0.05%)	1 (0.10%)	0 (0.00%)
16QAM Code0	0 (0.00%)	0 (0.00%)	0 (0.00%)
64QAM Code0	1934 (99.95%)	967 (99.90%)	967 (100.00%)
QPSK Code1	0 (0.00%)	0 (0.00%)	0 (0.00%)
16QAM Code1	0 (0.00%)	0 (0.00%)	0 (0.00%)
64QAM Code1	1933 (100.00%)	967 (100.00%)	966 (100.00%)
MCS Avg	54	27	27

UL MCS Ratio/s	Total	PCell	SCell1
QPSK	0 (0.00%)	0 (0.00%)	
16QAM	0 (0.00%)	0 (0.00%)	
64QAM			
MCS Avg			

Modulation Ratio

Parameter	PCell	SCell1
Technology		
RRC State		
EMM State		
Band		
Bandwidth DL (MHz)		
Frequency DL (MHz)		
EARFCN DL		
PCI		
RSSI (dBm)		
RSRP (dBm)		
RSRP Ant0		
RSRP Ant1		
SINR (dB)		
RSRQ (dB)		
PUSCH TxM		
TM		
Rank Indicator		
Pathloss (dB)		

CA Configuration

- Freeze window
- Select logfile
- One
- Two
- Thre
- Appl
- Edit
- Save

No.	PCell				SCell1				SCell2				SCell3			
	Slot0	Slot1	Slot0	Slot1	Slot0	Slot1	Slot0	Slot1	Slot0	Slot1	Slot0	Slot1	Slot0	Slot1		
98	246	246	246	246	189	189	189	189	636	636	636	636	58	58	60	60
96	246	246	246	246	189	189	189	189	636	636	636	636	58	58	60	60
94	261	261	261	261	249	249	249	249	681	681	681	681	76	76	78	78
92	261	261	261	261	249	249	249	249	681	681	681	681	76	76	78	78
90	287	287	287	287	261	261	261	261	719	719	719	719	85	85	87	87
88	287	287	287	287	261	261	261	261	719	719	719	719	85	85	87	87
86	586	586	586	586	38	38	38	38	751	751	751	751	120	120	122	122
84	586	586	586	586	38	38	38	38	751	751	751	751	120	120	122	122
82	647	647	647	647	61	61	61	61	778	778	778	778	139	139	139	139
80	647	647	647	647	61	61	61	61	778	778	778	778	139	139	139	139
78	796	796	796	796	40	40	40	40	786	786	786	786	191	191	189	189
76	796	796	796	796	40	40	40	40	786	786	786	786	191	191	189	189
74	834	834	832	832	52	52	52	52	815	815	815	815	214	214	212	212
72	834	834	832	832	52	52	52	52	815	815	815	815	214	214	212	212
70	927	927	927	927	288	288	288	288	549	549	549	549	311	311	311	311
68	927	927	927	927	288	288	288	288	549	549	549	549	311	311	311	311
66	949	949	949	949	317	317	317	317	580	580	580	580	339	339	339	339
64	949	949	949	949	317	317	317	317	580	580	580	580	339	339	339	339
62	830	830	830	830	192	192	192	192	188	188	188	188	369	369	371	371
60	830	830	830	830	192	192	192	192	188	188	188	188	369	369	371	371
58	862	862	862	862	222	222	222	222	214	214	214	214	405	405	405	405
56	862	862	862	862	222	222	222	222	214	214	214	214	405	405	405	405
54	782	782	782	782	10	10	10	10	527	527	527	527	429	429	429	429
52	782	782	782	782	10	10	10	10	527	527	527	527	429	429	429	429
50	809	809	809	809	14	14	14	14	570	570	570	570	445	445	445	445
48	809	809	809	809	14	14	14	14	570	570	570	570	445	445	445	445
46	572	572	572	572	196	196	196	196	644	644	644	644	458	458	460	460
44	572	572	572	572	196	196	196	196	644	644	644	644	458	458	460	460
42	585	585	585	585	227	227	227	227	680	680	680	680	474	474	476	476
40	585	585	585	585	227	227	227	227	680	680	680	680	474	474	476	476
38	874	874	874	874	433	433	433	433	572	572	572	572	167	167	163	163
36	874	874	874	874	433	433	433	433	572	572	572	572	167	167	163	163
34	906	906	906	906	451	451	451	451	609	609	609	609	188	188	184	184
32	906	906	906	906	451	451	451	451	609	609	609	609	188	188	184	184
30	971	971	973	973	429	429	429	429	610	610	610	610	380	380	378	378
28	971	971	973	973	429	429	429	429	610	610	610	610	380	380	378	378
26	978	978	980	980	442	442	442	442	642	642	642	642	404	404	402	402
24	978	978	980	980	442	442	442	442	642	642	642	642	404	404	402	402
22	536	536	536	536	376	376	376	376	466	466	466	466	494	494	494	494
20	536	536	536	536	376	376	376	376	466	466	466	466	494	494	494	494
18	560	560	560	560	400	400	400	400	481	481	481	481	504	504	502	502
16	560	560	560	560	400	400	400	400	481	481	481	481	504	504	502	502
14	390	390	390	390	196	196	196	196	255	255	255	255	493	493	493	493
12	390	390	390	390	196	196	196	196	255	255	255	255	493	493	493	493
10	424	424	424	424	217	217	217	217	285	285	285	285	500	500	500	500
8	424	424	424	424	217	217	217	217	285	285	285	285	500	500	500	500
6	456	456	456	456	24	24	24	24	247	247	247	247	2	2	2	2
4	456	456	456	456	24	24	24	24	247	247	247	247	2	2	2	2

RB Details

Parameter(DL)	Total(Kbps)	PCell(Kbps)	SCell1(Kbps)	SCell2(Kbps)
APP DL				
PDCP	414183.73			
RLC	415514.86			
MAC	387307.83	179633.43	64385.49	93288.41
PHY	369084.20	203248.50	66513.31	99322.39
PHY Code0	176381.50	93479.31	33144.48	49757.72
PHY Code1	192702.70	109769.19	33368.84	49564.67
Parameter(UL)	Total(Kbps)	PCell(Kbps)	SCell1(Kbps)	SCell2(Kbps)
APP UL				

Throughput

Parameter	PCell	SCell1
PDCCH Grant Count DL/s	309	
PDCCH Grant Count UL/s	935	
PUSCH RB Count/s		
PUSCH Scheduled RB Count/slot		
PDSCH RB Count/s	69501	92736
PDSCH Scheduled RB Count/slot	35.899	47.950

RB Schedule

MCS	PCell		SCell1	
	Code0	Code1	Code0	Code1
MCS0				
MCS1	1 (0.10%)			
MCS2				
MCS3				
MCS4				
MCS5				
MCS6				
MCS7				
MCS8				
MCS9				
MCS10				
MCS11				
MCS12				
MCS13				
MCS14				
MCS15				
MCS16				
MCS17				
MCS18				
MCS19				
MCS20				
MCS21				
MCS22				
MCS23	4 (0.41%)	3 (0.31%)		
MCS24	42 (4.34%)	34 (3.52%)		
MCS25	115 (11.88%)	113 (11.69%)		
MCS26	136 (14.05%)	130 (13.44%)	2 (0.21%)	2 (0.21%)
MCS27	120 (12.40%)	119 (12.31%)	15 (1.55%)	4 (0.41%)
MCS28	528 (54.55%)	537 (55.53%)	950 (98.24%)	960 (99.38%)
MCS29				
MCS30				
MCS31	22 (2.27%)	31 (3.21%)		

MCS Details DL

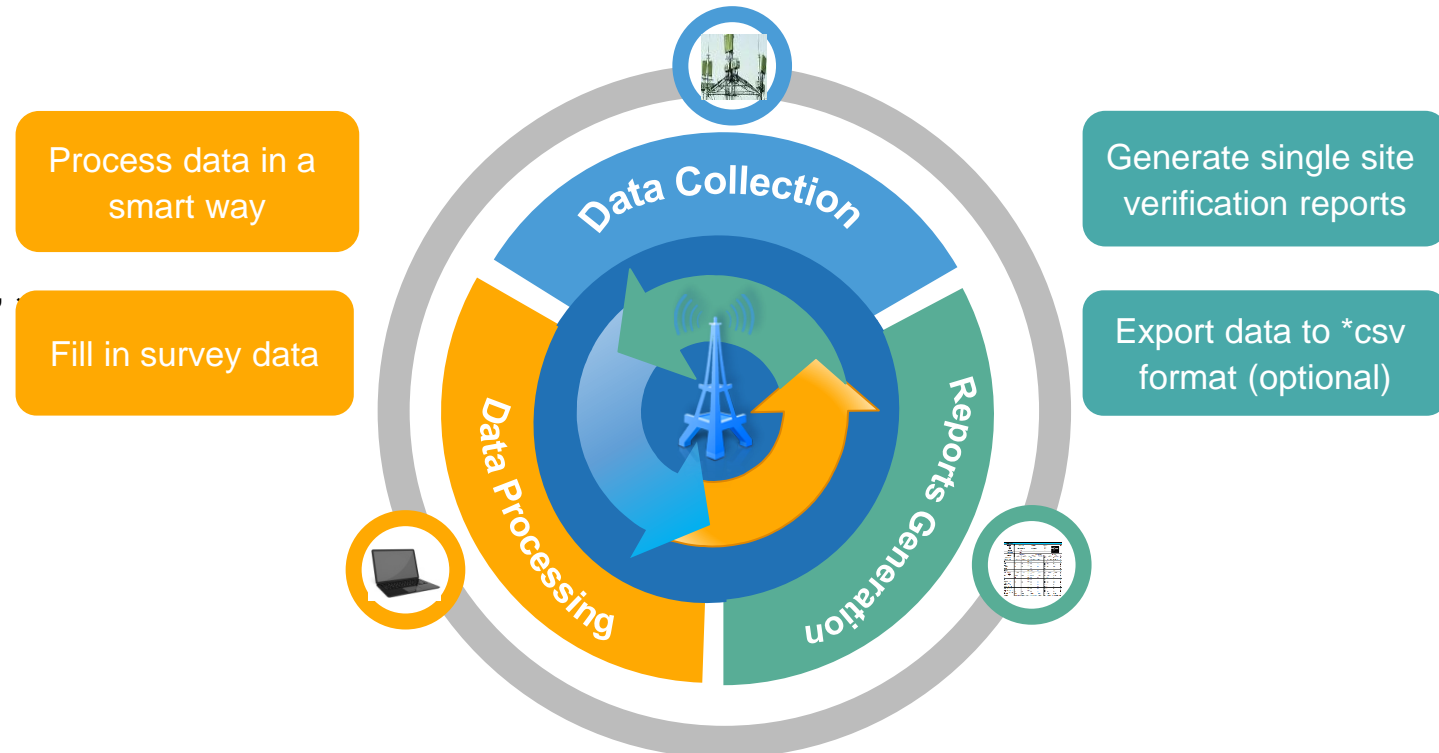
Single Site Verification

Single site verification is a three stage process that includes test, statistics and analysis, and reporting. The single site verification design promotes data processing efficiency and fast single site verification reports generation.

The following functions and KPIs are supported:

- Various pre-defined test scenarios and user-defined test scenarios
- Multi-dimensional KPIs for single site verification, such as radio parameters, coverage map, peak rate of data service, VoNR/EPS FB/VoLTE/CSFB KPIs, etc.
- Single site verification reports generation to preview verification results in a convenient way
- Supports data export to *.csv format for further processing, which satisfies more analysis scenarios.

- Obtain site information
- Collect data by scenario
- Test images screenshot as prompted



High-speed Rail Test with GPS Trajectory Compensation*

01

Optimized GPS module: external high-accuracy and high-sensitivity GPS module for rapid and stable positioning

02

Real-time Compensation with Gyroscope: External gyroscope, GPS and Google KML map are used to accurately display the test route geo-position (during test)

03

Flexible test: multi-network and multi-service test with multiple terminals

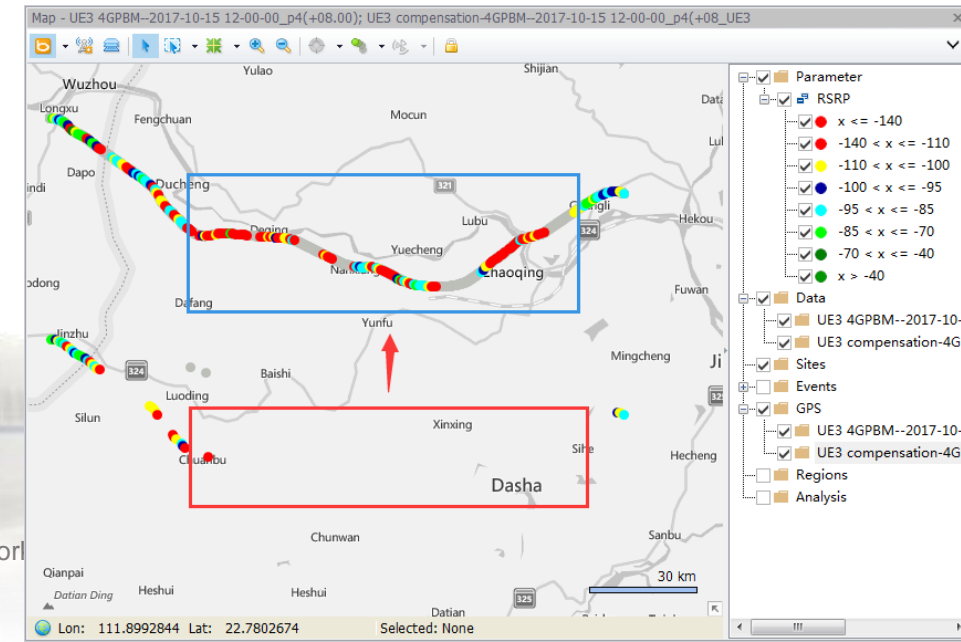
04

Intelligent trajectory compensation: intelligent GPS positioning compensation on the travelled routes with DingLi's proprietary algorithm, for the precise and actual network measurement positioning (after test)

05

Built-in routes: 65 Chinese high-speed rail and urban rail routes; customized route maps for all Chinese high-speed rail and highway routes

◆ Note: Unique to China market only, customers who want to have the access to this function may contact DingLi.



Parameters	Value	Parameters	Value
Total Receive Bytes	30653351	Media Quality	Super Definition
Download Progress (%)	100	Total Bit Rate (bps)	1202656
Current Rcv Speed (bps)	45916811	Video Duration Time(ms)	201000
ReBuffer Counts	0	Video FPS	25
Rebuffer Time(ms)	0	Video Width (px)	1105
Play Duration (ms)	28967	Video Height (px)	622
Stalling Ratio (%)	0	Video Codec	H264
Init Buffer Latency (ms)	1493	Audio Codec	AAC
vMOS	3.05	WebSite Type	
Quality Score	3.72	Video Title	【翼子】奥特...
Loading Score	3.21	Video Server IP	27.221.98.52
Stalling Score	5.00	Video Server Location	中国山东济南...

13:38:18.859	Video Play First Data	Access Delay:0.286(s)
13:38:19.972	Video Play Reproduction Request	Access Delay:1.00(s)
13:38:27.438	Video Play Last Data	Receive Size: 30.653(MB) ReBuffer Count: 0
13:38:48.940	Video Play vMOS Report	vMOS:3.05
13:38:49.187	Video Play Finish	Download Progress: 100 %
13:38:49.229	Network Disconnect	

ITU-T Recommendation P.800

MOS	Quality	Impairment
5	Excellent	Imperceptible
4	Good	Perceptible but not annoying
3	Fair	Slightly annoying
2	Poor	Annoying
1	Bad	Very annoying

Background:

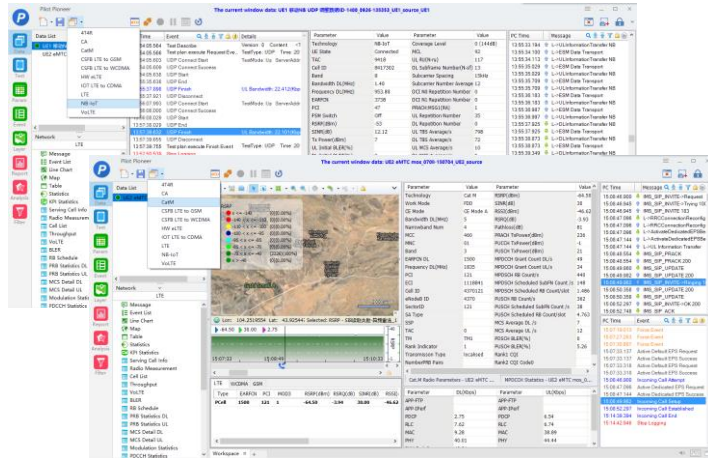
Video has become a technology consuming most network traffic, and video service experience has become a key index to measure network service quality. With the improvement of video resolution (from 720P/1080P to 4K/8K), video service are becoming increasingly demanding for the network. Therefore, the way to evaluate the video service experience under the current network has become increasingly important to users and operators.

DingLi:

DingLi cooperates with Huawei MBB to develop the Huawei vMOS technology. Pilot Pioneer has the privilege to introduce and support Huawei Mobile vMOS, which evaluates video quality with vMOS score. The vMOS video experience evaluation (e.g. vMOS scores) is designed to take into consideration the video source quality, start loading time, stalling ratio, and video play duration



LTE-IoT (NB-IoT and eMTC) Test



Customized NB-IoT and eMTC test scenarios



General

- Pilot Pioneer V10.5 supports LTE-IoT test with multiple NB-IoT and eMTC test modules. Each test module supports both NB-IoT and eMTC.
- Pilot Pioneer V10.5 may connect LiteProbe as one of the LTE-IoT test device.
- LTE-IoT test services: Ping and UDP through AT command, Ping and UDP over PPP



LTE-IoT test features

- Customized LTE-IoT test scenarios, one-click display of all NB-IoT and eMTC test KPIs
- Support 3GPP Release 14 protocol.
- Support multiple test services and forcing functions.
- Support HiSilicon and Qualcomm chipset.

Note: Multiple LiteProbes and LTE-IoT test modules can be connected to Pilot Pioneer 10.5 for concurrent testing.



Benefits and values

- Available LTE-IoT solutions
- Support various LTE-IoT application scenarios
- Meet customers' requirements for LTE-IoT test



@DingLi (3/26/2020)

Test modules with HiSilicon and Qualcomm chipset



DL1105PV



DingLicom network Experience

Top N Synchronous Signal Scanning

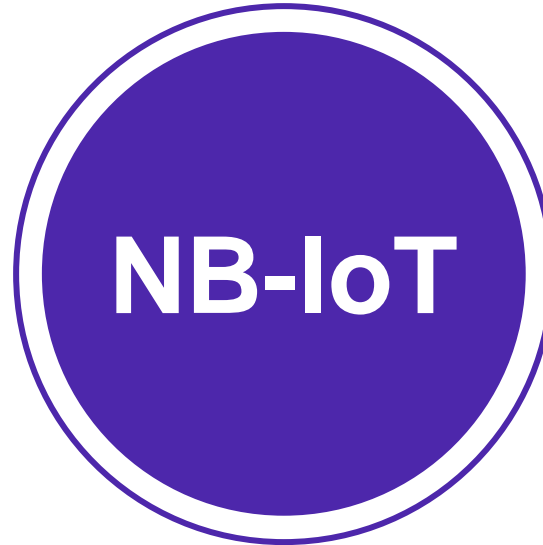
- Top N scanning: blind scan for various frequencies, and scan for dedicated cells.
- Complete scan data: EARFCN, PCI, NPSS-RP/RQ/RSSI, NSSS-RP/RQ/RSSI

User list Synchronous Signal Scanning

- **UserList Scanning:** exports complete test data, which include the data for EARFCN, PCI, NPSS RP/RQ/RSSI, NSSS RP/RQ/RSSI

Benefits and values:

- ✓ Provide better network optimization solutions for device manufacturers, service suppliers
 - Support frequency planning
 - Support network benchmarking test
- ✓ Available interference analysis for network operators
 - To identify whether the transmission problem is caused by cell overlapping coverage or external interference

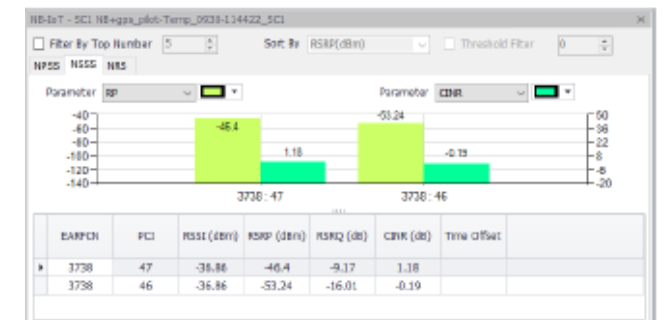


About the System

- Able to identify PCI
- Display intra-frequency and inter-frequency neighbor cell list
- Scan the blind cell (with dedicated frequencies) broadcast, and the lock cell (with dedicated frequencies) broadcast.
- MIB/SIB1 demodulation function: System bandwidth (MIB), antenna count, TraceArea and Cell ID (SIB1)

Channel Demodulation

- Channel demodulation for NRS, NPSS, NSSS, etc., calculating various channel power.



Real-Time KPIs Display

Total Test Duration		Total Test Distance		Coverage Ratio	
0 Hour	3 Minute	0.00	Meter	NB-IoT	100.0%

General Statistics		Radio Parameters			Exceptions	
Service Type	Attempts Count	Success Count	Failure Count	Test Dropped Count	Delay	Success Ratio
☐ Voice MO	0	0	0	0	0	0%
☐ Voice MT	0	0	0	0	0	0%
☐ FTP Download	0	0	0	0	0	0%
☐ FTP Upload	0	0	0	0	0	0%
☐ Ping	0	0	0	0	0	0%
☐ PBM	0	0	0	0	0	0%
☐ AT UDP	2	2	0	0	90	100.00%

Index	Start Time	End Time	Service Duration	Results
1	13:54:05	13:55:35	90	Success
2	13:56:08	13:57:38	90	Success

KPIs (e.g. test duration, test distance, coverage rate and various network technologies, etc.) can be displayed in real time. This release comes several KPIs categories:



FEATURES

- General Statistics: test execution count, test status, success rate, delay, etc.
- Radio Parameters: max, min, mean and median key parameters value, total samples count, parameters threshold, and CDF and PDF statistics, etc.
- Exceptions: service exceptions, low MOS score, low throughput, etc.

Users may click the exception to view its details as the exception information is synchronized in various window



BENEFITS&VALUES

- ✓ Users may rapidly view the test results.
- ✓ Users may adjust the test plan according to the KPIs.
- ✓ Promote the work efficiency.

Total Test Duration		Total Test Distance		Coverage Ratio	
0 Hour	3 Minute	0.00	Meter	NB-IoT	100.0%

General Statistics		Radio Parameters			Exceptions	
Parameters Name	Maximum	Minimum	Mean	Median	Total Measurement Samples	Count
☐ RSRP(dBm)	-50	-58	-53.31	-54	497	

Index	Threshold Range	Measurement Samples Count	PDF	CDF
1	(-INF,-140]	0	0%	0%
2	(-140,-110]	0	0%	0%
3	(-110,-100]	0	0%	0%
4	(-100,-95]	0	0%	0%
5	(-95,-85]	0	0%	0%
6	(-85,-70]	0	0%	0%
7	(-70,-40]	497	100.00%	100.00%
8	(-40,+INF)	0	0%	0%

☐ SINR(dB)	19.37	6.35	13.31	12.86	497
☐ FTP Download Rate(Kbps)	0	0	0	0	0

Real-Time KPIs Display

KPIs (e.g. test duration, test distance, coverage rate and various network technologies, etc.) can be displayed in real time. This release comes several KPIs categories:



General Statistics: test execution count, test status, success rate, delay, etc



Exceptions: service exceptions, low MOS score, low throughput, etc.



Benefits and values:

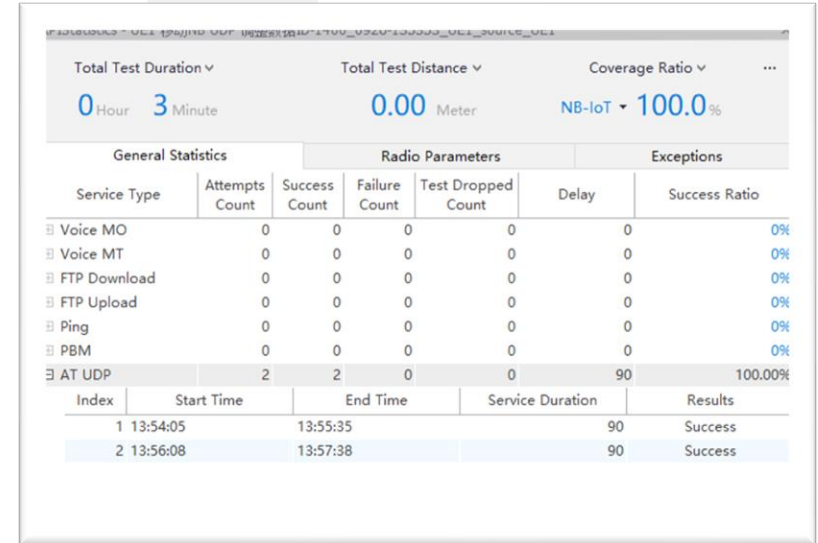
- Users may rapidly view the test results.
- Users may adjust the test plan according to the KPIs.
- Promote the work efficiency.



Radio Parameters: max, min, mean and median key parameters value, total samples count, parameters threshold, and CDF and PDF statistics, etc.



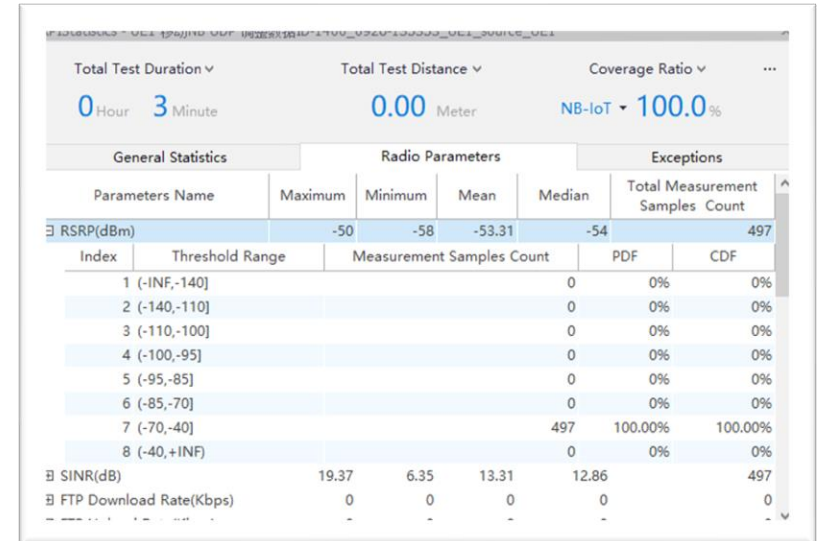
Users may click the exception to view its details as the exception information is synchronized in various window



Total Test Duration: 0 Hour 3 Minute
 Total Test Distance: 0.00 Meter
 Coverage Ratio: NB-IoT 100.0%

General Statistics		Radio Parameters			Exceptions	
Service Type	Attempts Count	Success Count	Failure Count	Test Dropped Count	Delay	Success Ratio
Voice MO	0	0	0	0	0	0%
Voice MT	0	0	0	0	0	0%
FTP Download	0	0	0	0	0	0%
FTP Upload	0	0	0	0	0	0%
Ping	0	0	0	0	0	0%
PBM	0	0	0	0	0	0%
AT UDP	2	2	0	0	90	100.00%

Index	Start Time	End Time	Service Duration	Results
1	13:54:05	13:55:35	90	Success
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Index	Threshold Range	Measurement Samples Count	PDF	CDF
1	(-INF,-140]		0	0%
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3	(-110,-100]		0	0%
4	(-100,-95]		0	0%
5	(-95,-85]		0	0%
6	(-85,-70]		0	0%
7	(-70,-40]	497	100.00%	100.00%
8	(-40,+INF)		0	0%

SINR(dB)	19.37	6.35	13.31	12.86	497
FTP Download Rate(Kbps)	0	0	0	0	0

/05

Conclusion

5G

Pilot Pioneer will be your ideal network optimization and evaluation solution.

For Network Operators, System Vendors and Service Providers

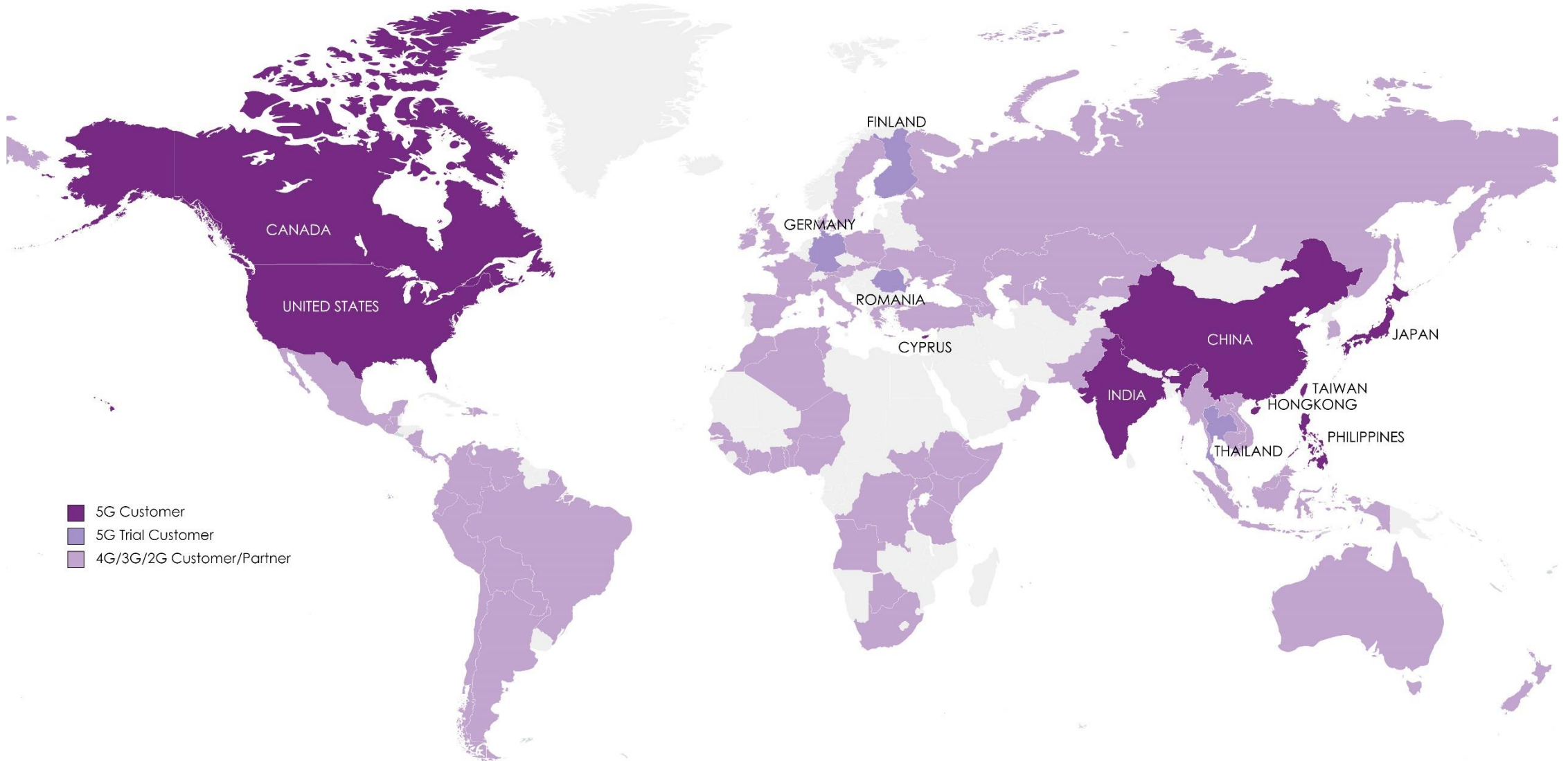
- Provides flexible authentication modes (such as hard dongle and soft dongle), support multiple commercial test terminals, which provides maximum benefits on the tool investment
- Multi-technology indoor and outdoor service tests, applicable throughout the network development process
- Improves test efficiency with highly integrated and automated services test
- Provides a user-friendly interface for easy operation

For Engineers

- Simple and easy operation, user-friendly interface for shorter learning curve
- Specialized technical support and customized services
- Automatic device configuration and data collection to reduce workload
- Integrated common services test and network troubleshooting ability to improve network optimization efficiency



Customer Base



Thanks

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