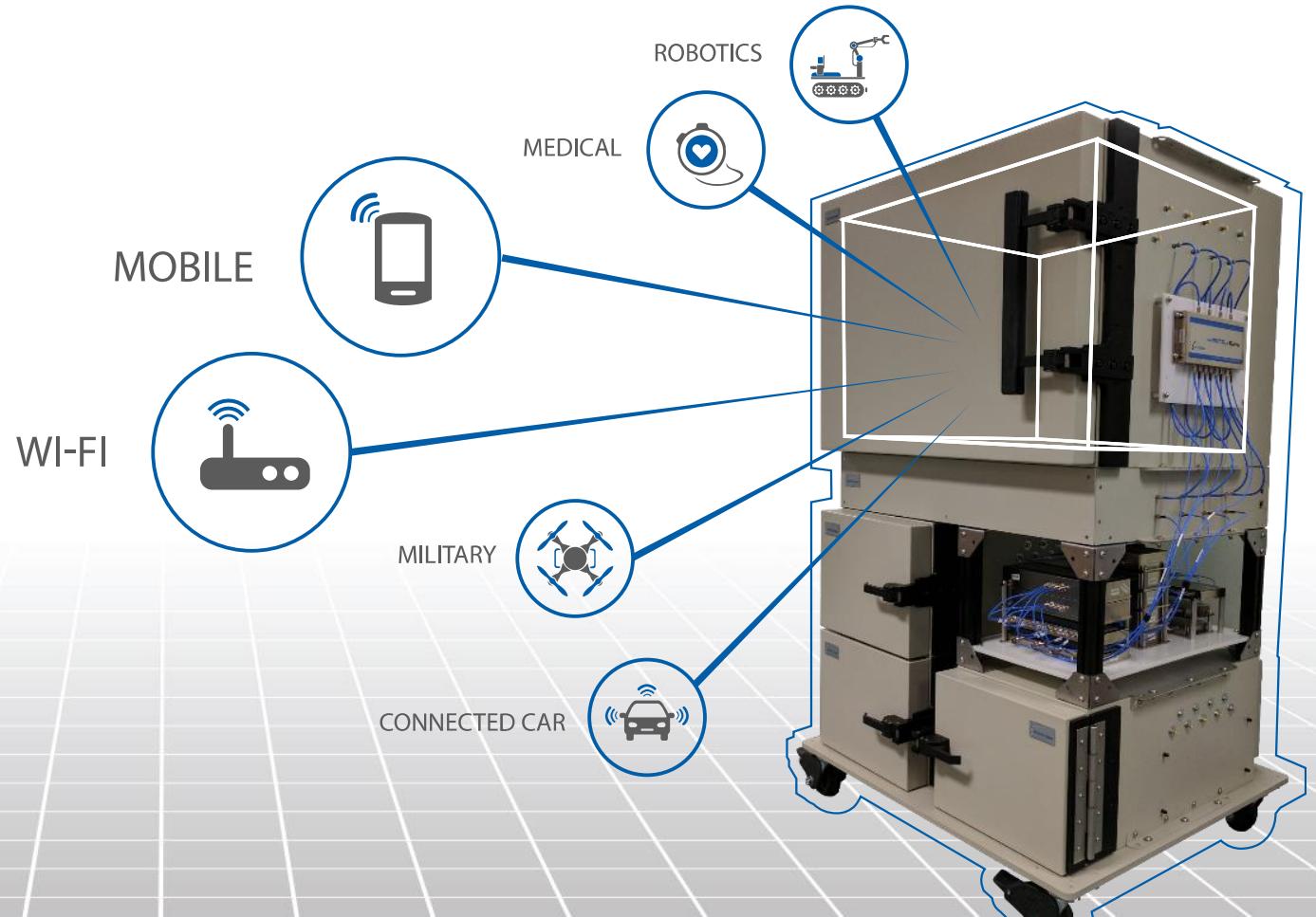




octoScope Introduction

April 2018



Company

Manufacturer of **personal testbeds** for Wi-Fi, LTE, IoT and other wireless markets

- Shipping the octoBox testbeds since 2013
- Serving wireless operators and their supply chain, including device and chipset vendors
- Solutions for Wi-Fi, LTE, 5G, IoT, wireless broadband, connected car, medical devices, robotics, public safety, military

Product

Compact, modular, completely isolated and controllable wireless testbed

- Automated, repeatable and accurate metrics of wireless performance & behavior
- Patented novel technology for emulating real-life RF environment
- Wireless performance, coexistence, behavior testing in controlled RF environment

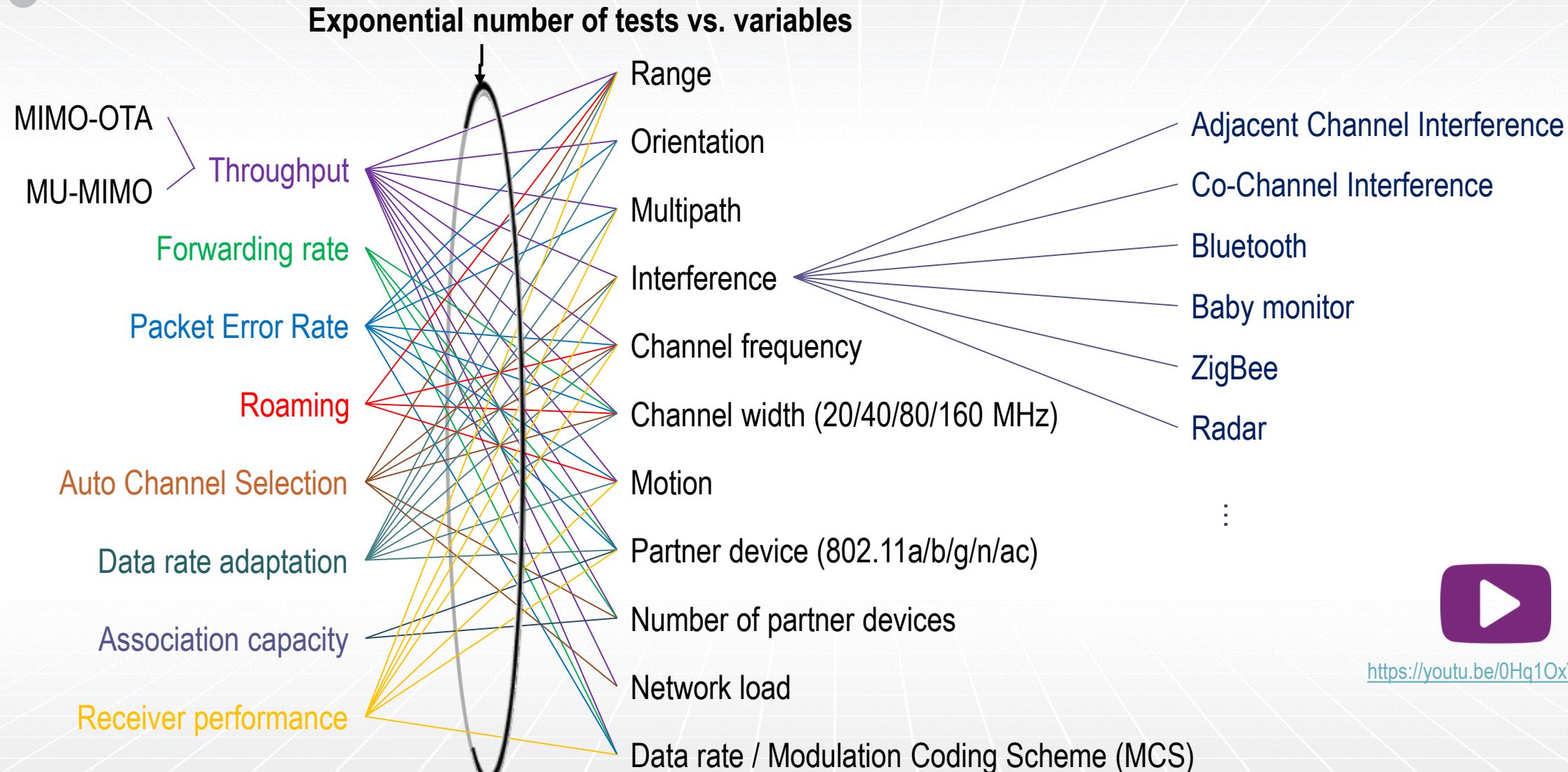
Team

Wireless test, channel emulation, wireless protocols and RF

- Track record of delivering successful communications and wireless test products
- Key team members worked together going back to mid-1980s at prominent test equipment companies including Teradyne, HP/Agilent, Azimuth/Anritsu and Spirent



Tests supported by the octoBox personal testbed



MIMO = multiple input multiple output

MU-MIMO = multi-user MIMO

<https://youtu.be/0Hq1OxVaAwk>

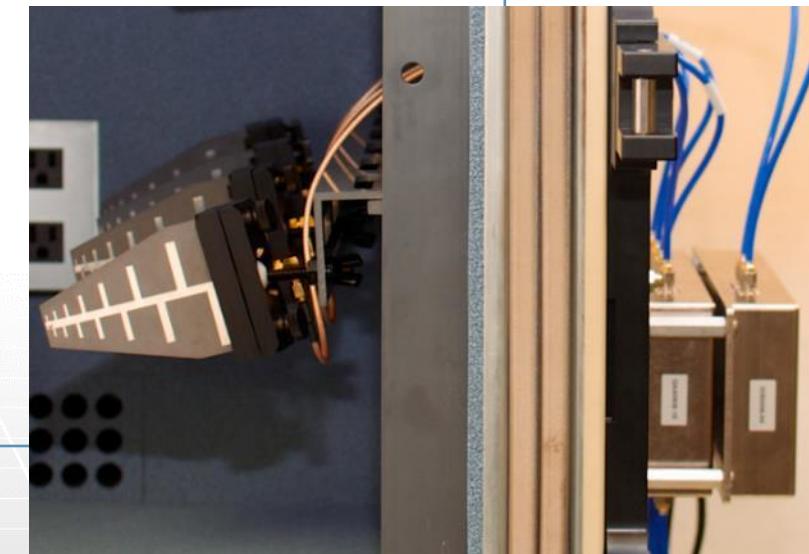


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Market segments and technologies

Market segments	Technologies	Test applications
Consumer Service providers (Comcast) IoT Wireless mobility (cellular, LTE) Enterprise IT (Cisco) Medical (Philips) ITS/DSRC Public Safety Military	Wi-Fi LTE-U, LTE-LAA LTE mmWave 2G/3G GPS Bluetooth Google Nest (ZigBee) LMR Proprietary	Performance Certification test Coexistence Low volume production

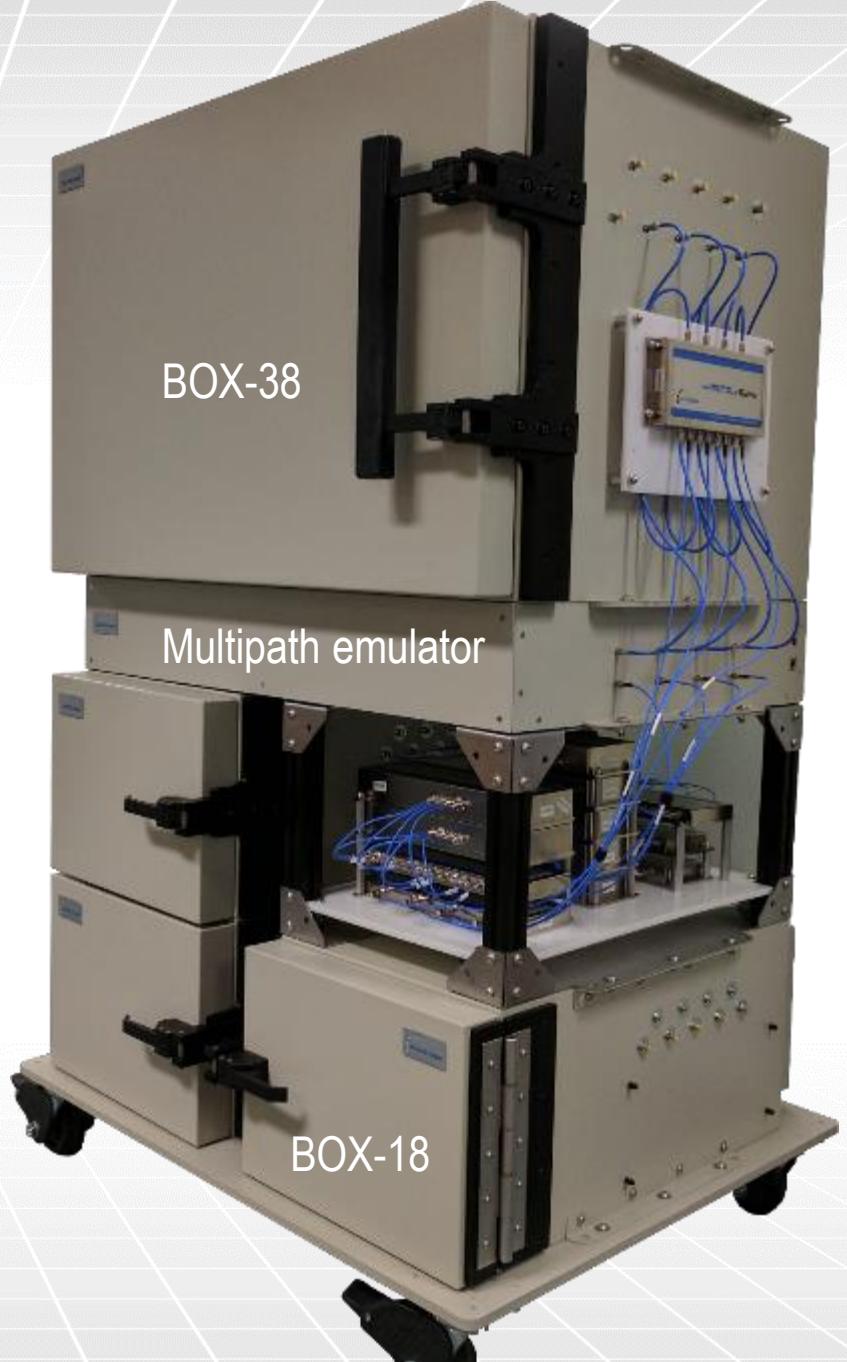
ITS = intelligent transportation systems
 DSRC = direct short range communications
 LTE = long term evolution
 LMR = land mobile radio
 IoT = internet of things





octoBox benefits

- Reduce wireless test time from weeks to hours
 - Complete isolation and repeatable RF environment minimizes time-consuming open-air testing
 - Automation accelerates data collection, improves test coverage and product quality
- Demonstrate highest achievable performance
 - Ideal MIMO environment for highest possible throughput
 - Supports latest technologies, such as 160 MHz 802.11ac, 802.11ax, MU-MIMO and Beamforming
- Qualify User Experience
 - Emulate real-world challenges
 - Programmable range of condition from best MIMO environment to challenging real-life impairments



octoScope octoScope customers

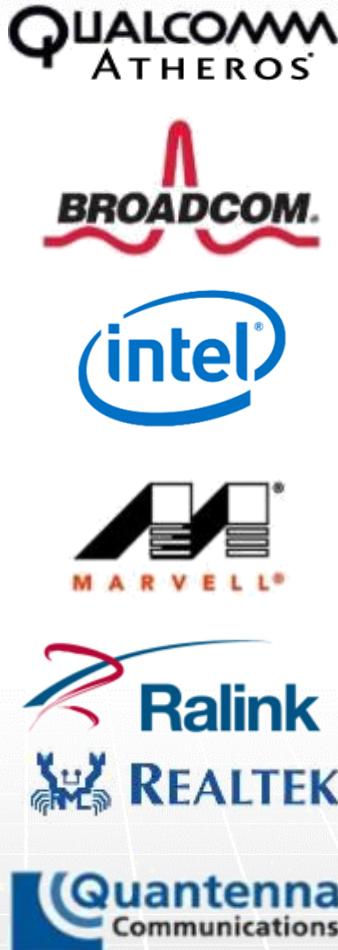
Operators



Labs



Chipset vendors



Equipment vendors



Synology

CISCO

ARUBA networks

HUAWEI

DELL

SAMSUNG

PHILIPS

EDIMAX

NETWORKING PEOPLE TOGETHER

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Wireless test applications

- Performance
 - MIMO OTA throughput
 - MU-MIMO gains
 - Load testing
 - Roaming
 - RX sensitivity
- User Experience
 - Adaptation to impairments, such as path loss, interference, multipath, load
 - Roaming behavior – find sticky clients
 - DFS (dynamic frequency selection)



octoSc OctoBox software suite

Cloud based
architecture for
worldwide
distributed teams

- Remote controllable via any browser
- Database for test records and testbed building blocks
- API for test automation

Note: Based on the
MEAN stack (Node.js,
mongo.DB and
Angular)

Autotest Dashboard

Traffic

Training duration: 2 Step duration: 10

Active	Name	From To	Protocol	IP Streams	Offered load (kbps)	Buffer (kb)	Window (kb)
<input checked="" type="checkbox"/>	Traffic-1	Local Traffic Endpoint 192.168.15.6@Pa2-PLU	tcp	4	0	0	0
+ Add new							

Configuration elements:

Add new...

Monitor

Range

Range (dB): 0 dB, 20 dB, 60 dB, Step (dB): 5

Primary quadAttenu	Series quadAttenu	Max attenuation	Delete
QA601010-20 @192.168.15.20	No series quadAttenu	60	Delete
+ Add new			

Orientation

Turntable: Turntable octoScope 0 [turntable] @0

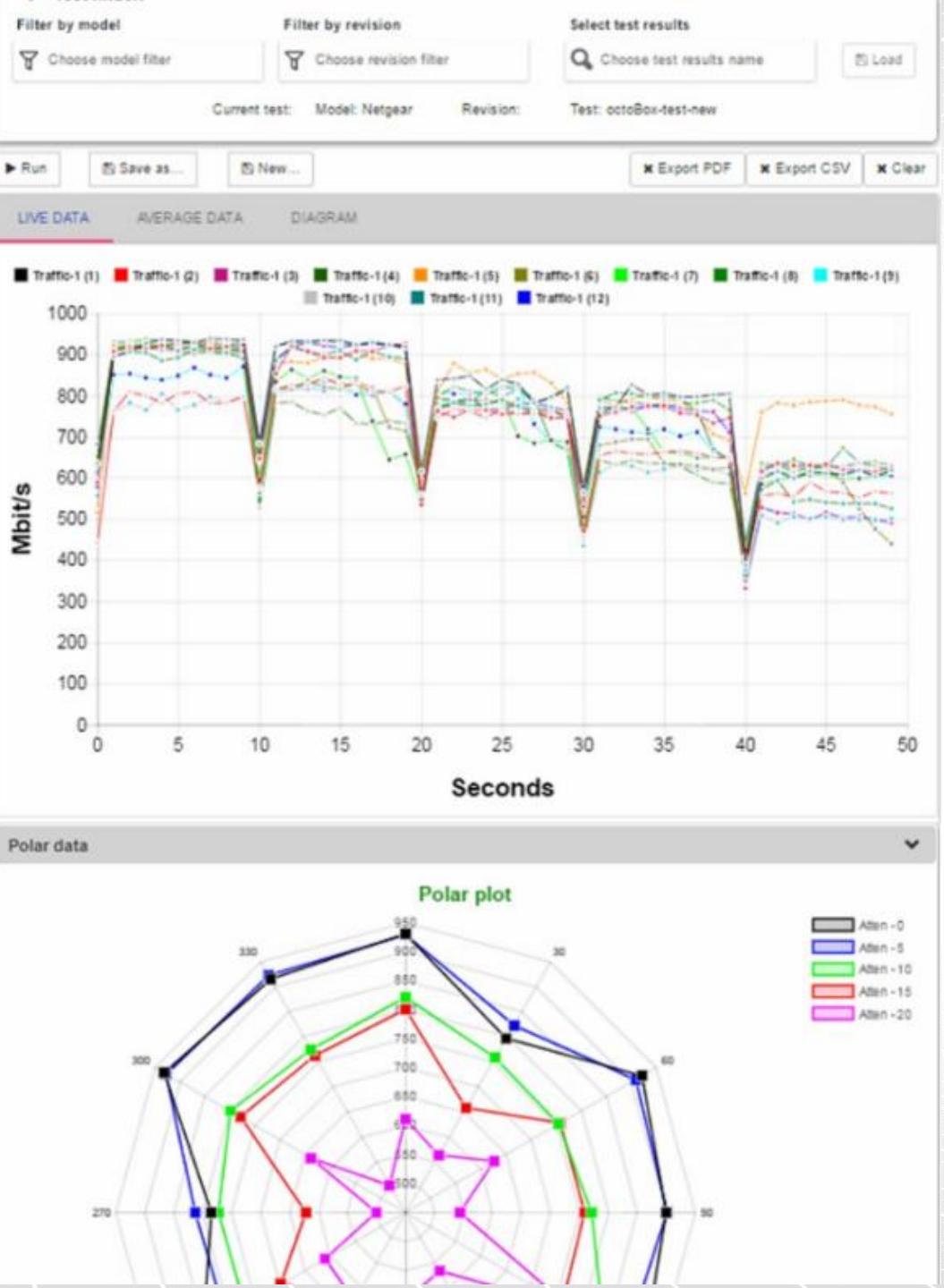
Rotate during test
 Polar plot

Rotation step: 30

Start position (deg): 0

End position (deg): 360

[Home turntable](#)



The Pal

Functionality
AP
STA (client)
Virtual STA, vSTA
Traffic replay
Monitoring
Wireshark captures

MU-MIMO
Beamforming
20/40/80/80+80/160 MHz channels



*Linux Yocto OS
Quad-core 2 GHz Intel Atom*

Qualcomm
QCA9984 4x4 160 MHz
Wave 2 radio



octoBox test applications

10

- Throughput
- Roaming
- Mesh
- DFS
- Interference
- Capacity
- Band steering
- Load balancing

- RX sensitivity
- Rate/MCS adaptation
- MIMO adaptation
- MU-MIMO
- Capture/replay
- Beamforming



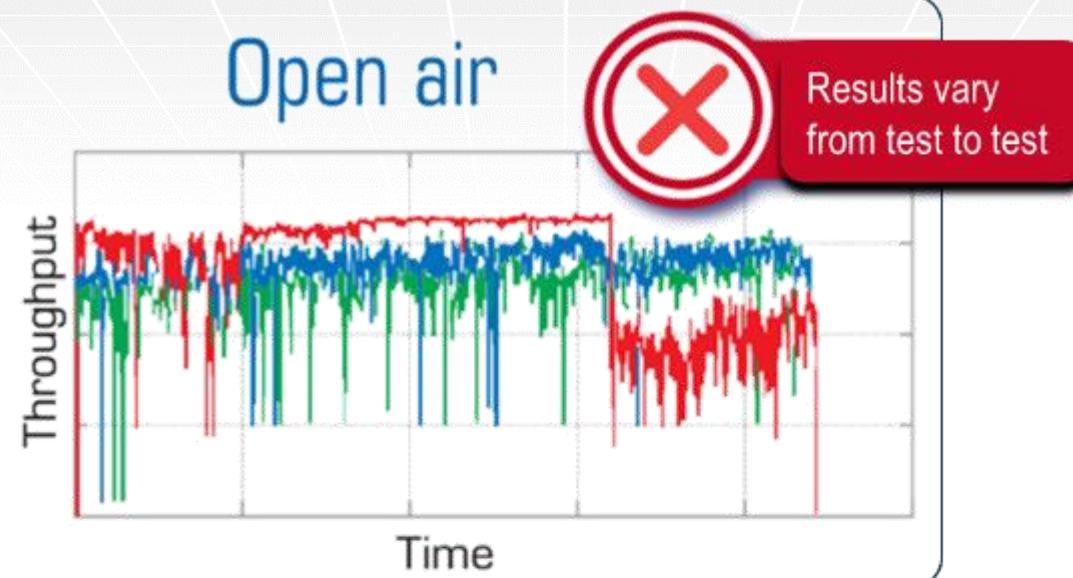
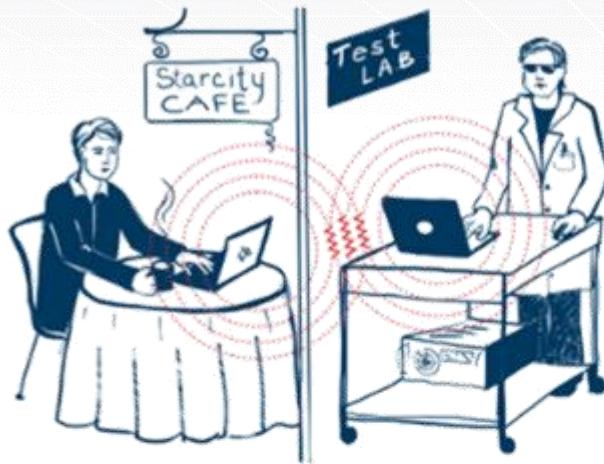
Wireless personal testbed usable out-of-the-box



***Ships preconfigured
and rolls out of its
crate ready to use.***



octoBox controlled test environment



Technologies Applications

Wi-Fi	Throughput
LTE	Roaming
2G/3G	Wi-Fi Alliance
Bluetooth	Wireless video
ZigBee	Coexistence
Proprietary	Multi-node/mesh

Capabilities

- MIMO (up to 8x8)
- Multipath + path loss
- Multi-channel interference
- Turn table for realistic results
- Completely isolated
- Stackable, configurable, compact
- Powerful test automation



Customer value proposition

- Repeatable RF environment makes wireless measurements easy to manage
- Automation accelerates data collection and time to market; improves quality
- Graphical reporting helps visualize device performance or behavior issues

Compact wireless personal testbed delivers cost-effective high performance repeatable MIMO OTA environment



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