



BEYOND 5G FRONTIERS


Accuver

ABOUT ACCUVER



Accuver is a leading supplier of wireless network testing, test & measurement, big data and network infrastructure solutions that enable operators to validate network features, optimize cellular performance and improve customer experience. We provide solutions for drive test, network optimization, benchmarking, big data analysis, cell site maintenance and small cells. We provide best-in-class solutions with latest 5G technologies including NSA, SA, Sub-6 and mmWave. Also, Our products support network testing on the widest range of 5G devices due to support of Qualcomm, Samsung, Hisilicon and MediaTek chipsets. Our solutions have been adopted for different use cases in the lab & field by all tier 1 operators and vendors.



Mobile Communication Test Equipment Company 


- Korea Sales | Marketing
- R&D | Manufacturing
- Customer Support

Accuver

Worldwide Sales Incorporation 


- Global Sales
- Customer Support

QUCELL NETWORKS

Small Cell Company 

- R&D | Manufacturing
- Customer Support

@Wayties

V2X Company 

- V2X Test Solutions
- Roadside/Onboard Unit

GLOBAL ORGANIZATION



220+ Customers from more than 50+ countries



Operators

Vendors

ACCUVER, A LEADER IN THE 5G INDUSTRY

We provide innovative solutions for successful businesses

Big Data
Analytics
Solution

Test &
Measurement
Solution

Small Cell
Solution

V2X Solution





NETWORK OPTIMIZATION SOLUTION (XCAL, XCAP)

enables measurement, analytics, Improvement of telecommunication service quality

It is a solution that collects and analyzes the radio wave environment and data transmission and reception between the base station and the terminal in real-time to improve the communication service quality.

Drive Test

Walk Test

Remote Test

Post-processing



Drive test solution that collects wireless network data from field environment in real-time



Optimization for shaded area



Interworking test between Mobile and Base Station



Voice quality test

Portable test solution that collects wireless network data through Handheld device



In-building test



Subway test



Mountain, Coastline

24/7 real-time wireless network quality monitoring and data collection



Real-time monitoring



Network trend evaluation



User Friendly UI

Analysis solution to process the collected data in various form



Root Cause Analysis



Support major KPIs



Autonomous report creation

XCAL

XCAP

Drive Test

Walk Test

XCAL

XCAL-Mobile

XCAL-EZMO

XCAL-Solo III

XCAL-HubC6

XCAL-Duo

XCAL-Hybrid

XCAL-Mate

XCAL-PU12

Post-processing

XCAL-MO III

XCAP

Remote Test

XCAL-Manager

XCAP-Cloud

XCAL-Ranger

XCAL-Air

XCAL

PC based Advanced 5G Network Optimization Solution

Used extensively on many of world’s largest networks, the intuitive and flexible XCAL series of drive test tools are designed to troubleshoot, monitor, maintain and optimize wireless voice and data network performance – all in real-time. XCAL assesses QoS/QoE and ensures seamless service integration with existing technologies ranging from 2G to 5G. By automatically recording and deciphering messages from the air interface, XCAL detects any network bottlenecks and impediments that may affect the delivery of high-quality voice and data services, providing invaluable insights for your network enterprise. Being the first to market on 5G and closely collaborating with early technology adopters, the product is equipped to meet all 5G drive test requirements.

Features

- * Support Benchmarking Test interworking with device of various manufacturer
- * Optimized for Field Test (Indoor & Outdoor)
- * E2E Network Performance measurement with AEGIS (Big Data Analytics Solution)

Functions

- * QoS, QoE, MOS Test
- * Key indicator monitoring : Signaling message, 5G NR Throughput, 5G NR Base Station information, etc.
- * Operator Benchmark Test
- * Display voice/data quality test result and RF information in real-time



ENDC (5G NR+LTE) Summary



Benchmarking RF Summary



Dynamic Spectrum Sharing



Detail Functions	
Data Collections	Layer 1,2,3 Message, TCP/IP packet information
	L1 : SSB Measurement/PDSCH/PUSCH, etc
	L2 : PDCP/RLC/MAC, etc
	L3 : RRC/NAS, etc
Chipsets	4G : Qualcomm, Samsung, LGE, GCT, Intel, MediaTek, Altair, Sequans, Hisilicon
	5G NR : Qualcomm, Samsung, MediaTek, Hisilicon
Technologies	WiFi, IS-95A/B, 1xRTT, EVDO Rev0/A/B, GSM/GPRS, EDGE, WCDMA, HSDPA, HSUPA, HSPA+, DC-HSDPA, DC-HSUPA, MC-HSDPA, LTE, LTE-A (CA ~ 7CA) LTE-U (LAA), PS-LTE (MCPTT), eMTC (Cat.M1), NB-IoT, 5G NR(NSA,SA,NRDC)
Application Automation Test	Voice/VoLTE/VoNR/VoWiFi(MOS: PESQ/POLQA), ViLTE(PEVQ), MCPTT(POLQA), SMS/MMS
	FTP, HTTP, Ping, i-Perf, E-mail, VOD, YouTube(PEVQ-S), MCPTT, Android APP automation Test, Messenger talk & Texting. TWAMP
Scanners	R&S, PCTEL, Anritsu

XCAL-EZMO

Innovative MOS Testing Solution up to 6 UEs

XCAL-EZMO is an innovative MOS testing solution that minimizes the load on the Host PC by performing MOS calculations within the device. It features 6 ports, each with its own individual sound control, allowing independent standard-based voice quality (MOS) testing for both mobile-to-mobile and mobile-to-landline test scenarios. The unique feature of this tool is that any phone supporting Bluetooth can be used for voice quality analysis, demonstrating that high-quality, scalable, and robust network benchmarking tools don't have to be expensive.

Features

- * Compact Size
- * Support independent MOS test per UE
- * Support benchmarking test to measure and compare KPIs up to 6 UEs

Functions

- * Mouth to Ear delay measurement
- * MCPTT and MOS measurement
- * Support CS, PS, VoIP, VoLTE call test
- * Diagnosis of network issues : Call Drop, Setup Fail, Throughput degradation
- * Support various QoS Algorithm (PESQ, POLQA(V2, V3))
- * UE control via Bluetooth



Item	Specification
Power Input	19.5 VDC
CPU	Intel Core I-Series-7Gen. i7 2.8GHz
Memory	16GB
HDD	512GB
OS	Windows 10 Pro 64bit
External Interface	USB Type-C 3.1 Gen2 x1 Port External USB Type-A 3.1 Gen1 x2 Ports
Phone Interface	USB Type-A 3.1 Gen2 : Type-A Receptacle Audio In/Out : 3.5-Phi Stereo Jack
Size	228.0 x 134.6 x 49.0 (W x D x H, mm)
Weight	1.16 kg

XCAL-HubC6

Sophisticated USB C-Type multi-hub supports up to 6 UEs

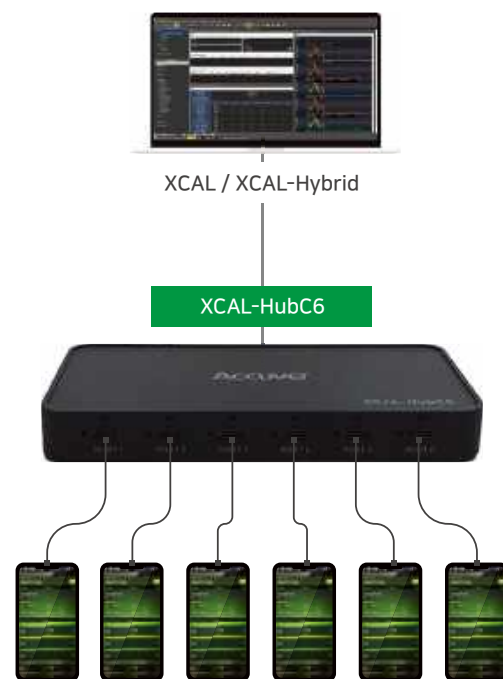
XCAL-HubC6 is a dedicated USB C-Type Multi hub that can be used in conjunction with XCAL solutions. It provides auto port recognition, fast charging and high-speed USB data communication. It is optimized for high-performance data transmission and reception tests and long-term tests of 5G UEs with high power consumption as it supports fast charging up to 6 times faster during high-speed DM data communication. In addition, by supporting AC power and portable PD battery, it can be used in various measurement environments such as building, subway, laboratory and drive tests.

Features

- * Support up to 6 Smartphones enables more service call test in parallel
- * Enhance stability by preventing user errors with automatic device detection & configuration
- * Power Supply to Smartphones more than enough for seamless test
- * Support Walk Test for Indoor measurement as well with PD Battery

Functions

- * Charging speed up to 6x faster than general Hub
- * Support USB 3.2 Gen2 (10Gbps)
- * Automatic mobile detection to port configuration
- * Control USB Port On/OFF one by one
- * Support USB-C Locking standard interface (Panel Mount locking screw)
- * Portable PD battery with Power Module



Item	Specification	
Input power voltage	12V DC	Adaptor : 12V/7.5A
External Interface	USB Type-C 3.2 Gen2 x1 Port	Host Port
Phone Interface	USB Type-C USB3.2 Gen2 x 6 Port	Mobile Port
Power Consumption	70W	
Output Power (per Port)	5V / 1.5A ~ Max 3A	
Size	162 x 86 x 24 (W x D x H, mm)	With Rubber Foot
Weight	280g	



USB 3.2 Gen 2

- Product capability : Product signals at 10Gbps
- Marketing name : SuperSpeed USB 10Gbps

XCAL-Hybrid

5G Benchmarking Test Solution up to 12 UEs

XCAL-Hybrid is an innovative benchmarking solution that combines the strengths of XCAL-Mobile and XCAL-M. This new concept harnesses the enhanced performance of smartphone application processors (APs) to enable data processing within XCAL-Mobile, allowing multiple devices to be supported on a single PC. With the dedicated USB hub XCAL-HubC6, you can test multiple smartphones up to 12 UEs. XCAL-Hybrid offers a simplified configuration compared to existing equipment like Pu12 and MO III.

Features

- * Simultaneous measurement of 12 mobiles with optimized performance
- * Full optimization data collecting in conjunction with XCAL-Mobile
- * Support various communications technology KPIs (2G to 5G NR)
- * Easy in-building measurement and real-time analysis with lightweight configuration
- * Benchmarking and Rollout test features in conjunction with XCAL-manager server

Functions

- * Intelligently manage massive volumes of drive test data, maps and performance counters
- * Full optimization data collecting in conjunction with XCAL-Mobile
- * Carry out Multiple data sessions on each test UEs
- * QoS/QoE Test (Voice, E-MOS, SMS, video, VQML, etc.)
- * Indoor/outdoor network performance analysis
- * Support various QoS Algorithm : PESQ, POLQA(V2, V3)



Full Feature List	
Data Collection	Collecting Layer 1,2,3 Message, TCP/IP packet information by interworking with device and scanner
	L1 : PCFICH/PDSCH/PUSCH, etc
	L2 : PDCP/RLC/MAC, etc
Chipsets	L3 : RRC/NAS, etc.
	Qualcomm, Samsung
Support devices	Android Smartphone (Up to 12 mobiles)
	WiFi
	GSM/GPRS, EDGE
Technologies	WCDMA, HSDPA, HSUPA, HSPA+, DC-HSDPA, DC-HSUPA, MC-HSDPA
	LTE, LTE-A (CA ~ 6CA) LTE-U (LAA), 5G-NR
MOS	Embedded MOS
	Voice(VoLTE)/SMS/FTP/Ping/HTTP/lperf/Email
	*Additional Autocall will be reviewed and added sequentially
Application automation test	
Scanners	R&S, PCTEL

XCAL-Pu6

Portable 5G network benchmarking solution with 6 UEs

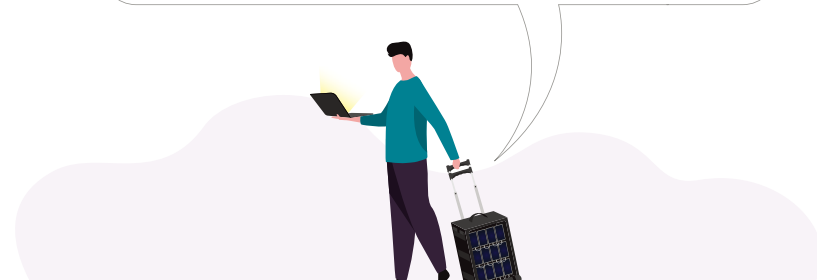
XCAL-Pu6 is a hardware-based mobile network test solution supporting 5G and 4G technologies. Designed for mobile network operators, infrastructure vendors, and smartphone and chipset manufacturers, it enables simultaneous measurements across up to six smartphones, providing comprehensive data for a variety of testing scenarios. Running on Windows OS, XCAL-Pu6 offers standalone operation and is optimized for low power consumption, making it ideal for both walk and drive testing. Its compatibility with 100W USB PD batteries ensures flexibility and extended testing durations in the field.

Features

- * Windows OS ensures no impact from the client's security programs
- * XCAL-Mate Backpack carriable, Support up to 12 UEs
- * Supports 100W PD with 2 ports, enabling battery replacement without powering off
- * Uses a cigarette lighter power source, eliminating the need for vehicle modifications
- * Enables unmanned measurement through Automatic Booting

Functions

- * Perform both manual and autonomous competitive network benchmarking and troubleshooting
- * L1/2/3 Message, TCP/IP Packet collection
- * HTML, SMS, FTP, iPerf, YouTube, Voice call, MCPTT Test



Item	Specification
Core	2.0-2.9GHz Quad-Core, Four-Thread
Processor	Intel® Celeron® N5105
Storage	M.2 NVMe (512GB)
RAM	LPDDR4 8GB 2933MHz
Max Power	100W
Size	19.5cm x 16cm x 4cm
Ports(Front)	User Port s: USB 3.2 Gen2 Type A X 3 Phone ports : USB 3.2 Gen2 Type C X 6 (5V/0.9A) USB Type C DP(Display) X 1 RJ-45 X1
FND	Display client number and boot state
Ports(Rear)	USB Type C, Supports PD X 2 (20V / 5A) Cannot be used simultaneously
FAN	Outside direction, 2ea
Booting Mode	Auto: Runs automatically on power. Manual: Runs when Power button is pressed after power
Rotary switch	Set ID : 0 to 9

XCAL-Pu12

Portable 5G wireless network benchmarking solution

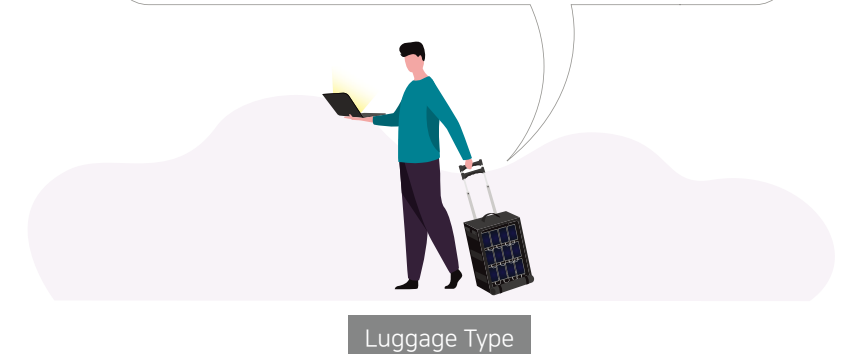
XCAL-Pu12 is a compact and portable multi-benchmarking solution that supports up to 12 User Equipments (UEs), offering optimized performance for 5G measurements. This solution allows for a comprehensive comparison of network operators' device performance from the perspective of customer Quality of Experience (QoE). The compact size and lightweight design of the Pu12 hardware enable testing in various locations, including in-building tests, drive tests, and walk tests with a portable setup.

Features

- * 12 UE Benchmarking Test at the same time
- * Field Test with Luggage type
- * E2E Network Performance measurement with AEGIS (Big Data Analytics Solution)

Functions

- * Interface with various devices
 - : Smartphone (up to 12)
 - : USB Modem (2)
 - : GPS (1), Scanner (2)
- * MOS Test
- * Key indicator monitoring
 - : Signaling message, 5G NR Throughput, 5G NR Base Station
- * Same GUI with XCAL
- * Display Voice/Data quality test result and RF information in real-time
- * External battery pack



Item	Specification
Power Input	19 - 24VDC
Power Consumption	Stand-by : < 10 W Maximum : 50 W (with mobile phone 4)
CPU	Intel Core i7-7Gen 2.8GHz x2
SSD/Memory	512GB x2 / 16GB x2
External interface	Front : Ethernet x 2 port (Gigabit) : Phone Interface x 12 (USB 3.2 Gen2 지원) : User USB Device x 4 (User 2Port / GPS 2Port) Rear : Debug Port x 1 (USB2.0 Mini B-Type) : HDMI x 2
Phone Interface	USB 3.1 Gen2
Size	170 x 87 x 170 (mm, W x H x D)
Weight	2.12 kg

XCAL-MO III

Real UE based Field Testing Solution up to 30 UEs

XCAL-MO III is an efficient benchmarking solution that allows for simultaneous interfacing with up to 30 mobile phones through parallel connections. It also supports various scanner brands, enabling users to test the true end-user network experience in real field conditions. Additionally, it can be scaled by connecting multiple XCAL-MO III together, providing excellent flexibility and portability while reducing overall costs.

Features

- * Support various wireless communication test including 5G NR
- * Support up to 30 UE simultaneously
- * Optimized for Field Test and Benchmarking Test
- * Scalable in Cascade form(2X) (up to 60 UEs)

Functions

- * Interface with various devices
 - : Smartphone (up to 30)
 - USB Modem (2)
 - GPS (1), Scanner (2)
- * Support independent OS per Slot(5 port each)
- * Measure various application including Layer 1, 2, 3
- * QoE (Quality of Experience) Measurement
- * Support Autocall and MOS Test
- * Display Voice/Data quality test result and RF information in real-time
- * Device control and sound source transmission by Bluetooth cable



Item	Specification
Power Input	48 VDC (Require external power supply)
Power Consumption	290W (Max. 450W)
CPU	Intel Core i7-7600U (Kabylake)
SSD/Memory	512GB / 16GB
OS	Windows 10
OS Recovery	Supported
Phone Interface	USB 6-ports USB3.1 (Gen2) 3A, 5V (Max.)
Size	249 x 193 x 327(W x H x D, mm)
Weight	< 7Kg

XCAL-Mobile

Smartphone based portable In-building Testing Solution

Capturing RAN (Radio Access Network) performance has never been easier. XCAL-Mobile is a leading handheld air interface monitoring tool that facilitates QoS (Quality of Service) and QoE (Quality of Experience) testing across various technologies, including GSM, CDMA, EVDO, WiFi, LTE, LTE-A, NB-IoT, and 5G NR. It provides extensive application testing capabilities and delivers real-time network measurement and visualization on smart devices. With XCAL-Mobile, all features can be easily controlled using the regular handset keys, making it user-friendly for anyone. It supports all major smartphones and can also be extended to include Android devices.

Features

- * Create and Edit Auto call scenario
- * Monitor measured data through smartphone display in real-time
- * Auto screen capture function for reporting the issue
- * Support MOS test
- * Remote control by XCAL-Manager (Log file management and remote control test)

Functions

- * Collect RF information in real-time
- * Autocall setting
- * Log mask setting
- * Call test result history
- * Log upload
- * In-building measurement
- * Google map



5G NR Features



Title	Description
Device Requirements	Android 8.0 (Android 8.0-11.0) or above
Wireless Telecommunication Technology	CDMA/EVDO, 2G (GSM/GPRS/EDGE), 3G (UMTS/HSPA), LTE (4G-FDD & TDD), LTE-A, 5GNR, NB-IoT, WIFI
Call Type	VoLTE, Voice, FTP, Web Browser, SMS, Email, Ping, YouTube, Netflix, Social media (facebook, Twitter, Instagram), Skype/WhatsApp, Dropbox, Google Play, etc.
5G NR KPI Monitoring	PCI, SSB Index, BRSRP, BRSRQ, SNR, DMRS SNR, Frequency Offset, Time Offset, SS-RSRP, Subcarrier Spacing, Pathloss, RB Num(Avg), MCS0 Index(Avg), MCS0 Mod. Rate(Q/16/64/256), PDSCH Throughput, MAC Throughput, PDCP Throughput, NR-ARFCN, DL Frequency, PDSCH BLER, UL RB Num(Avg), UL Allocated Slots, PUSCH BLER

XCAL-Solo III

Unlimited Handheld Network Testing Solution

XCAL-Solo is a handheld air interface measurement solution for conducting QoS and QoE tests without any limitations. It allows you to attach portable hardware to your smartphone, enabling a wide range of application testing, including real-time audio MOS measurement, network measurement, and data monitoring. XCAL-Solo also supports the creation and editing of measurement scenarios, as well as various automated call tests such as voice, VoLTE, FTP, web, email, iPerf, ping, YouTube, multi-call, multi-RAB, multi-session, and UDP (*IoT). The user-friendly touch interface, accessible through the Android OS GUI, enhances the overall usability of XCAL-Solo.

Features

- * Ultralight(100g) handy solution
- * Monitor measured data through smartphone display in real-time
- * Auto screen capture function for reporting the issue
- * Remote control by XCAL-Manager (Log file management and remote control test)
- * Rooting and Custom Kernel are not required

Functions

- * Collect RF information in real-time
- * Auto call setting
- * Log mask setting
- * Call test result history
- * Log upload
- * In-building measurement
- * Google map



XCAL SOLO III



Item	Specification
Operating power	Qualcomm QC8250 (Kryo™ 585 CPU 4x Kryo Gold (2.85GHz) + 4x Kryo Silver (1.8 GHz) Octa-core)
Bluetooth	8GB, LPDDR5(POP)
Phone Interface	128GB UFS3.0 Onboard Storage
Battery	Android OS Version 10
Memory	DC +9V / MAX 18W
Operating Condition	Temperature : 0°C ~ 50°C, Vibration : 3G (x-y-z axis)
Size	80 x 80 x 20 (mm, W x H x D)
Weight	100g

XCAL-Duo

Handheld Network Testing Solution up to 2 UEs

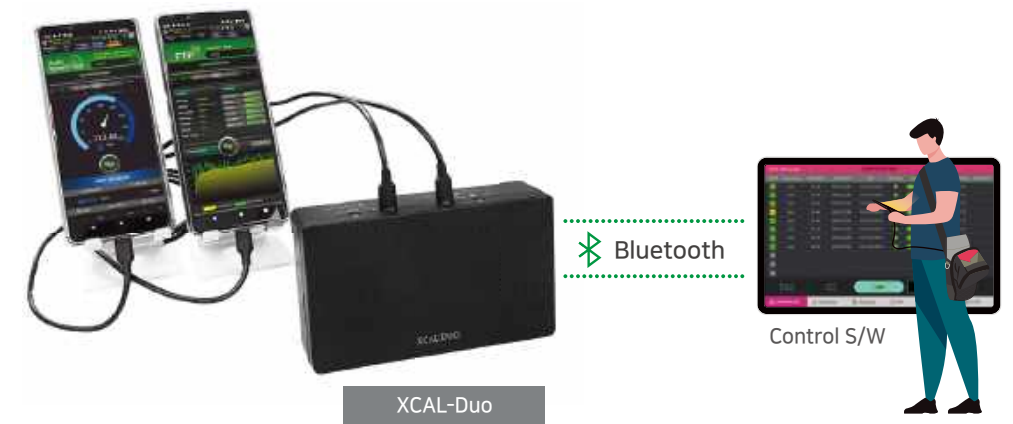
XCAL-Duo is a cutting-edge wireless network measurement solution capable of conducting QoS and QoE tests on two commercial smartphones simultaneously. It supports two non-rooted smartphones at the same time, providing a wider range of testing options. XCAL-Duo ensures reliable measurement of Mobile to Ear delay and Mobile to Mobile Data Latency. The lightweight and portable design makes it suitable for various measurement environments, including field tests, in-building tests, and lab tests.

Features

- * Test Two off-the-shelf smartphone simultaneously
- * Monitor measured data through smartphone display in real-time
- * MOS measurement by POLQA algorithm
- * Remote control by XCAL-Manager (Log file management and remote control test)
- * Rooting and Custom Kernel are not required

Functions

- * M2E Delay, Mobile to Mobile Data Latency Measurement
- * Collect RF information in real-time
- * Autocall setting
- * Logmask setting
- * Autocall test result history
- * Log File upload
- * In-building measurement
- * Google map



XCAL-Duo

Item	Specification
CPU	Qualcomm QC8250 (Kryo™ 585 CPU 4x Kryo Gold (2.85GHz) + 4x Kryo Silver (1.8 GHz) Octa-core)
Memory	8GB, LPDDR5(POP)
Storage	1TB NVMe M.2
Battery	RRC2020 : 10.80V, 9.22Ah, 99.60Wh
OS	Android OS
Input Voltage	DC +20V / 60W
Size	159.4 x 94.0 x 44.0 (mm, W x H x D)
Weight	750g

XCAL-Mate YOUR ULTIMATE COMPANION FOR WALK TESTING

The XCAL-Mate backpack is your essential companion for flawless mobile network optimization. Specially designed to accommodate XCAL network testing equipment such as the XCAL-PU12 and XCAL-Solo III, as well as up to 12 smartphones, it ensures stable testing conditions. With its extensive key features, it is the ideal choice for telecom professionals tackling network optimization tasks.

Features

- * 5.2kg Light-weight carbon frame
- * Support up to 12 smartphones
- * Embedded cooling fan to prevent over heating
- * Equipped with XCAL network testing tools
- * Embedded battery enables seamless test for walk and driving test

Functions

- * Walk test
- * In-building measurement
- * Collect RF information in real-time
- * Auto call test
- * Benchmarking test



	XM-PU12 Backpack	XM-HubC6 Backpack	XM-SOLO Backpack	XM-SOLO Pouch
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Solution Inside	XCAL-PU12	XCAL-HubC6	XCAL-Solo III 6ea	XCAL-Solo III
Number of UEs	12	6 or 12	6	1
Power	Battery Pack (RRC Battery 4ea)	Power Bank 3ea	Power Bank 6ea	Power Bank 1ea
Dimensions (W x D x H, mm)	400 x 220 x 530	450 x 160 x 620	460 x 140 x 640	200 x 100 x 250
Weight (excl. devices and batteries)	8.73 kg	3.50 kg	3.59 kg	0.49 kg
Power rating	19V / 10.5A / 199.5W	-	-	-
Cooling fan	0	0	-	-

XCAL-Manager Server based automated 5G network measurement solution

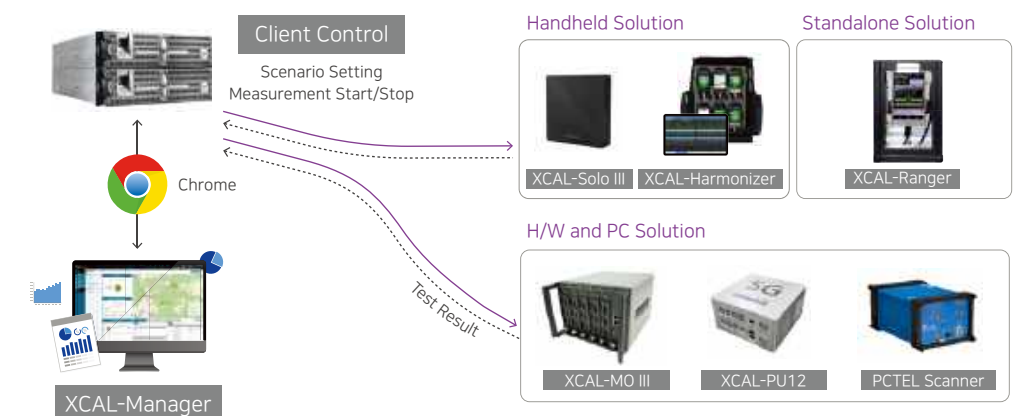
XCAL-Manager is a server-based automated measurement and analysis solution that offers fully systematic and continuous remote control, real-time monitoring, and analysis of measurement results. It provides an optimization solution that allows measurements to be conducted without limitations of time and location, with a fully automated system facilitated through a centralized server, eliminating the need for on-site engineers. XCAL-Manager maximizes measurement efficiency while minimizing costs. Moreover, it supports various measurement and analysis tasks such as base station capacity measurement, beamforming performance measurement, and handover performance analysis, essential for 5G network performance evaluation.

Features

- * Control XCAL Field solution remotely and monitor real-time status and RF information
- * Check and Stabilize the base station performance through various types of Load tests
- * Save time & cost for log analysis by classifying massive volume of log files according to test purpose

Functions

- * **Centralized management**
 - : Share test scenario and settings
 - : Alarm function when error occurs
- * **Monitoring**
 - : Check the location and RF information of test UE on the map
 - : Check field environment in real-time
- * **Autonomous measurement**
 - : Perform automated measurement via measurement schedule setup
 - : Manage measurement condition via automatic measurement termination option
 - : Easy Field test with Drive route function
- * **Statistics analysis**
 - : Check measurement result in real-time
 - : Provide automatic statistics via customer setup



Main



Various Report Types



Analysis



In-building Test

XCAL-Ranger

Unattended automated test solution for remote site

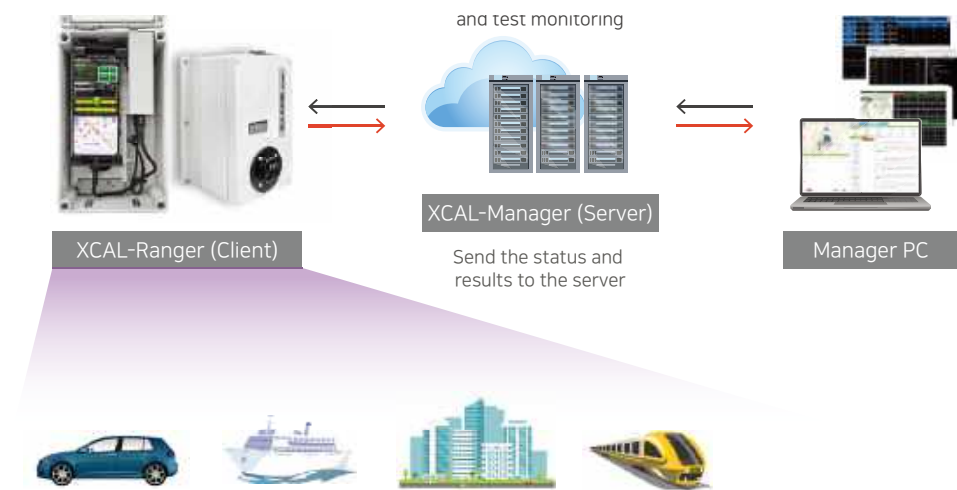
XCAL-Ranger is the perfect solution for unattended automatic measurement. It installs a smartphone into a robust XCAL-Ranger hardware, enabling flexible deployment for large-scale measurements at remote sites. Additionally, it seamlessly integrates with the XCAL-Manager platform, offering remote control and log file data storage on the server. XCAL-Ranger ensures accurate and efficient measurements without the need for constant human intervention.

Features

- * 24/7 measurement
- * Reduce manual test costs
- * Continuous data collection
- * Enhanced and wider coverage network testing

Functions

- * **Auto recovery feature**
: Automatically performs recovery for errors during measurement
- * **Status report**
: Reports current device status for remote monitoring
- * **Automated call**
: Supports various types of measurement including Voice, VoLTE, FTP, HTTP, Youtube, etc.
- * **Schedule for measurement**
: Provides various schedule feature to perform automated measurement according to the configured schedule
- * **Automated Log file management**
: Log files are uploaded to the server and deleted from the device automatically



Title	Specification
Power Input	5 VDC (Normal), 9V, 15V
Power Consumption	Max: 1.5W + a (Max 45W)
Power Input Connector	USB C-Type
Phone Interface	USB C-Type Cable
Enclosure Material	Aluminum / PC (Polycarbonate)
Size	240 x 56 x 150 (mm, W x H x D)
Weight	1.75kg (without wall bracket)

XCAP

PC based powerful analysis solution

XCAP is a robust and highly configurable analysis solution designed to extract, analyze, and generate reports from data collected in XCAL. It is available as a standalone platform or an enterprise-grade client-server solution, supporting all wireless standards and major third-party data formats. By automating the entire network post-processing and troubleshooting workflow, XCAP minimizes OPEX. Developed by engineers for engineers, it offers a comprehensive range of standard-specific KPIs, ensuring ease of use, configuration, and maintenance. Continuously evolving based on user feedback and incorporating major feature upgrades, XCAP, in conjunction with XCAL, provides an unparalleled combination of sophistication and simplicity to enhance your network performance.

Features

- * Efficient analytics by providing DM logs in various types of result data
 - : Comparison analysis by mobile/network/technology
 - : Visualize service and network-level performance geospatially
 - : Display GPS information
 - : Trend analysis and complex statistical analysis

Functions

- * **Analyze collected information**
: Analyze and Diagnose data collected in real time such as RF environment
- * **Call performance analytics**
: Displays wireless environment values in graphs, maps, tables, and statistics
- * **Synchronizing**
: Easy to analyze the radio wave section by comparing data such as graphs, maps, tables, and app status based on time
- * **In-building analytics**
: Display and analyze wireless environment measurement values by time/section in buildings
- * **Check Logging/packet message**
: All messages from the chipset can be checked.
: L1, L2, L3(RCC/NAS), TCP/IP, etc.
- * **Main tree function**
: Provide Graph, Map, Table, CDF/PDF



XCAP-Cloud

Cloud based collaborative analysis solution

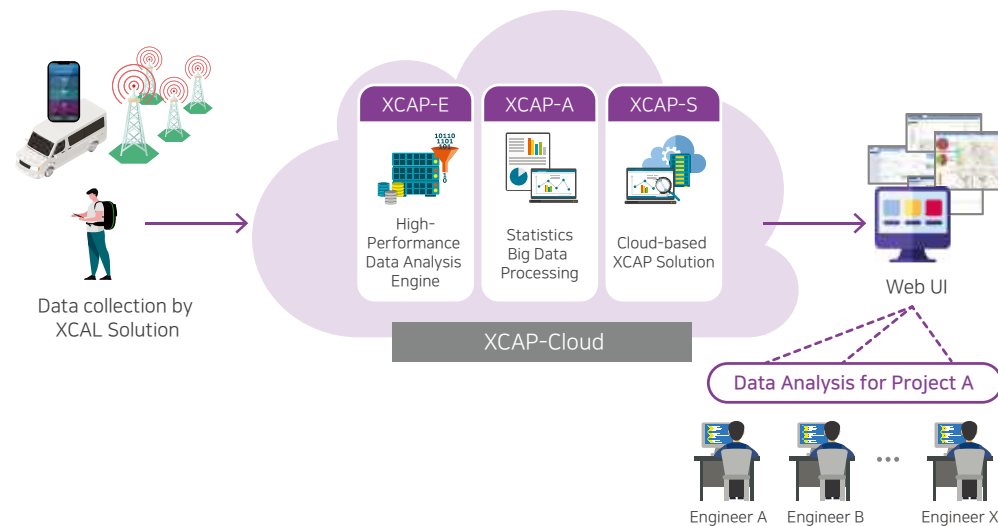
XCAP-Cloud is a collaborative analysis solution designed for mobile network optimization. Users can harness the power of XCAP on the cloud to perform statistical analysis on vast amounts of data. The analysis results can be shared in detail with colleagues. XCAP-Cloud offers a diverse range of dashboard formats, including tables, graphs, and geo-mapping, enabling comprehensive data visualization. It facilitates the collection, storage, and management of big data, allowing for systematic improvement of mobile network KPIs. Technical engineers can easily analyze data using the web-based packet viewer and SQL editor. With seamless integration with other server based solutions like XCAL-Manager and XCAL-RO, XCAP-Cloud maximizes usability without the need for high-end on-premises PCs or servers for analysis processing.

Features

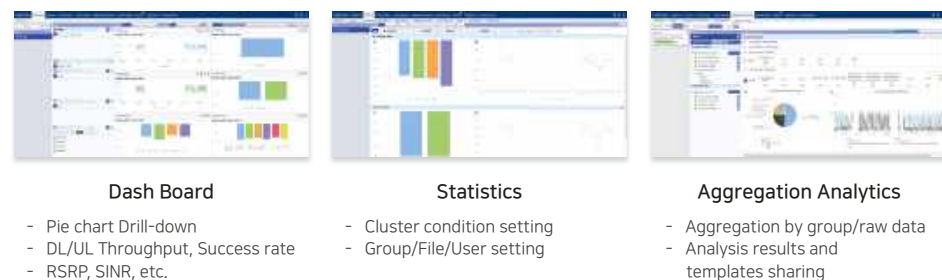
- * Ultimately compelling cloud analysis solution
- * Convenient and Agile analysis
- * Robust data management solution
 - : Managing and mining massive data quickly and easily
- * Reduce OPEX
- * Compatible with various chipset logs

Functions

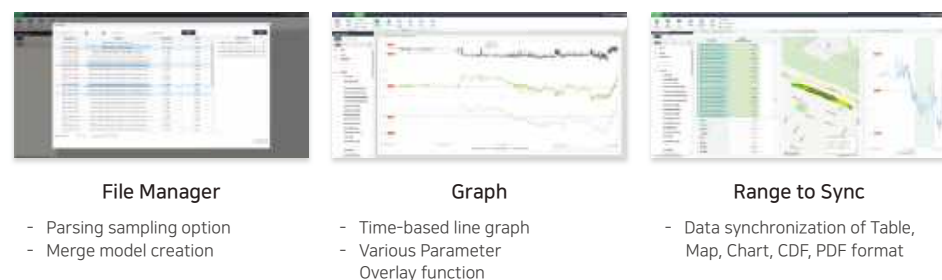
- * Custom Statistical analytics
 - : Support for custom query UI and SQL editing function
- * Detailed analytics per model unit
 - : Automatic analytics of data and report generation
 - : Cloud system-based data analytics
 - : Map, Table, Graph, Chart analytics same as PC version
- * Custom Report
 - : Pie, Bar, Line, Map chart and Excel table report function
 - : Create a report according to the template set by the user
- * Web based Packet viewer
 - : Packet decoding and analytics function
 - : Flow graph
 - : DRX/DRM file parsing



XCAP-A



XCAP-S



XCAL-Air

Drone-based Airspace Network Test Solution

XCAL-Air is a drone-based solution designed to assess the quality of airspace networks. This aims to ensure communication for Unmanned Aircraft Systems (UAS) and Urban Air Mobility (UAM) operational flight at altitudes of up to 600m. XCAL-Air is equipped with Accuver Network measurement devices including XCAL-Solo III and XCAT-IXA 2x C, along with a scanner. It can also be employed for assessing signals and detecting signal leaks within Private 5G zones. Furthermore, we offer a server-based drone control and measurement solution called XCAL-Manager Air. By mapping real-time measurement data onto a 3D map, you can analyze signal performance visually and intuitively.

XCAL-Air

Drone-based network measurement solution

- * 3D location-based 5G Network KPIs collection
- * Durable mounting and waterproofing for 1500 ft testing
- * Real-time network measurement for high-speed UAM
 - : signal strength, signal quality, throughput, latency, etc.
- * Support for various types of network measurement devices
 - : XCAL-Solo III, XCAT-IXA 2x C, Scanners

XCAL-Manager Air

Server-based measurement & control automation solution

- * Central control system for managing and scheduling remote tests conducted by XCAL-Air
- * Identify 5G coverage gaps and facilitate data-driven decisions for airspace 5G Network
- * Assign drone missions and pre-configure routes based on test scenarios
- * Comprehensive analysis of RF, messages, and protocols
- * Real-time network performance monitoring on 3D Map

XCAL-Air



XCAL-Manager Air



	XCAL-Air	Type 1	Type 2	Type 3
Incl.		XCAL-Solo III Smartphone Scanner	XCAL-Solo III 3ea Smartphone 3ea	XCAT-IXA 2x C Smartphone
Usage		Aerial network optimization Interference Monitoring Spectrum/Cell scanning	Aerial network optimization Network Benchmarking	Interference Monitoring Base station inspection
Technology		3G/LTE/5G	3G/LTE/5G	3G/LTE/5G
Weight		13 lbs	13 lbs	16.5 lbs
Max. measurement time (independent of drone operation)		Depend on Battery (e.g. FTP test: 4h / 10,000mAh Battery)	Depend on Battery (e.g. FTP test: 4h / 20,000mAh Battery)	3h 50m

TEST & MEASUREMENT SOLUTION (XCAT)

enables base station management, construction, test and maintenance

It is a solution for 5G and 4G Base station management, construction, test and maintenance.

Cell Site Maintenance






Lab Automation






Load and Capacity Test






Lightweight and portable Test & Measurement solution for base station measurement and maintenance

-  Portable & Lightweight
-  Easy to Use
-  Cloud based Monitoring Feature

Test Solution that allows the user to test and optimize the network without having to go to the field by configuring the actual wireless environment of the field in the Lab

-  Field test Environment in the Lab
-  Automated Test Results
-  Cost effective Solution

Load & Capacity Test of Base station through multiple device connection

-  System Test
-  Stress Test
-  Regression Test



Cell Site Maintenance

XCAT-CAN

XCAT-IXA

Lab Automation

XCAT-MAIS

XCAT-Smart Shield

XCAT-AIS C

Load and Capacity Test

XCAT-MTS

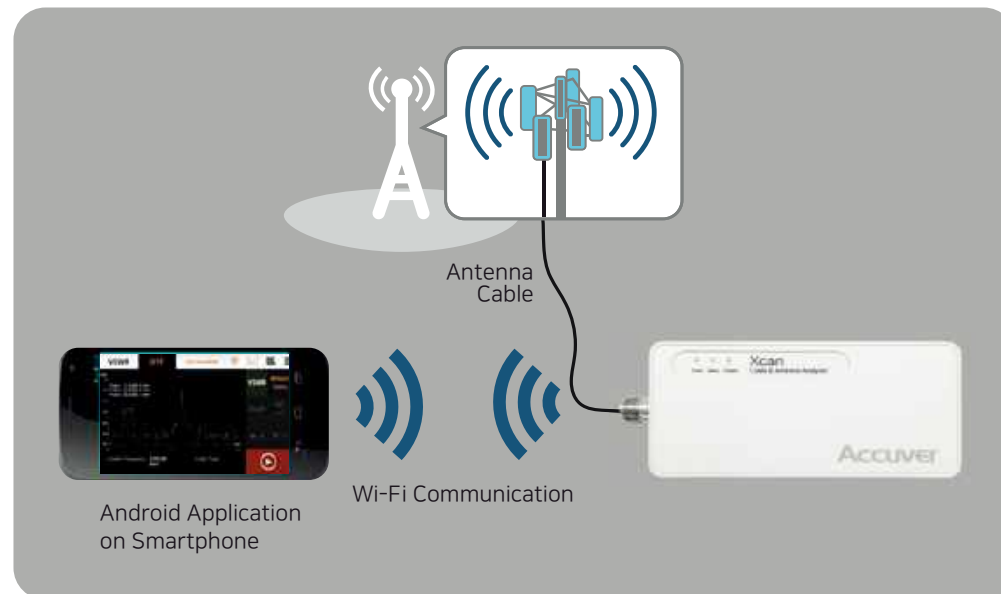
XCAT-CAN

Cable and Antenna analyzer for accurate measurement

XCAT-CAN is a handy solution for maintaining and troubleshooting wireless communication test sites. Designed for the convenience of field engineers, it combines cable and antenna analyzers in one device. XCAT-CAN supports various measurements including VSWR/Return loss, DTF, and CWG. With its lightweight and portable design, field engineers can easily carry it wherever it's needed. Utilizing state-of-the-art measurement technology, XCAT-CAN enables fast and highly accurate measurements.

Features

- * Wide frequency range
- * Fast and highly accurate measurement
- * Very light and compact design
- * Immediate diagnosis and troubleshooting
- * Easy to operate and convenient to use
- * Simple upgrade by S/W download
- * Rechargeable battery operated
- * USB interface for Wi-Fi dongle and host communication



Item	Specification
Frequency range	650MHz ~ 3.8GHz
VSWR range (resolution)	1.01 ~ 65.00 (0.01)
DTF Max. measurement range	500m (Max Loss 50dB)
Connector Type	N Type (Female)
Connection	Wi-Fi, USB
GUI	Android device
Battery capacity	3,200mAh
Calibration	Open, Short, Load
Size	80 x 196.7 x 20.2 (mm, W x H x D)
Weight	510 g

XCAT-IXA

Cloud based portable spectrum analyzer

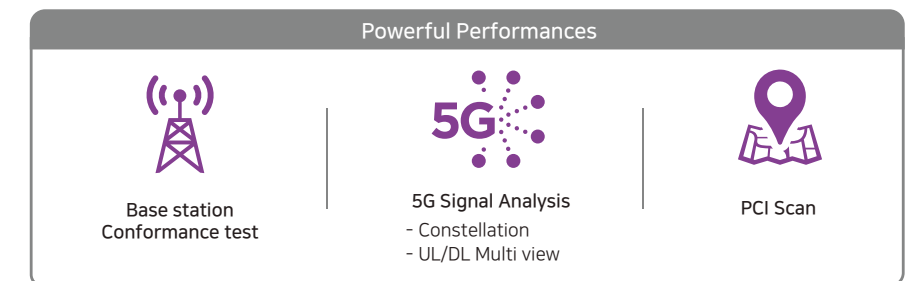
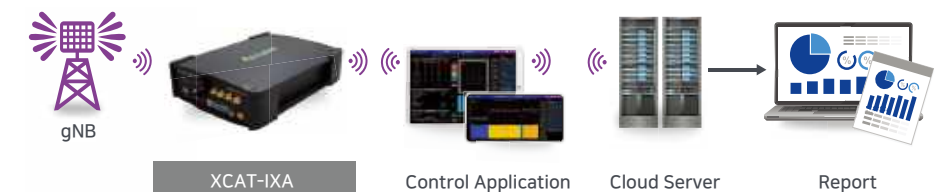
XCAT-IXA is a portable real-time spectrum analyzer that supports General Spectrum Feature, PCI Scanning Feature, and Multi-Viewer Feature. With a separate display, XCAT-IXA enables seamless connectivity to any Android device, which can serve as a display and controller. This advanced solution integrates with a cloud server, providing autonomous measurement capabilities. XCAT-IXA provides an opportunity to reduce OPEX and CAPEX across the network lifecycle, from deployment to maintenance and upgrades, by eliminating upfront equipment costs and staffing expenses.

Features

- * High portability
- * Easy to use
- * Upload measurement result to cloud server and monitor it through Remote PC in real-time
- * PCI scan of neighbor cell
- * Minimize human error by automated measurement
- * OTA(Over the Air) measurement

Functions

- * Spectrum Analyzer
 - : Spectrum / Channel Power / OBW / ACLR / SEM / SE
- * Modulation Analyzer
 - : 5G NR : Constellation / Error Vector / Multi View / SSB Location Auto Search
 - : LTE : Constellation / Error Vector / MQS
 - : WCDMA : Code Domain Power / Modulation Accuracy
- * PCI scan (5G NR + LTE)
- * Autonomous measurement (5G NR, LTE, WCDMA)
- * Application in the Tablet PC (Android OS)
- * Cloud SA management: Interoperable with cloud server (Optional)



Spec Item		XCAT-IXA 1x C	XCAT-IXA 2x C
Frequency	Operating Frequency	300KHz~7.5GHz	9KHz~20GHz
Exterior	Exterior		
	Type	Separate display	Separate display
	Tablet S/W	Same	Same
	Weight	1.54 kg	3.4kg
	Size	W105.8xH51xD255.5 mm	W190.0xH65.5xD267.6 mm
Battery	Operating time	1 hrs 30 min	3 hrs 50 min
Frequency Reference	AgingRate/Year	± 0.5 ppm/Year	± 0.5 ppm/Year
Sweep	Mode	Sweep & FFT (Hybrid)	Sweep & FFT (Hybrid)
Bandwidth	Demd. BW	~ 100MHz	~ 100MHz
SSB Phase Noise (@ 1GHz, 100 kHz offset)		-101.2 dBc	-101.2 dBc
Amplitude	Measurement Range	DANL ~ +20dBm	DANL ~ +20dBm
	Amplitude Accuracy	±1.3dB (±0.5 dB typical)	±1.3dB (±0.5dB typical)
Dynamic range		> 106 dB @ 3.5GHz	> 110 dB @ 2.4GHz
Second Harmonic Distortion (@ 4 GHz)		<-70dBc typical	<-70dBc typical
DANL (@ 4 GHz)	Pre-amp OFF	-144dBm typical	-147dBm typical
	Pre-amp ON	-161dBm typical	-162dBm typical

XCAT-SmartShield

Shield box solution with Over-The-Air technology applied for MIMO testing

XCAT-SmartShield offers an advanced shielding solution for precise RF testing of single UE. It ensures accurate maintenance of the UE's RF environment as specified by the Test Manager. With XCAT-SmartShield, you can achieve a 1-to-1 connection between base station (BS) and user equipment (UE) antennas in a lab area. It transmits a reference signal through probe antennas and measures RSRP in a field MIMO environment. With the increasing trend of UEs lacking externally accessible antenna connectors, XCAT-SmartShield simplifies the process by providing a virtual 1-to-1 wireless connection between the base station and the UE.

Features

- * Accurate measurement without external interference with excellent shielding performance
- * Minimize OTA (Over the Air) connection loss by applying near-field coupling method
- * Reliable MIMO testing with reduced cross-talk between antenna ports
- * Easy smartphone installation and minimal change in characteristics due to installation
- * Built-in MOS test module

Functions

- * Support Sub6 and mmWave (up to 40GHz)
- * Smartphone Test without external antenna connector
- * No interference from outside (Isolation > 60dB)
- * Support long time 5G NR test



Item	SmartShield 1x G2	SmartShield 4x G2
Frequency Range	Up to 6 GHz	Up to 40GHz
RF ports	8 ports (SMA female)	12 Ports (2.92mm female)
Connection loss	< 20 dB	< 30 dB
Cross-talk	< -20 dB (Support the cross-cancelling)	TBD
Shielding Performance	> 60 dB	> 60 dB
Max Input Signal Level	+ 20 dBm	+ 20 dBm
Smart functions	Cross-talk cancelling (with MAIS)	Cross-talk cancelling (with MAIS)
	Maximum Received Signal Power	Maximum Received Signal Power
Dimensions	196 x 101 x 500.8 (W x H x D, mm)	220 x 137 x 526.2 (W x H x D, mm)
Acceptable UE Size @ max	180 x 95 x 11 (W x H x D, mm)	180 x 95 x 11 (W x H x D, mm)
Weight	9.3 kg	12.4 kg

XCAT-Shield Box

Shield box with OTA technologies facilitates accurate MIMO testing for multiple UEs or cell

XCAT-Shield Box is engineered to optimize OTA signal performance for various network equipment, including small cells and multi-UEs. It features excellent shielding effectiveness to minimize interference and ensure precise measurements. It includes side-mounted antennas with adjustable direction to minimize OTA pathloss. A ball joint enables precise control over polarization and pointing. Antennas can be mounted on either side of the shield box, offering flexible configuration options. This design ensures stable radio wave reception and stable signal performance for OTA applications.

Features

- * High-performance RF absorbers minimize internal interference.
- * Adjustable mounts for antennas and DUTs ensure optimal signal quality and facilitate seamless MIMO testing.
- * Built-in MOS testing module.
- * Cooling fan prevents DUT overheating.
- * Provides a user-customizable I/O panel.
- * 19-inch rack mountable

Functions

- * Support for Sub-6 GHz and mmWave (up to 40 GHz).
- * Supports simultaneous testing of multiple UEs
- * Ensures optimal conditions for MIMO testing through flexible mount configurations.
- * Cooling prevents overheating and ensures consistent performance during long-duration testing.



Title	G2		G3
Frequency	100 ~ 6000 MHz / mmWave, 40GHz		
RF Ports	<ul style="list-style-type: none"> RF: 8-Port [SMA(F) outside and SMA(F) Inside] GPS: 1-Port[SMA to SMA] 	<ul style="list-style-type: none"> RF: 18-Port[SMA(F) outside and SMA(F) Inside] GPS: 1-Port[SMA to SMA] 	<ul style="list-style-type: none"> RF: 8-Port[SMA(F) outside and SMA(F) Inside] GPS: 1-Port[SMA to SMA]
Shielding Effectiveness	<ul style="list-style-type: none"> 100 to 3,000MHz : >70dB 3,000 to 6,000MHz : >60dB 	<ul style="list-style-type: none"> 100 to 3,000MHz : >80dB 3,000 to 6,000MHz : >70dB 	<ul style="list-style-type: none"> 100 to 6,000MHz : >90dB
Inner Reflectivity	<ul style="list-style-type: none"> 1,500 to 2,000MHz : <-10dB 2,000 to 6,000MHz : <-15dB 	<ul style="list-style-type: none"> 1,500 to 2,000MHz : <-10dB 2,000 to 6,000MHz : <-15dB 	<ul style="list-style-type: none"> 1,500 to 2,000MHz : <-10dB 2,000 to 6,000MHz : <-15dB
Interface	<ul style="list-style-type: none"> IO Panel: 16-port [USB 3.0 Type-A], 2-port [Ethernet(RJ45)], 1-port [Power(Universal)], 1-port [Optic], 1-port [DC Banana], 1-port [Coaxial con(F type)] 	<ul style="list-style-type: none"> IO Panel: 4-port [USB 3.0 Type-A], 2-port [Ethernet(RJ45)], 1-port [Power(Universal)], 1-port [Optic], 1-port [DC Banana], 1-port [Coaxial con(F type)] 	<ul style="list-style-type: none"> IO Panel: 16-port [USB 3.0 Type-A], 2-port [Ethernet(RJ45)], 1-port [Power(Universal)], 1-port [Optic], 1-port [DC Banana], 1-port [Coaxial con(F type)]
Dimension	483 x 600 x 444mm (19" x 10U)	1049 x 773 x 617 mm	483 x 905 x 575 mm (19" x 13U)
Weight	<50kg	<95kg	<50kg

XCAT-RTT

Mass Production RF Testing

Test automation system leveraging PXIe backplane bus technology, scalable for wireless communication equipment production. It integrates Signal Analyzer, Signal Generator, and RF Calibration functions to measure the RF performance of DUTs (Devices Under Test) using a non-signaling method.

Features

- * Integration of Signal Analyzer, Signal Generator, RF Calibration, and Verification functions into a single device
- * Simultaneous measurement of multiple DUTs to reduce production time and costs
- * Reduced test time, leading to lower production costs
- * Supports an instantaneous bandwidth of 1.2 GHz, enabling measurements for 802.11be (Wi-Fi 7) and wideband

Functions

- * Wireless Signal Measurement : LTE , 5G , WIFI
- * Cell Information : PCI/Group ID/Sector ID
- * Power Information : SS-RSSI/RSRP/RSRQ/SINR
- * Signal quality : Frequency Offset, Time Offset, Evm per channel
- * Test automation
- * Measurement of RF component characteristics
- * Storage and transmission of I/Q data



XCAT-RTT

Mass Production RF Testing

Item	SA specification
Input frequency range	10MHz to 8.0GHz
Bandwidth	400MHz to 1200MHz
Input power range	<div>▪ Max +25 dBm (CW)</div> <div>Max DANL</div> <div>- Preamp On : -162dBm</div> <div>- Preamp Off : -145dBm</div>
Input power accuracy	± 1.0 dB typical
Quantization	16 bits
Spectral flatness	± 1.5 dB (320 MHz), Typical
Inherent spurious floor	≤ -50 dBc typical
EVM	≤0.5% @ 5GNR 100MHz 256QAM
Adjacent Channel Leakage Ration(ACLR)	<-50dBc @NR 100MHz
Frequency Error	≤ ±0.2 ppm calibrated
VSWR	1.6 : 1

Item	SG specification
Output frequency range	10MHz to 8GHz
IF bandwidth	400MHz to 1200MHz
Output power range (CW)	Max +15 dBm (Unleveled +20 dBm)
Output power accuracy	± 1.0 dB (15dBm to -90 dBm) typical
Spurious (in-channel)	0 dBm output power ≤ -65 dBc (200 MHz)
RF Output Non-harmonic Spurs	<div>▪ Typical @0dBm</div> <div>10 kHz ≤ Offset < 100 kHz : < -70 dBc</div> <div>100 kHz ≤ Offset < 1 MHz : < -65 dBc</div> <div>1 MHz ≤ Offset : < -60 dBc</div>
Spectral flatness	± 1.5 dB (320 MHz), Typical
Phase Noise	< -130dBc/Hz (100kHz offset @ 1GHz, 0 dBm)
Carrier leakage	≤ -50 dBc typical
EVM	≤0.5% @ 5GNR 100MHz 256QAM
VSWR	1.7 : 1

XCAT-SMU

Source/Measurement and Battery Production

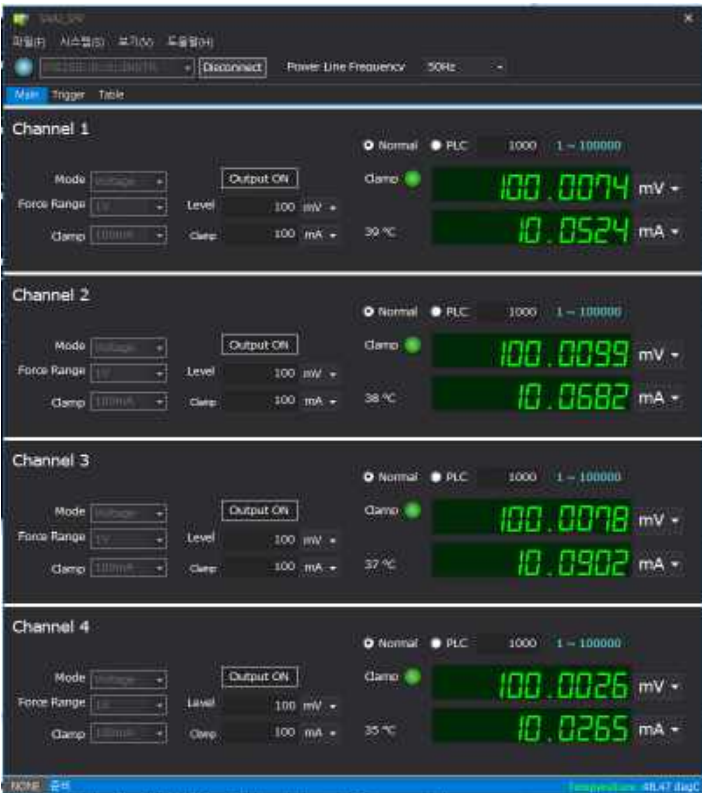
A source/measurement device utilizing PXIe backplane bus technology, freely expandable, integrates the functions of a DMM (Digital Multimeter), power supply and current source to support battery performance measurement tests.

Features

- * Integration of DMM (Digital Multimeter), power supply and current source into a single device.
- * Supports 4 channels simultaneously, reducing production time and costs.
- * Flexible configuration with a single-slot design.

Functions

- * Simultaneous and precise sourcing and measurement of voltage and current
- : Sourcing and measuring current (10μA ~ 3A) and voltage (±1.0V, ±6.0V) simultaneously.
- * User-specific test with API
- : Minimizes unnecessary communication between the host computer and SMU through List Mode.



XCAT-SMU

Source/Measurement and Battery Production

Title	Spec.
DC Voltage Range	±1.0V , ±6.0V
DC Current Source and Sink Range	10uA/ 100uA/ 1mA/ 10mA/ 100mA/ 1A/ 3A
Voltage Programming Range	±1.0V , ±6.0V
Voltage Programming and Measurement Resolution	±1.0V : 200nV
	±6.0V : 0.8uV
Voltage Programming and Measurement Accuracy	0.02% + 850uV
Current Programming Range	10uA/ 100uA/ 1mA/ 10mA/ 100mA/ 1A/ 3A
Current Programming and Measurement Resolution	10μA : 2pA
	100μA : 20pA
	1mA : 200pA
	10mA : 2nA
	100mA : 20nA
	1A : 200nA
Current Programming and Measurement Accuracy	3A : 400nA
	10uA : 0.05% + 5nA
	100uA: 0.05% + 50nA
	1mA : 0.05% + 500nA
	10mA : 0.05% + 5uA
	100mA : 0.05% + 50uA
Max Sample Rate	1M S/s per Channel
	60 VDC
	4 Channel
Protection Range	
VSWR	

XCAT-MAIS

Massive MIMO air interface simulator

XCAT-MAIS is a leading air interface simulation solution that allows engineers to replicate realistic radio wave propagation in laboratory environments. Its system architecture is fully scalable and flexible, with individual phase and amplitude adjustment per path, replicating the wireless channel environment of UEs. XCAT-MAIS offers various real-world test scenarios such as fading, path loss, mobility, and M-MIMO simulations. The operator can simulate complex field tests in the lab using XCAT-MAIS.

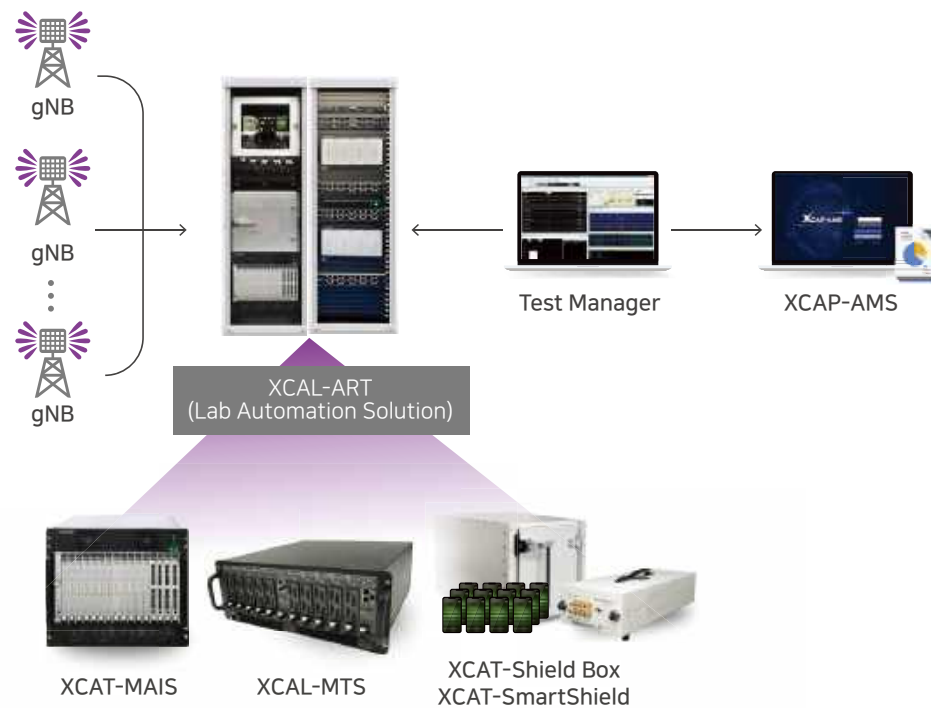
XCAT-MAIS can be seamlessly integrated and utilized as a Lab Automation Solution (XCAL-ART) in conjunction with other Accuver solutions, including XCAL-MTS, XCAT-SmartShield, Test Manager, and XCAP-AMS.

Features

- * Automated self-calibration for CR satisfaction (5G)
- * User-adjustable amp/phase
- * Monitor BS/UE inputs & outputs at each RF port
- * User-defined scenarios and associated channels
- * Automatic/manual call set up
- * Selectable KPI logging and in-depth Analyzer
- * Easy & simple system expansion by adding slot cards

Functions

- * Support latest wireless technology
 - : 5G, Massive-MIMO, Beamforming
- * Simulate various test environment
 - : Scattering, Reflection, Diffraction simulation by Multi-path fading channel
- * Distributed lab environment
 - : With MAIS, BS and UE don't have to be co-located, allowing international users to log in and access system resources at any time



Title	Spec.
Frequency	300 ~ 6,000MHz
Channel Bandwidth	100MHz
Insertion Loss	0dB
Path Loss control	0 ~ 89.5 dB, 0.5 dB step
System Delay	3.1 us
Calibration tolerances	ΔAmplitude < 0.35 dB, ΔPhase < 3 degree using external calibration hardware
RF Interface	Scalable by 4, up to 64 per chassis, TRX port
Max. power	+0 dBm (CW) per RF port (input/output)
Channel Models	ITU Ped. A/B, Veh. A/B, EPA, EVA, ETU, HST, 2D/3D SCM
Multi-path	8 per connection, each ranges from 0 to 25 us
Doppler Frequency	Up to 450 Hz (1350 Hz for HST)

XCAT-AIS C

Compact Multi-Cell / Multi-UE Air Interface Simulator

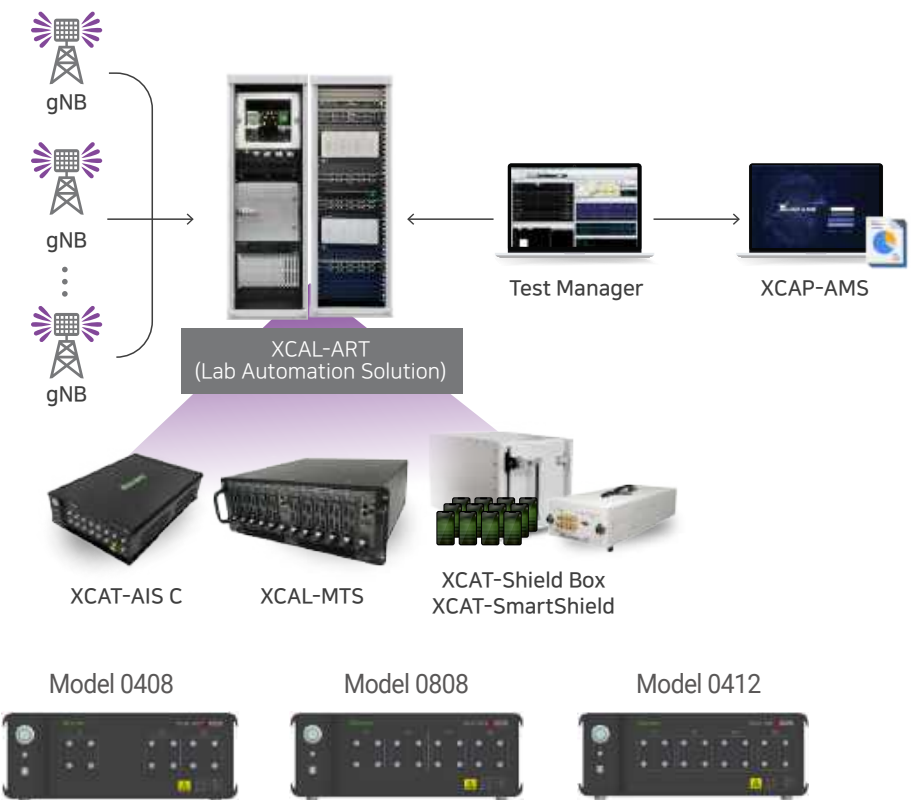
XCAT-AIS C is a compact channel emulator used to verify and evaluate the performance of various air interface technologies. Its compact design enables convenient testing and monitoring in any location, thanks to its portability and easy installation. This digital attenuator supports multiple models and operational modes, making it adaptable to a wide range of testing scenarios.

Features

- * Supports 4x4, 2x2, and 1x1 port configurations for single and multiple antenna testing.
- * Supports Normal Mode and Reverse Mode for various testing environments.
- * Supports an attenuation range up to 90dB, facilitating various tests.
- * Compact configuration for easy installation and mobility.
- * Easy scenario manipulation with a GUI-based Test Manager.
- * Provides API and SCPI for diverse control functions.

Functions

- * Support signal attenuation test.
- * Support Handover test.
- * Support Link Budget test.



Title		Spec.
Frequency		600 ~ 6,000 MHz
RF Signal Input Range		< +20dBm
Attenuation Range		< 90dB
Minimum Step Size		0.5dB
Minimum Setting Time		< 0.5s
Power Consumption		9V / 200mA Below
Size		216 x 82 x 310.3 (W x H x D, mm)
Weight	0808	4.5 kg
	0408	5.0 kg
	0412	6.5 kg

XCAL-MTS

Real UE based Load & Capacity Testing Solution
up to 40 UEs

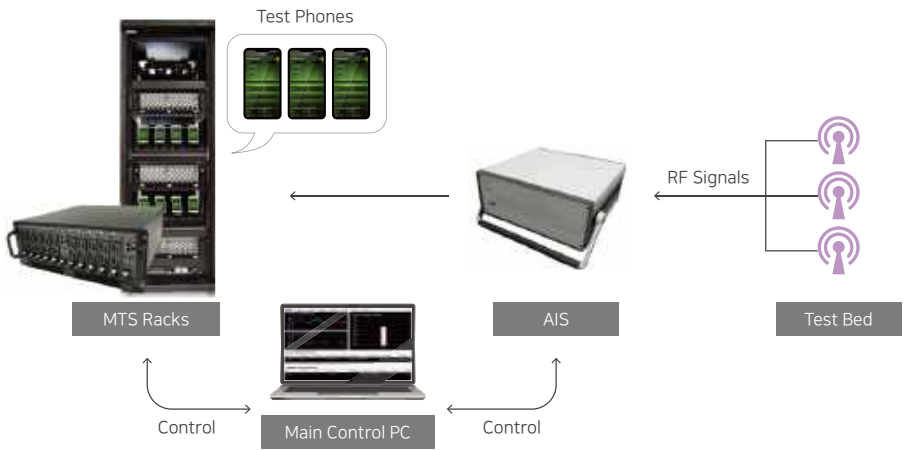
XCAL-MTS is specifically designed for load and capacity testing, supporting up to 40 simultaneous UEs connectivity. This powerful tool empowers users to troubleshoot, analyze, and benchmark wireless network environments. With its intuitive GUI, XCAL-MTS offers various types of connections specialized for system verification. This innovative solution provides a user-friendly interface with features like customizable graphs, message filtering, and visible and audible alarm indications. It enables users to monitor and identify problems in real-time, ensuring optimal network performance.

Features

- * Support various wireless communication test including 5G NR
- * Support up to 30 UE benchmarking test simultaneously
- * Scalable by Rack mount
- * Control multiple XCAL-MTS S/W via Test manager

Functions

- * Load & Capacity test with multiple UE
- * Field Test simulation in LAB environment by interworking with XCAT-MAIS
- * Measure various application including Layer 1, 2, 3
- * QoE (Quality of Experience) Measurement
- * Support Autocall and MOS Test
- * Display Voice/Data quality test result and RF information in real-time



Item	Specification (per shelf 1EA)
Power Input	AC(100V~240V, 49~61hz)
Power Consumption	Max. 1000W
CPU	Intel Core i7-7600U (Kabylake)
Memory	16GB
SSD	512GB
OS	Windows 10
OS Recovery	Supported
External Interface	I-Gbps Ethernet x 2 (per Section)
Phone Interface	USB 6-ports USB 3.1(Gen2) 3A, 5V (Max.)
Size	483 x 133 x 256 (W x H x D, mm)
Weight	14.5kg



AI/BIG DATA ANALYTICS SOLUTION

enables monitoring the status of all mobile communication network in real-time and maintaining the best quality.

We provide a platform and application that can analyze large volumes of telecommunication data in real-time based on AI/ML algorithms to monitor QoS, predict performance, and forecast potential issues.

Big Data Analysis



Big Data Platform



AI/ML



Monitors failures and customer service quality in real-time across 5G and 4G telecommunication networks, collecting, analyzing, and providing the results

Leveraging SQL and GPU acceleration for optimal performance, this solution offers deep data insights and fast analysis. It integrates with various databases to provide user-defined dashboards through both web service and standalone applications, allowing easy visualizations without developer assistance

Uses machine learning and a large-scale database to assess streaming video quality and QoE through live capture, without the need for the original video

Big Data Analysis

AI/ML

AEGIS

VQML™

Big Data Platform

AEGIS-O

XDB

AEGIS-A

XDV

AEGIS-CLAIR

AEGIS

Big data analytics solution

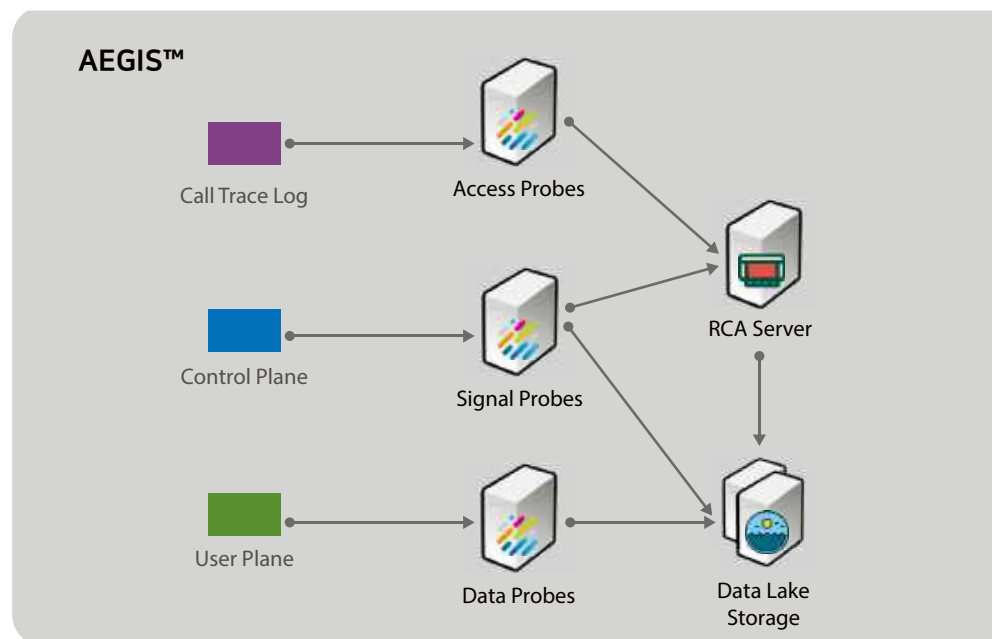
AEGIS empowers network operators to measure and analyze the end-to-end (E2E) performance of 3G, 4G, and 5G networks, including private LTE/local 5G, on a unified platform. By collecting real-time information from diverse network interfaces such as N2, N3, N4, X2, S1 MME, S11, S1U, AEGIS filters, connects, collects, and structures the data, providing an accurate representation of network performance. With AEGIS, network operators can optimize their operations and deliver exceptional service quality.

Features

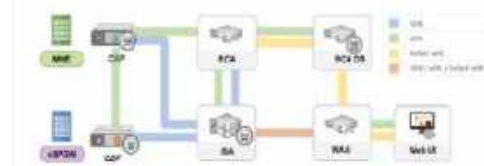
- * 3G/4G/5G Core Network Big data measurement/ analytics
- * Measure Signal and Data of main system(based on IMSI)
- * Provide an integrated solution for measurement monitoring and statistical analytics down to the cell level
- * Time Synchronization of all systems by using GPS

Functions

- * Provide auto recovery feature when error occurs
- * Provide data that compares the number of 5G service experienced customers and traffic usage by access NW
- * Provide a function to compare the traffic ratio for each access network type (gNB, eNB) of 5G customers
- * Provide a function to compare the number of customers by 5G phone
- * Provide a function to compare heavy user traffic share and gNB / eNB traffic ratio



Seamless Monitoring



Root Cause Analysis (RCA)



Data Service Analysis



VoLTE Analysis

AEGIS-O

O-RAN End-to-End Test & Measurement Platform

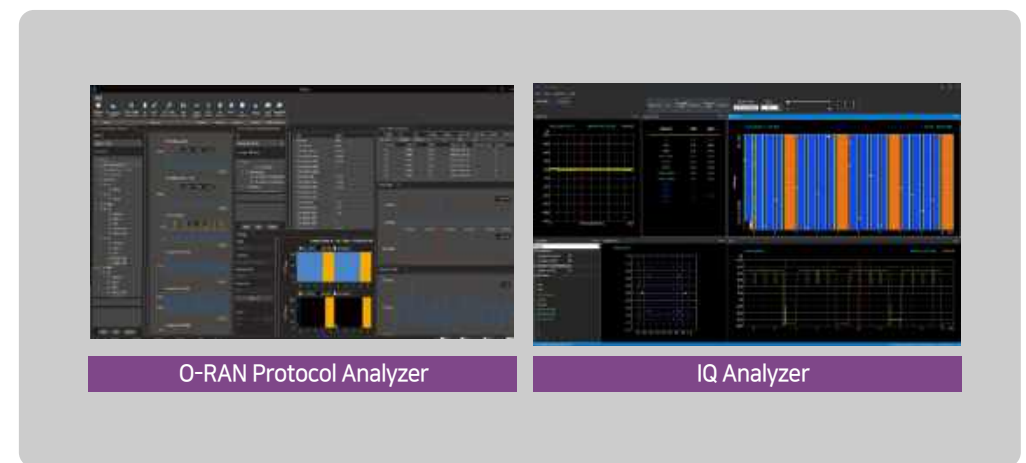
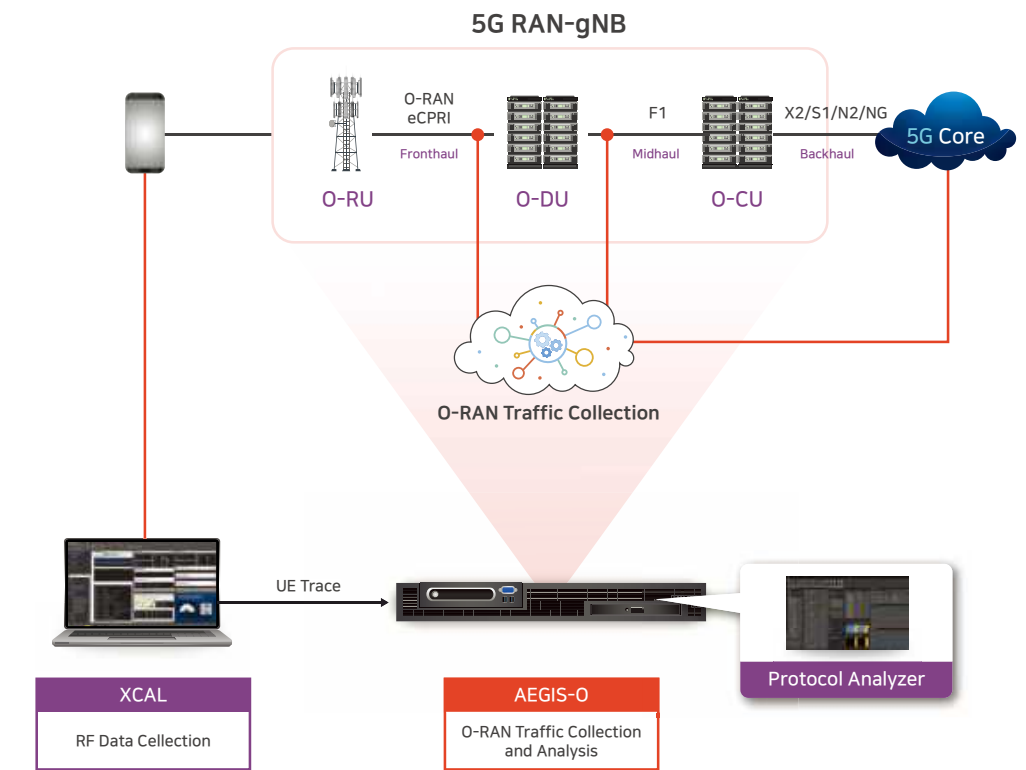
AEGIS-O is a comprehensive End-to-End network testing and analysis solution specifically designed for 5G O-RAN systems. With a focus on key network nodes on fronthaul, midhaul, and backhaul, AEGIS-O enables network performance monitoring and protocol conformance analysis. By collecting and analyzing control plane and user plane data using prove module, AEGIS-O provides valuable insights into the network's performance. Real-time packet tracer and user-friendly graphical charts provide intuitive understanding across all network interfaces. Additionally, AEGIS-O supports O-RAN Test Case of O-RAN Alliance and offers signal analysis capabilities through IQ Data decoding. With AEGIS-O, network operators and RU, DU, CU vendors can assess and optimize their 5G networks and equipment, ultimately improving the overall network performance.

Features

- * Simultaneous analysis of UE, O-RAN Fronthaul/Midhaul/ Backhaul
- * Signal and spectrum analysis through IQ data analysis
- * Objective performance calculation and comparative analysis of various vendor products
- * O-RAN Test Case support
- * Message flow check in real-time or post-processing
- * Beamforming/Scheduling analysis with UE's measured data

Functions

- * **O-RAN Protocol Analyzer**
 - : Collaborative Analytics with UE and Front/Mid/Backhaul packets
 - : Control XCAL and IQ-Analyzer
 - : Integrated dashboard
 - : 5GC Packet analysis
 - : O-FH Performance KPIs analysis
 - : O-FH CUS-Plane Delay/Jitter/ PDV measurement
 - : UE Monitoring, O-FH Analysis
- * **XCAL**
 - : UE trace analysis & Report
 - : Call script based automation
- * **IQ-Analyzer**
 - : Power vs Time
 - : RB MAP
 - : Constellation
 - : Error Vector Spectrum, etc.



AEGIS-A

End-to-End High-performance Data Analytics Platform

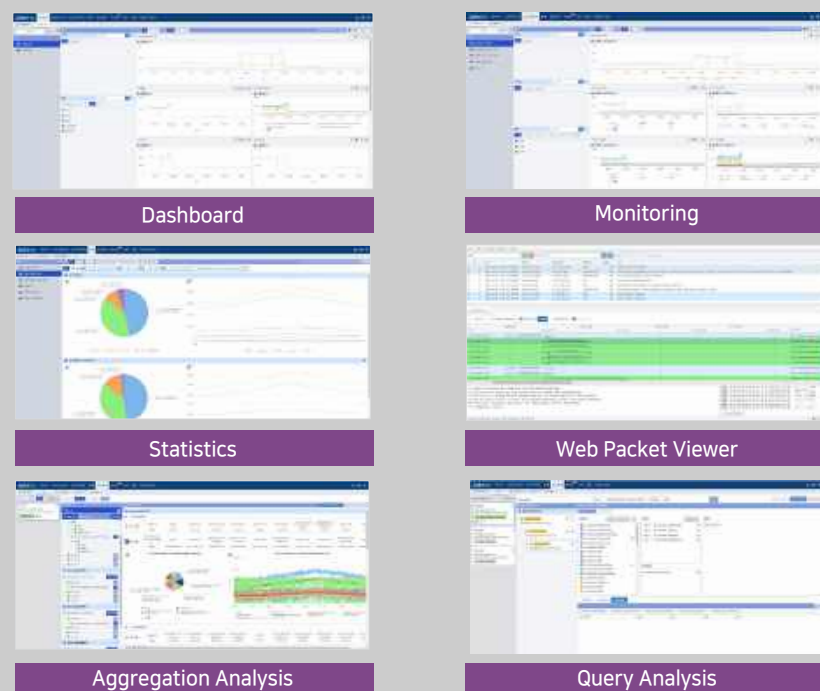
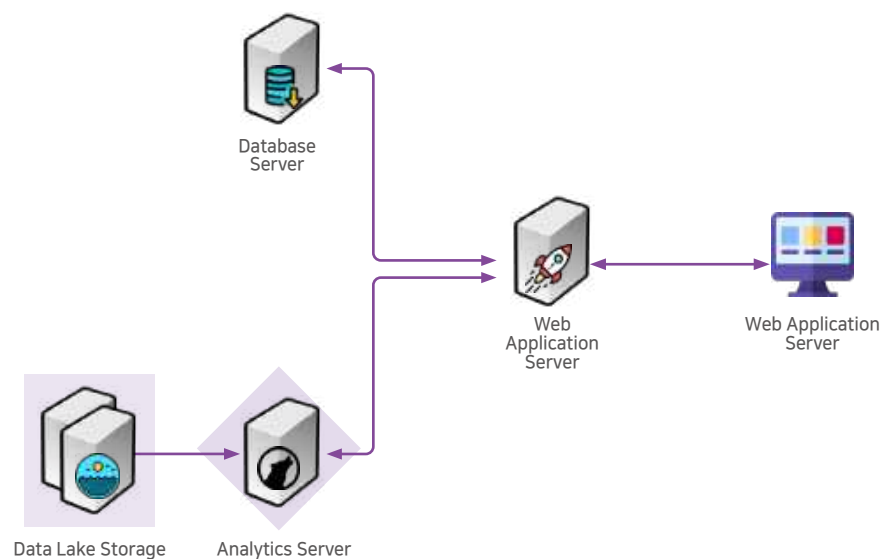
AEGIS-A is a powerful, built-in data analytics platform that enables network operators to efficiently identify specific data conditions from vast amounts of mobile network data. It empowers operators to measure and analyze the end-to-end performance of their 4G and 5G (NSA/SA) networks on a single, integrated platform. With its high-performance capabilities, AEGIS-A helps operators gain valuable insights and optimize their network operations.

Features

- * Monitoring performance and operating status of major network nodes in real-time
- * Check service status and trends based on various KPIs
- * Easy to understand subscriber trend by service statistics
- * Root cause analysis for defect calls
- * Call Trace function that can track call flow of each subscriber
- * Built-in a high-performance data analytics engine and support user-defined queries

Functions

- * **Aggregate Analytics**
 - : Inquire and analyze multi-collection sections at the same time
 - : Share analysis condition/result with other user
 - : Provide detailed analysis with Drill-Down for analysis results
- * **Report**
 - : Report via Pie, Bar, Line, Map chart and Excel table
 - : Generate report according to the user template
- * **Web based Packet viewer**
 - : Packet decode and analytics solution
 - : Support Packet Flow Chart
 - : Support raw data measured by DM



AEGIS-CLAIR

Wireless access network quality management and analytics solution

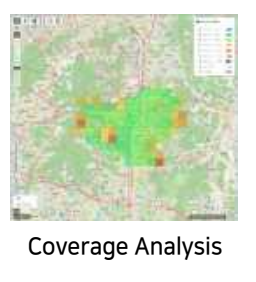
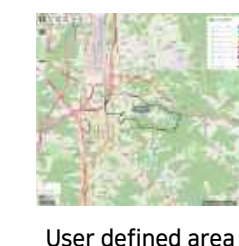
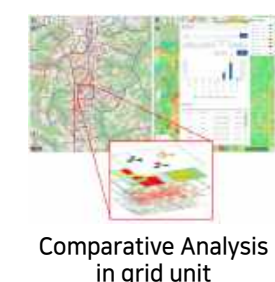
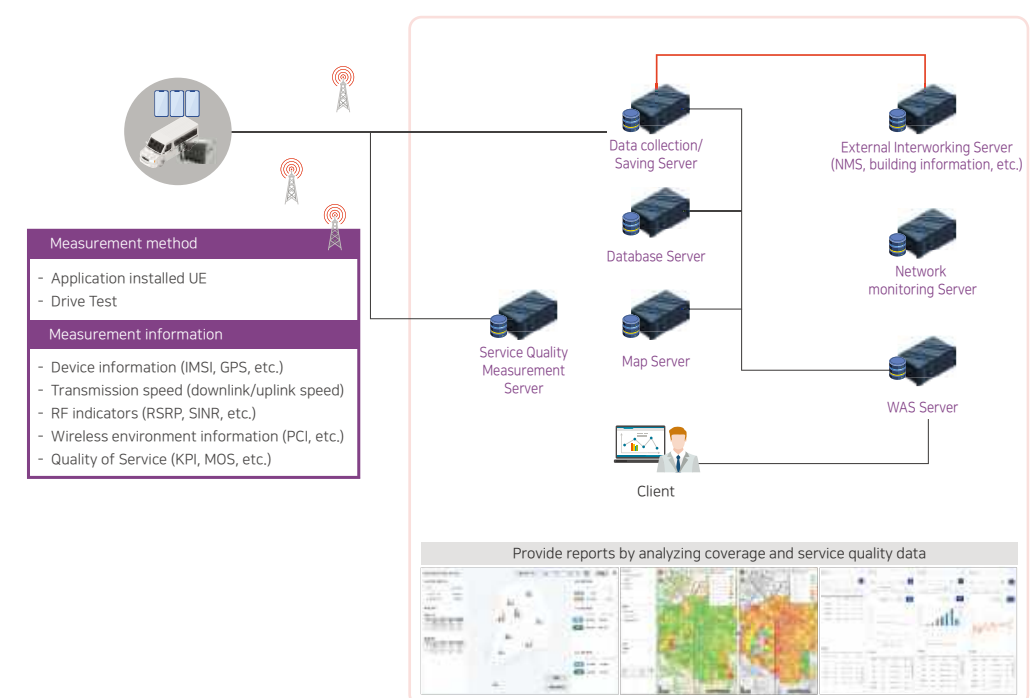
AEGIS-CLAIR is location-based wireless access network quality management and analytics solution using cloud computing/AI technology.

Features

- * Mobile quality information collection through dedicated app, measurement equipment
- * Setup scenario (collection cycle, collection start time, result upload time, etc.)
- * GIS integrated analytics
- * Statistical analytics within the domain

Functions

- * **GIS Analytics**
 - : Analytics of Key quality indicators in 75 x 75 grid units
 - : Time series trend analytics by time and period
 - : Spatial comparative analytics by region or major locations of interest
- * **Call Analytics**
 - : PCI Pollution
 - : MOD3 Collision
 - : PCI Distribution
- * **Failure Analytics**
 - : Sudden Drop RSRP
 - : Sudden Drop SINR
- * **Coverage Analytics**
 - : Interference
 - : RAN sharing
 - : Poor RSRP
 - : Poor SINR
- * **Statistics and monitoring**
 - : Statistical value per Indicator (Min. / Max. / Average / Count)
 - : Correlation analytics between Indicators
 - : Distribution graph



XDB

High-speed Big data processing and real-time analysis platform supporting GPU-accelerated parallel processing

XDB unleashes unprecedented speed with its support for massive parallel processing using SQL and GPU-accelerated operations. By leveraging both CPU and GPU, it delivers optimal performance, enabling comprehensive analysis of complex and massive data. With its ability to handle large data and deliver high speed, XDB serves as the ideal SQL engine, unlocking deeper data value and providing invaluable business insights that were previously hard to obtain.

Features

- * Support distributed massive parallel processing based on GPU-accelerated computation
- * Analyze all areas of complex and massive data at high speed through the combination of CPU and GPU
- * Analyze even petabyte-level large-capacity data
- * Reduce data collection and query execution time
- * Support standard SQL and various programming languages, APIs, and data sources

Functions

- * MPP (Massively Parallel Processing)
 - : Distributed parallel processing architecture using multiple GPU cards
 - : Process the SQL query in milliseconds and return the result
- * Distributed Architecture
 - : Accelerate big data processing by implementing Multi Node and Multi GPU
 - : Efficient use of resources with distributed architecture load balancing consisting of a master node and multiple data nodes
- * Open Architecture
 - : Easy integration with various devices and platforms
- * Standard SQL
 - : Compatible with ANSI-92 SQL / Excellent query performance
 - : Support complex aggregate operations and federated queries



Key of Data Processing	
Columnar	<ul style="list-style-type: none"> - Based on open Columnar Memory Format - Save Raw data in column unit - Improved performance by reducing memory usage and data migration when performing queries
Metadata	<ul style="list-style-type: none"> - Functions equivalent to indexes in existing databases - Storing data-related information such as min, max, datatype - Minimize unnecessary I/O, CPU, and memory usage through data skipping
Zero Copy	<ul style="list-style-type: none"> - Minimize the copy process that occurs when data is transferred over the network - Saving CPU and memory resources - Fast data processing and efficient memory management
Chunking	<ul style="list-style-type: none"> - Separate and store large columnar data into small chunks - Process for efficient use of GPU resources - Suitable for performing ad-hoc queries
Compression	<ul style="list-style-type: none"> - When data is stored, it automatically compresses according to the data tendency - Efficient use of disk space with high-performance compression technology - Improve database performance and reduce usage time
GPU Caching	<ul style="list-style-type: none"> - Utilizes CPU memory and GPU memory together for data storage - Minimize access latency by keeping specific data in GPU high-bandwidth memory - Ideal for real-time big data processing

XDV

Big Data Analysis & Visualization Solutions

XDV is a powerful visualization tool designed to simplify data analysis by connecting to various database systems, allowing users to create custom dashboards without needing technical expertise or developer support. It is available as both a web service and a standalone application, making it accessible for both individual and enterprise use. XDV enables quick, intuitive data exploration and offers powerful features for handling complex data processing tasks, making it an ideal solution for users seeking to gain insights from their data efficiently.

Features

- * Accessible via the web without installation
- * Content created online can be shared, distributed, and collaborated on
- * User data is securely stored in the server's database management system
- * Available as an easy-to-use app
- * Available on various OS
- * If connected to a database and network, anyone can execute unlimited queries

Functions

- * Various DB integration
- * Data Querying
- * Dashboard design
- * Data visualization
- * Result reporting
- * low-code platform for non-developers



Web Service



Application

Key of Advantages	
Big Data Compatibility	<ul style="list-style-type: none"> - Supports various data sources and DB connections with high - speed interfaces for JDBC and big data - Integration with major universal databases (Oracle, PostgreSQL, etc.).
Dynamic Dashboard Layout	<ul style="list-style-type: none"> - Define dashboard layout formats for convenient and efficient object placement - Change object placement methods with layout options - Enhance flexibility of the dashboard UI
SQL Query Editor	<ul style="list-style-type: none"> - Provides SQL query editing capabilities for comprehensive data analysis - Allows SQL syntax testing within the XDV environment - Query results from the editor are immediately usable in dashboards
Various Visualization Options	<ul style="list-style-type: none"> - Offers a variety of data visualization options - Enables quick comparison and intuitive analysis of datasets through visualization - Supports various forms of visualization, including line, bar, pie charts, and heatmaps
JavaScript-Based Scripting	<ul style="list-style-type: none"> - When data is stored, it automatically compresses according to the data tendency - Efficient use of disk space with high-performance compression technology - Improve database performance and reduce usage time
Custom Reports	<ul style="list-style-type: none"> - Provides data analysis results in user-friendly report formats - Supports standard and custom report templates - Facilitates efficient data analysis and visualization tasks

VQML™

AI based Video Quality Assessment Solution

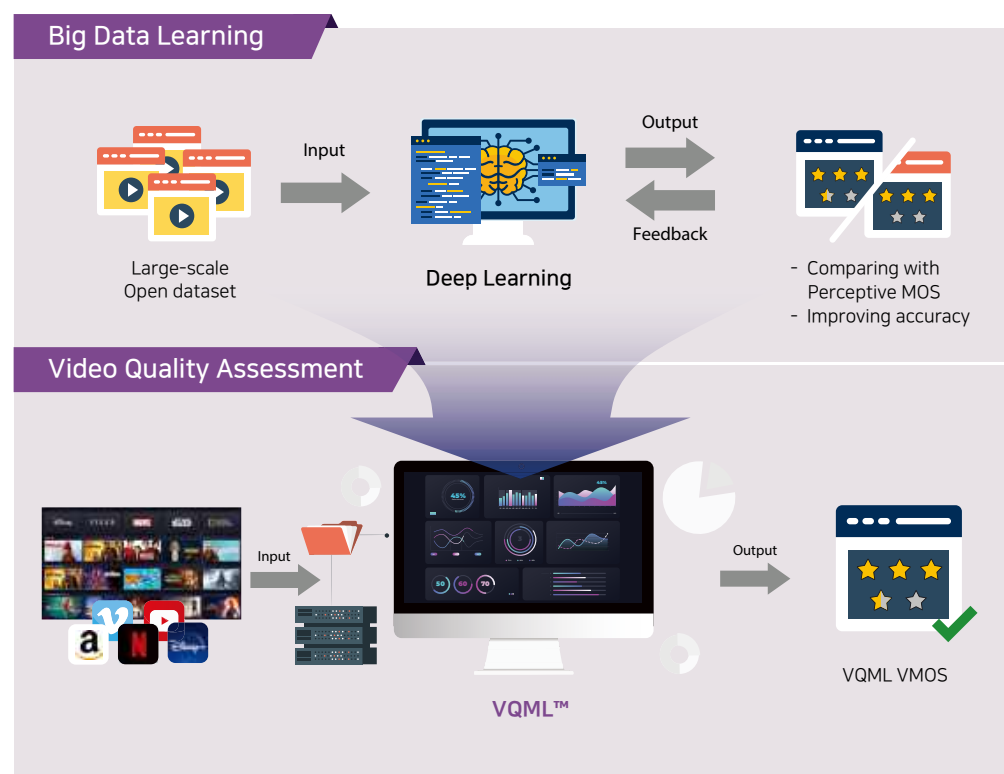
VQML is a comprehensive video quality assessment solution for the streaming video ecosystem. Leveraging ML (Machine Learning) technology and a large-scale database, VQML compares straming video and V-MOS. Operating in the NR (No Reference) method, VQML assesses QoE through live video capture, eliminating the requirement for preparing the original video. With VQML, users can easily and systematically monitor video quality, ensuring a seamless streaming video quality.

Features

- * Easy QoE check
- * No more complicated procedure
(No reference needed)
- * Real-time processing
- * Measurement based on Deep Learning
- * Learning by highly reliable Database
- : VQML learns the patterns of video and MOS value from the MOS training database built through large-scale viewer survey

Supported services

- * YouTube
- * Facebook messenger
- * Skype
- * WeChat
- * What's app
- * Zoom
- * Google Meet
- * Microsoft Teams
- * OTT service
- : Netflix, Disney, Apple TV, etc.



Title	Description
Reference method	NR (No Reference) based Video Quality Assessment
AI Model	A unique CNN(2)+GRU model with reference to published papers
Image classification	ResNet Algorithm and Deep Learning <ul style="list-style-type: none"> - The pixels of the original image are used as they are without any processing
Model learning	Learning by open database <ul style="list-style-type: none"> - Large-scale database (KoNVid-1k, KoNVid-150k) - Netflix public dataset (VMAF)
Accuracy	86% of correlation between VQML and KoNVid-1k dataset 89% of correlation between VQML and VMAF

SMALL CELL SOLUTION (QUCELL®)

Experience Effortless Installation and Improved Communication Quality Anytime, Anywhere

Our Small Cell Solution minimizes shadowed areas and ensures robust data processing capacity in high-density or data-demanding indoor areas. It also complies with the customer's diverse usage, requirements, and service deployment plan.



Extend LTE and 5G NR coverage simultaneously

1 5G NR Sub-6
4G LTE

2 CU+DU+RU
DU+RU

3 NSA/SA

Small Cell Solution for Citizen's Broadband Radio Service (CBRS)

1 5G NR Sub-6

2 CU+DU+RU
DU+RU

3 NSA/SA

Small Cell Solution capable of establishing LTE networks in various environments with easy installation and operation

1 Residential/SOHO

2 Enterprise

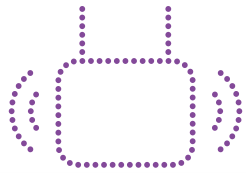
3 Outdoor

Management Solution for Small Cell monitoring, control and operation

1 Quick and Easy Installation and Operation

2 Comprehensive monitoring through KPI tracking

3 Scalability



5G + LTE Combo / 5G Small Cell

CBRS Small Cell (under development)

QUCELL® 5G LTE INT

QUCELL® 5G CBRS

QUCELL® 5G LTE EXT

4G Small Cell

QEMS

QUCELL® 4G Home

QEMS

QUCELL® 4G Enterprise

QUCELL® 4G Outdoor

5G + LTE Combo Small Cell Solutions

Single box supports both LTE and NR

- The single-device installation enables both LTE and 5G NR service at the same time.

Flexible service deployment options help the service rollout plan

- Various operation modes are supported according to the service plan (LTE only, 5G NSA, 5G SA)

Offers flexibility and freedom for deployment

- 5G NR NSA to 5G NR SA mode migration via a software upgrade, no hardware change needed.

Features

- * 5G + LTE (optional)
- * All-In-One (CU+DU+RU)
- * Split Option.2 (DU+RU)
- * Plug & Play

Functions

- * 5G NR Sub-6
- * NSA, SA
- * 2x2 MIMO
- * IEEE1588v2 (PTP)

Item	QUCELL® 5G + LTE Combo INT	QUCELL® 5G + LTE Combo EXT
Product		
Technologies	5G NR Sub-6 4G LTE	5G NR Sub-6 4G LTE
Max. TX Power	5G: 24dBm / path (Max.) 4G: 20dBm / path (Max.)	5G: 21dBm / path (Max.) 4G: 18dBm / path (Max.)
Bandwidth	5G: up to 100MHz 4G: up to 20MHz	5G: up to 100MHz 4G: up to 20MHz
RF Antenna	Internal antennas	External antennas
Cell Capacity/Layers	2T x 2R	2T x 2R
Max. Modulation	5G: DL(256QAM), UL(64QAM) 4G: DL(64QAM), UL(64QAM)	5G: DL(256QAM), UL(64QAM) 4G: DL(64QAM), UL(64QAM)
Synchronization	5G: IEEE1588v2 (PTP), SyncE 4G: NTP, PTP	5G: IEEE1588v2 (PTP), GPS 4G: NL, NTP, GPS
Interface	<ul style="list-style-type: none"> ▪ Backhaul (Internet) : 1G/2.5Gbps Ethernet x 1 ▪ Management : 1Gbps Ethernet x 1 ▪ Reset Pin Hole 	<ul style="list-style-type: none"> ▪ Backhaul (Internet) : 1G/2.5Gbps Ethernet x 1 ▪ Management : 1Gbps Ethernet x 1 ▪ GPS Antenna Port : SMA Female x 1 ▪ Reset Pin Hole
Power Input	PoE++	External 24V DC
Power Consumption	< 65W	< 65W
Size / Weight	260 x 260 x 55 (mm, w/o mount bracket) / <2.7Kg	254 x 254 x 54 (mm, w/o mount bracket) / <2.8Kg
Environmental	<ul style="list-style-type: none"> ▪ Operating : -5 ~ 40°C, 10 ~ 95%RH ▪ Storage : -20 ~ 70°C, 10 ~ 95%RH 	<ul style="list-style-type: none"> ▪ Operating : -5 ~ 40°C, 10 ~ 95%RH ▪ Storage : -20 ~ 70°C, 10 ~ 95%RH
IP Grade	IP30	IP30
Mount Type	Wall, Ceiling	Wall

4G Small Cell Solutions

QUCELL 4G Small Cells deliver a comprehensive solution for various customers. For home users, it provides clear voice call and better security than Wi-Fi. Automated, self-configuring Small Cell installation provides full bar LTE signal inside of homes and LTE shadow areas.

It also ideal for enterprises to use high-speed, full bar LTE signal and reliable wireless service and the total cost of operation for enterprises can be reduced. QUCELL 4G Small Cells enhance service improvement and offer considerable savings in urban areas and rural areas that require extend service coverage and offloading traffic.




Features

- * Verified performance by global commercialization
- * Build a stable and secure LTE network
- * Plug & Play
- * Build LTE network in various environment (Home, Enterprise, Outdoor, etc.)

Functions

- * LTE TDD/FDD support
- * TR-069 Interface
- * 2 x 2 MIMO
- * VoLTE support



Item	QUCELL® 4G Home	QUCELL® 4G Enterprise	QUCELL® 4G Outdoor
Product			
Max. TX Power	~ 100 mW	~200 mW	20W / 40W
Bandwidth	Max. 20MHz	Max. 20MHz	Max. 20MHz
MIMO	2 x 2 MIMO	2 x 2 MIMO	2 x 2 MIMO
Max. Active Users	8/16	16/32	32/64 (Roadmap)
Interface	RJ-45 1 port (WAN-backhaul)	RJ-45 1 port (WAN-backhaul)	Optic / RJ-45 (WAN-backhaul)
Power Input	DC12V (External AC-DC Adaptor)	DC12V (External AC-DC Adaptor)	AC100~220V

CBRS 5G Small Cell Solutions

CBRS(Citizens Broadband Radio System) uses 5G NR to provide data service in shared spectrum of 3.5GHz (3550MHz to 3700MHz). The process of assigning spectrum is automated, with SAS(Spectrum Allocation Servers) coordinating the scheme. QUCELL CBRS Total Solutions are ideal for Internet Service Providers, Neutral Host Providers and Industrial IoT.

It offers secure Private 5G network and enhance the connectivity in a various venues including manufacturers, offices and so on. CBRS FWA will be cost-effective, easy and fast solution than traditional wireless solution.

Features

- * 5G service by using CBRS(Citizen Broadband Radio System) band
- * All-in-One type (CU+DU+RU or DU+RU)
- * Installation cost reduction by PoE++
- * Easy installation with built-in Antenna
- * Plug & Play (with QEMS)

Functions

- * 5G support
- * CBRS Category A
- * 2 x 2 MIMO
- * PoE++ Support
- * SAS interworking
- * Domain IP Protocol support

Item	QUCELL® CBRS
Product	
Frequency Band	n48 TDD (3550 MHz ~ 3700 MHz)
Bandwidth	Up to 40 MHz ¹ (100 MHz TBD)
CBSD Category	Category A
Maximum Tx Power	* Internal: 24 dBm / path (EIRP ≤ 33 dBm) * External: 21 dBm / path (TBD)
MIMO	2T x 2R
# of UEs	32 UEs
Modulation	DL 256 QAM, UL 64 QAM
RF Antenna	2 Antennas (internal or external)
Synchronization	GPS, PTP (IEEE1588v2)
Interface	* Backhaul: 1 G / 2.5 Gbps Ethernet x 1 (w/ PoE++) * Backhaul (Optic): SFP+ 10 Gbps Cage x 1 * Management: 1 Gbps Ethernet x 1 * GNSS: SMA Female x 1
Power Input	PoE++ (IEEE802.3bt) or AC-DC Adapter 24 VDC / 2.5 A
Size / Weight	< 51 W
IP Grade	260 x 260 x 55 (mm) / 2.5 kg
IP Grade	IP30
Mount Type	Wall, Ceiling

QEMS (Qucell EMS)

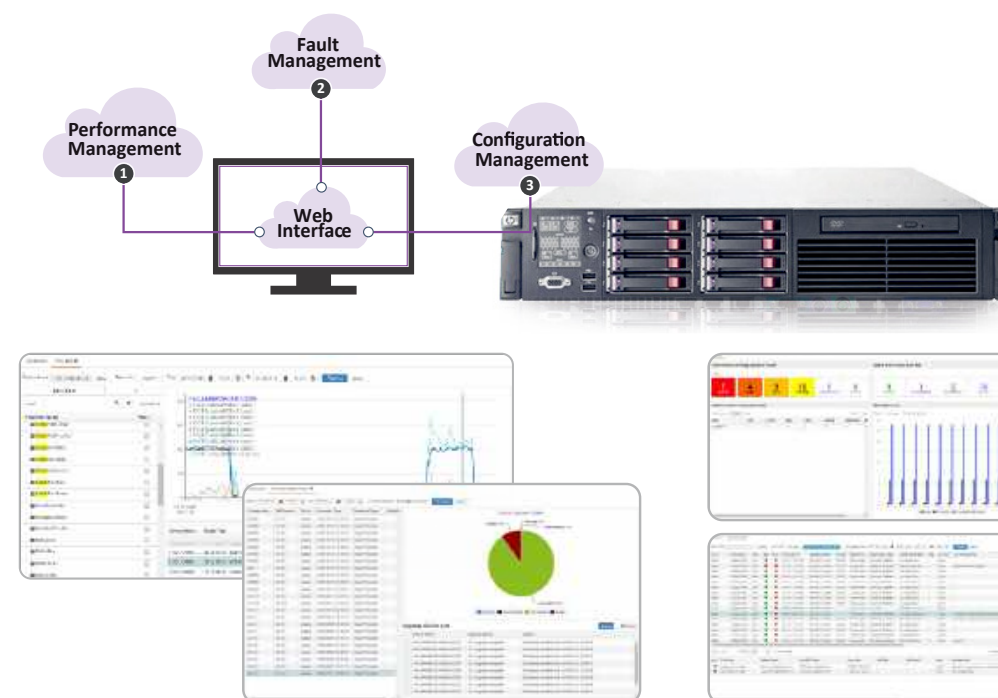
QEMS is a user-friendly software solution that simplifies the monitoring and management of QUCELL Small Cells. With its intuitive web interface, operators can efficiently handle Small Cell operations in real time. QEMS offers Performance Management (PM), Fault Management (FM), and Configuration Management (CM), enabling easy installation and delivering cost savings in terms of CAPEX and OPEX.

Features

- * Intuitive interface for monitoring, managing small cells
- * Large scale real-time data logging for big data analytics
- * Easy configuration parameter management
- * Comprehensive auditing through KPI tracking
- * Scalability to meet customer requirements
- * Charts and graphs support

Functions

- * User interface based on the latest web technology
 - * CM/FM/PM function
 - * Firmware and security management
- [5G]**
Data model
: O-RAN WG 01 standard
: NETCONF/YANG standard
- [LTE data model]**
Data model
: TR-069 standard
: TR-181/TR196 standard



Item	Functions
Configuration Management (CM)	<ul style="list-style-type: none"> - Configuration profile import/export - Auto configuration and provisioning - SW/FW file management and diagnosis - Read and write parameters related to the 5G/LTE stack [5G] gNodeB configuration through the O-RAN WG1 O1 interface [LTE] eNB configuration through the TR-069 RPC
Fault Management (FM)	<ul style="list-style-type: none"> Store all alarms in the database Alarm event filtering/view [5G] Real-time alarm monitoring through the O-RAN WG1 O1 interface [LTE] Real-time alarm monitoring through the TR-069 RPC
Performance Management (PM)	<ul style="list-style-type: none"> Instant view of key statistics through the GUI Line, bar, and pie chart support Export operator-selected statistics in Excel format
Security Management (SM)	<ul style="list-style-type: none"> Protection of sensitive information through encryption Comply with operator's security policy Store all user activity history

V2X SOLUTION

V2V, V2I, and V2P communication in Intelligent transportation system

V2X (Vehicle-to-Everything) solutions enable real-time communication between vehicles, road infrastructure, pedestrians, and other vehicles to enhance traffic safety and efficiency. This technology helps reduce congestion, prevent accidents, and enable smarter traffic management.





Test Solutions

QULINK RSU

QULINK OBU




Provides performance testing capabilities required for the development process of V2X devices (RSU / OBU)

-  V2X DrivingTest System
-  V2X Congestion Generator
-  RSU Performance Test System
-  V2X Application Bench Test System

A roadside system designed for C-V2X signal transmission and reception

-  Traffic optimization
-  Accident Prevention and Warning
-  Emergency Response
-  Predicting infrastructure maintenance

Compact C-V2X signal transmitting and receiving device installed in vehicles

-  Enable V2X communication with vehicles, RSUs, and pedestrians



Test Solutions

WCEX-DRTS

WCEX-CGTS

WCEX-RPTS

WCEX-ABTS

QULINK RSU

RSU

QULINK OBU

OBU

WCEX-DRTS

V2X Basic Safety Message conformance test solution

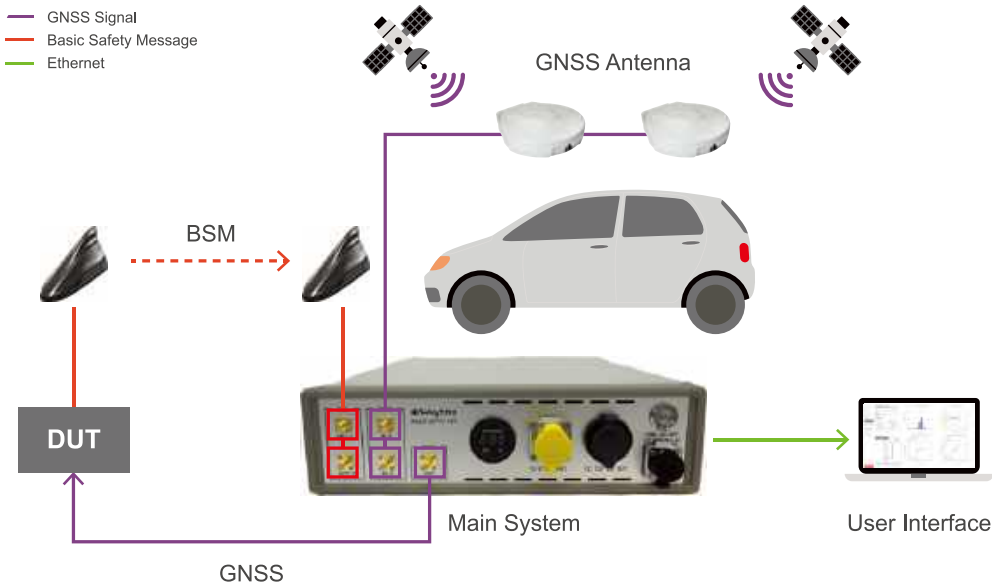
The Driving Test System (WCEX-DRTS) is a conformance testing tool designed to meet the SAE J2945/1 requirements for real-world road testing, specifically for On-Board System Requirements for V2V Safety Communications. This tool uses a V2X packet sniffer equipped with a high-precision GNSS system to analyze the Basic Safety Messages (BSM) received from the Device Under Test (DUT). Upon completion of the test, a detailed and comprehensive report is provided.

Features

- * BSM performance & conformance test solution compliant with SAE J2945/1, J3161/1, J2735
- * Receiving BSM messages sent by V2X OBU in a real vehicle driving environment and assessing message accuracy and conformity to standards
- * USA OmniAir Qualified Test Equipment (Nov. 2023)

Functions

- * Location, Altitude, Direction accuracy
- * Route history and distance (horizontal/vertical distance)
- * Hard braking
- * Renewing certificate
- * Real-time dashboard
- * Automated report generation



Titles		Spec
CPU		Intel Atom x6425E Processor 1.5M Cache, up to 3.00 GHz
Core/Thread		4 core / 4 Thread
Memory		DDR4-3200 16GB
SSD		NVMe SSD 512GB
OS		Ubuntu 22.04
Size		330 x 360 x 90 (W x H x D, mm)
Weight		4.65kg
Ports		GNSS, V2X, Ethernet, Power
DGNSS	Signal	GPS, GLONASS, BEIDOU, QZSS
	Performance	10cm ± 1ppm

WCEX-CGTS

V2X network congestion traffic generator

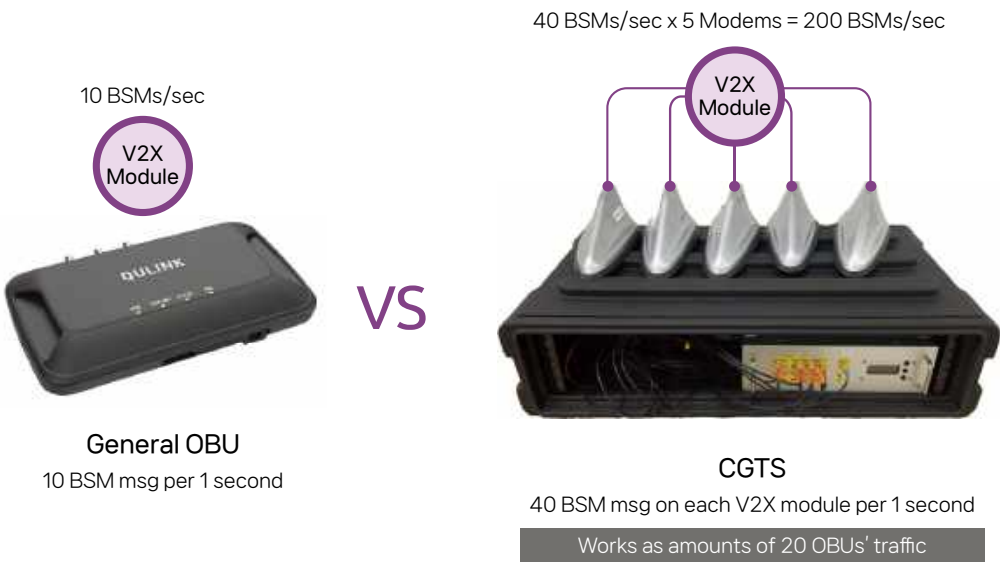
The WCEX-CGTS is a state-of-the-art virtual V2X message transmission test system capable of simulating V2X communication congestion environments. It supports the integration of up to 5 V2X modems and GNSS, providing a comprehensive platform for testing and evaluating the congestion control functionalities of V2X modems. It enables communication stack load testing, making it an essential solution for developers and research institutes aiming to enhance the efficiency and reliability of V2X communication systems.

Features

- * A system for transmitting large volumes of V2X messages to create V2X communication congestion environments
- * Built-in support for up to 5 V2X modems and a GNSS system
- * Used for V2X modem congestion control functionality, communication stack load testing, and more

Functions

- * Compatibility and transition between IEEE 802.11p and 3GPP Rel.14 PC5
- * Up to 200 Hz for static V2X messages (200 messages per second) / Up to 80 Hz for real-time changing BSM (80 messages per second)
- * Analysis of channel congestion impact in scenarios with a high concentration of devices (OBUs)
- * Analysis of adjacent channel interference effects (DSRC & C-V2X)



Titles	Spec
V2X Conformance Test standard	SAE J2945/1, SAE J3161
V2X Radio Standard	KR(ITSK-00137-6), EU(Car-2-Car), US & CN(TBD)
V2X Message Set Standard	KR(KS R 1600), US(SAE J2735), EU(ETSI ITS TBD), CN(TBD)
V2X Message Security	IEEE 1609.2 bundle certificate support (TBD)
Modems in Unit	5
SPS Flow Period in Modem	50, 100, 200, 500 ms
Message Generation Method	Zero Filling, 1-Filling, Random Filling, User Preset, Actual BSM(TBD)
Message Retransmission	Support Blind Retransmission
Unit I/O Port	V2X Main & Sub Antenna pairs : 5 , GNSS Antenna In : 1, 1PPS Out : 1, Ethernet : 1
Power Consumption	110V / 220VAC 1.8A Max
Unit Size (Inc. Exterior Housing)	403.2 x 155.6 x 562.0 (W x H x D, mm)
Unit Weight (Inc. Exterior Housing)	8.62kg

WCEX-RPTS

Roadside unit performance test system

The WCEX-RPTS is a specialized testing system designed to measure the basic performance of Roadside Units (RSUs) deployed on roadways. It ensures compliance with the basic performance requirements set as national standards for Intelligent Transportation Systems (ITS). WCEX-RPTS is an essential solution for verifying the adherence of RSUs to these national standards and has been successfully delivered as the core equipment for basic performance testing to the Korea Expressway Corporation (Kr-EX).

Features

- * A test system for measuring the basic performance of RSUs, including installation standards on roads
- * Tests for compliance with the Ministry of Land, Infrastructure, and Transport's ITS basic performance requirements
- * RSU basic performance testing equipment delivered to Korea Expressway Corporation (Kr-EX)

Functions

- * Performs basic, completion, and periodic evaluations of Roadside Units (RSUs)
- * Equipped with a 4-channel V2X receiver and high-precision GNSS
- * Supports testing of multiple RSUs within a driving section
- * Generates test performance and results, and manages logs through a GUI-based interface



RSU #2 on Upbound Lane



RSU #1 on Down Lane

Titles	Spec
Laptop	Intel I7 2.5GHz, RAM 16GB, SSD 200GB
V2X Radio	WAVE/DSRC, C-V2X
V2X Receiving Performance	PER < 5% for All V2X Channel/Datarate/Speeds(30/60/80kmph)
V2X Test Message Filter	Channel, Datarate, and PSID
V2X Antenna Specification	3dBm(±0.5), Cable:-5.2dBm(±0.26 Loss)/2.5m/2.5
Modems In Unit	4
Modem Group for Test	4x1 or 2x2 or 1x4 (Modem x Channel)
Unit I/O Port	V2X Main & Sub Antenna pairs : 4 , GNSS Antenna In : 1, 1PPS Out : 1, Ethernet : 1
Power Consumption	110V / 220VAC 1.8A Max
Unit Size (Inc. Exterior Housing)	403.2 x 155.6 x 562.0 (W x H x D, mm)
Unit Weight (Inc. Exterior Housing)	8.62kg

WCEX-ABTS

V2X application bench test system

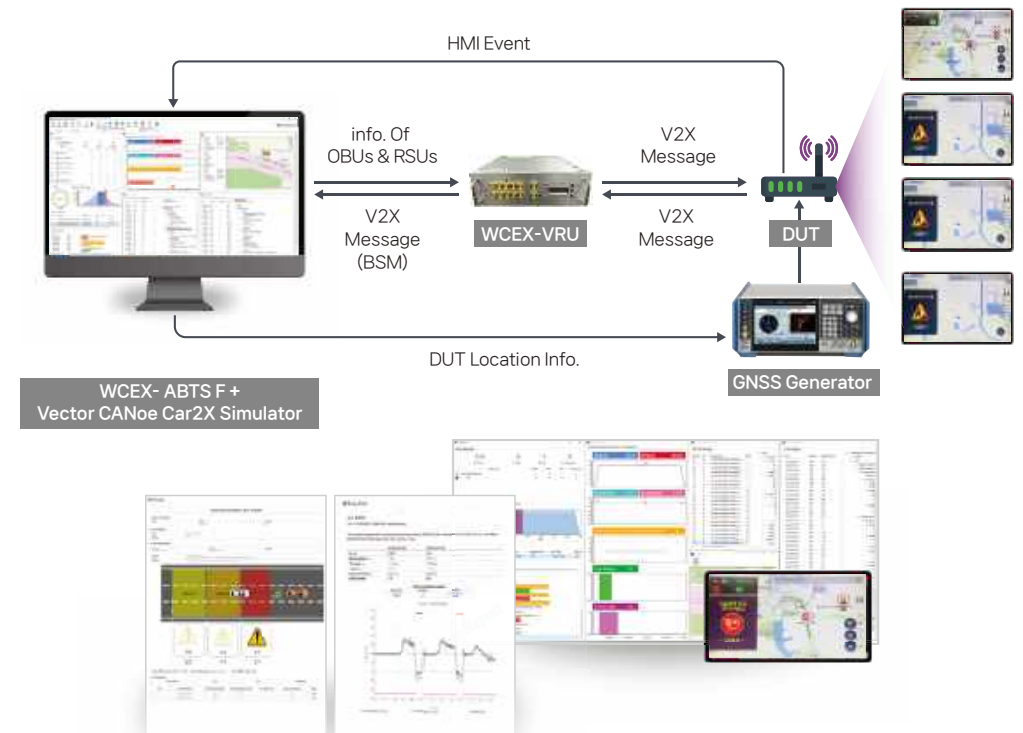
WCEX-ABTS supports functionality and performance testing of C-ITS services in a laboratory environment. It simulates real-time message transmission between RSUs (Roadside Units) and OBUs (On-Board Units) in a virtual real road environment, verifying and analyzing interactions in various traffic scenarios and situations. WCEX-ABTS provides an accurate and reliable testing environment, making it an essential tool for the development and verification of next-generation transportation systems.

Features

- * Simulation of field V2X environment in laboratory facilities
- * Generation of V2X messages (BSM, SPaT, MAP, TIM, etc.) and GNSS signals

Scenarios

- * Red Light Violation Warning (RLVW)
- * Forward collision Warning (FCW)
- * Road Work Warning
- * Disaster Information Warning (DIW)
- * Pedestrian collision Warning



Titles	Spec
V2X Radio Standard	DSRC, C-V2X(3GPP PC5 Rel.14)
V2X Application Test Standard	KR(ITSK-00137-6), EU(Car-2-Car), US & China(TBD)
V2X Message Set Standard	KR(KS R 1600), US(SAE J2735), EU(ETSI ITS), China(TBD)
V2X Message Security	IEEE 1609.2 bundle certificate support
Application Test Type	V2V,V2I,V2P
Realtime GNSS Control	Various GNSS simulator protocol support
In-vehicle Signal Stimulus	User customizable SOME/IP, CAN stimulation support
Unit I/O Port	V2X Main & Sub Antenna pairs : 5 , GNSS Antenna In : 1, 1PPS Out : 1, Ethernet : 1
Power Consumption	110V / 220VAC 1.8A Max
V2X Proxy Unit Size	216 x 82 x 310.3 (W x H x D, mm)

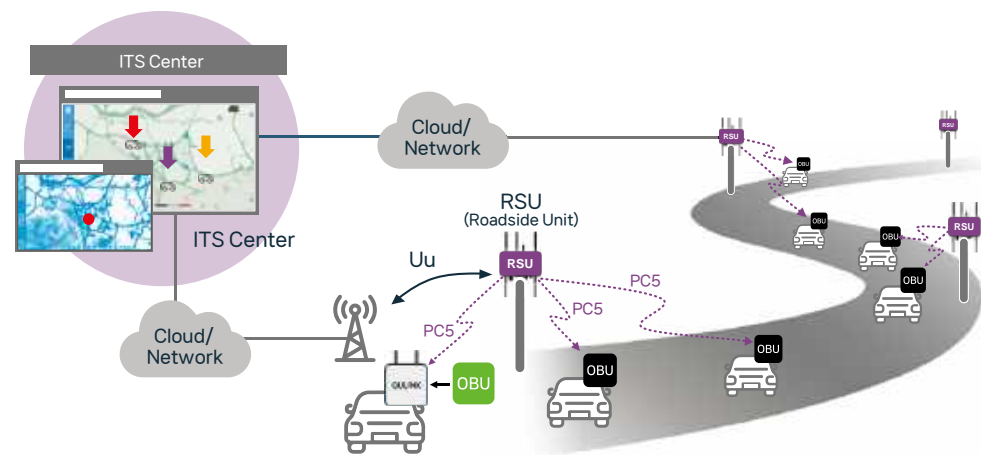
QULINK – RSU

Roadside Unit

A Roadside Unit (RSU) is equipment installed to support communication between vehicles and road infrastructure. RSUs play a crucial role in improving traffic flow, enhancing safety, and efficiently managing the overall traffic system by exchanging information between vehicles and the road. They are typically installed at key traffic points such as intersections, highways, and parking lots.

Features

- * Supports the latest C-V2X message specification
- * 5G NR Ready RSU
- * Versatile Connectivity
- * Reliable V2X Stack



Functions

- * **Data Exchange :** Shares traffic and road information with vehicles.
- * **Traffic Control :** Manages traffic signals and flow.
- * **Safety Alerts :** Warns vehicles about hazards.
- * **Data Collection :** Gathers traffic data for analysis.
- * **Communication :** Uses V2X technology to connect with various traffic elements.



Item	Specification	Note
CPU	i.MX 8QuadXPlus	Cortex-A35 x 4 (Up to 1.2GHz) Cortex-M4F x 1
Memory	LPDDR4 4GB /eMMC 8GB	
Security	W/ECDSA Block	
Ethernet	1Gbps, RJ-45	2 ports(1 for PoE)
C-V2X	23dBm (2x2 MIMO)	B47(5855~5925, 30MHz)
5G NR/LTE	23dBm (TBD, 4x2 MIMO)	For Korea
Wi-Fi/Bluetooth	23dBm (TBD, single antenna)	For Debug (2.4/5G Hz)
Power	Green	
Status	Green, Red, Amber	
Size / Weight	< 368 x 212 x 55 (mm, TBD) < 4.5Kg (TBD)	W/O Accessories
Operating	-34 ~ +74℃	

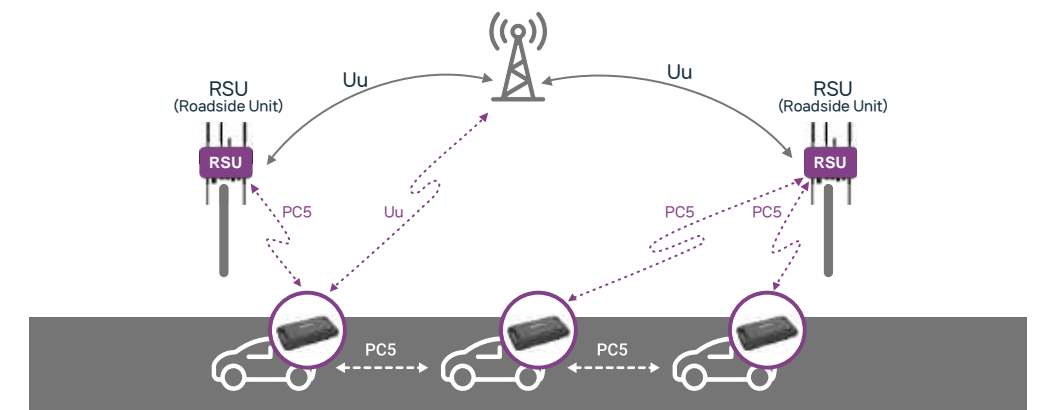
QULINK – OBU

On-Board Unit

An On-Board Unit (OBU) is a device installed in a vehicle that enables communication between the vehicle and external systems, such as road infrastructure or other vehicles. The OBU plays a crucial role in facilitating data exchange for various applications, including traffic management, navigation, and safety systems.

Features

- * Compact C-V2X signal transmitting and receiving devices installed in vehicles
- * Perform V2X communication with the surrounding environment (e.g. vehicles, RSUs, pedestrians)



Functions

- * **Communication :** Exchanges data with RSUs and other vehicles.
- * **Data Handling :** Receives and sends traffic and vehicle information.
- * **Navigation :** Provides real-time traffic updates and route guidance.
- * **Safety :** Issues warnings about potential hazards.
- * **Traffic Management :** Helps improve traffic flow and reduce congestion.

Item	Specification	Note
CPU	i.MX series	Cortex-A55(Up to 1.7GHz) Cortex-M33
Memory	LPDDR4 8GB /eMMC 8GB	
Security	W/ ECDSA Block	
Debug	UART 4PIN	For Debug (UART x 1)
C-V2X/DSRC	C-V2X : 23dBm / DSRC : 20dBm	B47
5G NR/LTE	23dBm (TBD, 4x2 MIMO)	For Korea (n77/B1/B3)
Wi-Fi/Bluetooth	Internal chip antenna	2.4/5G Hz
Power	Red	
Status	Green	V2X
		LTE/5G NR
		Wi-Fi/Bluetooth
Size	138.5 x 81 x 30.7 (W x H x D, mm)	W/O Accessories
Operating	-30 ~ +65℃	
Storage	-40 ~ +85℃	



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CONTACT US

[South Korea]

Innowireless Co., Ltd.
190 Seohyeon-ro,
Budang-gu, Seungnam-si,
Gyeonggi-do, Korea
Email : sales@innowireless.com
Tel : +82-31-788-1700

[Poland]

Accuver EMEA Sp. z o.o.
Domaniewska 37, Zepter
Business Center, 02-672,
Warsaw, Poland
Email : sales.emea@accuver.com
Tel : +48-22-370-2518

[UAE]

Email : sales.emea@accuver.com
Tel : +971 55 902 2354

[USA]

Accuver Americas, Inc.
500 N. Central Expressway, Suite
#210, Plano, Texas 75074, USA
Email : sales.usa@accuver.com
Tel : +1-469-241-6100

[Hong Kong SAR]

Accuver APAC Ltd.
Office Unit 2317, Level 23,
Tower 1, Metroplaza,
223 Hing Fong Road,
New Territories, Hong Kong SAR
Email : sales.apac@accuver.com
Tel : +852-2210-7004

[UK]

Accuver EMEA Ltd.
Unit 20, Building 6, Hatters Lane,
Watford, WD18 8YH, UK
Email : sales.emea@accuver.com
Tel : +44-203-457-4486

[China]

Accuver Shanghai Co., Ltd.
Room B715, 7th Floor, Building A,
No. 1439 Wuzhong Road,
Minhang District, 201103,
Shanghai, China
Email : sales.apac@accuver.com
Tel : +86-135 2473 0965

[Japan]

23F Kamiyacho Trust Tower
4-1-1 Toranomom Minato-ku,
Tokyo, Japan 105-6923
Email : sales@accuver.jp
Tel : +81-3-6430-2580

[India]

Innowireless India Ltd.
Office No. 1304, Maithili Signet
Plot No.39/4, Sector 30-A Vashi,
Navi Mumbai, 400703
Maharashtra, India
Email : innoindia.support@
innowireless.com
Tel : +91-224963-4902