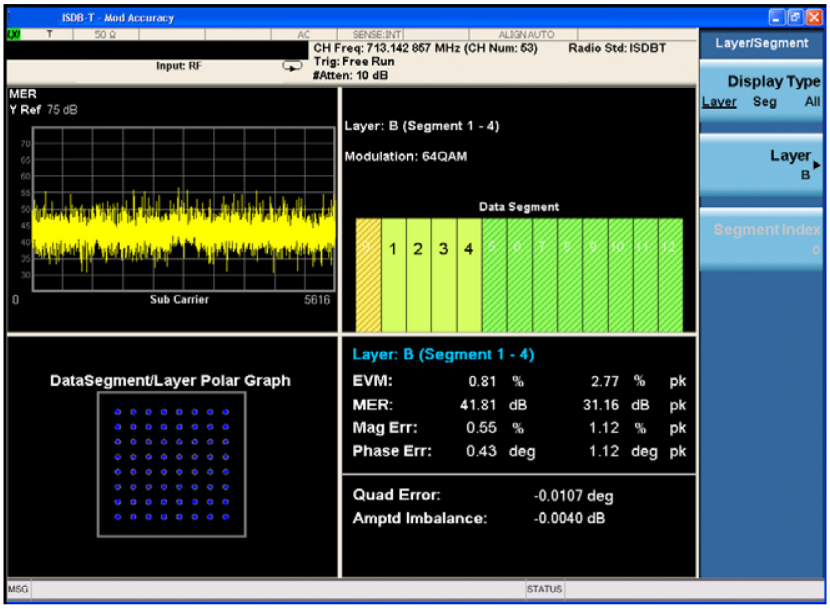
Keysight Technologies
ISDB-T/Tmm
X-Series Measurement App, Traditional UI
N6155EM0D

Technical Overview



- Measure ISDB-T or ISDB-Tmm RF transmitter, modulator, gap-filler, tuner, or amplifier performance
- Auto-detect the ISDB-T demodulation parameters and display in the TMCC decoding view; auto-detect and show the ISDB-Tmm configuration by super segment
- Single frequency network measurement (supports pre-, post-, 0-dB, and out-of-GI echo scenarios)
- Show the AC (auxiliary channel) decoded bits in AC decoding results view
- Perform one-button tests with pass/fail limit per ISDB-T and ISDB-T_{SB} standards
- Use hardkey/softkey manual user interface or SCPI remote control
- Leverage built-in context sensitive help
- Flexible licensing provides the option of using perpetual or time based licenses with one or multiple signal analyzers

KEYSIGHT TECHNOLOGIES

ISDB-T/Tmm Measurement Application

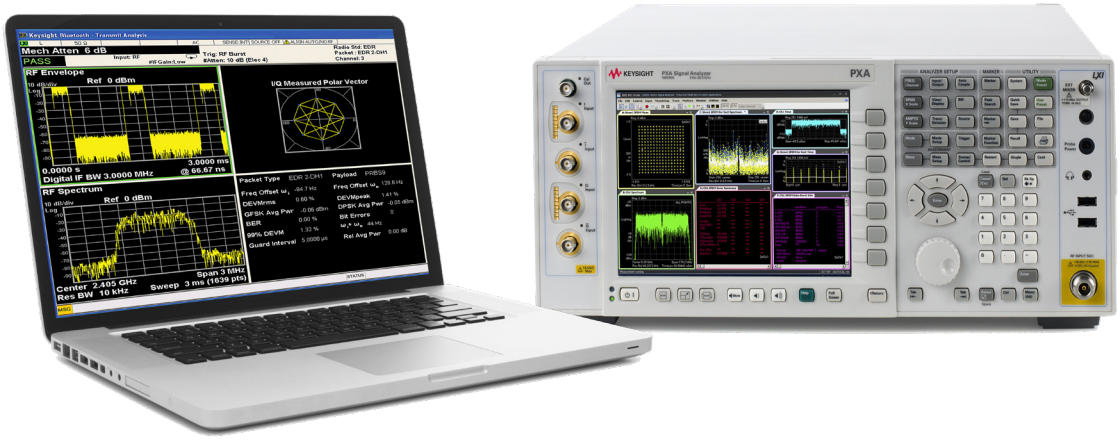
The ISDB-T/Tmm measurement application provides one-button, standard-based power and modulation analysis capabilities to help you with designing, evaluating, and manufacturing ISDB-T modulators, transmitters, amplifiers, tuners, and gap-fillers/ repeaters. Used with the optional analog baseband IQ inputs in the PXA or MXA signal analyzer, it can provide you the flexibility of measuring signal quality and modulation 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: ISDB-T, or ISDB-T_{SB}, and ISDB-Tmm
- Channel bandwidth: 6/ 7/ 8 MHz for ISDB-T; 14.5 MHz for ISDB-Tmm
- Segment number: 13 segments for ISDB-T, 1 or 3 segments for ISDB-T_{SB}, 33 segments for ISDB-Tmm
- FFT mode: 2K, 4K or 8K
- Guard interval: 1/4, 1/8, 1/16, 1/32
- Partial reception: On/Off
- Modulation: QPSK/16QAM/64QAM
- Input: RF or analog IQ (only available in the N9030A PXA or N9020A MXA) for signal quality and modulation accuracy measurements



ISDB-T, ISDB-T_{SB} , and ISDB-Tmm Standards Overview

ISDB-T, ISDB-T_{SB} and ISDB-T_B

Integrated services digital broadcasting (ISDB) is a Japanese standard for digital television (DTV) and digital radio used by the country's radio and television stations. ISDB-T and ISDB-T_{SB} standards are the digital terrestrial broadcasting systems developed by Japan's Association of Radio Industries and Business (ARIB). ISDB-T, as a terrestrial broadcasting system, has also been adopted by Brazil, where it is called ISDB-T_B. ISDB-T and ISDB-T_B both use an identical physical layer. ISDB-T_{SB} is used for audio and data program transmissions. The system and specifications of ISDB-T_{SB} are similar to ISDB-T, except that the bandwidth is narrower and there are only one or three segments in the channel. Keysight's ISDB-T measurement application supports measurement on both ISDB-T and ISDB-T_{SB} standards.

ISDB-Tmm and AC

The new VHF band, 207.5 to 222 MHz, introduced in 2011, after the analog TV switch-off in Japan. The government announced that ISDB-Tmm (Terrestrial Mobile Multimedia) will be used for new multimedia service in this band. The ISDB-Tmm standard employs the concatenated transmission method which, combining blocks of the 13-segment (Type A) and the 1-segment (Type B), eliminates the need for a guard band, making it possible to apply it to various bandwidths. Figure 2 is an example of ISDB-Tmm frame structure consisting of two Type A super segments and one Type B super segment.

Auxiliary channel (AC) is used to convey additional information on modulation signal-transmission control, or earthquake alarm information. The earthquake information is transmitted using the AC of the center segment (segment No. 0).

Segment and layer in ISDB-T

ISDB-T supports hierarchical transmission by introducing hierarchical layers, which means different services such as HDTV, multi-channel SDTV, and data, can be transmitted in one frequency channel. There are 13 OFDM segments in the ISDB-T transmission channel. Each layer consists of one or more segments which have their own transmission parameters (such as the inner coding rate, modulation scheme, and time interleaving length). A maximum of three layers can be provided, defined as Layer A, B, and C.

Partial reception

ISDB-T also supports partial receptions. Partial reception refers to the segment at the center of the transmission system. The range of frequency interleaving can be limited within the segment, so that narrow band (1-seg) receiver can receive services contained in the center segment. The general concept of hierarchical transmission and partial reception is shown in Figure 1.

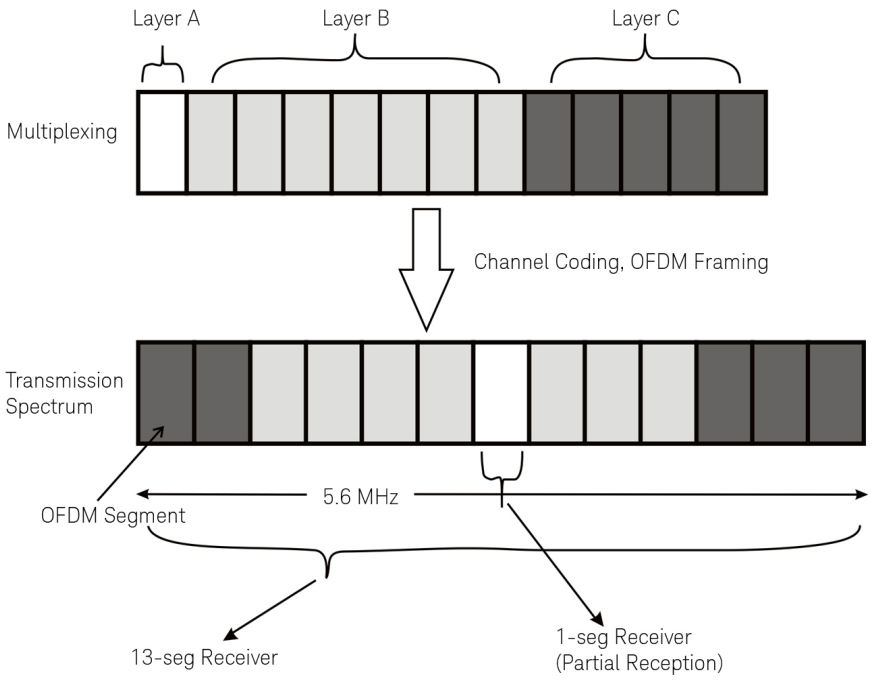


Figure 1. Hierarchical transmission and partial reception in ISDB-T

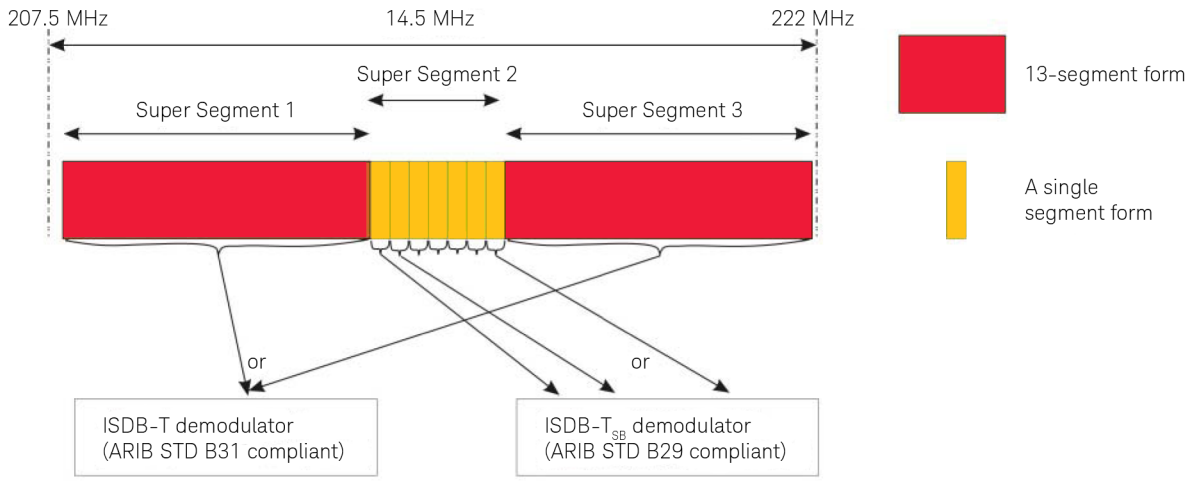


Figure 2. ISDB-Tmm frame configuration

Table 1. Key parameters in ISDB-T and ISDB-T$_{SB}$ standards

	ISDB-T	**ISDB-T$_{SB}$**	**ISDB-Tmm**
Frequency	UHF 470 to 770 MHz	VHF/UHF	VHF: 207.5 to 222 MHz
Bandwidth	6, 7, 8 MHz	430 kHz for 1-segment and 1.3 MHz for 3-segments for 6 MHz system	6 to 14.5 MHz
Segments	13 segments	1 or 3 segments	13 to 33 segments
Modulation	OFDM	OFDM	OFDM
Mode	Mode 1 /2/3	Mode 1 /2/3	Mode 1 /2/3
Modulation format	DQPSK/QPSK/16QAM/64QAM	DQPSK/QPSK/16QAM/64QAM	DQPSK/QPSK/16QAM/64QAM
Guard interval	1 /4, 1 /8, 1/16, 1/32	1 /4, 1 /8, 1/16, 1/32	1 /4, 1 /8, 1/16, 1/32
FEC	Inner coding: Convolution 1 /2, 2/3, 3 /4, 5/6, 7 /8 Outer coding: Reed Solomon (204, 188)	Inner coding: Convolution 1 /2, 2/3, 3 /4, 5/6, 7 /8 Outer coding: Reed Solomon (204, 188)	Inner coding: Convolution 1 /2, 2/3, 3 /4, 5/6, 7 /8 Outer coding: Reed Solomon (204,188)
Multiplexing	MPEG-2 TS	MPEG-2 TS	MPEG-2 TS
Video	MPEG-2 video or MPEG-4 AVC/H.264 (1-seg)	MPEG-2 video or MPEG-4 AVC/H.264 (1-seg)	MPEG-2 video or MPEG-4 AVC/H.264 (1-seg)
Audio	MPEG-2 audio (AAC)	MPEG-2 audio (AAC)	MPEG-2 audio (AAC)
Bit rate	3.651 ~ 23.234 Mb/s	0.280 ~ 1.787 Mb/s	
Other	Supports partial reception and AC		

Transmitter Tests

The RF transmitter test requirements for ISDB-T are defined in the JEITA handbook "Methods of Measurement for Digital Terrestrial Broadcasting Transmitters." 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 N6155EM0D

JEITA handbook V2.2 Paragraph #	**Transmitter test**	**N6155EM0D ISDB-T measurement application**
4.3.1	Frequency deviation	Spectrum analyzer mode (marker counter function)
4.3.2	Signal power	Channel power
4.3.3	Occupied frequency bandwidth	Occupied bandwidth (BW)
4.3.4	Spectrum mask	Spectrum emission mask
4.3.5	Unwanted emissions	Spectrum analyzer mode (spurious emissions measurement)
4.3.6	IFFT sampling frequency deviation	Spectrum analyzer mode (marker counter function)
4.3.7	Phase noise	N/W9068A phase noise measurement application
4.3.8	Amplitude-frequency characteristics	Monitor spectrum measurement
4.3.9	Group delay characteristics	Mod accuracy (frequency response view)
4.3.10	Delay time	N/A
4.3.11	Intermodulation	Monitor spectrum measurement
4.3.12	Gaussian noise vs. BER	N/A
4.3.13	Input electric field strength vs. BER	N/A
4.3.14	Power consumption	N/A
4.3.15	Input signal	Mod accuracy (TMCC decoding view)
4.3.17	Output mismatching range	Spectrum analyzer mode
4.3.18	MER characteristics	Mod accuracy (result metrics view)
4.3.19	Actual viewing of and listening to video and sound	N/A

Measurement Details

Most of the RF transmitter measurements as defined by the ISDB-T standard, as well as a wide range of additional measurements and analysis tools, are available with a 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 Keysight PXA or MXA signal analyzer equipped with BBIQ hardware. Supported baseband measurements include all of the modulation quality plus I/Q waveform measurements.

Table 3. One-button measurements provided by the N6155EM0D measurement application

Technology	**ISDB-T**	**ISDB-T_{SB}**	**ISDB-Tmm**
Measurement application	N6155EM0D	N6155EM0D	N6155EM0D
X-Series analyzer	PXA, MXA, EXA, CXA[1]	PXA, MXA, EXA, CXA[1]	PXA, MXA, EXA, CXA[1]
Measurements			
Channel power			
RF spectrum	●	●	●
Shoulder attenuation	●	●	
Adjacent channel power	●	●	●[2]
Spectrum emission mask	●	●	●[2]
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)	●	●	●
Tx power (dBm)	●	●	●
Quadrature error (deg)	●	●	●
Amplitude imbalance (dB)	●	●	●
In-band spectrum ripple			
Amax-Ac (dB)	●	●	●
Amin-Ac (dB)	●	●	●
MER/EVM vs. subcarriers/frequency	●	●	●
MER by layer A/B/C (dB)	●	●	●
MER by data, pilot, TMCC, and AC1 (dB)	●	●	●
Amplitude vs. subcarriers (dB)	●	●	●
Phase vs. subcarriers (deg)	●	●	●
Group delay vs. subcarriers (ns)	●	●	●
Spectral flatness (dB)	●	●	●
TMCC decoding	●	●	●
AC decoding	●	●	●
ISDB-Tmm configuration	●	●	●
Channel impulse response	●	●	●
Single frequency network (SFN) test (Pre-echo, Post-echo, 0-dB echo, and out-of-GI echo)	●	●	●

1. N6155A operates in the PXA, MXA, and EXA signal analyzers. W6155A operates in the CXA signal analyzer.
2. This measurement in ISDB-Tmm mode requires manual configuration.

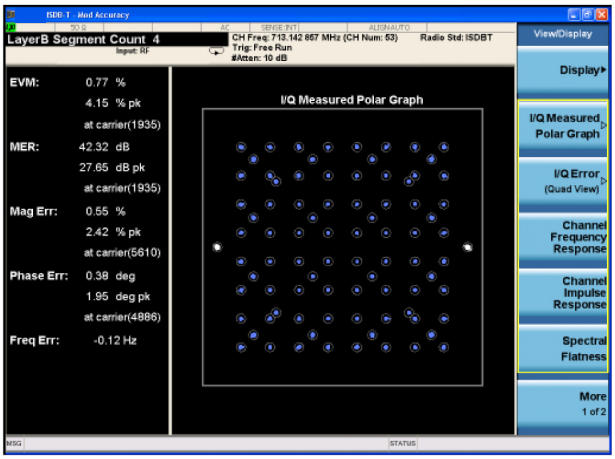


Figure 3. ISDB-T constellation and MER results

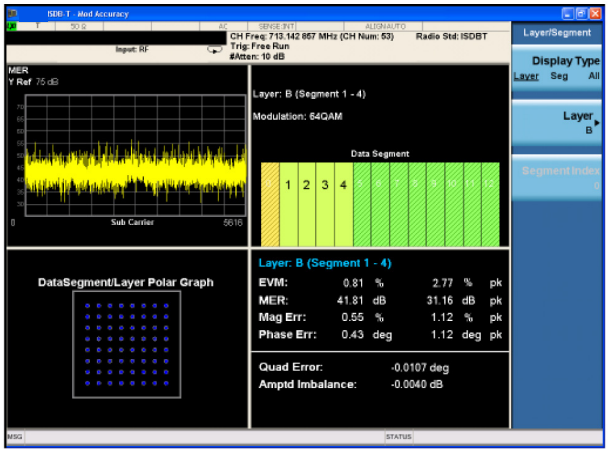


Figure 4. ISDB-T IQ quad view

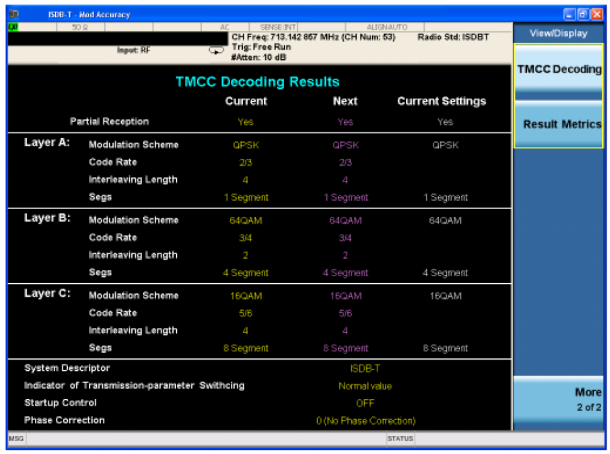


Figure 5. ISDB-T TMCC decoding view

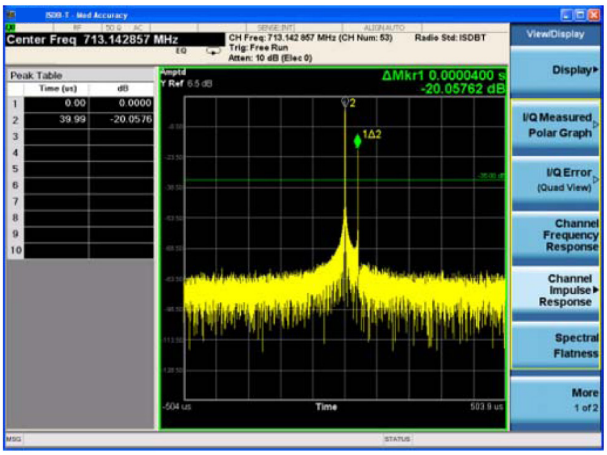


Figure 6. ISDB-T result metrics view

Figure 7. ISDB-T channel impulse response view

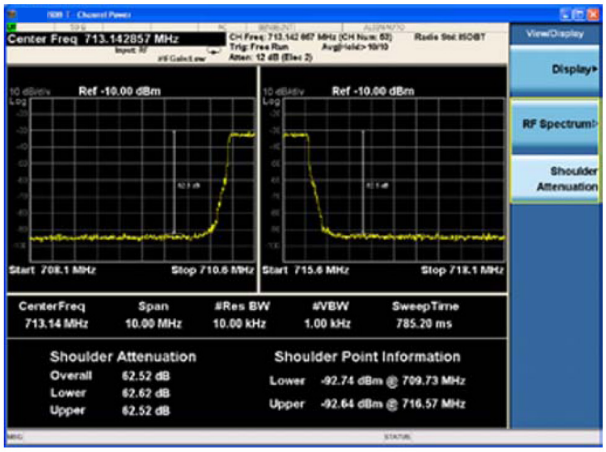


Figure 8. ISDB-T shoulder attenuation

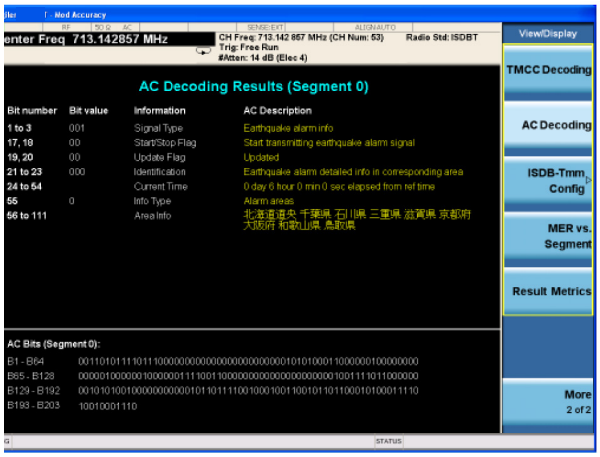


Figure 9. ISDB-T AC decoding view

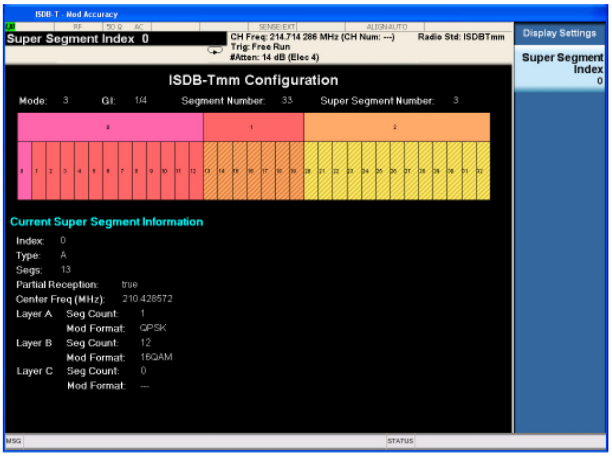


Figure 11. ISDB-Tmm configuration with Type A lowercase segments and super segment

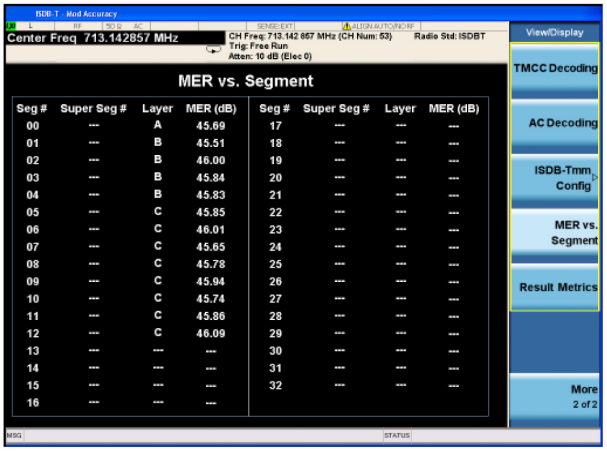


Figure 10. ISDB-Tmm MER vs. lowercase segments and super segment

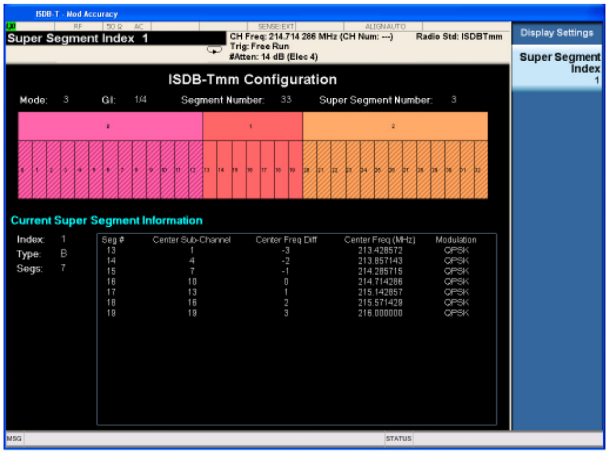


Figure 12. ISDB-Tmm configuration with Type B lowercase segments and super segment

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	–87.2 dBm	–84.2 dBm	–80.2 dBm	–77.2 dBm
Channel power with shoulder attenuation view				
5.60 MHz integration bandwidth	ML[1] = –14.0 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 3.4 MHz	92.9 dB (98.7 dB typ)	87.7 dB (94.1 dB typ)	82.5 dB (89.6 dB typ)	78.9 dB (86.6 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		5.60 MHz noise bandwidth, method = IBW		
Offset frequency 6 MHz	± 0.16 dB	± 0.38 dB	± 0.81 dB	± 1.20 dB

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

Description	PXA	MXA	EXA	CXA
Spectrum emission mask	Limit type: Manual; JEITA(ARIB-B31) according to P ≤ 0.025 W, 0.025 W < P ≤ 0.25 W, 0.25 W < P ≤ 2.5 W or P > 2.5 W: ABNT non-critical; ABNT sub-critical; ABNT-critical; ISDB-T_{SB}			
3.0 MHz offset (RBW = 10 kHz)				
Dynamic range, relative	93.8 dB (99.1 dB typ)	87.6 dB (93.9 dB typ)	82.3 dB (89.5 dB typ)	79.7 dB (86.4 dB typ)
Sensitivity, absolute	–110.5 dB (–114.5 dBm typ)	–106.5 dB (–111.5 dBm typ)	–101.5 dB (–107.5 dBm typ)	–98.5 dB (–104.5 dBm typ)
Accuracy				
Relative	± 0.08 dB	± 0.16 dB	± 0.16 dB	± 0.23 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%)
4.36 MHz offset (RBW = 10 kHz)				
Dynamic range, relative	94.2 dB (99.5 dB typ)	88.1 dB (94.4 dB typ)	82.8 dB (89.9 dB typ)	80.4 dB (87.7 dB typ)
Sensitivity, absolute	–110.5 dB (–114.5 dBm typ)	–106.5 dB (–111.5 dBm typ)	–101.5 dB (–107.5 dBm typ)	–98.5 dB (–104.5 dBm typ)
Accuracy				
Relative	± 0.01 dB	± 0.18 dB	± 0.18 dB	± 0.29 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%)
ISDB-T modulation accuracy	Segments = 13, mode 3, GI = 1/8, partial reception = off, layer A-C segment = 13, code rate = 3/4, time interleaving I = 2, modualtion = 64QAM ML[1] = –20 dBm, 20 to 30 °C			
EVM				
Operating range	0 to 8%	0 to 8%	0 to 8%	0 to 8%
Floor	0.36% (EQ OFF)	0.66% (EQ OFF)	0.80% (EQ OFF)	0.99% (EQ Off)
Accuracy from 0.40/0.66/0.80% (PXA/MXA/EXA) to 1.2%	± 0.20%	± 0.30%	± 0.40%	
from 1.2 to 2.0%	± 0.20%	± 0.20%	± 0.30%	
from 2.0 to 8.0%	± 0.70%	± 0.70%	± 0.70%	
MER				
Operating range	≥ 22 dB	≥ 22 dB	≥ 22 dB	≥ 22 dB
Floor	49 dB (EQ Off)	44 dB (EQ Off)	42 dB (EQ Off)	40.1 dB (EQ Off)
Accuracy from 38 to 48 dB (PXA/MXA/EXA)	± 2.54 dB	± 2.68 dB	± 3.00 dB	
from 34 to 38 dB	± 0.67 dB	± 1.16 dB	± 1.52 dB	
from 22 to 34 dB	± 0.61 dB	± 0.73 dB	± 0.85 dB	
Frequency error2				
Range	–100 to 100 kHz	–100 to 100 kHz	–100 to 100 kHz	–100 to 100 kHz
Accuracy	± 10 Hz + tfa3	± 10 Hz + tfa3	± 10 Hz + tfa3	± 10 Hz + tfa3
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
Channel impulse response (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			

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
ISDB-Tmm mod accuracy	For ISDB-Tmm, Segments = 33, Mode 3, GI = 1/4, Super Segment #0 ISDB-T, Super Segment #1 six one-Segment, Super Segment #2 ISDB-T, ML[1] = -23 dBm, 20 to 30 °C, CF ≤ 1 GHz			
EVM	EQ Off	EQ Off	EQ Off	EQ Off
Operating range	0 to 25%	0 to 25%	0 to 25%	0 to 25%
Floor	0.32%	0.51%	0.68%	0.99%
MER	EQ Off	EQ Off	EQ Off	EQ Off
Operating range	≥12 dB	≥12 dB	≥12 dB	≥12 dB
Floor	50 dB	46 dB	44 dB	40.1 dB
Frequency error[2]				
Range	–170 kHz to 170 kHz	–170 kHz to 170 kHz	–170 kHz to 170 kHz	–170 kHz to 170 kHz
Accuracy	± 1 Hz + tfa[3]	± 10 Hz + tfa[3]	± 10 Hz + tfa[3]	± 10 Hz + tfa[3]
Clock error[2]				
Accuracy	–100 Hz to 100 Hz	–100 Hz to 100 Hz	–100 Hz to 100 Hz	–100 Hz to 100 Hz
Range	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]	± 1 Hz + tfa[3]
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 (nom)
Channel impulse response (SFN echo pattern)	Same as ISDB-T channel impulse response			

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

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**

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.

ISDB-T/Tmm measurement application (N6155EM0D)

Model	Software License Type	Support Contract	Support Subscription (12-month) [1,2]
N6155EM0D-1FP	Node-locked perpetual	R-Y5C-001-A[2]	R-Y6C-001-L[2]
N6155EM0D-1FL	Node-locked 12-month	R-Y4C-001-L[1]	Included
N6155EM0D-1TP	Transportable perpetual	R-Y5C-004-D[2]	R-Y6C-004-L[2]
N6155EM0D-1TL	Transportable 12-month	R-Y4C-004-L[1]	Included
N6155EM0D-1NP	Floating perpetual	R-Y5C-002-B[2]	R-Y6C-002-L[2]
N6155EM0D-1NL	Floating 12-month	R-Y4C-002-L[1]	Included
N6155EM0D-1UP	USB portable perpetual	R-Y5C-005-E[2]	R-Y6C-005-L[2]
N6155EM0D-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**

Hardware Configuration

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

Benchtop:

- PXA N9030A
- MXA N9020A
- EXA N9010A
- 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
N6155A and W6155A ISDB-T Measurement Application, Demonstration Guide	5990-5932EN
N6155A & W6155A ISDB-T Measurement Application, Measurement Guide	N6155-90002
N6155A & W6155A ISDB-T Measurement Application, User's and Programmer's Reference	N6155-90001

Web

Product page:
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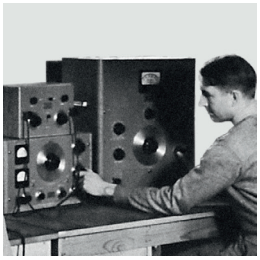

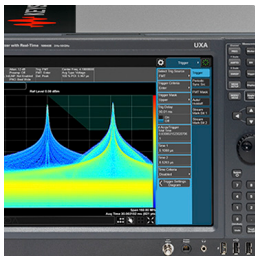

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