Quintech Electronics & Communications

Wireless Test Lab Automation and Management Solutions

Lab Equipment

Shield Rooms

RF

RF

Test Racks

RF

RF

Remote Control

NEXUS
Matrix Switch

Shield Box

Base Stations

Work Stations

QUINTECH®
The Source **for RF Reliability**

Wireless Test Lab Automation and Management Solutions

First to market with advanced wireless services and applications that work reliably upon introduction is a challenge. The explosive growth of triple play services (VoLTE, high speed data, streaming video) over wireless devices and rapid deployment of advanced technologies and mobile applications increase the complexity and size of test labs. Lab automation and management is now the keystone of the effective and efficient test lab.

Wireless technologies have been evolving to meet the ever-increasing demands of mobile data. Several trends have been shaping the wireless landscape:

- Coexistence of 3G, LTE, LTE Advanced, LTE-U, and Carrier WiFi and the reduction of 2G
- Rapid growth of IoT devices and the deployment of NB-IoT
- Heterogeneous Networks (HetNet) and Small Cells to boost coverage and data rate
- Voice and Data service continuity over cellular technologies and WiFi
- 5G, Massive MIMO and Beamforming to exploit the spatial domain
- Self-Organizing Networks (SON) for higher data throughput, better coverage and less interference
- Wireless Mesh networking powered LTE Direct, Vehicle-to-Vehicle, M2M

Wireless Test Challenges

Providing data and voice services that are delivered seamlessly across different technologies is the goal of mobility. Handover, inter-RAT and interoperability tests must be thoroughly performed to validate functionality and verify system performance. The increasing number of radio access technologies makes wireless test systems increasingly more complex. The growing number of antennas used in MIMO further complicates the systems. Product Mangers, Test Engineers and Lab Managers are facing the challenges of:

- Increasing lab equipment use efficiency to test devices for multiple global certifications, e.g. 3GPP, GCF, CTIA
- Automating repeatable and reliable test systems for testing devices on different equipment vendor systems
- Testing network mobility that involves many base stations and devices
- Accommodating increasing number of antennas used in MIMO
- Integration and Validation of Mobility, Interoperability and Service Continuity with an increasing number of radio access technologies
- Time to market pressure when covering many test cases with different test setups
- Limited lab resources and instruments that can lengthen the test cycles

The *NEXUS* Solution for Lab Automation and Management

To help our customers increase the productivity of their test labs to deliver products and services on time and with increased quality, Quintech offers a family of products for wireless testing, the **NEXUS** RF matrix switches. These matrices allow engineers to quickly set up an RF environment that connects and shares many base stations and many devices with high order MIMO connections to enable:

- Network Mobility Test
- Functional and Certification Test
- Integration and Validation
- Software and Firmware Regression Test
- Interoperability Test

NEXUS Family of Wireless Test Products

Each **NEXUS** switch is designed to meet a different balance of link budget, functionality, cost and performance.

The utilization of **NEXUS** switches will expand testing capabilities, improve the return on investment of laboratory resources, and reduce time to market.

	NEXUS Wi-5G	NEXUS-4	NEXUS-3	NEXUS-L	NEXUS-L	NEXUS-R
Size	8x8 in 3RU	8x32 to 32x32 in 6RU		32x32 in 6RU	16x16 in 3RU	32x32 in 12RU
Frequency	700 to 6000 MHz	700 to 4000 MHz	700 to 2800 MHz	700 to 2800 MHz	700 to 3000 MHz	DC to 2800 MHz
Switch Type	Fully Non-Blocking			Fan-out / Splitting		Fully Blocking
Attenuators	64	1024		32	16	No

NEXUS Wi-5G

The **NEXUS Wi-5G** is a wideband 600 MHz to 5.8 GHz bi-directional RF Attenuator Matrix Test System which enables testing of 2x2 to 8x8 MIMO connections. 64 sets of integrated fixed attenuators and 0 to 60 dB programmable attenuators provide up to 90 dB of total attenuation per connection. The **NEXUS Wi-5G** can connect any input port to one or all output ports and any output port to one or all input ports using integrated wideband splitters and combiners. Unused connections can be turned off using internally terminated 100 dB isolation switches. The **NEXUS Wi-5G** enables interoperability, coexistence and testing of current and emerging standards. The matrix is used for roaming, handover, beam forming, wireless mesh network test and validation of network equipment. Its frequency range covers 2G/3G/4G/LTE/VoLTE/802.11x WiFi/MIMO. Circuit-switched fallback testing can be conducted in a controlled environment isolated from commercial signals, emulation of mobility scenarios, inter-band carrier aggregation and WiFi interference tests are easily configured. Regression testing can be completed in reduced time enhancing laboratory ROI. The **NEXUS Wi-5G** used in conjunction with Quintech's proprietary **Q-LAAMP**® software management platform provides a ready-to-use test system with an intuitive GUI and user configurable RF fading applications.

(fig. 1 *NEXUS Wi-5G*)

NEXUS-4 and NEXUS-3

The **NEXUS-4** and **NEXUS-3** are universal non-blocking RF Matrices that can route any of 32 A ports to any 32 B ports in a 6 RU chassis. With integrated splitters, each base station can be simultaneously shared with up to 32 devices. Any combination of 32 base stations can be connected to each device. The 1024 programmable attenuators allow the emulation of free space signal transmission in a controlled environment. The **NEXUS** switches dramatically increase lab efficiency by replacing the patch panel and manual cabling and can be remotely reconfigured for different test setups consistently in seconds.
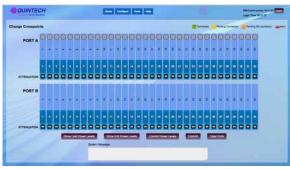

(fig. 2 *NEXUS-4*)

Q-LAAMP® Software

Quintech's proprietary Laboratory Automation and Management Platform, **Q-LAAMP**, provides lab managers the ability to remotely manage and allocate resources such as base stations, test racks and RF instruments to many shared users. Using the **NEXUS Wi-5G, NEXUS-4** or **NEXUS-3**, this software manages resource allocation and scheduling of different labs and users without using a manual patch panel. Its web-based user interface provides easy access from any browser on a PC or tablet. With the support of RADIUS servers, Authentication, Authorization and Accounting (AAA) management of users such as employees and vendors is made easy. Other web-based intuitive features facilitate testing, monitoring and troubleshooting.

Q-LAAMP enables recordable, repeatable and reliable (RRR) testing and makes 24/7 lab management and resource sharing easy. **Q-LAAMP** significantly increases lab efficiency, reduces test time and saves costs.

(fig. 3 **Q-LAAMP** screen shots)

(fig. 4 **NEXUS-L**)

NEXUS-L

NEXUS-L is a fan-out/splitting RF matrix. With integrated splitters, functional and certification tests of a device needing multiple combinations of base stations or a base station needing multiple combinations of devices are quickly and repeatably configured. It is ideal for replacing patch panels for high throughput testing.

(fig. 5 **NEXUS-R**)

NEXUS-R

NEXUS-R is a blocking matrix switch that can relay 32 A ports to 32 B ports. It is designed to handle high power up to 50W for direct connection to base stations. Based on latching relay switching technology, it retains the connections even upon power loss. Quintech's proprietary design minimizes the return signal and insertion loss through the switch while maximizing the isolation between ports. Group delay and path length are consistent between all cross point connections. As a result, the **NEXUS-R** has superior RF performance and can be used even for highly demanding wireless technologies such as Active Antenna System (AAS) testing.
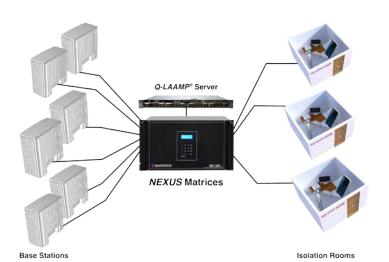
Applications

Network Mobility

Designed to meet the growing Network Mobility challenges, *NEXUS* switches are the ideal solution to create test setups with the ever increasing number of base stations, access points, phones, and tablets using multiple antennas.

With a 32x32 non-blocking bidirectional matrix in one unit, *NEXUS-4* and *NEXUS-3* can easily handle dozens of base stations and devices. The matrices' built-in attenuation array and fast programming interface enable dynamic mobility scenarios for:
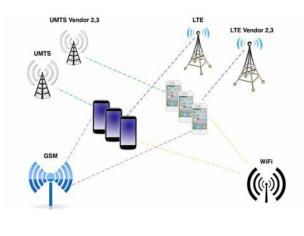
• Handover Test
• Inter-RAT Test
• VoLTE Fallback
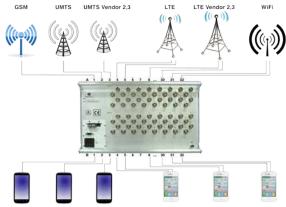• WiFi Cellular Continuity
• Voice over WiFi Roaming

The *NEXUS* matrices are protocol agnostic, and can be used for all wireless technologies including 2G, 3G, 4G, LTE-A, WiFi and any combination of them.

(fig. 6. Handover test setup)

(fig. 7. Q-LAAMP)

"EFFICIENT, QUICK AND AGILE LABS"

Lab Management and Resource Sharing

In most labs, resources are a limiting factor for development and testing. Many teams need to access the same base stations and instruments. A traditional way to manage the labs and coordinate schedules is to use patch panels and change connections manually. However this approach is not scalable and is inefficient. It can be unreliable due to connector and cable fatigue after many changes.

NEXUS switches, powered by *Q-LAAMP* software, allow the lab manager to schedule resources in advance and optimize lab usage. Assigning base stations to RF isolation labs can be completed at the assigned time within seconds. Lab managers can easily manage dozens of base stations and labs and virtually eliminate system down time due to patch panel reconfiguration. *Q-LAAMP* also provides lab configuration views on demand, and generates activity reports on which resources are used and for how long. The lab manager can use these reports to optimize equipment inventory and lab availability.

Carrier WiFi Testing

Carrier WiFi has been a strategic part of operator's deployment as well as enterprise network. It is treated to some extent as another radio access technology. New tests are needed to ensure the WiFi delivers carrier grade services. Many WiFi access points are using 3 to 6 antennas, making it difficult to scale the test using a traditional channel emulator approach. **NEXUS Wi-5G** is an ideal solution to create a controlled environment for testing WiFi:

• Beam forming control and effectiveness
• 2 to 8 antenna MIMO
• Range vs rate and handovers
• Fast and slow moving users
• Video streaming and voice quality when roaming
• Performance with real traffic interference
• Device smart selection of cellular over WiFi

Many of the WiFi test cases require close to a dozen APs to evaluate its true performance in the real world. A **NEXUS Wi-5G** is the most reliable, repeatable and cost effective way to create such setups for automated testing.

(fig. 8. *Carrier WiFi testing*)

"DEPLOY QUALITY PRODUCTS AND SERVICES THAT WORK RELIABLY UPON RELEASE"

(fig. 9. *Mesh network testing*)

Wireless Mesh Network Testing

Multi-hop wireless mesh networks that support wide area distributed communications are cost effective in wireless broadband and military applications. Testing mesh networks is challenging due to the sheer number of radio links. Quintech's 6 RU mesh network test solution features any-to-any connections with variable attenuation allowing the user to create diverse network topologies and varying distances between any of the 32 mesh nodes. The test scenario is repeatable and can be remotely configured in milliseconds.

Such a test bed can be used for testing:

• Military communications radios
• LTE Direct devices
• Vehicle-to-Vehicle (V2V) mesh network
• WiFi mesh routers
• Machine-to-Machine (M2M) mesh
• Small cells mesh backhaul and SON interference control, ad-hoc and sensor networks

Quintech's **NEXUS** Family of Wireless Matrix Switches provide a scalable, repeatable and cost-effective solution for all wireless test needs, now and in the future.