

IxLoad[®] — Wireless XAir2

Problem: Ensuring Optimized Performance for New Mobile Infrastructure Technologies

Continuous increase in capacity demand drives mobile wireless operators to greatly expand their network capacities. Service providers are under pressure to offer more throughput per user, while guaranteeing end-to-end quality of service. Vendors are employing new technologies to deepen network capacities beyond just expanding radio coverage, bringing in new challenges for lab testing.

Solution: LTE Emulation for End-To-End QoS Validation

Ixia's XAir2 load module provides LTE user equipment (UE) emulation that enables a powerful IxLoad eNodeB Layer 1 to 7 test solution. With complex UE modeling, it offers realistic and easily configured traffic models and call patterns. Using IxLoad's real-world subscriber modeling, testers do not need to be protocol experts to develop test realism. From a single tool, users can perform capacity tests, detail a cell throughput, measure voice and video quality, model a wide variety of mobility scenarios.

Real-world subscriber modeling

- Full-featured LTE UE emulation within all frequency bands and FDD/TDD duplex modes.
- Mobile application modeling with voice, video, and data traffic, including QoE (MOS, PESQ) and QoS measurements
- Complex signaling operation, including Attach, Detach, Handover, TAU, DRX, and Idle Mode operation

Highlights

- Validate eNodeB functionality by assessing full protocol stack from Layer 1 to Layer 7
- Determine total cell throughput
- Asses the maximum number of subscribers within a cell/sector
- Benchmark the control plane performance of eNodeBs
- Test complex mobility scenarios
- Perform service quality validation with subscriber modeling, multiplay voice, video, and data traffic generation

- Channel modeling that allows UE cell center/edge simulation with LTE DL Fast Fading emulations including Pedestrian, Vehicle, Urban, High-Speed Train, and Custom mode
- LTE Advanced
- Visit www.keysight.com for more details on the IxLoad product

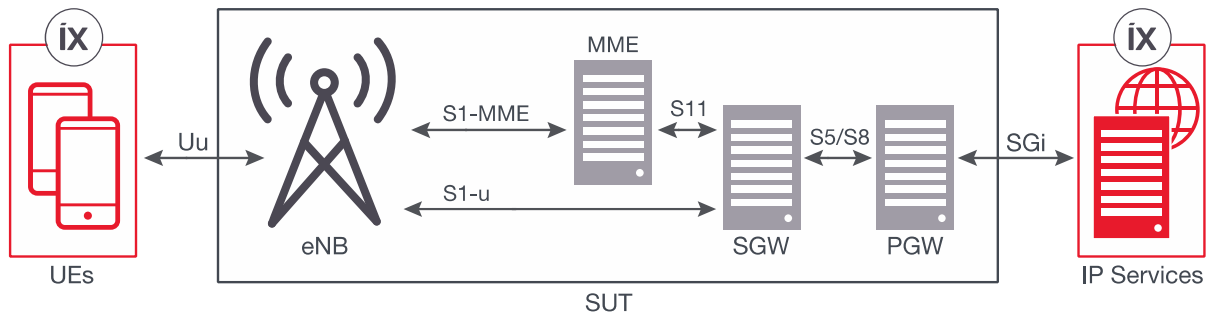


Product Capabilities

- 4 Primary Carriers
- FDD and TDD duplex, selectable on each carrier
- LTE-Advanced Carrier Aggregation (2CA through 4CA, FDD & TDD)
- LAA support
- 5, 10, 15, 20 MHz channel bandwidth support
- 4 CPRI Ports supporting CPRI line rates 3, 5, and 7 (2457.6 to 9830.4 Mbit/s)
- SISO, 2x2 and 4x4 MIMO antenna configurations
- Transmission Modes ranging from TM1 to TM4, TM9
- Gigabit LTE speed per single UE (4x4 MIMO, 3CA, 256QAM)
- Up to 256QAM Downlink and 64QAM Uplink
- Built-in high accuracy Stratum 1 10MHz clock
- Support for 3GPP release 12 UE Categories (1-6, 9-12 with additional Cat. 16 DL / Cat. 13 UL)
- eMTC Cat-M1 support
- NAS/PDCP compression and ciphering
- Full DL/UL HARQ capability
- Semi-persistent scheduling
- CBRS 3.5GHz bands support
- Supports the Ixia Wideband Radio (bands in the range of 400 MHz to 6 GHz)
- Mobility validation with Handover and Reestablishment scenarios
- Standard and Custom Channel Modeling features
- Thousands of simulated UEs
- Automatic configuration of MIB/SIB parameters
- Application support for IxLoad Voice, Video, and Data protocols including VoLTE/ViLTE, HTTP, FTP
- Automation via Tcl, Python, Robot framework, and Rest API scripting
- EPC simulation available for testing eNodeB in isolation, offering:
 - Coordinated simulation of MME, SGW, and IP Services
 - Full capability for L7 Triple Play application traffic generation (Volte, Video, Data)
 - Negative Testing and Failure Scenarios: Paging Storm, S1 failures, NAS retransmissions and rejects, Handover failures
 - SGi passthrough capability (expose SGi interface towards external IP address)
 - Full IMS Core capabilities, including mobile2mobile and mobile2ixLoad Volte calls

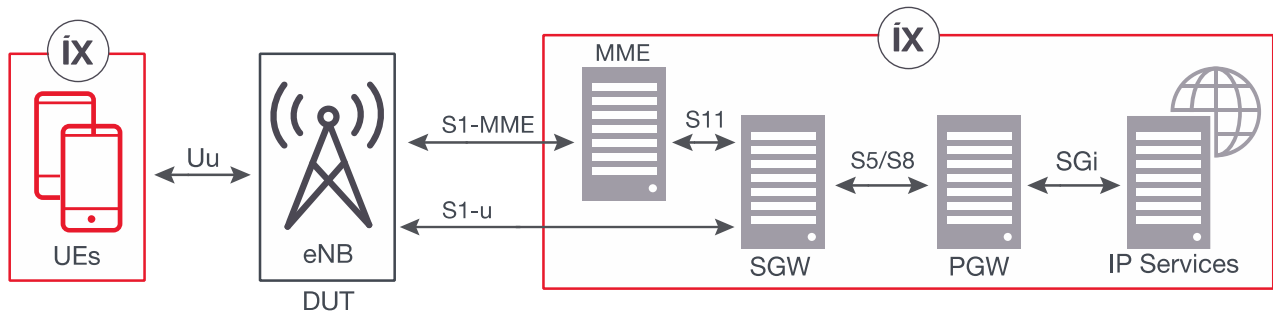
Test Topologies

- End-to-end system test offering a comprehensive view for the entire wireless network functionality and performance

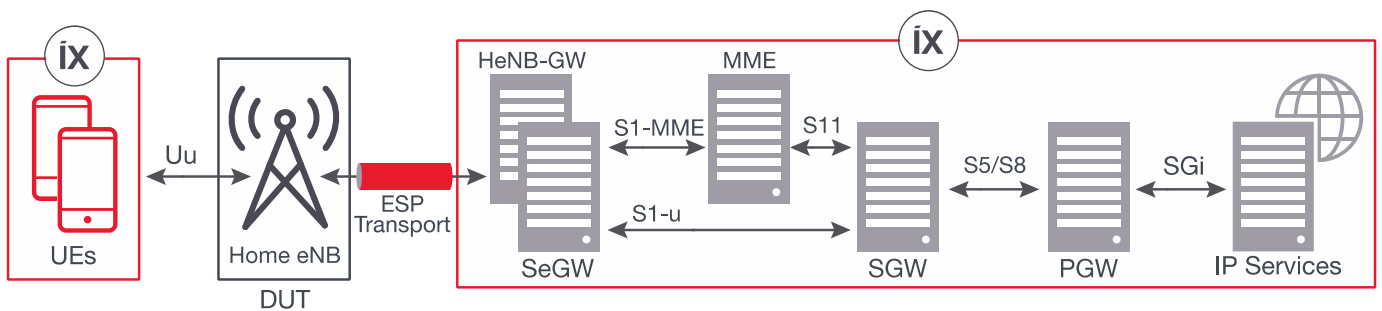


End to End Test Configuration

- eNodeB / Home eNodeB wrap-around test scenarios, simulating all necessary network elements to completely assess eNodeB capabilities and behavior under various types of traffic, loads and network events



eNodeB isolation topology



Home eNodeB isolation topology

Additional Hardware Required with XAir2

The complete XAir2 LTE UE simulation solution requires several other hardware and software components. The additional hardware items are listed in the table below.

Category	Options	Ixia Part Number
Connection Kit	LTE Access XGS Connection Kit. One connection kit is required for every XAir2 module present	949-1035
RadioHead	LTE Access 6GHz Wideband Radio	949-1034
Radio Connection Enclosure	LTE Access Radio Connection Enclosure (RCE) Low Band 690MHz-2690MHz	949-1026
	LTE Access Radio Connection Enclosure (RCE) High Band 1000MHz-3900MHz	949-1029

RadioHead

The XAir2 Module is connected to the eNodeB device under test (DUT) through a radio frequency (RF) connection provided by the Ixia 6GHz Wideband Radio. The specifications for this radio are provided in the table below.



Specifications

Protocol	Feature
3GPP Release	<ul style="list-style-type: none"> All 3GPP R8 2009 specifications 3GPP R9 June and December 2010 specifications 3GPP R10 December 2011 specifications 3GPP Release 11, Release 12 UE Categories for 4CA
Control Plane	<ul style="list-style-type: none"> 3GPP TS 24.301 Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS) 3GPP TS 36.331 Radio Resource Control (RRC) protocol specification 3GPP TS 36.323 Packet Data Convergence Protocol (PDCP) specification 3GPP TS 36.322 Radio Link Control (RLC) protocol specification 3GPP TS 36.321 Medium Access Control (MAC) protocol specification 3GPP TS 36.211 Physical Channels and Modulation 3GPP TS 36.212 Multiplexing and channel coding 3GPP TS 36.213 Physical layer procedures
User Plane	<ul style="list-style-type: none"> VoLTE Voice & Video (IR.92 & IR.94)

Protocol	Feature
	<ul style="list-style-type: none"> • Video on Demand [VoD] • HTTP Streaming • HTTP, FTP, POP3, SMTP • Stateless UDP

General Specifications	
Performance	<ul style="list-style-type: none"> • 4 Primary carriers per XAir2 • Up to 24 sectors in one XGS-12 chassis • 1200 simultaneous RRC-Connected UEs per Carrier, 4000 per blade • 400 simultaneous Volte calls per Carrier, 1200 per blade • 1 Gbps traffic per one UE • Custom channel modeling and pre-defined DL channel models based on 3GPP TS 36.101 (AWGN, EPA5Hz, EVA5Hz, EVA70Hz, ETU70Hz, ETU300Hz, HST)

Physical Specifications	
XAir2	<ul style="list-style-type: none"> • Number of CPRI ports: 4 • Number of 10G Ethernet ports: 1 connected by Optical Multimode 850nm transceiver with SFP+ • The ports currently used are: CPRI 1, CPRI 2, CPRI 5, CPRI 6 and Port 4 • Provides connection to an eNodeB through Ixia's Remote RadioHead unit that covers all FDD and TDD frequency bands • Built-in high accuracy 10MHz clock for eNB synchronization • 1U high 19" rack mounted interface card • Dimensions: 17.3" (L) x 1.3" (W) x 12.0" (H) / 440mm (L) x 33mm (W) x 305mm (H) • Power consumption: 184 Watts • Gross Weight: Module only: 12.9 lbs (5.85 kg) / Shipping: 19.7 lbs (8.94 kg)
Wideband RadioHead 400MHz – 5.9GHz	<ul style="list-style-type: none"> • Channel Bandwidth: 5/10/15/20 MHz • Tunable range 400MHz – 5925MHz • FDD or TDD operation • 4TX and 4RX female SMA antenna connectors allowing SISO through 1x 4x4 MIMO configuration • TX power (10dB PAR): <ul style="list-style-type: none"> ◦ 0dBm (400-2700MHz) ◦ -10dBm (2700-5500MHz) ◦ -15dBm (5500-5925MHz)

Physical Specifications	
	<ul style="list-style-type: none"> • RX input levels: <ul style="list-style-type: none"> ◦ -25dBm, normal operation, 10dB PAR ◦ +25dBm, max safe power for CW • Operating input voltage: 100 – 240 VAC, 50-60 Hz • Typical input power 95W; Maximum input power 130W • 19" Rack Mount; Height: 1U; Depth: <500mm

Platform Options

Visit www.keysight.com for More Information on IxLoad Platform Options	
Chassis	<ul style="list-style-type: none"> • XGS-12 HS/SD/HSL Chassis • XGS-2 HS/SD/HSL Chassis
Load Modules	<ul style="list-style-type: none"> • XAir2 • PerfectStorm

Ordering Information

960-0518

XAir2 Module - LTE Multi-UE RLC/MAC/PHY multiple carriers simulation

949-1034

Wireless LTE Wideband Radio Head 400MHz – 5.9GHz

949-1026

LTE Access Radio Connection Enclosure (RCE) Low Band (690 MHz – 2690 MHz)

949-1029

LTE Access Radio Connection Enclosure (RCE) High Band (1000MHz-3900MHz)

949-1035

Chassis Connection Kit

All-inclusive software bundles

925-4440

IxLoad LTE Multi-UE bundle: Support for UE Simulation over FDD and TDD, 3GPP Rel8/9/10/12; includes EPC-Simulation plugin

925-4419

IxLoad LTE Multi-UE support for Carrier Aggregation

925-4420

Access Gigabit LTE bundle (256QAM, 4x4 MIMO, TM9)

925-4421

Cellular IoT (Cat-M1, eDRX, PSM)

925-4424

LAA - License Assisted Access

930-3379

IxLoad Multiplay-2016, Software Bundle, Layer 4-7 Performance Test Application
Data-Video-Voice package

Learn more at: www.keysight.com

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