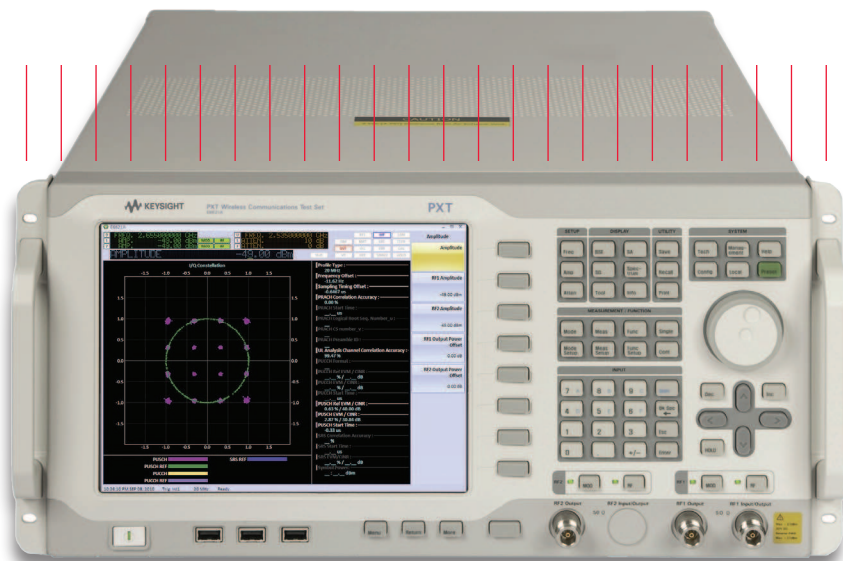# Keysight PXT E6621A
LTE Wireless Communications Test Set
Accelerate time-to-market for LTE UE designs

Technical Overview

Keysight PXT E6621A LTE wireless communications test set

KEYSIGHT
TECHNOLOGIES

Introduction

The Keysight Technologies, Inc. PXT E6621A LTE wireless communications test set represents a significant breakthrough in LTE UE testing. It incorporates flexible base station/network emulation and RF parametric tests into one integrated unit and extends Keysight's unmatched portfolio of LTE test solutions for development and verification.

The PXT includes a suite of LTE RF measurements that may be used for characterization, calibration, and verification purposes.

With realistic base station/network emulation, the PXT LTE test set offers a controlled environment which can be used to provide network signaling to verify UE functional performance such as throughput. The PXT provides maximum flexibility to configure a range of connection and network parameters. This enables test, stress, and debug of the protocol and data handling capabilities of designs including circuit switched fall back (CSFB), simultaneous voice and LTE (SVLTE), and single radio voice call continuity (SRVCC).

Optional software applications are available to enable more detailed protocol and application testing and analysis.

With the PXT, Keysight helps you get designs to market faster and more efficiently, and continues to provide you with comprehensive tools for all stages of the product lifecycle.

Signaling Test Items

- Support for multiple 3GPP LTE dated specifications, optional FDD and TDD
- Settable frequency, power, modulation schemes, bandwidth, and grant/allocation
- Attach, connection, reconfiguration, authentication, NAS and RRC security
- High data throughput using internal test mode or end-to-end IP data—up to 102 Mbps DL, 51 Mbps UL, and Cat 3FDD
- Transmission modes 1-4 and 6, SISO, Tx diversity, open-loop MIMO, and closed-loop MIMO operation
- UE reporting for ACK/NACK's lost packets, UCI and measurement reporting, as well as CQI, PMI, and RI for FDD
- LTE-to-LTE handovers
- 2G GSM/(E)GPRS, 3G W-CDMA/HSPA, cdma2000®/1xEV-DO/eHRPD, and TD-SCDMA interRAT handovers when connected to the Agilent 8960 Series 10 wireless communications test set
- LTE real-time protocol logging and analysis
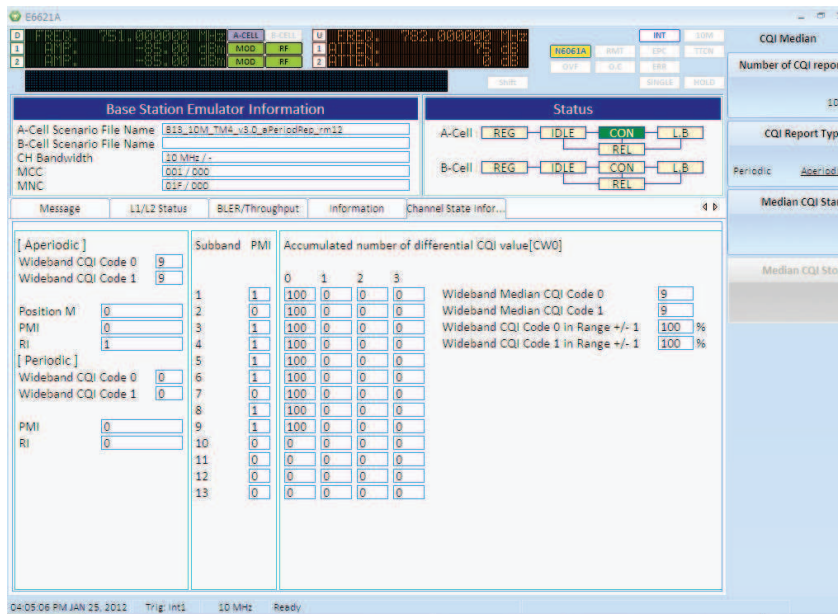- Highly configurable detailed signaling control with LTE message editor application

Figure 2. N6050A LTE mobile test software channel state information screen

www.valuetronics.com

UE Receiver (DL) Test

- – Measurements based on 3GPP 36.521 requirements
- – Measurements in UE test mode, end-to-end data test, or with UE set to receive only
- – High data throughput using internal test mode or end-to-end IP data–up to 102 Mbps, DL, 51 Mbps UL, and Cat 3 FDD
- – Settable frequency, power, modulation schemes, bandwidth, and grant/allocation
- – Display of UE reports (CQI, PMI, RI, UCI and power headroom, buffer reporting)
- – 2x2 downlink MIMO channel with wide-band and sub-band CQI per code
- – Built-in traffic generation for UE downlink test
- – ACK/NACK/lost packet reports
- – DL error rate percentage (text and graphical)
- – DL instantaneous throughput (text and graphical)
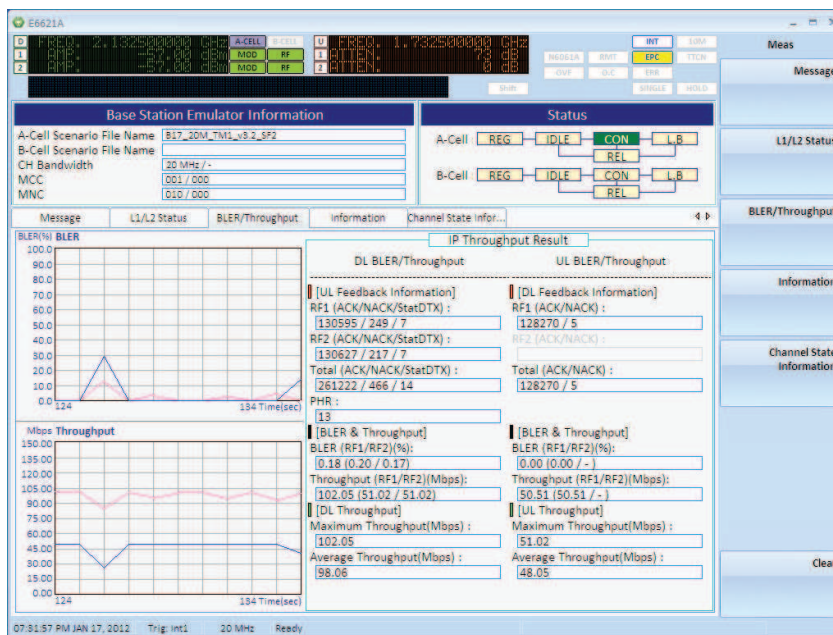- – OCNG and AWGN impairments

Figure 3. N6052C Category 3 MIMO throughput – 102 Mbps DL/51 Mbps UL

4

UE Transmitter (UL) Test

- Measurements based on 3GPP 36.521 requirements
- Measurements in test mode, end-to-end data test, or with UE set to transmit only
- Settable frequency, power, modulation schemes, bandwidth, and grant/allocation
- Channel power, power spectrum, power versus time, and flatness
- Occupied bandwidth
- Spectrum emission mask
- Adjacent channel power
- Constellation, EVM
- Frequency and timing error
- Received I/Q data
- UL throughput
- Supports 89600 VSA software for additional in-depth RF analysis
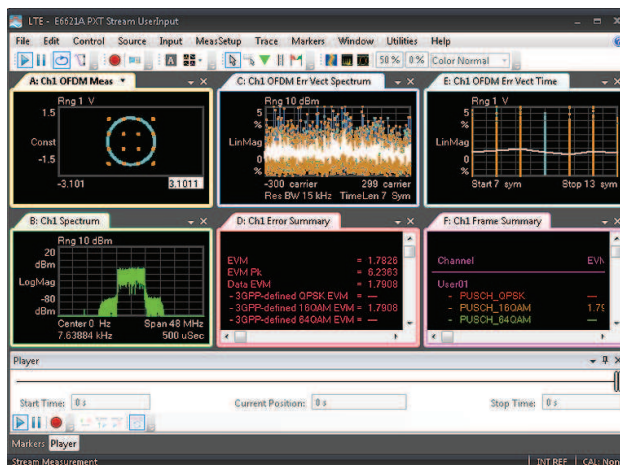

Figure 4. N6061A IQ data measurement

Figure 5. 89600 VSA software support

5

LTE Message Editor

LTE message editor is a highly flexible tool for configuring Layer 3 messages (RRC and NAS). It provides detailed parameter control offering far more flexibility than a normal one-box tester.

– Create and modify scenario files for download into the PXT
– Complete control over all settings including system, network, and base station information
– Send erroneous messages to test UE responses
– Easy to use, with intuitive tree menu structure for message management
– Share scenarios during collaborative test development and for faster troubleshooting
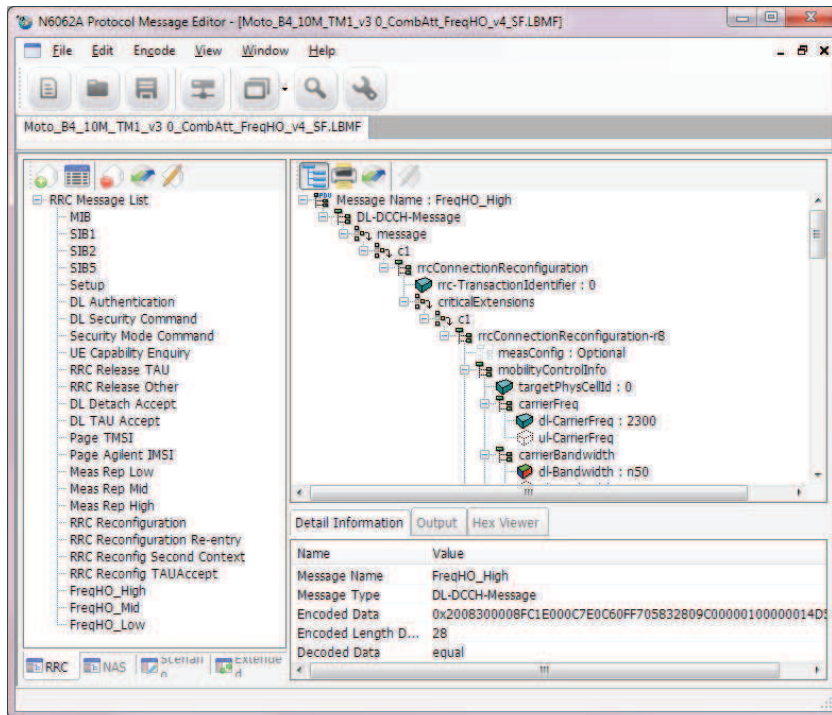

Figure 6. Absolute signaling flexibility with message editor

www.valuetronics.com

LTE Protocol Logging and Analysis

LTE protocol logging and analysis are essential tools for debugging interoperability issues that are inevitable with evolving radio technologies such as LTE. Even relatively simple tests such as UE attach can become frustrating without the tools to adequately debug and resolve issues.

– Real time logging and post capture analysis of all layers from L1 to NAS
– Message filtering—sort data by protocol layer
– View detailed decodes down to bit level
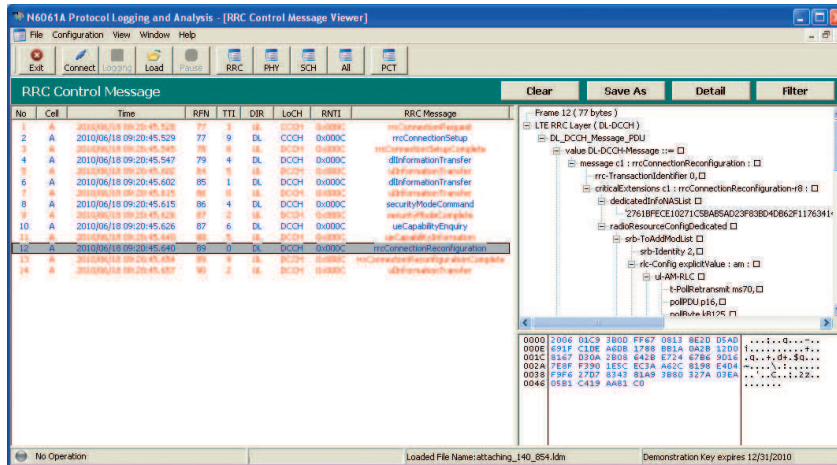– Export files into Wireshark-supported format

Figure 7. Real-time logging and post capture analysis of all layers from L1 to NAS

7

Easily Test Real-World User Experiences

Keysight's Interactive Functional Test (IFT) software, designed to fully utilize the industry-leading signaling and data capabilities of the Agilent 8960 (E5515C/E) and PXT (E6621A) wireless communications test sets, provides a solution for real-world functional test of mobile devices. Bring real-world test into the design cycle earlier by automating and simplifying design, verification, stress test, and realistic user-experience scenarios.

– System configuration wizard
– Easy and flexible set up of operations
– Ability to perform operations simultaneously (just as an end-user would)
– Easy script development for test sequence repetition

PXT wireless communications test set

UE with battery

N6705B DC power analyzer with N6781A SMU in measure-only mode

RF

Control interface

Battery voltage & current metering

LAN

Optional PC or internet connection for running server applications

PC running N5972A IFT software and 14585A battery drain analysis software
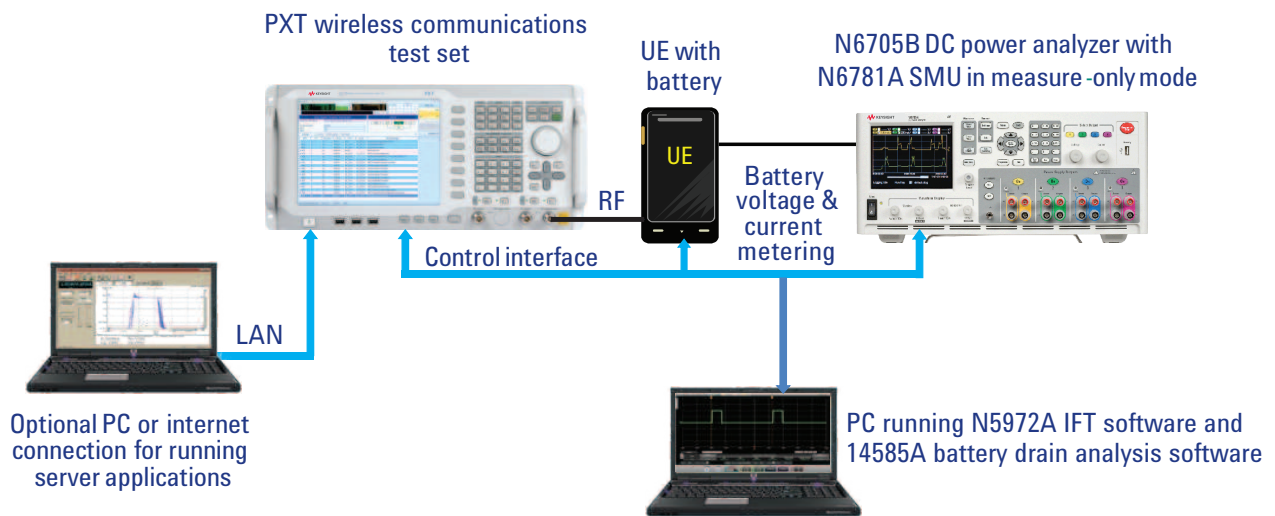
Figure 8. Interactive functional test system

www.valuetronics.com

Network Operator Test Plans

Let Keysight write your operator-specific test plans for you

In addition to requiring the minimum regulatory requirements be met, many network operators require additional testing to approve the UE for use on their networks. Understanding the test requirements and creating test plans for every operator can be time consuming and extend time to market.

Keysight smoothes the path through the operator—specific approvals process by providing pre-packaged automated test scripts for many operator-specific test plans, providing the required test output in the formats required by each operator.

N5973A

The N5973A scripts support the following Verizon Wireless compliance test plans 1FP: LTE-CDMA interRAT, 2FP: LTE-CDMA interRAT SVD, and 4FP: IMS VoIP

- Verizon Wireless-listed test solution
- Automatically outputs results in the Verizon Wireless—required format
- Supports the established Keysight 8960 and PXT wireless communications test sets
- Includes the Keysight E6966A IMS-SIP server and client

N5974A-9FP

IFT automation for AT&T Wireless compliance test plan, battery drain operations
- AT&T Wireless-listed test solution
- Automatic test scripts based on the AT&T Wireless test plan
- Compatible with selected Keysight DC power sources for battery emulation
- Supports the established Keysight 8960 and PXT test sets

N5978A-1FP

IFT automation for TD-LTE IOT test plan, Phase 1
- Automatic test scripts based on the TD-LTE IOT test plan
- Supports the established Keysight 8960 and PXT test sets

www.valuetronics.com

Easily Test Real-World User Experiences

Efficiently verify performance of UE in an All-IP IMS-SIP test environment

The Keysight Technologies E6966A IMS-SIP network emulator software is designed to complement the powerful 8960 and PXT wireless test sets, delivering unique capabilities for UE performance testing. These test sets establish data connection to UEs with various radio access technologies, including LTE (VoLTE), W-CDMA/HSPA, and more. Use the E6966A's IMS-SIP server/client pair for testing voice, video, and SMS services on all-IP networks.

E6966A lets you

- Manually or automatically control via a defined API
- View detailed call flow logs and ladder diagrams
- Allocate IPv6 and IPv4 addresses
- Achieve registration, authentication, and de-registration
- View detailed call flow logs
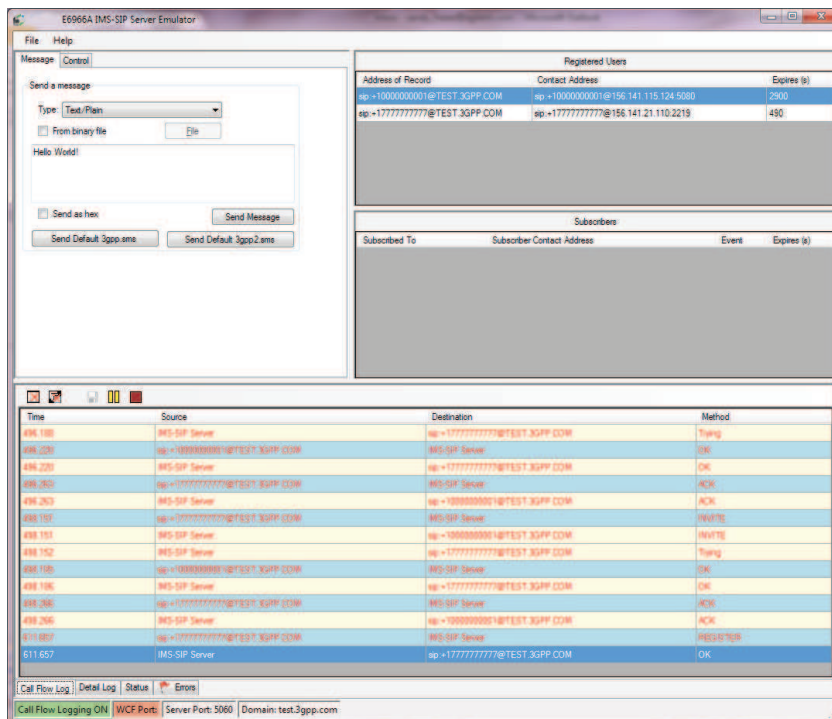- Insert error conditions for a typical response testing

Figure 9. View of registration and connection log on E6966A IMS-SIP server

10

Easily Test Real-World User Experiences

Quickly and easily automate wireless device calibration and test

Keysight's Wireless Test Manager software makes it quick and easy to automate and optimize wireless device calibration and test. The Wireless Test Manager supports the popular wireless technologies, runs on a Windows PC and supports Keysight test system hardware. Features include ready-to-use tests, test plans, test sequencing, Visual Basic 6 or Visual Basic .NET test development (using customer-supplied Visual Basic 6 or Visual Basic .NET software) and custom application development utilities. (Test development platform is dependent on Wireless Test Manager product selection.)

Wireless Test Manager lets you
- Pre-defined test steps and devices with user-friendly Windows interface
- Define and change test plans easily—without any programming
- Use Visual Basic .NET-based development platform for maximum flexibility when customizing test steps and adding new instruments
- Use PC-based software designed for fast development and deployment for manufacturing, service, and R&D needs

Figure 10. Simplify your automated test plans with Keysight WTM software

11

Product Configuration

The flexible PXT instrument can be used in a variety of configurations.

- Optional PXT instrument hardware and firmware to configure the instrument for maximum flexibility or minimum cost
- Additional PC and applications to further extend flexibility, debug, and analysis
- Connections to the 8960 with lab applications for 2G/3G/cdma2000 I-RAT handover testing
- Options automation and network operator automated test scripts

N5972A
N5973A
N5973AS
N5974A
N5974AS

IFT and operator test scripts

IMS-SIP server/client

E6966A-1FP
E6966A-2FP

E6567E
E6568E

Wireless Test Manager

N6050A-7FP
N6050A-8FP
N6050AS-1SY

LTE FDD/LTE TDD

Engineering PC

E6621A-OPC

89601B-200
89601B-300

VSA software

N6051A-1FP

RF measurements

N6062A-1TP

Message editor

N6052A-1FP

PXT E6621A
-503, -506, -2D2, -BB1

N6061A-1TP

Functional test for protocol, end-to-end applications

Protcol logger

Figure 11. Maximum flexibility to satisfy all configuration needs

www.valuetronics.com

E6621A Specifications

PXT frequency range	
E6621A	**PXT wireless communications test set**
E6621A-503	Frequency range from 500 MHz to 3.0 GHz (default)
E6621A-506	Frequency range from 500 MHz to 5.9 GHz
Other PXT options	
E6621A-2D2	Downlink 2x2 MIMO (default)
E6621A-BB1	Enhanced baseband processing (Adds hardware required for 2-cell)
PXT application options	
N6050A	LTE mobile test software
N6050A-7FP	LTE FDD base station emulation
N6050A-8FP	LTE TDD base station emulation
N6051A-1FP	LTE RF parametric test with test mode signaling
N6052A-1FP	LTE functional and application test
PC for N6061A and N6062A	
E6621A-0PC	Desktop PC, high performance
PC application options	
E6966A	IMS-SIP network emulator software
E6567E	cdma2000®/1xEV-DO/LTE Wireless Test Manager
E6568E	2G/3G/LTE Wireless Test Manager
N5972A-1FP	IFT software
N5973A-1FP	IFT automation for Verizon Wireless compliance test plan, LTE-CDMA Inter-RAT operations
N5973A-2FP	IFT automation for Verizon Wireless compliance test plan, simultaneous voice and data
N5973A-4FP	IFT automation for Verizon Wireless compliance test plan, IMS-VoIP
N5974A-9FP	IFT automation for AT&T Wireless compliance test plan, battery drain operations
N5978A-1FP	IFT automation for TD-LTE IOT test plan, Phase 1
N6061A-1TP	LTE protocol logging and analysis
N6062A-1TP	LTE message editor
Software and technical support contract	

Software and technical support contracts (STSC) entitle you to software updates and feature enhancements, as well as direct access to technical experts. These contracts are designed to increase your productivity by delivering software updates and providing a formal technical support channel for any operational difficulties you may encounter. The N6050AS STSC entitles the user to software and support for the E6621A PXT products N6061A, N6062A, N6050A, N6051A, and N6052A for both FDD or TDD options.

The N5973AS STSC covers all automation scripts you have purchased for the N5973A and also provides you with updates to the related IFT and IMS-SIP software.

N5973AS-1SY	Software and technical support contract for N5973A
N5974AS-1SY	Software and technical support contract for N5974A
N5978AS-1SY	Software and technical support contract for N5978A
N6050AS-1SY [1]	LTE mobile test software – 1 year STSC
Start-up assistance	
PS-S20-01	1 day start-up assistance
Repair options/Warranty	
Select coverage	
Included	3-year warranty (return to Keysight), standard
R-51B-001-5Z	5-year warranty assurance plan (return to Keysight)

1. Software and technical support contracts with suffix 1SY are valid for one year. To extend your software and technical contract to two or three years use suffix –2SY or –3SY.

www.valuetronics.com

PXT Specifications

The PXT will meet its warranted performance after one hour within the stated environmental operating range plus one hour after turn on. Unless otherwise stated all specifications are valid over the operating temperature range. Supplemental characteristics are intended to provide additional information, useful in applying the instrument by giving typical (expected), but not warranted,
performance parameters at room temperature (20 to 30 °C). These characteristics are shown in *italics*. The specifications in this data sheet apply to all instruments after and including serial number MY52190101.

Signal analyzer specifications	
Frequency	
Frequency range [1]	500 MHz to 3.0 GHz (E6621A-503)
	500 MHz to 5.9 GHz (E6621A-506)
Frequency setting resolution	1 Hz
Frequency accuracy	Same as frequency reference
Amplitude	
Modulated level accuracy 20 MHz channel bandwidth	
Up to 3 GHz, input amplitude	
–40 to –10 dBm	±0.90 dB
–50 to –40 dBm	±1.00 dB
3 to 5.9 GHz, input amplitude	
–40 to –10 dBm	±1.00 dB
–50 to –40 dBm	±1.00 dB
Modulated level accuracy 5, 10 MHz channel bandwidth	
Up to 3 GHz, input amplitude	
–40 to –10 dBm	±0.70 dB
–50 to –40 dBm	±1.00 dB
3 to 5.9 GHz, input amplitude	
–40 to –10 dBm	±0.70 dB
–50 to –40 dBm	±1.00 dB
UL spurious	
	< –65 dBc excluding IF image
	< –50 dBc including IF image
Performance	
EVM accuracy	
Up to 3 GHz, input amplitude	
–30 to –10 dBm	1.50%
–40 to –30 dBm	3.00%
3 to 5.9 GHz, input amplitude	
–30 to –10 dBm	2.00%
–40 to –30 dBm	3.75%

1. Frequency can be set from 350 MHz, but with no warranted performance.

Signal generator specifications	
Frequency	
Frequency range [1]	500 MHz to 3.0 GHz (E6621A-503)
	500 MHz to 5.9 GHz (E6621A-506)
Frequency resolution	1 Hz (0.5 to 1.3 GHz)
	2 Hz (1.3 to 3.3 GHz)
	4 Hz (3.3 to 5.9 GHz)
Frequency accuracy	Same as frequency reference
Amplitude	
CW level range	RF Out only –110 to –10 dBm
	RF In/Out –110 to –15 dBm
Level setting resolution	0.1 dB
CW level accuracy/flatness	
Up to 3 GHz, output amplitude	
–106 to –10 dBm [2]	±0.4 dB
–110 to –106 dBm	±0.6 dB
3 to 5.9 GHz, output amplitude	
–98 to –10 dBm [2]	±0.6 dB
–110 to –98 dBm	±0.7 dB
Performance	
EVM accuracy	
Up to 3 GHz, output amplitude	
–22 to –10 dBm [2]	2.00%
≤ –22 dBm	1.25%
3 to 5.9 GHz, output amplitude	
–22 to –10 dBm [2]	3.00%
≤ –22 dBm	1.25%
Harmonics	≤ –30 dBc (0.5 to 3.3 GHz)
	≤ –25 dBc (3.3 to 5.9 GHz)
	For level ≤ –10 dBm minus internal loss
Sub-harmonics	≤ –30 dBc (3.3 to 4.0 GHz)
	≤ –23 dBc (4.0 to 5.9 GHz)
Non-harmonic spurious	≤ –46 dBc

1. Frequency can be set from 350 MHz, but with no warranted performance.
2. RF In/Out port is only specified up to –15 dBm.

www.valuetronics.com

E6621A Specifications

Maximum data throughput	
Data throughput	
UE test mode or end-to-end IP connection	102 Mbps (CAT3) DL 51 Mbps UL (CAT3)

General specifications	
RF input/output impedance	50 Ω (nominal)
Maximum safe input level	+20 dBm
Interfaces	USB, LAN, GPIB, trigger in/out, IQ/IF inputs/ outputs, reference input/output
RF reference input/output	10 MHz
Frequency reference accuracy	± 1E-6
Aging per year	5x10E-8 (–20 to 70 °C)
Temperature stability	2x10E-8
Power requirement	100 to 240 Vac, 50/60 Hz
Size (w x d x h)	444 mm x 600 mm x 222 mm
Weight	27.6 kg maximum with all possible options
Operating temperature	0 to 45 °C
Storage temperature	–20 to 70 °C

Related Keysight Literature

Publication title	Pub number
Greater Insight into LTE Design and Test Brochure	5989-7817EN
Accounting for Antenna and MIMO Channel Effects Using Keysight SystemVue Application Note	5990-6435EN
Testing Handovers Between LTE and 3G cdma2000/1xEV-DO Cellular Networks	5990-8362EN
N5973A IFT Automation Scripts for the Verizon Wireless Compliance Test Plan Technical Overview	5990-9071EN
Keysight 14565B Software and 66319B/D and 66321B/D Mobile Communications DC Sources	5990-3503EN

www.valuetronics.com

myKeysight

www.keysight.com/find/mykeysight

A personalized view into the information most relevant to you.

Three-Year Warranty

www.keysight.com/find/ThreeYearWarranty

Keysight's commitment to superior product quality and lower total cost of ownership. The only test and measurement company with three-year warranty standard on all instruments, worldwide.

Keysight Assurance Plans

www.keysight.com/find/AssurancePlans

Up to five years of protection and no budgetary surprises to ensure your instruments are operating to specification so you can rely on accurate measurements.

www.keysight.com/quality

Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2008
Quality Management System

cdma2000 is a registered certification mark of the Telecommunications Industry Association

www.keysight.com/find/e6621a
www.keysight.com/find/pxt
www.keysight.com/find/lte
www.keysight.com/find/sct
www.keysight.com/find/wtm
www.keysight.com/find/e6966a

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:
www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	0800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:
www.keysight.com/find/contactus
(BP-07-10-14)

KEYSIGHT
TECHNOLOGIES

www.valuetronics.com