Keysight Technologies CMMB X-Series Measurement Application N6158A & W6158A

Technical Overview



# Introduction

- Measure CMMB transmitters, exciters, modulators, gap-fillers, tuners, or amplifiers performance
- Perform one-button tests with CMMB standard compliant pass/fail limit

- Use hardkey/softkey manual user interface or SCPI remote user interface
- Leverage built-in, context-sensitive help
- Move the application between X-Series signal analyzers with transportable licensing

## **CMMB** Measurement Application

The CMMB measurement application provides one-button standard-based power and modulation analysis capabilities to help your design, evaluation and manufacturing of CMMB modulators, transmitters, amplifiers, tuners and gap-fillers/repeaters. With the optional analog baseband IQ inputs in the PXA or MXA signal analyzer, it can also provide the flexibility of measuring signal quality and modulation accuracy with the RF input or analog IQ input.

### Key parameter setup

- Device type: Transmitter/exciter
- Measurement type: PLCH/timeslot/frame
- Modulation format: BPSK/QPSK/16QAM
- Trigger mode: External trigger, periodic timer, free run
- Input: RF or analog IQ (only available in the N9030A PXA or N9020A MXA) for signal quality and modulation accuracy measurements

	Mod Accuracy							
Center Fred	0 Ω <b>1 634.000000 M</b> H	Ιz	AC S CH Freq Trig: Pe	ENSE:INT : 634.000 000 I riodic Timer	ALIG MHz (CH Num: AvalHold: 10/1	28) Radio Std: C 10 Mod Format	MMB QPSK	Measurements
EVM:	0.41 %		Atten: 10	dB (Elec 0)		PLCH: SLCH	10	Channel Power
	1.57 % pk at carrier(1428)			I/Q Meas	sured Pola	r Graph		ACP
WER.	36.07 dB pk at carrier(1428)		۲	۲	۲	٩		Power Stat CCDF
Mag Err:	0.29 % 1.41 % pk at carrier(102)		۲	۹	۹	•		Spectrum Emission Mask
Phase Err:	0.21 deg 1.48 deg pk at carrier(1353)		۹	•	۲	۲		Mod Accuracy
Freq Err:	0.01 Hz		۲	۲	۲	ø		Occupied BW
				Cu	rrent Slot# 1			More 1 of 2
MSG						STATUS		

The CMMB measurement application is just one in a common library of more than 25 measurement applications in the Keysight Technologies, Inc. X-Series, an evolutionary approach to signal analysis that spans instrumentation, measurements, and software. The X-Series analyzers, with upgradeable CPU, memory, disk drives, and I/O ports, enable you to keep your test assets current and extend instrument longevity. Proven algorithms, 100% code-compatibility, and a common UI across the X-Series create a consistent measurement framework for signal analysis that ensures repeatable results and measurement integrity so you can leverage your test system software through all phases of product development. In addition to fixed, perpetual licenses for our X-Series measurement applications, we also offer transportable licenses which can increase the value of your investment by allowing to you transport the application to multiple X-Series analyzers.

### CMMB Standards Overview

China multimedia mobile broadcasting (CMMB) is a mobile digital video standard developed in China by the State Administration of Radio, Film, and Television. Announced in 2006, CMMB network has been deployed in more than hundreds of cities in China.

The core part of CMMB is satellite and terrestrial interactive multiservice infrastructure (STiMi). It uses both satellite and terrestrial signals to obtain effective coverage both in densely populated cities and in sparsely populated rural areas. CMMB system supports single-frequency network (SFN) and multiple-frequency network (MFN).

CMMB physical layer can support N (1~39) data streams at the same time (Fig 1). Each data stream is configurable on channel coding, constellation and timeslots allocation. That means CMMB signal can broadcast up to 39 services (e.g., SDTV, HDTV), giving each service different error protections.

The CMMB broadcasting system uses physical logical channels (PLCH) to transmit the upper-layer services. The allocation of PLCH is shown in Fig 2. The PLCHs include one control logical channel (CLCH) and 1~39 service logical channels (SLCH). CLCH contains CMMB broadcast system control information and occupies only time slot 0. SLCH can be configured to contain one or more time slots to transmit one broadcasting service.



Figure 1. The block diagram of CMMB system



Figure 2. CMMB PLCH

# **RF** Transmitter Tests

The RF transmitter test requirements for CMMB transmitter and exciter are defined in GD/J020-2008 technical specification and methods of measurement for mobile multimedia broadcasting transmitters and technical specification and method of measurement for mobile multimedia broadcasting exciters (draft) standards. Table 1 shows RF transmitter and exciter tests defined by the specs along with the corresponding measurements provided by the CMMB measurement application. Table 1. Required RF transmitter and exciter measurements and the corresponding measurements in N/W6158A and other modes

Test item	GD/J020-2008 (For transmitter measurement)	Test specification (For exciter measurement)	N/W6158A CMMB measurement application
Frequency adjustable step	•	•	Spectrum analyzer mode (marker counter function)
Frequency stability	•	•	Spectrum analyzer mode (marker counter function)
Frequency accuracy	•	•	Spectrum analyzer mode (marker counter function)
RF power		•	Channel power (RF spectrum view)
RF power stability	•	•	Channel power (RF spectrum view)
RF effective bandwidth		•	Spectrum analyzer mode (marker counter)
Shoulder attenuation	•	•	Channel power (shoulder attenuation view)
In-band spectrum flatness	٠	٠	Modulation accuracy (spectral flatness view)
Spectrum mask	٠		Channel power (spectrum mask view) or spectrum emission mask
Useless power in adjacent channel	•	•	ACP
Power outside adjacent channel	•	•	ACP
Phase noise	•	•	N/W9068A phase noise measurement application
Peak-to-average power ratio		•	Power stat CCDF
Modulation error ratio	•	•	Modulation accuracy (result metrics view)

## Measurement details

Measurements as defined by the CMMB standard, as well as a wide range of additional measurements and analysis tools, are available with a press of a button (Table 2). These measurements are fully remote controllable via the IEC/IEEE bus or LAN, using SCPI commands.

Analog baseband measurements are available on the PXA or MXA signal analyzer equipped with BBIQ hardware. Supported baseband measurements include all of the modulation quality plus I/Q waveform and CCDF measurements. Table 2. One-button measurements provided by the CMMB measurement application

Technology	CMMB
Maggurament application	
X-Series signal analyzer	PXA, MXA, EXA, CXA
Measurements	Channel power RF spectrum Shoulder attenuation
	Adjacent channel power
	Spectrum emission mask
	Power statistic CCDF
	Occupied bandwidth
	Monitor spectrum
	IQ waveform
	Modulation accuracy RMS EVM (%) Peak EVM (%) Position of peak EVM RMS MER (dB) Peak MER (dB) Position of peak MER RMS mag error (%) Peak mag error (%) Position of peak mag error RMS phase error (deg) Peak phase error (deg) Position of peak phase error Frequency error (Hz) Tx power (dBm) Quadrature error (deg) Amplitude imbalance (%) Timing skew (s) Trigger difference (s) MER/EVM vs. subcarriers (frequency Amplitude vs. subcarriers (dB) Phase vs. subcarriers (dB) Phase vs. subcarriers (ns) Channel impulse response (dB) MER of data (dB) MER of continual pilot (dB) MER of scatter pilot (dB) In-band spectrum ripple Amax-Ac (dB) Region index Transmitter index

СММВ -	Mod Accuracy							
Center Free	<sup>50 Ω</sup> a 634.000000 Mi	lz	AC S CH Free	ENSE:INT 4: 634.000 000	ALIG MHz (CH Num:	28) Radio Std: C	MMB	Measurements
	Input: RF		Atten: 1	riodic Timer 0 dB (Elec 0)	Avg Hold: 10/1	IO Mod Format PLCH: SLCI	: QPSK 10	
EVM:	0.41 %							Channel Power
	1.57 % pk			I/Q Mea	sured Polar	Graph	_	
	at carrier(1428)							ACP
MER:	47.72 dB P							
	36.07 dB pk		۲	۲	۲	۲		Power Stat
	at carrier(1428)					۲		CCDF
Mag Err:	0.29 %					۲		
	1.41 % pk							Spectrum
	at carrier(102)					۲		Emission Mask
Phase Err:	0.21 deg		۲					
	1.48 deg pk							Mod Accuracy
	at carrier(1353)							
Freg Err:	0.01 Hz		۲					
								Occupied BW
								More
				Cu	rrent Slot# 1			1 07 2
MSG		-				STATUS		

Figure 3. CMMB constellation and MER results

	CMMB - Mod Accurat								
Cent	50 Ω er Freg 634.00	00000 M	Hz	AC SEN CH Freq: 6	ISE:INT 634.000 000	ALIGN MHz (CH Num: 2	AUTO Radio	Std: CMMB	View/Display
	li li	nput: RF		Trig: Perio Atten: 10 o	odic Timer dB (Elec 0)	Avg Hold:>10/1	0 Mod F PLCH:	ormat: QPSK SLCH0	MED ve
		Nu	meric	Results	Sum	narv			Timeslot
		nu	mente	Results	Guilli	nary			
	EVM:	0.4	%	1.52	% pk	at ca	arrier(-504)		
	MER:	47.7	5 dB P	36.38	dB pk	at ca	arrier(-504)		Result Metrics
	Mag Err:	0.2	9 %	1.40	% pk	at ca	arrier(-214)		
	Phase Err:	0.2	l deg	-1.29	deg pk	atca	arrier(-1018)		
		D	ata	Co	nt Pilot	Sc	at Pilot		
	EVM:	0.4	%	0.4	1 %	0.4	41 %		
	MER:	47.7	7 dB	47.7	5 dB	47.8	82 dB		
	Freq Err:	0.10 Hz		т	× Power	-9.55	dBm		
	Quad Error:	-0.0133	deg						
	Amptd Imbala	nce:	0.0000	dB					
	Timing Skew:		1.00218	E-04 us					
	Trigger Differe	ence:	5.00008	E-02 us					
	TxID								
	Region Inc	dex:	0	т	ransmitte	r Index 128			More
	Inband Spectr	um Ripp	le						2 of 2
	Amax - Ac	: 0.0	613 dB	P A	min - Ac:	-0.0986	dB P		
MSG							STATUS		

Figure 5. CMMB result metrics



Figure 7. CMMB channel impulse response view

CMMB - Mod Accuracy				
Center Freq 634.000000 MHz	SENSE:INT Freq: 634.000 000 MHz (CH N	ALIGNAUTO um: 28) Radio Std	CMMB	View/Display
MER Y Ref 55 dB	n: 10 dB (Elec 0) Logical Channel:	PLCH: SL	CH0	Display
53.00 51.00 42.00 er (a. 1999) er (and and and and and an a 47.00 er (a. 1999) er (and and and and and an an and an an and an an	CLCH         0         BPSK           SLCH0         1-4         160AM           SLCH1         5-8         160AM           SLCH2         9-12         0PSK           SLCH3         13-18         0PSK	240,240 1/2 Mode1 240,240 1/2 Mode1 240,240 1/2 Mode1 240,240 1/2 Mode1 240,240 1/2 Mode1 240,240 1/2 Mode1	Mode0 Mode0 Mode0 Mode0 Mode0 Mode0	I/Q Measured Polar Graph
4500	SLCH4 17-18 BPSK SLCH5 19-20 BPSK SLCH6 21-39 QPSK	240,240 1/2 Mode1 240,240 1/2 Mode1 240,240 1/2 Mode1	Mode0 Mode0 Mode0	I/Q Error (Quad View)
.1538 Subcarrier 1538				Channe Frequency Response
Polar Graph	EVM: 0.41 MER: 47.77	% 1.62 dB ⊵ 35.81	% pk dB pk	Channel Impulset Response
9 2 0 0 0 7 0 0 0	Phase Err: 0.21	% 1.62 deg 1.44	‰ рк deg pk	Spectra Flatness
9 9 9 9 9	Quad Error: Amptd Imbalance: Timing Skew:	-0.0159 deg 0.0004 dB 9.9732E-05 us		More 1 of 2
460		STATIK		

Figure 4. CMMB IQ quad view

	CMMB - Mo	d Accuracy						
	50 g	634 000000 M	AC CH F	SENSE:INT reg: 634.000 000 M	ALIGN AUTO Hz (CH Num: 28)	Radio Std: CMM	в	View/Display
	inter i req	Input: RF	Trig: Atten	Periodic Timer : 10 dB (Elec 0)		Frame		Display▶
			MER vs.	Timeslot				
	TS Index	PLCH Index	MER (dB)	TS Index	PLCH Index	MER (dB)		I/Q Measured
	00	CLCH	47.25	20	SLCH5	47.99		Polar Graph
	01	SLCH0	47.71	21	SLCH6	48.66		
	02	SLCH0	48.20	22	SLCH6	48.23		
	03	SLCH0	47.31	23	SLCH6	48.10		I/Q Error
	04	SLCH0	47.82	24	SLCH6	48.66		(Quad View)
	05	SLCH1	48.37	25	SLCH6	47.79		
	06	SLCH1	47.87	26	SLCH6	47.78		Channel
	07	SLCH1	47.98	27	SLCH6	48.03		Frequency
	08	SLCH1	47.60	28	SLCH6	47.88		Response
	09	SLCH2	47.27	29	SLCH6	47.67		
	10	SLCH2	48.48	30	SLCH6	48.25		Channel
	11	SLCH2	48.16	31	SLCH6	48.02		Impulse⊳
	12	SLCH2	48.44	32	SLCH6	47.83		Response
	13	SLCH3	46.95	33	SLCH6	47.90		
	14	SLCH3	47.39	34	SLCH6	48.29		Spectral
	15	SLCH3	47.90	35	SLCH6	48.30		Flatness
	16	SLCH3	48.36	36	SLCH6	47.86		Thursdo
	17	SLCH4	47.80	37	SLCH6	48.54		
	18	SLCH4	48.22	38	SLCH6	47.88		More
	19	SLCH5	47.85	39	SLCH6	48.63		1 of 2
1100					0747	10		

Figure 6. CMMB MER vs. timeslot

СММВ -	hannel Power											
Center Fred	° 634.000000	MHz	AC CH Fre	SENSE:INT q: 634.000	000 MHz (C	ALIG H Num:	28)	Radio	Std: (	сммв		View/Display
PASS	Input: RF	#IFGain:Lov	Trig: Fr Atten:	ree Run 12 dB (Ele 10 dB/d	AvgjH c 2)	old>10/	10 0 dBm	Devic	e: Tra	nsmitt	ter	Display▶
-40 -50		j j		-30 -40 -50								RF Spectrum⊳
-60 -70 -80	49.00	10 mart		-60   -70   -70		L. Vo		2.4 dB				Shoulder Attenuation
-100 -110 -110				-100				<b>Ner</b> ost	**77	*****	***	
Start 629 M	z	Stop 6	530.7 MHz	Start	637.3 MHz			s	top (	639 N	ЛНZ	
CenterFre 634.00 MI	q Sp: Iz 10.00	an MHz	#Res B 3.00 kH	W	#VBW 3.00 kH	z	Sw	eepT 1.73 :	ime s			
Sho	ulder Atten	uation		Sho	oulder F	oint	Info	mat	ion			
Over	all -52.42	dB		Low	er -98.3	8 dBn	n @ 6:	29.80	MH:	z		
Uppe	er -53.03 er -52.42	dB dB		Uppe	ər -97.7	6 dBn	n @ 6:	38.20	MH	z		
MSG							STATUS					

Figure 8. CMMB shoulder attenuation

# **Key Specifications**

### Definitions

- Specifications describe the performance of parameters covered by the product warranty.
- 95th percentile values indicate the breadth of the population (≈2σ) of performance tolerances expected to be met in 95% of cases with a 95% confidence. These values are not covered by the product warranty.
- Typical values are designated with the abbreviation "typ." These are performance beyond specification that 80% of the units exhibit with a 95% confidence. These values are not covered by the product warranty.
- Nominal values are designated with the abbreviation "nom." These values indicate expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- PXA specifications apply to analyzers with frequency options of 526 and lower. For analyzers
  with higher frequency options, specifications are not warranted but performance will
  nominally be close to that shown in this section.

Note: Data subject to change

### Performance specifications

Description	РХА	МХА	EXA	СХА
Channel power				
7.512 MHz integration bandwidth	–50 dBm (nom)	–50 dBm (nom)	-50 dBm (nom)	-50 dBm (nom)
Absolute power accuracy				
20 to 30 °C	± 0.61 (± 0.19 dB 95%)	± 0.82 dB (± 0.23 dB 95%)	± 0.94 dB (± 0.27 dB 95%)	± 1.33 dB (± 0.61 dB 95%)
Measurement floor	-85.7 dBm	-82.7 dBm	-78.7 dBm	–75.7 dBm
Channel power with shoulder attenuation v	view			
7.512 MHz integration bandwidth	$ML^{1} = -14.0 \text{ dBm}$ (nom)	$ML^{1} = -16.0 \text{ dBm}$ (nom)	$ML^{1} = -16.0 \text{ dBm}$ (nom)	$ML^{1} = -15.0 \text{ dBm}$ (nom)
Dynamic range, relative				
Offset freq				
4.2 MHz	98.4 dB (103.7 dB typ)	92.2 dB (98.5 typ)	86.9 dB (94.0 dB typ)	84.5 dB (91.7 dB typ)
Power statistics CCDF				
Minimum power at RF input	–50 dBm (nom)	–50 dBm (nom)	-50 dBm (nom)	–50 dBm (nom)
Histogram resolution	0.01 dB	0.01 dB	0.01 dB	0.01 dB
Adjacent channel power				
Minimum power at RF input; 0 to 55 °C	-36 dBm (nom)	-36 dBm (nom)	-36 dBm (nom)	-36 dBm (nom)
ACPR accuracy		7.512 MHz noise band	dwidth, method = IBW	
Offset freq				
8 MHz	± 0.18 dB	± 0.44 dB	± 0.93 dB	± 1.54 dB

1. ML (mixer level) is RF input power minus attenuation.

### Performance specifications (continued)

Description	РХА	МХА	EXA	СХА
Spectrum emission mask	8 MHz integration bandw	idth, RBW = 3.9 kHz		
4.2 MHz offset				
Dynamic range, relative	98.4 dB (103.7 dB typ)	92.2 dB (98.5 dB typ)	86.9 dB (94.0 dB typ)	84.5 dB (91.7 dB typ)
Sensitivity, absolute	–114.5 dBm (–118.5 dBm typ)	–110.5 dBm (–115.5 dBm typ)	–105.5 dBm (–111.5 dBm typ)	–102.5 dBm (–108.5 dBm typ)
Accuracy				
Relative	± 0.10 dB	± 0.18 dB	± 0.18 dB	± 0.27 dB
Absolute, 20 to 30 °C	± 0.62 dB (± 0.20 dB 95%)	± 0.88 dB (± 0.23 dB 95%)	± 1.05 dB (± 0.31 dB 95%)	± 1.53 dB (± 0.64 dB 95%)
10.0 MHz offset				
Dynamic range, relative	100.8 dB (106.2 dB typ)	94.6 dB (100.6 dB typ)	89.3 dB (96.0 dB typ)	87.2 dB (95.0 dB typ)
Sensitivity, absolute	–114.5 dBm (–118.5 dBm typ)	–110.5 dBm (–115.5 dBm typ)	–105.5 dBm (–111.5 dBm typ)	–102.5 dBm (–108.5 dBm typ)
Accuracy				
Relative	± 0.12 dB	± 0.21 dB	± 0.21 dB	± 0.36 dB
Absolute	± 0.62 dB (± 0.20 dB 95%)	± 0.88 dB (± 0.23 dB 95%)	± 1.05 dB (± 0.31 dB 95%)	± 1.53 dB (± 0.64 dB 95%)
Modulation analysis				
ML <sup>1</sup> = -20 dBm, 20 to 30 °C	CLCH + SLCH0, CLCH: Timeslot 0, LDPC 1/2 SLCH0: Timeslot 1-39, LDPC	, Reed Solomon code (240,2 1/2, Reed Solomon code (240	40), Interleaver mode 1, M ,240), Interleaving mode 1, I	odulation type BPSK Modulation type 16QAM
EVM	EQ Off			
Operating range	0 to 16%	0 to 16%	0 to 16%	0 to 16% (nom)
Floor	0.39%	0.54%	0.70%	0.70% (nom)
Accuracy				
from 0.4%/0.54%/0.7% (PXA/MXA/EXA) to 1.0%	± 0.20%	± 0.30%	± 0.30%	
from 1.0% to 2.0%	± 0.10%	± 0.20%	± 0.30%	
from 2.0% to 16.0%	± 0.40%	± 0.40%	± 0.40%	
MER	EQ Off			
Operating range	≥ 16 dB	≥ 16 dB	≥ 16 dB	≥ 16 dB (nom)
Floor	48 dB	45 dB	43 dB	43 dB (nom)
Accuracy				
from 39 to 48 dB/45 dB/43 dB (PXA/MXA/EXA )	± 2.83 dB	± 2.78 dB	± 2.93 dB	
from 34 to 39 dB	± 0.50 dB	± 0.89 dB	± 1.41 dB	
from 16 to 34 dB	± 0.23 dB	± 0.34 dB	± 0.52 dB	
Frequency error <sup>2</sup>				
Range	-20 to 20 kHz	-20 to 20 kHz	-20 to 20 kHz	-20 to 20 kHz
Accuracy	±1 Hz + tfa <sup>3</sup>	±1 Hz + tfa <sup>3</sup>	±1 Hz + tfa <sup>3</sup>	±1 Hz + tfa <sup>3</sup>
Quad error range	-5 to 5 deg	-5 to 5 deg	-5 to 5 deg	-5 to 5 deg
Amplitude imbalance range	–1 to +1 dB	–1 to +1 dB	–1 to +1 dB	–1 to +1 dB

1. ML (mixer level) is RF input power minus attenuation.

2. The accuracy specification applies at the EVM = 1%.

*3. tfa* = *transmitter frequency* × *frequency reference accuracy*.

# Ordering Information

### Software licensing and configuration

Choose from two license types:

 Fixed, perpetual license: This allows you to run the application in the X-Series analyzer in which it is initially installed.

### - Transportable, perpetual license:

This allows you to run the application in the X-Series analyzer in which it is initially installed, plus it may be transferred from one X-Series analyzer to another.

The table below contains information on our fixed, perpetual licenses. For more information, please visit the product web pages.

### N6158A & W6158A CMMB X-Series measurement application

Description	Model-	Option	Additional information
	PXA, MXA, EXA	СХА	
СММВ	N6158A-2FP	W6158A-2FP	

For a complete list of specifications refer to the appropriate specifications guide.

PXA: www.keysight.com/find/pxa\_specifications

MXA: www.keysight.com/find/mxa\_specifications

EXA: www.keysight.com/find/exa\_specifications

CXA: www.keysight.com/find/cxa\_specifications

# Hardware configuration

# N9030A PXA signal analyzer

Description	Model-Option	Additional information
Analog baseband IQ (BBIQ) inputs	N9030A-BBA	Required for analog baseband measurement
3.6, 8.4, 13.6, 26.5, 42.98, 44 or 50 GHz frequency range	N9030A-503, -508, -513, -526, -543, -544 or -550	One required
Precision frequency reference	N9030A-PFR	Recommended
Electronic attenuator, 3.6 GHz	N9030A-EA3	Recommended
Preamplifier, 3.6, 8.4, 13.6, 26.5, 42.98, 44 or 50 GHz	N9030A-P03, -P08, -P13, -P26, -P43, -P44 or P50	One recommended
Analysis bandwidth to 25, 40, or 160 MHz	N9030A-B25, -B40, or -B1X	One optional

### N9020A MXA signal analyzer

Description	Model-Option	Additional information
3.6, 8.4, 13.6, or 26.5 GHz frequency range	N9020A-503, -508, -513, or -526	One required
Analog baseband IQ (BBIQ) inputs	N9020A-BBA	Required for analog baseband measurement
Precision frequency reference	N9020A-PFR	Recommended
Electronic attenuator, 3.6 GHz	N9020A-EA3	Recommended
Preamplifier, 3.6, 8.4, 13.6, or 26.5 GHz	N9020A-P03, -P08, -P13, or -P26	One recommended
Analysis bandwidth to 25 or 40 MHz	N9020A-B25, -B40	One optional

# N9010A EXA signal analyzer

Description	Model-Option	Additional information
3.6, 7.0, 13.6, or 26.5 GHz frequency range	N9010A-503, -507, -513, or -526	One required
Precision frequency reference	N9010A-PFR	Recommended
Fine step attenuator	N9010A-FSA	Recommended
Electronic attenuator, 3.6 GHz	N9010A-EA3	Recommended
Preamplifier, 3.6 or 7.0 GHz	N9010A-P03 or -P07	One recommended
Analysis bandwidth to 25 or 40 MHz	N9010A-B25, -B40	One optional

### N9000A CXA signal analyzer

Description	Model-Option	Additional information
3.0, 7.5, 13.6, or 26.5 GHz frequency range	N9000A-503, -507, -513, or -526	One required
Precision frequency reference	N9000A-PFR	Recommended
Analysis bandwidth to 25 MHz	N9000A-B25	Optional
Tracking generator, 9 kHz to 3GHz or 6 GHz	N9000A-T03 or T06	One optional
Fine step attenuator	N9000A-FSA	Recommended
Preamplifier, 3.0, 7.5, 13.6, or 26.5 GHz	N9000A-P03, -P07, -P13, or -P26	One recommended
Wideband IF output	N9000A-CR3	Optional

# Related Literature

N6158A and W6158A CMMB Measurement Application, Demonstration Guide, Literature Number 5990-5934EN

N6158A & W6158A CMMB Measurement Application, Measurement Guide, Part number N6158-90002

N6158A & W6158A CMMB Measurement Application, User's and Programmer's Reference, Part Number N6158-90001

# Web

Product page: www.keysight.com/find/N6158A and www.keysight.com/find/W6158A

X-Series measurement applications: www.keysight.com/find/X-Series\_Apps

X-Series signal analyzers: www.keysight.com/find/X-Series

Application pages: www.keysight.com/find/digitalvideo

Digital video solution table: www.keysight.com/find/digitalvideo\_solution

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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

United Kingdom

For other unlisted countries: www.keysight.com/find/contactus (BP-09-04-14)



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