HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247 (FHSS) and subpart B

FOR:

Hermes Innovation Ltd.

Smartphone controlled wearable gadget with OLED display

Model: SAY necklace

FCC ID:2AKDU100

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1 Applicant information

Client name:	Hermes Innovation Ltd.
Address:	12 Ayelet Hashahar St., Even Yehuda 4053085, Israel
Telephone:	+972-72-274-8730
Fax:	+972-3-958-5525
E-mail:	leveitan@gmail.com
Contact name:	Mr. Eitan Lev

2 Equipment under test attributes

Product name:	Smartphone controlled wearable gadget with OLED display
Product type:	Transceiver
Model(s):	SAY necklace
Serial number:	Prototype
Hardware version:	3.3
Software release:	1.0
Receipt date	29-Sep-16

3 Manufacturer information

Manufacturer name:	Hermes Innovation Ltd.
Address:	12 Ayelet Hashahar St., Even Yehuda 4053085, Israel
Telephone:	+972-72-274-8730
Fax:	+972-3-958-5525
E-Mail:	leveitan@gmail.com
Contact name:	Mr. Eitan Lev

4 Test details

Project ID:	28858
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	29-Sep-16
Test completed:	25-Oct-16
Test specification(s):	FCC 47CFR part 15 subpart C § 15.247 (FHSS) and subpart B, class B

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.247(a)1, 20 dB bandwidth	Pass
Section 15.247(a)1, Frequency separation	Pass
Section 15.247(a)1, Number of hopping frequencies	Pass
Section 15.247(a)1, Average time of occupancy	Pass
Section 15.247(b), Peak output power	Pass
Section 15.247(d), Radiated spurious emissions	Pass
Section 15.247(d), Emissions at band edges	Pass
Section 15.247(i)5, RF exposure	Pass, the exhibit to the application of certification is provided
Section 15.203, Antenna requirements	Pass
Section 15.207(a), Conducted emission	Pass
Unintentional emissions	
Section 15.107, Conducted emission at AC power port	Pass
Section 15.109, Radiated emission	Pass

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

This test report supersedes the previously issued test report identified by Doc ID:HERRAD_FCC.28858.

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer	October 25, 2016	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	November 16, 2016	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	December 18, 2016	

6 EUT description

6.1 General information

The EUT is a wearable device, comprising OLED display, rechargeable Li-Po battery (600 mAh) and a Smart Ready Class 2 Bluetooth interface. The EUT comprises a non approved BLE/BT module operating in 2402-2480 MHz frequency range. The EUT is powered from external AC/DC adapter connected via the MICRO-USB-B connector amd is defined for indoor use only. The AC/DC adapter manufactured by GPT, model PCU-240 was used throughout the testing. The EUT was tested in “Operation during Charging” mode.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	MICRO-USB-B	EUT	AC/DC adapter	1	Shielded	0.9 m	Indoor
Power	AC power	AC/DC adapter	AC mains	1	NA	NA	Indoor

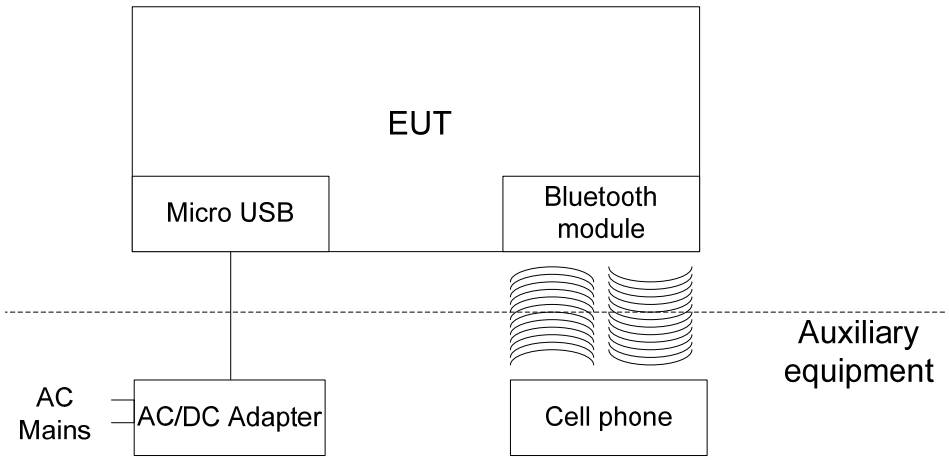
6.3 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
Cellular phone	LG	LG-D821	353490-06-004345-8

6.4 Changes made in EUT

No changes were implemented in the EUT during the testing.

6.5 Test configuration



6.6 EUT test positions

Photograph 6.6.1 EUT in X-axis orthogonal position

Photograph 6.6.2 EUT in Y-axis orthogonal position

Photograph 6.6.3 EUT in Z-axis orthogonal position

6.7 Transmitter characteristics

Type of equipment	
	Stand-alone (Equipment with or without its own control provisions)
X	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)
	Plug-in card (Equipment intended for a variety of host systems)

Intended use		**Condition of use**
	fixed	Always at a distance more than 2 m from all people
	mobile	Always at a distance more than 20 cm from all people
X	portable	May operate at a distance closer than 20 cm to human body

Assigned frequency range	2400-2483.5 MHz
Operating frequency range	2402 – 2480 MHz

Maximum rated output power	At transmitter 50 Ω RF output connector	NA
	Peak output power	13.76 dBm @ GFSK modulation 13.23 dBm @ 8DPSK modulation 13.71 dBm @ DQPSK modulation

Is transmitter output power variable?					
X	No				
	Yes		continuous variable		
			stepped variable with stepsize	dB	
		minimum RF power		dBm	
		maximum RF power		dBm	

Antenna connection				
unique coupling	standard connector	X	integral	with temporary RF connector
				X without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Embedded 2.4 GHz antenna	Ethertronics	P/N 1001312	1.72 dBi

Transmitter aggregate data rate/s			
Type of modulation	GFSK	8DPSK	DQPSK
Transmitter aggregate data rate/s	0.925 Mbps	3 Mbps	3 Mbps

Modulating test signal (baseband)	PRBS

Transmitter power source					
X	Battery	**Nominal rated voltage**	3.7 V	Battery type	Lithium-Polymer
	DC	**Nominal rated voltage**	VDC		
X	AC mains	**Nominal rated voltage**	120 VAC	Frequency	60 Hz

Spread spectrum parameters for transmitters tested per FCC 15.247 only		
FHSS	Total number of hops	79
	Bandwidth per hop	1378 kHz
	Max. separation of hops	1015 kHz

Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C requirements

7.1 20 dB bandwidth

7.1.1 General

This test was performed to measure the 20 dB bandwidth of the transmitter hopping channel. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 20 dB bandwidth limits

Assigned frequency, MHz	Maximum bandwidth, kHz	Modulation envelope reference points*, dBc
902.0 – 928.0	250	20
2400.0 – 2483.5	NA	
5725.0 – 5850.0	1000	

* - Modulation envelope reference points provided in terms of attenuation below the peak of modulated carrier.

7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit modulated carrier at maximum data rate.

The transmitter bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

7.1.2.3 The test was repeated for each data rate and each modulation format.

Figure 7.1.1 The 20 dB bandwidth test setup

Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks:			

Table 7.1.2 The 20 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
DETECTOR USED: Peak
SWEEP TIME: Auto
VIDEO BANDWIDTH: ≥ RBW
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
MODULATING SIGNAL: PRBS
FREQUENCY HOPPING: Disabled

Carrier frequency, MHz	Type of modulation	Data rate, Mbps	99% BW kHz	20 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
2402	GFSK	0.925	870.05	947.03			
	8DPSK	3	1236.5	1371.0			
	DQPSK	3	1222.5	1365.0			
2441	GFSK	0.925	857.27	945.81			
	8DPSK	3	1227.6	1361.0			
	DQPSK	3	1227.0	1378.0			
2480	GFSK	0.925	867.09	952.32			
	8DPSK	3	1226.3	1357.0			
	DQPSK	3	1242.8	1373.0			

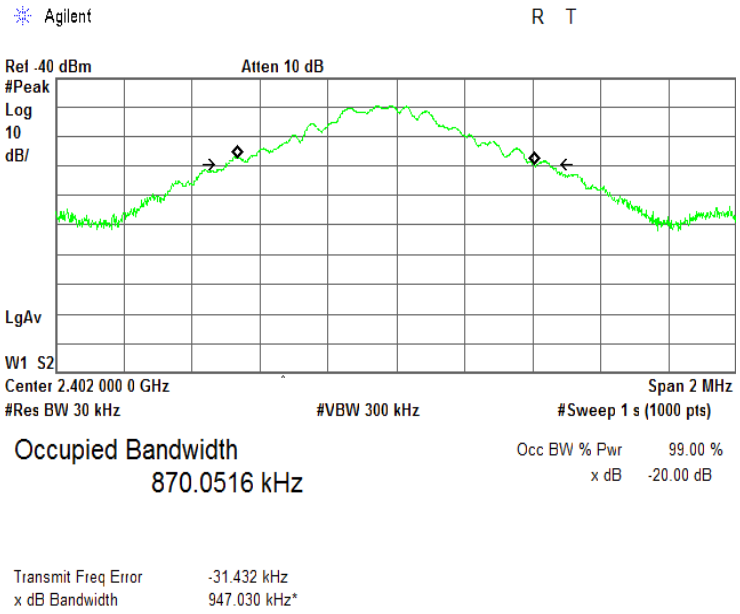
Reference numbers of test equipment used

HL 521	HL 4353	HL 5101	HL 1984	3818				

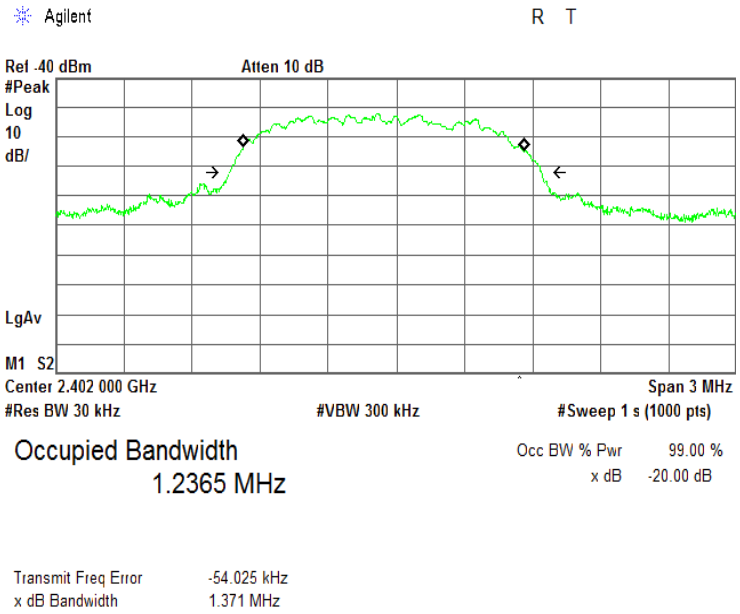
Full description is given in Appendix A.

Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks:			

Plot 7.1.1 The 20 dB bandwidth test result at low frequency, GFSK modulation

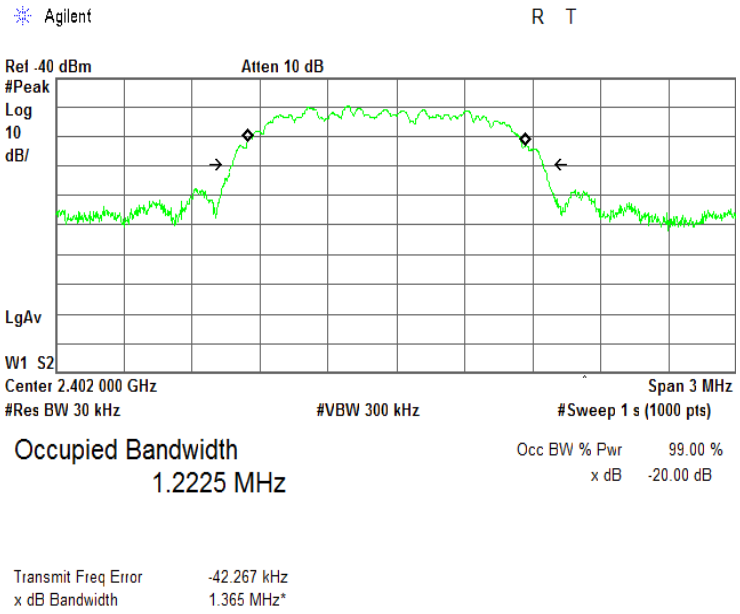


Plot 7.1.2 The 20 dB bandwidth test result at low frequency, 8DPSK modulation

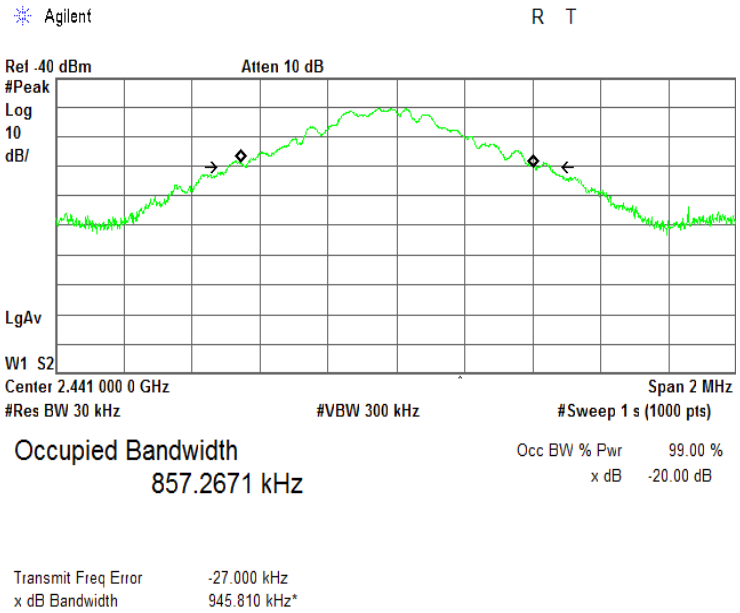


Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks:			

Plot 7.1.3 The 20 dB bandwidth test result at low frequency, DQPSK modulation

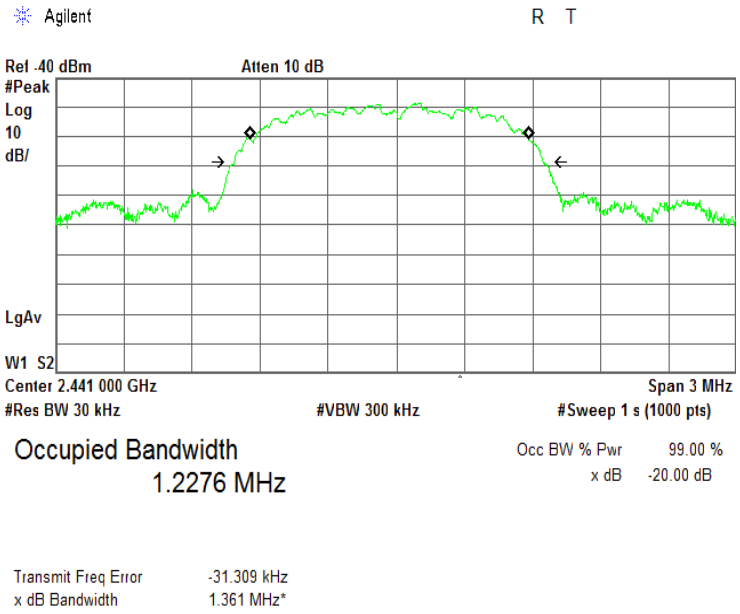


Plot 7.1.4 The 20 dB bandwidth test result at mid frequency, GFSK modulation

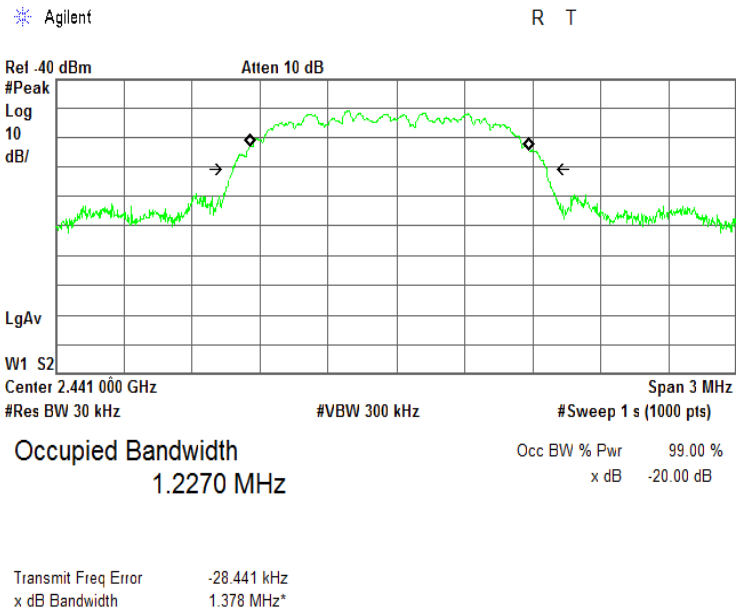


Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks:			

Plot 7.1.5 The 20 dB bandwidth test result at mid frequency, 8DPSK modulation

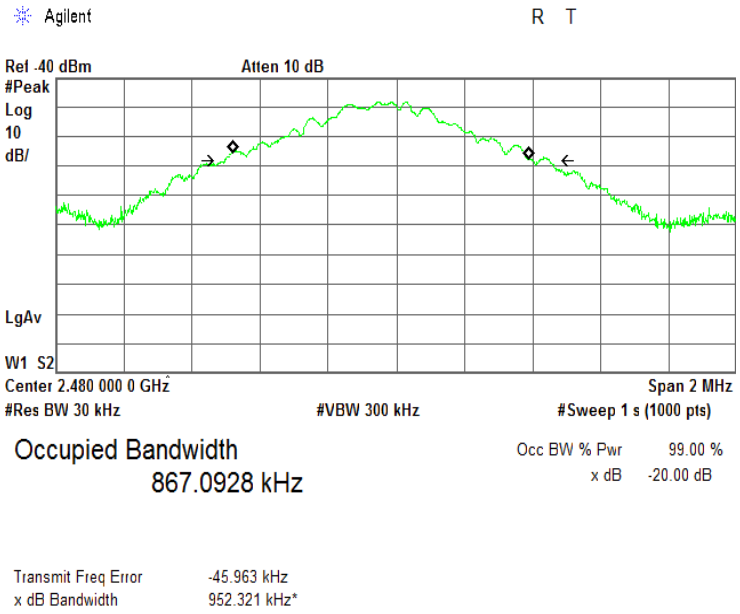


Plot 7.1.6 The 20 dB bandwidth test result at mid frequency, DQPSK modulation

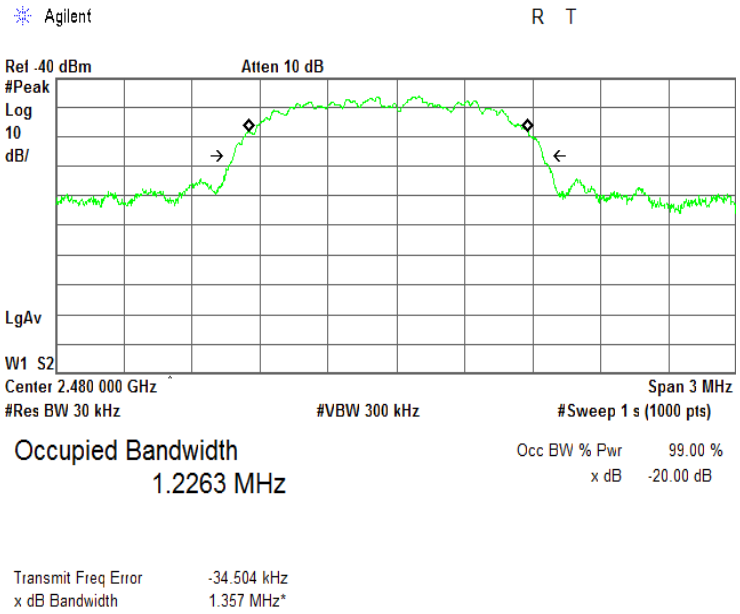


Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks:			

Plot 7.1.7 The 20 dB bandwidth test result at high frequency, GFSK modulation

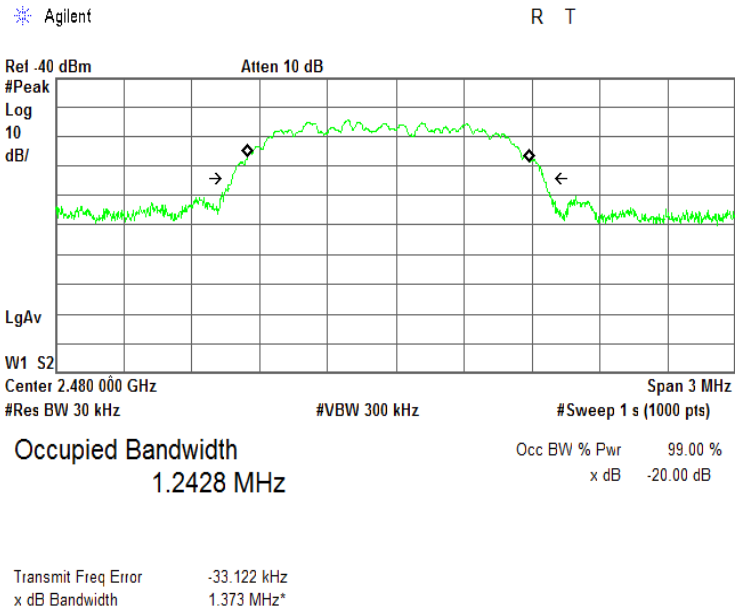


Plot 7.1.8 The 20 dB bandwidth test result at high frequency, 8DPSK modulation



Test specification:	Section 15.247(a)1, 20 dB bandwidth		
Test procedure:	ANSI C63.10, section 7.8.7		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks:			

Plot 7.1.9 The 20 dB bandwidth test result at high frequency, DQPSK modulation



Test specification:	Section 15.247(a)1, Frequency separation		
Test procedure:	ANSI C63.10, section 7.8.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1013 hPa	Power: 120 VAC
Remarks:			

7.2 Carrier frequency separation

7.2.1 General

This test was performed to measure frequency separation between the peaks of adjacent channels. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Carrier frequency separation limits

Assigned frequency range, MHz	Carrier frequency separation	
	Output power 30 dBm	Output power 21 dBm
902.0 – 928.0	25 kHz or 20 dB bandwidth of the hopping channel, whichever is greater	25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater
2400.0 – 2483.5		
5725.0 – 5850.0		

7.2.2 Test procedure

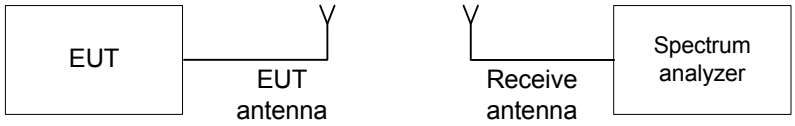
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized with frequency hopping function enabled and its proper operation was checked.

7.2.2.2 The spectrum analyzer span was set to capture the carrier frequency and both of adjacent channels, the lower and the higher. The resolution bandwidth was set wider than 1 % of the frequency span.

7.2.2.3 The spectrum analyzer was set in max hold mode and allowed trace to stabilize.

7.2.2.4 The frequency separation between the peaks of adjacent channels was measured as provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Carrier frequency separation test setup



Test specification:	**Section 15.247(a)1, Frequency separation**		
Test procedure:	ANSI C63.10, section 7.8.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1013 hPa	**Power:** 120 VAC
Remarks:			

Table 7.2.2 Carrier frequency separation test results

ASSIGNED FREQUENCY BAND: 2400-2483.5 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW
FREQUENCY HOPPING: Enabled

Modulation	Carrier frequency separation, kHz	20 dB BW, kHz	Limit,* kHz	Margin,** kHz	Verdict
GFSK	1015	952.35	634.9	380.1	Pass
8DPSK		1371.00	914.0	101.0	Pass
DQPSK		1378.80	919.2	95.8	Pass

* - two-thirds of the 20 dB bandwidth of the hopping channel
** - Margin = Carrier frequency separation – specification limit.

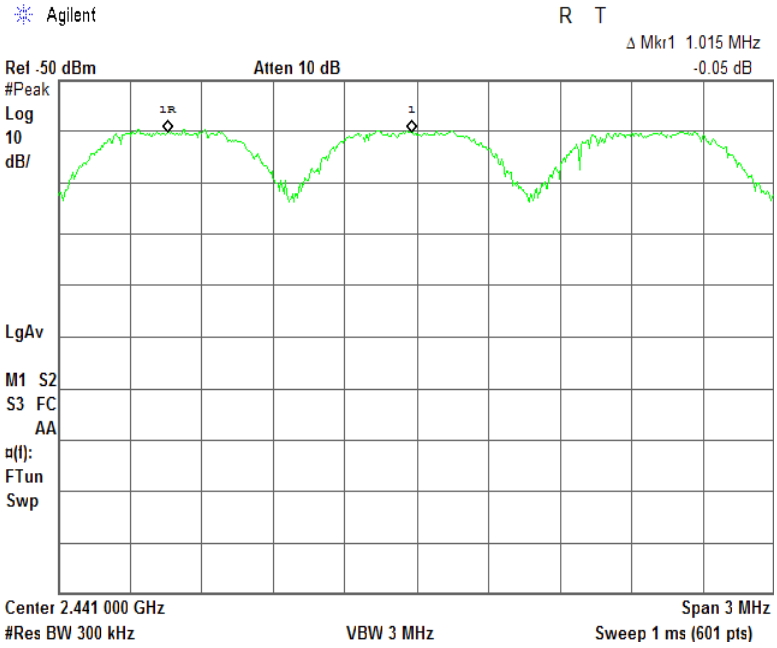
Reference numbers of test equipment used

HL 3818							

Full description is given in Appendix A.

Test specification:	Section 15.247(a)1, Frequency separation		
Test procedure:	ANSI C63.10, section 7.8.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1013 hPa	Power: 120 VAC
Remarks:			

Plot 7.2.1 Carrier frequency separation



Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 120 VAC
Remarks:			

7.3 Number of hopping frequencies

7.3.1 General

This test was performed to calculate the number of hopping frequencies used by the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Minimum number of hopping frequencies

Assigned frequency range, MHz	Number of hopping frequencies
902.0 – 928.0	50 (if the 20 dB bandwidth is less than 250 kHz) 25 (if the 20 dB bandwidth is 250 kHz or greater)
2400.0 – 2483.5	15
5725.0 – 5850.0	75

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized with frequency hopping function enabled and its proper operation was checked.

7.3.2.2 Initially the spectrum analyzer span was set equal to frequency band of operation and the resolution bandwidth was set wider than 1 % of the frequency span. If the separate hopping channels were not clearly resolved the frequency band of operation was broken to sections and the resolution bandwidth was set wider than 1 % of the frequency span of each section.

7.3.2.3 The spectrum analyzer was set in max hold mode and allowed trace to stabilize.

7.3.2.4 The number of frequency hopping channels was calculated as provided in Table 7.3.2 and the associated plots.

Figure 7.3.1 Hopping frequencies test setup

Test specification:	**Section 15.247(a)1, Number of hopping frequencies**		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC
Remarks:			

Table 7.3.2 Hopping frequencies test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW
FREQUENCY HOPPING: Enabled

Modulation	Number of hopping frequencies	Minimum number of hopping frequencies	Margin*	Verdict
GFSK	79	15	64	Pass
8DPSK	79	15	64	Pass
DQPSK	79	15	64	Pass

* - Margin = Number of hopping frequencies – Minimum number of hopping frequencies.

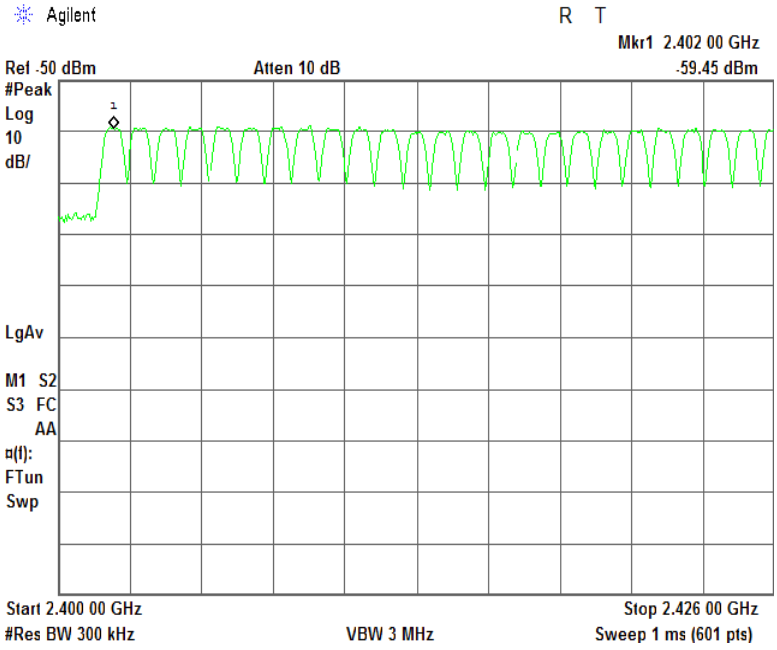
Reference numbers of test equipment used

HL 2780	HL 3818	HL 3901					

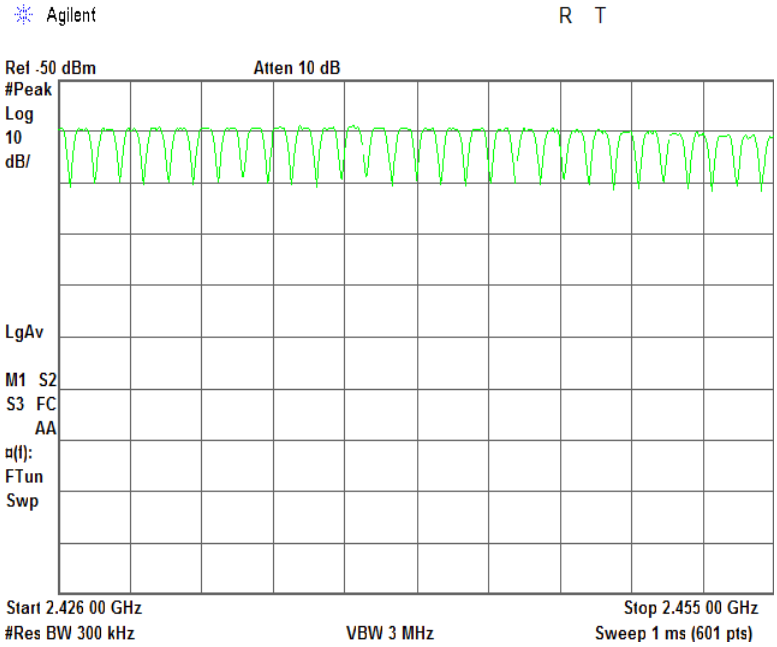
Full description is given in Appendix A.

Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 120 VAC
Remarks:			

Plot 7.3.1 Number of hopping frequencies, GFSK modulation (25 channels)

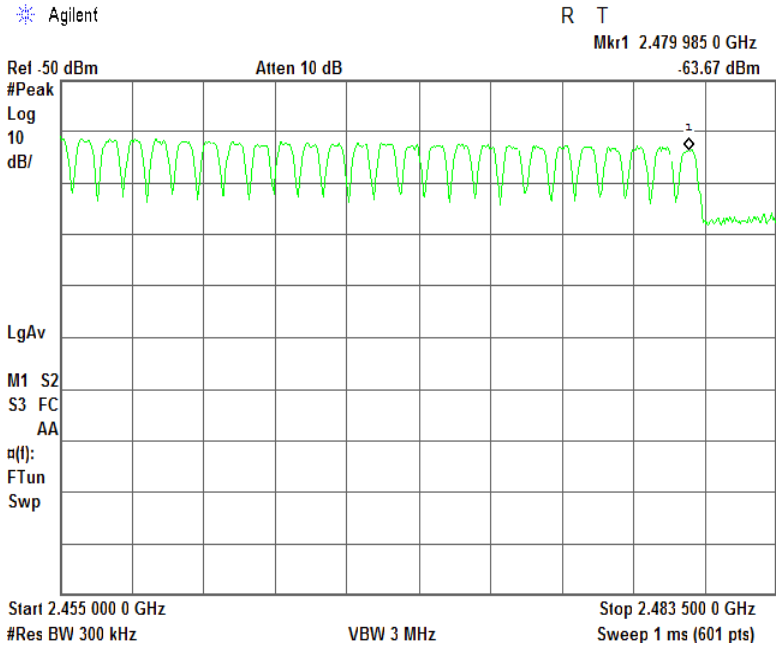


Plot 7.3.2 Number of hopping frequencies, GFSK modulation (29 channels)



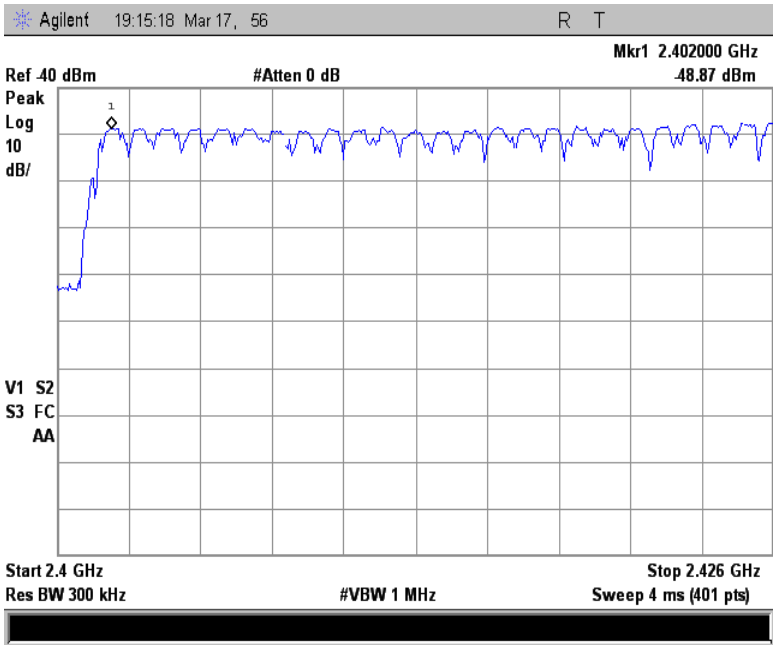
Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 120 VAC
Remarks:			

Plot 7.3.3 Number of hopping frequencies, GFSK modulation (25 channels)

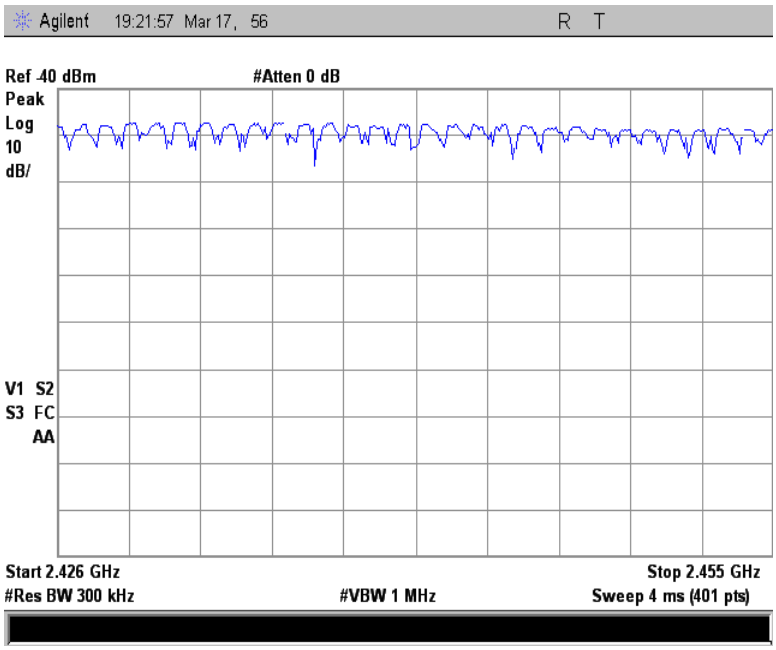


Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 120 VAC
Remarks:			

Plot 7.3.4 Number of hopping frequencies, 8DPSK modulation (25 channels)

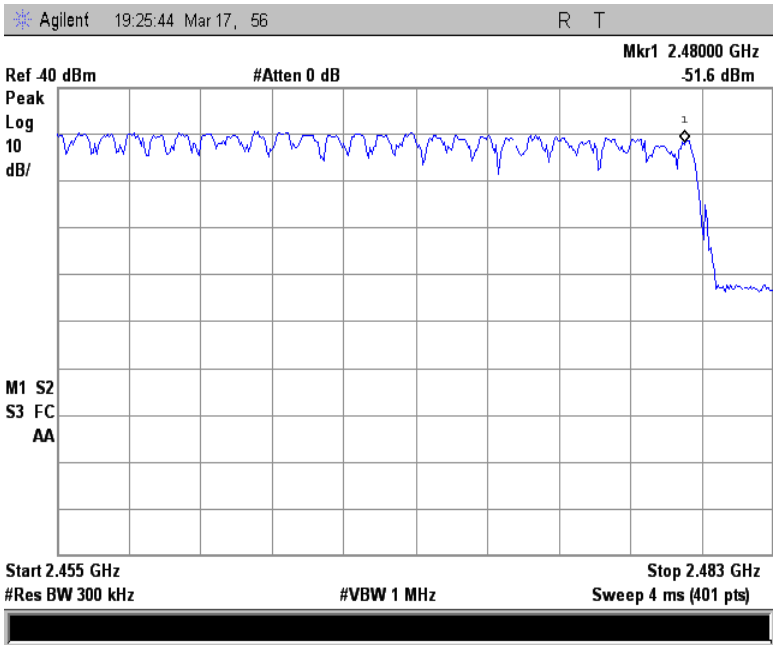


Plot 7.3.5 Number of hopping frequencies, 8DPSK modulation (29 channels)

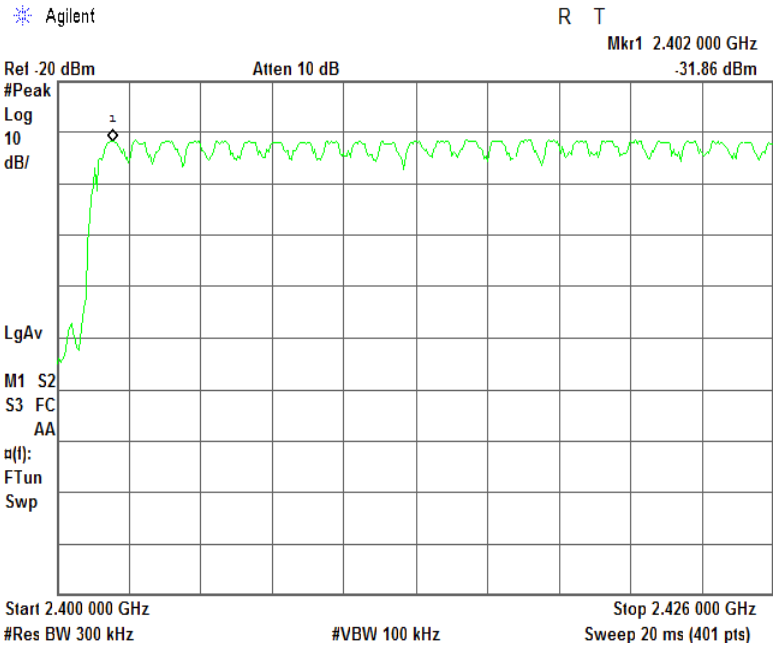


Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 120 VAC
Remarks:			

Plot 7.3.6 Number of hopping frequencies, 8DPSK modulation (25 channels)

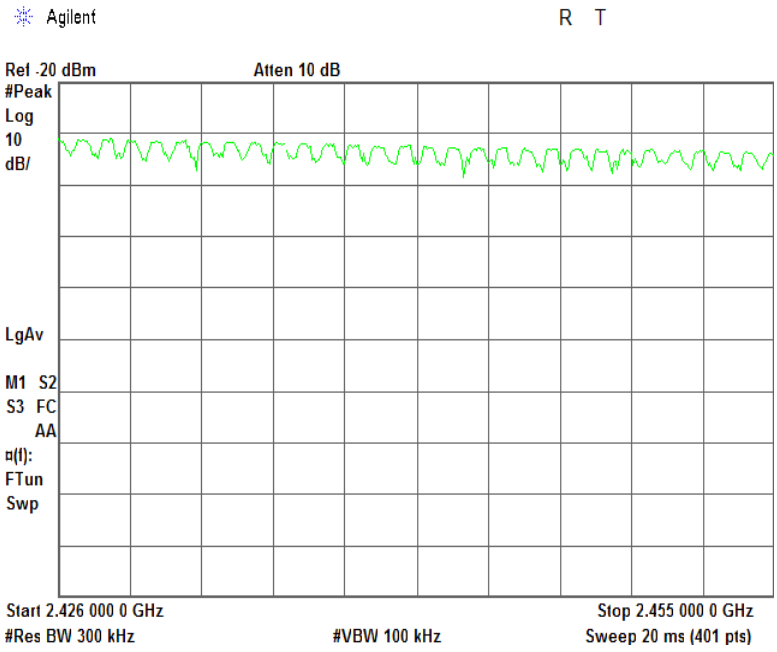


Plot 7.3.7 Number of hopping frequencies,DQPSK modulation (25 channels)

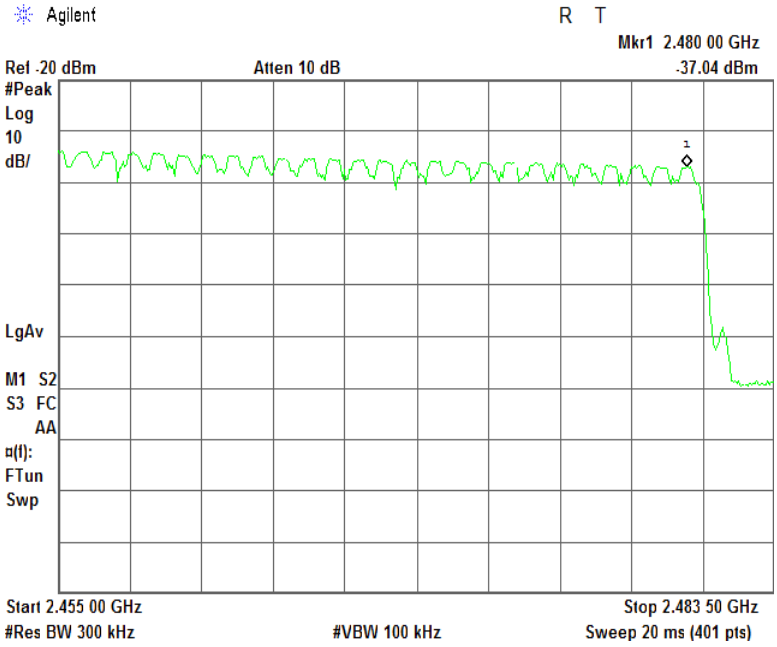


Test specification:	Section 15.247(a)1, Number of hopping frequencies		
Test procedure:	ANSI C63.10, section 7.8.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1010 hPa	Power: 120 VAC
Remarks:			

Plot 7.3.8 Number of hopping frequencies,DQPSK modulation (29 channels)



Plot 7.3.9 Number of hopping frequencies,DQPSK modulation (25 channels)



Test specification:	Section 15.247(a)1, Average time of occupancy		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1013 hPa	Power: 120 VAC
Remarks:			

7.4 Average time of occupancy

7.4.1 General

This test was performed to calculate the average time of occupancy (dwell time) on any frequency channel of the EUT. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Average time of occupancy limits

Assigned frequency range, MHz	Maximum average time of occupancy, s	Investigated period, s	Number of hopping frequencies
902.0 – 928.0	0.4	20.0	≥ 50
902.0 – 928.0	0.4	10.0	< 50
2400.0 – 2483.5	0.4	0.4 × N	N (≥ 15)
5725.0 – 5850.0	0.4	30.0	≥ 75

7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized with frequency hopping function enabled and its proper operation was checked.

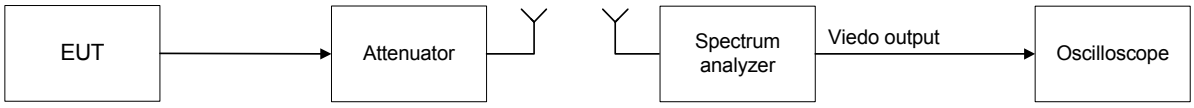
7.4.2.2 The spectrum analyzer span was set to zero centered on a hopping channel.

7.4.2.3 The single transmission duration and period were measured with oscilloscope.

7.4.2.4 The average time of occupancy was calculated as the single transmission time multiplied by the investigated period and divided by the single transmission period.

7.4.2.5 The test was repeated at each data rate and modulation type as provided in Table 7.4.2 and the associated plots.

Figure 7.4.1 Average time of occupancy test setup



Test specification:	**Section 15.247(a)1, Average time of occupancy**		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1013 hPa	**Power:** 120 VAC
Remarks:			

Table 7.4.2 Average time of occupancy test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz
MODULATING SIGNAL: PRBS
DETECTOR USED: Peak
NUMBER OF HOPPING FREQUENCIES: 79
INVESTIGATED PERIOD: 31.6 s
FREQUENCY HOPPING: Enabled

Carrier frequency, MHz	Transmission duration, ms	Transmission period, ms	Average time of occupancy*, s	Investigated period, s	Modulation	Limit, s	Margin, s**	Verdict
2441	2x0.1733	176.2	0.0622	31.6	GFSK	0.4	-0.3378	Pass
	2x0.1733	174.2	0.0629	31.6	8DPSK	0.4	-0.3371	Pass
	2x0.1733	178.0	0.0615	31.6	DQPSK	0.4	-0.3385	Pass

* - Average time of occupancy = (Single transmission duration × Investigated period) / (Single transmission period).
** - Margin = Average time of occupancy – specification limit.

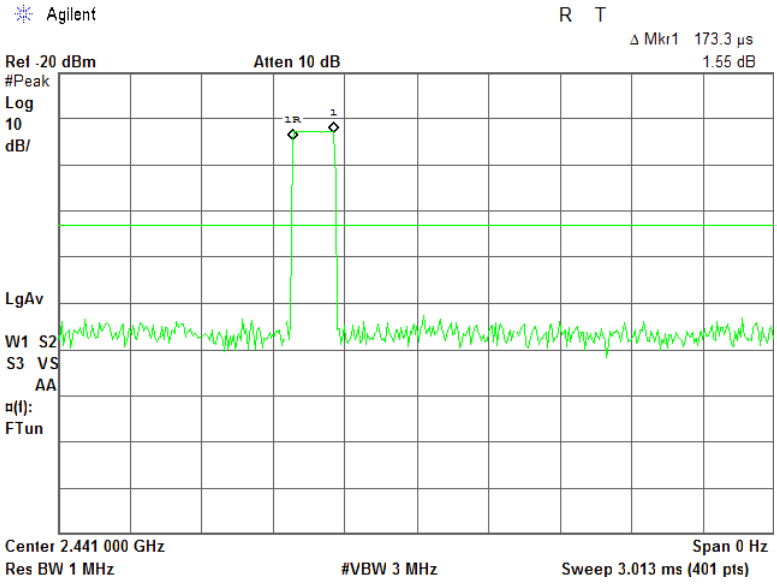
Reference numbers of test equipment used

HL 2780	HL 3818						

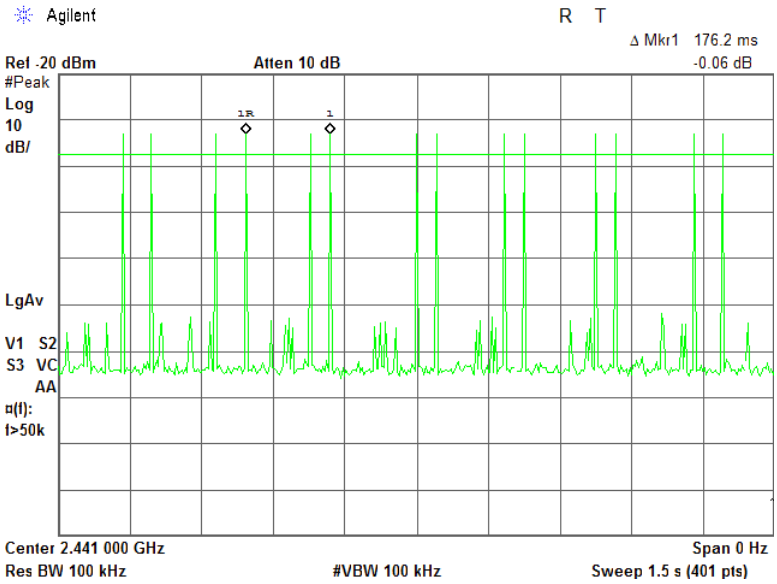
Full description is given in Appendix A.

Test specification:	Section 15.247(a)1, Average time of occupancy		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1013 hPa	Power: 120 VAC
Remarks:			

Plot 7.4.1 Single transmission duration, GFSK modulation

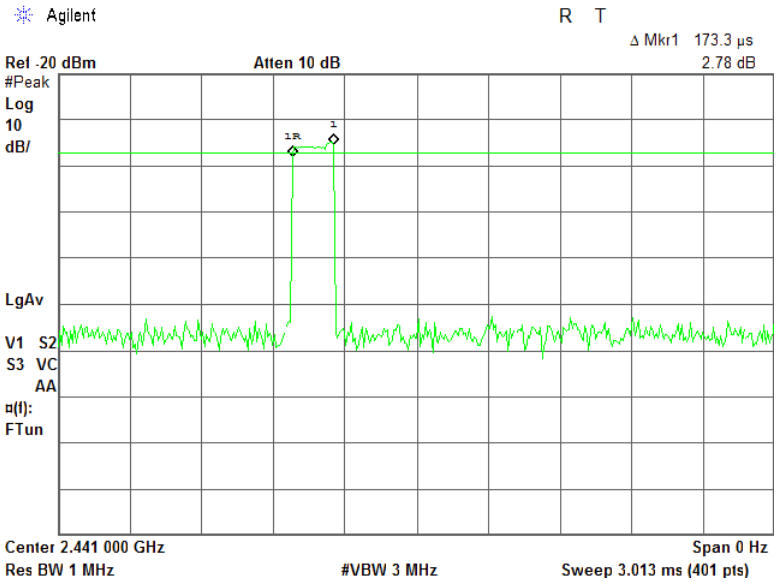


Plot 7.4.2 Transmission period, GFSK modulation

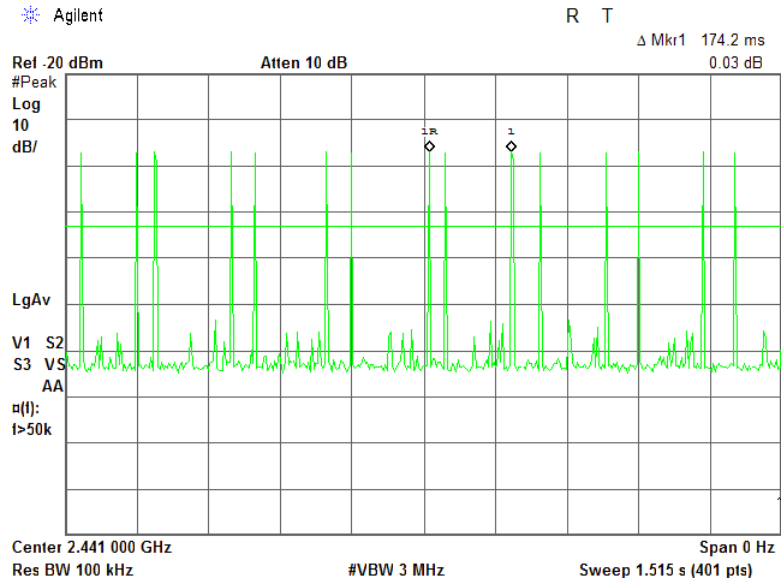


Test specification:	Section 15.247(a)1, Average time of occupancy		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1013 hPa	Power: 120 VAC
Remarks:			

Plot 7.4.3 Single transmission duration, 8DPSK modulation

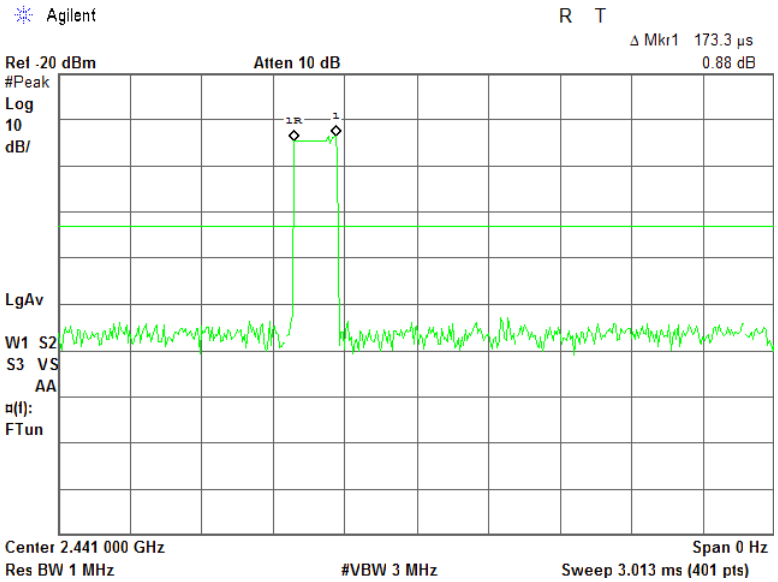


Plot 7.4.4 Transmission period, 8DPSK modulation

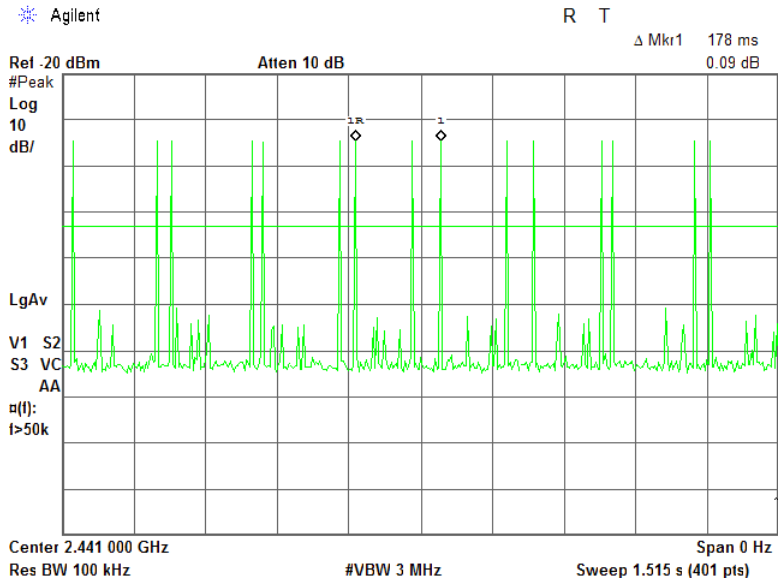


Test specification:	Section 15.247(a)1, Average time of occupancy		
Test procedure:	ANSI C63.10, section 7.8.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	13-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1013 hPa	Power: 120 VAC
Remarks:			

Plot 7.4.5 Single transmission duration, DQPSK modulation



Plot 7.4.6 Transmission period, DQPSK modulation



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

7.5 Peak output power at 8DPSK modulation

7.5.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak output power limits

Assigned frequency range, MHz	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)*	Maximum antenna gain, dBi
	W	dBm		
902.0 – 928.0	0.25 (<50 hopping channels) 1.0 (≥50 hopping channels)	24.0(<50 hopping channels) 30.0 (≥50 hopping channels)	125.2 (<50 hopping channels) 131.2 (≥50 hopping channels)	6.0*
2400.0 – 2483.5	0.125 (<75 hopping channels) 1.0 (≥75 hopping channels)	21.0(<75 hopping channels) 30.0 (≥75 hopping channels)	122.2 (<75 hopping channels) 131.2 (≥75 hopping channels)	
5725.0 – 5850.0	1.0	30.0	131.2	

*- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×G)/r, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.
**- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

- by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
- without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
- by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

7.5.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.5.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.5.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.5.2 and associated plots.

7.5.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

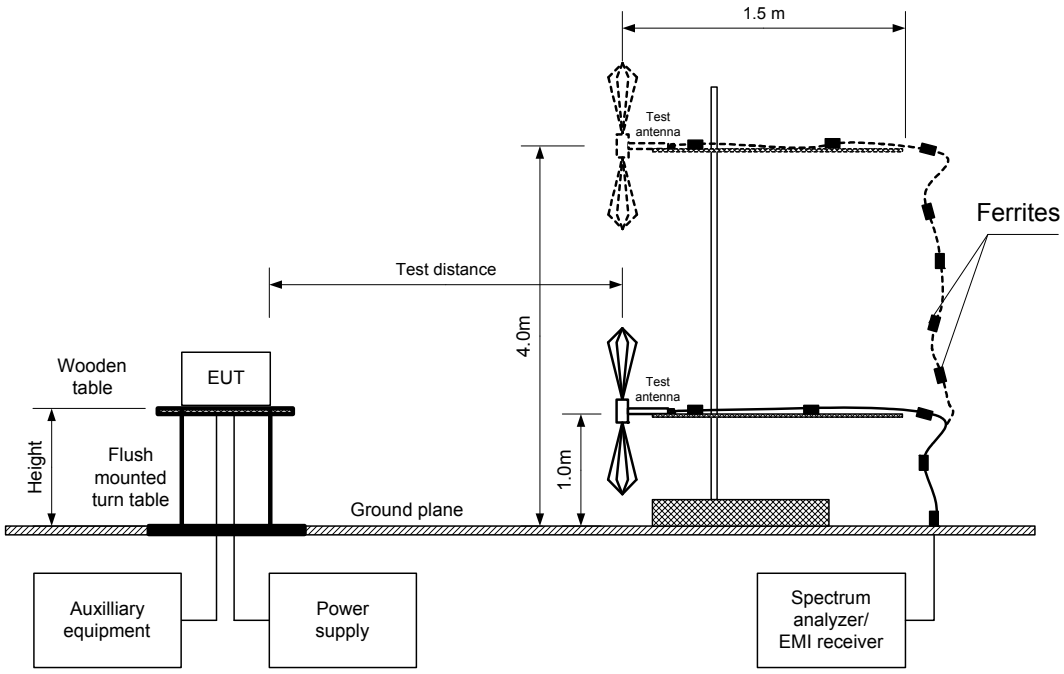
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB

7.5.2.6 The worst test results (the lowest margins) were recorded in Table 7.5.2.

Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

Figure 7.5.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1005 hPa	**Power:** 120 VAC
Remarks: 8DPSK modulation			

Table 7.5.2 Peak output power test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 1.5 m
DETECTOR USED: Peak
TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: 8DPSK
MODULATING SIGNAL: PRBS
BIT RATE: 3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Peak
EUT 20 dB BANDWIDTH: 1.371 MHz
RESOLUTION BANDWIDTH: 3 MHz
VIDEO BANDWIDTH: 3 MHz
FREQUENCY HOPPING: Disabled
NUMBER OF FREQUENCY HOPPING CHANNELS:

Frequency, MHz	Field strength, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2402	110.15	Horizontal	1.7	10	1.72	13.23	30	-16.77	Pass
2441	107.68	Horizontal	1.7	10	1.72	10.76	30	-19.24	Pass
2480	106.76	Horizontal	1.8	20	1.72	9.84	30	-20.16	Pass

*****- EUT front panel refer to 0 degrees position of turntable.
******- Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$,
where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Peak output power – specification limit.

Reference numbers of test equipment used

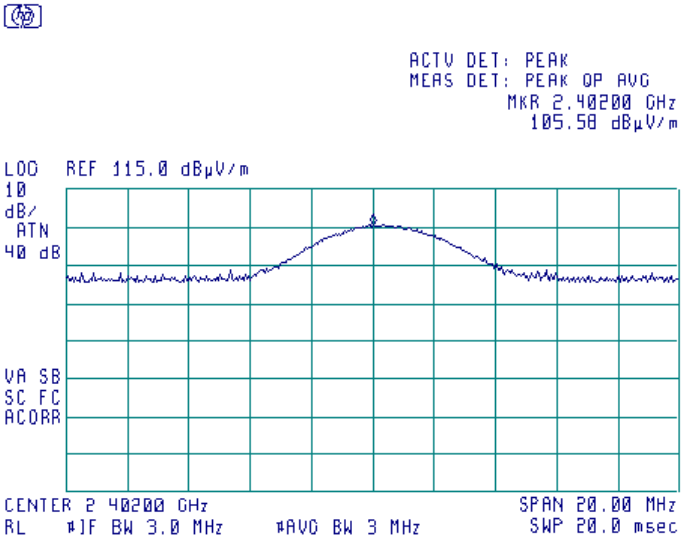
HL 0521	HL 1984	HL 4353	HL 5101				

Full description is given in Appendix A.

Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

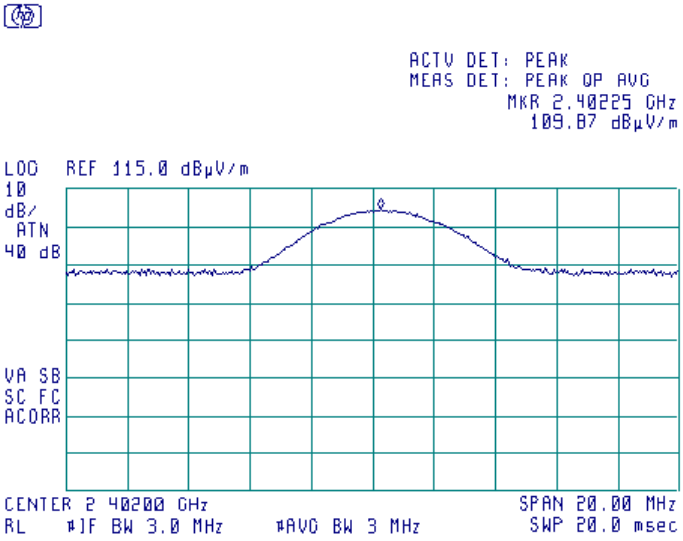
Plot 7.5.1 Field strength of carrier at low frequency, vertical antenna polarization

EUT POSITION: X-axis



Plot 7.5.2 Field strength of carrier at low frequency, vertical antenna polarization

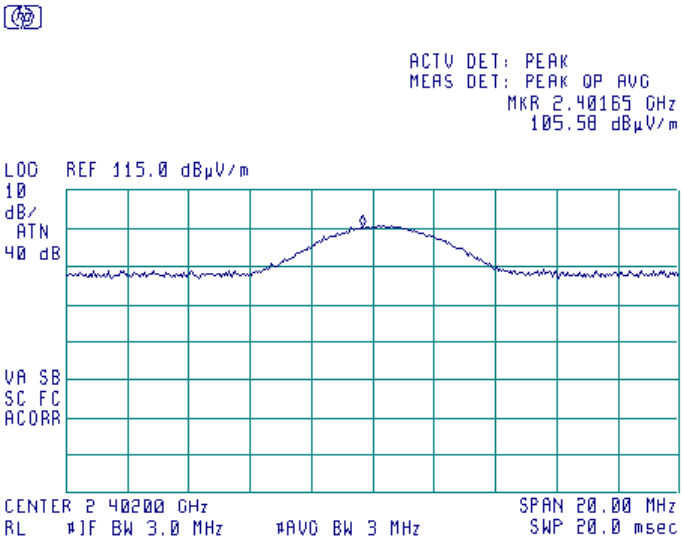
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

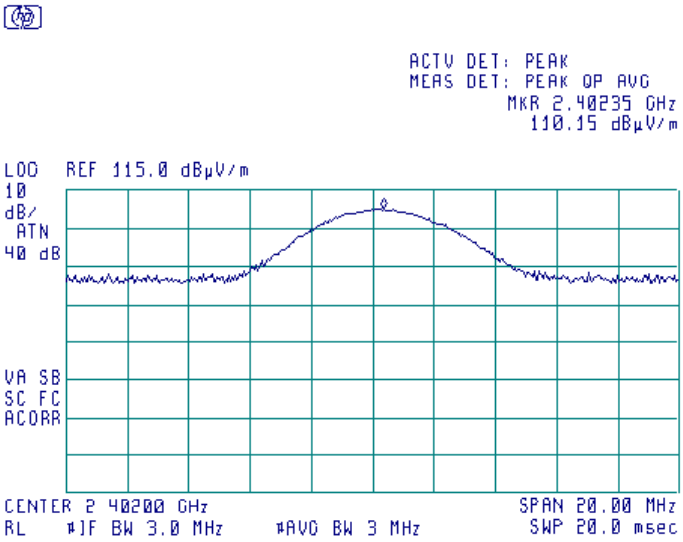
Plot 7.5.3 Field strength of carrier at low frequency, vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.5.4 Field strength of carrier at low frequency horizontal antenna polarization

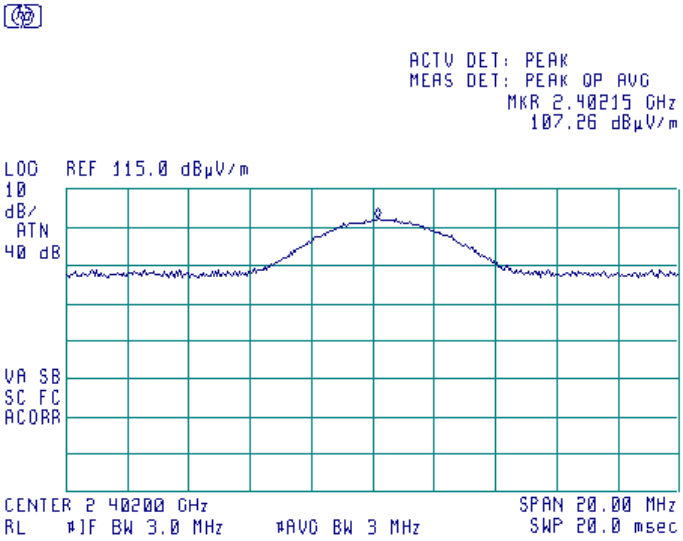
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

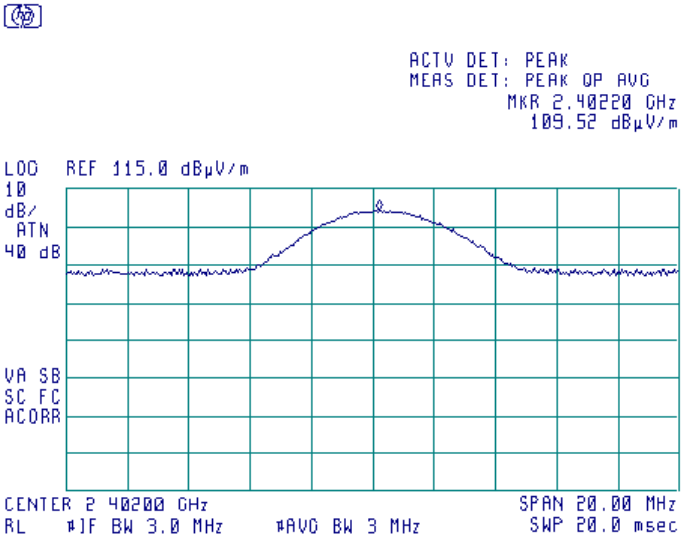
Plot 7.5.5 Field strength of carrier at low frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.5.6 Field strength of carrier at low frequency horizontal antenna polarization

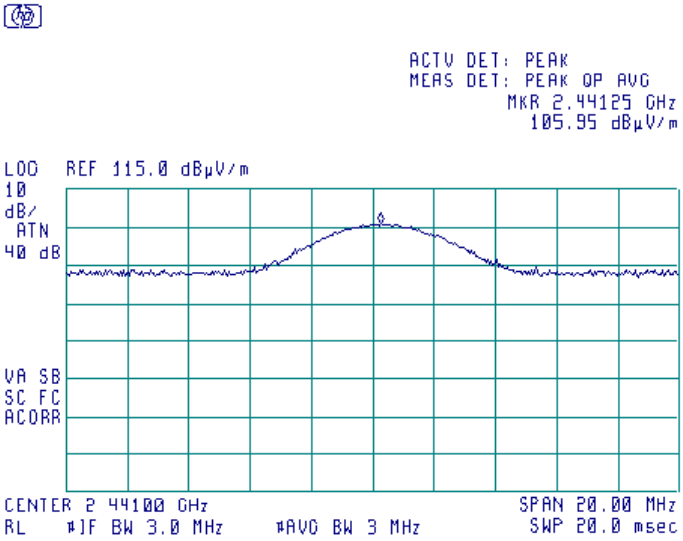
EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

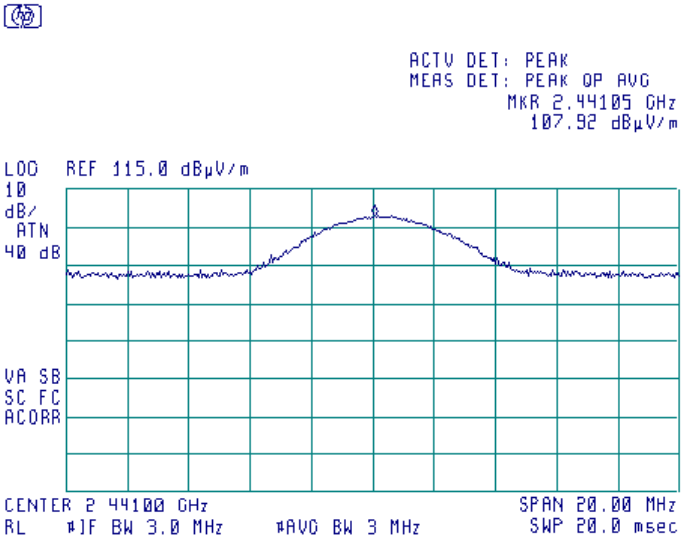
Plot 7.5.7 Field strength of carrier at mid frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.5.8 Field strength of carrier at mid frequency vertical antenna polarization

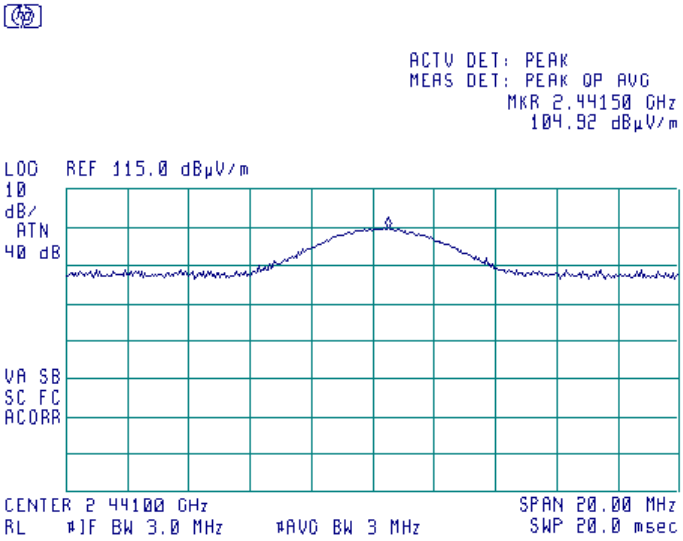
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

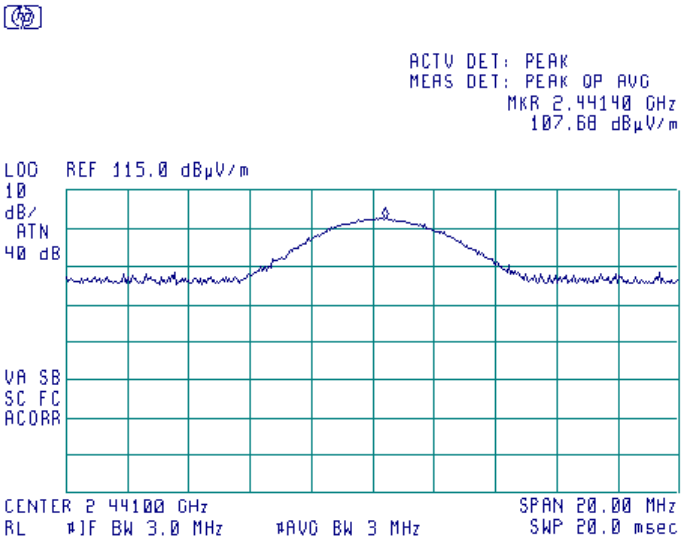
Plot 7.5.9 Field strength of carrier at mid frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.5.10 Field strength of carrier at mid frequency horizontal antenna polarization

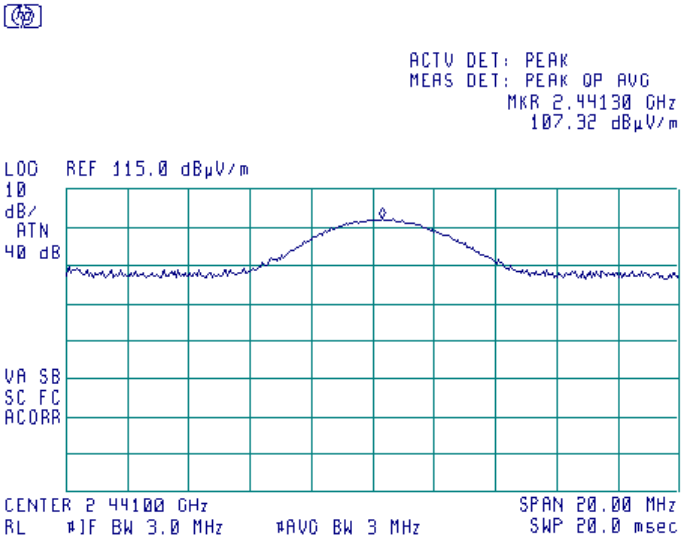
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

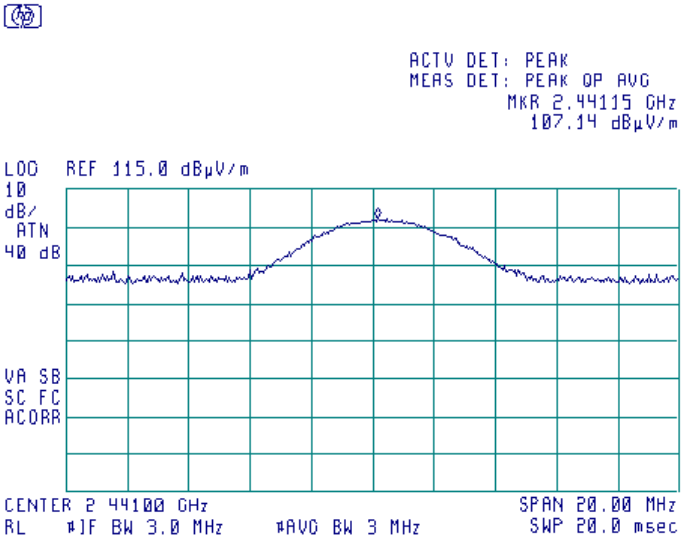
Plot 7.5.11 Field strength of carrier at mid frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.5.12 Field strength of carrier at mid frequency horizontal antenna polarization

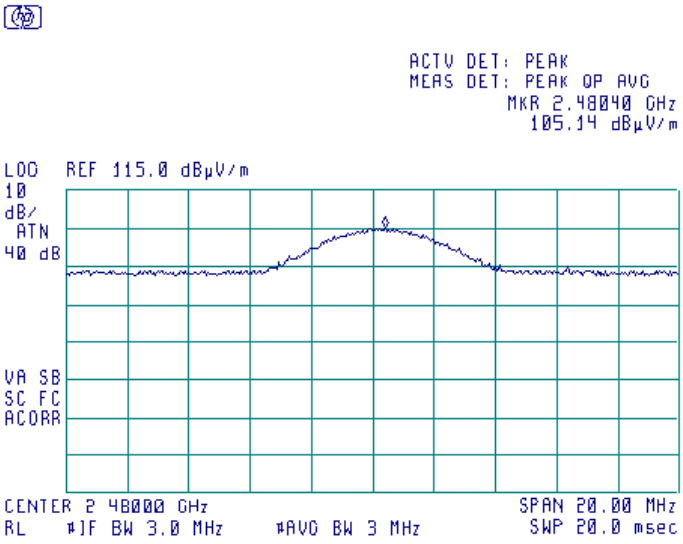
EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

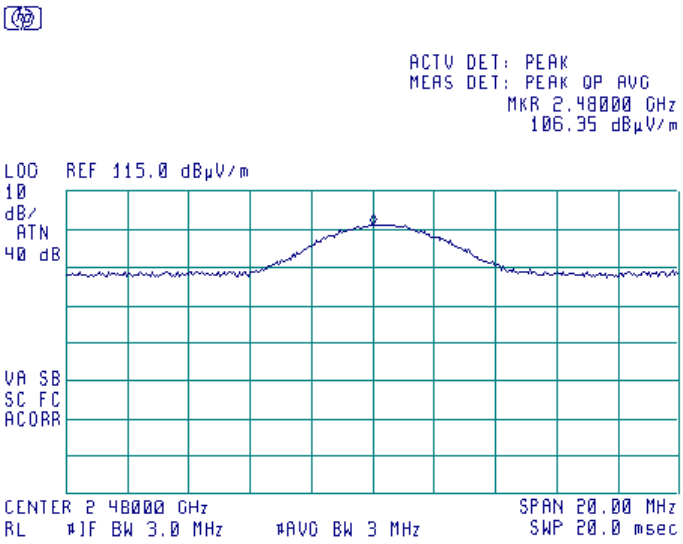
Plot 7.5.13 Field strength of carrier at high frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.5.14 Field strength of carrier at high frequency vertical antenna polarization

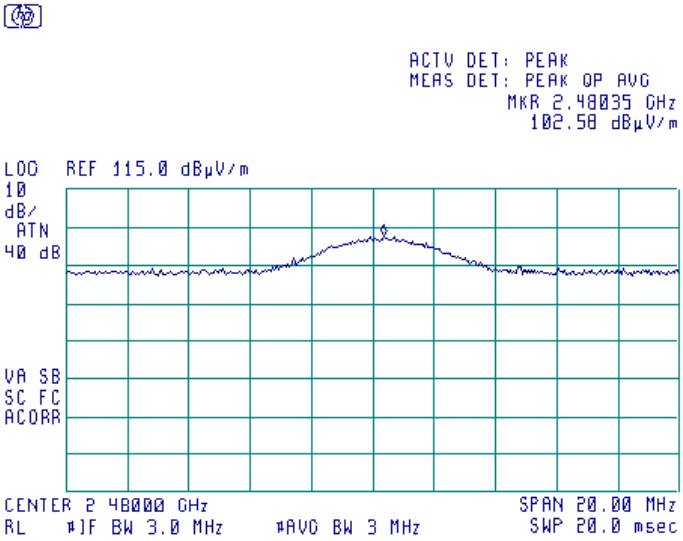
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

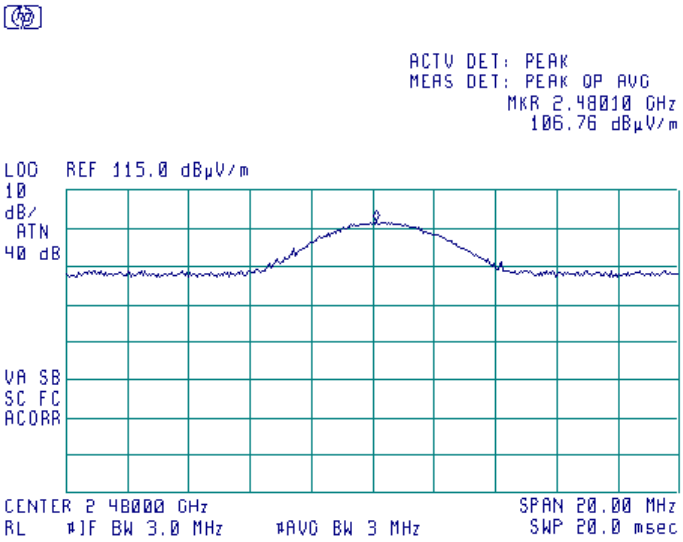
Plot 7.5.15 Field strength of carrier at high frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.5.16 Field strength of carrier at high frequency horizontal antenna polarization

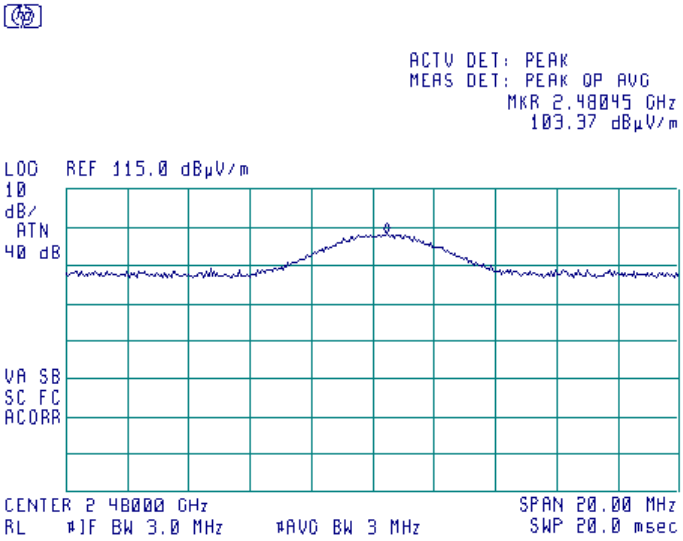
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: 8DPSK modulation			

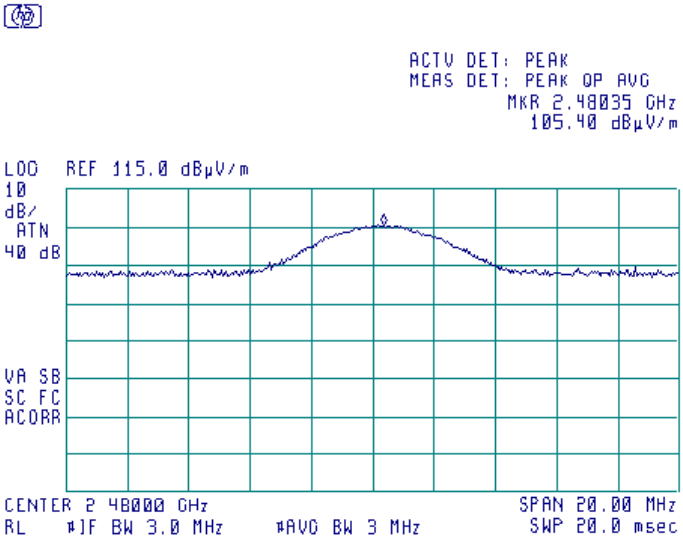
Plot 7.5.17 Field strength of carrier at high frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.5.18 Field strength of carrier at high frequency horizontal antenna polarization

EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

7.6 Peak output power at DQPSK modulation

7.6.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Peak output power limits

Assigned frequency range, MHz	Peak output power*		Equivalent field strength limit @ 3m, dB(µV/m)*	Maximum antenna gain, dBi
	W	dBm		
902.0 – 928.0	0.25 (<50 hopping channels) 1.0 (≥50 hopping channels)	24.0(<50 hopping channels) 30.0 (≥50 hopping channels)	125.2 (<50 hopping channels) 131.2 (≥50 hopping channels)	6.0*
2400.0 – 2483.5	0.125 (<75 hopping channels) 1.0 (≥75 hopping channels)	21.0(<75 hopping channels) 30.0 (≥75 hopping channels)	122.2 (<75 hopping channels) 131.2 (≥75 hopping channels)	
5725.0 – 5850.0	1.0	30.0	131.2	

*- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×G)/r, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.
**- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

- by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
- without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
- by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

7.6.2 Test procedure

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.

7.6.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.6.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.6.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.6.2 and associated plots.

7.6.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

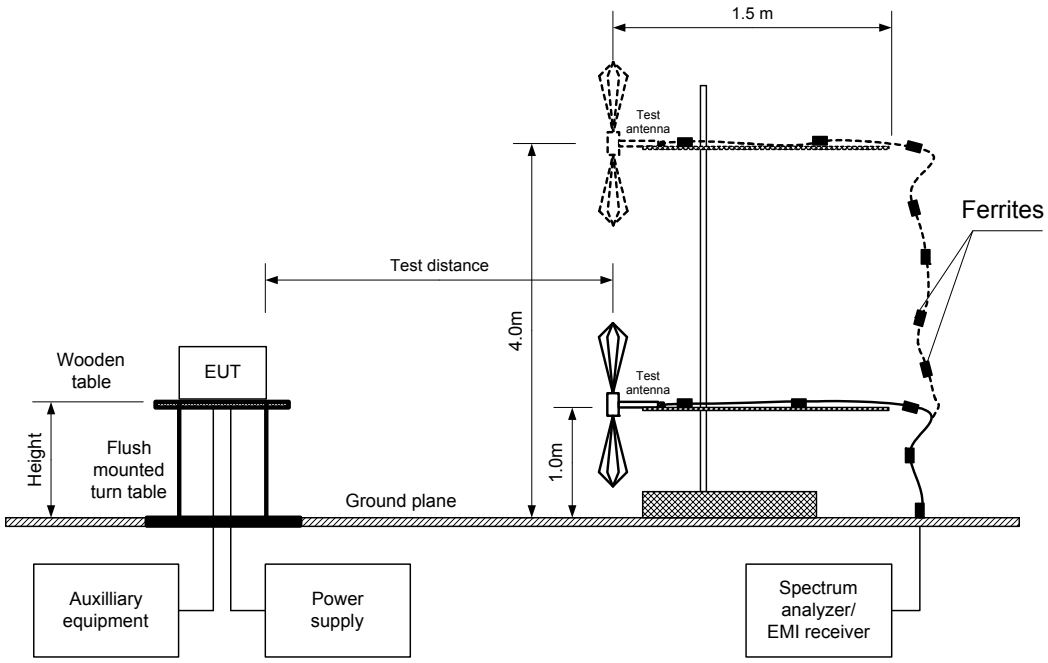
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB

7.6.2.6 The worst test results (the lowest margins) were recorded in Table 7.6.2.

Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1005 hPa	**Power:** 120 VAC
Remarks: DQPSK modulation			

Figure 7.6.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1005 hPa	**Power:** 120 VAC
Remarks: DQPSK modulation			

Table 7.6.2 Peak output power test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 1.5 m
DETECTOR USED: Peak
TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: DQPSK-
MODULATING SIGNAL: PRBS
BIT RATE: 3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Peak
EUT 20 dB BANDWIDTH: 1.379 MHz
RESOLUTION BANDWIDTH: 3 MHz
VIDEO BANDWIDTH: 3 MHz
FREQUENCY HOPPING: Disabled
NUMBER OF FREQUENCY HOPPING CHANNELS:

Frequency, MHz	Field strength, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2402	110.63	Horizontal	1.7	10	1.72	13.71	30	-16.29	Pass
2441	106.50	Horizontal	1.7	10	1.72	9.58	30	-20.42	Pass
2480	105.27	Horizontal	1.8	20	1.72	8.35	30	-21.65	Pass

*****- EUT front panel refer to 0 degrees position of turntable.
******- Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$,
where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Peak output power – specification limit.

Reference numbers of test equipment used

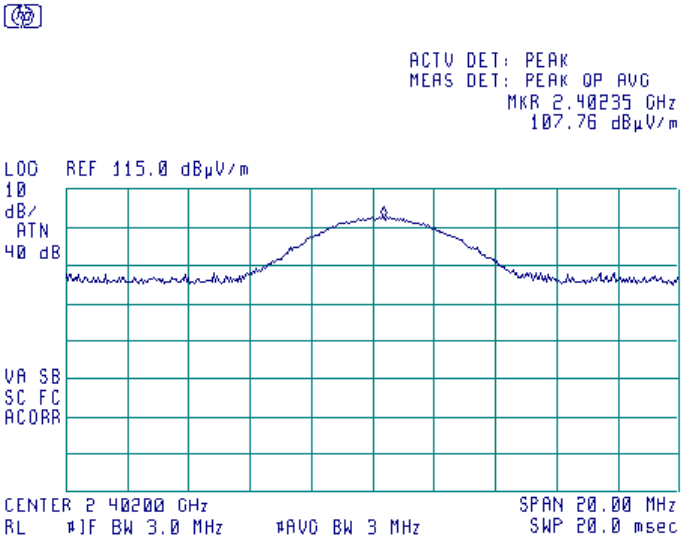
HL 0521	HL 1984	HL 4353	HL 5101				

Full description is given in Appendix A.

Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

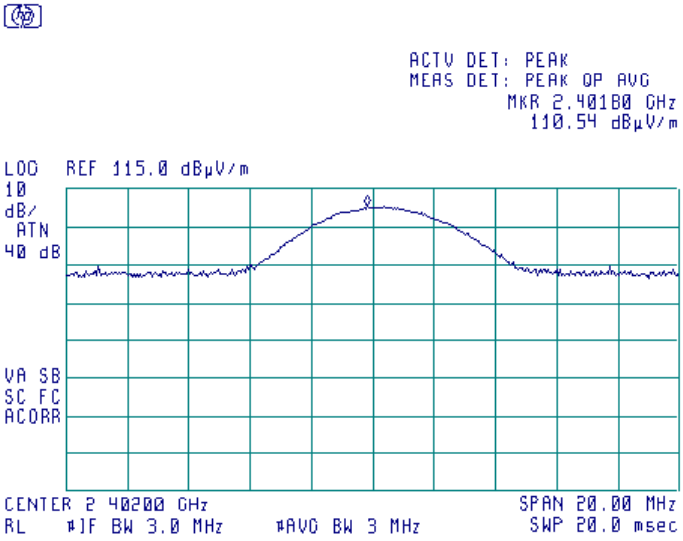
Plot 7.6.1 Field strength of carrier at low frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.6.2 Field strength of carrier at low frequency vertical antenna polarization

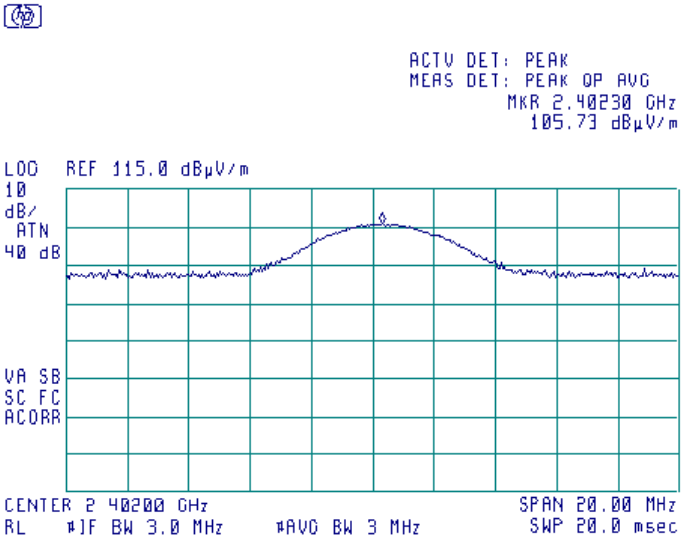
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

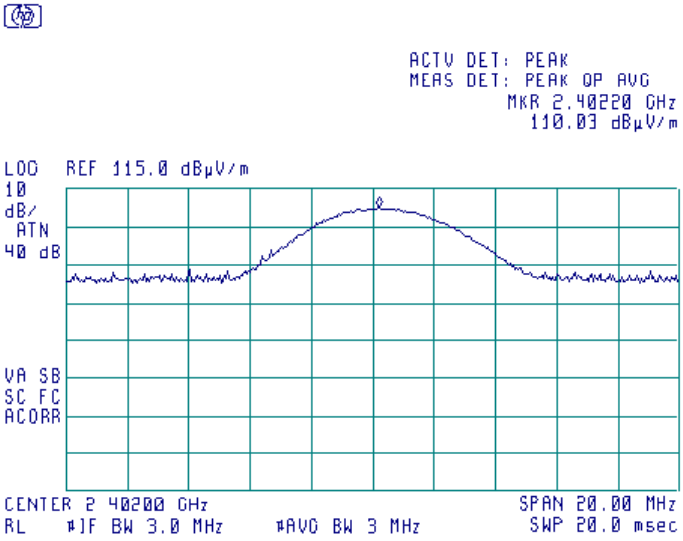
Plot 7.6.3 Field strength of carrier at low frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.6.4 Field strength of carrier at low frequency horizontal antenna polarization

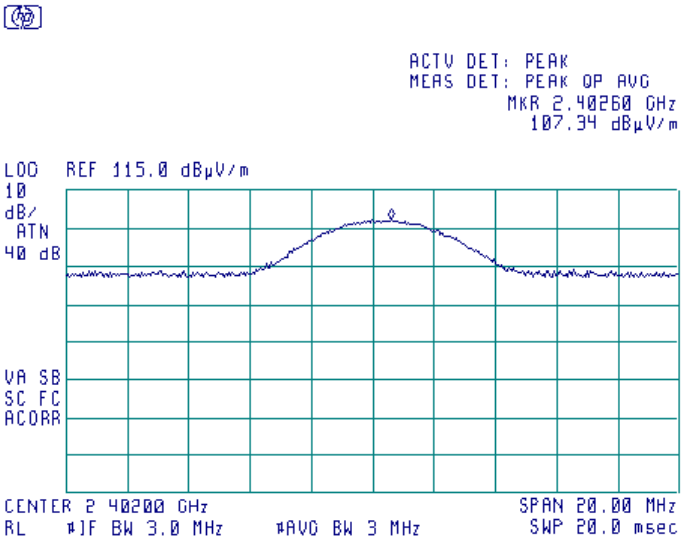
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

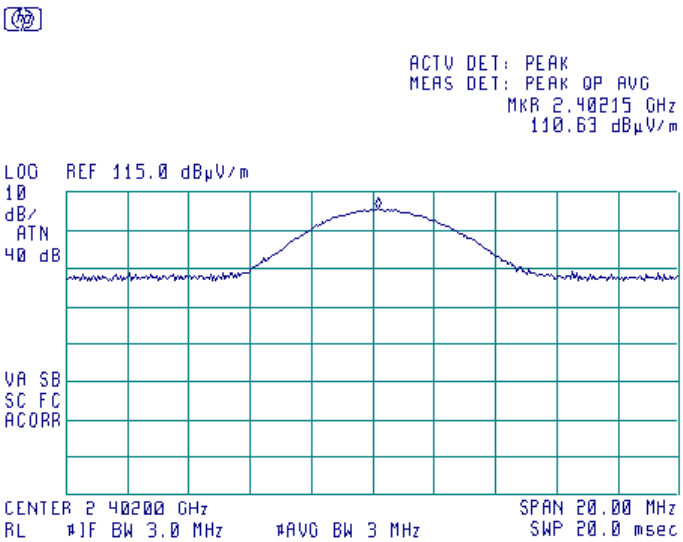
Plot 7.6.5 Field strength of carrier at low frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.6.6 Field strength of carrier at low frequency horizontal antenna polarization

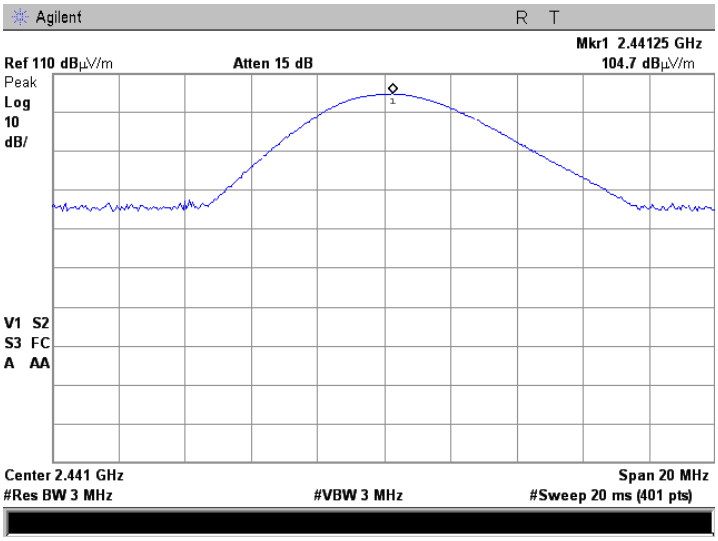
EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

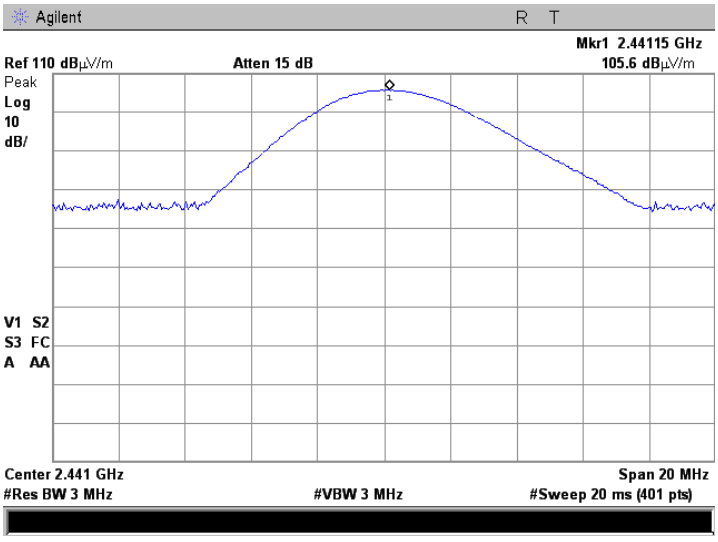
Plot 7.6.7 Field strength of carrier at mid frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.6.8 Field strength of carrier at mid frequency vertical antenna polarization

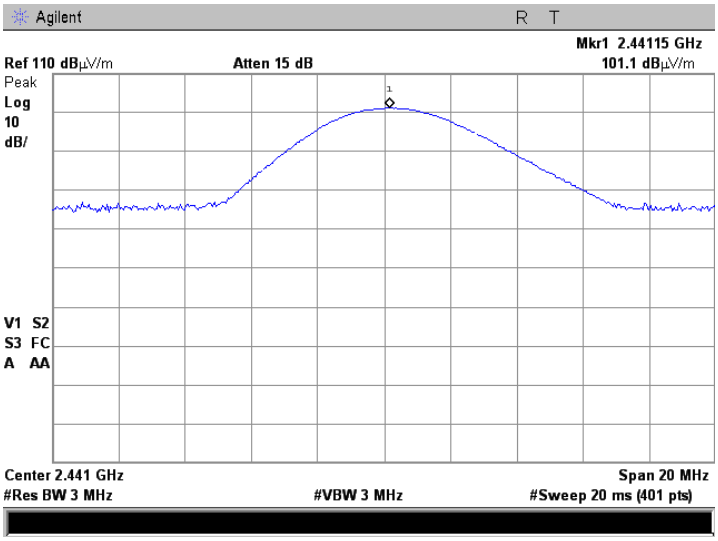
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

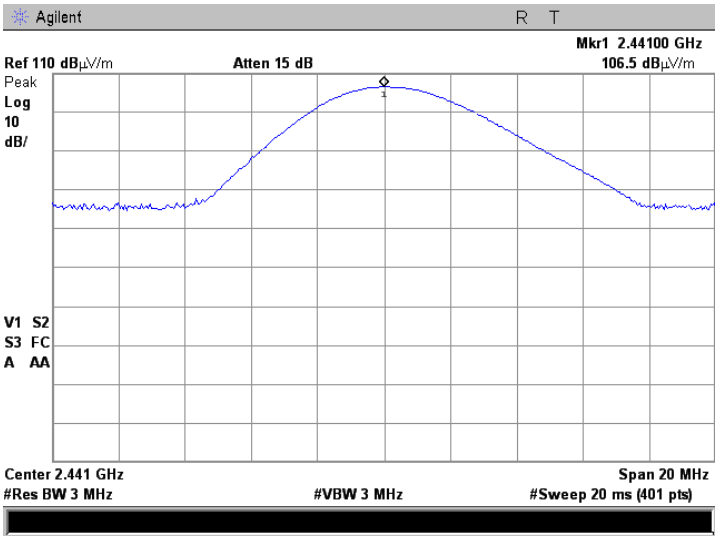
Plot 7.6.9 Field strength of carrier at mid frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.6.10 Field strength of carrier at mid frequency horizontal antenna polarization

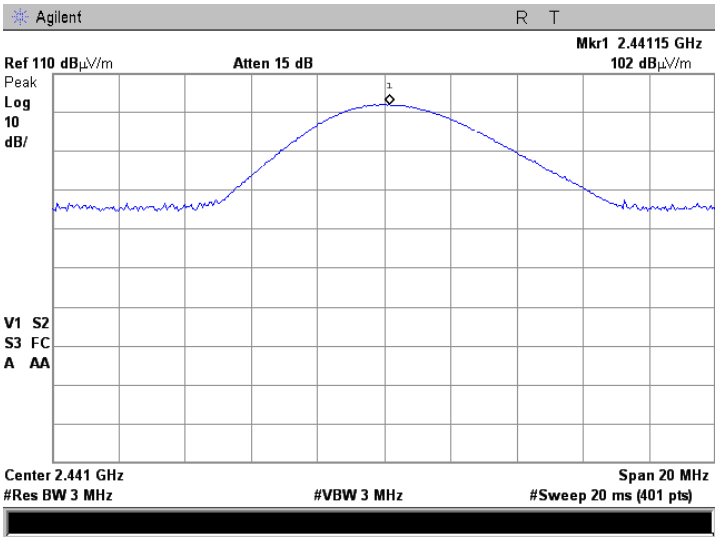
EUT POSITION: X-axis



Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1005 hPa	**Power:** 120 VAC
Remarks: DQPSK modulation			

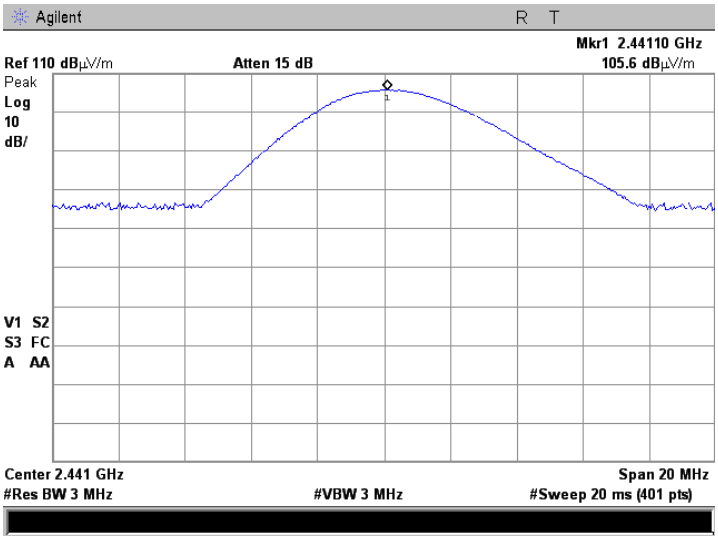
Plot 7.6.11 Field strength of carrier at mid frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.6.12 Field strength of carrier at mid frequency horizontal antenna polarization

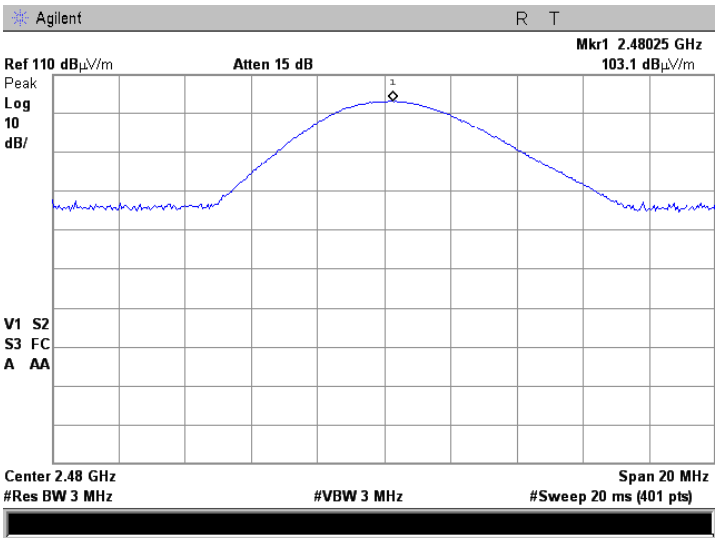
EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

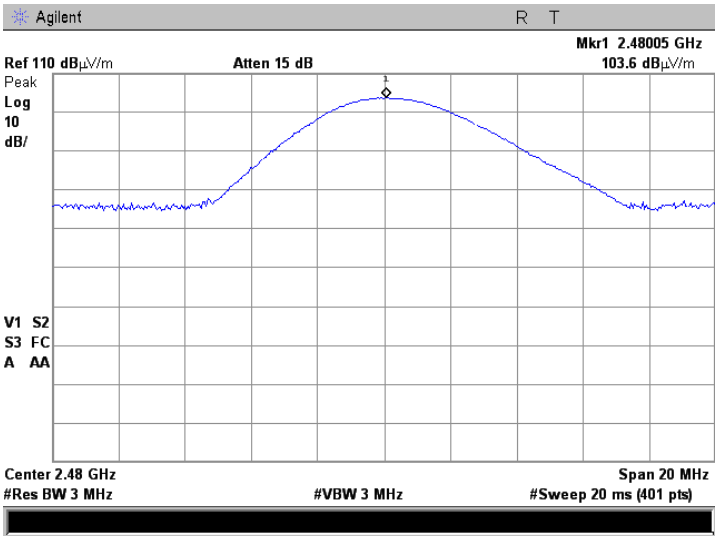
Plot 7.6.13 Field strength of carrier at high frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.6.14 Field strength of carrier at high frequency vertical antenna polarization

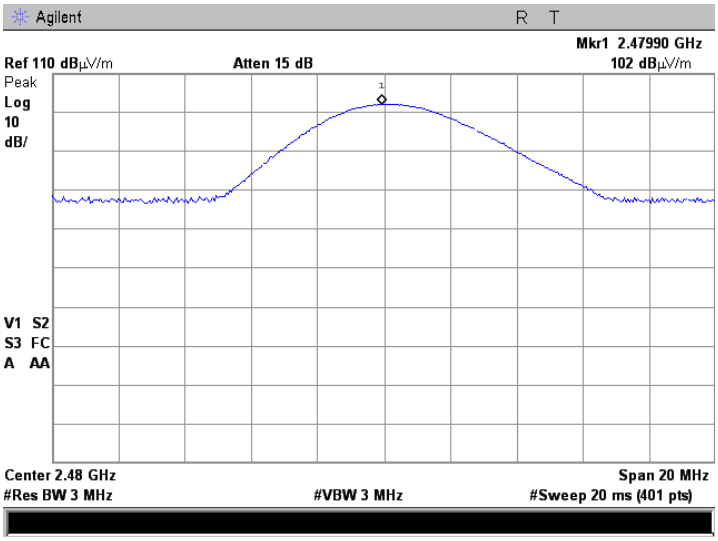
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

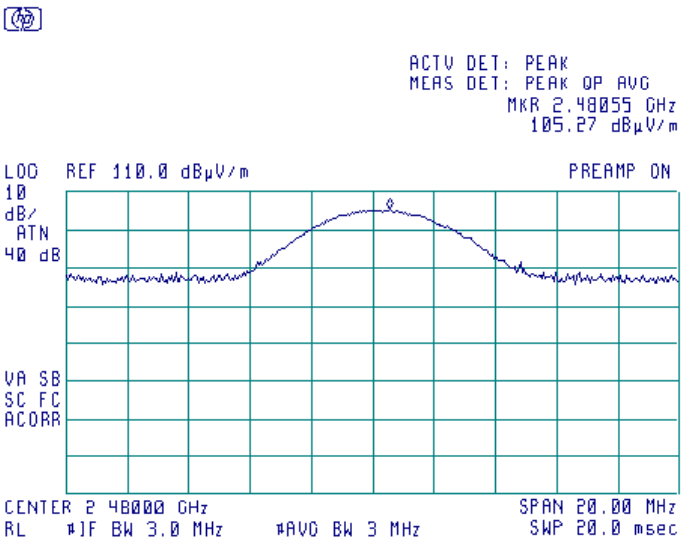
Plot 7.6.15 Field strength of carrier at high frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.6.16 Field strength of carrier at high frequency horizontal antenna polarization

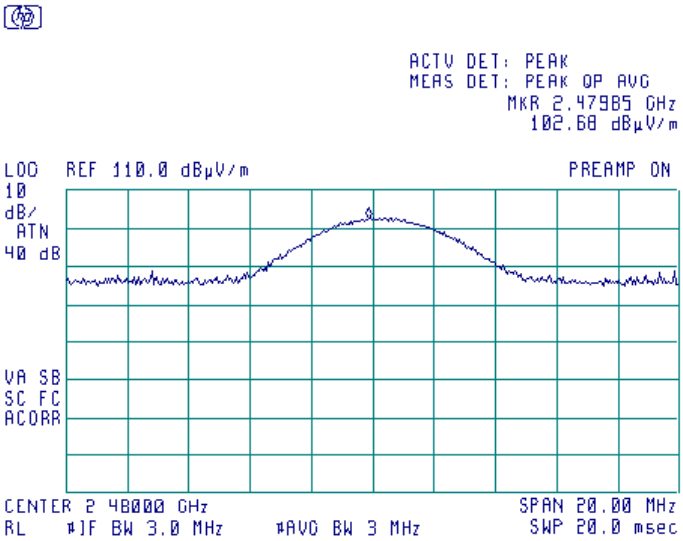
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16 - 05-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: DQPSK modulation			

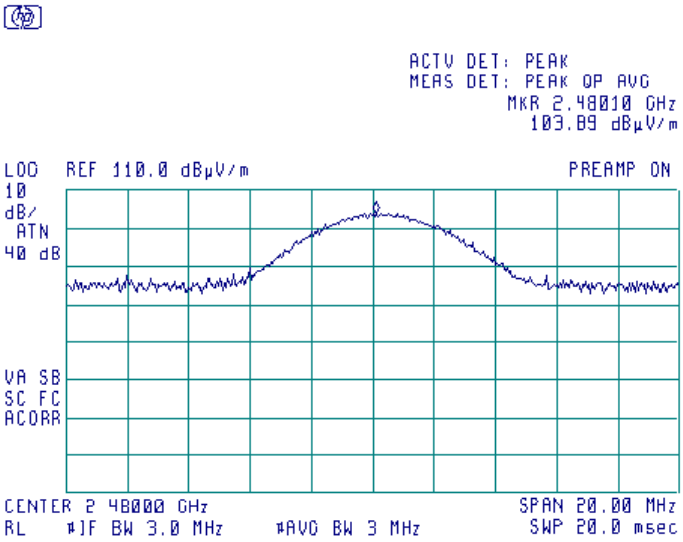
Plot 7.6.17 Field strength of carrier at high frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.6.18 Field strength of carrier at high frequency horizontal antenna polarization

EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

7.7 Peak output power at GFSK modulation

7.7.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Peak output power limits

Assigned frequency range, MHz	Peak output power*		Equivalent field strength limit @ 3m, dB(µV/m)*	Maximum antenna gain, dBi
	W	dBm		
902.0 – 928.0	0.25 (<50 hopping channels) 1.0 (≥50 hopping channels)	24.0(<50 hopping channels) 30.0 (≥50 hopping channels)	125.2 (<50 hopping channels) 131.2 (≥50 hopping channels)	6.0*
2400.0 – 2483.5	0.125 (<75 hopping channels) 1.0 (≥75 hopping channels)	21.0(<75 hopping channels) 30.0 (≥75 hopping channels)	122.2 (<75 hopping channels) 131.2 (≥75 hopping channels)	
5725.0 – 5850.0	1.0	30.0	131.2	

*- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×G)/r, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.
**- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

- by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
- without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
- by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

7.7.2 Test procedure

7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.

7.7.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.7.2.3 The frequency span of spectrum analyzer was set approximately 5 times wider than 20 dB bandwidth of the EUT and the resolution bandwidth was set wider than 20 dB bandwidth of the EUT. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.7.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.7.2 and associated plots.

7.7.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

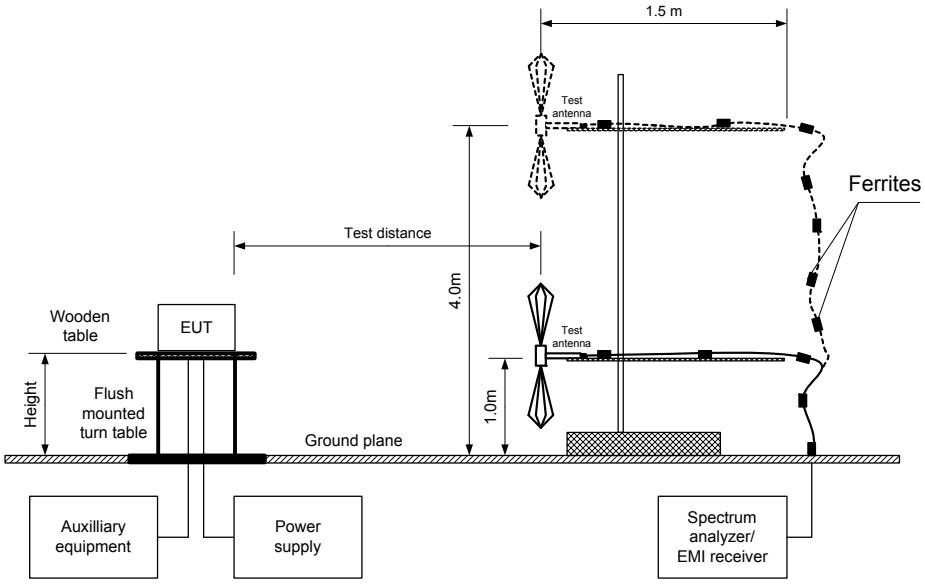
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB

7.7.2.6 The worst test results (the lowest margins) were recorded in Table 7.7.2.

Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1005 hPa	**Power:** 120 VAC
Remarks: GFSK modulation			

Figure 7.7.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b), Peak output power**		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1005 hPa	**Power:** 120 VAC
Remarks: GFSK modulation			

Table 7.7.2 Peak output power test results

ASSIGNED FREQUENCY: 2400-2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 1.5 m
DETECTOR USED: Peak
TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: GFSK
MODULATING SIGNAL: PRBS
BIT RATE: 0.925 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Peak
EUT 20 dB BANDWIDTH: 0.952 MHz
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: 3 MHz
FREQUENCY HOPPING: Disabled
NUMBER OF FREQUENCY HOPPING CHANNELS:

Frequency, MHz	Field strength, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2402	110.68	Horizontal	1.7	10	1.72	13.76	30	-16.24	Pass
2441	107.63	Horizontal	1.7	10	1.72	10.71	30	-19.29	Pass
2480	106.94	Horizontal	1.8	20	1.72	10.02	30	-19.98	Pass

*****- EUT front panel refer to 0 degrees position of turntable.
******- Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$,
where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Peak output power – specification limit.

Reference numbers of test equipment used

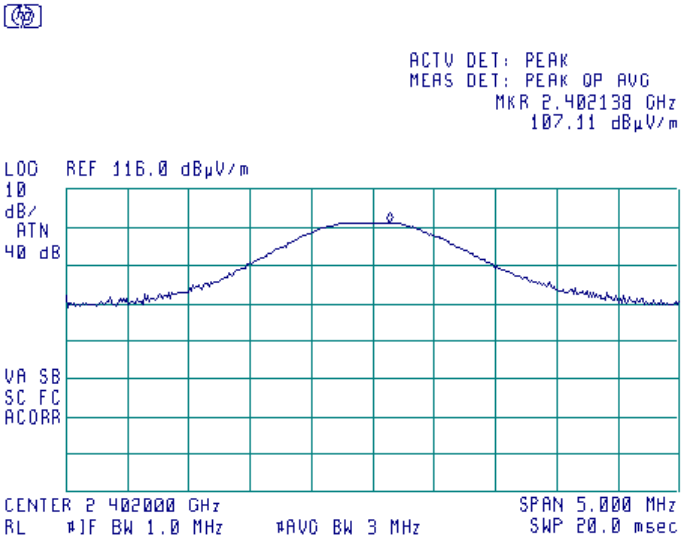
HL 0521	HL 1984	HL 4353	HL 5101				

Full description is given in Appendix A.

Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

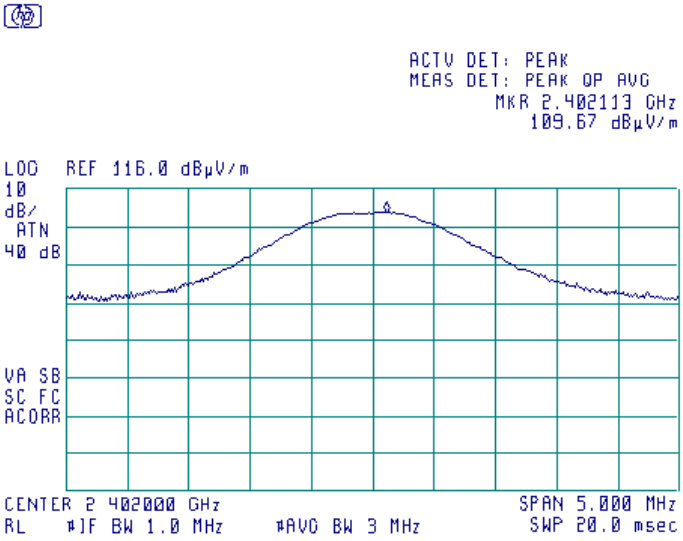
Plot 7.7.1 Field strength of carrier at low frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.7.2 Field strength of carrier at low frequency vertical antenna polarization

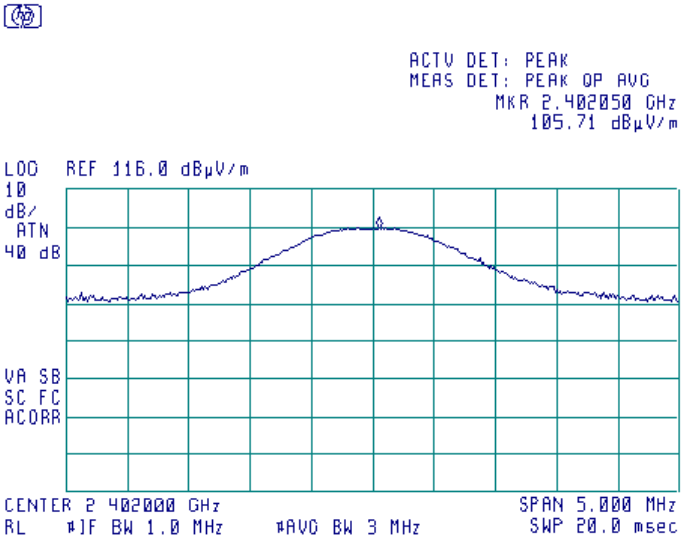
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

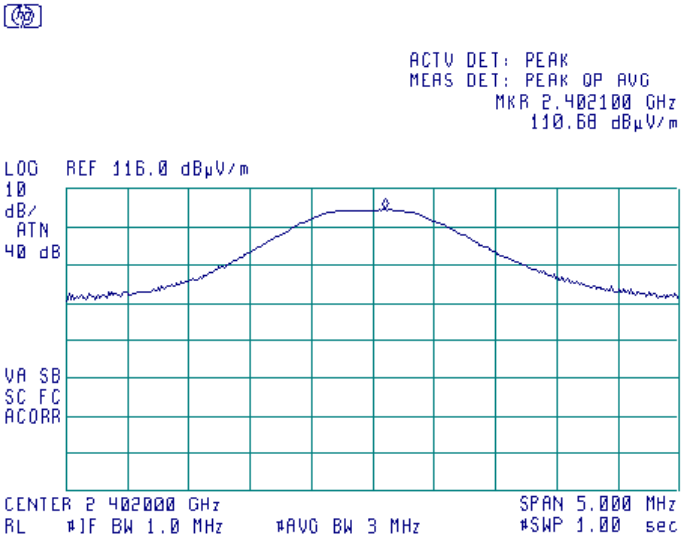
Plot 7.7.3 Field strength of carrier at low frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.7.4 Field strength of carrier at low frequency horizontal antenna polarization

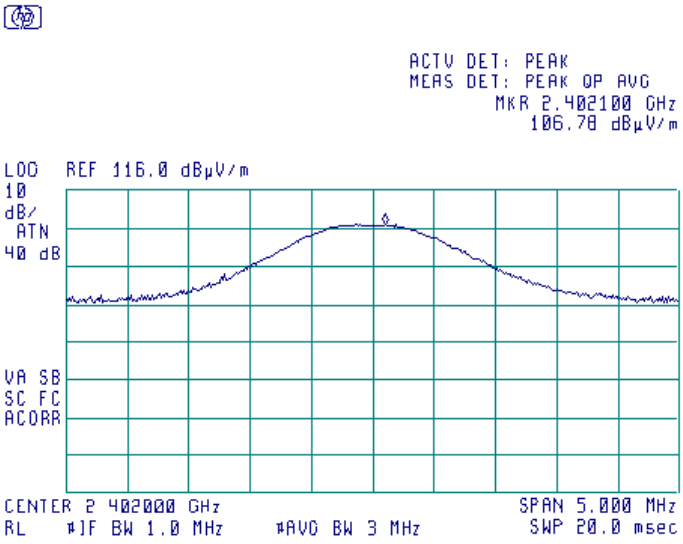
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

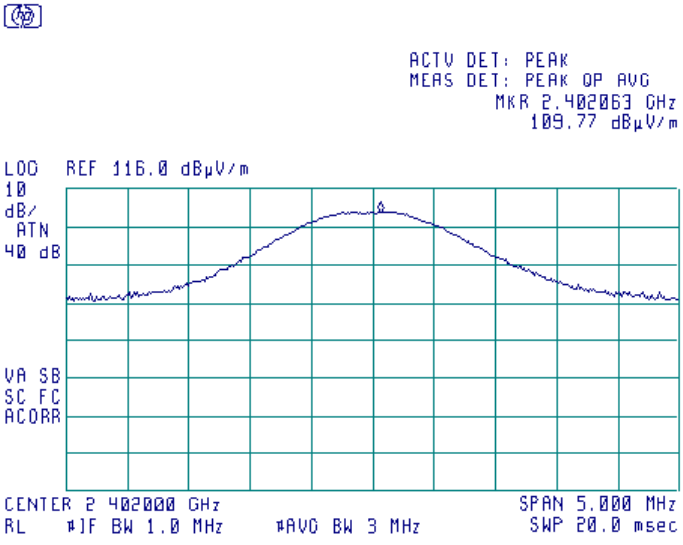
Plot 7.7.5 Field strength of carrier at low frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.7.6 Field strength of carrier at low frequency horizontal antenna polarization

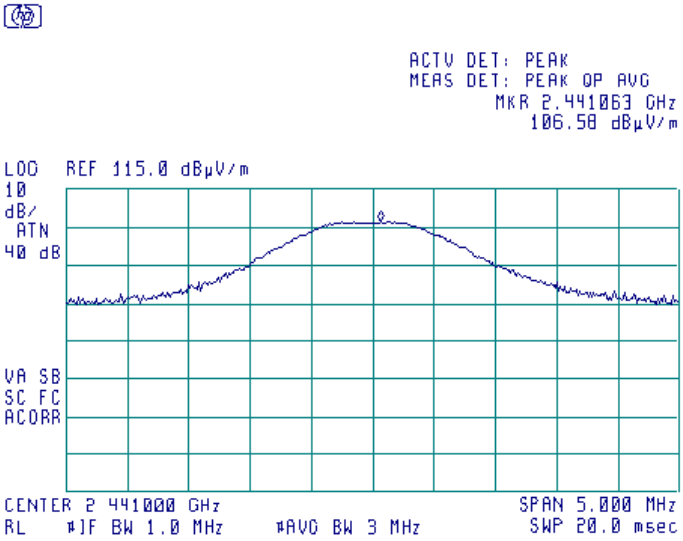
EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

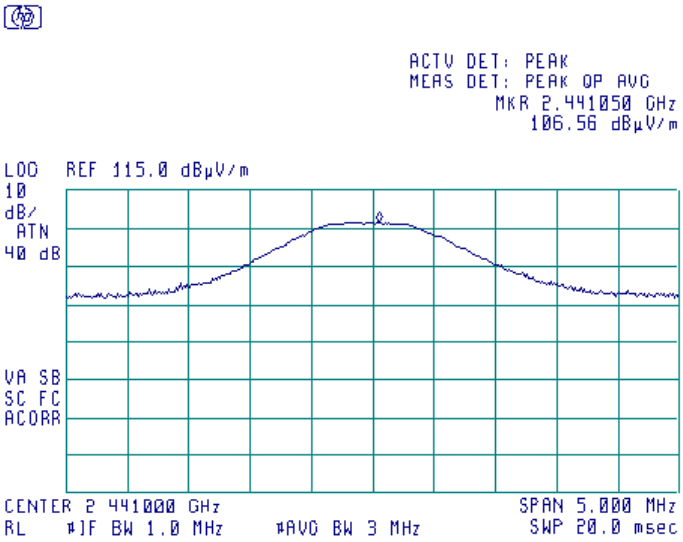
Plot 7.7.7 Field strength of carrier at mid frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.7.8 Field strength of carrier at mid frequency vertical antenna polarization

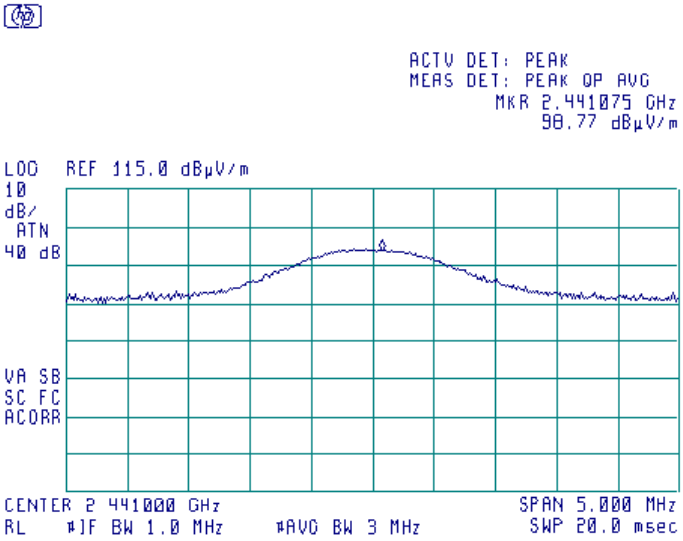
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

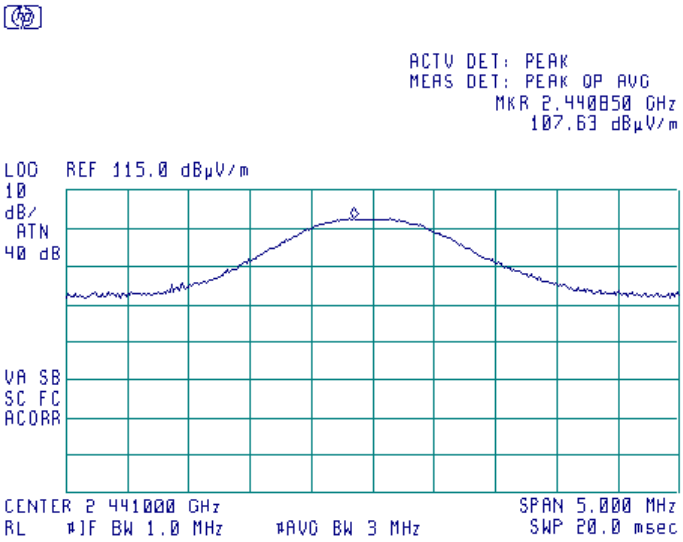
Plot 7.7.9 Field strength of carrier at mid frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.7.10 Field strength of carrier at mid frequency horizontal antenna polarization

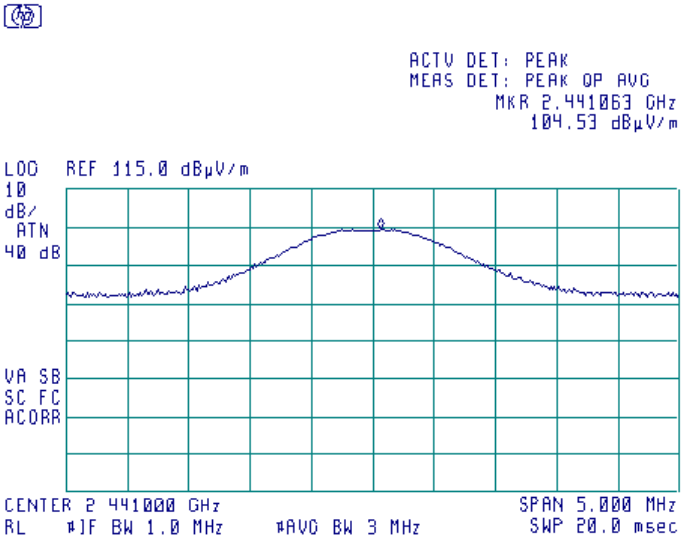
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

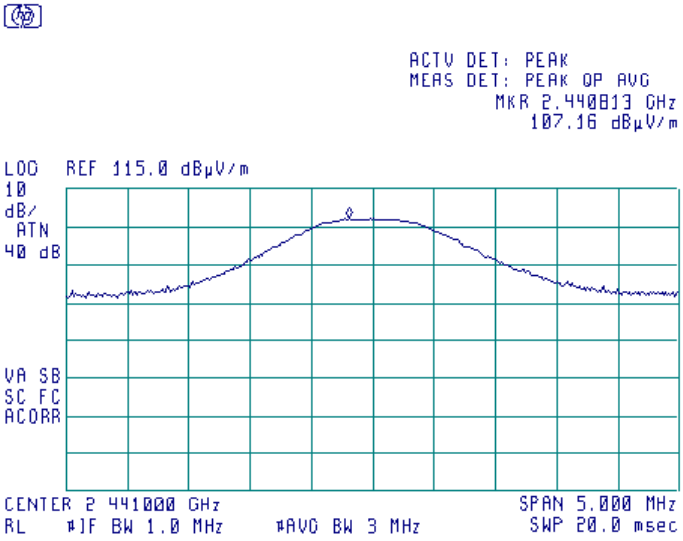
Plot 7.7.11 Field strength of carrier at mid frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.7.12 Field strength of carrier at mid frequency horizontal antenna polarization

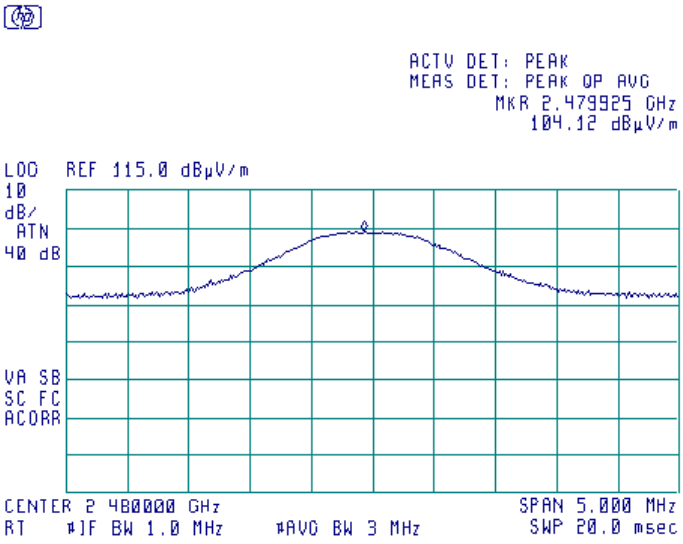
EUT POSITION: Z-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

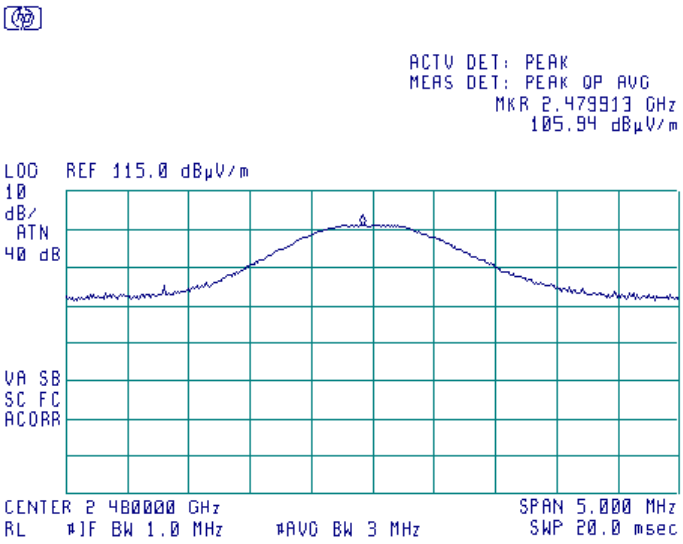
Plot 7.7.13 Field strength of carrier at high frequency vertical antenna polarization

EUT POSITION: X-axis



Plot 7.7.14 Field strength of carrier at high frequency vertical antenna polarization

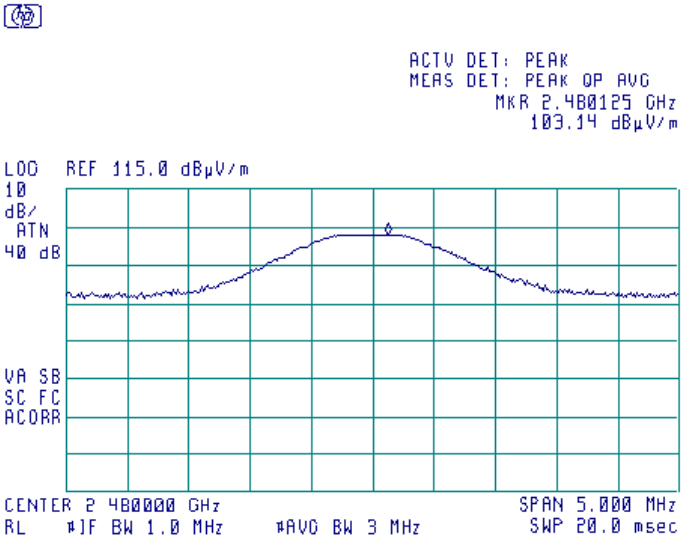
EUT POSITION: Y-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

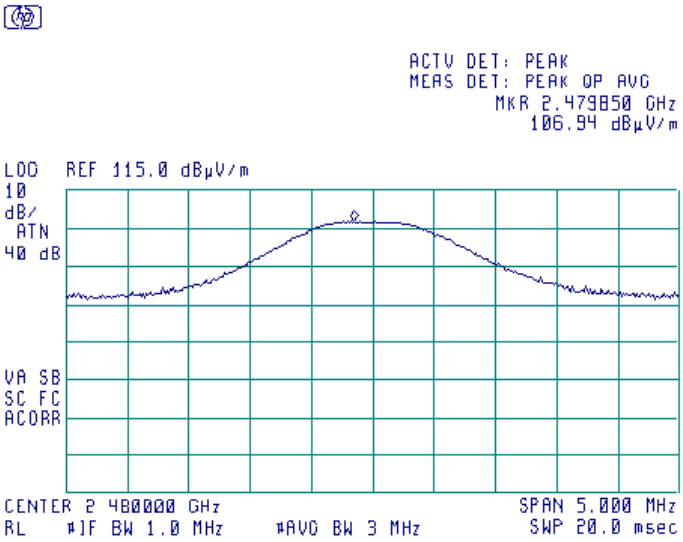
Plot 7.7.15 Field strength of carrier at high frequency vertical antenna polarization

EUT POSITION: Z-axis



Plot 7.7.16 Field strength of carrier at high frequency horizontal antenna polarization

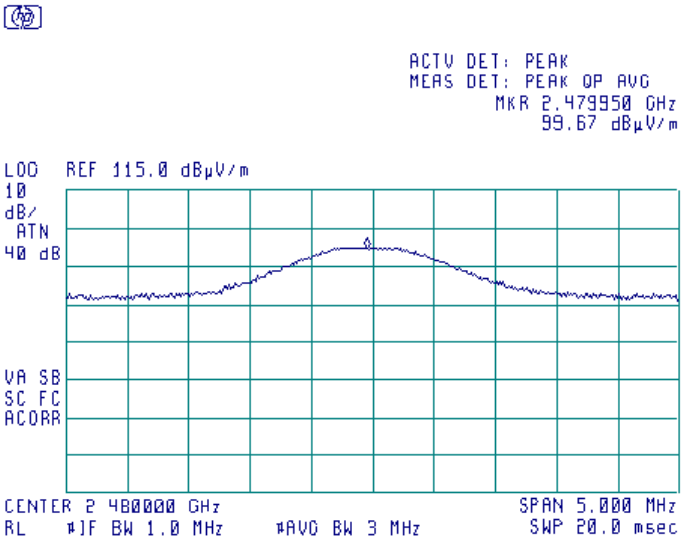
EUT POSITION: X-axis



Test specification:	Section 15.247(b), Peak output power		
Test procedure:	ANSI C63.10, section 7.8.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	29-Sep-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK modulation			

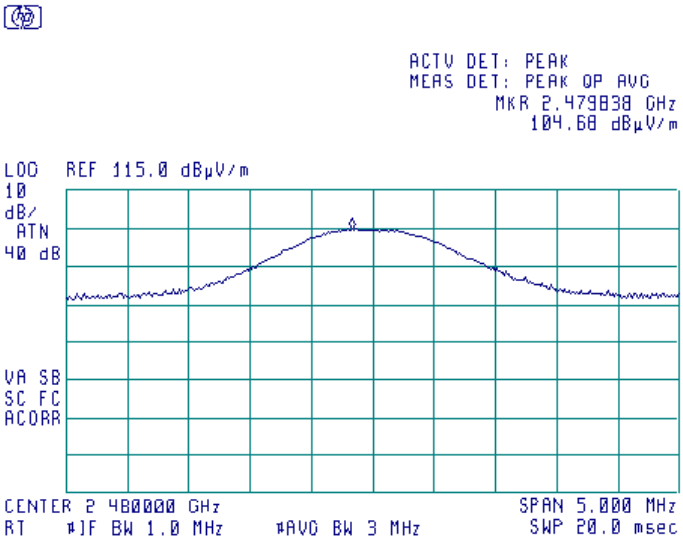
Plot 7.7.17 Field strength of carrier at high frequency horizontal antenna polarization

EUT POSITION: Y-axis



Plot 7.7.18 Field strength of carrier at high frequency horizontal antenna polarization

EUT POSITION: Z-axis



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

7.8 Field strength of spurious emissions

7.8.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.8.1.

Table 7.8.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)***			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	20.0
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
1000 – 10thharmonic	74.0	NA	54.0	

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

**- The limit decreases linearly with the logarithm of frequency.

*** - The field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

7.8.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.8.2.1 The EUT was set up as shown in Figure 7.8.1, energized and the performance check was conducted.

7.8.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

7.8.2.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

7.8.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.8.3.1 The EUT was set up as shown in Figure 7.8.2, Figure 7.8.3, energized and the performance check was conducted.

7.8.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.8.3.3 The worst test results (the lowest margins) were recorded and shown in the associated plots.

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

Figure 7.8.1 Setup for spurious emission field strength measurements below 30 MHz

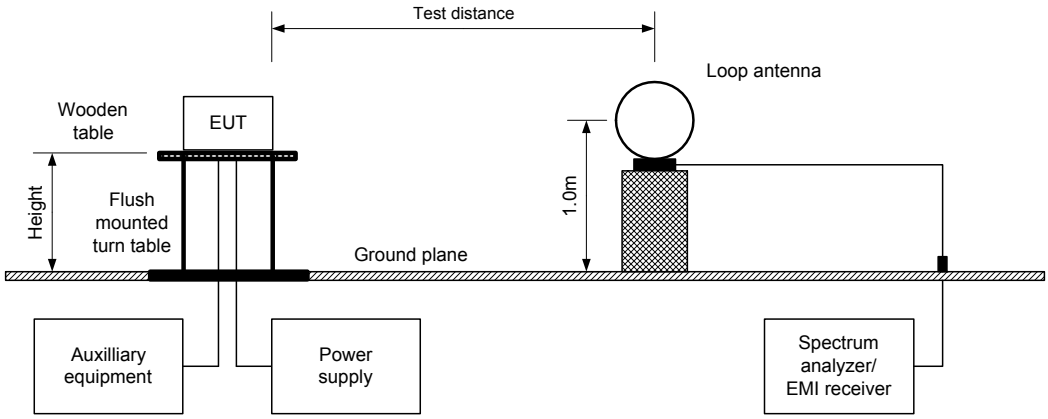
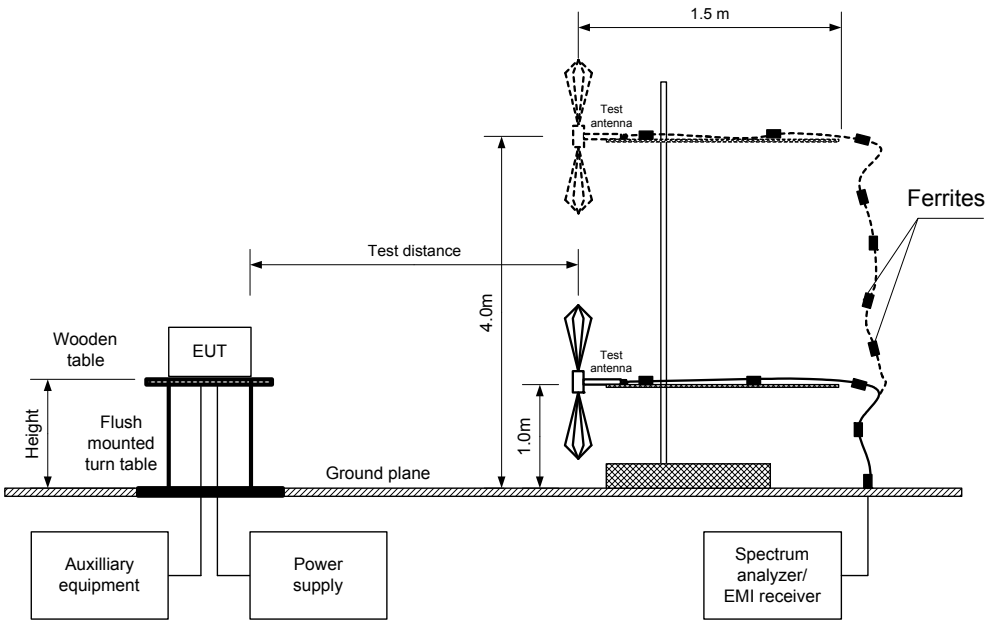
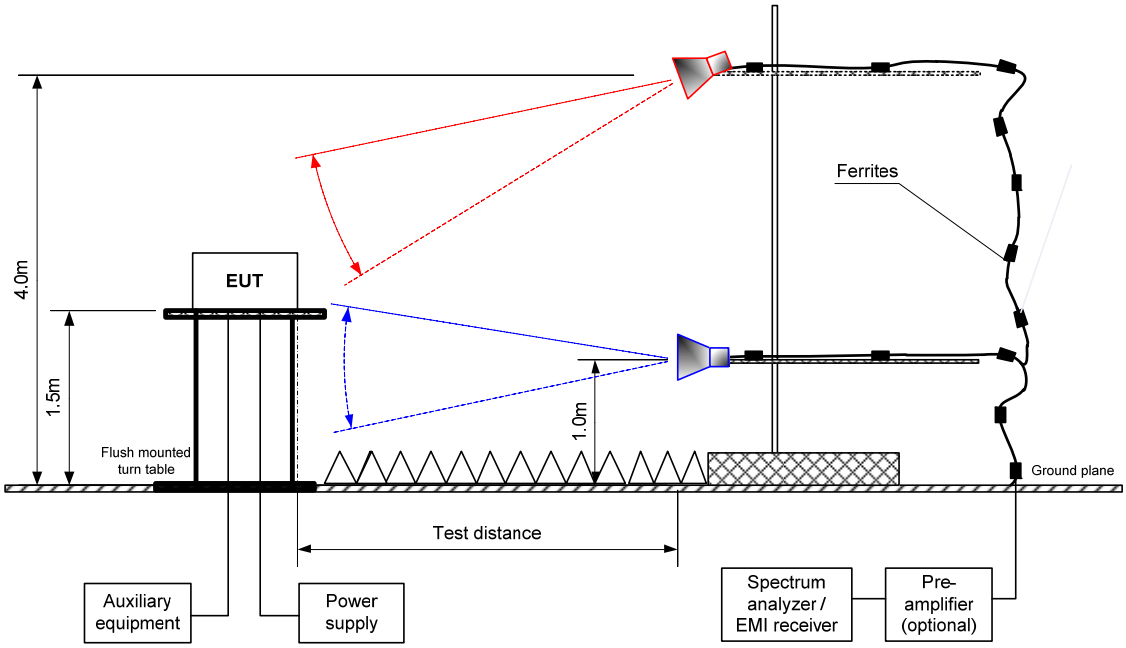


Figure 7.8.2 Setup for spurious emission field strength measurements in 30 – 1000 MHz



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

Figure 7.8.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

Table 7.8.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY BAND:	2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 - 25000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK (max output power)
MODULATING SIGNAL:	PRBS
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconical (30 MHz – 200 MHz) Log periodic (200 MHz – 1000 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)
FREQUENCY HOPPING:	Disabled

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
7205.43	63.88	Vertical	1.3	129	109.90	-46.02	20.0	-26.02	Pass
9607.28	57.36	Vertical	1.0	110		-52.54		-32.54	
14412.71	59.87	Vertical	1.2	90		-50.03		-30.03	
21616.33	44.53	Vertical	1.6	90		-65.37		-45.37	
24018.18	44.36	Vertical	1.6	80		-65.54		-45.54	
Mid carrier frequency									
9764.48	57.31	Vertical	1.2	80	105.51	-48.20	20.0	-28.20	Pass
14644.85	61.34	Vertical	1.1	120		-44.17		-24.17	
24408.18	46.70	Vertical	1.7	90		-58.81		-38.81	
High carrier frequency									
9919.26	58.97	Vertical	1.1	110	105.20	-46.23	20.0	-26.23	Pass
14880.74	58.64	Vertical	1.3	110		-46.56		-26.56	
24798.18	44.72	Vertical	1.6	90		-60.48		-40.48	

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Attenuation below carrier – specification limit.

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

Table 7.8.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY BAND:	2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	1000 -25000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1000 kHz
TEST ANTENNA TYPE:	Double ridged guide
FREQUENCY HOPPING:	Disabled

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
4804.31	H	1.3	60	60.23	74	-13.77	60.23	18.33	54	-35.67	Pass
12009.20	V	1.4	0	57.18	74	-16.82	57.18	15.28	54	-38.72	
19214.58	V	1.7	30	56.55	74	-17.45	56.55	14.65	54	-39.35	
Mid carrier frequency											
4882.23	H	1.4	90	61.03	74	-12.97	61.03	19.13	54	-34.87	Pass
7322.49	V	1.1	120	61.41	74	-12.59	61.41	19.51	54	-34.49	
12204.03	V	1.1	0	57.76	74	-16.24	57.76	15.86	54	-38.14	
19526.55	V	1.7	0	53.43	74	-20.57	53.43	11.53	54	-42.47	
High carrier frequency											
4960.30	H	1.1	90	64.73	74	-9.27	64.73	22.83	54	-31.17	Pass
7439.42	V	1.0	90	66.90	74	-7.10	66.90	25.00	54	-29.00	
12400.74	V	1.3	30	51.01	74	-22.99	51.01	9.11	54	-44.89	
19838.60	V	1.7	0	58.99	74	-15.01	58.99	17.09	54	-36.91	
22318.4	V	1.7	90	48.59	74	-25.41	48.59	6.69	54	-47.31	

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Measured field strength - specification limit.
***- Margin = Calculated field strength - specification limit,
where Calculated field strength = Measured field strength + average factor.

Table 7.8.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Number pulse during 100 msec	Duration, ms	Period, ms		
0.4	2	NA	NA	NA	-41.9

*- Average factor was calculated as follows

for pulse train shorter than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train\right)$$

for pulse train longer than 100 ms: $$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\,ms} \times Number\ of\ bursts\ within\ 100\,ms\right)$$

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

Table 7.8.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY BAND:	2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
RESOLUTION BANDWIDTH:	0.2 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	> Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconical (30 MHz – 200 MHz) Log periodic (200 MHz – 1000 MHz) Biconilog (30 MHz – 1000 MHz)
FREQUENCY HOPPING:	Disabled

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No signals were found								Pass

Test specification:	**Section 15.247(c), Radiated spurious emissions**		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC
Remarks: GFSK			

Table 7.8.6 Restricted bands according to FCC section 15.205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 – 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 – 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

Reference numbers of test equipment used

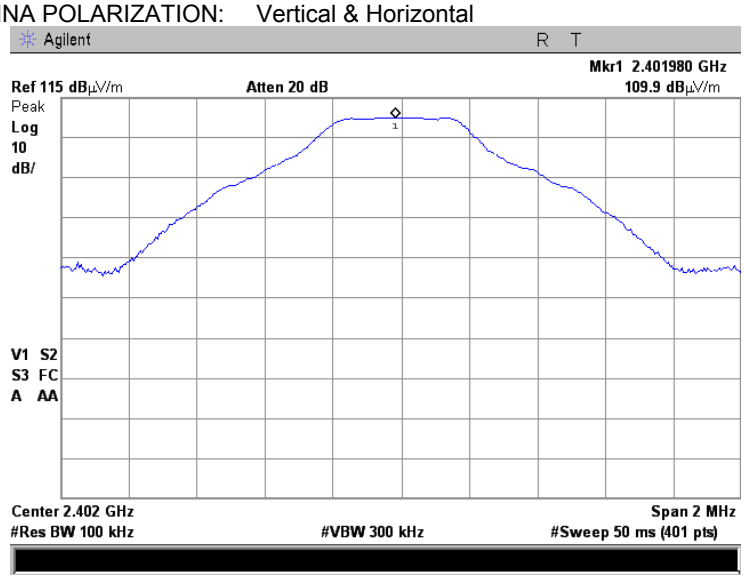
HL 0446	HL 0521	HL 0604	HL 1984	HL 4338	HL 4353	HL 4933	HL 4956
HL 5101	HL 5111						

Full description is given in Appendix A.

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

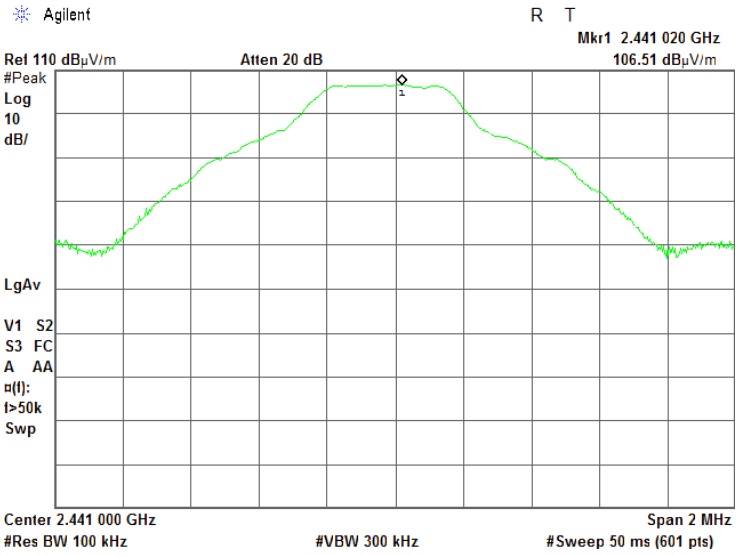
Plot 7.8.1 Radiated emission measurements at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Plot 7.8.2 Radiated emission measurements at the mid carrier frequency

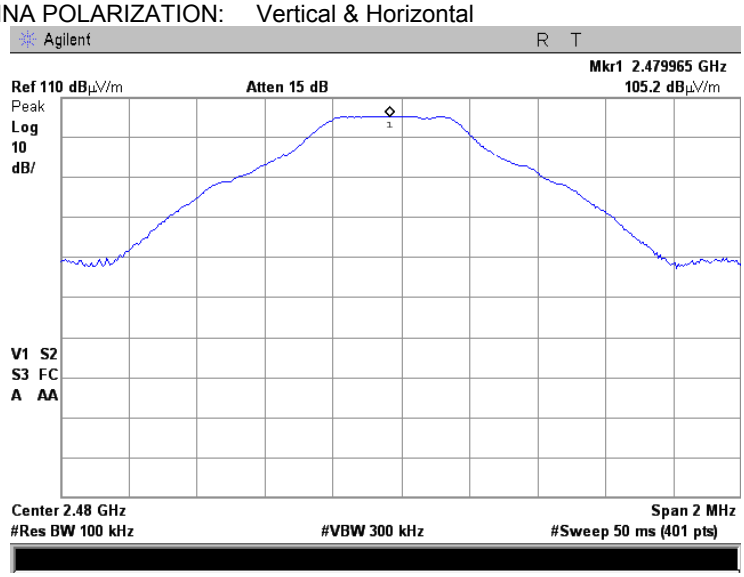
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

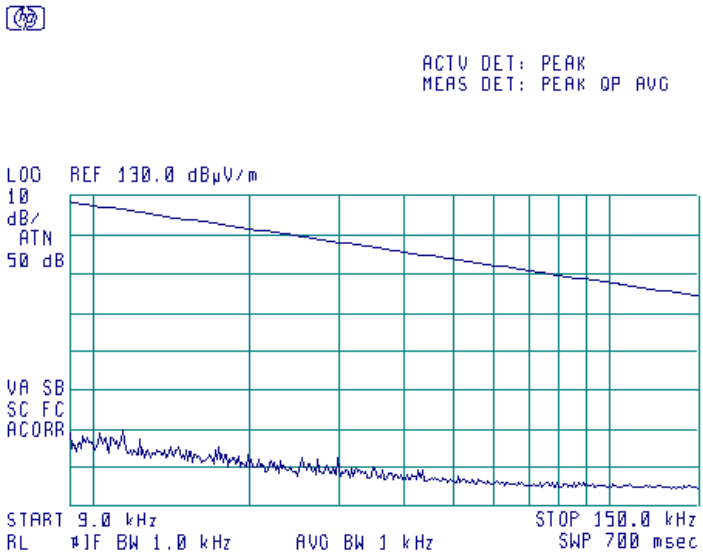
Plot 7.8.3 Radiated emission measurements at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Plot 7.8.4 Radiated emission measurements from 9 to 150 kHz at the low, mid, high carrier frequency

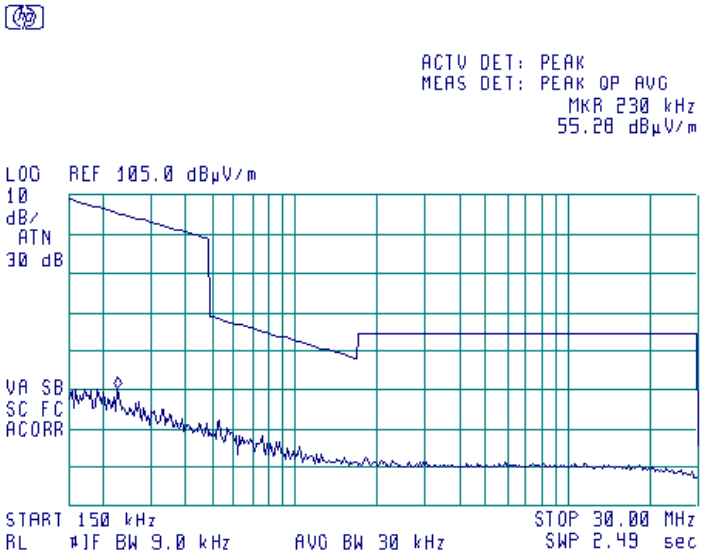
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

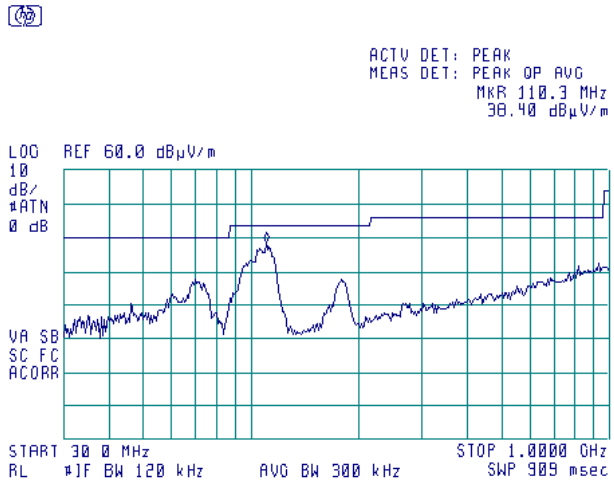
Plot 7.8.5 Radiated emission measurements from 0.15 to 30 MHz at the low, mid, high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical

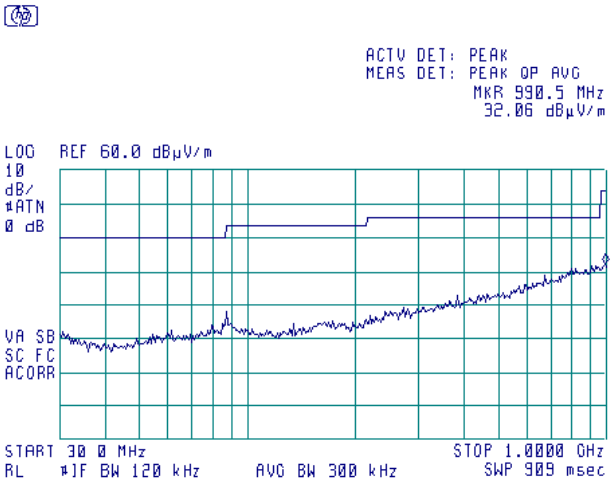


Plot 7.8.6 Radiated emission measurements from 30 to 1000 MHz at the low, mid, high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



With AC/DC power supply

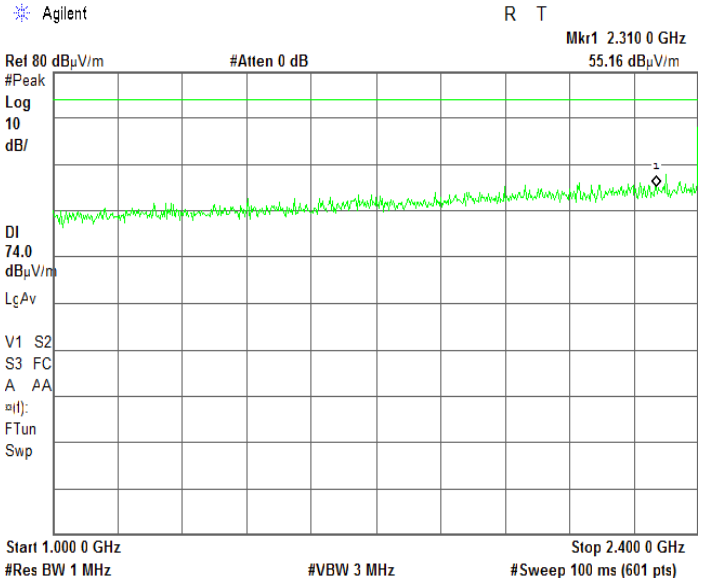


Without AC/DC power supply

Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

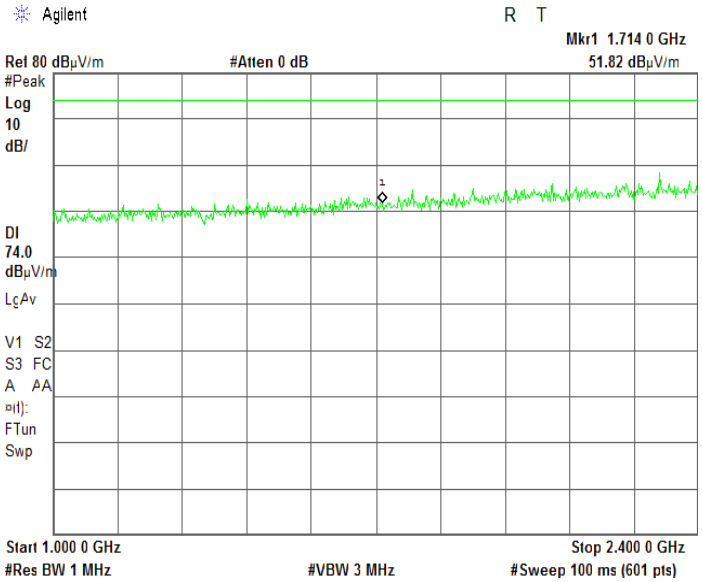
Plot 7.8.7 Radiated emission measurements from 1000 to 2400 MHz at the low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.8.8 Radiated emission measurements from 1000 to 2400 MHz at the mid carrier frequency

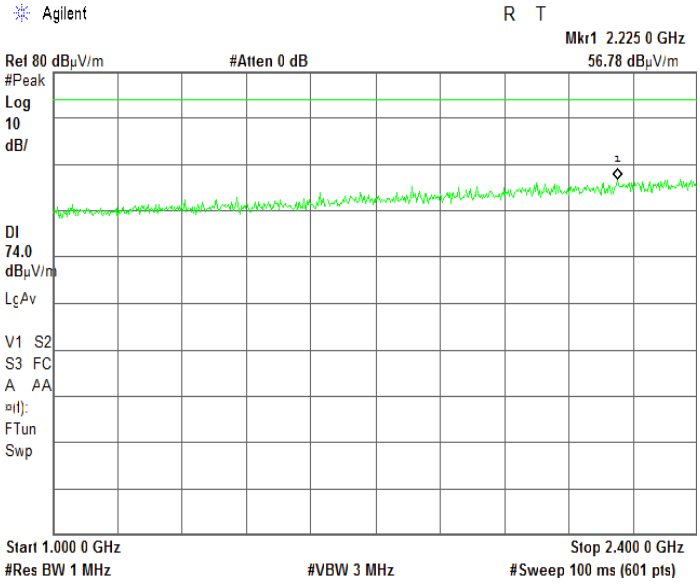
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

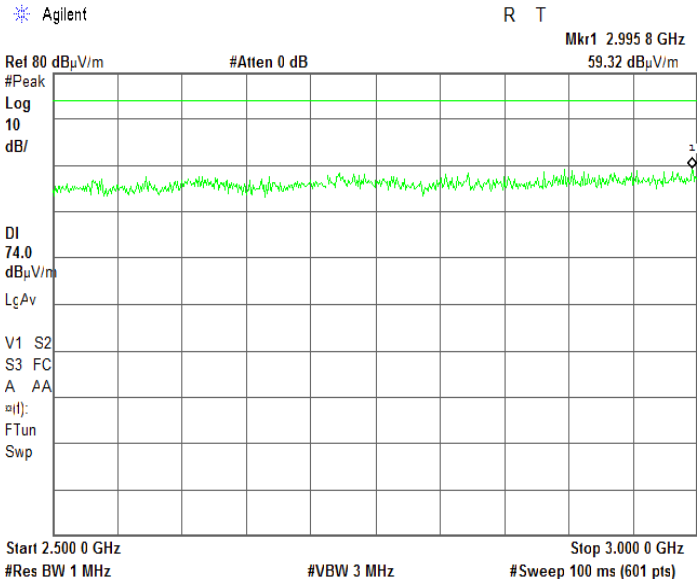
Plot 7.8.9 Radiated emission measurements from 1000 to 2400 MHz at the high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.8.10 Radiated emission measurements from 2500 to 3000 MHz at the low carrier frequency

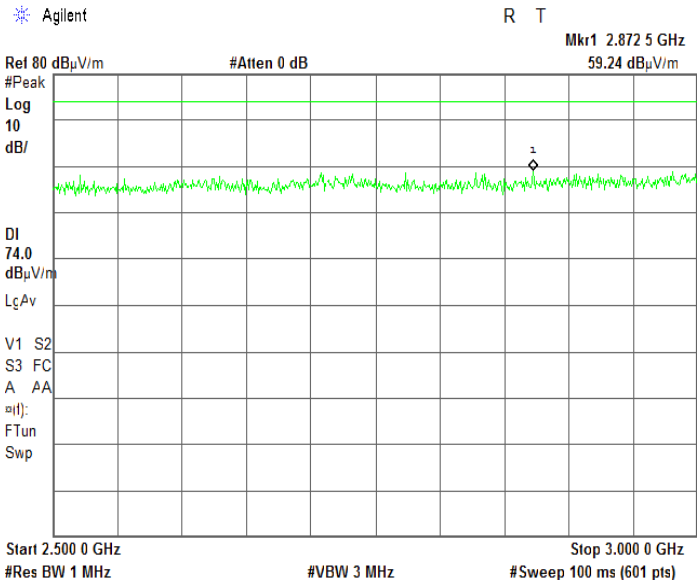
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

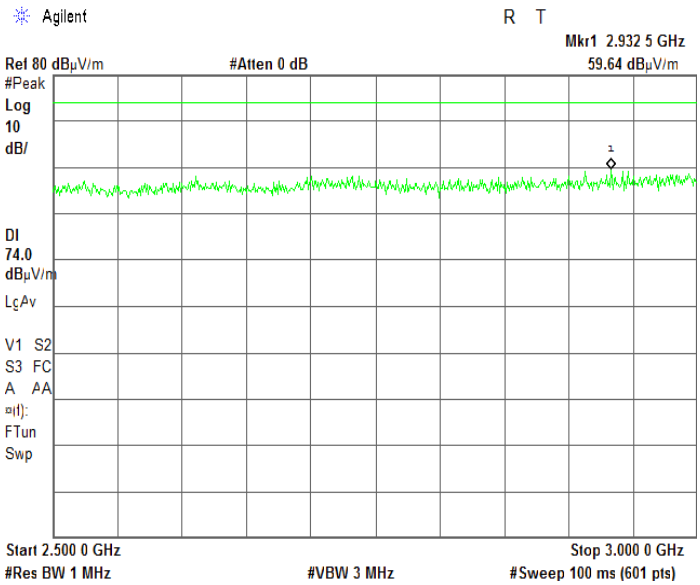
Plot 7.8.11 Radiated emission measurements from 2500 to 3000 MHz at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.8.12 Radiated emission measurements from 2500 to 3000 MHz at the high carrier frequency

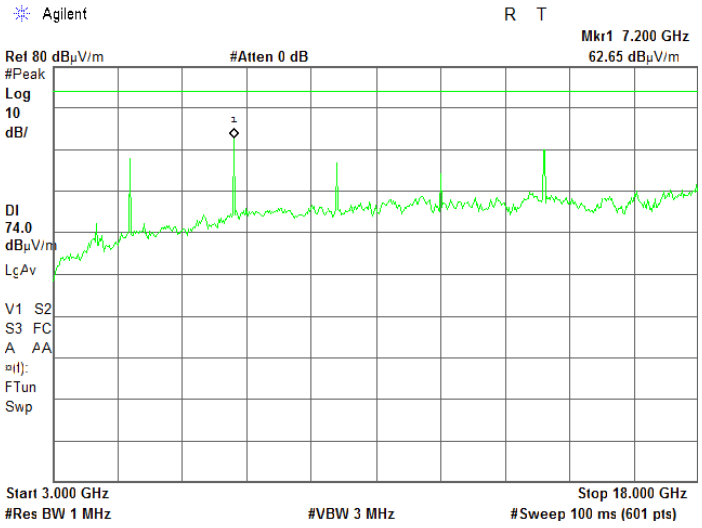
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

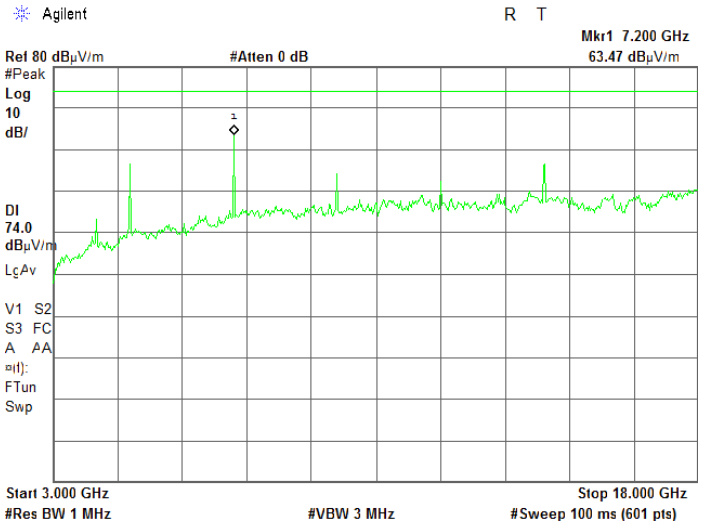
Plot 7.8.13 Radiated emission measurements from 3000 to 18000 MHz at low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.8.14 Radiated emission measurements from 3000 to 18000 MHz at low carrier frequency

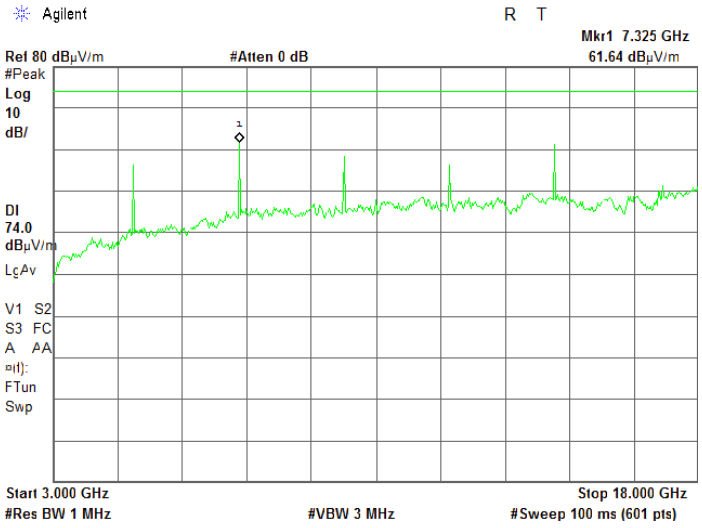
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

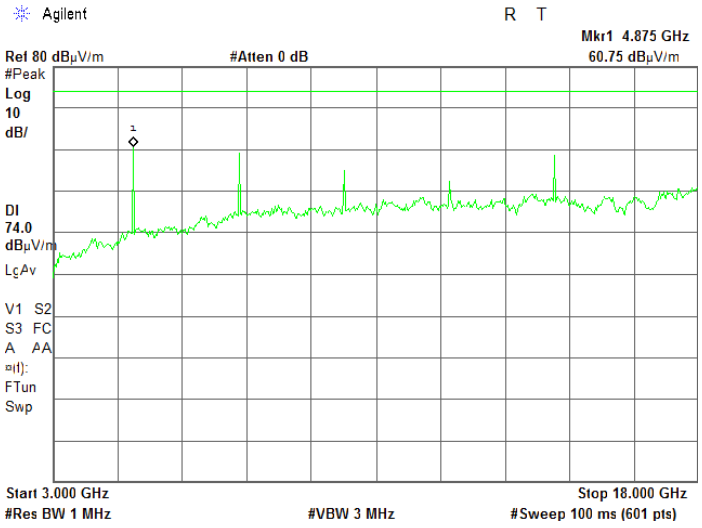
Plot 7.8.15 Radiated emission measurements from 3000 to 18000 MHz at mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.8.16 Radiated emission measurements from 3000 to 18000 MHz at mid carrier frequency

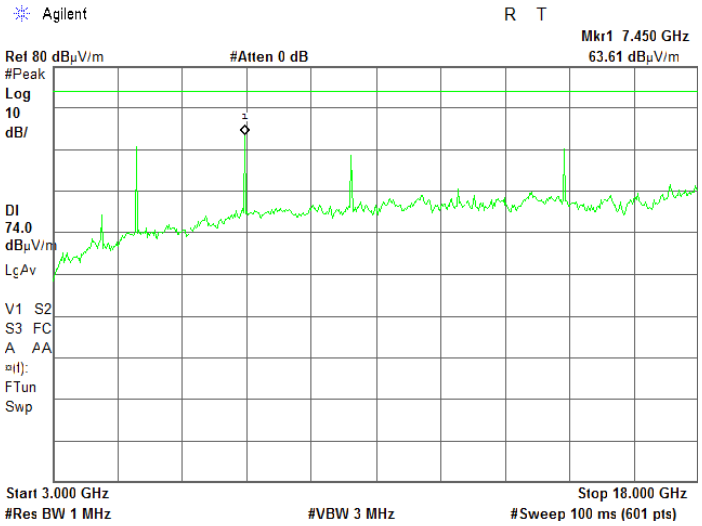
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

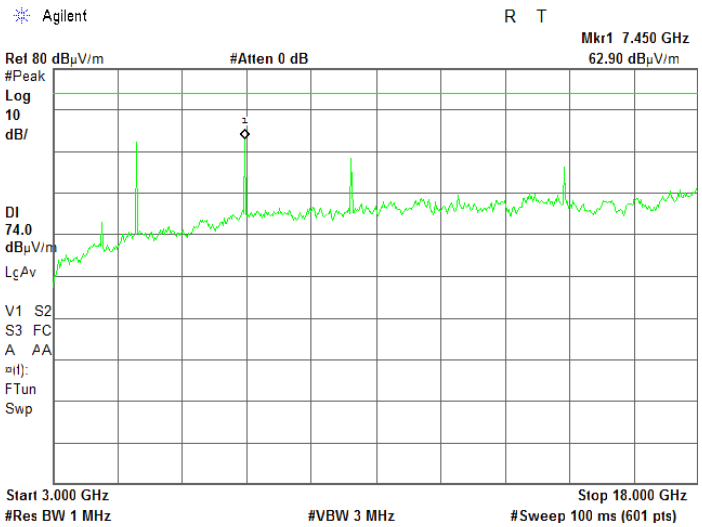
Plot 7.8.17 Radiated emission measurements from 3000 to 18000 MHz at high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.8.18 Radiated emission measurements from 3000 to 18000 MHz at high carrier frequency

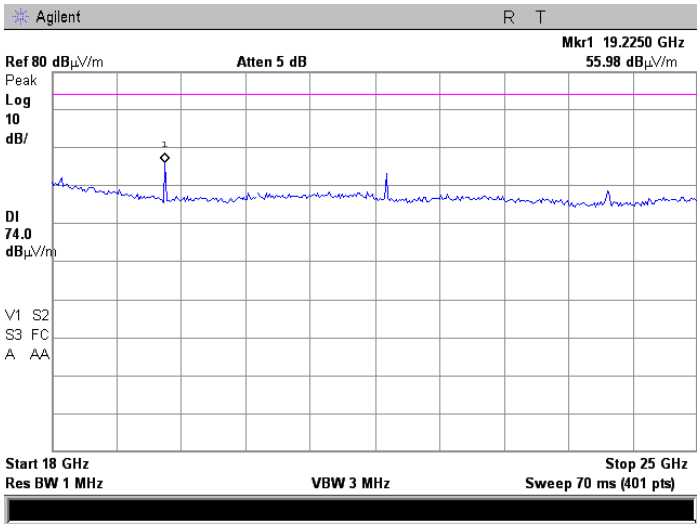
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

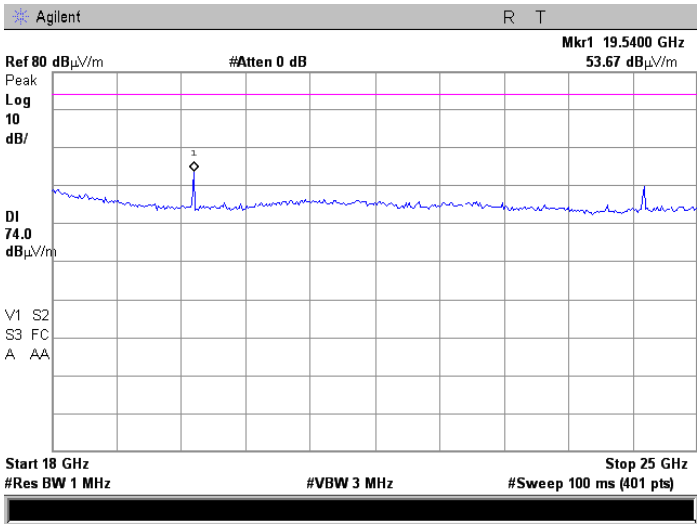
Plot 7.8.19 Radiated emission measurements from 18000 to 25000 MHz at low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Plot 7.8.20 Radiated emission measurements from 18000 to 25000 MHz at mid carrier frequency

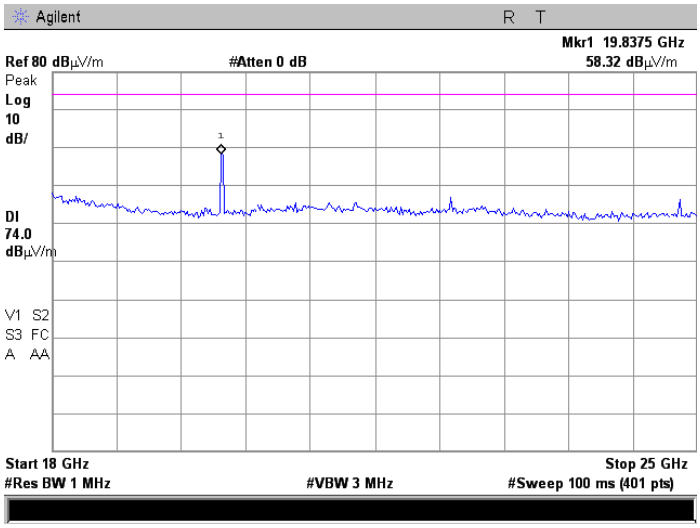
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

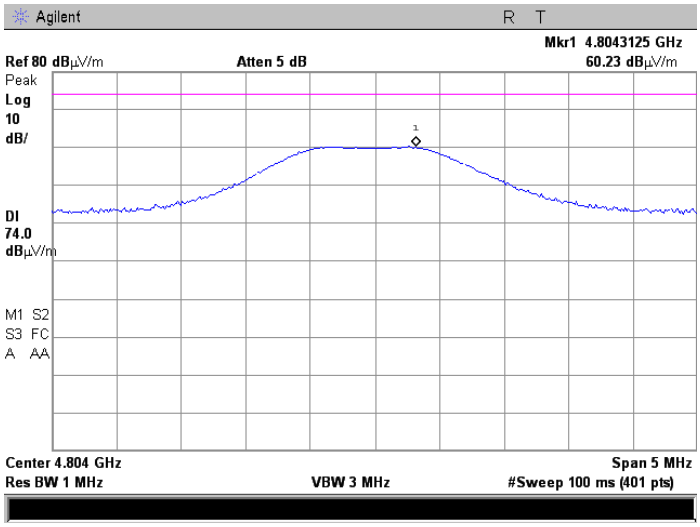
Plot 7.8.21 Radiated emission measurements from 18000 to 25000 MHz at high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



Plot 7.8.22 Radiated emission measurements at the second harmonic of low carrier frequency

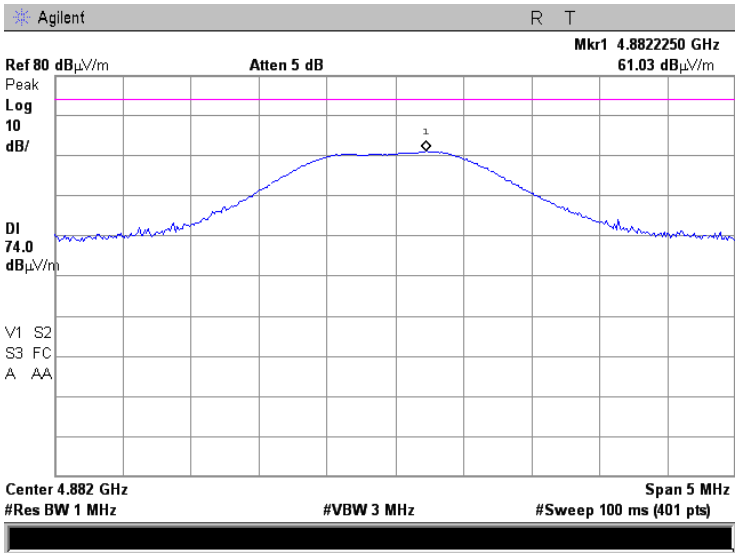
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

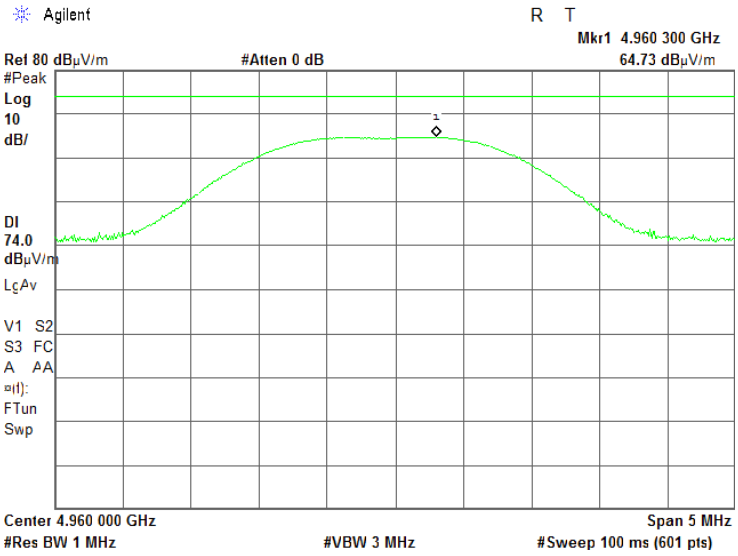
Plot 7.8.23 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.24 Radiated emission measurements at the second harmonic of high carrier frequency

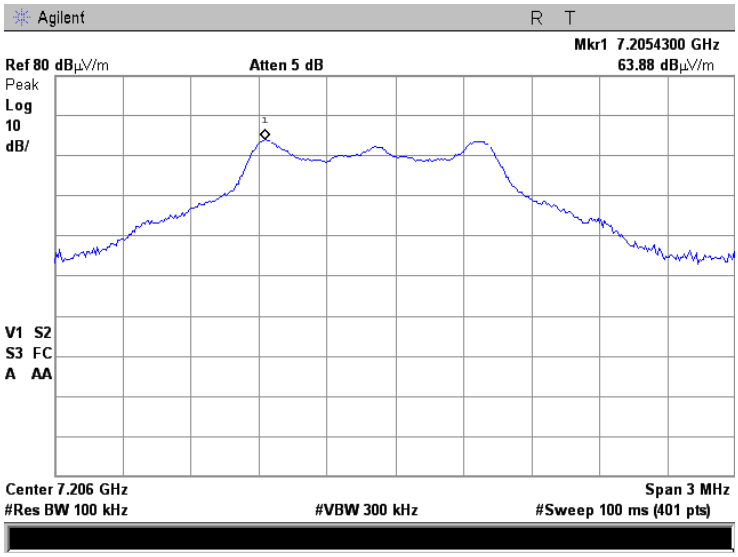
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

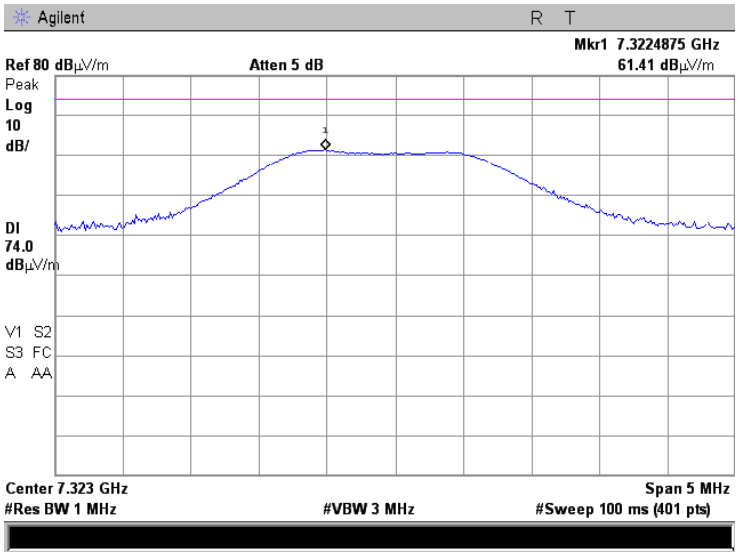
Plot 7.8.25 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.26 Radiated emission measurements at the third harmonic of mid carrier frequency

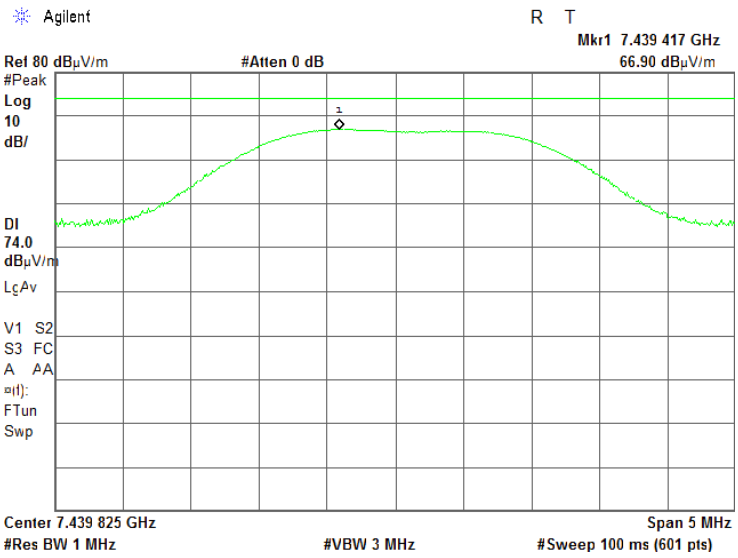
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

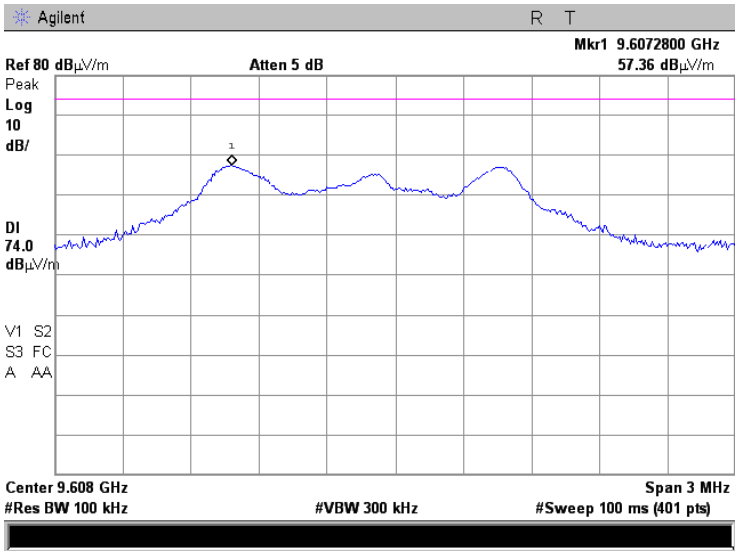
Plot 7.8.27 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.28 Radiated emission measurements at the fourth harmonic of low carrier frequency

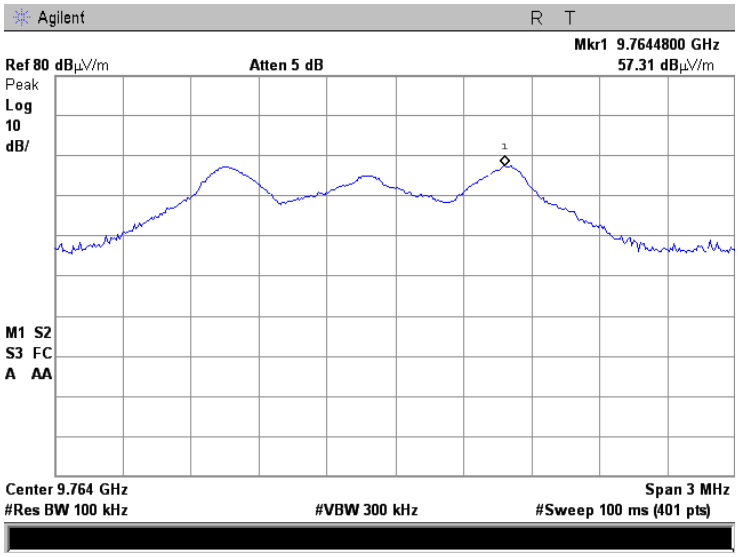
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

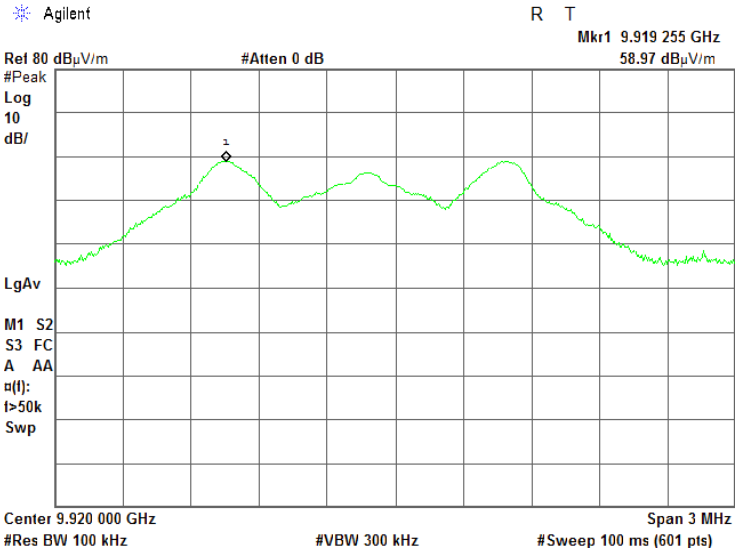
Plot 7.8.29 Radiated emission measurements at the fourth harmonic of mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.30 Radiated emission measurements at the fourth harmonic of high carrier frequency

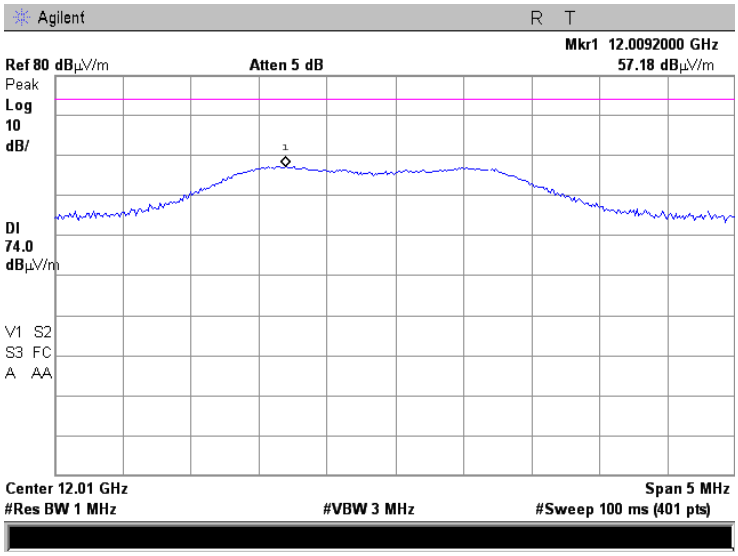
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

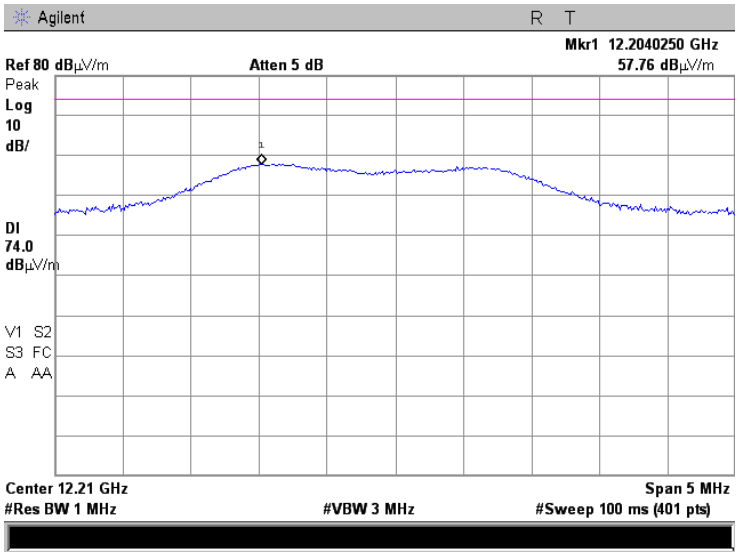
Plot 7.8.31 Radiated emission measurements at the fifth harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.32 Radiated emission measurements at the fifth harmonic of mid carrier frequency

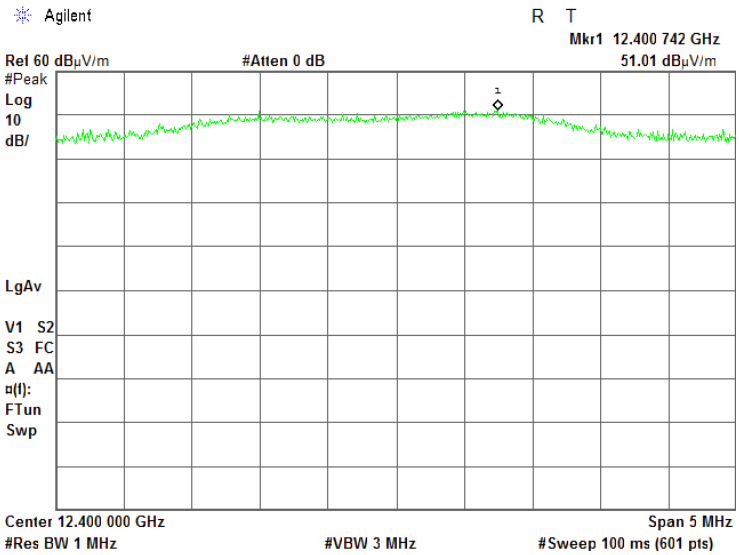
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

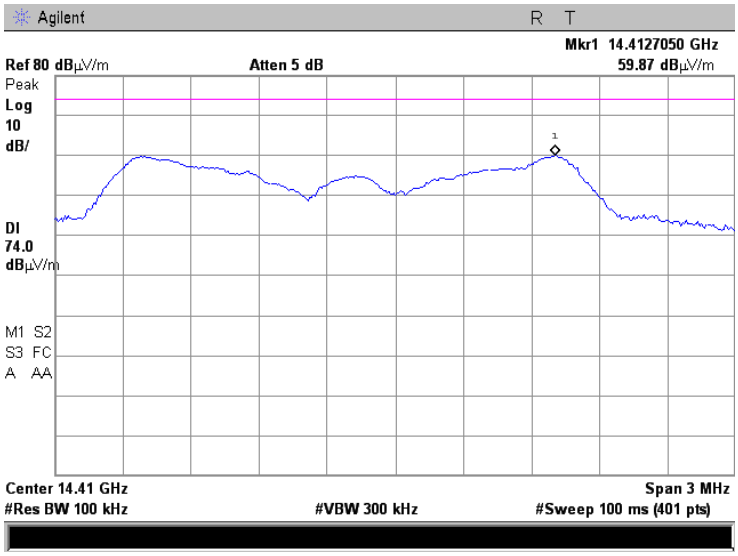
Plot 7.8.33 Radiated emission measurements at the fifth harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.34 Radiated emission measurements at the sixth harmonic of low carrier frequency

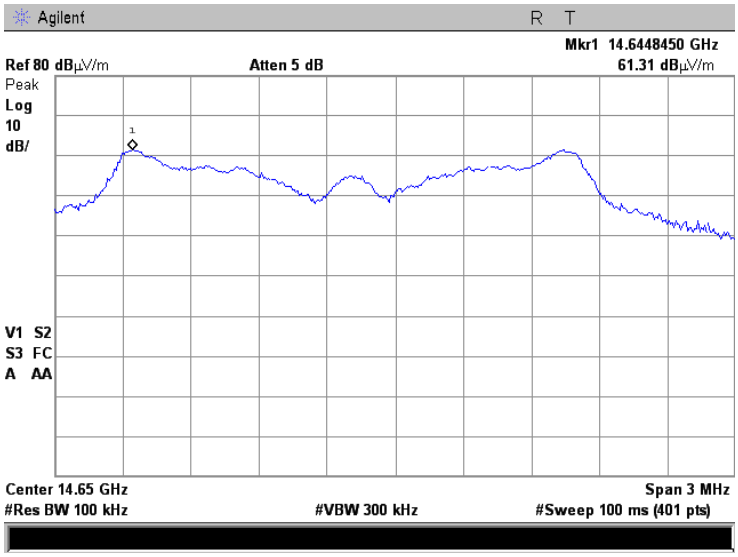
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

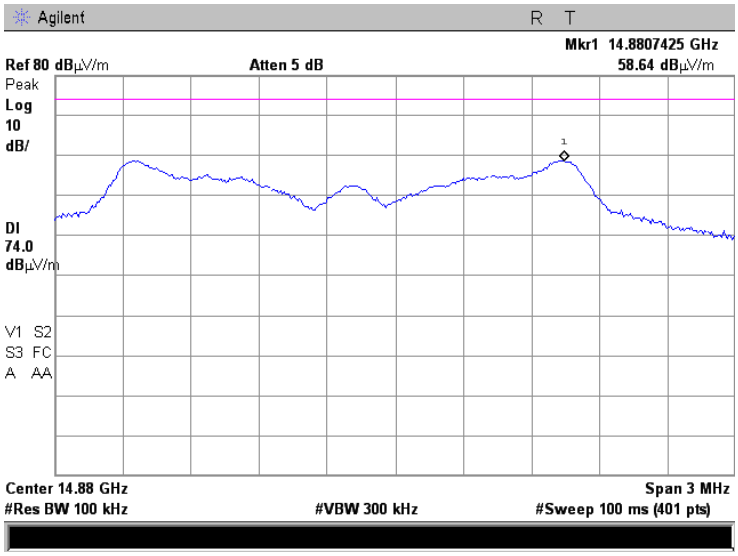
Plot 7.8.35 Radiated emission measurements at the sixth harmonic of mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.36 Radiated emission measurements at the sixth harmonic of high carrier frequency

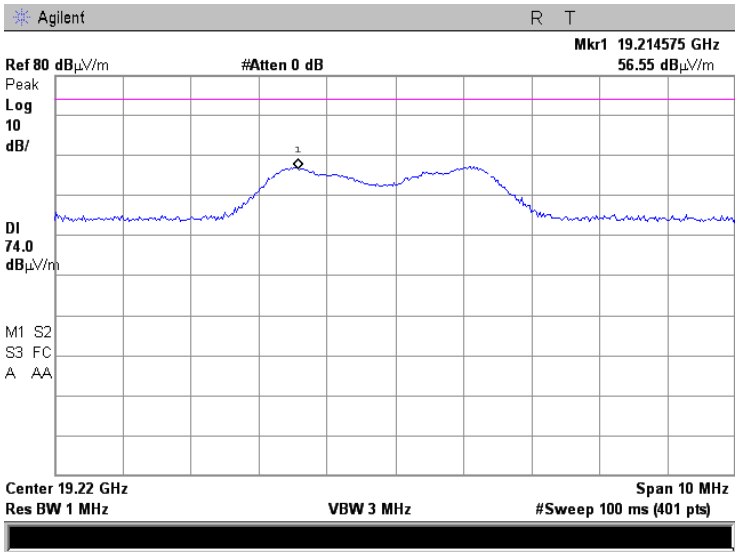
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

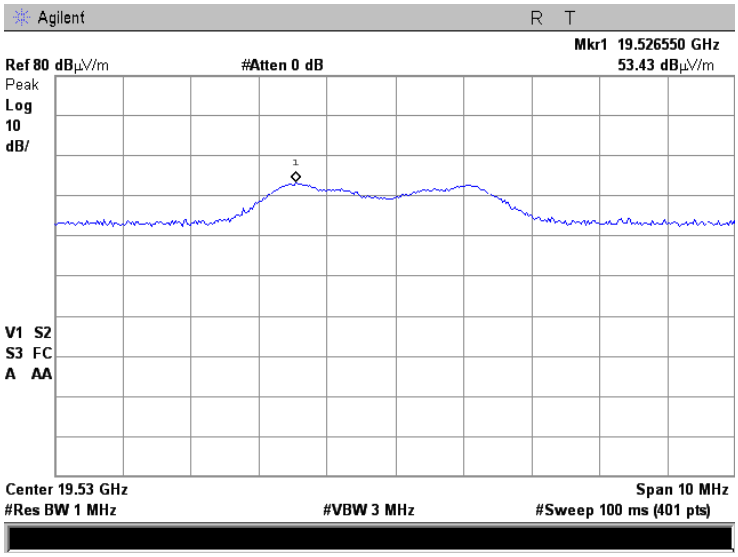
Plot 7.8.37 Radiated emission measurements at the eighth harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION Vertical & Horizontal



Plot 7.8.38 Radiated emission measurements at the eighth harmonic of mid carrier frequency

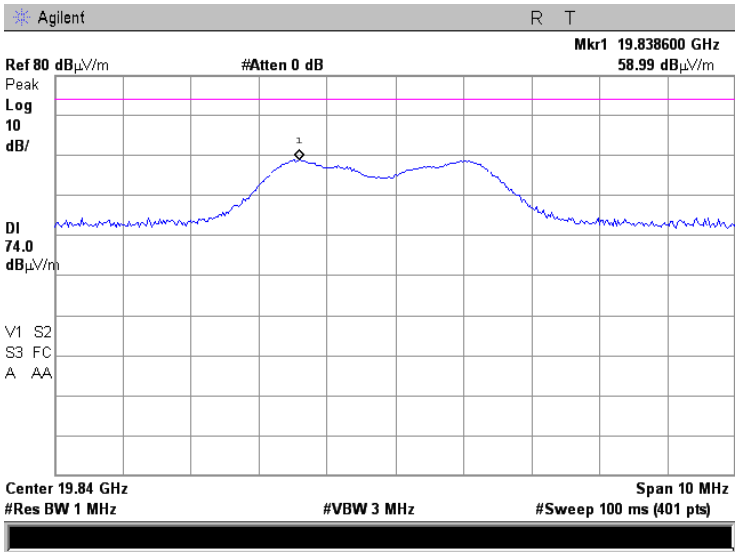
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION Vertical & Horizontal



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

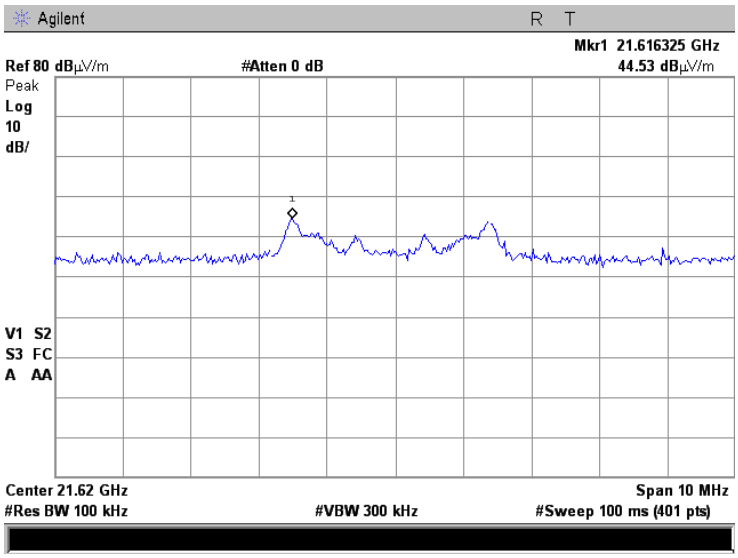
Plot 7.8.39 Radiated emission measurements at the eighth harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION Vertical & Horizontal



Plot 7.8.40 Radiated emission measurements at the ninth harmonic of low carrier frequency

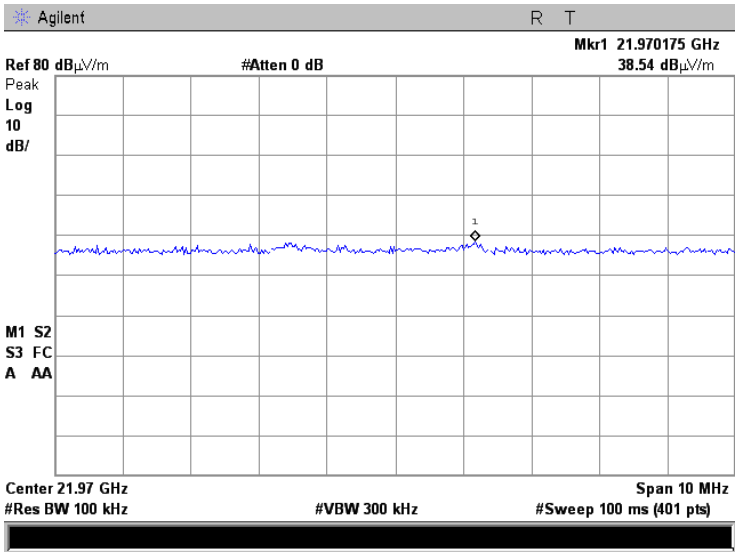
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

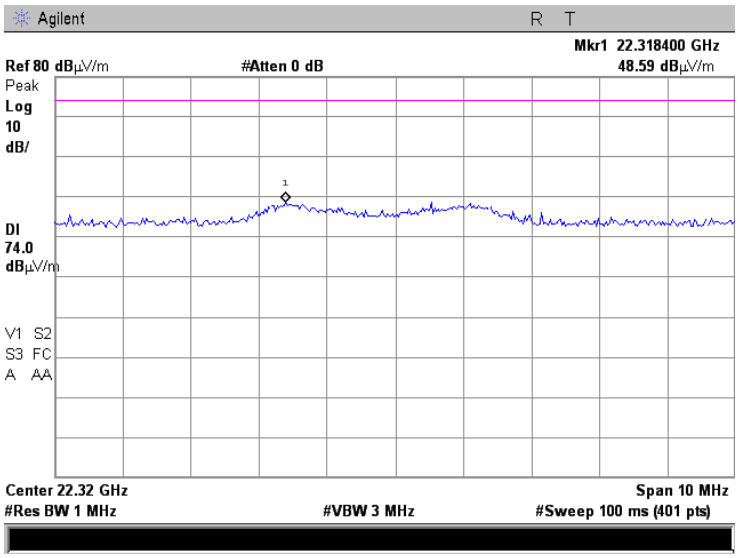
Plot 7.8.41 Radiated emission measurements at the ninth harmonic mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION Vertical & Horizontal



Plot 7.8.42 Radiated emission measurements at the ninth harmonic of high carrier frequency

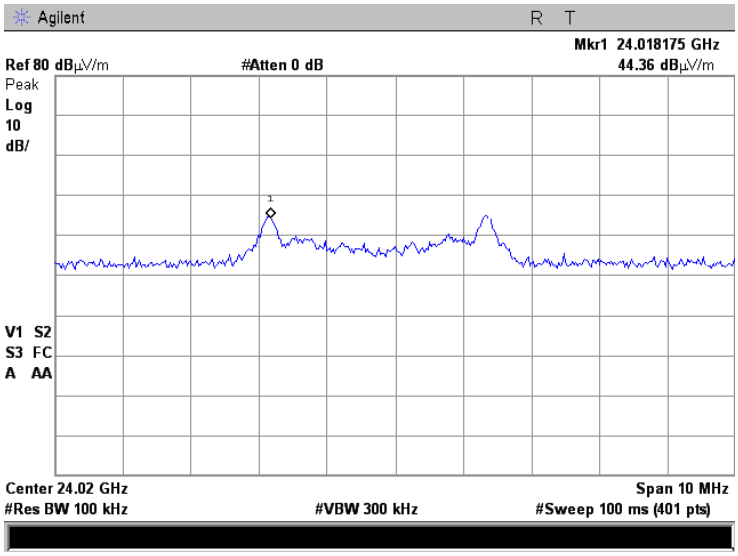
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

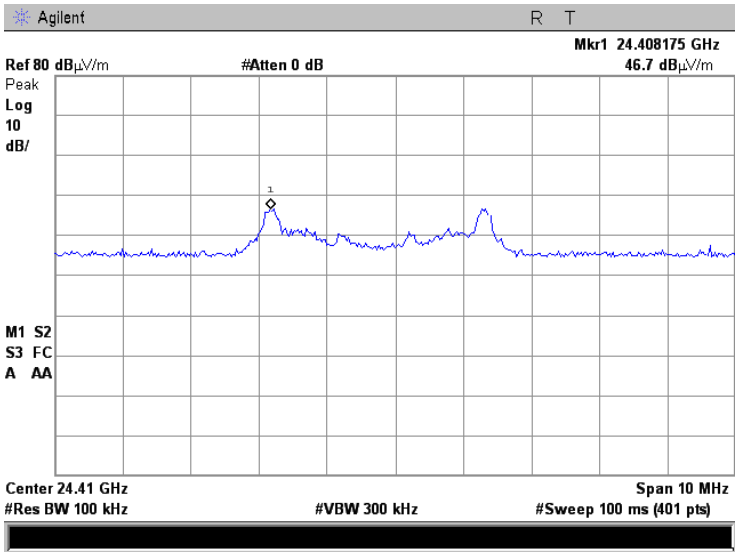
Plot 7.8.43 Radiated emission measurements at the tenth harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.8.44 Radiated emission measurements at the tenth harmonic of mid carrier frequency

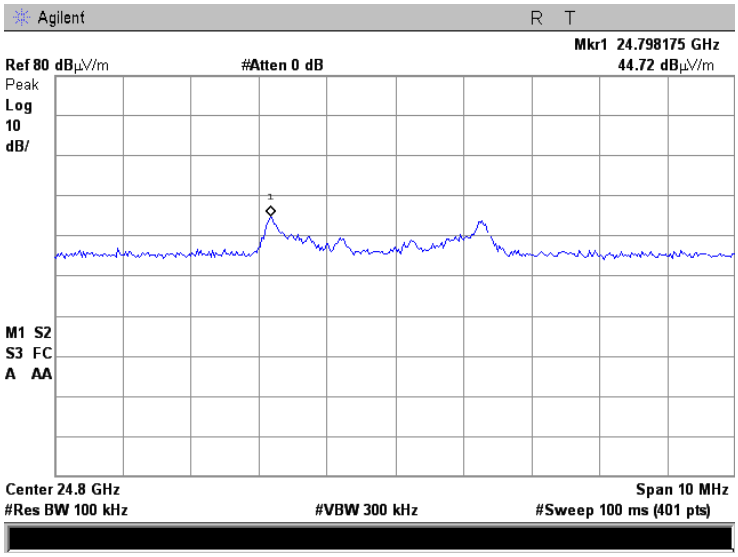
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

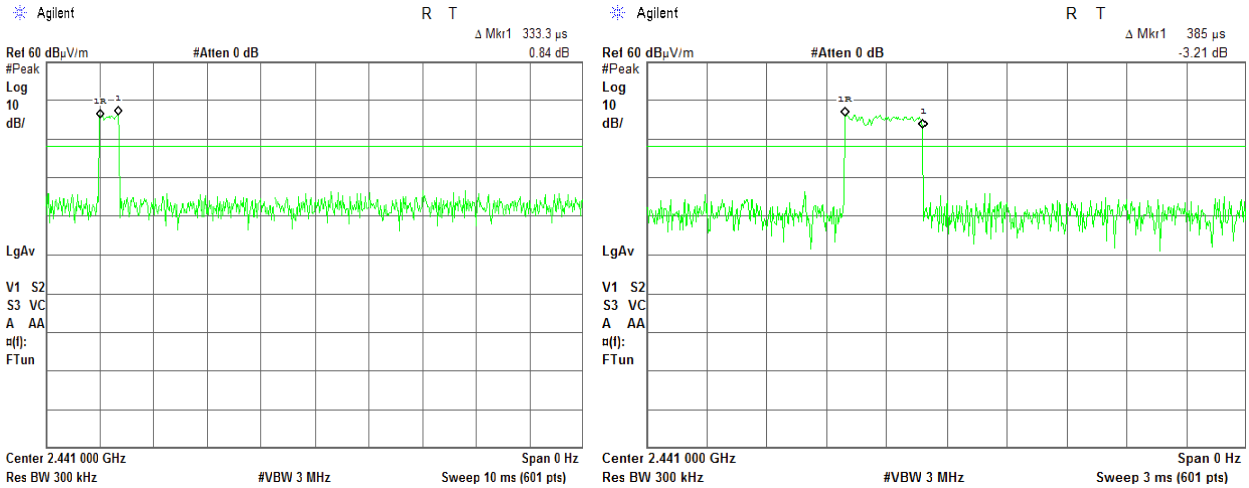
Plot 7.8.45 Radiated emission measurements at the tenth harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m

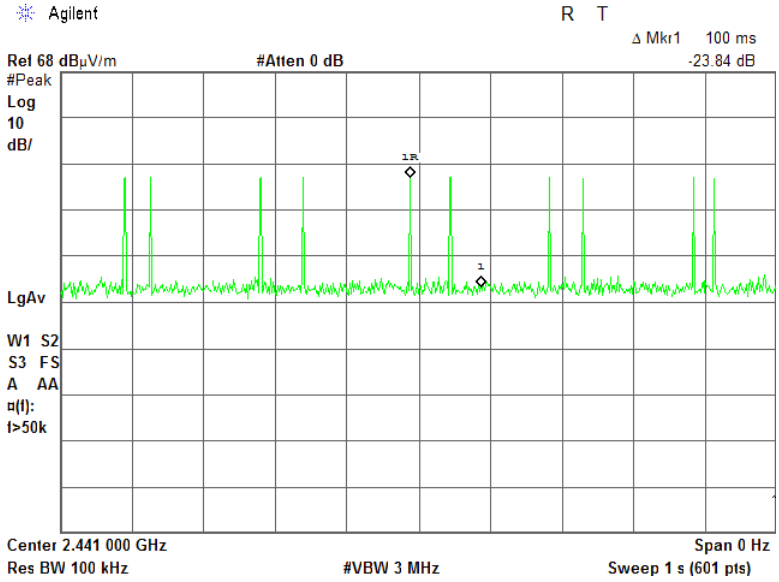


Test specification:	Section 15.247(c), Radiated spurious emissions		
Test procedure:	ANSI C63.10, sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 20-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: GFSK			

Plot 7.8.46 Transmission pulse duration



Plot 7.8.47 Transmission pulse period



Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: DQPSK			

7.9 Band edge radiated emissions at DQPSK modulation

7.9.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.9.1.

Table 7.9.1 Band edge emission limits

Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(μV/m)	
		Peak	Average
902.0 – 928.0	20.0	74.0	54.0
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.9.2 Test procedure

7.9.2.1 The EUT was set up as shown in Figure 7.9.1, energized normally modulated at the maximum data rate with its hopping function disabled and its proper operation was checked.

7.9.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

7.9.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

7.9.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

7.9.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.9.2 and associated plots and referenced to the highest emission level measured within the authorized band.

7.9.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

7.9.2.7 The above procedure was repeated with the frequency hopping function enabled.

Figure 7.9.1 Band edge emission test setup

Test specification:	**Section 15.247(d), Emissions at band edges**		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 40 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC
Remarks: DQPSK			

Table 7.9.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz
DETECTOR USED: Peak
MODULATION: DQPSK
MODULATING SIGNAL: PRBS
BIT RATE: 3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
VIDEO BANDWIDTH: ≥ RBW

At low carrier frequency

FHSS	Band edge emission, dB(μV/m)	Emission at carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
disabled	65.08	106.2	-41.12	20.0	-21.12	Pass
enabled	67.88		-38.32		-18.32	

At high carrier frequency

FHSS	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)			Verdict
	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	
disabled	65.11	74	-8.89	48.74	54	-5.26	Pass
enabled	68.42	74	-5.58	48.43	54	-5.57	

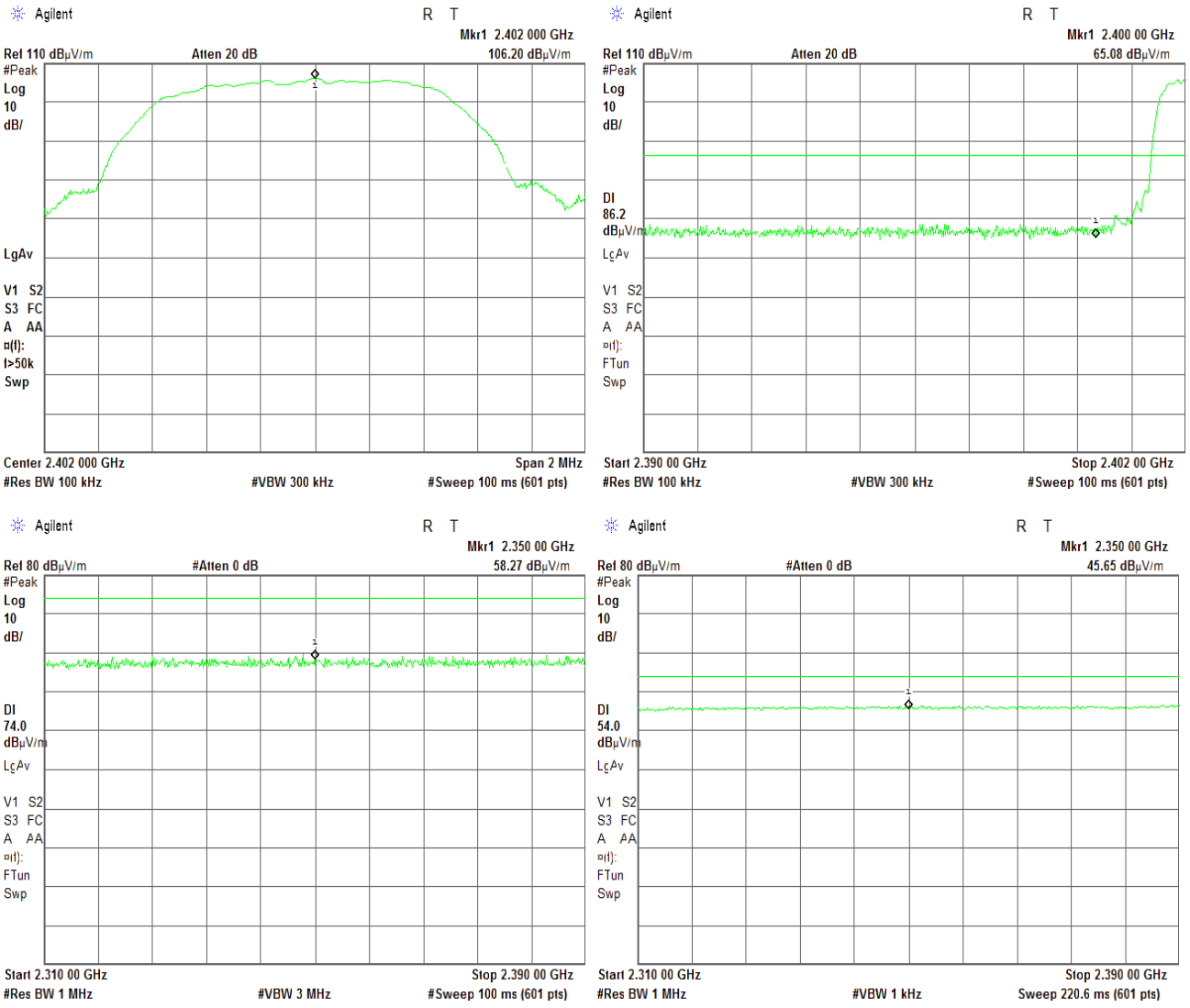
Reference numbers of test equipment used

HL 1984	HL 2780	HL 3818	HL 4353	HL 5101			

Full description is given in Appendix A.

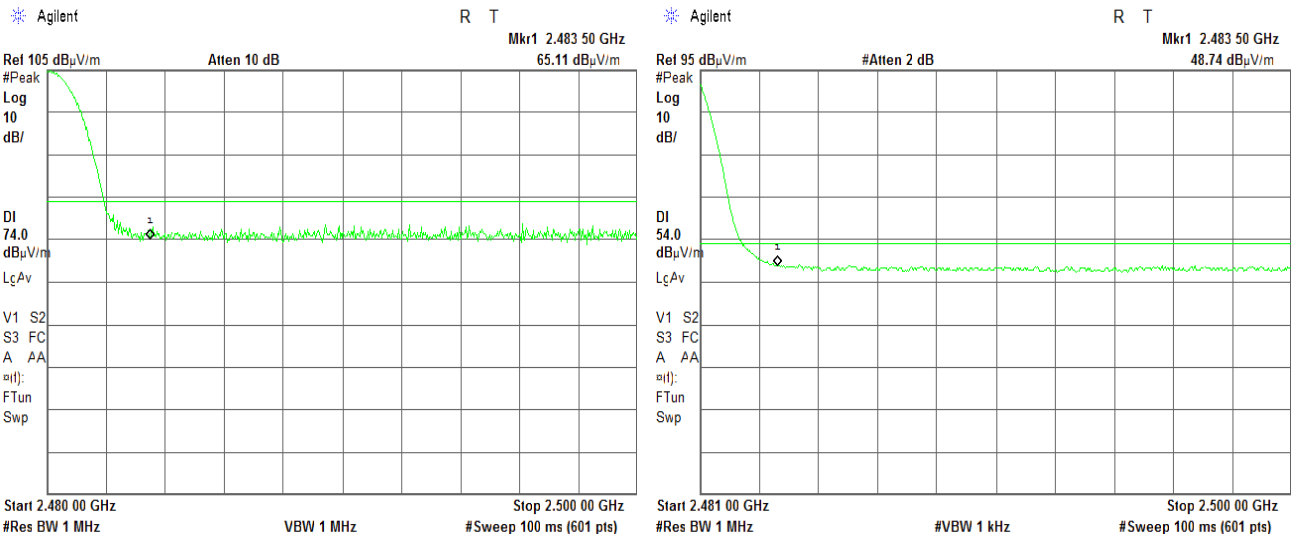
Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: DQPSK			

Plot 7.9.1 The highest band edge emission at low carrier frequency with hopping function disabled



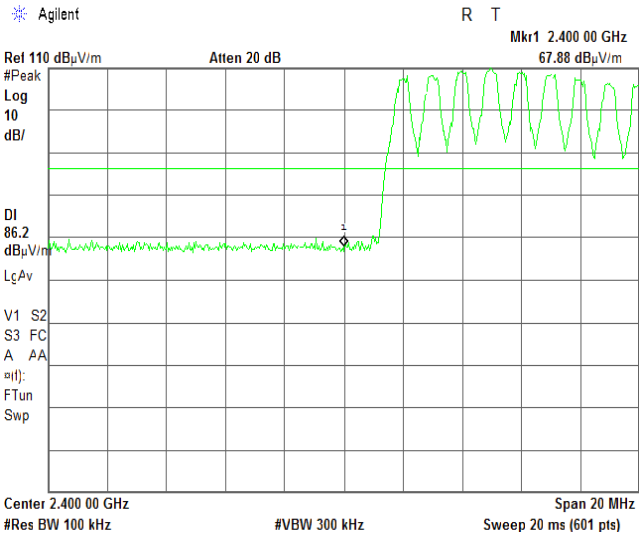
Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: DQPSK			

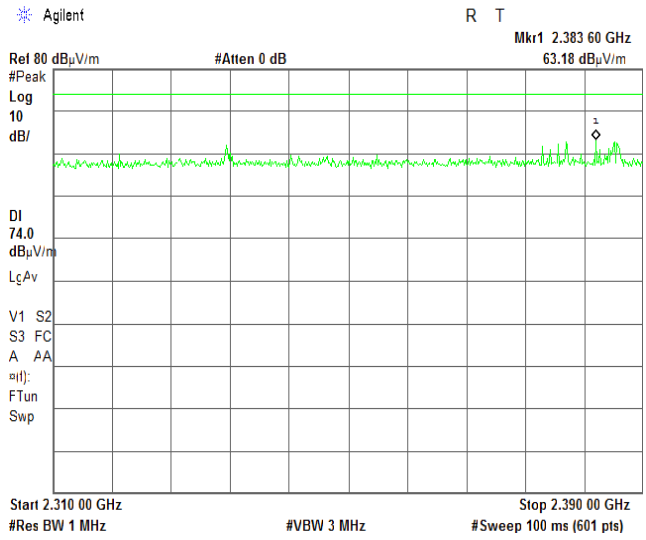
Plot 7.9.2 The highest band edge emission at high carrier frequency with hopping function disabled

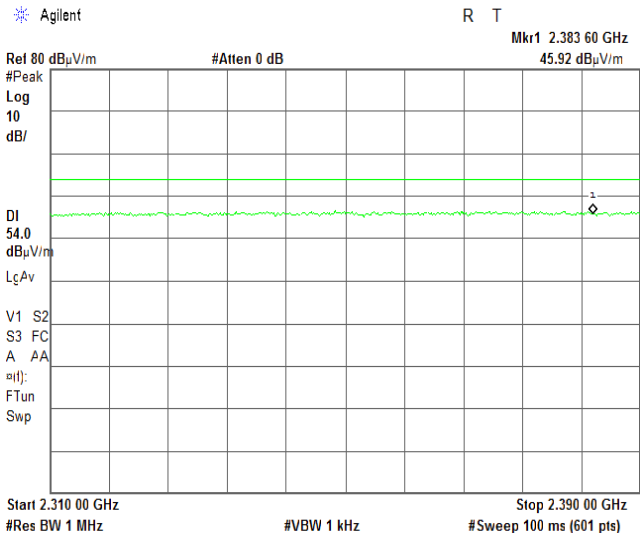


Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: DQPSK			

Plot 7.9.3 The highest band edge emission at low carrier frequency with hopping function enabled

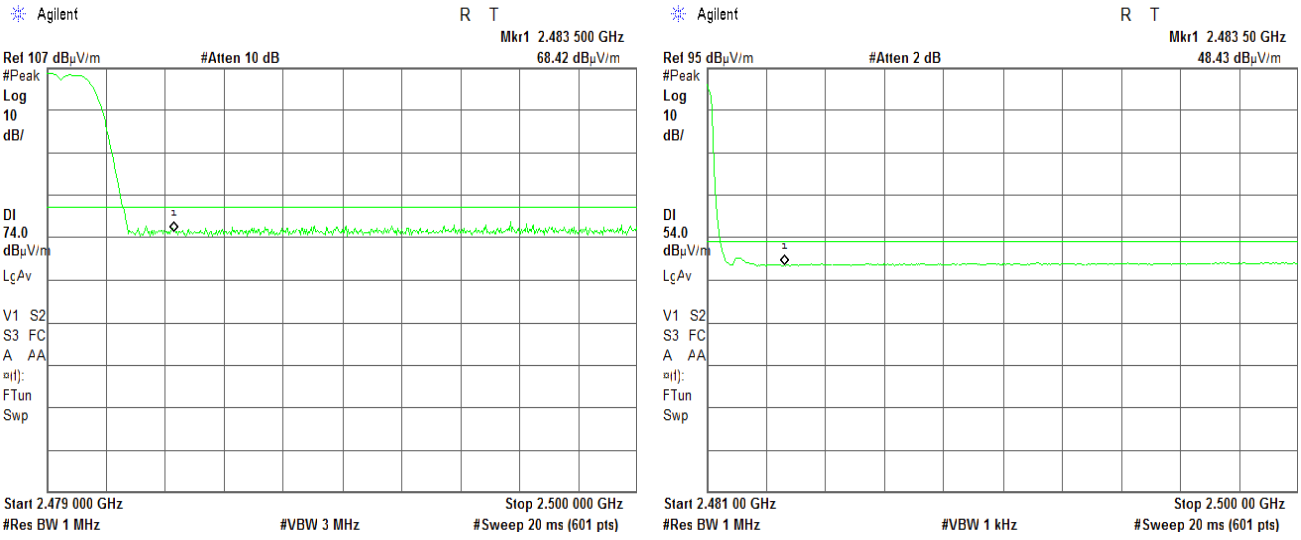






Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: DQPSK			

Plot 7.9.4 The highest band edge emission at high carrier frequency with hopping function enabled



Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: 8DPSK			

7.10 Band edge radiated emissions at 8DPSK modulation

7.10.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.10.1.

Table 7.10.1 Band edge emission limits

Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(μV/m)	
		Peak	Average
902.0 – 928.0	20.0	74.0	54.0
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.10.2 Test procedure

7.10.2.1 The EUT was set up as shown in Figure 7.10.1, energized normally modulated at the maximum data rate with its hopping function disabled and its proper operation was checked.

7.10.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

7.10.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

7.10.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

7.10.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.10.2 and associated plots and referenced to the highest emission level measured within the authorized band.

7.10.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

7.10.2.7 The above procedure was repeated with the frequency hopping function enabled.

Figure 7.10.1 Band edge emission test setup

Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: 8DPSK			

Table 7.10.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400-2483.5 MHz
DETECTOR USED: Peak
MODULATION: 8DPSK
MODULATING SIGNAL: PRBS
BIT RATE: 3 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
VIDEO BANDWIDTH: ≥ RBW

At low carrier frequency

FHSS	Band edge emission, dB(μV/m)	Emission at carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
disabled	68.20	105.86	-37.66	20.0	-17.66	Pass
enabled	68.19		-37.67		-17.67	

At high carrier frequency

FHSS	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)			Verdict
	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	
disabled	65.20	74	-8.8	46.37	54	-7.63	Pass
enabled	67.84	74	-6.16	48.44	54	-5.56	

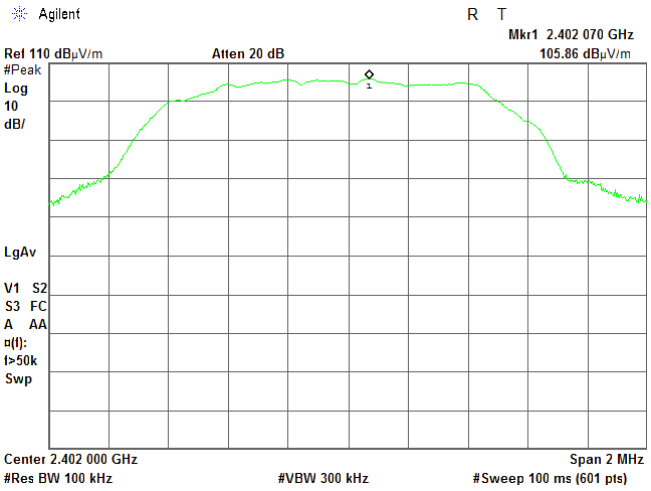
Reference numbers of test equipment used

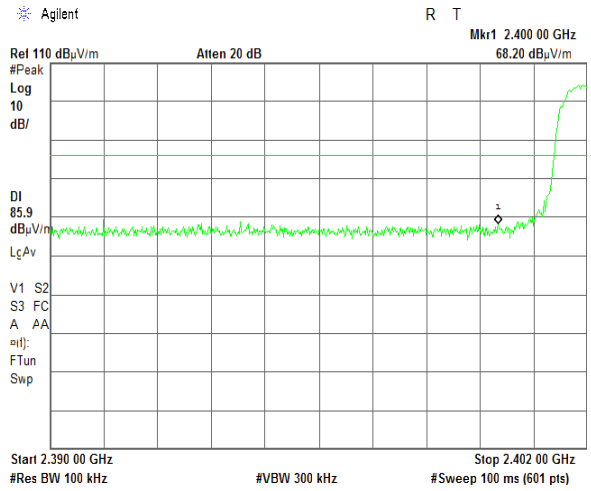
HL 1984	HL 2780	HL 3818	HL 4353	HL 5101			

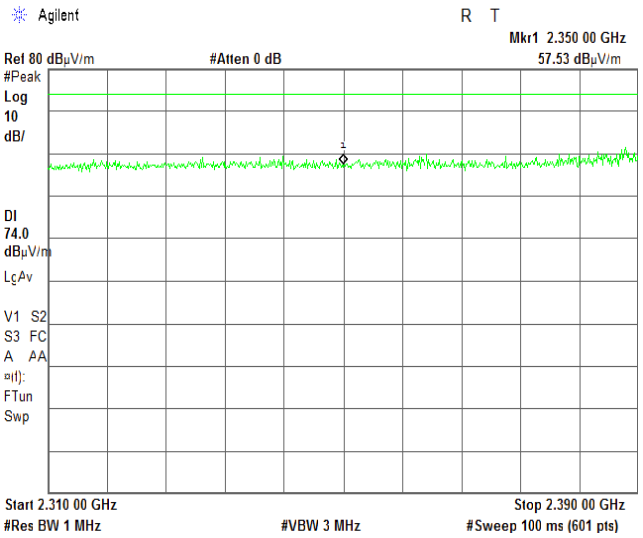
Full description is given in Appendix A.

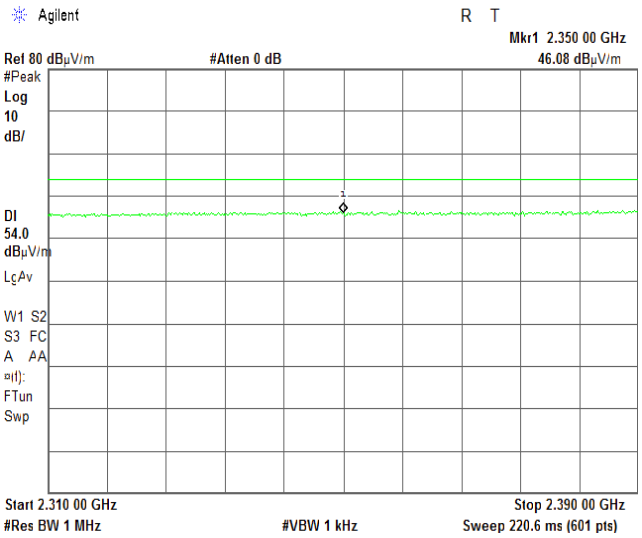
Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: 8DPSK			

Plot 7.10.1 The highest band edge emission at low carrier frequency with hopping function disabled



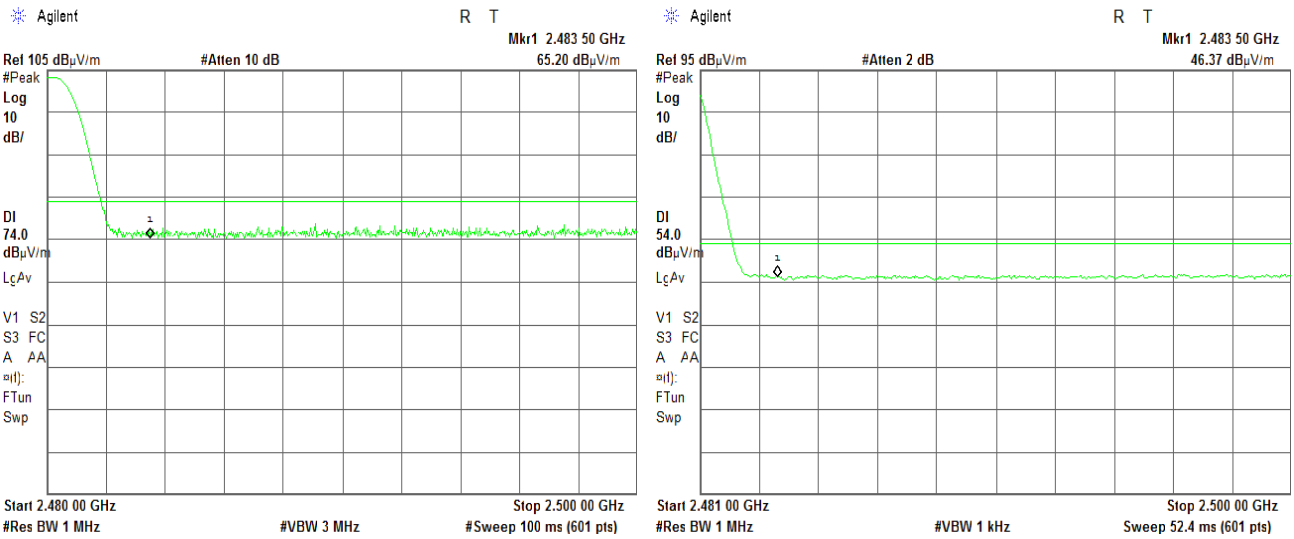






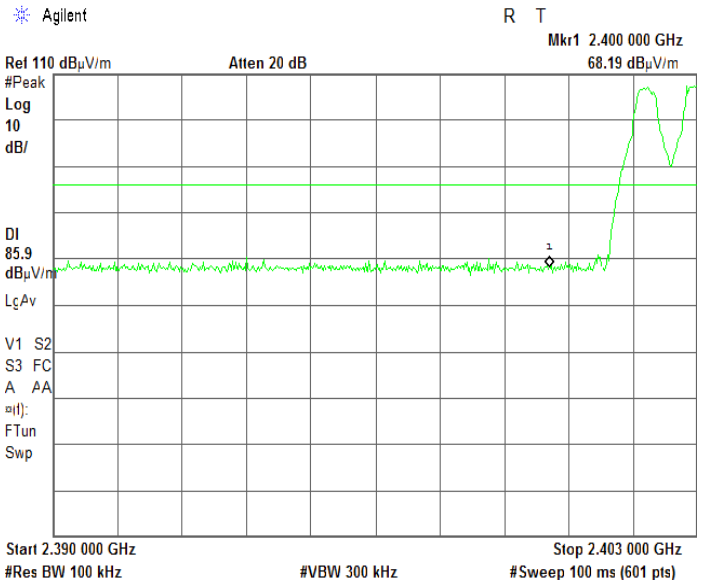
Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: 8DPSK			

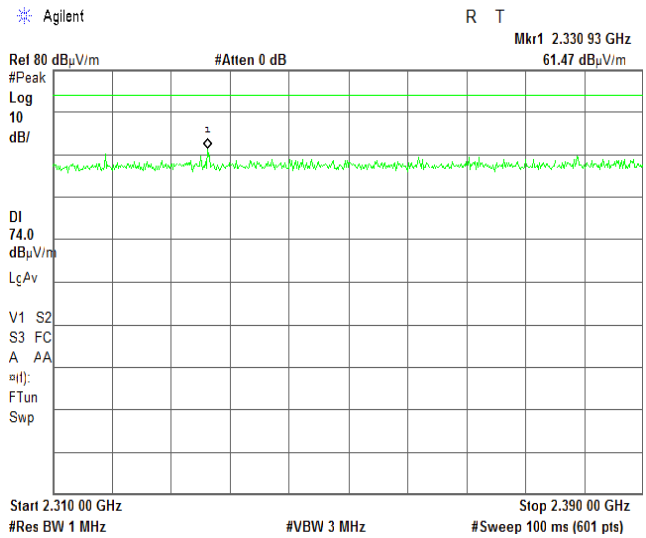
Plot 7.10.2 The highest band edge emission at high carrier frequency with hopping function disabled

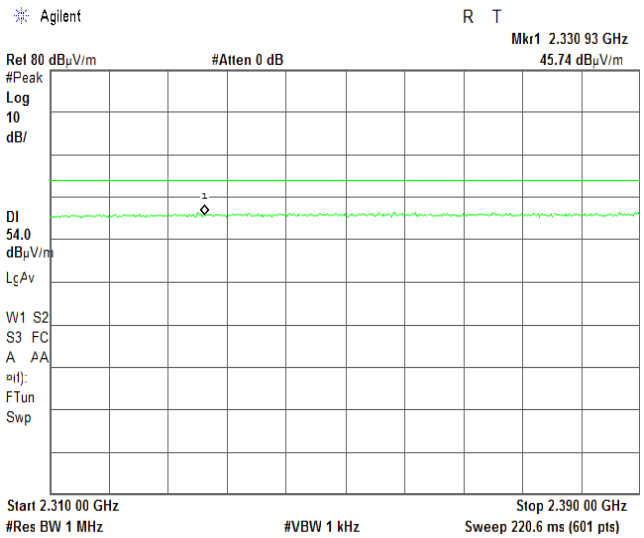


Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: 8DPSK			

Plot 7.10.3 The highest band edge emission at low carrier frequency with hopping function enabled

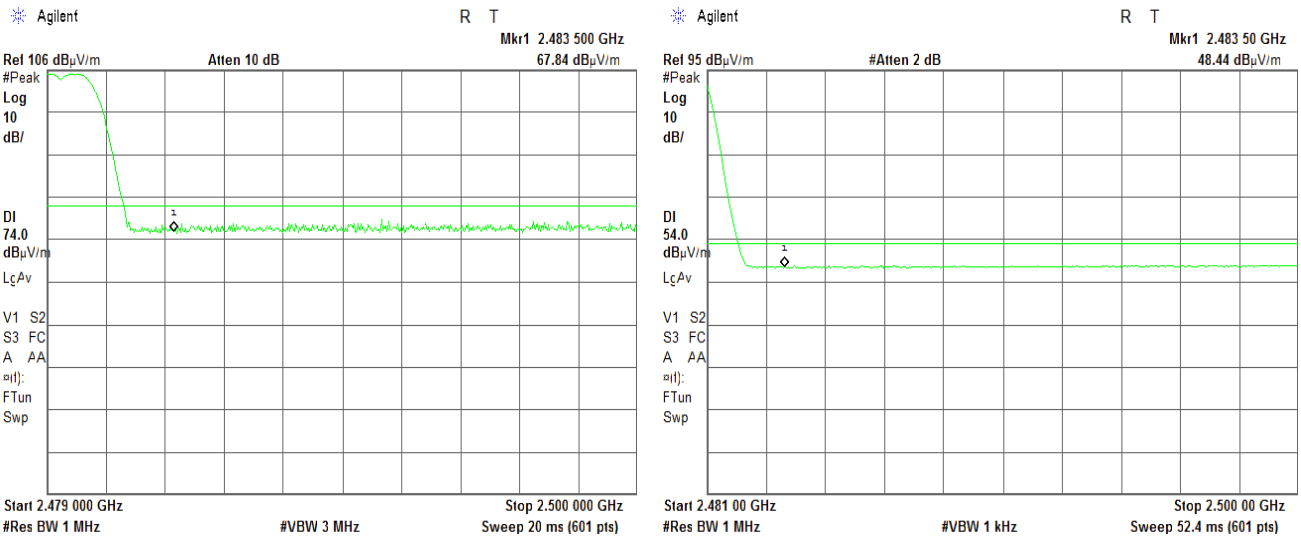






Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 44 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks: 8DPSK			

Plot 7.10.4 The highest band edge emission at high carrier frequency with hopping function enabled



Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK			

7.11 Band edge radiated emissions at GFSK modulation

7.11.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.11.1.

Table 7.11.1 Band edge emission limits

Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(μV/m)	
		Peak	Average
902.0 – 928.0	20.0	74.0	54.0
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.11.2 Test procedure

7.11.2.1 The EUT was set up as shown in Figure 7.11.1, energized normally modulated at the maximum data rate with its hopping function disabled and its proper operation was checked.

7.11.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

7.11.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

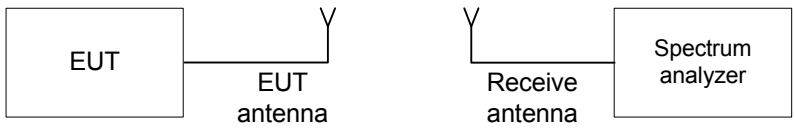
7.11.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

7.11.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.11.2 and associated plots and referenced to the highest emission level measured within the authorized band.

7.11.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

7.11.2.7 The above procedure was repeated with the frequency hopping function enabled.

Figure 7.11.1 Band edge emission test setup



Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK			

Table 7.11.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE:	2400-2483.5 MHz
DETECTOR USED:	Peak
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
BIT RATE:	0.925 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
RESOLUTION BANDWIDTH:	≥ 1% of the span
VIDEO BANDWIDTH:	≥ RBW

At low carrier frequency

FHSS	Band edge emission, dB(μV/m)	Emission at carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
disabled	67.25	109.9	-42.65	20.0	-22.65	Pass
enabled	68.05		-41.85		-21.85	

At high carrier frequency

FHSS	Peak field strength(VBW=3 MHz)			Average field strength(VBW>10 Hz)			Verdict
	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB	
disabled	67.32	74	-6.68	46.49	54	-7.51	Pass
enabled	68.94	74	-5.06	48.71	54	-5.29	

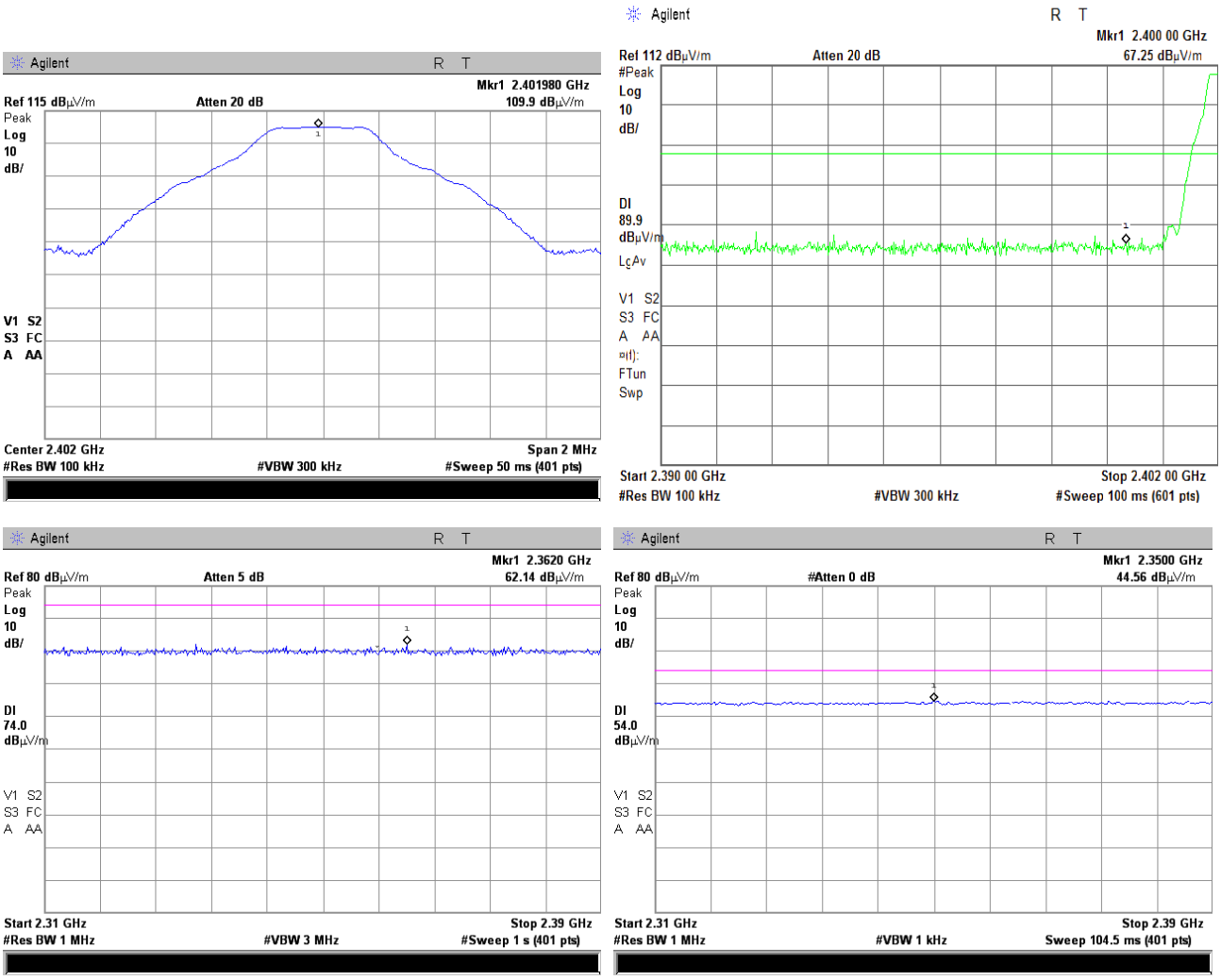
Reference numbers of test equipment used

HL 1984	HL 2780	HL 3818	HL 4353	HL 5101			

Full description is given in Appendix A.

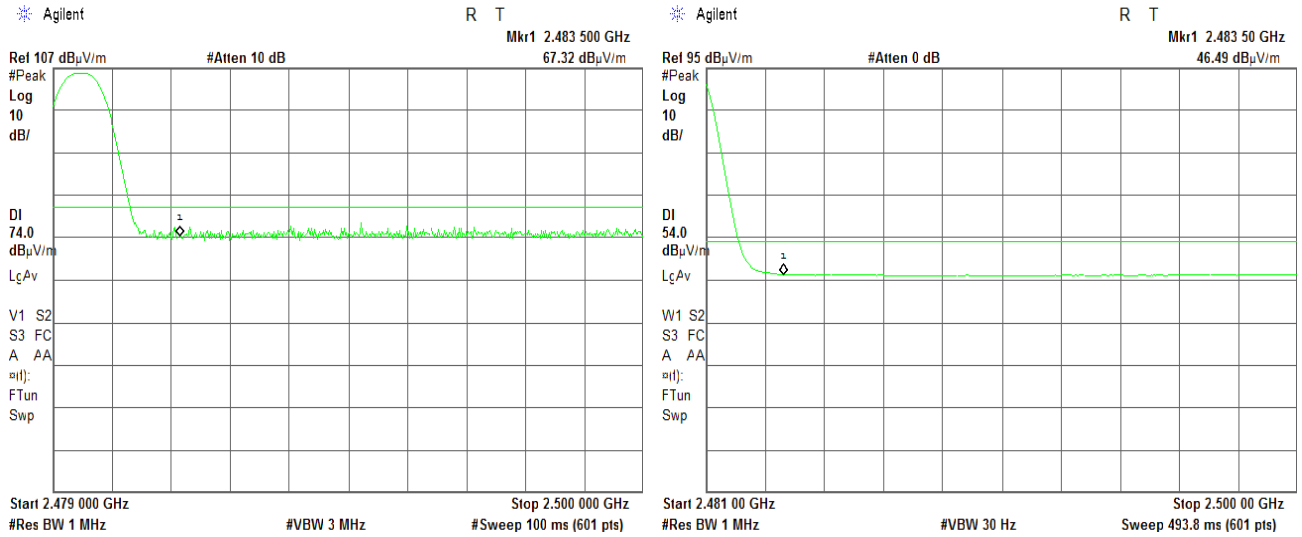
Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK			

Plot 7.11.1 The highest band edge emission at low carrier frequency with hopping function disabled



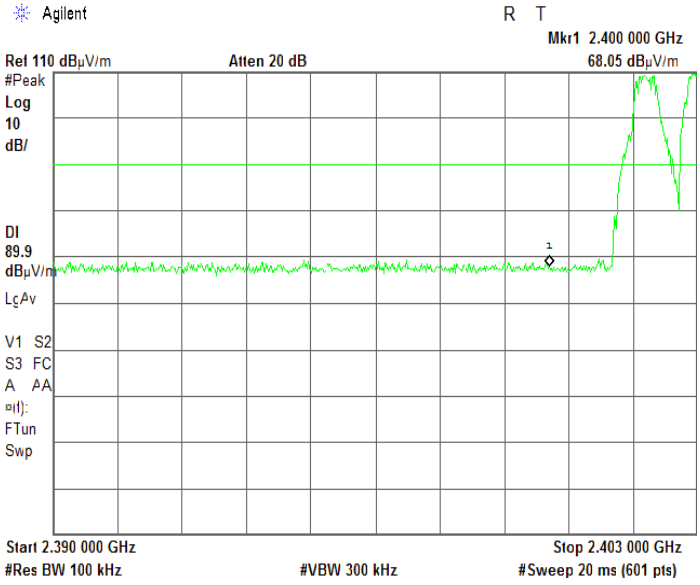
Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK			

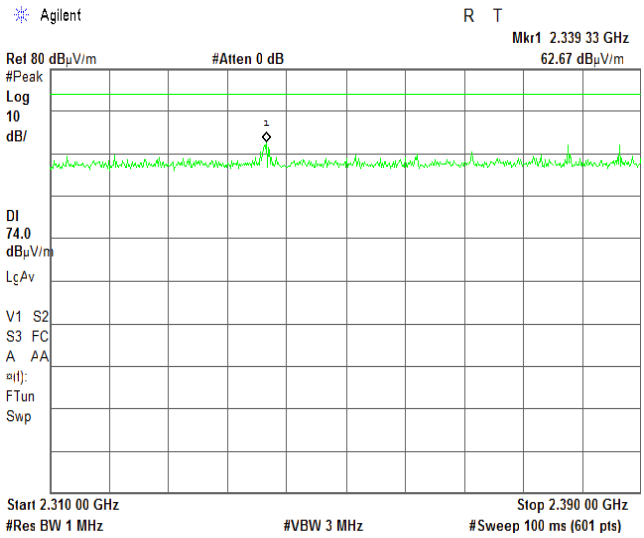
Plot 7.11.2 The highest band edge emission at high carrier frequency with hopping function disabled

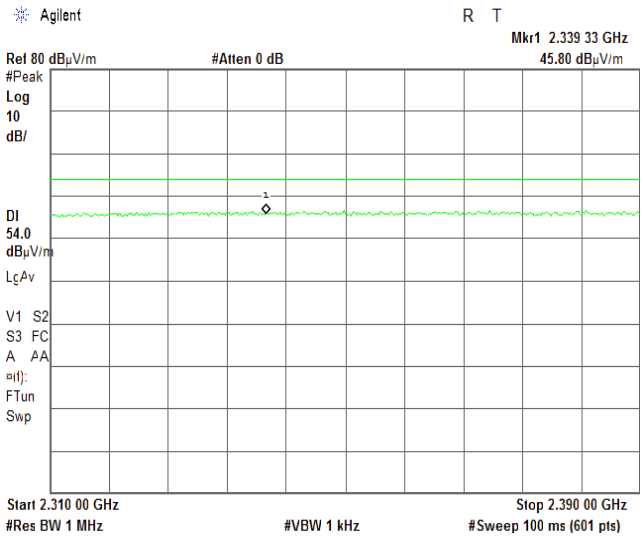


Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK			

Plot 7.11.3 The highest band edge emission at low carrier frequency with hopping function enabled

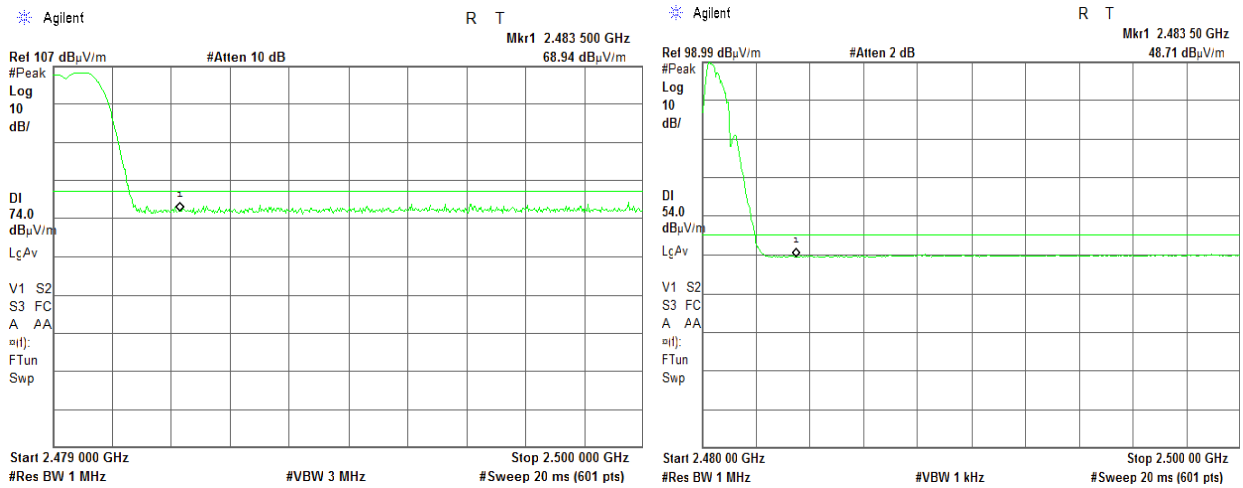






Test specification:	Section 15.247(d), Emissions at band edges		
Test procedure:	ANSI C63.10, section 7.8.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 40 %	Air Pressure: 1005 hPa	Power: 120 VAC
Remarks: GFSK			

Plot 7.11.4 The highest band edge emission at high carrier frequency with hopping function enabled



Test specification:	Section 15.203, Antenna requirements		
Test procedure:	Visual inspection		
Test mode:	Compliance	Verdict:	PASS
Date(s):	25-Oct-16		
Temperature: 23 ºC	Relative Humidity: 44 %	Air Pressure: 1013 hPa	Power: 120 VAC
Remarks:			

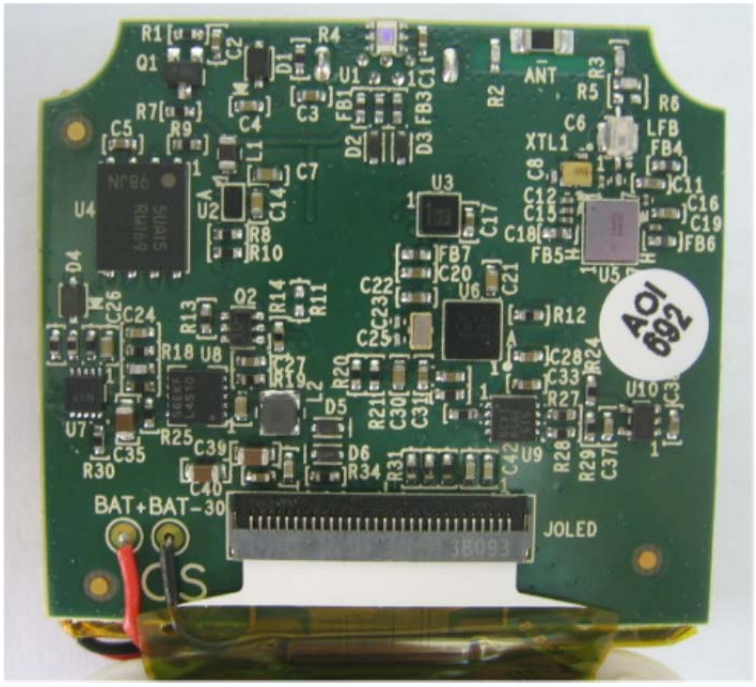
7.12 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.12.1.

Table 7.12.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Photograph 7.12.1 Antenna assembly



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16		
Temperature: 24 ºC	Relative Humidity: 47 %	Air Pressure: 1012 hPa	Power: 120 VAC
Remarks:			

7.13 Conducted emissions

7.13.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.13.1.

Table 7.13.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* The limit decreases linearly with the logarithm of frequency.

7.13.2 Test procedure

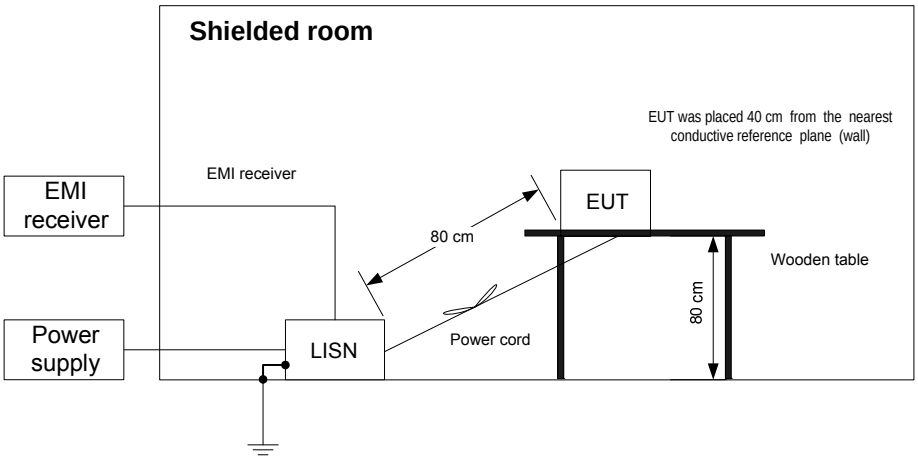
7.13.2.1 The EUT was set up as shown in Figure 7.13.1 and associated photographs, energized and the performance check was conducted.

7.13.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.13.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

7.13.2.3 The position of the device cables was varied to determine maximum emission level.

7.13.2.4 The worst test results (the lowest margins) were recorded in Table 7.13.2 and shown in the associated plots.

Figure 7.13.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC
Remarks:			

Table 7.13.2 Conducted emission test results

LINE: AC mains
EUT OPERATING MODE: Transmit
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.151588	47.60	42.44	65.92	-23.48	26.98	55.92	-28.94	L1	Pass
0.193520	43.37	40.28	63.90	-23.62	26.35	53.90	-27.55		
0.207325	41.66	38.97	63.37	-24.40	24.99	53.37	-28.38		
0.240630	39.18	35.77	62.09	-26.32	21.84	52.09	-30.25		
0.274965	36.22	32.58	61.03	-28.45	20.13	51.03	-30.90		
0.327515	30.87	27.28	59.56	-32.28	18.12	49.56	-31.44		
0.155040	45.67	40.90	65.75	-24.85	25.98	55.75	-29.77	L2	Pass
0.181730	41.73	37.59	64.45	-26.86	23.45	54.45	-31.00		
0.199170	39.50	35.81	63.69	-27.88	22.42	53.69	-31.27		
0.237980	35.87	32.27	62.19	-29.92	19.36	52.19	-32.83		
0.296285	31.17	27.14	60.39	-33.25	17.00	50.39	-33.39		
11.715380	23.00	19.81	60.00	-40.19	16.97	50.00	-33.03		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

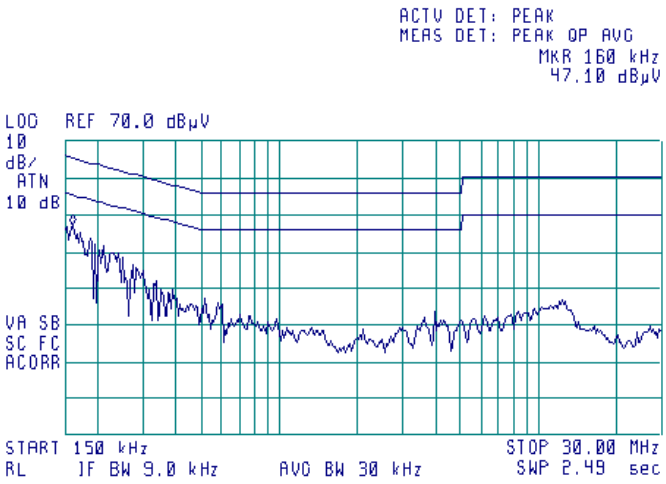
HL 0447	HL 0787	HL 1513	HL 3612	HL 4778			

Full description is given in Appendix A.

Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16		
Temperature: 24 ºC	Relative Humidity: 47 %	Air Pressure: 1012 hPa	Power: 120 VAC
Remarks:			

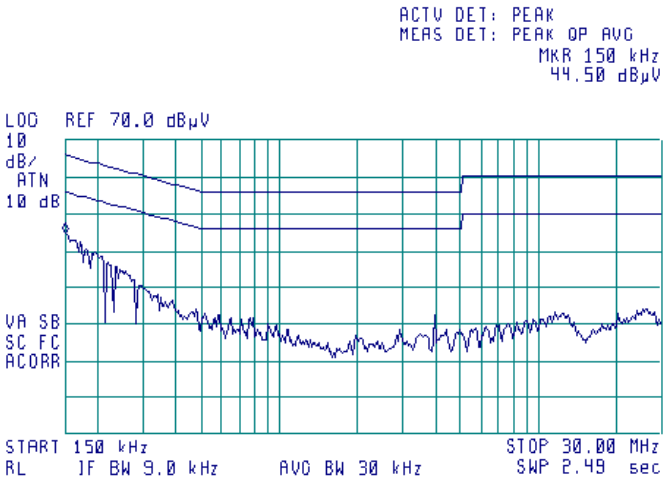
Plot 7.13.1 Conducted emission measurements

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.13.2 Conducted emission measurements

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 7.3 and 12.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16		
Temperature: 24 ºC	Relative Humidity: 47 %	Air Pressure: 1012 hPa	Power: 120 VAC
Remarks:			

8 Emission tests according to 47CFR part 15 subpart B requirements

8.1 Conducted emissions

8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μV)		Class A limit, dB(μV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

* The limit decreases linearly with the logarithm of frequency.

8.1.2 Test procedure

8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.

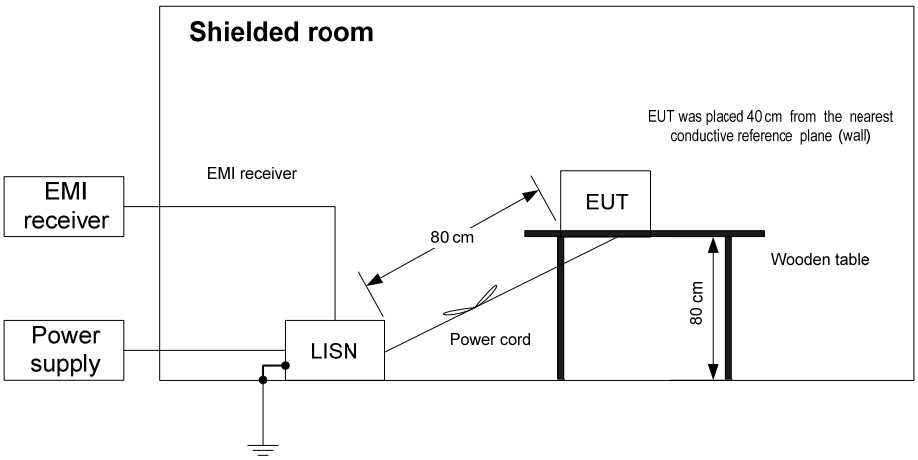
8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 8.1.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

8.1.2.3 The position of the device cables was varied to determine maximum emission level.

8.1.2.4 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 7.3 and 12.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16		
Temperature: 24 ºC	Relative Humidity: 47 %	Air Pressure: 1012 hPa	Power: 120 VAC
Remarks:			

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment



Photograph 8.1.1 Setup for conducted emission measurements

Test specification:	**Section 15.107, Conducted emission at AC power port**		
Test procedure:	ANSI C63.4, Sections 7.3 and 12.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC
Remarks:			

Table 8.1.2 Conducted emission test results

LINE: AC mains
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.151588	47.60	42.44	65.92	-23.48	26.98	55.92	-28.94	L1	Pass
0.193520	43.37	40.28	63.90	-23.62	26.35	53.90	-27.55		
0.207325	41.66	38.97	63.37	-24.40	24.99	53.37	-28.38		
0.240630	39.18	35.77	62.09	-26.32	21.84	52.09	-30.25		
0.274965	36.22	32.58	61.03	-28.45	20.13	51.03	-30.90		
0.327515	30.87	27.28	59.56	-32.28	18.12	49.56	-31.44		
0.155040	45.67	40.90	65.75	-24.85	25.98	55.75	-29.77	L2	Pass
0.181730	41.73	37.59	64.45	-26.86	23.45	54.45	-31.00		
0.199170	39.50	35.81	63.69	-27.88	22.42	53.69	-31.27		
0.237980	35.87	32.27	62.19	-29.92	19.36	52.19	-32.83		
0.296285	31.17	27.14	60.39	-33.25	17.00	50.39	-33.39		
11.715380	23.00	19.81	60.00	-40.19	16.97	50.00	-33.03		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

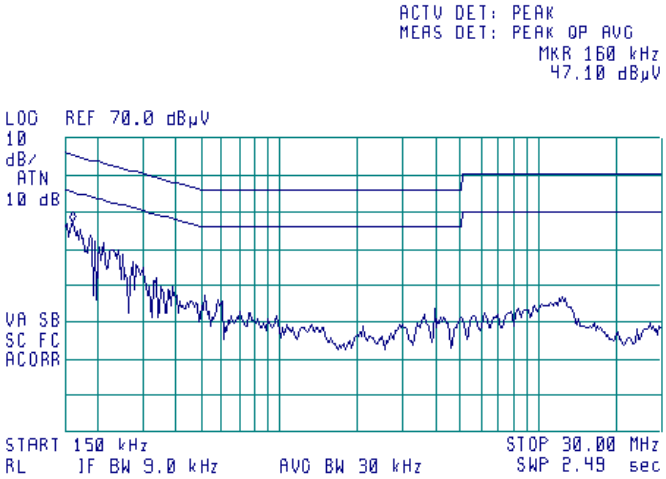
HL 0447	HL 0787	HL 1513	HL 3612	HL 4778			

Full description is given in Appendix A.

Test specification:	Section 15.107, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 7.3 and 12.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Oct-16		
Temperature: 24 ºC	Relative Humidity: 47 %	Air Pressure: 1012 hPa	Power: 120 VAC
Remarks:			

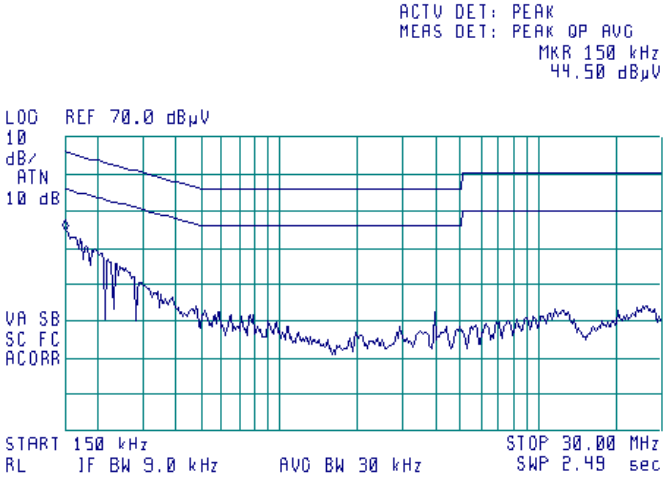
Plot 8.1.1 Conducted emission measurements

LINE:	L1
LIMIT:	Class B
EUT OPERATING MODE:	Receive / Stand-by
LIMIT:	QUASI-PEAK, AVERAGE
DETECTOR:	PEAK



Plot 8.1.2 Conducted emission measurements

LINE:	L2
LIMIT:	Class B
EUT OPERATING MODE:	Receive / Stand-by
LIMIT:	QUASI-PEAK, AVERAGE
DETECTOR:	PEAK



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC
Remarks:			

8.2 Radiated emission measurements

8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1.

Table 8.2.1 Radiated emission test limits

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
Above 960	43.5*	54.0	49.5	60.0*

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

8.2.2 Test procedure

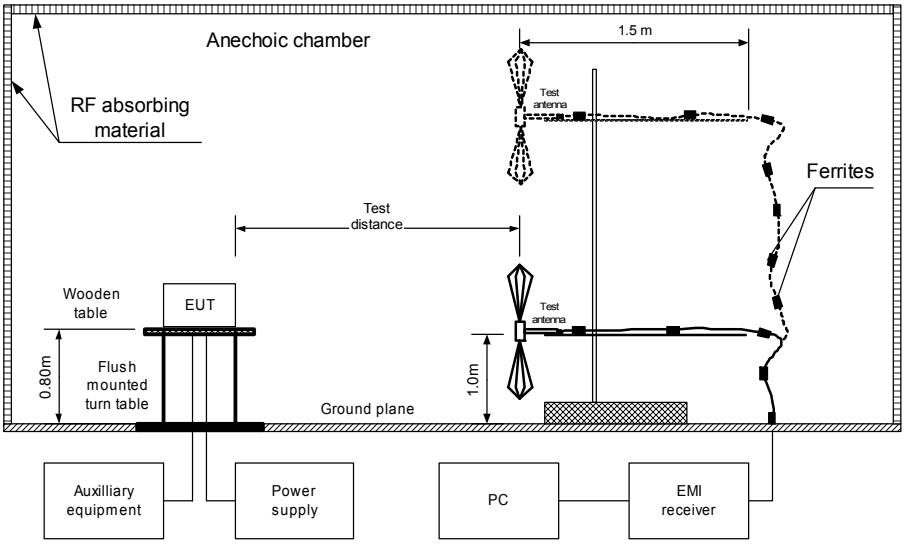
8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and associated photograph/s, energized and the performance check was conducted.

8.2.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

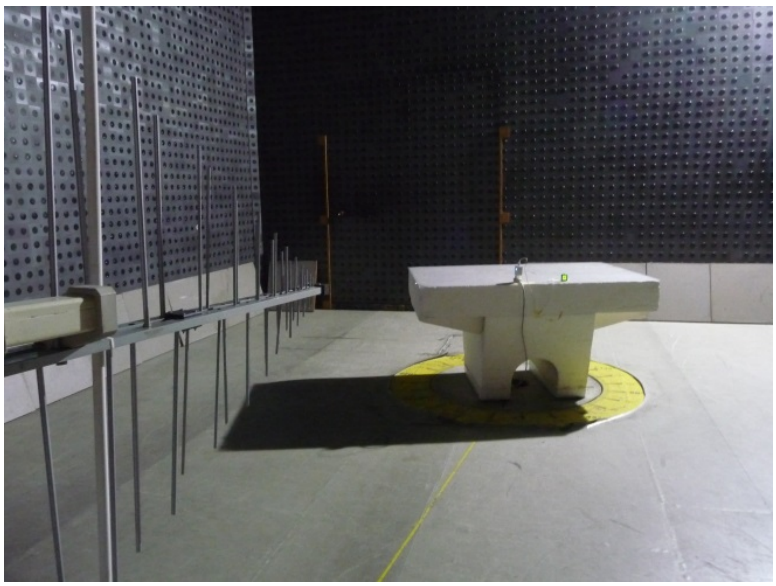
8.2.2.3 The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks:			

Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



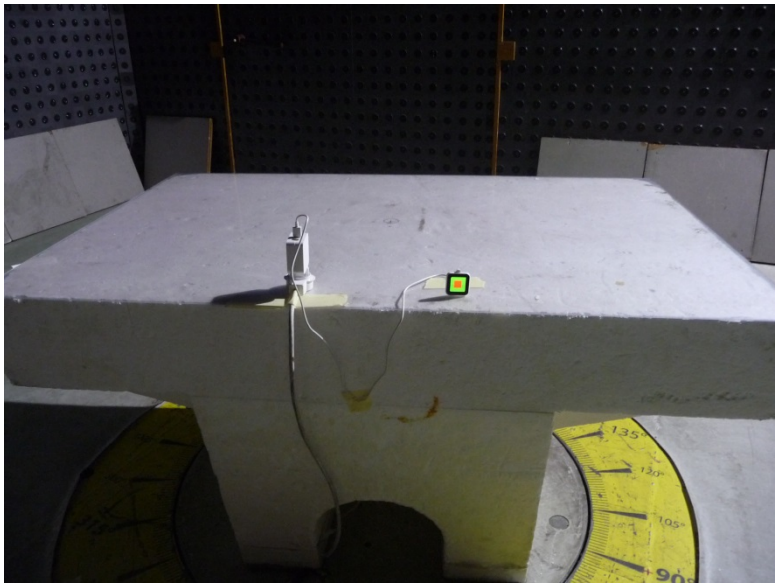
Photograph 8.2.1 Setup for radiated emission measurements



Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks:			

Photograph 8.2.2 Setup for radiated emission measurements

Photograph 8.2.3 Setup for radiated emission measurements, EUT cabling



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Receive / Stand-by
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
71.1	28.8	24.5	40.0	15.5	Vertical	1.0	0	Pass
111.9	38.5	31.4	43.5	12.1	Vertical	1.0	0	
179.5	28.9	23.0	43.5	20.5	Vertical	1.0	0	

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 12500 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No signals were found										Pass

*****- Margin = Measured emission - specification limit.
******- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

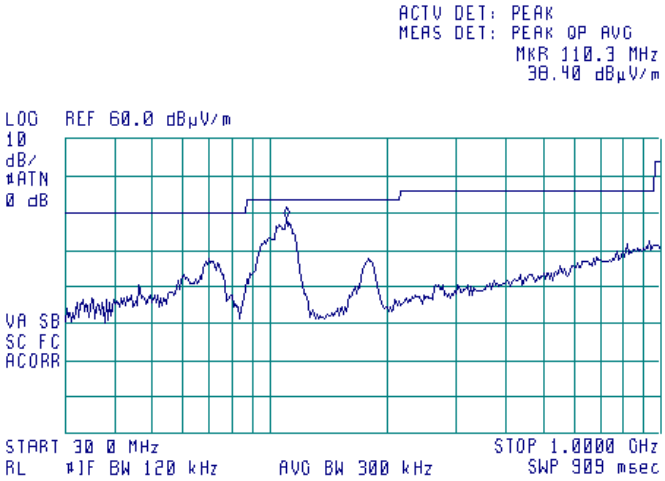
HL 0521	HL 0604	HL 3818	HL 4353	HL 4933	HL 5101		

Full description is given in Appendix A.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks:			

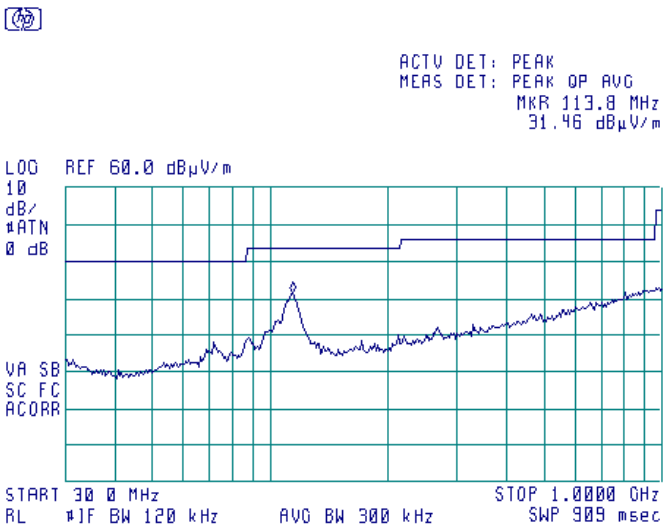
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



Plot 8.2.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

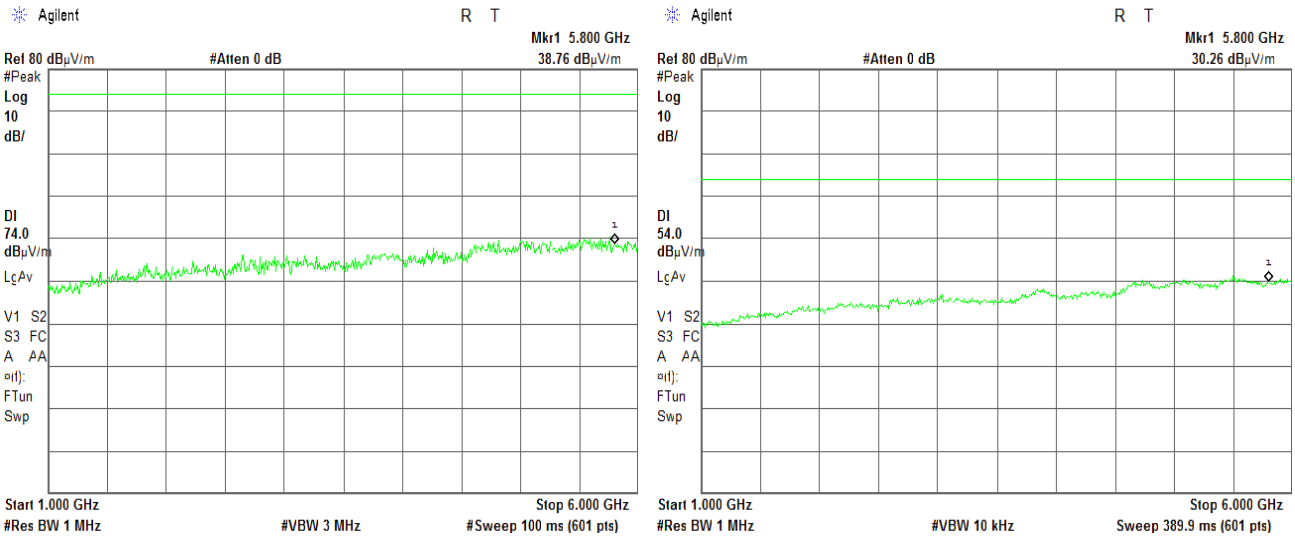
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Oct-16 - 10-Oct-16		
Temperature: 24 ºC	Relative Humidity: 49 %	Air Pressure: 1008 hPa	Power: 120 VAC
Remarks:			

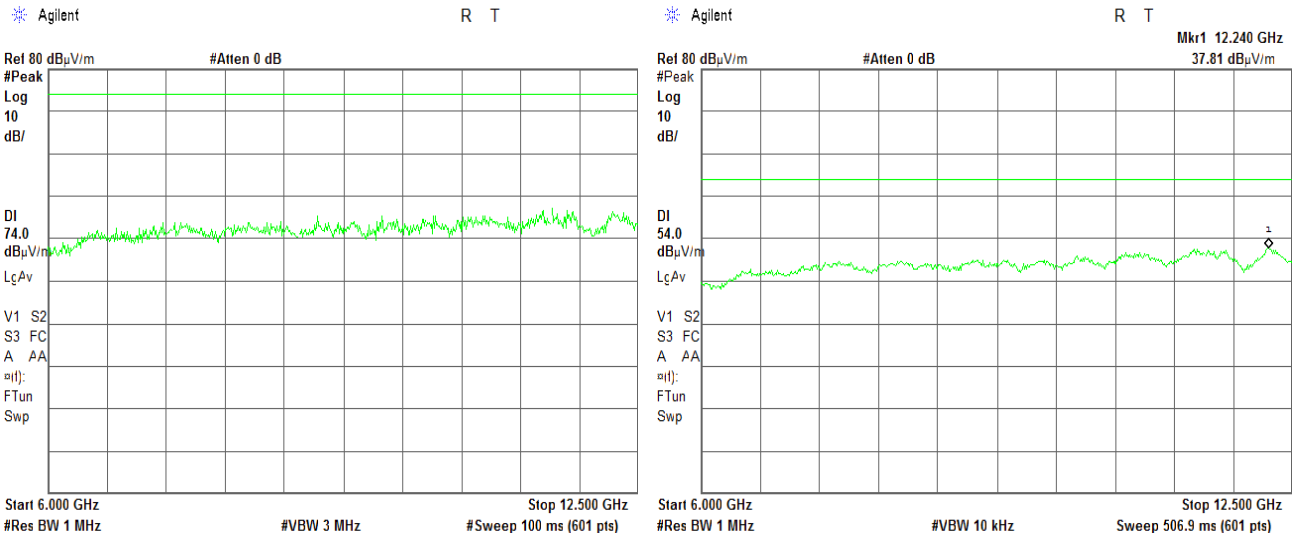
Plot 8.2.3 Radiated emission measurements in 1-6 GHz range, vertical & horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



Plot 8.2.4 Radiated emission measurements in 6-12.5 GHz range, vertical & horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	18-Jan-16	18-Jan-17
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	01-Nov-16	01-Nov-17
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	27-Oct-16	27-Oct-17
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-May-16	10-May-17
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	26-Oct-16	26-Oct-17
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	20-Sep-16	20-Sep-17
1984	Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz, 300 W	EMC Test Systems	3115	9911-5964	28-Mar-16	28-Mar-17
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	08-Sep-16	08-Nov-17
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	07-Dec-15	07-Dec-16
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	03-May-16	03-May-17
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	15-Feb-16	15-Feb-17
4338	Reject Band Filter, 50 Ohm, 0 to 2170 and 3000 to 18000 MHz,SMA-FM / SMA-M	Micro-Tronics	BRM 50702-02	023	08-May-16	08-May-17
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	15-Mar-16	15-Mar-17
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00 262, 3427A001 23	31-Oct-16	31-Oct-17
4933	Active Horn Antenna, 1 GHz to 18 GHz	Com-Power Corporation	AHA-118	701046	14-Oct-16	14-Oct-17
4956	Active horn antenna, 18 to 40 GHz	Com-Power Corporation	AHA-840	105004	09-Nov-16	09-Nov-17
5101	RF cable, 18 GHz, 6 m, N-type	Huber-Suhner	SF106A/1 1N/11N/6 000MM	500847/6A	26-Jul-16	26-Jul-17
5111	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/ 11SK/11S K/5500M M	502493/2E A	26-Jul-16	26-Jul-17

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB 12.4 GHz to 40 GHz: ± 2.3 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

11 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.
Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-869 for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports). The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

FCC 47CFR part 15: 2015	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

13 APPENDIX E Test equipment correction factors

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/m).

Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
26	7.8	580	20.6	1320	27.8
28	7.8	600	21.3	1340	28.3
30	7.8	620	21.5	1360	28.2
40	7.2	640	21.2	1380	27.9
60	7.1	660	21.4	1400	27.9
70	8.5	680	21.9	1420	27.9
80	9.4	700	22.2	1440	27.8
90	9.8	720	22.2	1460	27.8
100	9.7	740	22.1	1480	28.0
110	9.3	760	22.3	1500	28.5
120	8.8	780	22.6	1520	28.9
130	8.7	800	22.7	1540	29.6
140	9.2	820	22.9	1560	29.8
150	9.8	840	23.1	1580	29.6
160	10.2	860	23.4	1600	29.5
170	10.4	880	23.8	1620	29.3
180	10.4	900	24.1	1640	29.2
190	10.3	920	24.1	1660	29.4
200	10.6	940	24.0	1680	29.6
220	11.6	960	24.1	1700	29.8
240	12.4	980	24.5	1720	30.3
260	12.8	1000	24.9	1740	30.8
280	13.7	1020	25.0	1760	31.1
300	14.7	1040	25.2	1780	31.0
320	15.2	1060	25.4	1800	30.9
340	15.4	1080	25.6	1820	30.7
360	16.1	1100	25.7	1840	30.6
380	16.4	1120	26.0	1860	30.6
400	16.6	1140	26.4	1880	30.6
420	16.7	1160	27.0	1900	30.6
440	17.0	1180	27.0	1920	30.7
460	17.7	1200	26.7	1940	30.9
480	18.1	1220	26.5	1960	31.2
500	18.5	1240	26.5	1980	31.6
520	19.1	1260	26.5	2000	32.0
540	19.5	1280	26.6		
560	19.8	1300	27.0		

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/m).

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/m).

Antenna factor, HL 4933

COM-POWER CORPORATION

Active Horn Antenna Factor Calibration

1 GHz to 18 GHz

Equipment:	**ACTIVE HORN ANTENNA**
Model:	**AHA-118**
Serial Number:	**701046**
Calibration Distance:	**3 Meter**
Polarization:	**Horizontal**
Calibration Date:	**11/12/2014**

Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)	Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)
1	40.96	-16.47	10	40.94	-1.97
1.5	41.21	-14.53	10.5	40.63	-1.06
2	41.44	-13.30	11	40.74	-1.50
2.5	41.71	-12.87	11.5	40.65	-0.52
3	41.96	-12.26	12	40.76	-0.15
3.5	42.14	-11.77	12.5	41.03	-0.85
4	42.13	-10.91	13	41.37	-0.81
4.5	41.79	-9.41	13.5	41.18	0.05
5	41.44	-7.54	14	40.98	0.36
5.5	40.91	-6.47	14.5	40.81	1.26
6	40.69	-5.48	15	40.65	0.25
6.5	40.64	-5.53	15.5	40.93	-1.05
7	40.76	-4.12	16	41.31	-1.44
7.5	40.94	-3.12	16.5	40.96	-0.80
8	40.68	-1.69	17	40.64	-0.02
8.5	40.08	-1.71	17.5	40.57	1.81
9	40.41	-1.86	18	40.08	3.63
9.5	41.21	-2.73			

Calibration according to ARP 958

Antenna Factor to be added to receiver reading:

Meter Reading (dBuV) + Antenna Factor (dB/m) = Corrected Reading (dBuV/m)

Antenna factor, HL 4956

COM-POWER CORPORATION

Active Horn Antenna Factor Calibration

18 GHz to 40 GHz

Equipment:	**ACTIVE HORN ANTENNA**
Model:	**AHA-840**
Serial Number:	**105004**
Calibration Distance:	**3 meter**
Polarization:	**Horizontal**
Calibration Date:	**1/26/2015**

Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)	Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)
18	38.83	-1.06	29.5	42.47	-5.33
18.5	39.34	-2.65	30	41.91	-4.86
19	39.71	-3.88	30.5	41.60	-4.64
19.5	39.87	-4.35	31	41.52	-4.60
20	39.98	-3.97	31.5	41.56	-4.79
20.5	40.42	-3.68	32	41.80	-5.21
21	41.12	-4.06	32.5	42.29	-5.54
21.5	41.74	-5.46	33	42.79	-5.63
22	42.14	-6.22	33.5	42.88	-5.38
22.5	42.35	-6.42	34	42.62	-4.76
23	42.50	-6.59	34.5	42.63	-4.84
23.5	42.65	-6.82	35	43.15	-5.13
24	42.81	-7.01	35.5	43.91	-5.83
24.5	42.86	-7.37	36	44.59	-6.39
25	42.73	-7.53	36.5	45.04	-6.64
25.5	42.77	-7.45	37	45.08	-6.40
26	42.85	-7.21	37.5	44.82	-5.75
26.5	42.98	-7.17	38	44.16	-4.58
27	43.14	-7.22	38.5	42.90	-2.66
27.5	43.18	-7.32	39	42.39	-1.71
28	43.04	-7.10	39.5	43.76	-2.49
28.5	43.01	-6.73	40	45.98	-5.21

Calibration per ANSI C63.5: 2006

Standard Site Method, Equations 1-6 (3-antenna)

Corrected Reading (dBµV/m) = Meter Reading (dBµV) + AFE(dB/m)

Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories, HL 0447

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A
HL 3901

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	9500	4.29	21000	6.67
100	0.41	10000	4.40	22000	6.92
500	0.93	10500	4.52	23000	7.00
1000	1.33	11000	4.64	24000	7.18
1500	1.63	11500	4.76	25000	7.29
2000	1.90	12000	4.87	26000	7.55
2500	2.12	12500	4.99	27000	7.70
3000	2.33	13000	5.11	28000	7.88
3500	2.50	13500	5.20	29000	8.02
4000	2.67	14000	5.31	30000	8.15
4500	2.82	14500	5.42	31000	8.35
5000	2.99	15000	5.51	32000	8.40
5500	3.16	15500	5.58	33000	8.62
6000	3.32	16000	5.68	34000	8.73
6500	3.51	16500	5.78	35000	8.78
7000	3.65	17000	5.91	36000	8.94
7500	3.79	17500	5.99	37000	9.21
8000	3.92	18000	6.07	38000	9.37
8500	4.04	19000	6.36	39000	9.45
9000	4.18	20000	6.49	40000	9.52

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M, NC29-N1N1-244S/N 12025101 003,
HL 4353

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		

Cable loss
RF Cable, Huber-Suhner, 18 GHz, 6 m, N- type,
SF106A/11N/11N/6000MM, S/N 500847/6A
HL 5101

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	2.42
50	0.22	6000	2.53
100	0.31	6500	2.65
200	0.43	7000	2.76
300	0.53	7500	2.86
400	0.62	8000	2.96
500	0.69	8500	3.06
600	0.76	9000	3.16
700	0.82	9500	3.26
800	0.87	10000	3.35
900	0.93	10500	3.44
1000	0.98	11000	3.54
1100	1.03	11500	3.62
1200	1.08	12000	3.70
1300	1.12	12500	3.80
1400	1.17	13000	3.88
1500	1.21	13500	3.97
1600	1.25	14000	4.04
1700	1.29	14500	4.13
1800	1.33	15000	4.22
1900	1.37	15500	4.31
2000	1.41	16000	4.39
2500	1.59	16500	4.47
3000	1.75	17000	4.54
3500	1.90	17500	4.61
4000	2.04	18000	4.68
4500	2.17		
5000	2.30		

Cable loss
RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,
SF102EA/11SK/11SK/5500MM, S/N 502493/2EA
HL 5111

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
100	0.69	20500	10.18
200	0.97	21000	10.32
300	1.18	21500	10.47
500	1.52	22000	10.60
1000	2.14	22500	10.75
1500	2.62	23000	10.87
2000	3.03	23500	11.00
2500	3.40	24000	11.12
3000	3.73	24500	11.23
3500	4.04	25000	11.35
4000	4.33	25500	11.52
4500	4.60	26000	11.64
5000	4.86	26500	11.73
5500	5.10	27000	11.84
6000	5.34	27500	11.93
6500	5.57	28000	12.05
7000	5.79	28500	12.19
7500	6.00	29000	12.33
8000	6.21	29500	12.44
8500	6.43	30000	12.53
9000	6.62	30500	12.58
9500	6.82	31000	12.71
10000	7.01	31500	12.86
10500	7.17	32000	13.00
11000	7.34	32500	13.11
11500	7.51	33000	13.24
12000	7.68	33500	13.33
12500	7.84	34000	13.44
13000	8.00	34500	13.58
13500	8.16	35000	13.69
14000	8.32	35500	13.81
14500	8.48	36000	13.93
15000	8.63	36500	14.05
15500	8.77	37000	14.24
16000	8.92	37500	14.28
16500	9.08	38000	14.38
17000	9.23	38500	14.50
17500	9.37	39000	14.61
18000	9.51	39500	14.70
18500	9.66	40000	14.83
19000	9.78		
19500	9.92		
20000	10.07		

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF DOCUMENT