

TEST REPORT

**ACCORDING TO: FCC 47 CFR part 15 section 15.255 and subpart B;
RSS-210 issue 10 Annex J, RSS-Gen issue 5 with Am.1, ICES-003 Issue 7:2020**

FOR:

Siklu Communication Ltd.

**Terminal unit of point-to-multipoint high
BW system operating in 57-66 GHz**

Model: MH-T260-CNN-N-MWB

FCC ID: 2ACYESK-MH60TG-A4

IC:12353A-MH60TGA4

This report is in conformity with ISO/IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested.
This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

Table of contents

1	Applicant information	3
2	Equipment under test attributes	3
3	Manufacturer information	3
4	Test details	3
5	Tests summary	4
6	EUT description	5
6.1	General information	5
6.2	Ports and lines	5
6.3	Support and test equipment	5
6.4	Changes made in the EUT	5
6.5	Test configuration	6
6.6	Transmitter characteristics	7
7	Transmitter tests	8
7.1	Transmitter power test	8
7.2	Occupied bandwidth test	15
7.3	Field strength of emissions	20
7.4	Out of band radiated emissions above 40 GHz up to 200 GHz	31
7.5	Frequency stability test	65
7.6	Conducted emissions	68
7.7	Antenna requirements	72
8	Emission tests according to 47CFR part 15 subpart B requirements	73
8.1	Conducted emissions	73
8.2	Radiated emission measurements	78
9	APPENDIX A Test equipment and ancillaries used for tests	85
10	APPENDIX B Measurement uncertainties	87
11	APPENDIX C Test laboratory description	88
12	APPENDIX D Specification references	88
13	APPENDIX E Test equipment correction factors	89
14	APPENDIX F Abbreviations and acronyms	99

1 Applicant information

Client name: Siklu Communication Ltd.
Address: 43 Hasivim street, Petach-Tikva 49517, Israel
Telephone: +972 3921 4015
Fax: +972 3921 4162
E-mail: baruch@siklu.com
Contact name: Mr. Baruch Schwarz

2 Equipment under test attributes

Product name: Terminal unit of point-to-multipoint high BW system operating in 57-66 GHz
Product type: Transceiver
Model(s): MH-T260-CNN-N-MWB
Trademark: MultiHaul™
Serial number: FB06444487
Hardware version: A1
Software release: 1.1.1
Receipt date: 24-May-21

3 Manufacturer information

Manufacturer name: Siklu Communication Ltd.
Address: 43 Hasivim street, Petach-Tikva 49517, Israel
Telephone: +972 3921 4015
Fax: +972 3921 4162
E-Mail: baruch@siklu.com
Contact name: Mr. Baruch Schwarz

4 Test details

Project ID: 42910
Location: Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started: 24-May-21
Test completed: 07-Jun-21
Test specification(s): FCC 47CFR part 15 subpart C sec. 15.255 and subpart B;
RSS-210 issue 10 Annex J, RSS-Gen issue 5 with Am.1, ICES-003 issue 7:2020

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.255(c)(1)(i),(e) / RSS-210 section J.2.2(b), J.4, Transmitter power and power spectral density	Pass
FCC section 15.215(c)/ RSS-210 section J.4(c), RSS-Gen, Section 6.7, Occupied bandwidth	Pass
FCC section 15.255(d)(2)/ RSS-210 section J.3, Radiated spurious emissions below 40 GHz	Pass
FCC section 15.255(d)(3)/ RSS-210 section J.3, Radiated emissions outside assigned band and above 40 GHz up to 200 GHz	Pass
FCC section 15.255(f)/ RSS-210 section J.6, Frequency stability	Pass
FCC Section 15.207(a)/ RSS-Gen, section 8.8, Conducted emission	Pass
FCC section 15.255(g)/ RSS-Gen, section 3.4, RF exposure	Pass, exhibit included in Application for certification
RSS-Gen section 7.3, Receiver spurious emission	Pass*
Unintentional emissions	
FCC section n 15.107/ICES-003, Section 3.2.1, Class B, Conducted emission	Pass
FCC section 15.109/ICES-003, Section 3.2.2, Class B, Radiated emission	Pass

*Note: tested during the transmitter radiated spurious emissions below 40 GHz.

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.

	Name and Title	Date	Signature
Tested by:	Mr.A. Morozov, test engineer	June 7, 2021	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	June 16, 2021	
Approved by:	Mr. S. Samokha, Technical Manager, EMC and Radio	December 20, 2021	

6 EUT description

Note: The following data in this clause is provided by the customer and represents his sole responsibility.

6.1 General information

The EUT is the Terminal Unit, model MH-T260-CNN-N-MWB. The unit operates in 57-66 GHz regulated V-band. It communicates to the MH-N366-CCP-PoE-MWB TG Distribution node using the TG protocol, acting as an end point in a fully meshed MultiHahul TG topology.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length, m
Power/Data	Power/Data	POE/DATA	RJ-45	1	Shielded	100

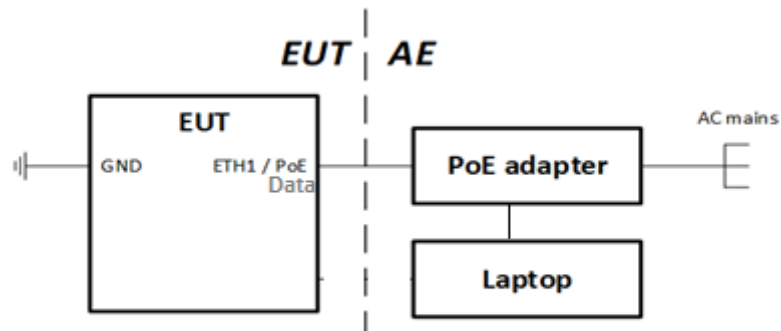
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	Lenovoc	X220	R9L080Z
PoE adapter	Power Dsine Microsemi	PD-9501GC/AC	C18466280000000058

6.4 Changes made in the EUT

No changes were performed in the EUT during testing.

6.5 Test configuration



6.6 Transmitter characteristics

Type of equipment						
☒	Stand-alone (Equipment with or without its own control provisions)					
☐	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				
☐	portable	May operate at a distance closer than 20 cm to human body				
Assigned frequency range		57.0 GHz – 66.0 GHz				
Operating frequency range		58320 -64800 MHz				
Test frequencies		58320 MHz, 62640 MHz, 64800 MHz				
Maximum rated output power		EIRP		41.30 dBm		
Is transmitter output power variable?		☒ No				
		☐ Yes	continuous variable			
			stepped variable with stepsize			dB
			minimum RF power			dBm
			maximum RF power			
Antenna connection						
unique coupling	standard connector	☒	Integral	with temporary RF connector		
				without temporary RF connector		
Antenna/s technical characteristics						
Type	Manufacturer	Model number		Gain		
Patch antenna array	Siklu	PCB267		22.5 dBi		
Transmitter 99% power bandwidth, MHz		Transmitter aggregate data rate/s, Mbps		Type of modulation		
2135.1		385		BPSK		
2082.2		4620		16QAM		
Type of multiplexing		TDD				
Transmitter power source						
☒	DC	Nominal rated voltage	Battery type			
		Nominal rated voltage	48 V via POE			
		Voltage range				
	AC mains	Nominal rated voltage	120 V	Frequency	60 Hz	
Common power source for transmitter and receiver			☒	yes	no	



Test specification: FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power			
Test procedure: 47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5			
Test mode: Compliance		Verdict: PASS	
Date(s): 30-May-21			
Temperature: 26 °C	Relative Humidity: 42 %	Air Pressure: 1010 hPa	Power: 48 VDC
Remarks:			

7 Transmitter tests

7.1 Transmitter power test

7.1.1 General

This test was performed to measure the peak output power. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Output power limits

Assigned frequency range, MHz	Maximum output power			
	Peak conducted output power		EIRP, dBm	
	mW	dBm	Peak	Average
57000 – 71000	500	27.0	43	40

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 adjusted to produce maximum available for end user RF output power.
- 7.1.2.3 The average and peak voltage was measured at the low and high frequency channels with oscilloscope connected to RF detector and provided in the associated plots.
- 7.1.2.4 The unmodulated signal was applied to Zero-Biased Detector via variable attenuator as shown in Figure 7.1.2.
- 7.1.2.5 The variable attenuator was adjusted such that the oscilloscope indicated a voltage equal to the peak voltage recorded in the step 7.1.2.3.
- 7.1.2.6 The variable attenuator was disconnected from the Zero-Biased Detector.
- 7.1.2.7 Without changing any settings, the variable attenuator was connected to a power meter as shown in Figure 7.1.3.
- 7.1.2.8 The power was measured and result was recorded in Table 7.1.2 and Table 7.1.3.
- 7.1.2.9 The steps 7.1.2.4 through 7.1.2.8 were repeated for the average voltage recorded in the step 7.1.2.3 and 7.1.2.4.

Test specification:		FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power	
Test procedure:		47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5	
Test mode:		Verdict: PASS	
Date(s):			
30-May-21			
Temperature: 26 °C	Relative Humidity: 42 %	Air Pressure: 1010 hPa	Power: 48 VDC
Remarks:			

Figure 7.1.1 Peak output power test setup

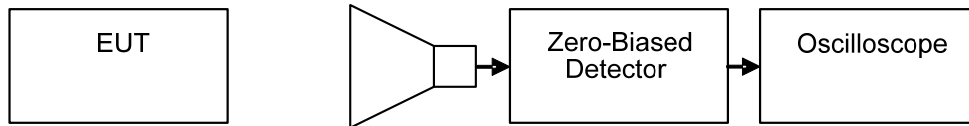


Figure 7.1.2 Peak output power test setup

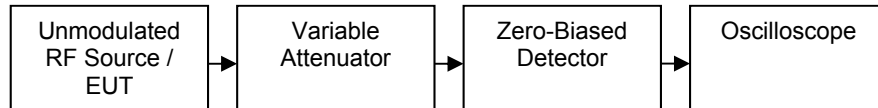
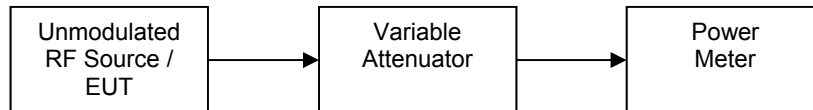


Figure 7.1.3 Peak output power test setup





Test specification: FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power			
Test procedure: 47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5			
Test mode:	Compliance	Verdict: PASS	
Date(s):	30-May-21		
Temperature: 26 °C	Relative Humidity: 42 %	Air Pressure: 1010 hPa	Power: 48 VDC
Remarks:			

Table 7.1.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 57.0 – 71.0 GHz
 DETECTOR USED: Peak
 MEASUREMENTS DISTANCE: 3 m
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 EUT ANTENNA GAIN: 22.5 dBi

MODULATION: BPSK
 EUT CONFIGURATION: MCS1
 DATA RATE: 385 Mbps

Frequency, MHz	λ^* , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	E_{meas}^{**} , dBuV/m	EIRP ^{***} , dBm	Limit, dBm	Margin ^{****} , dB	Verdict
58320	0.005144	2.07	-15.37	24.0	133.20	38.04	43.0	-4.95	Pass
62640	0.004789	3.61	-13.42	24.0	135.77	40.62	43.0	-2.38	Pass
64800	0.004630	3.61	-13.03	24.0	136.46	41.30	43.0	-1.70	Pass

Note: Max peak conducted power is 41.30 dBm – 22.5 dBi = 18.8 dBm, where 22.5 dBi is the antenna array gain

MODULATION: 16QAM
 EUT CONFIGURATION: MCS12
 DATA RATE: 4620 Mbps

Frequency, MHz	λ^* , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	E_{meas}^{**} , dBuV/m	EIRP ^{***} , dBm	Limit, dBm	Margin ^{****} , dB	Verdict
58320	0.005144	2.01	-15.51	24.0	133.06	37.91	43.0	-5.09	Pass
62640	0.004789	3.55	-13.60	24.0	135.59	40.44	43.0	-2.56	Pass
64800	0.004630	3.61	-13.03	24.0	136.46	41.30	43.0	-1.70	Pass

Note: Max peak conducted power is 41.30 dBm – 22.5 dBi = 18.8 dBm

* - $\lambda = 300/\text{Frequency(MHz)}$

** - $E_{\text{meas}} = 126.8 - 20\log(\lambda) + \text{Power measured} - \text{Measurement Antenna Gain (24 dBi)}$

*** - $\text{EIRP} = E_{\text{meas}} + 20\log(\text{Measurements distance}) - 104.7$

**** - $\text{Margin} = \text{EIRP} - \text{Limit}$



Test specification: FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power			
Test procedure: 47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5			
Test mode:	Compliance	Verdict: PASS	
Date(s):	30-May-21		
Temperature: 26 °C	Relative Humidity: 42 %	Air Pressure: 1010 hPa	Power: 48 VDC
Remarks:			

Table 7.1.3 Average output power test results

ASSIGNED FREQUENCY RANGE: 57.0 – 71.0 GHz
 DETECTOR USED: Peak
 MEASUREMENTS DISTANCE: 3 m
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 EUT ANTENNA GAIN: 22.5 dBi

MODULATION: BPSK
 EUT CONFIGURATION: MCS1
 DATA RATE: 385 Mbps

Frequency, MHz	λ^* , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	E_{meas}^{**} , dBuV/m	EIRP ^{***} , dBm	Limit, dBm	Margin ^{****} , dB	Verdict
58320	0.005144	0.99	-16.33	24.0	132.24	37.09	40.0	-2.91	Pass
62640	0.004789	2.63	-14.33	24.0	134.86	39.71	40.0	-0.29	Pass
64800	0.004630	2.62	-14.40	24.0	135.09	39.93	40.0	-0.07	Pass

MODULATION: 16QAM
 EUT CONFIGURATION: MCS12
 DATA RATE: 4620 Mbps

Frequency, MHz	λ^* , m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	E_{meas}^{**} , dBuV/m	EIRP ^{***} , dBm	Limit, dBm	Margin ^{****} , dB	Verdict
58320	0.005144	1.06	-16.20	24.0	132.37	37.22	40.0	-2.78	Pass
62640	0.004789	2.58	-14.23	24.0	134.96	39.81	40.0	-0.19	Pass
64800	0.004630	2.53	-14.40	24.0	135.09	39.93	40.0	-0.07	Pass

* - $\lambda = 300/\text{Frequency(MHz)}$

** - $E_{\text{meas}} = 126.8 - 20\log(\lambda) + \text{Power measured} - \text{Measurement Antenna Gain (24 dBi)}$

*** - $\text{EIRP} = E_{\text{meas}} + 20\log(\text{Measurements distance}) - 104.7$

**** - $\text{Margin} = \text{EIRP} - \text{Limit}$

Reference numbers of test equipment used

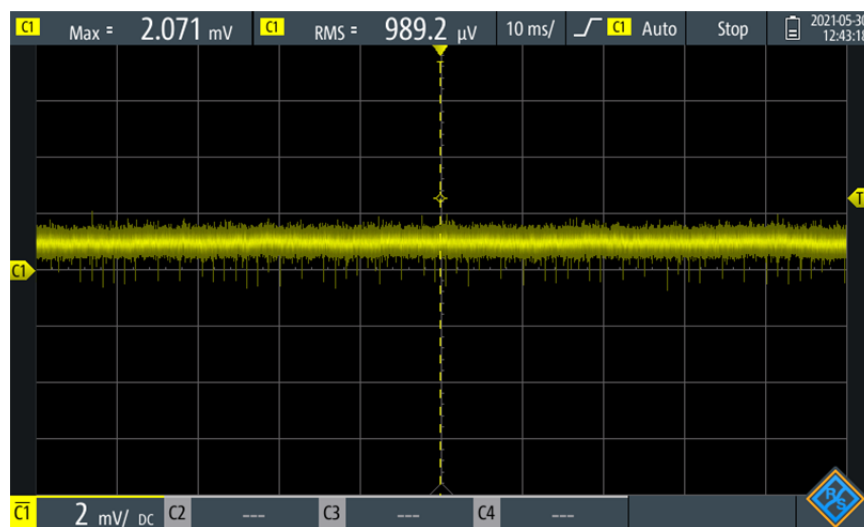
HL 0771	HL 3291	HL 3293	HL 4856	HL 5360	HL 5371	HL 5377	HL 5410
HL 5714							

Full description is given in Appendix A.

Test specification: FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power			
Test procedure: 47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5			
Test mode: Compliance	Verdict: PASS		
Date(s): 30-May-21			
Temperature: 26 °C	Relative Humidity: 42 %	Air Pressure: 1010 hPa	Power: 48 VDC
Remarks:			

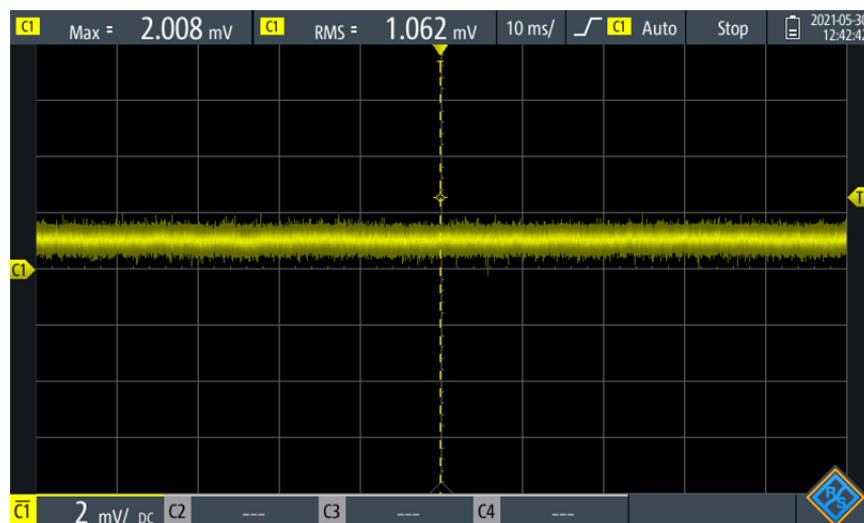
Plot 7.1.1 Output power test result at the 58.32 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	BPSK
EUT CONFIGURATION:	MCS1 385 Mbps



Plot 7.1.2 Output power test result at the 58.32 GHz frequency

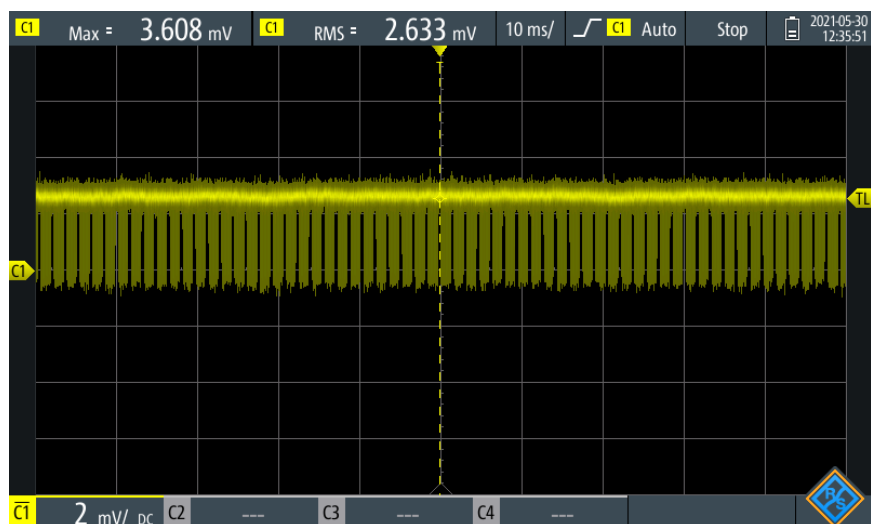
DETECTOR:	Peak/Average
MODULATION:	16QAM
EUT CONFIGURATION:	MCS12 4620 Mbps



Test specification: FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power			
Test procedure: 47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5			
Test mode: Compliance	Verdict: PASS		
Date(s): 30-May-21			
Temperature: 26 °C	Relative Humidity: 42 %	Air Pressure: 1010 hPa	Power: 48 VDC
Remarks:			

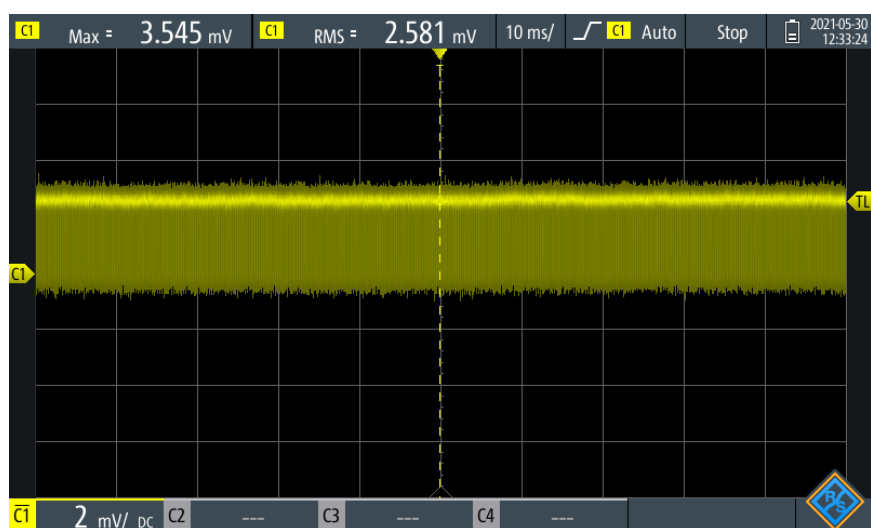
Plot 7.1.3 Output power test result at the 62.64 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	BPSK
EUT CONFIGURATION:	MCS1 385Mbps



Plot 7.1.4 Output power test result at the 62.64 GHz frequency

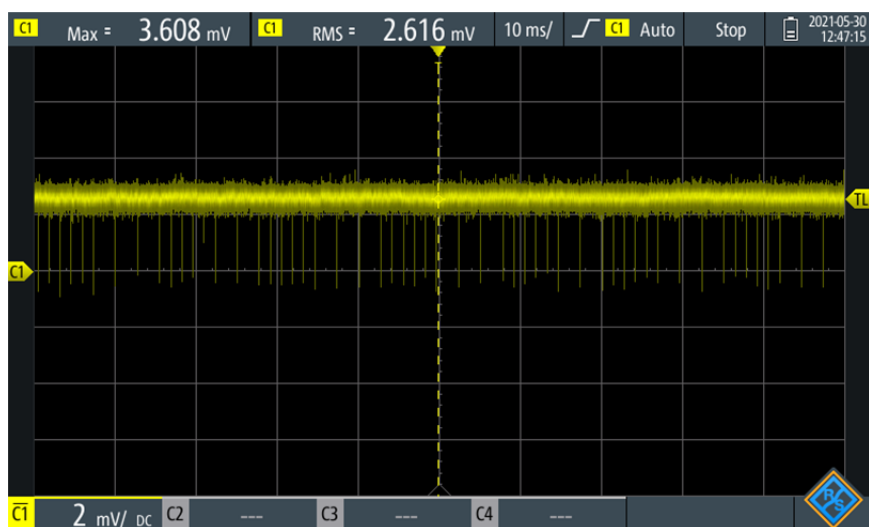
DETECTOR:	Peak/Average
MODULATION:	16QAM
EUT CONFIGURATION:	MCS12 4620Mbps



Test specification: FCC Section 15.255(c)(1)(i),(e), RSS-210 section J.2.2(b), J.4, Transmitter power			
Test procedure: 47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Sections 9.4, 9.5			
Test mode: Compliance	Verdict: PASS		
Date(s): 30-May-21			
Temperature: 26 °C	Relative Humidity: 42 %	Air Pressure: 1010 hPa	Power: 48 VDC
Remarks:			

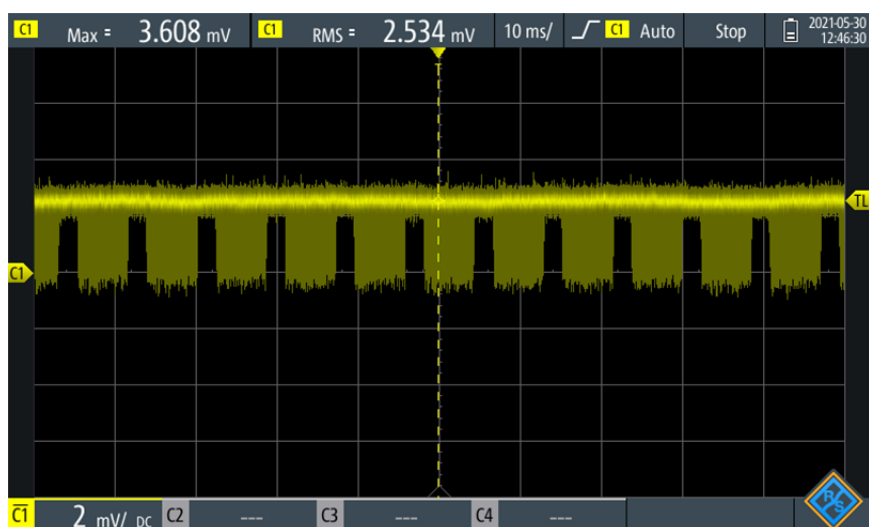
Plot 7.1.5 Output power test result at the 64.80 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	BPSK
EUT CONFIGURATION:	MCS1 385Mbps



Plot 7.1.6 Output power test result at the 64.80 GHz frequency

DETECTOR:	Peak/Average
MODULATION:	16QAM
EUT CONFIGURATION:	MCS12 4620Mbps



Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Verdict: PASS	
Date(s):			
01-Jun-21			
Temperature: 24 °C	Relative Humidity: 42 %	Air Pressure: 1007 hPa	Power: 48 VDC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency range, MHz	Modulation envelope reference points	
57000 - 71000	6 dBc	99%

NOTE: Modulation envelope reference points provided in terms of attenuation below unmodulated carrier.

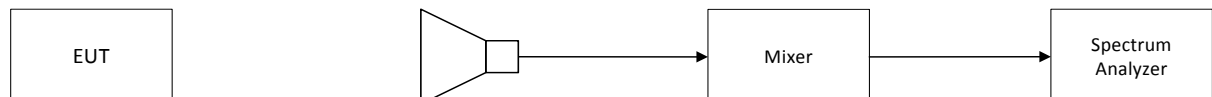
7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit modulated carrier as provided in Table 7.2.2.

7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope. The test results are provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup





Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Compliance	Verdict: PASS
Date(s):		01-Jun-21	
Temperature: 24 °C	Relative Humidity: 42 %	Air Pressure: 1007 hPa	Power: 48 VDC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

ASSIGNED FREQUENCY RANGE:

57000 –71000 MHz

DETECTOR USED:

Peak

Frequency, GHz	Occupied bandwidth 6 dBc, MHz	Occupied bandwidth 99%, MHz	Verdict
EUT configuration MCS1			
58.32	1497.0	2124.4	Pass
62.64	1766.0	2133.4	Pass
64.80	1765.0	2135.1	Pass
EUT configuration MCS12			
58.32	1485.0	1995.2	Pass
62.64	1659.0	2082.2	Pass
64.80	1411.0	2063.6	Pass

Reference numbers of test equipment used

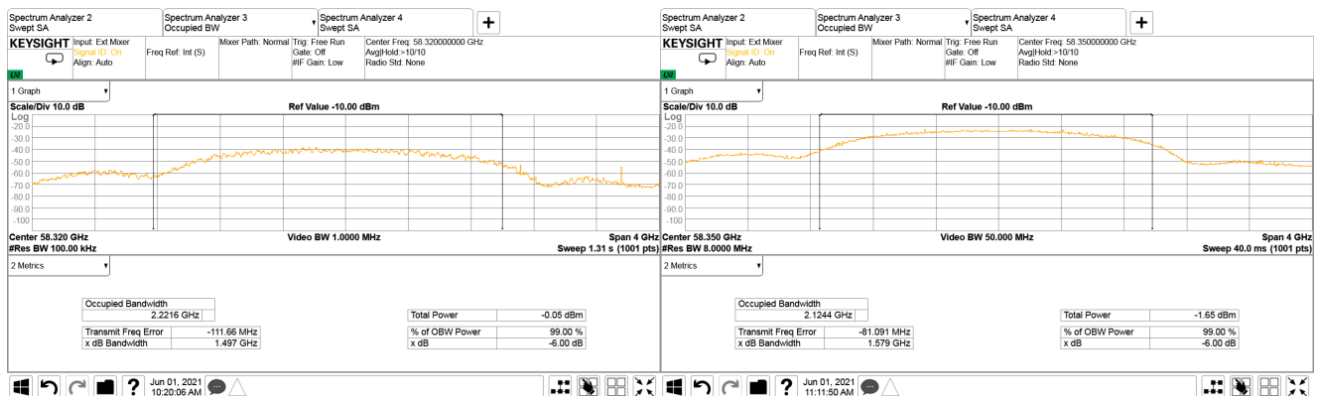
HL 0771	HL 3291	HL 5376	HL 5380				
---------	---------	---------	---------	--	--	--	--

Full description is given in Appendix A.

Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Compliance	Verdict: PASS
Date(s):		01-Jun-21	
Temperature: 24 °C	Relative Humidity: 42 %	Air Pressure: 1007 hPa	Power: 48 VDC
Remarks:			

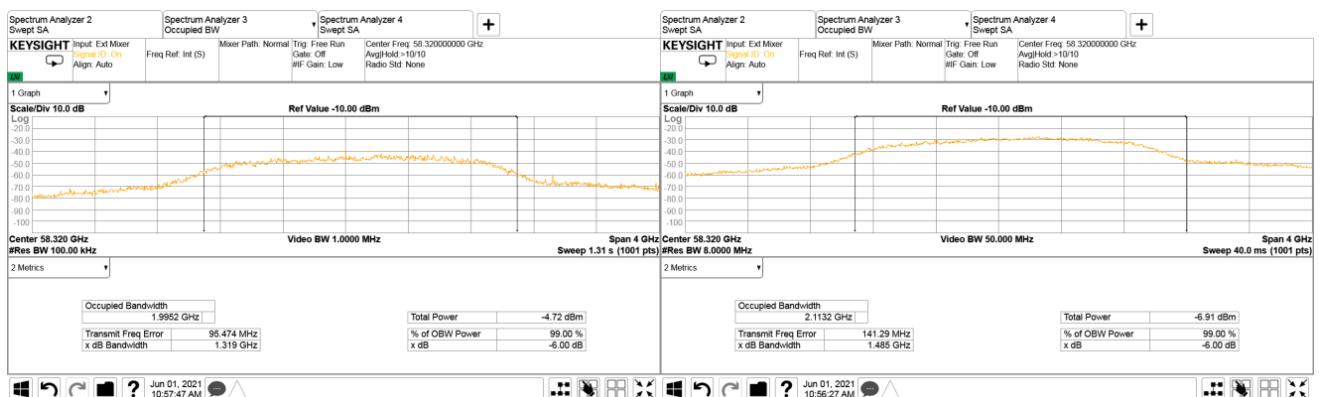
Plot 7.2.1 The 6dBc and 99% occupied bandwidth

FREQUENCY:	58.32 GHz
MODULATION:	BPSK
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
EUT CONFIGURATION:	MCS1



Plot 7.2.2 The 6dBc and 99% occupied bandwidth

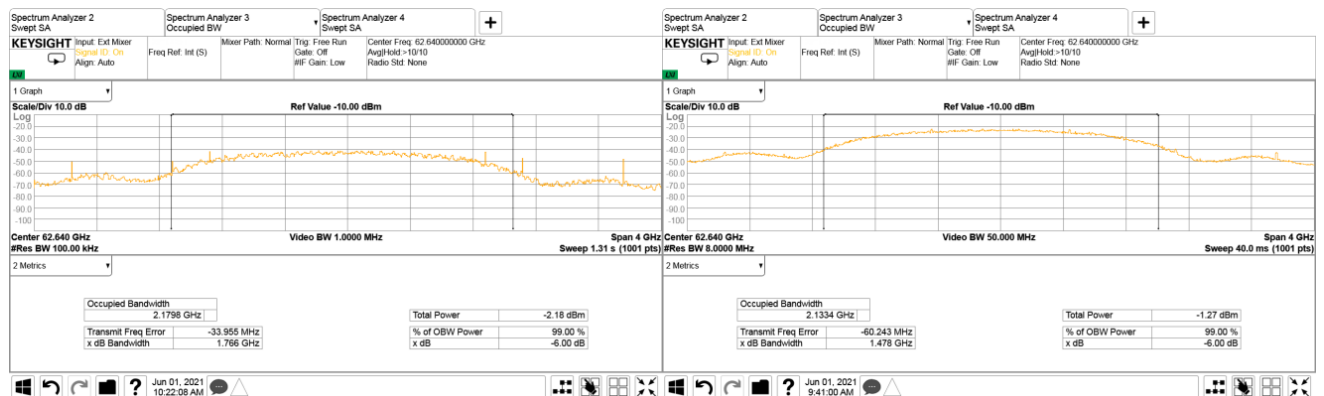
FREQUENCY:	58.32 GHz
MODULATION:	16QAM
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
EUT CONFIGURATION:	MCS12



Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Compliance	Verdict: PASS
Date(s):		01-Jun-21	
Temperature: 24 °C	Relative Humidity: 42 %	Air Pressure: 1007 hPa	Power: 48 VDC
Remarks:			

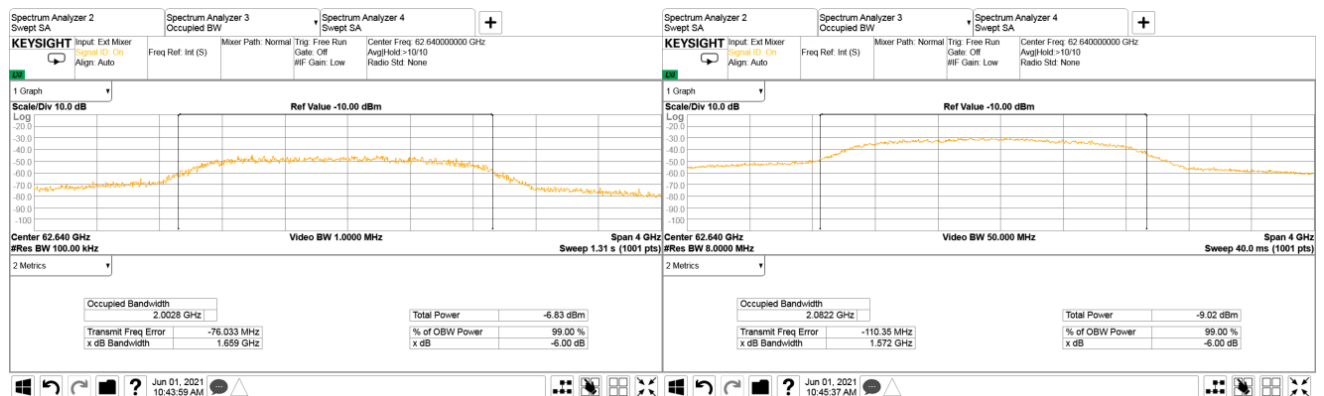
Plot 7.2.3 The 6dBc and 99% occupied bandwidth

FREQUENCY:	62.64 GHz
MODULATION:	BPSK
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
EUT CONFIGURATION:	MCS1



Plot 7.2.4 The 6dBc and 99% occupied bandwidth

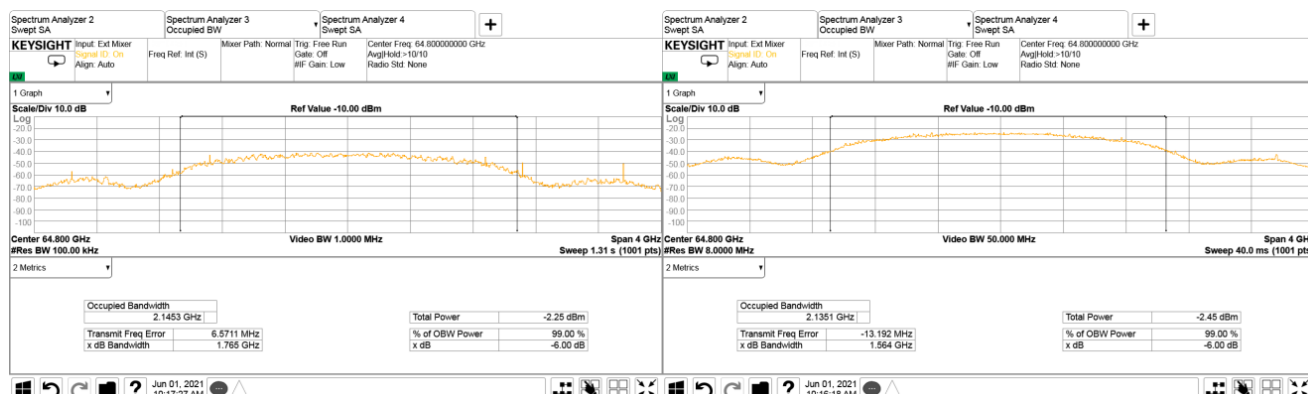
FREQUENCY:	62.64 GHz
MODULATION:	16QAM
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
EUT CONFIGURATION:	MCS12



Test specification:		FCC Section 15.215(c), RSS-210 section J.4(c), RSS-Gen section 6.7, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049, ANSI C63.10, Section 9.3	
Test mode:		Compliance	Verdict: PASS
Date(s):		01-Jun-21	
Temperature: 24 °C	Relative Humidity: 42 %	Air Pressure: 1007 hPa	Power: 48 VDC
Remarks:			

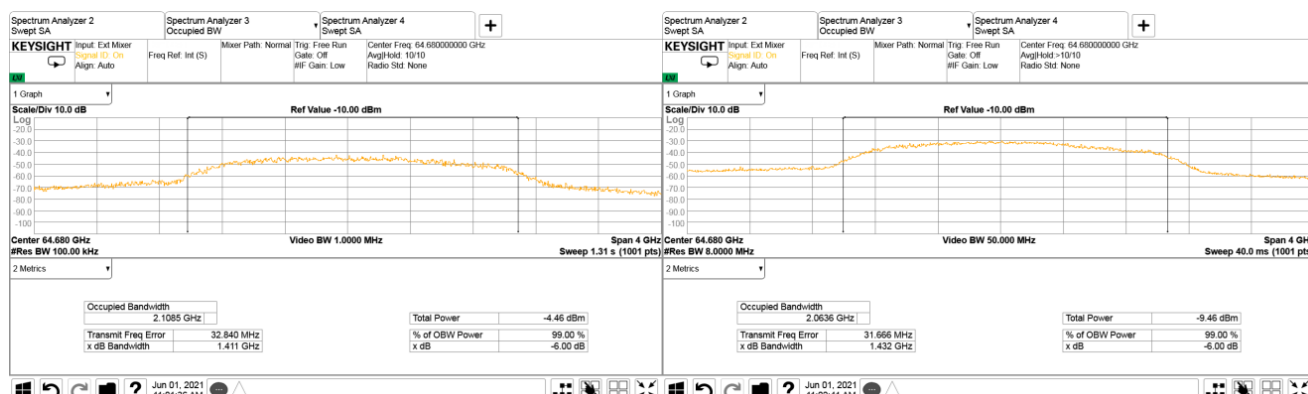
Plot 7.2.5 The 6dBc and 99% occupied bandwidth

FREQUENCY:	64.80 GHz
MODULATION:	BPSK
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
EUT CONFIGURATION:	MCS1



Plot 7.2.6 The 6dBc and 99% occupied bandwidth

FREQUENCY:	64.80 GHz
MODULATION:	16QAM
ENVELOPE POINT: 6 dBc	ENVELOPE POINT: 99%
EUT CONFIGURATION:	MCS12





Test specification: FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz			
Test procedure: 47 CFR, Section 2.1053; ANSI C63.10, Section 9.13			
Test mode: Compliance		Verdict: PASS	
Date(s): 02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

7.3 Field strength of emissions

7.3.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emissions limits

Frequency range, MHz	Field strength at 3 m, dB(μV/m)*		
	Within restricted bands		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
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 – 40000	74.0	NA	54.0

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

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log (S_1/S_2),$$

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

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

Note: The above 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 but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.

Test specification:		FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz	
Test procedure:		47 CFR, Section 2.1053; ANSI C63.10, Section 9.13	
Test mode:		Verdict: PASS	
Date(s):			
02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

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

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.

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

7.3.2.3 The worst test results (the lowest margins) were recorded in Table 7.3.3 and shown in the associated plots.

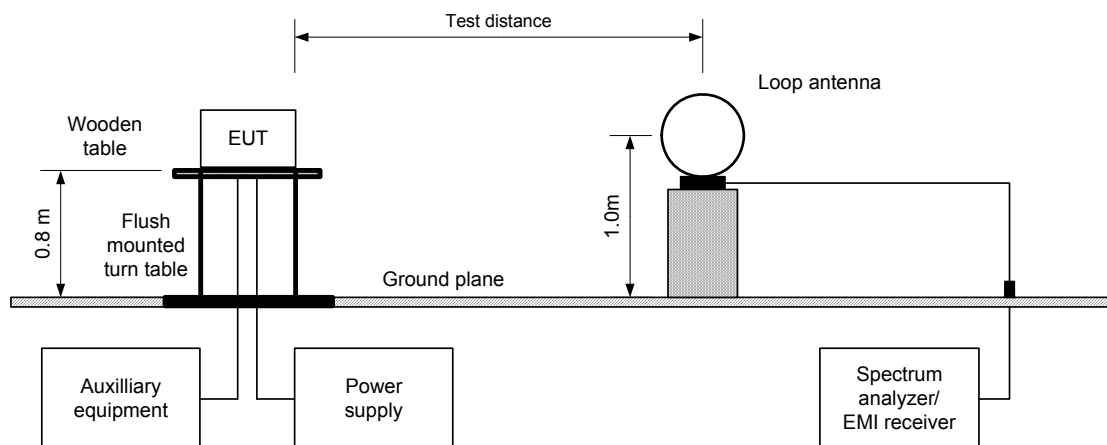
7.3.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.3.3.1 The EUT was set up as shown in Figure 7.3.2, Figure 7.3.3, energized and the performance check was conducted.

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

7.3.3.3 The worst test results (the lowest margins) were recorded in Table 7.3.2 and shown in the associated plots.

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz



Test specification:		FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz	
Test procedure:		47 CFR, Section 2.1053; ANSI C63.10, Section 9.13	
Test mode:		Verdict: PASS	
Date(s):			
02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

Figure 7.3.2 Setup for spurious emission field strength measurements in 30 – 1000 MHz

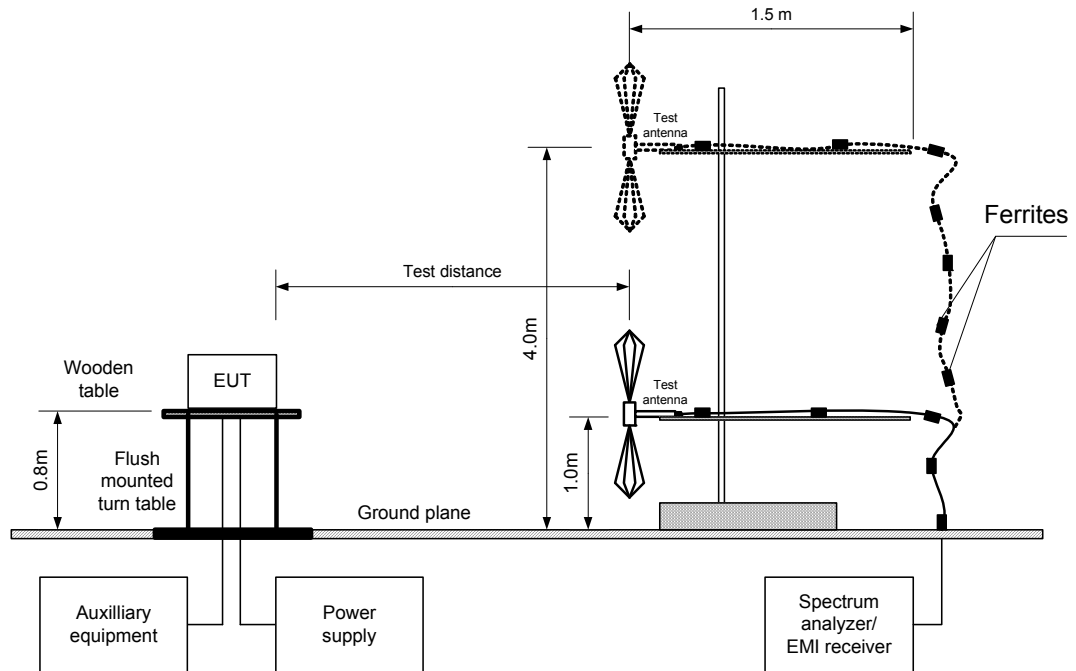
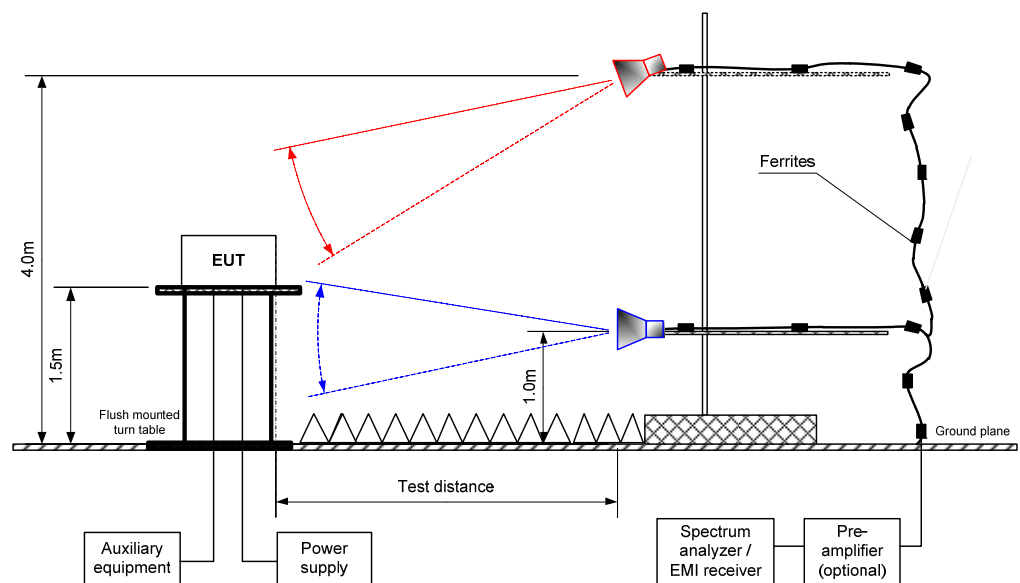


Figure 7.3.3 Setup for spurious emission field strength measurements above 1000 MHz



Test specification:		FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz	
Test procedure:		47 CFR, Section 2.1053; ANSI C63.10, Section 9.13	
Test mode:		Verdict: PASS	
Date(s):			
02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

Table 7.3.2 Field strength of spurious emissions at frequencies above 1 GHz

TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
MODULATION: 16QAM
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 1000 - 40000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1.0 MHz
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)

Double ridge guide (above 1000 MHz)												
F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Avr factor, dB	Average field strength			Verdict	
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		
Low frequency 58320 MHz												
2804.0	H	1.62	208	45.84	74.0	-28.16	NA	32.74	54.0	-21.26	Pass	
6250.7	V	1.00	205	46.56	74.0	-27.44	NA	40.64	54.0	-13.36		
7290.0	H	1.32	180	55.38	74.0	-18.62	NA	53.09	54.0	-0.91		
8099.8	H	1.32	204	50.36	74.0	-23.64	NA	45.24	54.0	-8.76		
8750.9	V	2.24	189	49.89	74.0	-24.11	NA	42.88	54.0	-11.12		
10063.3	V	1.93	168	50.30	74.0	-23.70	NA	44.33	54.0	-9.67		
12501.1	H	2.24	155	50.15	74.0	-23.85	NA	41.73	54.0	-12.27		
14525.2	V	2.03	207	65.44	74.0	-8.56	NA	48.16	54.0	-5.84		
Mid frequency 62640 MHz												Pass
6250.7	V	1.00	205	46.56	74.0	-27.44	NA	40.64	54.0	-13.36		
7830.0	H	1.32	208	53.50	74.0	-20.50	NA	50.10	54.0	-3.90		
8750.9	V	2.24	189	49.89	74.0	-24.11	NA	42.88	54.0	-11.12		
10063.3	V	1.93	168	50.30	74.0	-23.70	NA	44.33	54.0	-9.67		
12501.1	H	2.24	155	50.15	74.0	-23.85	NA	41.73	54.0	-12.27		
14903.7	H	1.62	209	58.61	74.0	-15.39	NA	42.66	54.0	-11.34		
15742.5	H	1.32	142	56.00	74.0	-18.00	NA	41.48	54.0	-12.52		
High frequency 64800 MHz												Pass
2804.0	H	1.62	208	45.84	74.0	-28.16	NA	32.74	54.0	-21.26		
6250.7	V	1.00	205	46.56	74.0	-27.44	NA	40.64	54.0	-13.36		
8099.8	H	1.32	204	50.36	74.0	-23.64	NA	45.24	54.0	-8.76		
8750.9	V	2.24	189	49.89	74.0	-24.11	NA	42.88	54.0	-11.12		
10063.3	V	1.93	168	50.30	74.0	-23.70	NA	44.33	54.0	-9.67		
12501.1	H	2.24	155	50.15	74.0	-23.85	NA	41.73	54.0	-12.27		
15718.7	H	1.62	246	57.19	74.0	-16.81	NA	42.71	54.0	-11.29		
16762.2	H	1.32	141	57.56	74.0	-16.44	NA	45.02	54.0	-8.98		

*- EUT front panel refers to 0 degrees position of turntable.

** - Margin = dB below (negative if above) specification limit.



HERMON LABORATORIES

Test specification:		FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz	
Test procedure:		47 CFR, Section 2.1053; ANSI C63.10, Section 9.13	
Test mode:		Verdict: PASS	
Date(s):			
02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

Table 7.3.3 Field strength of emissions below 1 GHz

TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
MODULATION: 16QAM
INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
DETECTOR USED: Peak
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)
Biconilog (30 MHz – 1000 MHz)

Decimals (50 MHz – 1000 MHz)								
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*				
Low, mid, high frequencies								
31.984	28.53	21.92	40.0	-18.08	Vertical	1.04	288	Pass
42.761	42.73	36.28	40.0	-3.72	Vertical	1.04	313	
45.284	42.93	36.45	40.0	-3.55	Vertical	1.00	325	
46.012	44.11	37.10	40.0	-2.90	Vertical	1.00	338	
49.182	39.64	33.47	40.0	-6.53	Vertical	1.02	0	
59.980	32.06	25.43	40.0	-14.57	Vertical	1.00	360	
68.091	41.96	35.19	40.0	-4.81	Vertical	1.00	360	
72.013	41.83	38.28	40.0	-1.72	Vertical	1.02	26	
92.128	26.80	20.32	43.5	-23.18	Vertical	1.02	14	
105.314	29.54	23.02	43.5	-20.48	Vertical	1.02	310	
788.570	39.56	33.25	46.0	-12.75	Horizontal	1.02	8	
934.930	45.99	34.38	46.0	-11.62	Horizontal	2.20	100	

*- Margin = Measured emission - specification limit.

** - EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

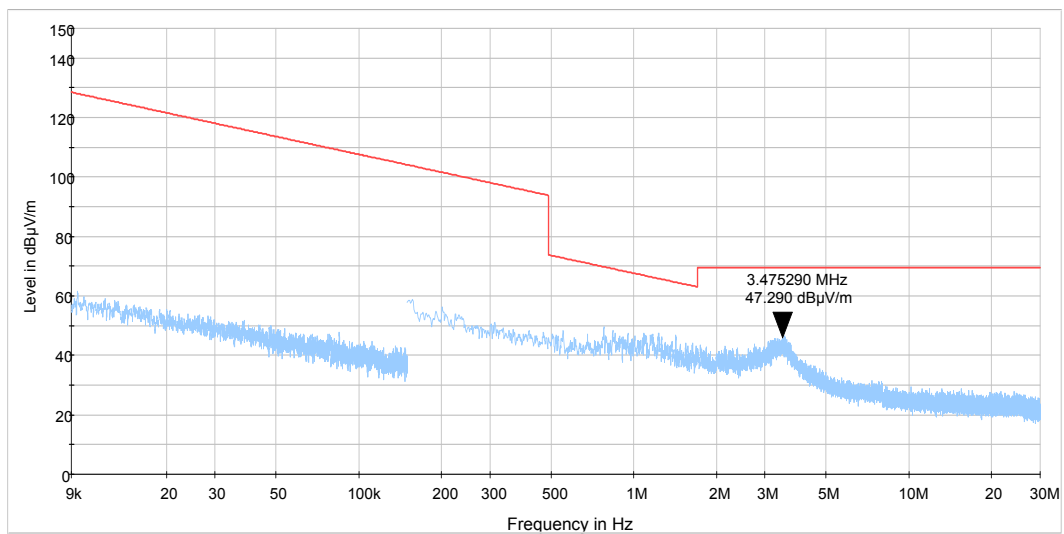
HL 0446	HL 3903	HL 4360	HL 4933	HL 4956	HL 5112	HL 5288	HL 5902
---------	---------	---------	---------	---------	---------	---------	---------

Full description is given in Appendix A.

Test specification:		FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz	
Test procedure:		47 CFR, Section 2.1053; ANSI C63.10, Section 9.13	
Test mode:		Verdict: PASS	
Date(s):			
02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

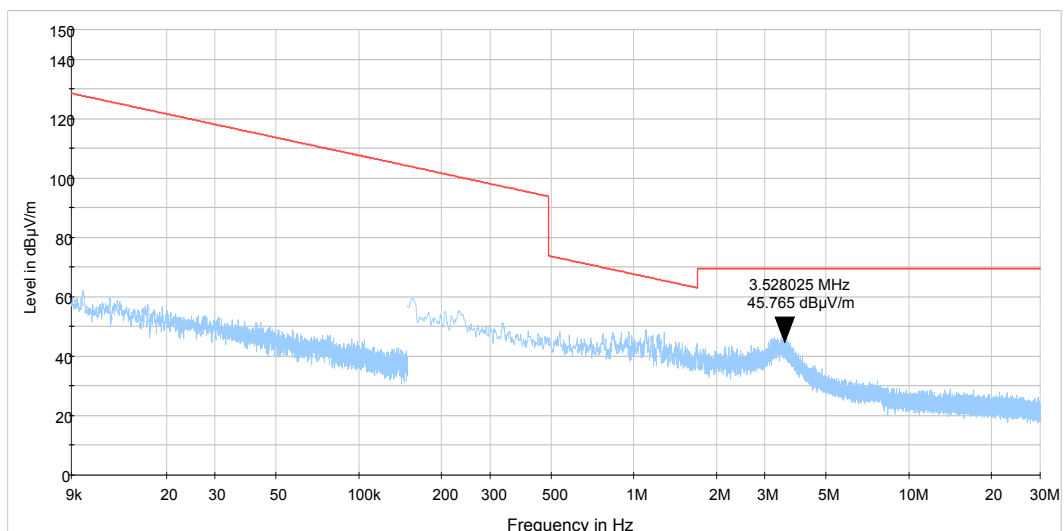
Plot 7.3.1 Radiated emission measurements from 9 kHz to 30 MHz at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
EUT POSITION: Typical (Vertical)



Plot 7.3.2 Radiated emission measurements from 9 kHz to 30 MHz at mid frequency

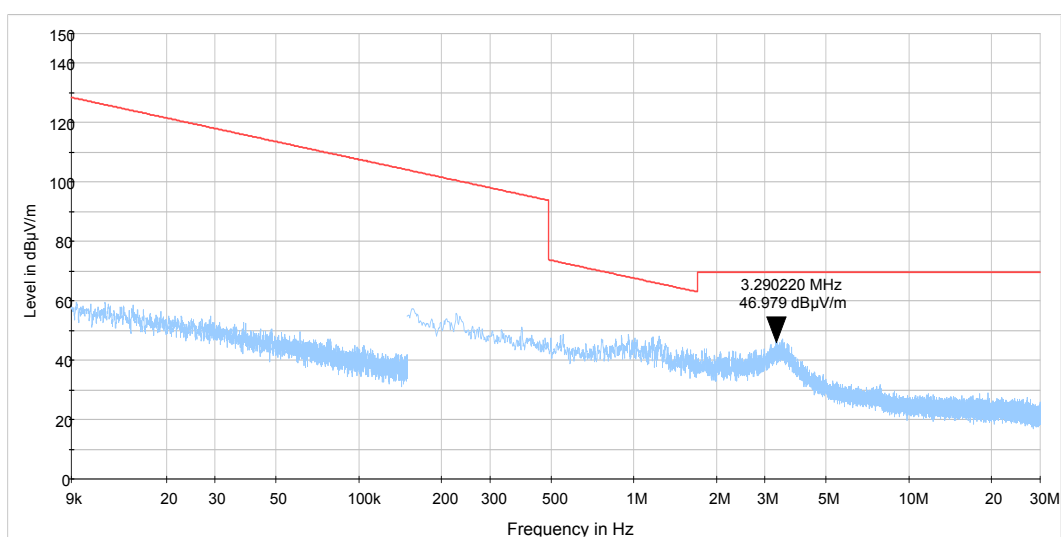
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
EUT POSITION: Typical (Vertical)



Test specification:		FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz	
Test procedure:		47 CFR, Section 2.1053; ANSI C63.10, Section 9.13	
Test mode:		Verdict: PASS	
Date(s):			
02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

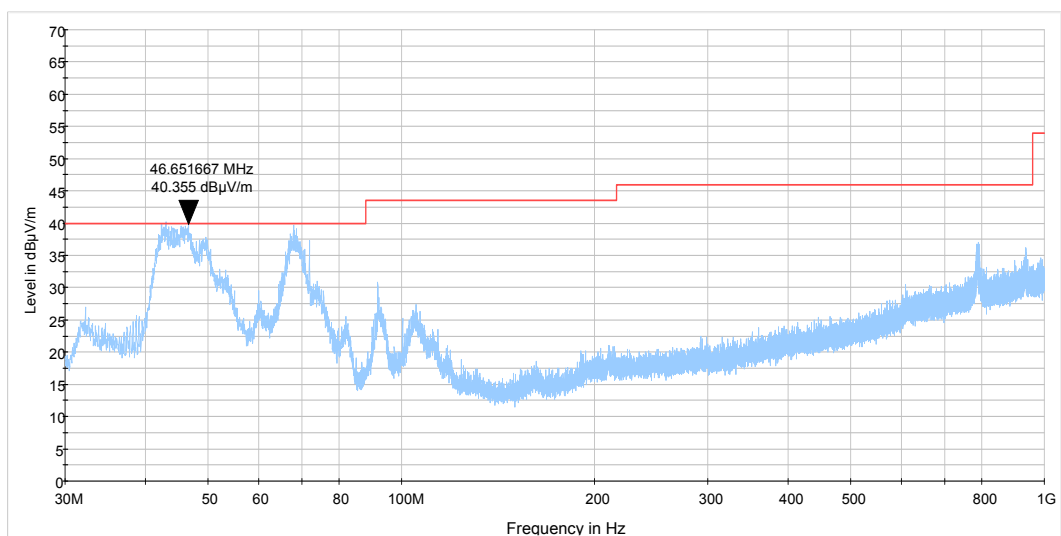
Plot 7.3.3 Radiated emission measurements from 9 kHz to 30 MHz at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
EUT POSITION: Typical (Vertical)



Plot 7.3.4 Radiated emission measurements from 30 to 1000 MHz at low frequency

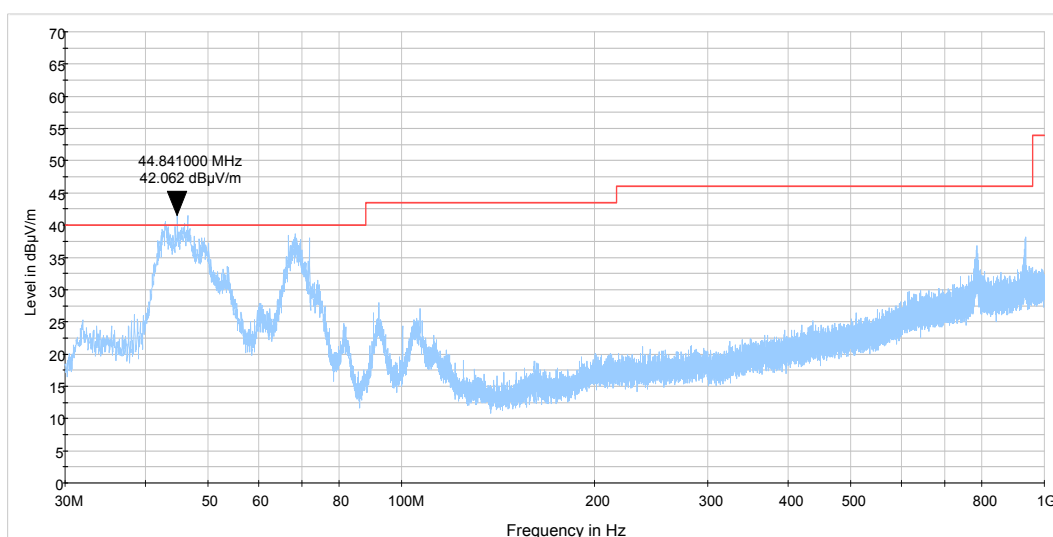
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Test specification: FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz			
Test procedure: 47 CFR, Section 2.1053; ANSI C63.10, Section 9.13			
Test mode: Compliance	Verdict: PASS		
Date(s): 02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

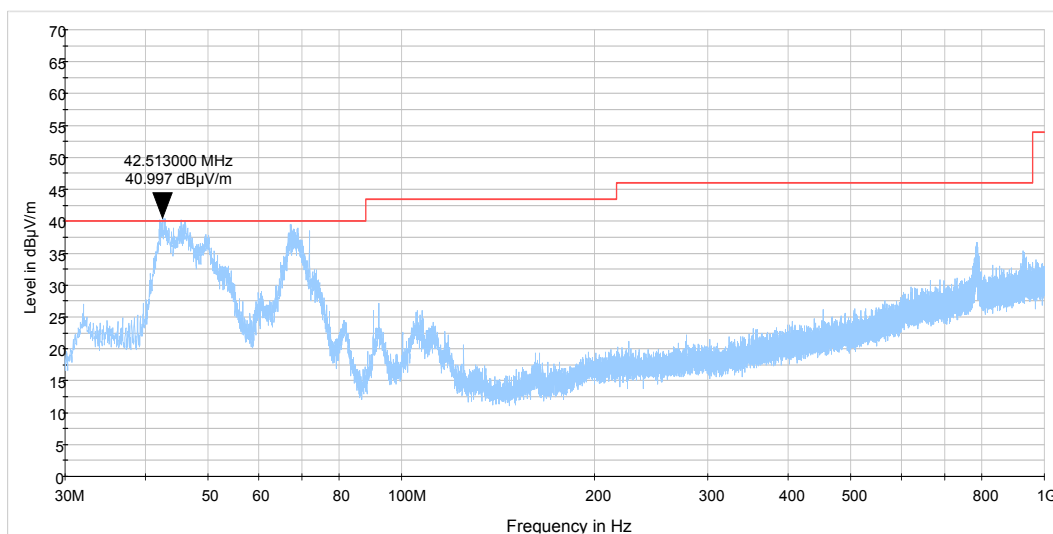
Plot 7.3.5 Radiated emission measurements from 30 to 1000 MHz at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Plot 7.3.6 Radiated emission measurements from 30 to 1000 MHz at high frequency

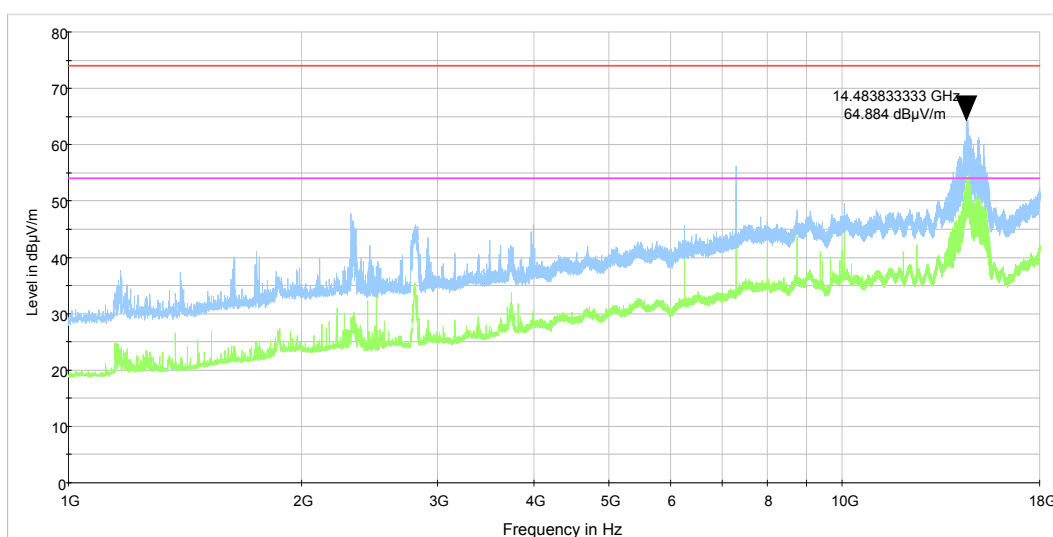
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Test specification: FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz			
Test procedure: 47 CFR, Section 2.1053; ANSI C63.10, Section 9.13			
Test mode:	Compliance	Verdict: PASS	
Date(s):	02-Jun-21 - 03-Jun-21		
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

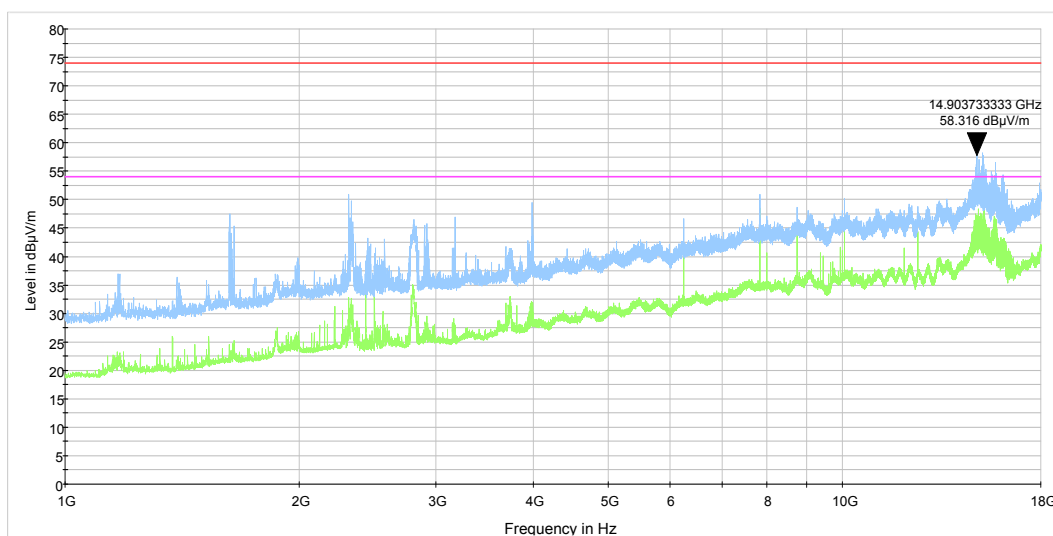
Plot 7.3.7 Radiated emission measurements from 1 to 18 MHz at low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Plot 7.3.8 Radiated emission measurements from 1 to 18 MHz at mid frequency

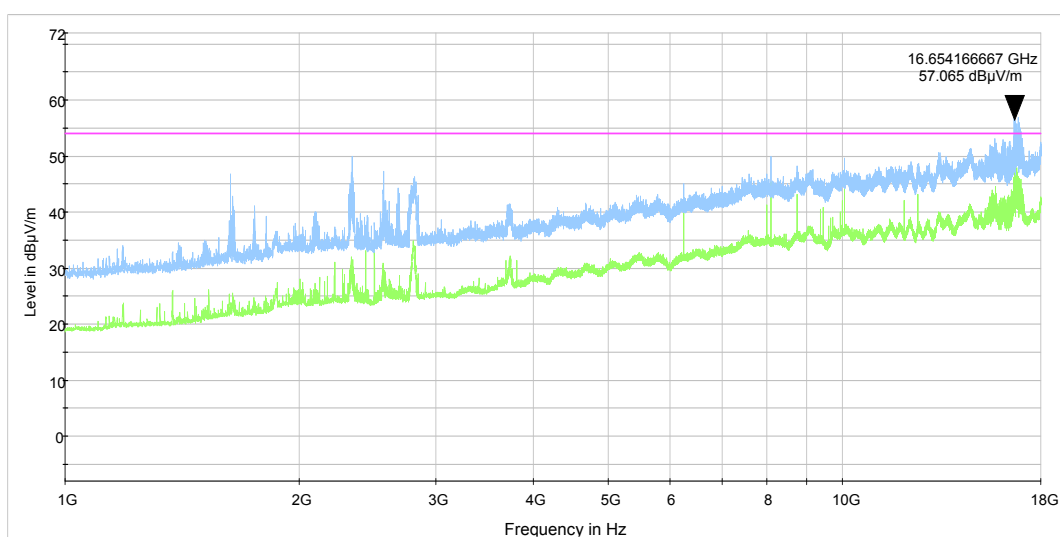
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Test specification:		FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz	
Test procedure:		47 CFR, Section 2.1053; ANSI C63.10, Section 9.13	
Test mode:		Verdict: PASS	
Date(s):			
02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

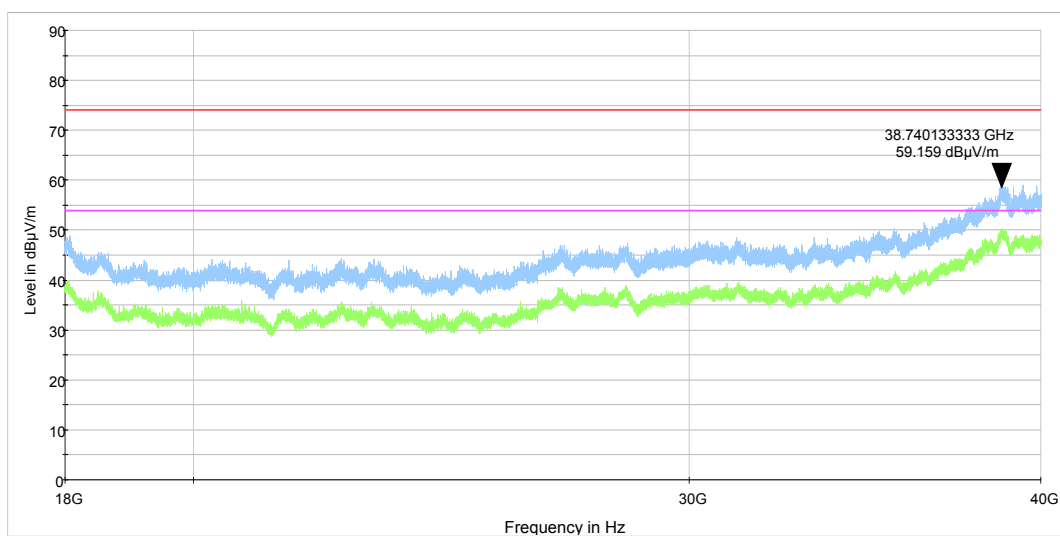
Plot 7.3.9 Radiated emission measurements from 1 to 18 MHz at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Plot 7.3.10 Radiated emission measurements from 18 to 40 GHz at low frequency

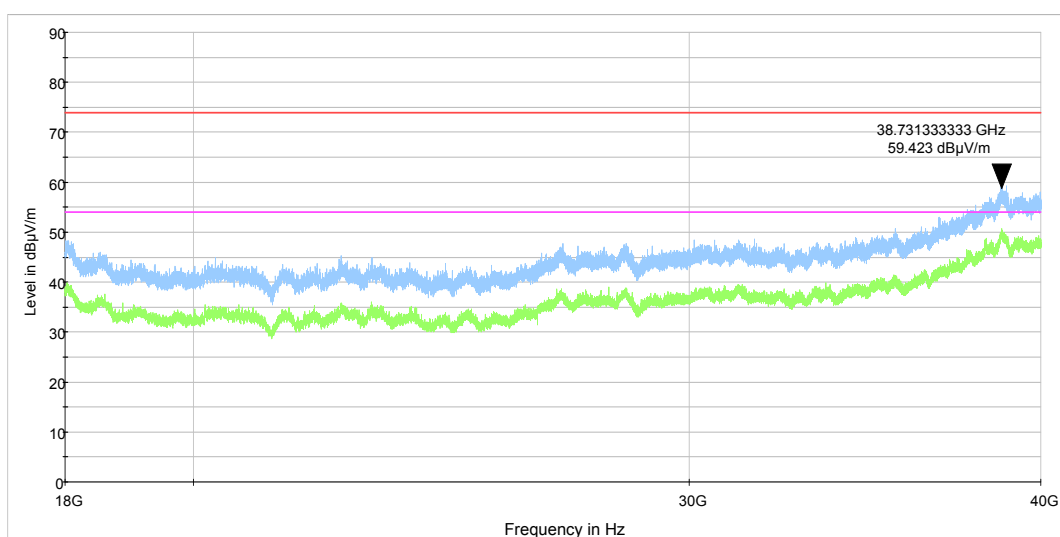
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Test specification: FCC Section 15.255(d)(2), RSS-210 section J.3, Out of band radiated emissions below 40 GHz			
Test procedure: 47 CFR, Section 2.1053; ANSI C63.10, Section 9.13			
Test mode: Compliance	Verdict: PASS		
Date(s): 02-Jun-21 - 03-Jun-21			
Temperature: 24 °C	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 48 VDC
Remarks:			

Plot 7.3.11 Radiated emission measurements from 18 to 40 GHz at mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)



Plot 7.3.12 Radiated emission measurements from 18 to 40 GHz at high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)

