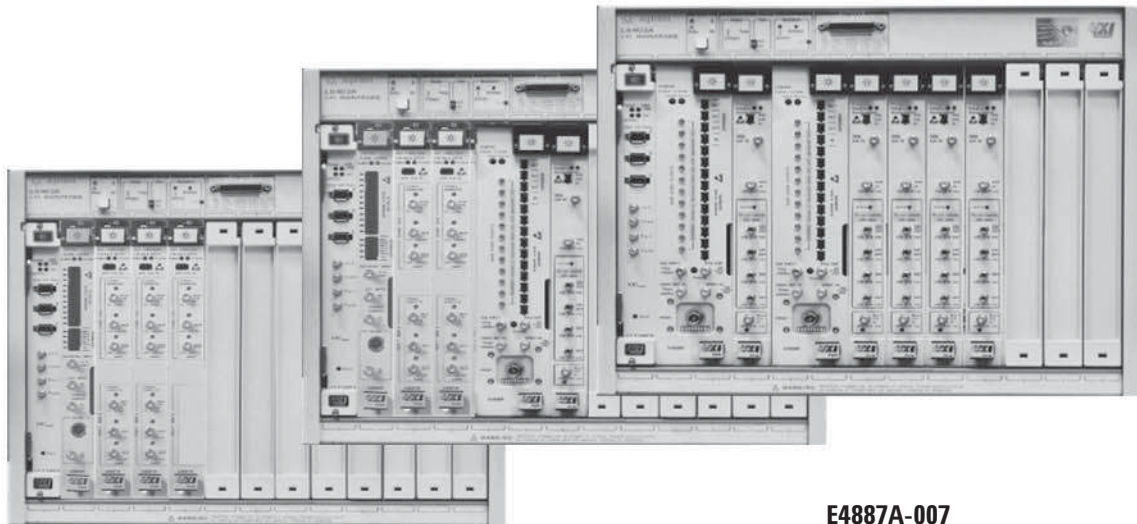
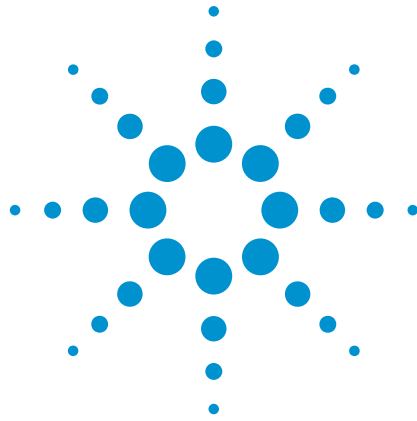


# Agilent E4887A HDMI TMDs Signal Generator Platform

Data Sheet

Version 2.1



**E4887A-003**

**E4887A-037**

**E4887A-007**



**Agilent Technologies**

## Convenient Compliance Testing and Characterization of HDMI

### 1.3 Devices

The High-Definition Multimedia Interface (HDMI) specification ensures the interoperability of all digital audio and video devices. Agilent offers solutions for testing HDMI sources, cables and sinks. The instruments of each solution provide outstanding performance, ideal for characterizing HDMI devices. The dedicated HDMI test automation software controls the instruments and simplifies HDMI source, cable and sink compliance testing.

#### Source test solution

The DSO80000 Series Oscilloscope is the core of Agilent's source test solution. The high bandwidth, low noise and excellent probing solutions of these real-time oscilloscopes show clear eye diagrams and the real margin of your HDMI sources. The N5399A software guides you confidently through most compliance source tests.

#### Cable test solution

The E5971C network analyzer and the 86100C DCA-J, with its TDR modules and software, provide impedance, intra- and inter-pair skew measurements for HDMI cables.

#### Sink test solution

The E4887A HDMI TMDS Signal Generator Platform provides parallel signals with low intrinsic jitter and fast edges. The HDMI Frame Generator Software is ideal for manual testing and debugging. It configures the generator with a wide variety of HDMI video frames. The software controls up to two E4438C Vector Signal Generators or 33250A Arbitrary Waveform Generators as well as the TMDS Signal Generator for defined jittered signals for jitter tolerance testing.

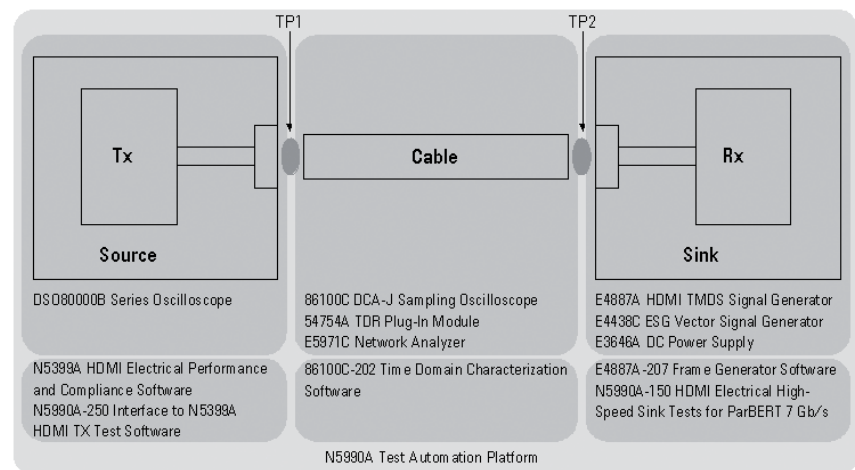


Figure 1: Agilent provides solutions for each HDMI test.

#### High performance connections

Agilent offers various fixtures for HDMI testing. The N1080A test point access adapters (TPAs) provide SMA to plug, or receptacle to SMA connections with very low loss and high bandwidth. The N5404A transmitter test fixture is especially developed for HDMI source testing.

#### Test automation

The N5990A Test Automation Platform enables HDMI compliance testing and systematic, in-depth characterization with high data quality and throughput. The software controls all related instruments and directs you step by step through the tests. All test results are documented in Microsoft® Excel format.

## E4887A HDMI TMDS Signal Generator Platform

The core of the Agilent HDMI sink test solution is the E4887A HDMI TMDS Signal Generator Platform. It offers a choice of three configurations:

### **E4887A-007:** High resolution HDMI TMDS Signal Generator

**Target Audience:** ATC, chip vendors

- In-depth characterization beyond today's test needs up to 7 Gb/s including separate and combined jitter tolerance characterization for all data rates
- Highest signal performance with low intrinsic jitter and fast transition times
- Fast automated CTS compliant test routines

### **E4887A-037:** Standard compliant and characterisation test

**Target Audience:** R&D labs for Audio, Video, TV requiring compliance pass/fail and high speed characterization

- CTS based compliant pass/fail testing on all data rates
- Combined jitter tolerance compliance and characterization testing at all data rates
- Separate jitter tolerance compliance and characterization starting at 74 MHz pixel clock
- Upgrade to E4887A-007

### **E4887A-003:** Economic high speed tester up to 3.4 Gb/s

**Target Audience:** HDMI related development for economic device characterization.

- Covers most critical HDMI tests starting at 74 MHz pixel clock
- Combined and separate jitter tolerance characterization and compliance testing starting at 74 MHz pixel clock
- Ideal test solution for debug and stimulus in R&D
- Upgrade to E4887A-037

## E4887A and N5990A Platform combination

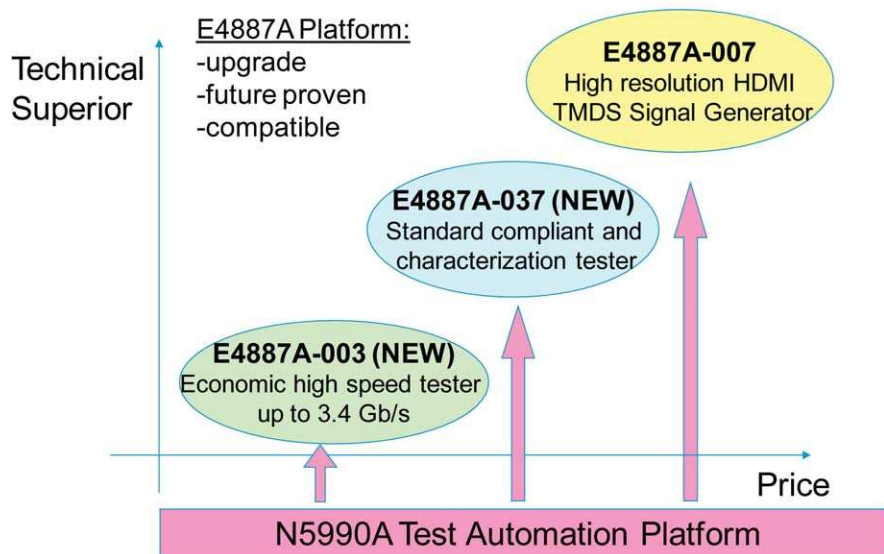


Figure 2: E4887A and N5990A platform combination

**High quality signals for clock and data signals**

Clean signals with fast transition times and very low intrinsic jitter are necessary for device characterization. The E4887A HDMI TMDS Signal Generator Platform is based on Agilent's ParBERT 81250, which provides industry leading signal performance for high speed characterization.

**TMDS signal generator for independent jitter injection on the clock signal and data signals**

In combination with the E4438C Vector Signal Generator or the 33250A Arbitrary Waveform Generator, the E4887A HDMI TMDS Signal Generator Platform offers linear clock and data jitter injection compliant to HDMI CTS 1.3. Especially designed for jitter tolerance device characterization, it lets you stress your device with independent jitter components on the clock and data signal for in-depth sink characterization.

**Easy to use with many video formats**

You can choose from a vast variety of video formats. The frame generator software set ups the TMDS Signal Generator with the chosen format. The jitter injection is also conveniently controlled using the frame generator software.

**Integrated into compliance test software**

The N5990A Test Automation Software integrates the E4887A HDMI TMDS Signal Generator Platform and the DSO80000 Series Real-Time Oscilloscope. This HDMI sink test solution provides calibrated jitter injection for accurate jitter tolerance characterization and compliance tests with a high test throughput.

**Future proof with data rates up to 7 Gb/s**

The high resolution version of the E4887A-007 HDMI TMDS Signal Generator is able to generate signals up to 7 Gb/s and protects your investment for future device characterization.

**Cable emulators designed for HDMI 1.3**

A set of different cable emulators especially designed for HDMI 1.3 are offered to match CAT 1 and CAT 2 reference cables.

Enabling high-speed on most recent HDMI devices is the most critical and important requirement for in-depth characterization. The E4887A HDMI TMDS Signal Generator Platform is exactly addressing this test-need through all individual configurations. Paired with excellent signal performance, the test engineer has got the highest benefit for true and exact device characterization.

**E4887A-007 High resolution HDMI TMDS Signal Generator**

Jitter Tolerance Testing	D_Jitter on TMDS_Clock E4887A-007		D_Jitter on TMDS_Data E4887A-007	
	Comp.	Charact.	Comp.	Charact.
Frequency				
27 MHz TMDS Clock	✓	>2.5 TBit	✓	>2.5 TBit
74.25 MHz TMDS Clock	✓	>2.5 TBit	✓	>2.5 TBit
148.5 MHz TMDS Clock	✓	>2.5 TBit	✓	>2.5 TBit
222.75 MHz TMDS Clock	✓	>2.5 TBit	✓	>2.5 TBit
297 MHz TMDS Clock	✓	>2.5 TBit	✓	>2.5 TBit
340 MHz TMDS Clock	✓	>2.5 TBit	✓	>2.5 TBit

**Table 1: E4887A—007 jitter tolerance capabilities**

**E4887A-037 Standard compliant and characterization tester**

Jitter Tolerance Testing	D_Jitter on TMDS_Clock E4887A-037		D_Jitter on TMDS_Data E4887A-037	
	Comp.	Charact.	Comp.	Charact.
Frequency				
27 MHz TMDS Clock	✓	>2.5 TBit	—	—
74.25 MHz TMDS Clock	✓	>2.5 TBit	✓	0.3713 TBit
148.5 MHz TMDS Clock	✓	>2.5 TBit	✓	0.74 TBit
222.75 MHz TMDS Clock	✓	>2.5 TBit	✓	1.11 TBit
297 MHz TMDS Clock	✓	>2.5 TBit	✓	1.485 TBit
340 MHz TMDS Clock	✓	>2.5 TBit	✓	1.7 TBit

**Table 2: E4887A-037 jitter tolerance capabilities**

**E4887A-003 Economic high speed tester up to 3.4 Gb/s**

Jitter Tolerance Testing	D_Jitter on TMDS_Clock E4887A-003		D_Jitter on TMDS_Data E4887A-003	
	Comp.	Charact.	Comp.	Charact.
Frequency				
27 MHz TMDS Clock	—	—	—	—
74.25 MHz TMDS Clock	✓	0.3713 TBit	✓	0.3713TBit
148.5 MHz TMDS Clock	✓	0.74 TBit	✓	0.74 TBit
222.75 MHz TMDS Clock	✓	1.11 TBit	✓	1.11 TBit
297 MHz TMDS Clock	✓	1.485 TBit	✓	1.485TBit
340 MHz TMDS Clock	✓	1.7 TBit	✓	1.7 TBit

**Table 3: E4887A—003 jitter tolerance capabilities**

**Note: TBit = One bit time at the specified TMDS rate (1 TBit = 1 Unit Interval)**



**E4887A-007**

Frequency range	620 Mb/s to 7 Gb/s internal clock mode <sup>1)</sup>  620 Mb/s to 6 Gb/s ESG E44838C with opt. 506 used as clock source  620 Mb/s to 4 Gb/s ESG E44838C with opt. 504 used as clock source
Skew between data channels	20 ps typ. <sup>2)3)5)</sup>
Delay = start delay + fine delay	Can be specified as leading edge delay in fraction of bits in each channel
Start delay range	0 ns to 100 ns
Fine delay range	±1 period <sup>4)</sup>
Delay resolution	100 fs
Delay accuracy	±10 ps ±20 ppm relative to zero-delay placement <sup>5)</sup>
Relative delay accuracy	±2 ps ±2% typ. <sup>3)</sup>

**Table 3: TMD5 Signal Generator: timing specifications**

- 1) E4438C ESG Vector Signal Generator needed for jitter injection
- 2) After cable deskewing at customer levels and unchanged system frequency.
- 3) @ 25 °C to 40 °C ambient temperature
- 4) Can be changed without stopping the system
- 5) For N4910A cable set (2.4 mm connector, 24" matched pair)

**E4887A-007 (N4874A)**

Output	Differential or single ended, 2.4 mm(f) <sup>1)</sup>
Impedance	50 Ω typ.
Output amplitude/resolution	0.1 Vpp to 1.8 Vpp / 5 mV
Output voltage window	-2 V to +3 V; for HDMI output up to 3.3V use Bias Tee kit <sup>2)</sup>
Data formats	NRZ, DNRZ
Transition times 20% to 80%	<20 ps <sup>4)</sup>
Intrinsic jitter	9 ps peak to peak typ. <sup>3)4)</sup>

**Table 4: TMD5 Signal Generator: output specifications**

- 1) In single ended mode, the unused output must be terminated with 50 Ω to GND
- 2) Voltage window direct at module output is -2 V to +3 V; DC power supply needed with Bias Tee.
- 3) Clock out to data out of same module. NRZ data format
- 4) For N4910A cable set (2.4 mm connector, 24" matched pair)

**E4887A-007 (N4874A)**

PRBS/PRWS	2n-1 n = 7, 9, 10, 11, 15, 23, 31
Errored PRBS/PRWS	2n-1 n = 7, 9, 10, 11, 15
Extended ones or zeroes	2n-1 n = 7, 9, 10, 11, 15
User definable memory based patterns	Up to 64 Mbit
Video formats	See table 4, requires E4887A-207 HDMI frame generator software

**Table 5: TMD5 Signal Generator: pattern and video formats****Specification assumptions**

The specifications in this data sheet describe the instrument's warranted performance. Non-warranted values are stated as typical (typ.).

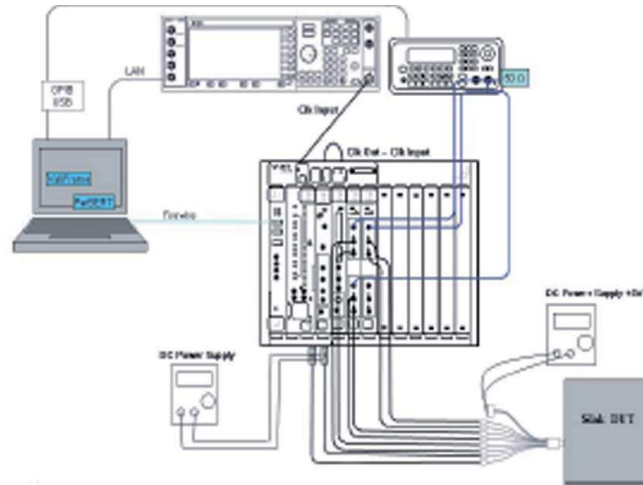
All specifications are valid from 10 °C to 40 °C ambient temperature after a 30 minute warm-up phase, with outputs and inputs terminated with 50 Ω to ground at ECL levels if not specified otherwise.

**Standard Compliant and Characterization Tester E4887A-037 TMDs Signal Generator up to 3.4 Gb/s**

The E4887A-037 TMDs Signal Generator offers fastest compliance testing based on CTS requirements including characterization capabilities up to 3.4 Gb/s.

Jitter Tolerance capabilities:

- Combined jitter tolerance compliance and characterization on all data rates
- Separate jitter tolerance compliance start at 74 MHz pixel clock.
- Separate jitter tolerance characterization starting at 148 MHz pixel clock



**Figure 4: Characterization Setup up to 3.4Gb/s**

**Instruments**

- |               |   |
|---------------|---|
| 1x E4887A-037 | HDMI TMDs Generator max. bit rate 3.4 Gb/s            |
| 1x E4438C     | ESG Vector Signal Generator with options see page 18. |
| 1x 33220A     | Arbitrary Waveform Generator up to 20 MHz             |
| 1x E3646A     | DC Power Supply, dual output, dual range              |

**Software**

- |               |  |
|---------------|--|
| 1x E4887A-207 | HDMI Frame Generator Software for E4887A |
|---------------|--|

**Accessories**

- |               |  |
|---------------|--|
| 1x E4887A-309 | Accessory and cable kit for E4887A-037 |
| 1x N1080A-H01 | Test point access adapter plug         |
| 1x N1080A-H02 | Test point access adapter receptacle   |
|               | 2 units needed for cable test          |
| 1x N1080A-H03 | Low frequency control board            |

**BitifEye Digital Test Solutions ([www.bitifeye.com](http://www.bitifeye.com)), required:**

- |                      |  |
|----------------------|--|
| 1x BIT-HDMI-BTK-0037 | Bias Tee kit for E4887A-037                      |
| 1x BIT-HDMI-PPD-7373 | Probe power distribution kit for DSO 8000 series |

For additional accessories, see the E4887A ordering instructions on page 18.

**For automated compliance sink and source testing**

- |             |  |
|-------------|--|
| 1x DSO80000 | Real-time Oscilloscope   |
| 1x N5399A   | HDMI software package for DSO80000   |
| 1x N5990A   | Test Automation Platform with options -010, -150, -250, and -001 recommended |

For more details on the cable emulators see page 16.

**E4887A-037**

Frequency range	20.843 Mb/s to 3.4 Gb/s (E4861B/E4862B) internal clock mode <sup>1)</sup>  620 Mb/s to 6 Gb/s (N4874A) ESG E44838C with opt. 506 used as clock source <sup>2)</sup>  620 Mb/s to 4 Gb/s (N4874A) ESG E44838C with opt. 504 used as clock source
Skew between data channels	50 ps typ. <sup>3,4)</sup>
Delay = start delay + fine delay	Can be specified as leading edge delay in fraction of bits in each channel
Start delay range	0 ns to 200 ns
Fine delay range	±1 period <sup>5)</sup>
Delay resolution	1 ps
Delay accuracy	±25 ps ±50 ppm relative to zero-delay placement <sup>3)</sup>

**Table 6: TMDS Signal Generator: timing specifications**

- 1) 33250A Arbitrary Waveform Generator needed for jitter injection
- 2) E4438C ESG Vector Signal Generator needed for jitter injection
- 3) After cable deskewing at customer levels and unchanged system frequency.
- 4) @ 25 °C to 40 °C ambient temperature
- 5) Can be changed without stopping the system

**E4887A-037 (E4861B/62B)**

Output	Differential or single ended, 3.5 mm(f)
Impedance	50 Ω typ.
Output amplitude/resolution	0.05 Vpp to 1.8 Vpp / 10 mV
Output voltage window	-2 V to +3.5 V; for HDMI output up to 3.3V use Bias Tee kit <sup>1)</sup>
Data formats	NRZ, DNRZ
Transition times 20% to 80%	<75 ps
Intrinsic jitter	<30 ps peak to peak typ. <sup>2)</sup>

**Table 7: TMDS Signal Generator: output specifications**

- 1) Voltage window direct at module output is -2 V to +3.5 V; DC power supply needed with Bias Tee. For output voltage > 3 V the termination voltage > 3 V needs to be applied
- 2) Measured with E4808A Clock Module, spec as intra channel jitter

**E4887A-037 (E4861B/62B)**

PRBS/PRWS	2n-1 n = 7, 9, 10, 11, 15, 23, 31
Errored PRBS/PRWS	2n-1 n = 7, 9, 10, 11, 15
Extended ones or zeroes	2n-1 n = 7, 9, 10, 11, 15
User definable memory based patterns	Up to 16 Mbit
Video formats	See table 4, requires E4887A-207 HDMI frame generator software

**Table 8: TMDS Signal Generator: pattern and video formats****Specification assumptions**

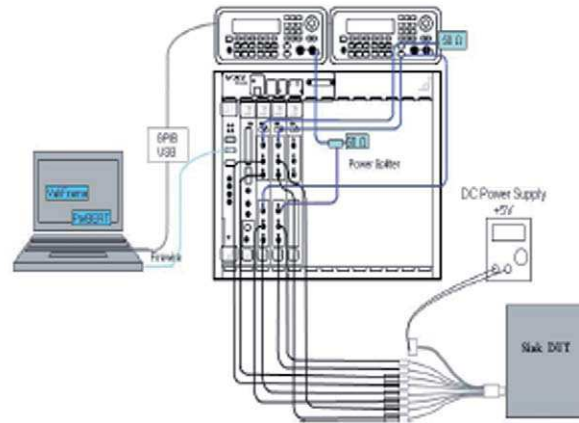
The specifications in this data sheet describe the instrument's warranted performance. Non-warranted values are stated as typical (typ.). All specifications are valid from 10 °C to 40 °C ambient temperature after a 30 minute warm-up phase, with outputs and inputs terminated with 50 Ω to ground at ECL levels if not specified otherwise.

## Economic High Speed Test up to 3.4 Gb/s E4887A-003 Signal Generator

The economic E4887A-003 Signal Generator provides compliant HDMI sink testing for HDMI devices from 740 Mbit up to 3.4 Gb/s and does fully follow the test requirements of the HDMI CTS specification. Independent jitter injection on TMDS clock and TMDS data is provided as well as jitter injection of clock and data jitter components on the TMDS clock.

Jitter Tolerance capabilities are provided:

- Combined and separate Jitter tolerance compliance starting at 74 MHz pixel clock
- Combined and separate Jitter tolerance characterization starting at 148 MHz pixel clock



**Figure 5: Test Setup up to 3.4Gb/s**

### Instruments

1x E4887A-003	HDMI signal generator max. bit rate 3.4 Gb/s
2x 33220A	Arbitrary Waveform Generator up to 20 MHz
1x E3646A	DC power supply, dual output, dual range

### Software

1x E4887A-207	HDMI frame generator software for E4887A
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### Accessories

1x E4887A-303	Accessory and cable kit for E4887A-003
1x N1080A-H01	Test point access adapter plug
1x N1080A-H02	Test point access adapter receptacle 2 units needed for cable test
1x N1080A-H03	Low frequency control board

### BitifEye Digital Test Solutions ([www.bitifeye.com](http://www.bitifeye.com)), required:

1x BIT-HDMI-BTK-0003	Bias Tee kit for E4887A-003
1x BIT-HDMI-PPD-7373	Probe power distribution kit for DSO 8000 series

For additional accessories, see the E4887A ordering instructions on page 19.

### Additional for compliance sink and source testing

1x DSO80000	Real-time Oscilloscope
1x N5399A	HDMI software package for DSO80000
1x N5990A	Test Automation Platform with options-010, -150, -250, and -001 recommended

For more details on the cable emulators see page 16.

<b>E4887A-003</b>	
Frequency range	20.843 Mb/s to 3.4 Gb/s (E4861B/E4862B) internal clock mode <sup>1)</sup>
Skew between data channels	50 ps typ. <sup>2,3)</sup>
Delay = start delay + fine delay	Can be specified as leading edge delay in fraction of bits in each channel
Start delay range	0 ns to 200 ns
Fine delay range	±1 period <sup>4)</sup>
Delay resolution	1 ps
Delay accuracy	±25 ps ±50 ppm relative to zero-delay placement <sup>3)</sup>

**Table 9: 3.4 Gb/s Signal Generator: timing specifications**

- 1) 33250A Arbitrary Waveform Generator needed for jitter injection
- 2) After cable deskewing at customer levels and unchanged system frequency.
- 3) @ 25 °C to 40 °C ambient temperature
- 4) Can be changed without stopping the system

<b>E4887A-003 (E4861B/62B)</b>	
Output	Differential or single ended, 3.5 mm(f)
Impedance	50 Ω typ.
Output amplitude/resolution	0.05 V <sub>pp</sub> to 1.8 V <sub>pp</sub> / 10 mV
Output voltage window	-2 V to +3.5 V; for HDMI output up to 3.3V use Bias Tee kit <sup>1)</sup>
Data formats	NRZ, DNRZ
Transition times 20% to 80%	<75 ps
Intrinsic jitter	<30 ps peak to peak typ. <sup>2)</sup>

**Table 10: 3.4 Gb/s Signal Generator: output specifications**

- 1) Voltage window direct at module output is -2 V to +3.5 V; DC power supply needed with Bias Tee. For output voltage > 3 V the termination voltage > 3 V needs to be applied
- 2) Measured with E4808A clock module, spec as intra channel jitter

<b>E49887A-003 (E4861B/62B)</b>	
PRBS/PRWS	2 <sup>n</sup> -1 n = 7, 9, 10, 11, 15, 23, 31
Errored PRBS/PRWS	2 <sup>n</sup> -1 n = 7, 9, 10, 11, 15
Extended ones or zeroes	2 <sup>n</sup> -1 n = 7, 9, 10, 11, 15
User definable memory based patterns	Up to 16 Mbit
Video formats	See table 4, requires E4887A-207 HDMI frame generator software

**Table 11: 3.4 Gb/s Signal Generator: pattern and video formats**

### Specification assumptions

The specifications in this data sheet describe the instrument's warranted performance. Non-warranted values are stated as typical (typ.).

All specifications are valid from 10 °C to 40 °C ambient temperature after a 30 minute warm-up phase, with outputs and inputs terminated with 50 Ω to ground at ECL levels if not specified otherwise.

## E4887A-203 HDMI Frame Generator Software

Select from a comprehensive variety of video modes. The HDMI Frame Generator software sets up the HDMI TMDS Signal Generator with the selected video frame and color depth in one click. It offers DVI compliant modes, too.

Control the TMDS Signal Generator conveniently from the instrument parameter screen of the frame generator software. Define clock and data swing or change the data rate. Select the jitter mix you need for your device.



Figure 6: Push button video frame selection.

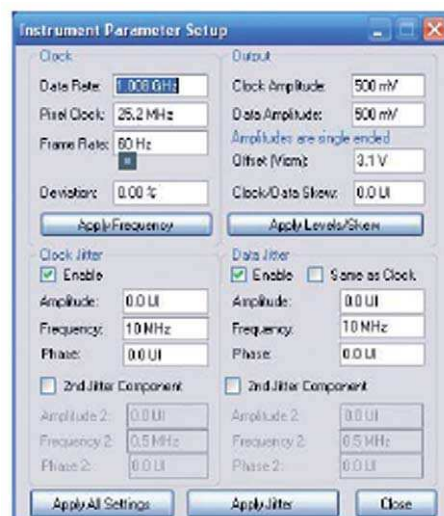


Figure 7: Easy control of whole TMDS Signal Generator .

Create your own color scheme with the HDMI Frame Generator Software. Define start and end value for red, green and blue and look at the result with the preview screen, or simply select the compliance gray-scale scheme.



Figure 8: Preview Frame Generator

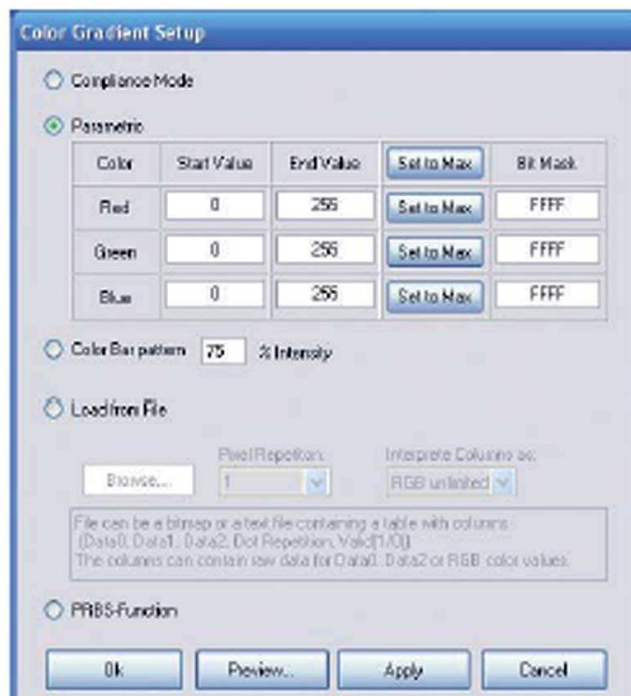


Figure 9: Color gradient setup to change the color scheme

Supported Video Modes by  
E4887A-207 (I)

CEA Video Code	Format	Frame Rate	Picture Aspect Ratio	24 bit	30 bit	36 bit	48 bit
1	640x480p	60 Hz	4:3	X	X	X	X
2	720x480p	60 Hz	4:3	X		X	X
3	720x480p	60 Hz	16:9	X		X	X
4	1280x720p	60 Hz	16:9	X		X	X
5	1920x1080i	60 Hz	16:9	X	3G	X	X
6	1440x480i	60 Hz	4:3	X		X	X
7	1440x480i	60 Hz	16:9	X		X	X
8	1440x240p	60.115 Hz	4:3	X	X	X	X
9	1440x240p	59.886 Hz	16:9	X	X	X	X
10	2880x480i	60 Hz	4:3	X		X	X
11	2880x480i	60 Hz	16:9	X		X	X
12	2880x240p	60.115 Hz	4:3	X	X	X	X
13	2880x240p	59.886 Hz	16:9	X	X	X	X
14	1440x480p	60 Hz	4:3	X		X	X
15	1440x480p	60 Hz	16:9	X		X	X
16	1920x1080i	60 Hz	16:9	X		X	X
17	720x576p	50 Hz	4:3	X	X	X	X
18	720x576p	50 Hz	16:9	X	X	X	X
19	1920x720p	50 Hz	16:9	X	X	X	X
20	1920x1080i	50 Hz	16:9	X	X	X	X
21	1440x576i	50 Hz	4:3	X	X	X	X
22	1440x576i	50 Hz	16:9	X	X	X	X
23	1440x288p	50.08 Hz	4:3	X	X	X	X
24	1440x288p	49.761 Hz	16:9	X	X	X	X
25	2880x576i	50 Hz	4:3	X	X	X	X
26	2880x576i	50 Hz	16:9	X	X	X	X
27	2880x288p	50.08 Hz	4:3	X	X	X	X
28	1440x576p	49.761 Hz	16:9	X	X	X	X
28	1920x1080p	49.92 Hz	16:9	X	X	X	X
29	1920x1080p	50 Hz	4:3	X	X	X	X
30	1920x1080p	50 Hz	16:9	X	X	X	X
31	1920x1080p	50 Hz	16:9	X	X	X	X
32	2880x480p	23.976 Hz	16:9	X			X
32	2880x480p	24 Hz	16:9	X			X
33	2880x576p	25 Hz	16:9	X	X	X	X
34	1920x1080p	29.976 Hz	16:9	X	X	X	X
34	1920x1080p	30 Hz	16:9	X	X	X	X
35	2880x480p	60 Hz	4:3	X		X	X
36	2880x480p	60 Hz	16:9	X		X	X
37	2880x576p	50 Hz	4:3	X	X	X	X
38	2880x576p	50 Hz	16:9	X	X	X	X

Table 12: E4887A-207 Frame Generator Software: available video formats

„X“ -> This video mode is supported by E4887A-007; -037; -003  
 „3G“ -> This video mode is supported by E4887A-003; -037

Supported Video Modes by  
E4887A-207 (II)

CEA Video Code	Format	Frame Rate	Picture Aspect Ratio	24 bit	30 bit	36 bit	48 bit
39	1920x1080i	50 Hz	16:9	X	X	X	X
40	1920x1080i	100 Hz	16:9	X	X	X	X
41	1280x720p	100 Hz	16:9	X		X	X
42	720x576p	100 Hz	4:3	X	X	X	X
43	720x576p	100 Hz	16:9	X	X	X	X
44	1440x576i	100 Hz	4:3	X	X	X	X
45	1440x576i	100 Hz	16:9	X	X	X	X
46	1920x1080i	119.88 Hz	16:9	X		X	X
46	1920x1080i	120 Hz	16:9	X		X	X
47	1280x720p	119.88 Hz	16:9	X			X
47	1280x720p	120 Hz	16:9	X			X
48	720x480p	119.88 Hz	4:3	X			X
48	720x480p	120 Hz	4:3	X		3G	X
49	720x480p	119.88 Hz	16:9	X		3G	X
49	720x480p	120 Hz	16:9	X		3G	X
50	1440x480i	119.88 Hz	4:3	X		3G	X
50	1440x480i	120 Hz	4:3	X		3G	X
51	1440x480i	119.88 Hz	16:9	X		3G	X
51	1440x480i	120 Hz	16:9	X		3G	X
52	720x576p	200 Hz	4:3	X	X	X	X
53	720x576p	200 Hz	16:9	X	X	X	X
54	1440x576i	200 Hz	4:3	X	X	X	X
55	1440x576i	200 Hz	16:9	X	X	X	X
56	720x480p	200 Hz	4:3	X			X
57	720x480p	240 Hz	16:9	X			X
58	1440x480i	240 Hz	4:3	X			X
59	1440x480i	240 Hz	16:9	X			X

Table 13: E4887A-207 Frame Generator Software: available video formats

„X“ -> This video mode is supported by E4887A-007; -037; -003  
 „3G“ -> This video mode is supported by E4887A-003; -037

## E4887A-10x Series Cable Emulators

The E4887A-10x series offers different cable emulators for compliant jitter tolerance testing. Each cable emulator is packaged and has 3.5 mm (f) connectors for TMDS clock and all three TMDS data lanes. Each lane is differential and matched in length.

The cable emulators are offered in 3 versions:

E4887A-101 CTS 1.3 low frequency  $\leq 74.25$  MHz

E4887A-102 CTS 1.3 high frequency  $> 74.25$  MHz

E4887A-103 CTS 1.3 compliant passive EQ cable emulator

The E4887A-101 emulates a CAT 1 reference cable, while E4887A-102 emulates a CAT 2 reference cable.

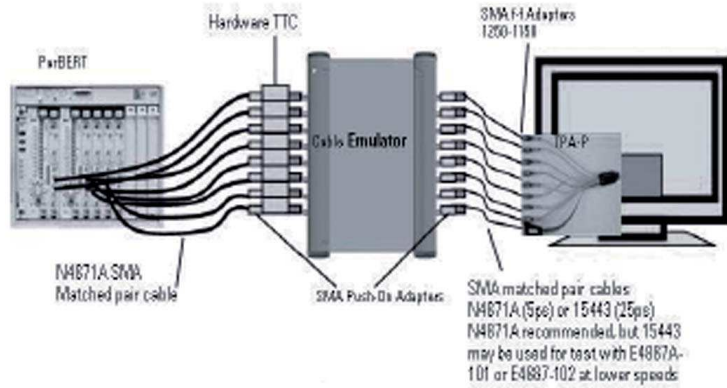


Figure 10: Typical cable emulator application

	E4887A-101*	E4887A-102**
Intra-Pair Skew	$\leq 50$ ps	$\leq 15$ ps
Inter-Pair Skew	$< 250$ ps	$< 100$ ps
Amplitude matching	$< 2\%$	$< 2\%$
Amplitude accuracy	$< 5\%$	$< 7\%$

Table 14: Detailed specification

\* measured at 742.5 Mb/s using 1-0 pattern

\*\* measured at 3400 Mb/s using 1-0 pattern



Figure 11: Cable Emulator

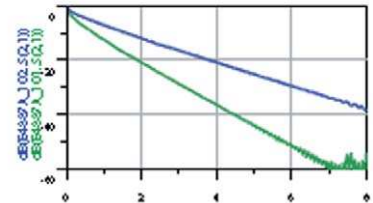


Figure 12: Frequency characteristics

<b>High resolution HDMI TMDS Signal Generator</b> 620 Mb/s to 7 Gb/s Includes: 2x E4809A; 5x N4874A; 1x E4875A; 1x 81250A-149; 1x 81250A-013; 1x E4809A-001; 1x 81250A-015	E4887A-007
<b>Vector signal generator for jitter injection</b> ESG Vector Signal Generator (2x) 250 kHz to 6 GHz, requires option –UNJ 250 kHz to 4 GHz, requires option -1E5 Internal baseband generator	E4438C E4438C-506 E4438C-504 E4438C-601
<b>Frame generator software</b> For TMDS Signal Generator E4887A-007	E4887A-207
<b>Accessories and cables</b> Accessory and cable kit for E4887A-007  Includes: 11x N4912A; 5x N4871A; 2x 15442A; 1x1250-2015; 1x 8710-1582 2x 1250-1744; 8x 83059B; 2x 8120-1839; 1x 1250-2206	E4887A-308
CTS 1.3 low frequency cable emulator	E4887A-101
CTS 1.3 high frequency cable emulator	E4887A-102
Passive equalizer cable emulator (8 pieces)	E4887A-103
HDMI test point access, plug	N1080A-H01
HDMI test point access, receptacle	N1080A-H02
HDMI Low Speed Board	N1080A-H03
<b>BitifEye Digital Test Solutions (<a href="http://www.bitifeye.com">www.bitifeye.com</a>):</b> Bias Tee Kit for E4887A-007 Transition Time Converter Kit for E4887A-007 Test automation Cable Kit for E4887A-007/-037 Low Speed Kit for E4887A Probe Power Distribution Kit for DSO80000 series oscilloscope Snap-on Connector Kit (80 pc.) Network Connection Kit (8-port LAN switch and 5 LAN cable)	BIT-HDMI-BTK-0007 BIT-HDMI-TTC-0007 BIT-HDMI-TAK-0737 BIT-HDMI-LSK-7373 BIT-HDMI-PPD-7373  BIT-GEN-SCK-0080 BIT-GEN-NCK-0001
<b>DC-Power supply</b> Dual output, 0-8V and 0-20V / 1.5A, 60W, GPIB Power Supply for 3.3V LAN to GPIB converter	E3646A E3600 series USB/GPIB Interface
<b>For HDMI compliance testing:</b> Real-Time Oscilloscope Differential probes and probe heads  HDMI software package for DSO80000 Test automation platform HDMI sink test Interface to N5399A HDMI software Recommended: Data base interface	DSO80000 or higher 1169A (4x), N5380A (5x) N5399A N5990A-010 N5990A-150 N5990A-250 N5990A-001

<b>Standard compliant and characterisation tester</b>	
20.834 Mb/s to 3.4 Gb/s Data	E4887A-037
620Mb/s to 7Gb/s Clock	
Includes: 1xE4808A; 2x E4861B; 4x E4862B;	
1x E4809A; 1x N4874A; 1x E4875A;	
1x 81250A-149; 1x 81250A-013; 1x E4809A-001;	
1x 81250A-015	
<b>Signal generator for jitter injection</b>	
ESG Vector Signal Generator (1x)	E4438C
250 kHz to 6 GHz, requires option –UNJ	E4438C-506
250 kHz to 4 GHz, requires option -1E5	E4438C-504
Internal baseband generator	E4438C-601
Arbitrary Waveform Generator 20MHz (1x)	33220A
<b>Frame generator software</b>	
For TMD5 Signal Generator E4887A-037	E4887A-207
<b>Accessories and cables</b>	
Accessory and cable kit for E4887A-037	E4887A-309
Includes: 2x N4912A; 5x N4871A; 3x 15442A;	
1x 1250-1744; 1x 11901C; 8x 83059B; 1x 8710-1582	
2x 1250-2015; 3x 1250-1698; 2x 1250-2206;	
CTS 1.3 low frequency cable emulator	E4887A-101
CTS 1.3 high frequency cable emulator	E4887A-102
Passive equalizer cable emulator (8pieces)	E4887A-103
HDMI test point access, plug	N1080A-H01
HDMI test point access, receptacle	N1080A-H02
HDMI Low Speed Board	N1080A-H03
<b>BitifEye Digital Test Solutions (<a href="http://www.bitifeye.com">www.bitifeye.com</a>):</b>	
Bias Tee Kit for E4887A-037	BIT-HDMI-BTK-0037
Transition Time Converter Kit for E4887A-037	BIT-HDMI-TTC-0037
Test automation Cable Kit for E4887A-007/-037	BIT-HDMI-TAK-0737
Low Speed Kit for E4887A	BIT-HDMI-LSK-7373
Probe Power Distribution Kit for DSO80000 series	BIT-HDMI-PPD-7373
oscilloscope	
Snap-on Connector Kit (70 pc.)	BIT-GEN-SCK-0070
Network Connection Kit (8-port LAN switch and	BIT-GEN-NCK-0001
5 LAN cable)	
<b>DC-Power supply</b>	
Dual output, 0-8V and 0-20V / 1.5A, 60W, GPIB	E3646A
Power Supply for 3.3V	E3600 series
LAN to GPIB converter	USB/GPIB Inteface
<b>For HDMI compliance testing:</b>	
Real-Time oscilloscope	DSO80000 or higher
Differential probes and probe heads	1169A (4x), N5380A (5x)
HDMI software package for DSO80000	N5399A
Test automation platform	N5990A-010
HDMI sink test	N5990A-150
Interface to N5399A HDMI software	N5990A-250

**Economic high speed tester up to 3.4Gb/s**

20.834 Mb/s to 3.4 Gb/s Data + Clock  
 Includes: 1xE4808A; 3x E4861B; 5x E4862B;  
 1x E4875A; 1x 81250A-149; 1x 81250A-013;  
 1x 81250A-015; 1x E4809A-001

E4887A-003

**Signal generator for jitter injection**

Arbitrary Waveform Generator 20MHz (2x)

33220A

**Frame generator software**

For TMDS Signal Generator E4887A-003

E4887A-207

**Accessories and cables**

Accessory and cable kit for E4887A-003

E4887A-303

Includes: 5x N4871A; 3x 15442A; 8x 83059B;  
 1x 8710-1582; 1x 11636B; 3x 1250-2015;  
 3x 1250-1698; 2x 1250-2206

CTS 1.3 low frequency cable emulator

E4887A-101

CTS 1.3 high frequency cable emulator

E4887A-102

Passive equalizer cable emulator (8pieces)

E4887A-103

HDMI test point access, plug

N1080A-H01

HDMI test point access, receptacle

N1080A-H02

HDMI Low Speed Board

N1080A-H03

**BitifEye Digital Test Solutions (www.bitifeye.com):**

Bias Tee Kit for E4887A-003

BIT-HDMI-BTK-0003

Transition Time Converter Kit for E4887A-003

BIT-HDMI-TTC-0003

Test Automation Cable Kit for E4887A-003

BIT-HDMI-TAK-0003

Low Speed Kit for E4887A

BIT-HDMI-LSK-7373

Probe Power Distribution Kit for DSO80000  
 series oscilloscopes

BIT-HDMI-PPD-7373

Snap-on Connector Kit (70 pc.)

BIT-GEN-SCK-0070

Network Connection Kit (8-port LAN switch  
 and 5 LAN cable)

BIT-GEN-NCK-0001

**DC-Power supply**

Dual output, 0-8V and 0-20V / 1.5A, 60W, GPIB  
 Power Supply for 3.3V

E3646A

LAN to GPIB converter

E3600 series

USB/GPIB Interface

**For HDMI compliance testing:**

Real-Time oscilloscope

DSO80000

HDMI software package for DSO80000

N5399A

Test automation platform

N5990A-010

HDMI sink test

N5990A-150

Interface to N5399A HDMI software

N5990A-250

Recommended: Test automation data base interface

N5990A-001

**Related Literature**

ParBERT 81250  
Product Overview

**Pub. No.**

**5968-9188E**

HDMI Jitter Tolerance  
Testing Application Note

**5989-4959EN**

Agilent Test Solutions for HDMI  
Brochure

**5989-7169EN**

E4438C ESG Vector  
Signal Generator  
Data Sheet

**5988-4039EN**

E364xA DC Power  
Supplies  
Data Sheet

**5968-7355EN**

N5990A Test Auto-  
mation Software  
Data Sheet

**5989-5483EN**

Infiniium 8000 Series  
Oscilloscopes  
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**5989-1487EN**

N5399A HDMI Electrical  
Performance Software  
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**5989-3047EN**

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