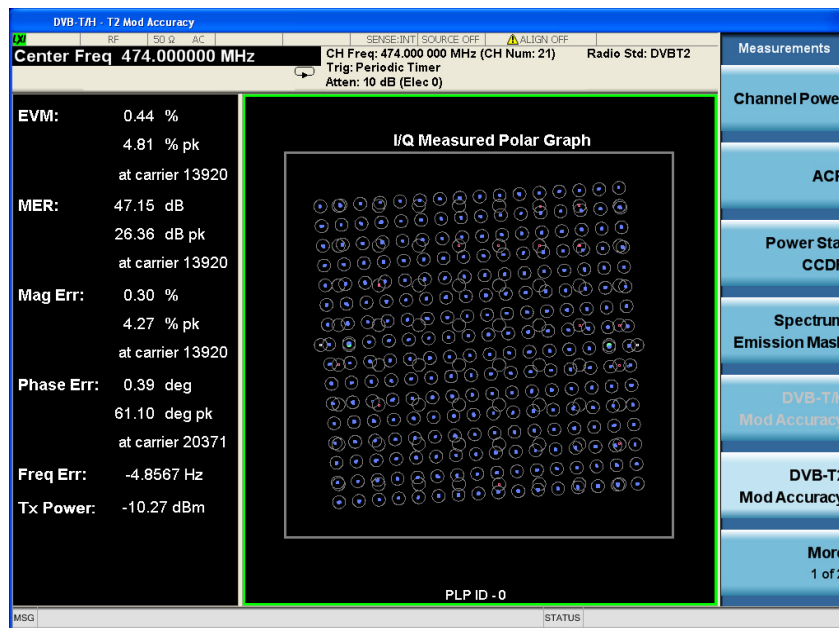# Keysight Technologies
DVB-T/H with T2
X-Series Measurement App, Traditional UI
N6153EM0D

Technical Overview

- DVB-T/H/T2 RF transmitters, modulators, gap-fillers, tuners, or amplifiers measurements
- Single frequency network measurement (supports pre-, post-, 0 dB, and out-of-GI echo scenarios)
- Auto-detect demodulation parameters from TPS decoding of DVB-T/H or from L1-Signalling of DVB-T2
- DVB-T2 supports both single PLP and multi-PLP modes as well as SISO and MISO measurements
- One-button tests with pass/fail limit per DVB-T, DVB-H, and DVB-T2 standards
- Hardkey/softkey manual user interface or SCPI remote control
- Built-in, context-sensitive help
- Flexible licensing provides the option of using perpetual or time based licenses with one or multiple signal analyzers

KEYSIGHT
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DVB-T/H with T2 Measurement Application

The Keysight Technologies, Inc. N6153EM0D measurement application provides one-button, standards-based power and modulation analysis capabilities to help you with designing, evaluating, and manufacturing DVB-T/H/T2 modulators, transmitters, amplifiers, tuners, and gap-fillers/repeaters. Optional analog baseband IQ inputs in the PXA or MXA signal analyzer provide you the flexibility to measure signal quality and mod-ulation accuracy with RF input or analog IQ input.

X-Series measurement applications can help you:
– Gain more insight into device performance with intuitive display and graphs for your application. Select from our library of over 25 different measurement applications.
– Ensure that your design meets the latest standard. Updates are made to the X-Series measurement applications as standards evolve.
– Apply the same measurement science across multiple hardware platforms for consistent measurement results over your design cycle from R&D to production.
– Choose the license structure that meets your business needs. We provide a range of license types (node-locked, transportable, floating or USB portable) and license terms (perpetual or time-based).

Key parameter setup

– Radio standard: DVB-T, DVB-H, and DVB-T2 (versions 1.1.1 and 1.2.1) Channel bandwidth: 5/6/7 /8 MHz in DVB-T/H; 1.7/5/6/7 /8/10 MHz in DVB-T2
– FFT Mode: 2K/8K in DVB-T, 2K/4K/8K in DVB-H, 1k/2K/4K/8K/16K/32K in DVB-T2
– Modulation: QPSK/16QAM/64QAM in DVB-T/H; QPSK,16/64/256QAM in DVB-T2
– Input: RF or analog IQ (available in the PXA or MXA) for signal quality and modulation accuracy measurements
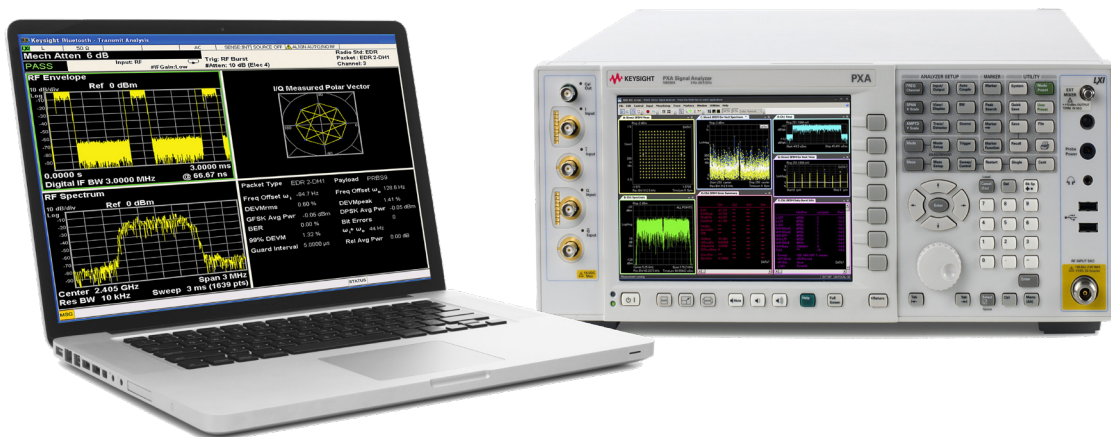
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DVB-T/H Standards Overview

Digital video broadcasting-terrestrial/ handheld (DVB-T/H) is the European-based consortium standard for broadcast transmission of digital terrestrial/handheld television.

DVB-T

DVB-T is a flexible system that allows networks to be designed for the delivery of compressed digital audio, video, and other data in an MPEG transport stream using OFDM modulation with concatenated channel coding (i.e. COFDM). It is the most widely adopted digital terrestrial television broadcasting standard in the world and is deployed in more than 30 countries.

In DVB-T, the use of OFDM modulation with appropriate guard interval allows optimal tradeoff between network topology and frequency efficiency. The capacity for hierarchical modulation can enable two completely separate data streams to transmit in a single signal which can be used to trade off bit rate versus ruggedness. DVB-T has the following technical characteristics that make it a very flexible system.

DVB-H

DVB-H is an extension of the DVB-T standard, which takes into account the handheld receiver's specific properties such as the small size, light weight, portability, and battery operation.

DVB-H uses a time slicing technique which results in a large battery power saving effect, and introduces a multiprotocol encapsulation forward error correction (MPE-FEC) scheme for reliable transmission in poor signal reception conditions. A transmission mode of 4k is defined in DVB-H to offer a tradeoff between the transmission cell size and mobile reception capabilities.

The complexity of the DVB-T/H standards demands flexibility and excellent modulation analysis for system development and evaluation.

DVB-T2

The DVB-T2 standard, defined in ETSI EN 302 755, is an extension of the existing DVB-T standard, aiming to provide a minimum of 30% capacity increase over the DVB-T, improving single-frequency-network (SFN) performance, service specific robustness, better error correction ability, and bandwidth and frequency flexibility.

A new technology, called Rotated Constellation, is used and provides significant additional robustness in difficult channels. DVB-T2 defines two modes: Mode A (single PLP) and Mode B (multi-PLPs). A multi-PLPs mechanism is provided to separately adjust the robustness of each delivery service within a channel to meet the required reception conditions. Furthermore, a receiver can save power by decoding only a single service rather than the entire multiplex of service.

Table 1. Key parameters in DVB-T, DVB-H, and DVB-T2 standards

	DVB-T	DVB-H	DVB-T2
Frequency	VHF-III (170 to 230 MHz) UHF-IV/V (470 to 862 MHz)	VHF-III (170 to 230 MHz) UHF-IV/V (470 to 862 MHz) L (1.452 to 1.492 GHz)	VHF-III (170 to 230 MHz) UHF-IV/V (470 to 862 MHz)
Bandwidth	5, 6, 7, 8 MHz	5, 6, 7, 8 MHz	1.7, 5, 6, 7, 8, 10 MHz
Modulation	OFDM	OFDM	OFDM
FFT size	2K, 8K	2K, 4K, 8K	1K, 2K, 4K, 8K, 16K, 32K
Modulation format	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM	QPSK,16/64/256QAM
Guard interval	1 /4, 1 /8, 1/16, 1/32	1 /4, 1 /8, 1/16, 1/32	1 /4, 19/256, 1 /8, 19/128, 1/16, 1/32, 1/128
FEC	Convolution + Reed Solomon 1 /2, 2/3, 3 /4, 5/6, 7 /8	Convolution + Reed Solomon 1 /2, 2/3, 3 /4, 5/6, 7 /8, and MPE-FEC	LDPC+BCH 1 /2, 3/5/, 2/3, 3 /4, 4/5, 5/6
Constellation rotation	No	No	Yes
MIMO Support	SISO	SISO	SISO, MISO
Stream	MPEG-2 TS	DVB-IPDC and MPEG-2 TS	TS, GSE, GCS, or GFPS
Bit rate	4.976 ~ 31.668 Mb/s	4.976 ~ 31.668 Mb/s	Up to 50.34 Mb/s
Other		Time slicing	

Transmitter Tests

The RF transmitter test requirements for DVB standards are defined in the ETSI TR 101 290 standard. Table 2 shows the required base station RF transmitter tests along with the corresponding measurement applications.

Table 2. Required RF transmitter measurements and the corresponding measurements in N6153EM0D

ETSI TR101 290 v.1.2.1 Paragraph #	Transmitter test	N6153EM0D DVB-T/H with T2 measurement application
9.1.1	RF frequency accuracy (precision)	Spectrum analyzer mode (marker counter function)
9.1.2	RF channel width (sampling frequency accuracy)	Spectrum analyzer mode (marker counter function)
9.1.3	Symbol length measurement at RF (guard interval verification)	Spectrum analyzer mode (marker counter function)
9.2	Selectivity	Modulation accuracy (BER view)
9.4	Phase noise of local oscillators (LO)	N/W9068A phase noise measurement application
9.5	RF/IF signal power	Channel power
9.7	RF and IF spectrum	Monitor spectrum
9.8	Receiver sensitivity/dynamic range for a Gaussian channel	Modulation accuracy (BER view)
9.9	Equivalent noise degradation (END)	Modulation accuracy (BER view)
9.9.1	Equivalent noise floor (ENF)	Modulation accuracy (BER view)
9.10	Linearity characterization (shoulder attenuation)	Channel power (shoulder attenuation view)
9.12	Coherent interferer	Spectrum analyzer mode
9.13	BER vs C/N ratio by variation of transmitter power	Modulation accuracy (BER view)
9.14	BER vs C/N ratio by variation of Gaussian noise power	Modulation accuracy (BER view)
9.15	BER before Viterbi (inner) decoder	Modulation accuracy (BER view)
9.16	BER before RS (outer) decoder	Modulation accuracy (BER view)
9.17	BER after RS (outer) decoder	Modulation accuracy (BER view)
9.18.1	I/Q analysis definition	NA
9.18.2	Modulation error ratio	Modulation accuracy (result metrics view)
9.18.3	System target error	NA
9.18.4	Carrier suppression	Modulation accuracy (result metrics view)
9.18.5	Amplitude imbalance	Modulation accuracy (result metrics view)
9.18.6	Quadrature error	Modulation accuracy (result metrics view)
9.18.7	Phase jitter	Modulation accuracy (result metrics view)

Measurement details

All of the RF transmitter measurements as defined by the DVB-T/H/T2 standard, as well as a wide range of additional measurements and analysis tools, are available with the press of a button (Table 3). 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, power stat CCDF, and IQ waveform measurements.

Table 3. One-button measurements provided by the N6153EM0D measurement application

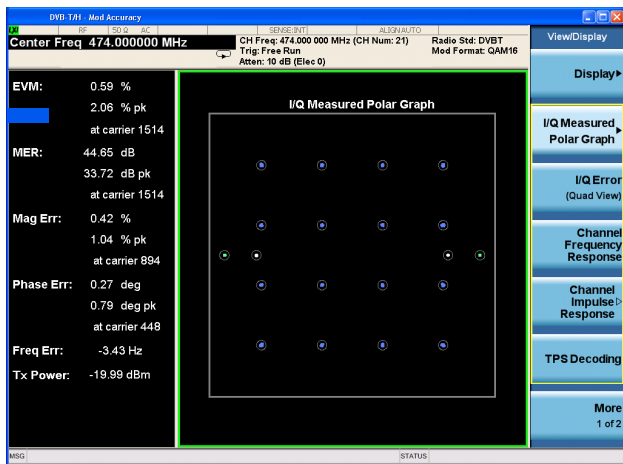| Technology / Measurements	DVB-T/H	DVB-T2
Channel power	●	●
Shoulder attenuation	●	●
Spectrum mask with analog TV in adjacent channel	●	●
Adjacent channel power	●	●
Spectrum emission mask	●	●
Power statistic CCDF	●	●
Spurious emission	●	●
Modulation accuracy		
RMS EVM (%)	●	●
Peak EVM (%)	●	●
Position 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)	●	●
Clock error (Hz)	●	●
Tx power (dBm)	●	●
Amplitude Imbalance	●	●
Quadrature error (deg)	●	
Phase jitter (rad)	●	
Carrier suppression (dB)	●	
SNR (dB)	●	
TPS power ratio (dB)	●	
Data power ratio (dB)	●	
MER/EVM vs. subcarriers/frequency	●	●
MER of data (dB)	●	●
MER of pilot/TPS (dB)	●	
MER of P2 Pilot/L1-Pre/L1-Post/Cont Pilot/Scat Pilot/FC Pilot		●
Amplitude vs. subcarriers (dB)	●	●
Phase vs. subcarriers (deg)	●	●
Group delay vs. subcarriers (ns)	●	●
Channel impulse response (dB)	●	●
Single frequency network (SFN) test (pre-, post-, and 0 dB echo)	●	●
BER results	●	●
TPS decoding		●
L1 signalling		●
MER monitor		
MER vs. PLP		
MISO Support		

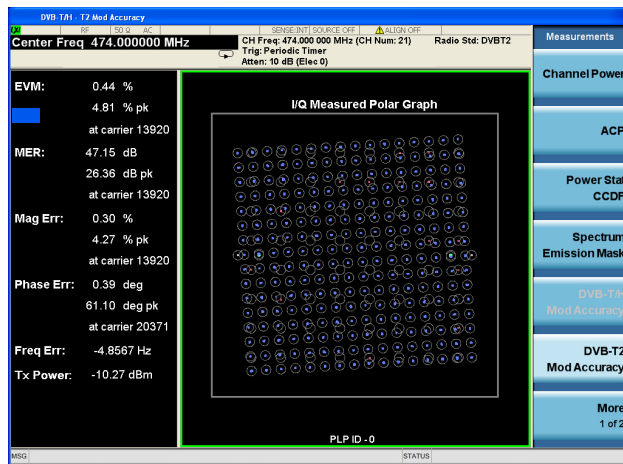Figure 1. DVB-T/H constellation and MER results

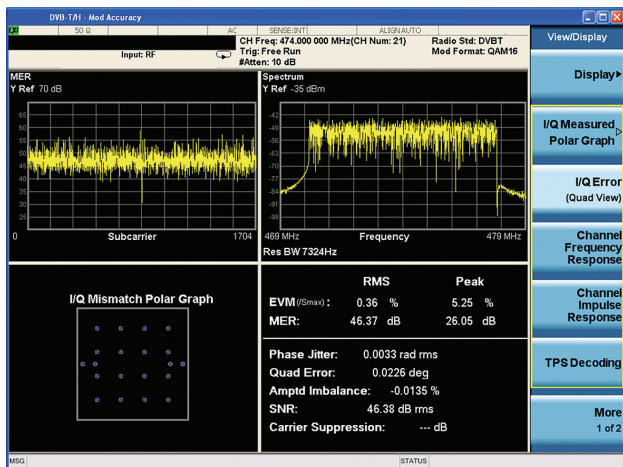Figure 4. DVB-T2 constellation and MER result view

Figure 2. DVB-T/H IQ error (quad view)
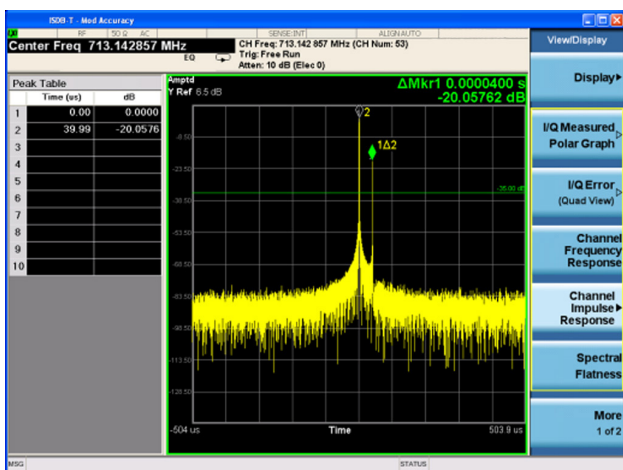

Figure 5. DVB-T2 L1 signaling view

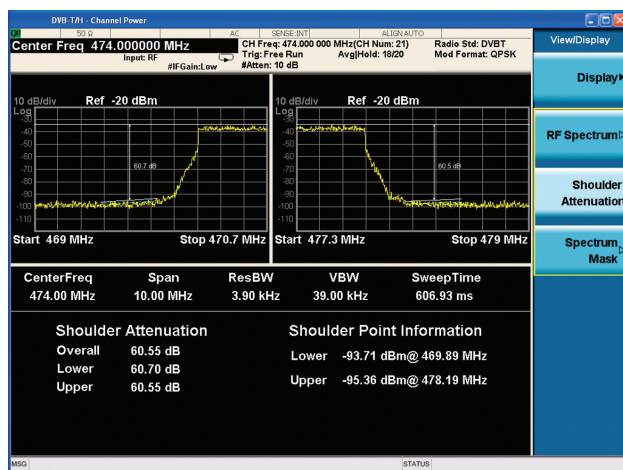Figure 3. DVB-T/H channel impulse response with peak table

Figure 6. DVB-T/H 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

Description	PXA	MXA	EXA	CXA
Channel power				
5.60 MHz integration bandwidth	–50 dBm (nom)	–50 dBm (nom)	–50 dBm (nom)	–50 dBm (nom)
Absolute power accuracy 20 to 30 °C	± 0.61 dB (± 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	–85.9 dBm	–82.9 dBm	–78.9 dBm	–75.9 dBm
Channel power with shoulder attenuation view				
5.60 MHz integration bandwidth	ML[1] = –15.0 dBm (nom)	ML[1] = –16.0 dBm (nom)	ML[1] = –16.0 dBm (nom)	ML[1] = –15.0 dBm (nom)
Dynamic range, relative Offset frequency 7.61/ 2 MHz	97.8 dB	92.2 dB	86.9 dB	84.6 dB
+ 500 kHz	(102.8 dB typ)	(98.5 dB typ)	(94.0 dB typ)	(91.8 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	7.61 MHz noise bandwidth, method = IBW			
Offset frequency 8 MHz	± 0.20 dB	± 0.44 dB	± 0.94 dB	± 1.37 dB
Spectrum emission mask	8 MHz integration bandwidth, RBW = 3.9 kHz			
4.0 MHz offset				
Dynamic range, relative	97.8 dB (102.8 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 dB (–118.5 dBm typ)	–110.5 dB (–115.5 dBm typ)	–105.5 dB (–111.5 dBm typ)	–102.5 dB (–108.5 dBm typ)

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

Description	PXA	MXA	EXA	CXA
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	100.2 dB (105.1 dB typ)	94.5 dB (100.5 dB typ)	89.2 dB (95.9 dB typ)	87.1 dB (94.9 dB typ)
Sensitivity, absolute				
RBW = 3.9 kHz	–114.3 dBm (–118.3 dBm typ)	–110.3 dBm (–115.3 dBm typ)	–107.3 dBm (–111.3 dBm typ)	–102.3 dBm (–108.3 dBm typ)
RBW = 100 kHz	–100.2 dBm (–104.2 dBm typ)	–96.2 dBm (–101.2 dBm typ)	–93.2 dBm (–99.2 dBm typ)	–88.2 dBm (–94.2 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%)
Spurious emission				
Mixer level	2 dBm	3 dBm	3 dBm	–3 dBm
Dynamic range, relative				
RBW = 3.9 kHz	114.2 dB (118.2 dB typ)	106.0 dB (111.0 dB typ)	102.5 dB (107.8 dB typ)	92.8 dB (95.4 dB typ)
RBW = 100 kHz	100.1 dB (104.1 dB typ)	91.9 dB (96.9 dB typ)	88.5 dB (93.7 dB typ)	78.7 dB (81.3 dB typ)
Sensitivity, absolute				
RBW = 3.9 kHz	–114.3 dBm (–118.3 dBm typ)	–110.3 dBm (–115.3 dBm typ)	–107.3 dBm (–111.3 dBm typ)	–102.3 dBm (–108.3 dBm typ)
RBW = 100 kHz	–100.2 dBm (–104.2 dBm typ)	–96.2 dBm (–101.2 dBm typ)	–93.2 dBm (–99.2 dBm typ)	–88.2 dBm (–94.2 dBm typ)
Accuracy, absolute				
20 Hz to 3.6 GHz	0.19 dB (95%)	0.29 dB (95%)	0.38 dB (95%)	
3.5 to 8.4 GHz	1.08 dB (95%)	1.17 dB (95%)	1.22 dB (95%)	
8.3 to 13.6 GHz	1.48 dB (95%)	1.54 dB (95%)	1.59 dB (95%)	
100 kHz to 3.0 GHz				0.81 dB (95%)
3.0 to 7.5 GHz				1.80 dB (95%)
DVB-T/H modulation accuracy	DVB-T 64QAM EVM, ML[1] = –20 dBm, 20 to 30 °C			
EVM				
Operating range	0 to 8%	0 to 8%	0 to 8%	0 to 8%
Floor	0.30% (EQ ON) 0.32% (EQ OFF)	0.52% (EQ ON) 0.56% (EQ OFF)	0.64% (EQ ON) 0.73% (EQ OFF)	0.95% (EQ ON) 1.02% (EQ OFF)
Accuracy				
From 0.35/0.66/0.70% (PXA/MXA/EXA) to 1.2%	± 0.20%	± 0.20%	± 0.30%	
From 1.2 to 2.0%	± 0.10%	± 0.20%	± 0.20%	
From 2.0 to 8.0%	± 0.20%	± 0.20%	± 0.20%	
MER				
Operating range	≥ 22 dB	≥ 22 dB	≥ 22 dB	≥ 22 dB
Floor	51 dB (EQ On) 50 dB (EQ Off)	46 dB (EQ On) 45 dB (EQ Off)	44 dB (EQ On) 43 dB (EQ Off)	40.4 dB (EQ On) 39.8 dB (EQ Off)
Accuracy				
From 38 to 49 dB/44 dB/ 43 dB (PXA/MXA/EXA)	± 2.64 dB	± 2.20 dB	± 2.62 dB	
From 34 to 38 dB	± 0.36 dB	± 0.69 dB	± 1.02 dB	
From 22 to 34 dB	± 0.25 dB	± 0.36 dB	± 0.48 dB	
Frequency error[2]				
Range	–100 to 100 kHz	–100 to 100 kHz	–100 to 100 kHz	–100 to 100 kHz
Accuracy	± 10 Hz + tfa[3]	± 10 Hz + tfa[3]	± 10 Hz + tfa[3]	± 10 Hz + tfa[3]

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

Description	PXA	MXA	EXA	CXA
Phase jitter				
Range	0 to 0.0349 rad	0 to 0.0349 rad	0 to 0.0349 rad	0 to 0.0349 rad
Resolution	0.0001 rad	0.0001 rad	0.0001 rad	0.0001 rad
Quad error				
Range	–4 to 5 deg	–4 to 5 deg	–4 to 5 deg	–4 to 5 deg
Accuracy	± 0.090 deg	± 0.090 deg	± 0.090 deg	± 0.090 deg
Amplitude imbalance				
Range	–5 to 5%	–5 to 5%	–5 to 5%	–5 to 5%
Accuracy	± 0.45%	± 0.45%	± 0.50%	± 0.50%
BER before Viterbi				
Range	0 to 1.0×10^{-1}	0 to 1.0×10^{-1}	0 to 1.0×10^{-1}	0 to 1.0×10^{-1}
BER before Reed-Solomn				
Range	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}
BER after Reed-Solomn				
Range	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}
Channel impulse response (also called echo pattern)	(a) Selectable center and time/div (b) Scale type by Time or Distance (c) Results sorted by Amplitude or Time/Distance (d) Default echo search limit –35 dB and adjustable (e) Adjustable FFT Start Position (0/8 to 8/8 GI), and MER metric displayed on the top of the view can be used as the criteria to tune the FFT window (f) Support pre-echo, post-echo, 0 dB echo and out-of-GI echo scenarios (time range supports up to one OFDM symbol length Tu with Decoding On) (h) Cell ID (hex/dec) display			
DVB-T2 modulation accuracy	DVB-T2 single PLP, 32K FFT, 256QAM, constellation rotation yes, ML[1] = –20 dBm, 20 to 30 °C			
EVM				
Operating range	0 to 6%	0 to 6%	0 to 6%	0 to 6%
Floor	0.27% (EQ Off)	0.58% (EQ Off)	0.72% (EQ Off)	1.11% (EQ Off)
MER				
Operating range	≥ 24 dB	≥ 24 dB	≥ 24 dB	≥ 24 dB
Floor	51 dB (EQ Off)	45 dB (EQ Off)	43 dB (EQ Off)	39.1 dB (EQ Off)
Frequency error[2]				
Range	–380 kHz to 380 kHz	–380 kHz to 380 kHz	–380 kHz to 380 kHz	–380 kHz to 380 kHz
Accuracy	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]
Clock error[2]				
Range	–20 Hz to 20 Hz	–20 Hz to 20 Hz	–20 Hz to 20 Hz	–20 Hz to 20 Hz
Accuracy	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]
Quad error				
Range	–5 deg to 5 deg	–5 deg to 5 deg	–5 deg to 5 deg	–5 deg to 5 deg
Amplitude imbalance				
Range	–1 to +1 dB	–1 to +1 dB	–1 to +1 dB	–1 to +1 dB
BER before LDPC				
Range	0 to 1.0×10^{-1}	0 to 1.0×10^{-1}	0 to 1.0×10^{-1}	0 to 1.0×10^{-1}
BER before BCH				
Range	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}
BER after BCH				
Range	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}	0 to 1.0×10^{-3}
Packet error rate				
Range	0 to 1.0	0 to 1.0	0 to 1.0	0 to 1.0

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

Description	PXA	MXA	EXA	CXA
LDPC itineration times				
Data	0 to 100	0 to 100	0 to 100	0 to 100
L1-pre	0 to 100	0 to 100	0 to 100	0 to 100
L1-post	0 to 100	0 to 100	0 to 100	0 to 100
MISO Tx1 only	Measurements same as SISO			
MISO Tx2 only	Measurements same as SISO			
MISO Tx1+Tx	(a) Combined data MER/EVM (rms) (b) Combined L1-pre EVM/MER (rms) (c) Combined L1-post EVM/MER (rms) (d) Combined BER result (e) Combined data per PLP (MER rms, EVM rms, Magnitude Error rms, Phase Error rms) (f) Channel frequency response (Tx1) (g) Channel frequency response (Tx2) (h) Frequency error (Hz) (i) Clock error (Hz) (j) Tx power (dBm)			
Channel impulse response (SISO-SFN and MISO-SFN echo pattern)	(a) Selectable center and time/div (b) Scale type by Time or Distance (c) Results sorted by Amplitude or Time/Distance (d) Default echo search limit –35 dB and adjustable (e) Adjustable FFT Start Position (0/8 to 8/8 GI), and MER metric displayed on the top of the view can be used as the criteria to tune the FFT window (f) Support pre-echo, post-echo, 0 dB echo and out-of-GI echo scenarios (g) Cell ID (hex/dec) display (h) Adjustable echo display, from MISO Tx1 group, or from MISO Tx2 group, or from MISO Tx1+Tx2 (dual trace, relative amplitude and delay display between Tx1 group and Tx2 group)			

Ordering Information

Flexible licensing and configuration

– **Perpetual:** License can be used in perpetuity.
– **Time-based:** License is time limited to a defined period, such as 12-months.
– **Node-locked:** Allows you to use the license on one specified instrument/computer.
– **Transportable:** Allows you to use the license on one instrument/computer at a time. This license may be transferred to another instrument/computer using Keysight's online tool.
– **Floating:** Allows you to access the license on networked instruments/computers from a server, one at a time. For concurrent access, multiple licenses may be purchased.
– **USB portable:** Allows you to move the license from one instrument/computer to another by end-user only with certified USB dongle, purchased separately.
– **Software support subscription:** Allows the license holder access to Keysight technical support and all software upgrades

You Can Upgrade!

All of our X-Series application options are license-key upgradeable.

UP GRADE

DVB-T/H with T2 measurement application (N6153EM0D)

Model	Software License Type	Support Contract	Support Subscription (12-month) [1,2]
N6153EM0D-1FP	Node-locked perpetual	R-Y5C-001-A[2]	R-Y6C-001-L[2]
N6153EM0D-1FL	Node-locked 12-month	R-Y4C-001-L[1]	Included
N6153EM0D-1TP	Transportable perpetual	R-Y5C-004-D[2]	R-Y6C-004-L[2]
N6153EM0D-1TL	Transportable 12-month	R-Y4C-004-L[1]	Included
N6153EM0D-1NP	Floating perpetual	R-Y5C-002-B[2]	R-Y6C-002-L[2]
N6153EM0D-1NL	Floating 12-month	R-Y4C-002-L[1]	Included
N6153EM0D-1UP	USB portable perpetual	R-Y5C-005-E[2]	R-Y6C-005-L[2]
N6153EM0D-1UL	USB portable 12-month	R-Y4C-005-L[1]	Included

One month software support subscription extensions [3]

Model	Description
R-Y6C-501[3]	1-month of software support subscription for node-locked license
R-Y6C-502[3]	1-month of software support subscription for floating license
R-Y6C-504[3]	1-month of software support subscription for transportable license
R-Y6C-505[3]	1-month of software support subscription for USB portable license

1. All time-based X-Series measurement application licenses includes a 12-month support contract which also includes the 12-month software support subscription as same duration.
2. Support contract must bundle software support subscription for all perpetual licenses in the first year. All software upgrades and Keysight support are provided for software licenses with valid support subscription.
3. After the first year, software support subscription may be extended with annual or monthly software support subscription extension.

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Hardware Configurations

To learn more about compatible platforms and required configurations, please visit: **www.keysight.com/find/X-Series_apps_platform**

Software Models & Options

To learn more about X-Series measurement application licensing, model numbers and options, please visit: **www.keysight.com/find/X-Series_apps_model**

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

For optimizing the DVB-T/H with T2 measurement application, Keysight recommends a minimum level of instrument hardware functionality at each instrument performance point. Supported instruments include:

Benchtop:
  – PXA N9030A   – EXA N9010A
  – MXA N9020A   – CXA N9000A

N90x0A X-Series signal analyzer

Capability	Instrument Option	Benefit
Analysis bandwidth	10 or 25 MHz as default or higher	**Required**: Wider analysis bandwidth options such as 25/40/85/160 MHz can be selected depending on the specified signal analyzer model
Precision frequency reference	-PFR	**Recommended**: For enhanced frequency accuracy and repeatability for lower measurement uncertainty
Electronic attenuator	-EA3	**Recommended**: Fast and reliable attenuation changes ideal for manufacturing without the wear associated with mechanical attenuators up to 3.6 GHz in 1 dB steps
Pre-amplifier	3.6 GHz (-P03) or higher	**Recommended**: For maximizing the measurement sensitivity
Fine resolution step attenuator	-FSA	**Recommended**: Useful for maximizing useable dynamic range to see signals
Analog baseband I/Q inputs	-BBA on PXA and MXA only	**Optional**: To extend measurements at baseband if required by device under test

Related Literature

Description	Publication number
N6153A & W6153A DVB-T/H with T2 Measurement Application, Demonstration Guide	5990-5931EN
N6153A & W6153A DVB-T/H with T2 Measurement Application, Measurement Guide	N6153-90002
N6153A & W6153A DVB-T/H with T2 Measurement Application, User's and Programmer's Reference	N6153-90001

Web

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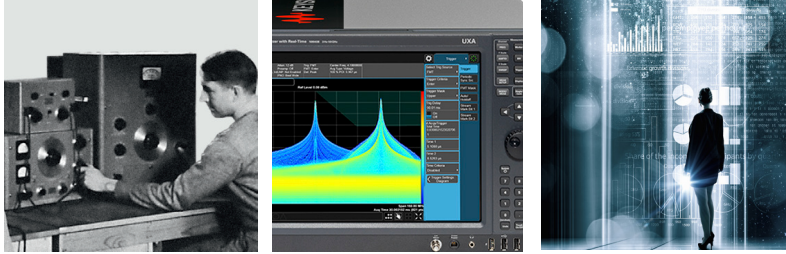www.keysight.com/find/digitalvideo

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