HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC CFR 47 Part 90, subpart I

FOR:

HiRiseTech Ltd.

Radio Repeater System

Model: HawkIII

Part number: HRT2000SYS0030

FCC ID: 2ASFAHRT2000SYS0030

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1 Applicant information

Client name:	HiRiseTech Ltd.
Address:	20 Hamgshimim street, Petach Tikva 4934829, Israel
Telephone:	+972 546183182
E-mail:	meir@hirisetechnology.com
Contact name:	Mr. Meir Sasson

2 Equipment under test attributes

Product name:	Radio Repeater System
Product type:	Transceiver
Model(s):	Hawklll
Serial number:	0002
Hardware version:	HRP0131
Software release:	CCU_App v2.0.62
Receipt date	06-Jun-21

3 Manufacturer information

Manufacturer name:	HiRiseTech Ltd.
Address:	20 Hamgshimim street, Petach Tikva 4934829, Israel
Telephone:	+972 546183182
E-Mail:	meir@hirisetechnology.com
Contact name:	Mr. Meir Sasson

4 Test details

Project ID:	42206
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	06-Jun-21
Test completed:	12-Jul-21
Test specification(s):	FCC part 90, subpart I

5 Tests summary

Test	Status
Transmitter characteristics	
Section 90.205, Maximum output power	Pass
Section 90.209, Occupied bandwidth	Pass
Section 90.210, Emission mask	Pass
Section 90.210, Radiated spurious emissions	Pass
Section 90.210, Conducted spurious emissions	Pass
Section 90.213, Frequency stability	Pass
Section 90.214, Transient frequency behaviour	Pass
Section 90.207, Modulation limiting	Pass
Section 90.214, Audio frequency response	Pass
Section 2.1091, RF radiation exposure evaluation	Pass, Exhibit in application for certification provided

This test report supersedes the previously issued test report identified by Doc ID: HIRRAD_FCC.42206

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, EMC & Radio	06-Jun-21 – 12-Jul-21	
Reviewed by:	Mrs. S. Peysahov Sheynin, test engineer, EMC & Radio	20-Sep-21	
Approved by:	Mr. S. Samokha, technical manager, EMC & Radio	30-Nov-21	

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 a First-Responders Emergency Radio Repeater for High-Rise buildings.It comprises of Dedicated Radio Console (DRC), Central Control Unit (CCU), Repeater Unit, Multi-coupler Unit, Power Unit ,Smart Splitters and Antennas.The repeater Unit comprises of 4 iCOM (UHF) units approved by FCC under FCC ID:AFJ333502. The Multi-coupler is connected via main coax to Smart Splitters. The CCU is connected via Etherner cable to DRC.

6.2 Ports and lines

Port type	Port description	Conected from	Connected to	Qty.	Cable type	Cable length, m
Power	AC	mains	EUT	1	Unshielded	2
RF	Signal	CCU	SMSP	2	Coax	3
Signal	Ethernet	CCU	Console	3	Shielded CAT6	2

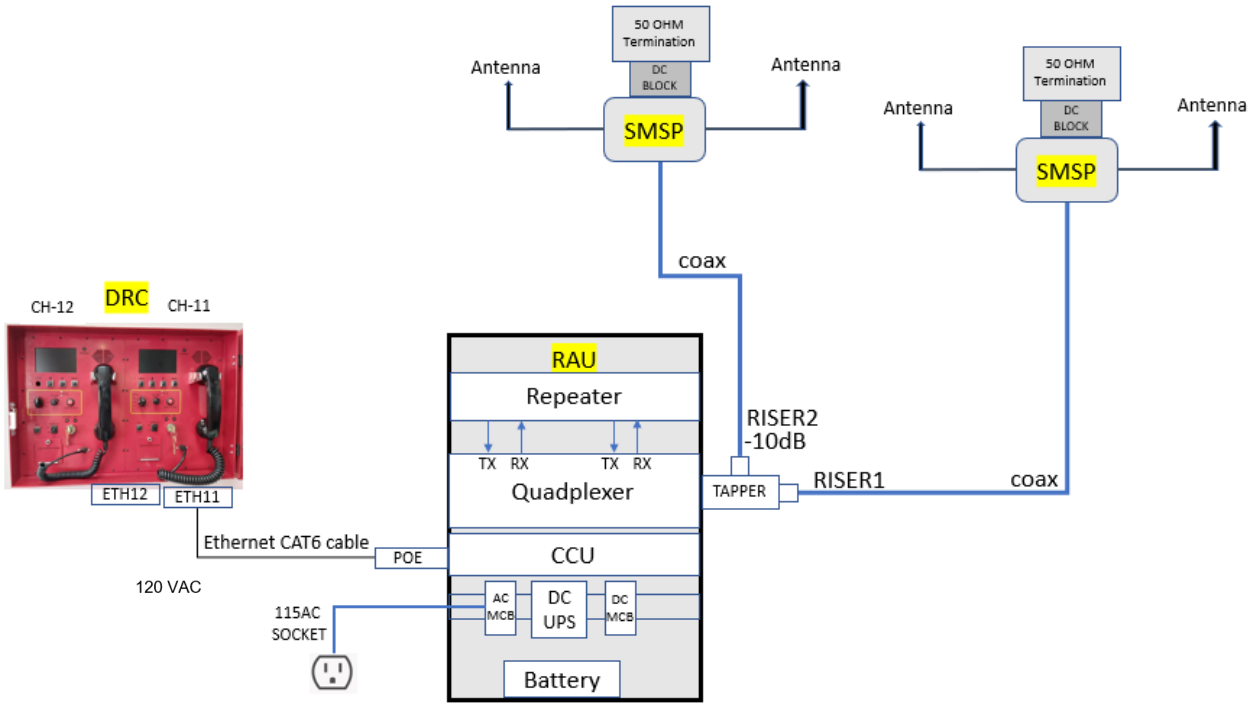
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Dedicated Radio Console (DRC)	HiriseTech	HRP0121 (HRT2102CSL0010)	NA
CCU UNIT	HiriseTech	HRP0045	NA
Repeater unit	HiriseTech	HRP0044	NA
Multicoupler UNIT	HiriseTech	HRP0057	NA
13db Smart Splitter	HiriseTech	HRP0069	NA
18db Smart Splitter	HiriseTech	HRP0075 (HRT2103SMS0010)	NA
UHF panel antenna	HiriseTech	HRP0122 (HRT2004ANT0010)	NA
UHF OMNI antenna	HiriseTech	HRP0123 (HRT2004ANT0020)	NA
UHF T-shape antenna	HiriseTech	HRP0086	NA

6.4 Changes made in EUT

No changes were implemented 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)
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
X	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	450- 512 MHz
Operating frequencies	483.0125; 484.7625 MHz

Maximum rated output power	At transmitter 50 Ω RF output (splitter) connector (Output RISER-1)	16.78 dBm
	At transmitter 50 Ω RF output (splitter) connector (Output RISER-2)	14.71 dBm
	Output power declared by FCC ID:AFJ318002 grant	46.5 dBm

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

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

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
External (panel antenna)	HiriseTech	HRP0122 (HRT2004ANT0010)	6 dBi
External (OMNI antenna)	HiriseTech	HRP0123 (HRT2004ANT0020)	2 dBi
External (T-shape antenna)	HiriseTech	HRP0086	3dBi

Transmitter 99% power bandwidth	12.1 kHz
Transmitter aggregate data rate/s	Voice+telemetry (9600bps)
Type of modulation	FM+C4FM over FM
Modulating test signal (baseband)	PRBS

Maximum transmitter duty cycle in normal use		**Tx ON time**		**Period**	
Transmitter duty cycle supplied for test		**Tx ON time**		**Period**	

Transmitter power source						
	Battery	**Nominal rated voltage**		Battery type		
	DC	**Nominal rated voltage**	VDC			
X	AC mains	**Nominal rated voltage**	120 VAC	Frequency	60 Hz	

Common power source for transmitter and receiver	X yes	no

Test specification:	Section 90.205, Maximum output power		
Test procedure:	ANSI C63.26, Section 5.2.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Jun-21 - 10-Jun-21		
Temperature: 22.1 ºC	Relative Humidity: 47 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7 Transmitter tests according to 47CFR part 90

7.1 Peak output power test

7.1.1 General

This test was performed to measure the peak output power at RF antenna connector. Specification test limits are given in Table 7.1.1. The test results are provided in Table 7.1.2 and the associated plots.

Table 7.1.1 Peak output power limits

Assigned frequency range, MHz	Maximum declared output power	
	W	dBm
470 - 512	45	46.5

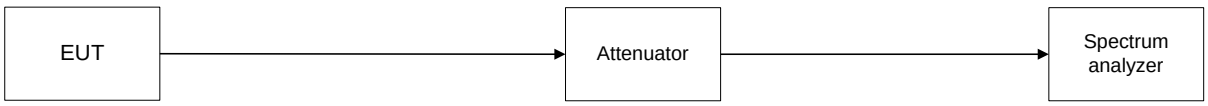
7.1.2 Test procedure

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 to the end user RF output power.

7.1.2.3 The peak output power was measured with spectrum analyzer as provided in Table 7.1.2 and associated plots.

Figure 7.1.1 Peak output power test setup



Test specification:	**Section 90.205, Maximum output power**		
Test procedure:	ANSI C63.26, Section 5.2.4.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Jun-21 - 10-Jun-21		
Temperature: 22.1 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.1.2 Peak output power test results

OPERATING FREQUENCY RANGE: 470 – 512 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 30 kHz
VIDEO BANDWIDTH: 91 kHz
MODULATION: FM
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
EUT CONFIGURATION: Splitter output to Antenna A

Frequency, MHz	Modulation	SA reading, dBm	Duty Cycle, %	Output correction factor, dB	Maximum output power, dBm**	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency from RISER -1								
483.0125	FM	16.78	100	18.2	34.98	46.5	-11.52	Pass
High carrier frequency from RISER -1								
484.7625	FM	15.88	100	18.2	34.08	46.5	-12.42	Pass
Low carrier frequency from RISER -2								
483.0125	FM	14.71	100	13.2	27.91	46.5	-18.59	Pass
High carrier frequency from RISER -2								
484.7625	FM	14.39	100	13.2	27.59	46.5	-18.91	Pass

*****- Margin = RF power – Limit
******- Maximum output power was calculated as follows: *Maximum Output Power = SA Reading + Output correction Factor* where *Output correction Factor* = Cable loss + Splitter loss + Splitter attenuation ;
For low carrier frequency output correction Factor = 0.1 + 0.1 +18.0 dB. = 18.2
For high carrier frequency output correction Factor = 0.1 + 0.1 +13.0 dB. = 13.2

Reference numbers of test equipment used

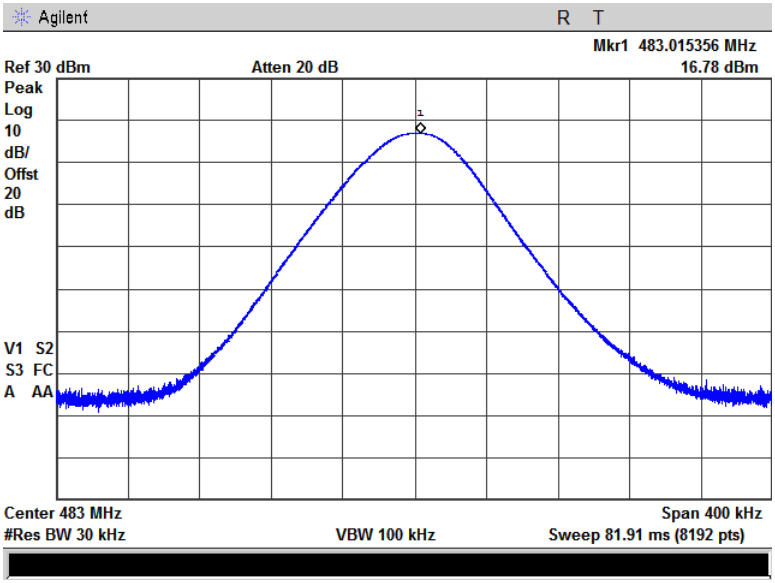
HL 1205	HL 2909	HL 5672	HL 5692				

Full description is given in Appendix A.

Test specification:	Section 90.205, Maximum output power		
Test procedure:	ANSI C63.26, Section 5.2.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Jun-21 - 10-Jun-21		
Temperature: 22.1 ºC	Relative Humidity: 47 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

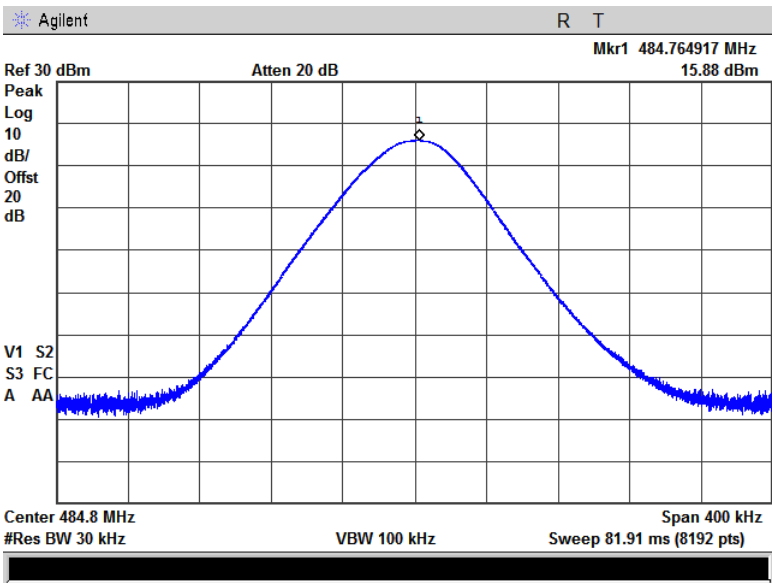
Plot 7.1.1 Peak output power test results at low carrier frequency from RISER -1 Splitter output to Antenna A

CARRIER FREQUENCY: 483.0125 MHz
CONFIGURATION: Splitter output to Antenna A



Plot 7.1.2 Peak output power test results at high carrier frequency from RISER -1 Splitter output to Antenna A

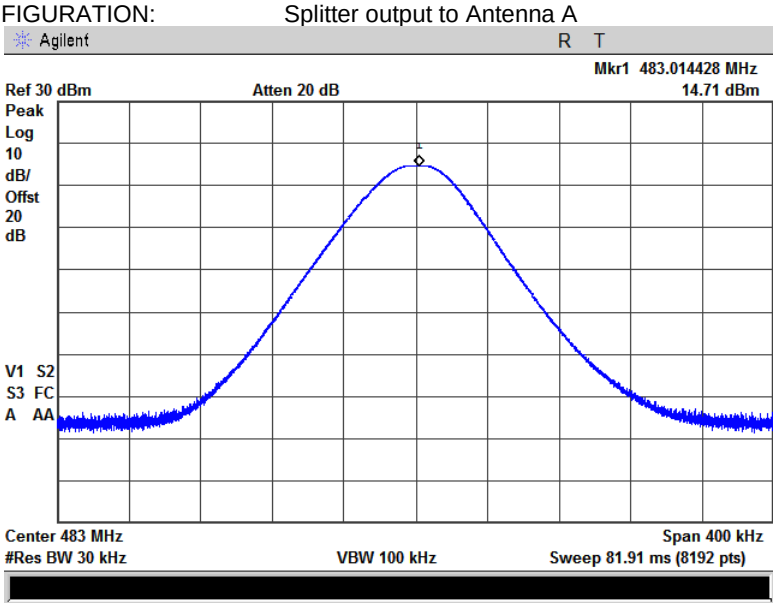
CARRIER FREQUENCY: 484.7625 MHz
CONFIGURATION: Splitter output to Antenna A



Test specification:	Section 90.205, Maximum output power		
Test procedure:	ANSI C63.26, Section 5.2.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Jun-21 - 10-Jun-21		
Temperature: 22.1 ºC	Relative Humidity: 47 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

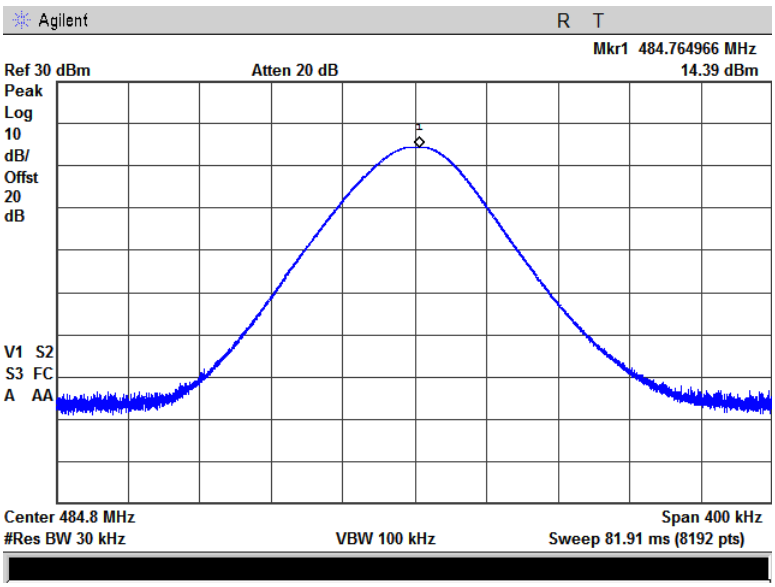
Plot 7.1.3 Peak output power test results at low carrier frequency from RISER -2 Splitter output to Antenna A

CARRIER FREQUENCY: 483.0125 MHz
CONFIGURATION: Splitter output to Antenna A



Plot 7.1.4 Peak output power test results at high carrier frequency from RISER -2 Splitter output to Antenna A

CARRIER FREQUENCY: 484.7625 MHz
CONFIGURATION: Splitter output to Antenna A



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	ANSI C63.26, Section 5.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Jun-21		
Temperature: 23.1 ºC	Relative Humidity: 46 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
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. The test results are provided in Table 7.2.2 and the associated plots.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, kHz
483.0125	26	25
484.7625		25

* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

7.2.2 Test procedure

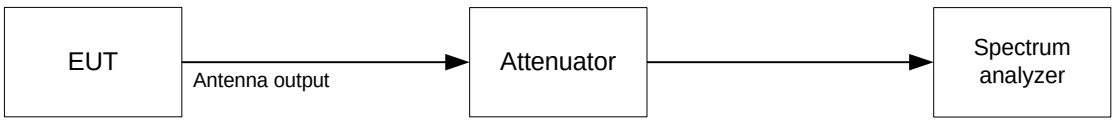
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit the unmodulated carrier and the reference peak power level was measured.

7.2.2.3 The EUT was set to transmit the normally modulated carrier.

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

Figure 7.2.1 Occupied bandwidth test setup



Test specification:	**Section 90.209, Occupied bandwidth**		
Test procedure:	ANSI C63.26, Section 5.4.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Jun-21		
Temperature: 23.1 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.2.2 Occupied bandwidth test results with Private Line

DETECTOR USED:	Peak hold
RESOLUTION BANDWIDTH:	300 Hz
VIDEO BANDWIDTH:	1 kHz
MODULATION ENVELOPE REFERENCE POINTS:	26 dBc
MODULATION:	FM
MODULATING SIGNAL:	2.5kHz tone
PORT:	RISER -1

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
483.0125	12.074	25.0	-12.926	Pass
484.7625	11.444	25.0	-13.556	Pass

PORT: RISER -2

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
483.0125	12.087	25.0	-12.913	Pass
484.7625	11.263	25.0	-13.737	Pass

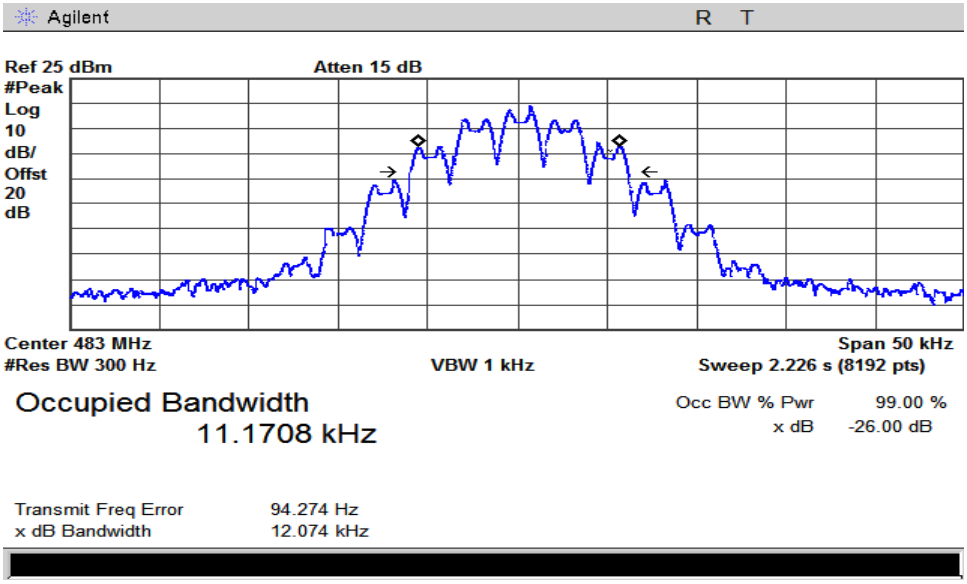
Reference numbers of test equipment used

HL 2909	HL 5672	HL 5692					

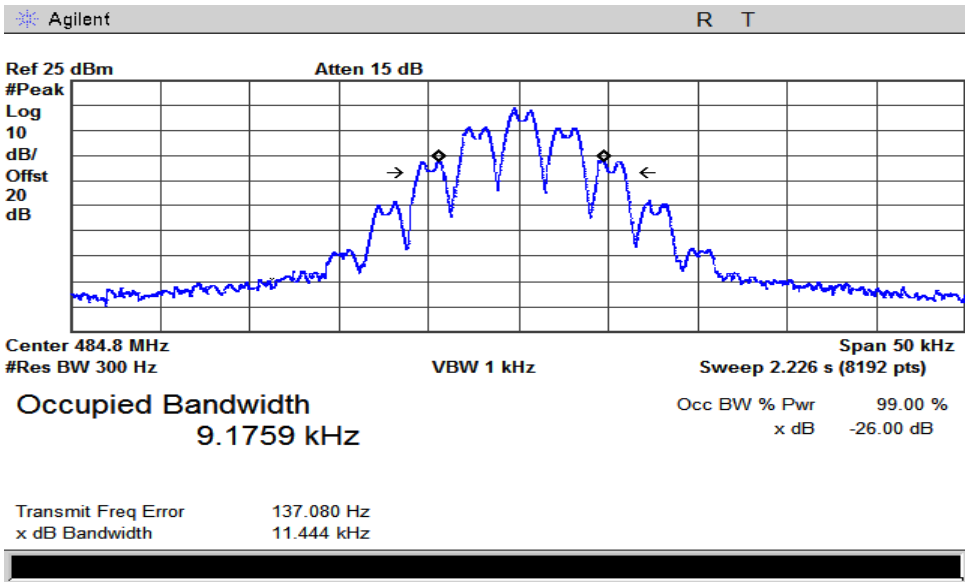
Full description is given in Appendix A.

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	ANSI C63.26, Section 5.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Jun-21		
Temperature: 23.1 ºC	Relative Humidity: 46 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at 483.0125 MHz with Private Line from RISER -1

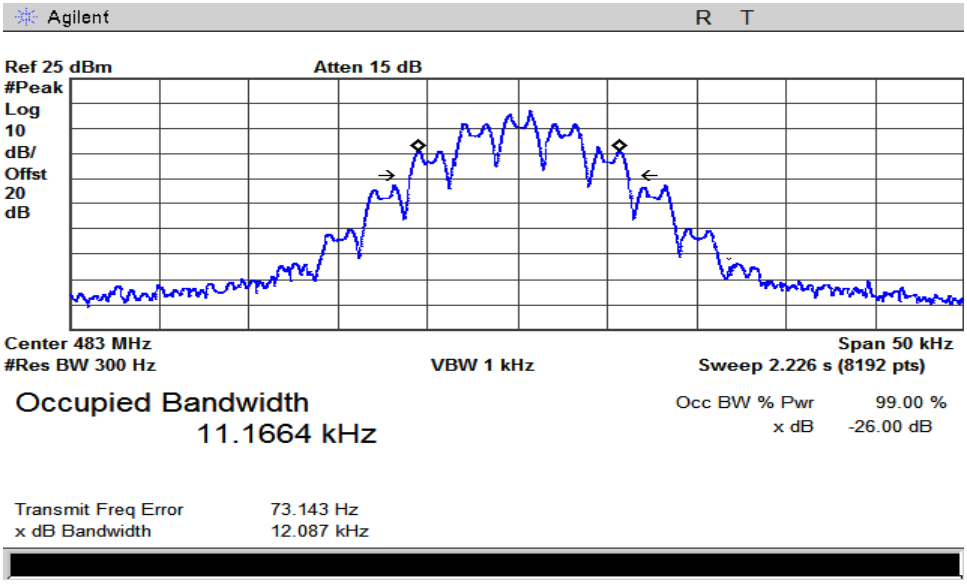


Plot 7.2.2 Occupied bandwidth test result at 484.7625 MHz with Private Line from RISER -1

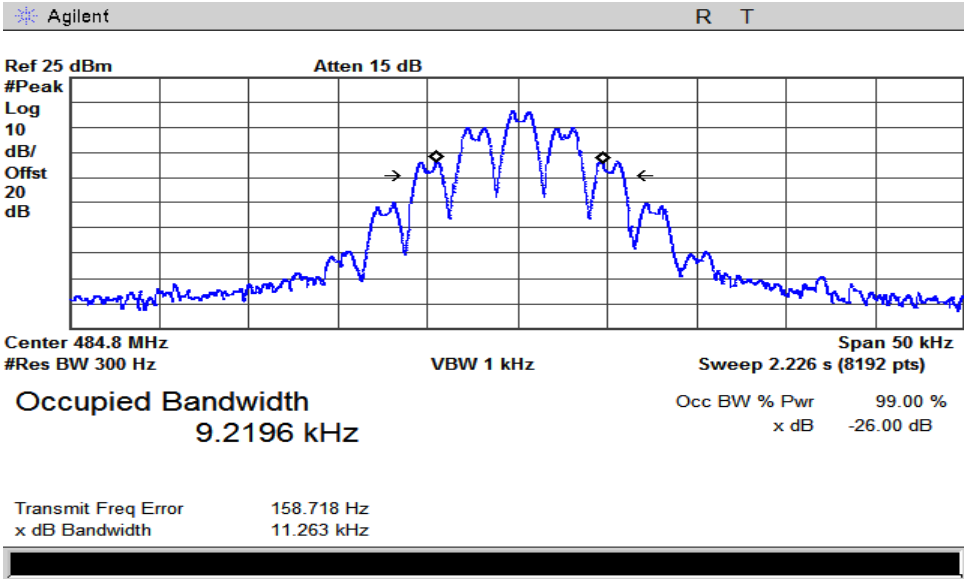


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	ANSI C63.26, Section 5.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Jun-21		
Temperature: 23.1 ºC	Relative Humidity: 46 %	Air Pressure: 1010 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.2.3 Occupied bandwidth test result at 483.0125 MHz with Private Line from RISER -2



Plot 7.2.4 Occupied bandwidth test result at 484.7625 MHz with Private Line from RISER -2



Test specification:	Section 90.210, Emission mask		
Test procedure:	ANSI C63.26, Section 5.2.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Jun-21		
Temperature: 25.6 ºC	Relative Humidity: 54 %	Air Pressure: 1004 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.3 Emission mask test

7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1. The test results are provided in the associated plots.

Table 7.3.1 Emission mask limits

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask B (Channel bandwidth 25 kHz, authorized bandwidth 20 kHz) with audio low pass filter	
0 – 12.5 kHz	0
12.5 – 25.0 kHz	25.0
25.0 – 62.5 kHz	35.0
More than 62.5 kHz	43+10logP(W

* - linearly increase with frequency
** - emission mask includes carrier modulation envelope within ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

7.3.2 Test procedure

7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

7.3.2.2 The emission mask was measured with spectrum analyzer as provided in the associated plots.

Figure 7.3.1 Emission mask test setup

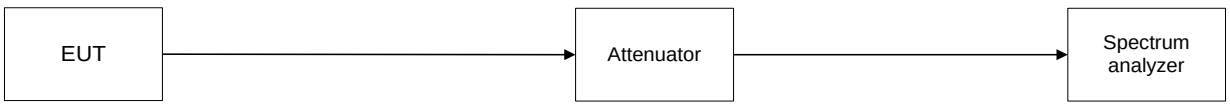


Table 7.3.2 Emission mask test results

Carrier frequency, MHz	Limit	Verdict
483.0125	Emission mask B	Pass
484.7625		

Reference numbers of test equipment used

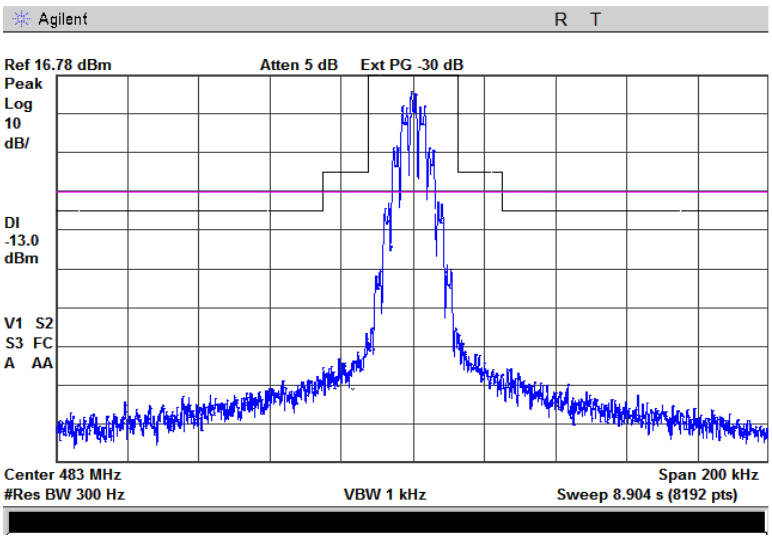
HL 1205	HL 2909	HL 5602	HL 5672				

Full description is given in Appendix A.

Test specification:	Section 90.210, Emission mask		
Test procedure:	ANSI C63.26, Section 5.2.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Jun-21		
Temperature: 25.6 ºC	Relative Humidity: 54 %	Air Pressure: 1004 hPa	Power: 120 VAC, 60 Hz
Remarks:			

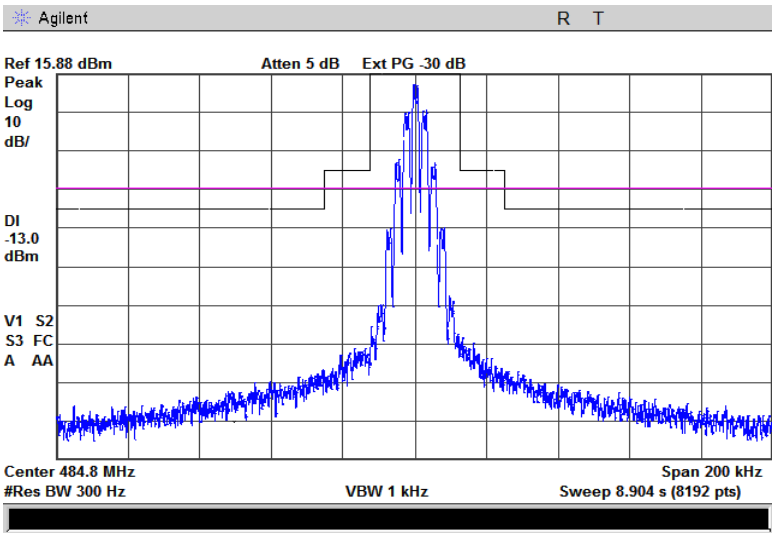
Plot 7.3.1 Emission mask test results at low 483.0125 MHz with Private Line

DETECTOR USED:	Peak
MODULATION:	FM
MODULATING SIGNAL:	2.5 kHz tone
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
PORT:	RISER -1 output



Plot 7.3.2 Emission mask test results at high 484.7625 MHz with Private Line

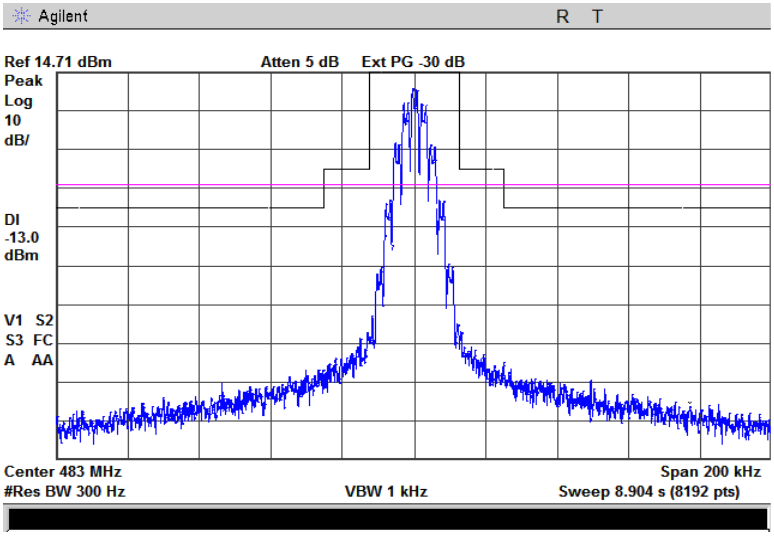
DETECTOR USED:	Peak
MODULATION:	FM
MODULATING SIGNAL:	2.5 kHz tone
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
PORT:	RISER -1 output



Test specification:	Section 90.210, Emission mask		
Test procedure:	ANSI C63.26, Section 5.2.4.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Jun-21		
Temperature: 25.6 ºC	Relative Humidity: 54 %	Air Pressure: 1004 hPa	Power: 120 VAC, 60 Hz
Remarks:			

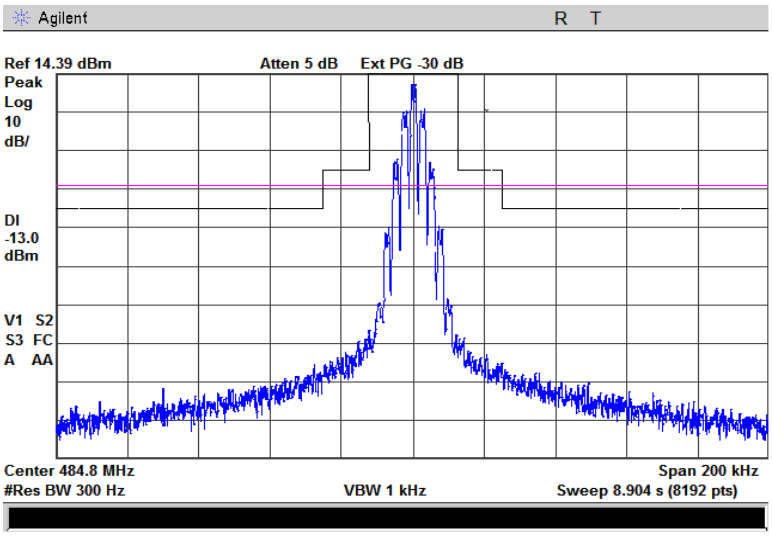
Plot 7.3.3 Emission mask test results at low 483.0125 MHz with Private Line

DETECTOR USED:	Peak
MODULATION:	FM
MODULATING SIGNAL:	2.5 kHz tone
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
PORT:	RISER -2 output



Plot 7.3.4 Emission mask test results at high 484.7625 MHz with Private Line

DETECTOR USED:	Peak
MODULATION:	FM
MODULATING SIGNAL:	2.5 kHz tone
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
PORT:	RISER -2 output



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Jun-21 - 07-Jun-21		
Temperature: 24.7 ºC	Relative Humidity: 47 %	Air Pressure: 1008 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.4 Radiated spurious emission measurements

7.4.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emission test limits

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(µV/m)***
0.009 – 10th harmonic*	43+10logP**	-13	84.4

* - Excluding the in band emission within ± 250 % of the authorized bandwidth from the carrier
** - P is transmitter output power in Watts
*** - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows: E=sqrt(30×P×1.64)/r, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

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

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

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

7.4.2.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

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

7.4.3.1 The EUT was set up as shown in Figure 7.4.2, energized and the performance check was conducted.

7.4.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

7.4.3.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Jun-21 - 07-Jun-21		
Temperature: 24.7 ºC	Relative Humidity: 47 %	Air Pressure: 1008 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.4.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

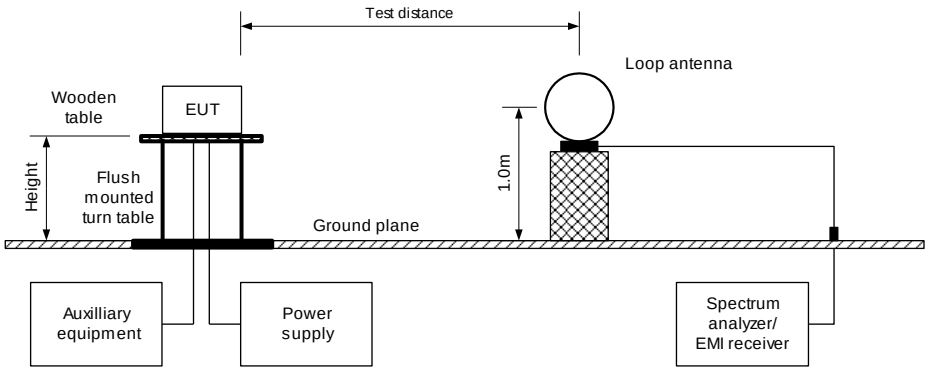
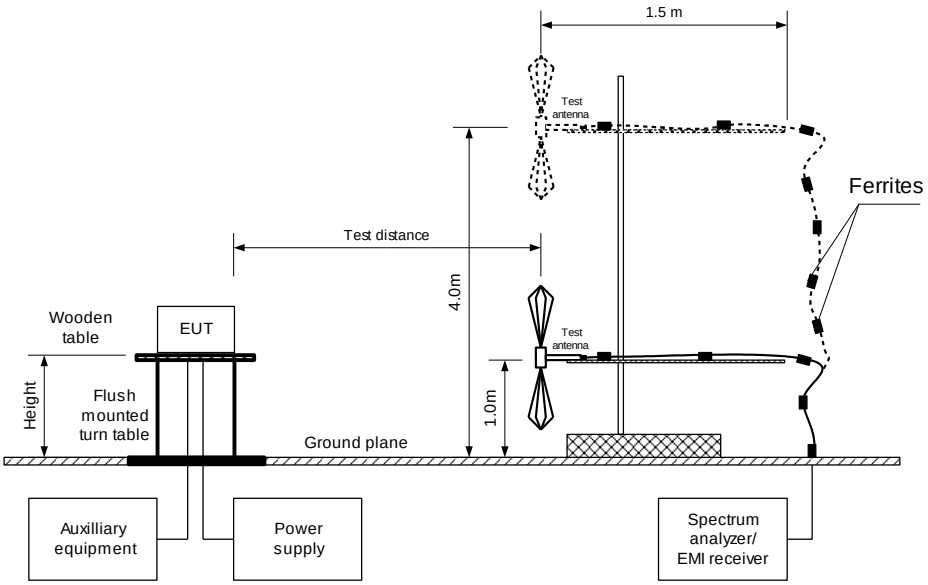


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	**Section 90.210, Radiated spurious emissions**		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jun-21 - 07-Jun-21		
Temperature: 24.7 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE:	470-512 MHz
TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
INVESTIGATED FREQUENCY RANGE:	0.009 – 5000 MHz
DETECTOR USED:	Peak
VIDEO BANDWIDTH:	> Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
All emissions are more than 20 dB below the limit							

*****- Margin = Field strength of spurious – calculated field strength limit.
******- EUT front panel refers to 0 degrees position of turntable.
*****- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

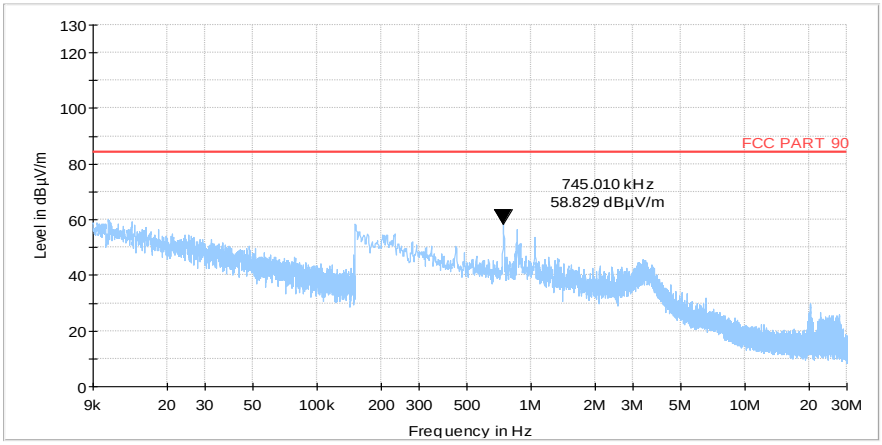
HL 0446	HL 2834	HL 3903	HL 4011	HL 4360	HL 4933	HL 5085	HL 5288

Full description is given in Appendix A.

Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Jun-21 - 07-Jun-21		
Temperature: 24.7 ºC	Relative Humidity: 47 %	Air Pressure: 1008 hPa	Power: 120 VAC, 60 Hz
Remarks:			

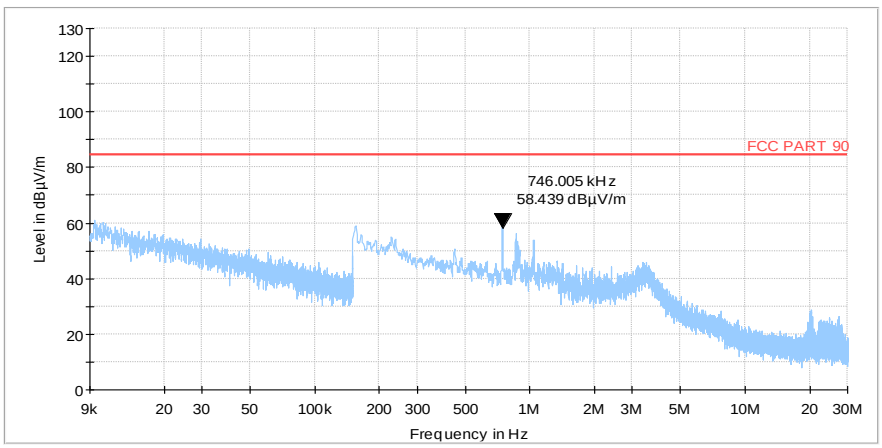
Plot 7.4.1 Radiated emission measurements in 9 kHz – 30 MHz range at the low frequency

TEST SITE:	Semi anechoic chamber
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
Tx frequency:	483.0125 MHz



Plot 7.4.2 Radiated emission measurements in 9 kHz – 30 MHz range at the high frequency

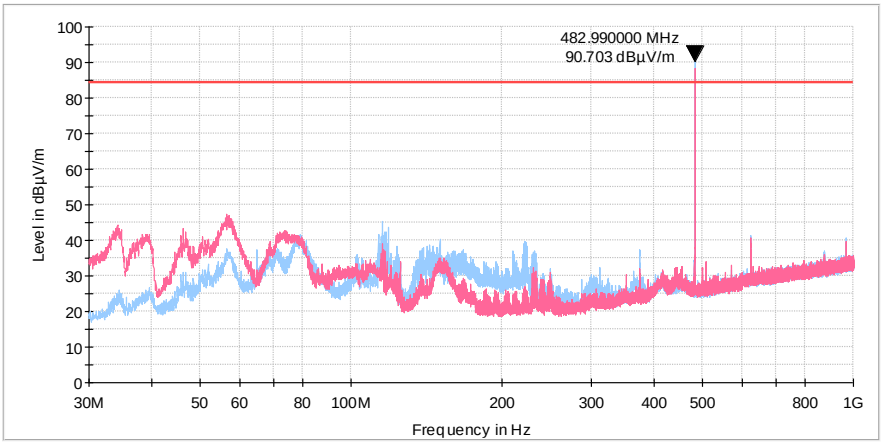
TEST SITE:	Semi anechoic chamber
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
Tx frequency:	484.7625 MHz



Test specification:	**Section 90.210, Radiated spurious emissions**		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jun-21 - 07-Jun-21		
Temperature: 24.7 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1008 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

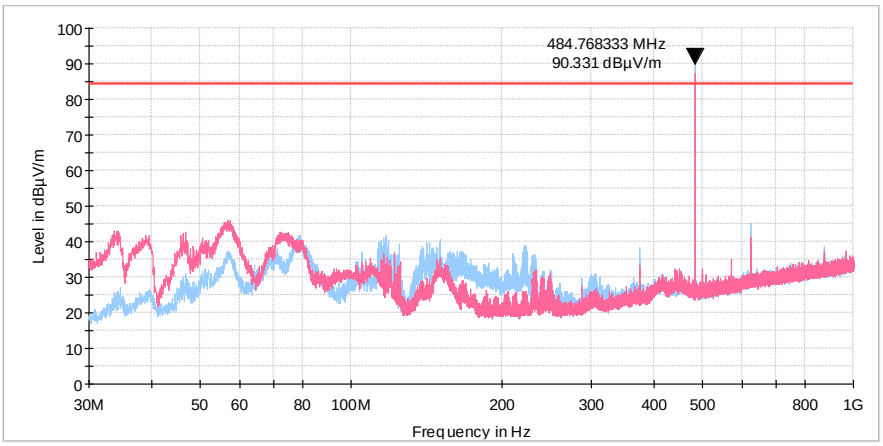
Plot 7.4.3 Radiated emission measurements in 30 - 1000 MHz range at the low frequency

TEST SITE:	Semi anechoic chamber
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
Tx frequency:	483.0125 MHz



Plot 7.4.4 Radiated emission measurements in 30 - 1000 MHz range at the high frequency

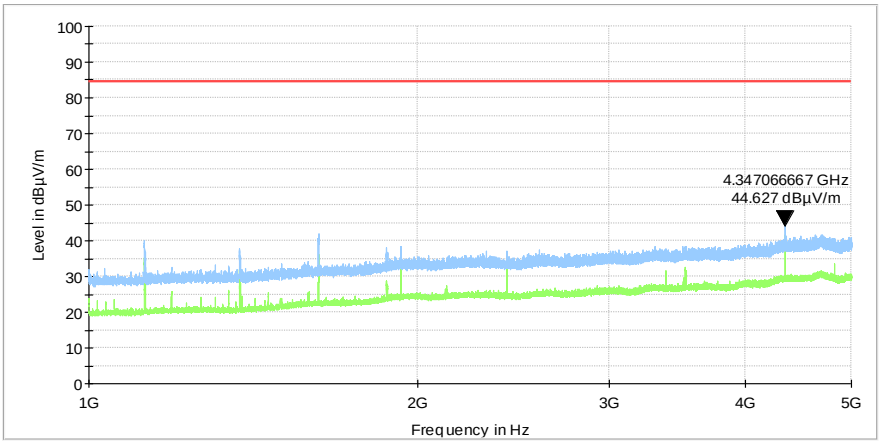
TEST SITE:	Semi anechoic chamber
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
Tx frequency:	484.7625 MHz



Test specification:	Section 90.210, Radiated spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	06-Jun-21 - 07-Jun-21		
Temperature: 24.7 ºC	Relative Humidity: 47 %	Air Pressure: 1008 hPa	Power: 120 VAC, 60 Hz
Remarks:			

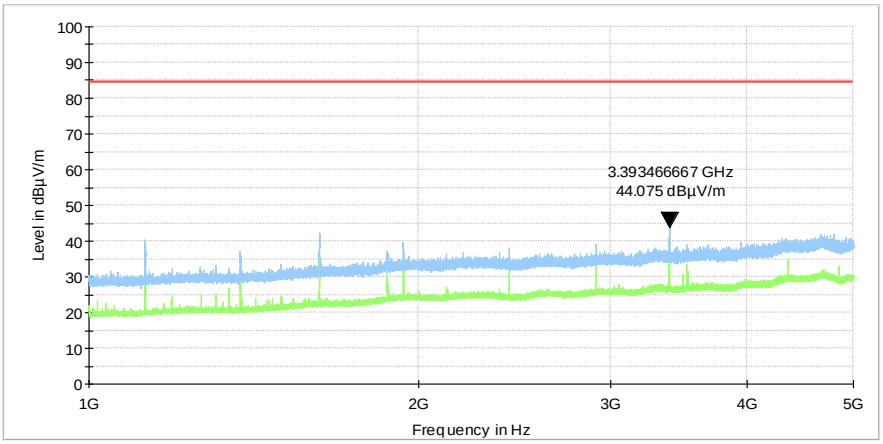
Plot 7.4.5 Radiated emission measurements in 1000 – 5000 MHz range at the low frequency

TEST SITE:	Semi anechoic chamber
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
Tx frequency:	483.0125 MHz



Plot 7.4.6 Radiated emission measurements in 1000 – 5000 MHz range at the high frequency

TEST SITE:	Semi anechoic chamber
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m
Tx frequency:	484.7625 MHz



Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.5 Spurious emissions at RF antenna connector test

7.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Spurious emission limits

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm
0.009 – 10th harmonic*	43+10logP** (mask B, C)	-13.0

* - spurious emission limits do not apply to the in band emission within ± 250 % of the authorized bandwidth from the carrier; investigated in course of emission mask testing
** - P is transmitter output power in Watts

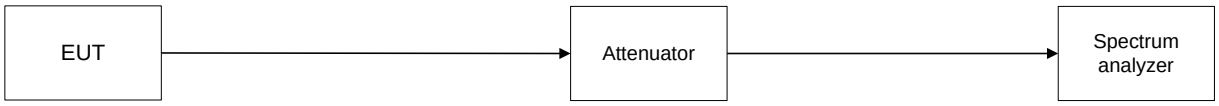
7.5.2 Test procedure

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 for end user RF output power.

7.5.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and associated plots.

Figure 7.5.1 Spurious emission test setup



Test specification:	**Section 90.210, Conducted spurious emissions**		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1009 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.5.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 470 - 512 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 5000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ 3*Resolution bandwidth
MODULATION: FM
MODULATING SIGNAL: 2.5 kHz tone
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
TRANSMITTER OUTPUT POWER FOR RISER-1: 16.78 dBm at low frequency (0.047643098681 W)
15.88 dBm at high frequency (0.038725764492 W)
TRANSMITTER OUTPUT POWER FOR RISER-2: 14.71 dBm at low frequency (0.029580124666 W)
14.39 dBm at high frequency (0.027478941531 W)

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Attenuation below carrier, dBc	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency from RISER -1 to splitter 18dB at ANT A output port									
482.450	-36.23	30.00	Included	100.00	-36.23	53.01	-13.00	-23.23	Pass
483.575	-35.90	30.00	Included	100.00	-35.90	52.68	-13.00	-22.90	Pass
High carrier frequency from RISER -1 to splitter 18dB at ANT A output port									
484.200	-36.30	30.00	Included	100.00	-36.30	52.18	-13.00	-23.30	Pass
483.325	-36.73	30.00	Included	100.00	-36.73	52.61	-13.00	-23.73	Pass
Low carrier frequency from RISER -2 to splitter 13dB at ANT A output port									
482.450	-38.31	30.00	Included	100.00	-38.31	51.01	-13.00	-23.30	Pass
483.575	-38.00	30.00	Included	100.00	-38.00	51.44	-13.00	-23.73	Pass
High carrier frequency from RISER -2 to splitter 13dB at ANT A output port									
484.200	-37.77	30.00	Included	100.00	-37.77	52.16	-13.00	-24.77	Pass
485.325	-37.89	30.00	Included	100.00	-37.89	52.28	-13.00	-27.89	Pass

*****- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

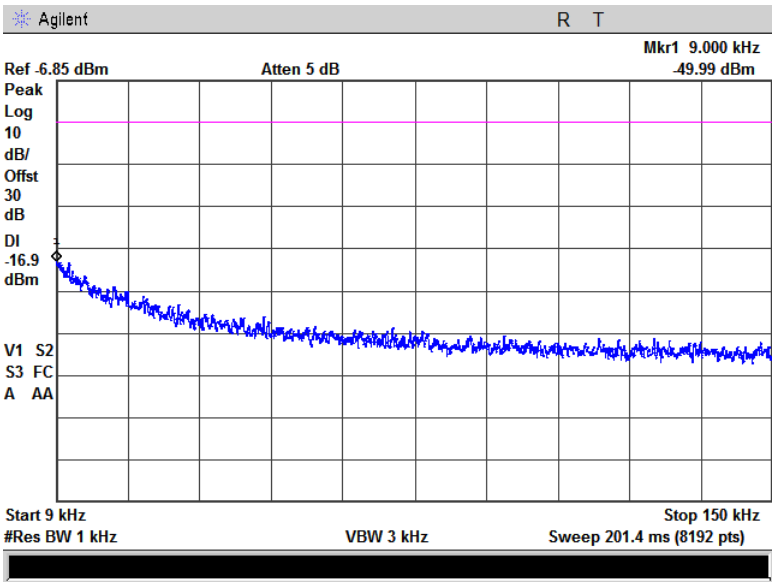
HL 1205	HL 2909	HL 5672	HL 5692				

Full description is given in Appendix A.

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

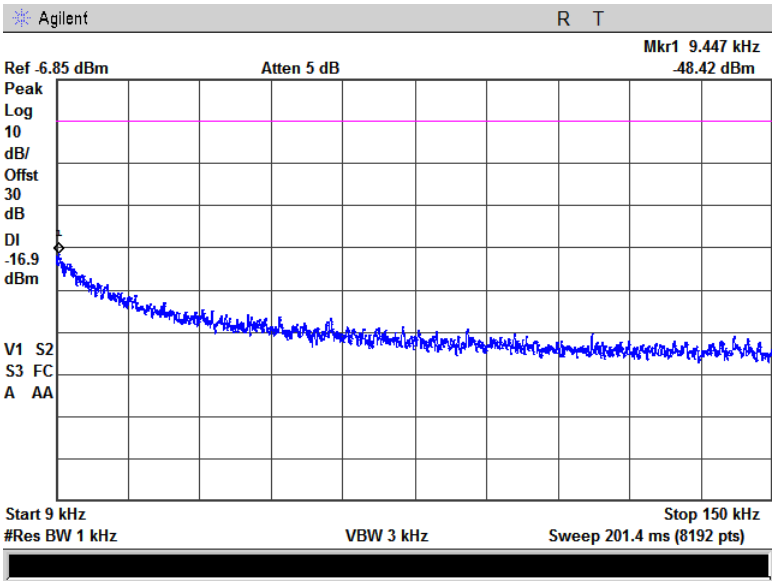
EUT CONFIGURATION:: RISER-1 output via 18 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

EUT CONFIGURATION:: RISER-1 output via 18 dB splitter to ANT A port

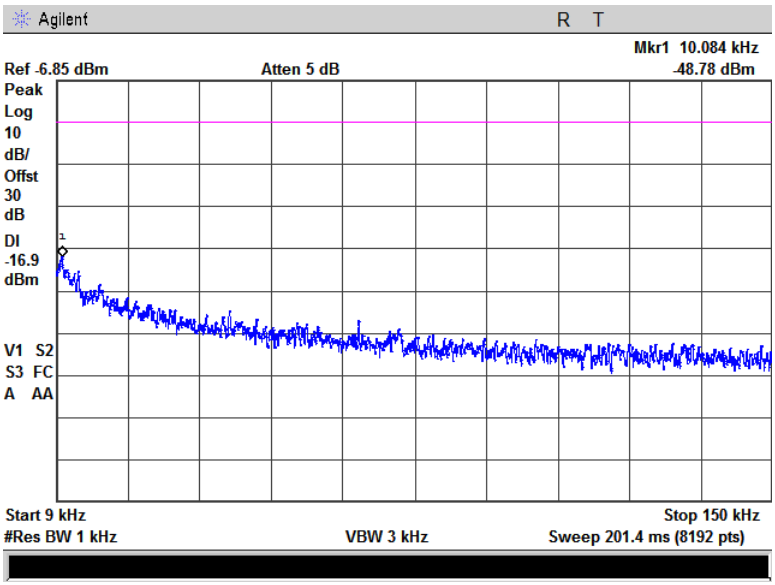


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.3 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

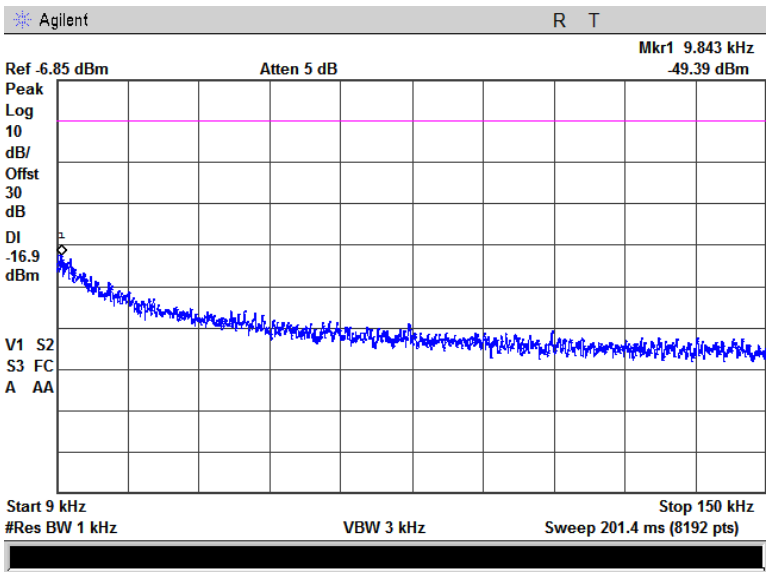
EUT CONFIGURATION:: RISER-2 output via 13 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.4 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

EUT CONFIGURATION:: RISER-2 output via 13 dB splitter to ANT A port

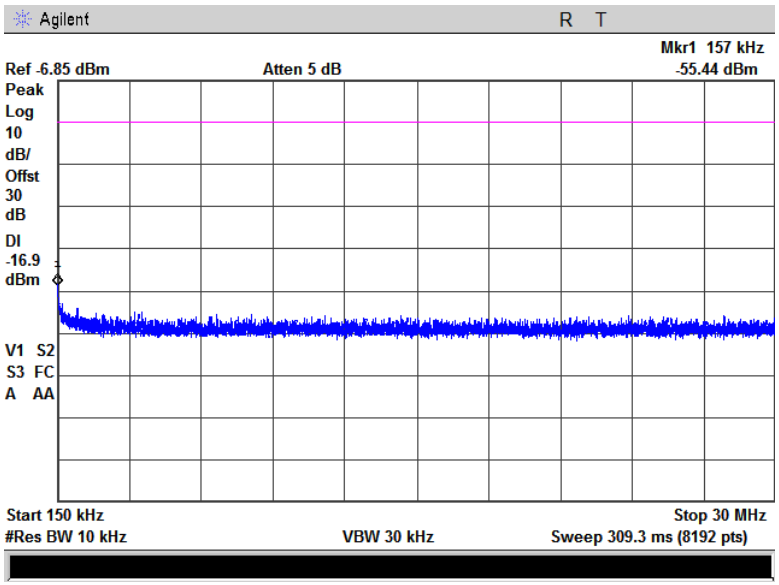


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.5 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

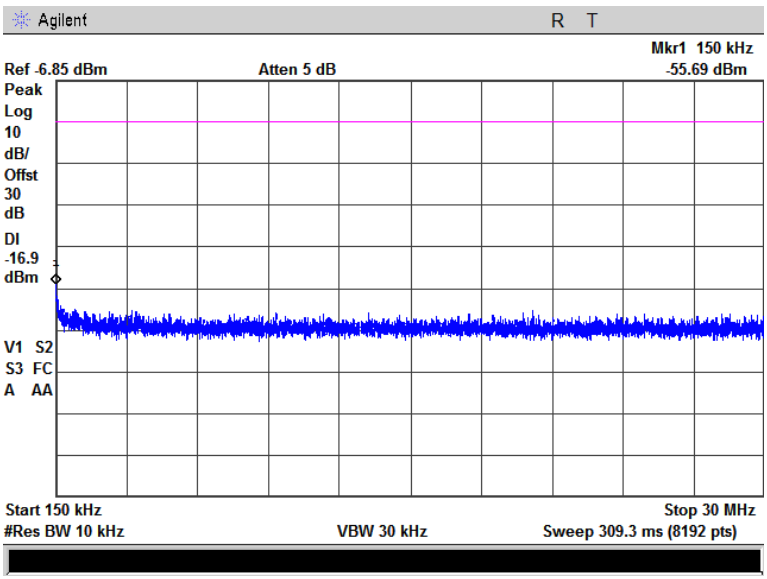
EUT CONFIGURATION:: RISER-1 output via 18 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.6 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency

EUT CONFIGURATION:: RISER-1 output via 18 dB splitter to ANT A port

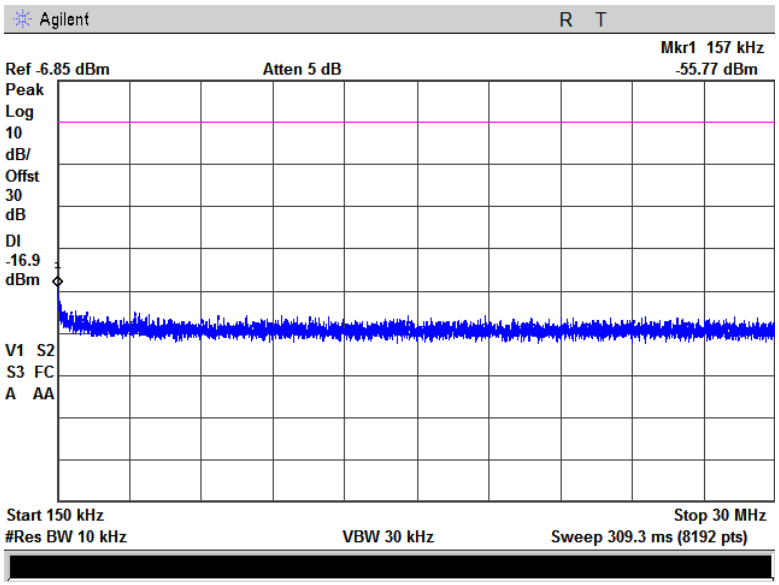


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.7 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

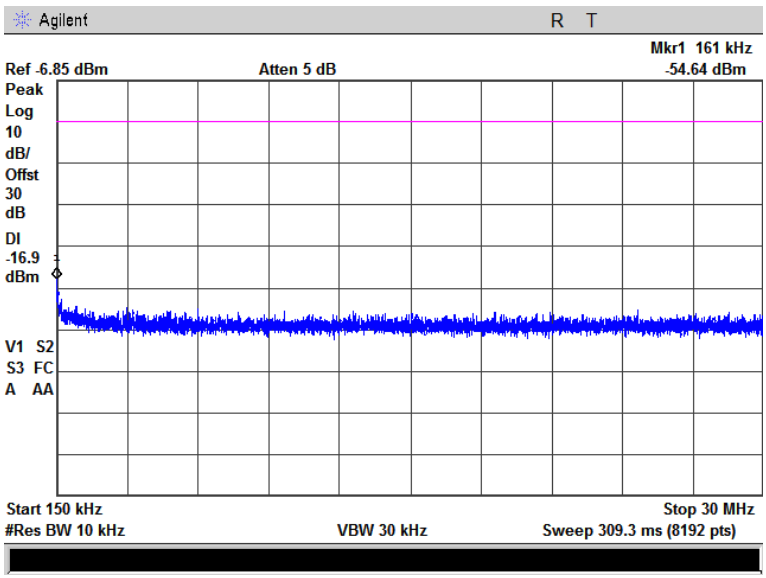
EUT CONFIGURATION:: RISER-2 output via 13 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.8 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency

EUT CONFIGURATION:: RISER-2 output via 13 dB splitter to ANT A port

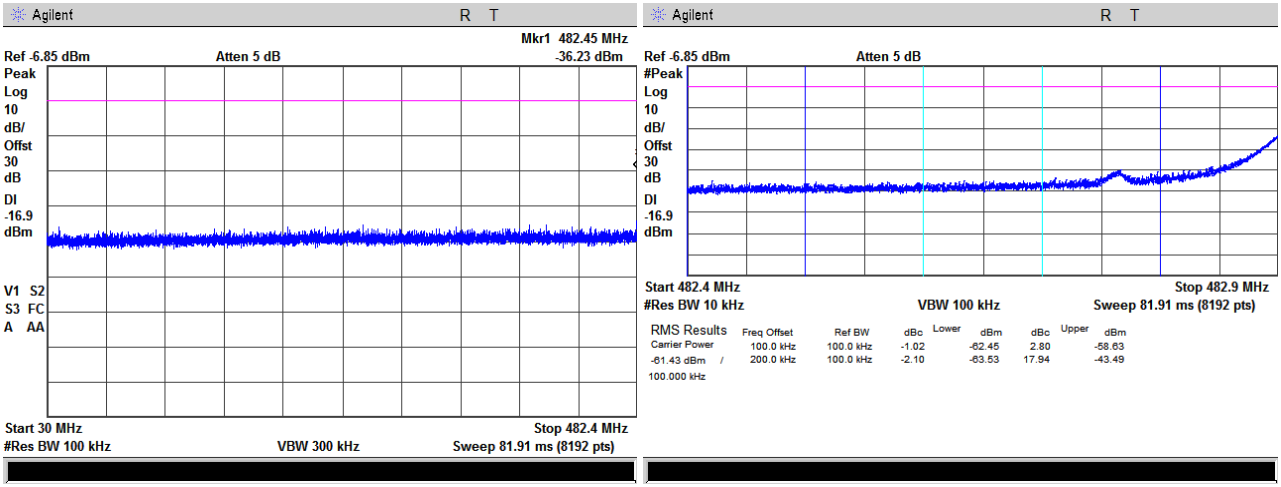


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.9 Spurious emission measurements in 30.0 – 489.9 MHz range at low carrier frequency

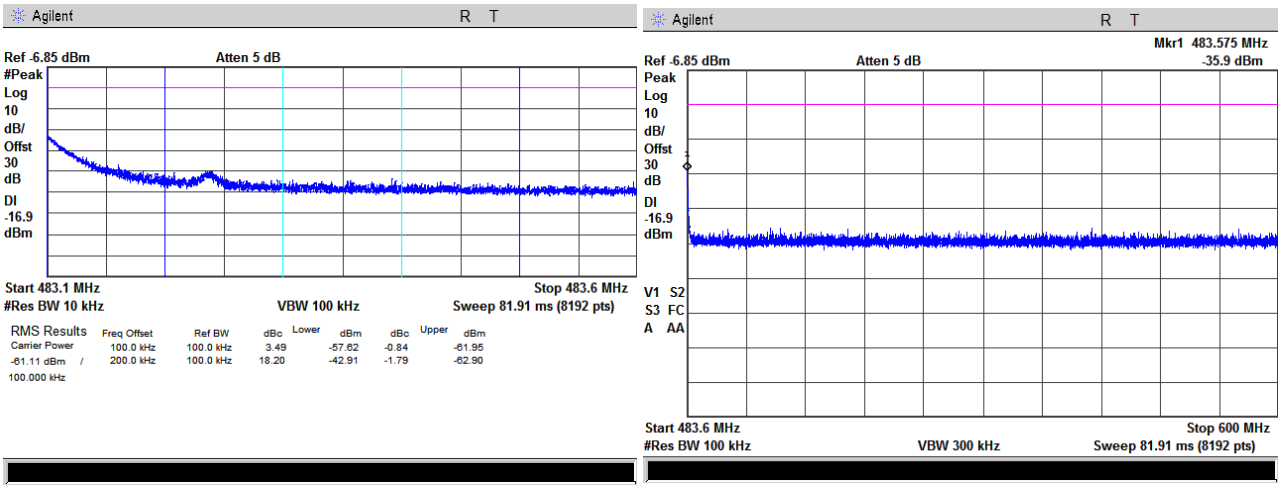
EUT CONFIGURATION: RISER-1 output via 18 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.10 Spurious emission measurements in 483.1 - 600 MHz range at low carrier frequency

EUT CONFIGURATION:: RISER-1 output via 18 dB splitter to ANT A port



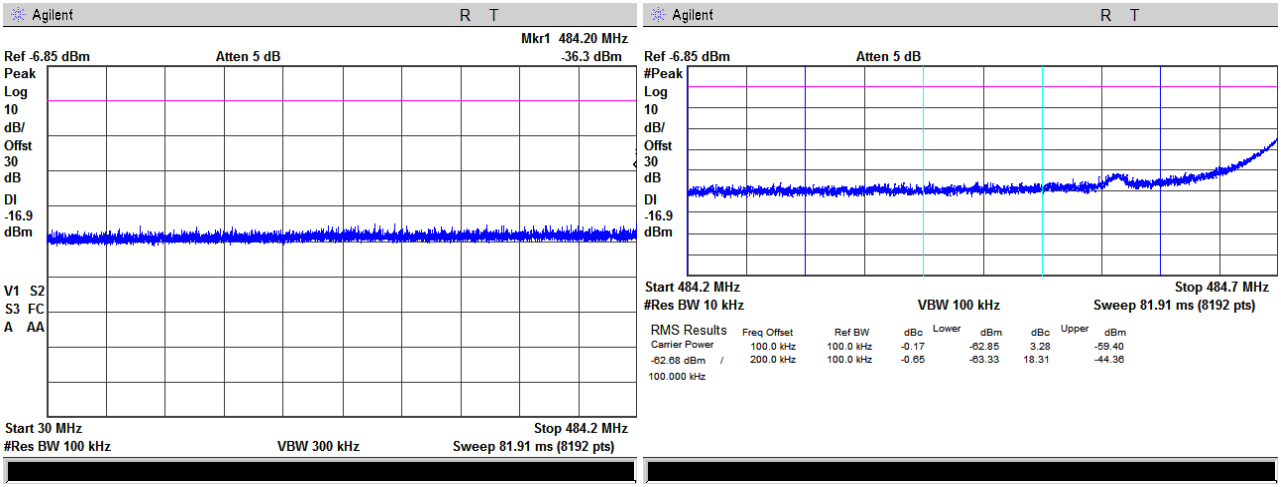
*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.11 Spurious emission measurements in 30.0 – 484.7 MHz range at high carrier frequency

EUT CONFIGURATION::

RISER-1 output via 18 dB splitter to ANT A port

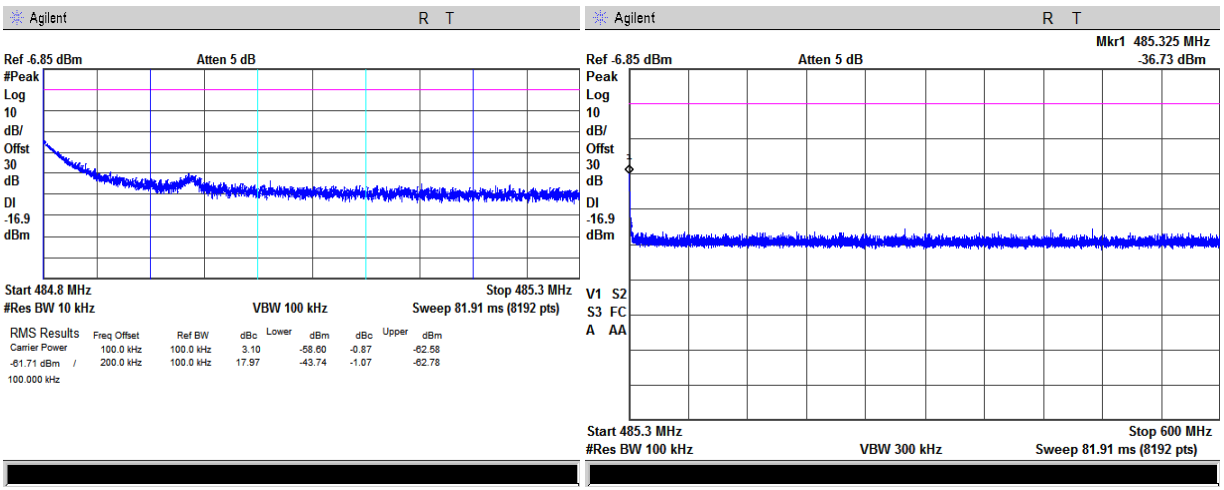


*Will be applied limit of -13 dBm

Plot 7.5.12 Spurious emission measurements in 484.8 - 600 MHz range at high carrier frequency

EUT CONFIGURATION:

RISER-1 output via 18 dB splitter to ANT A port

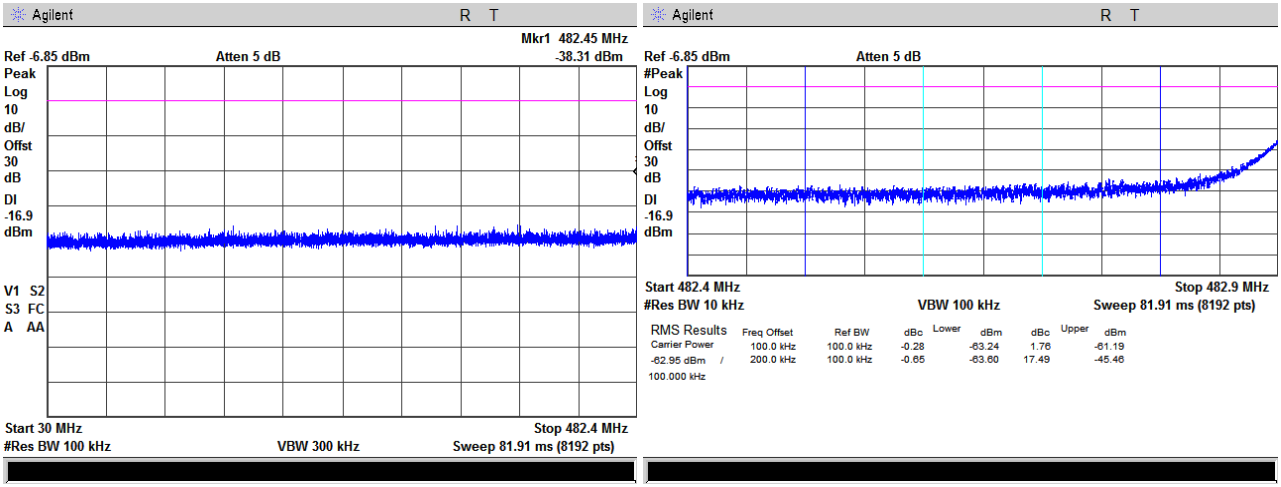


*Will be applied limit of -13 dBm

Test specification:	**Section 90.210, Conducted spurious emissions**		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	**Relative Humidity:** 51 %	**Air Pressure:** 1009 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Plot 7.5.13 Spurious emission measurements in 30.0 – 482.9 MHz range at low carrier frequency

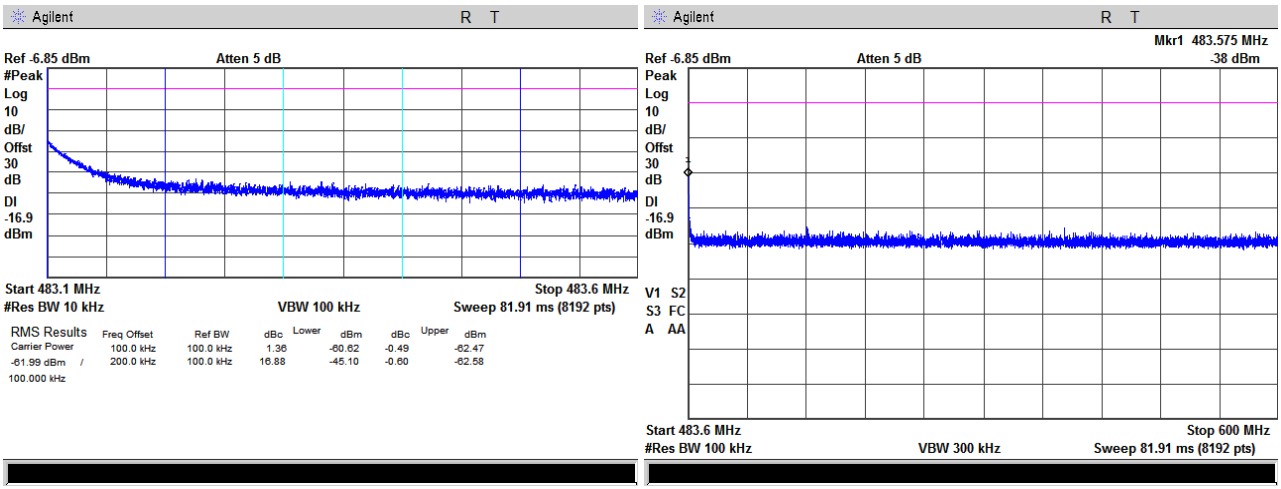
EUT CONFIGURATION:: RISER-2 output via 13 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.14 Spurious emission measurements in 483.1 – 600 MHz range at low carrier

EUT CONFIGURATION:: RISER-2 output via 13 dB splitter to ANT A port

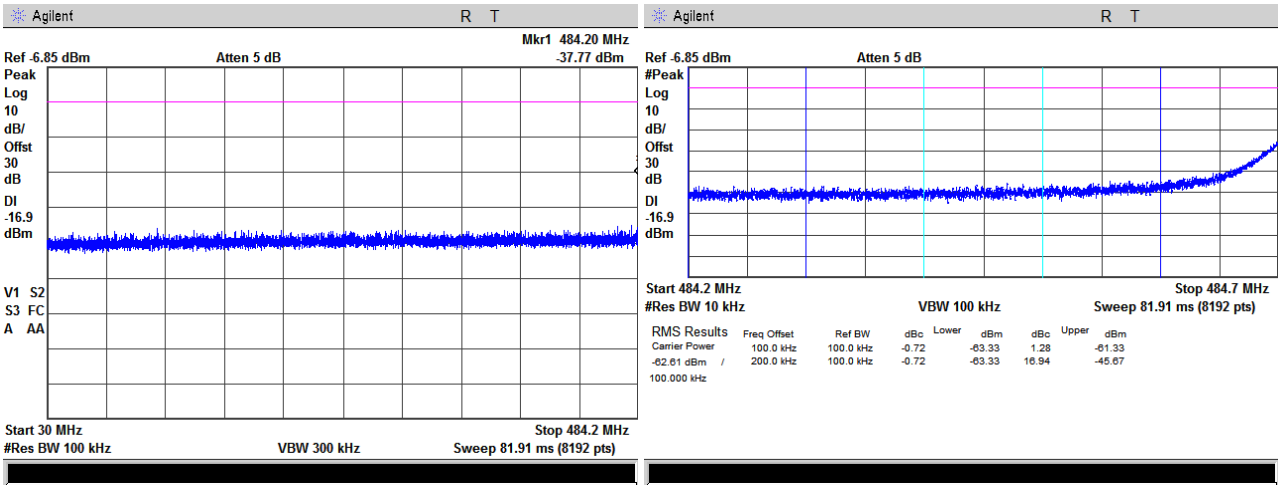


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.15 Spurious emission measurements in 30.0 – 484.7 MHz range at high carrier frequency

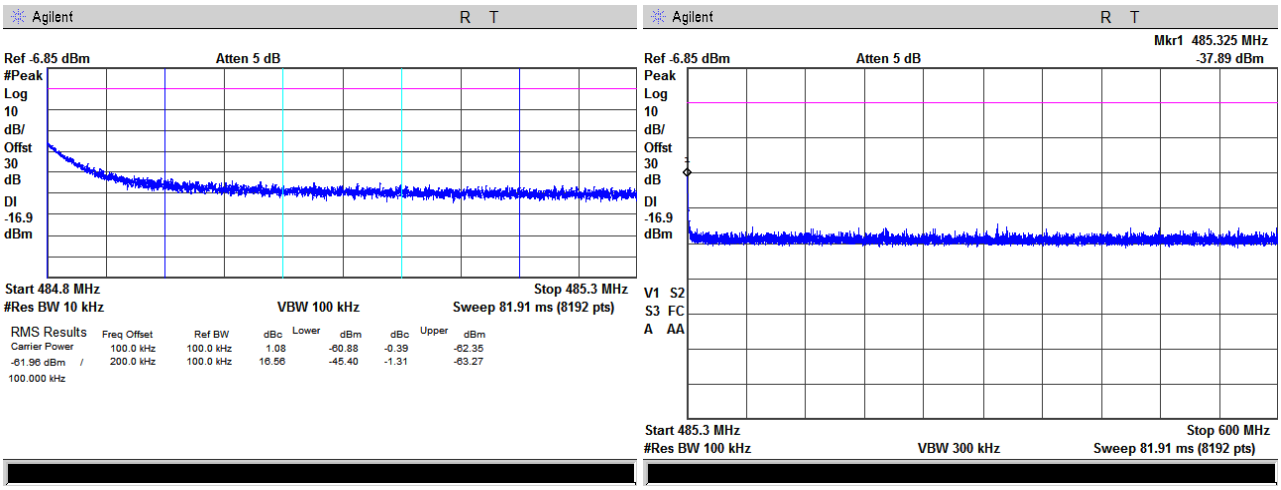
EUT CONFIGURATION: RISER-2 output via 13 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.16 Spurious emission measurements in 484.8 – 600 MHz range at high carrier frequency

EUT CONFIGURATION: RISER-2 output via 13 dB splitter to ANT A port

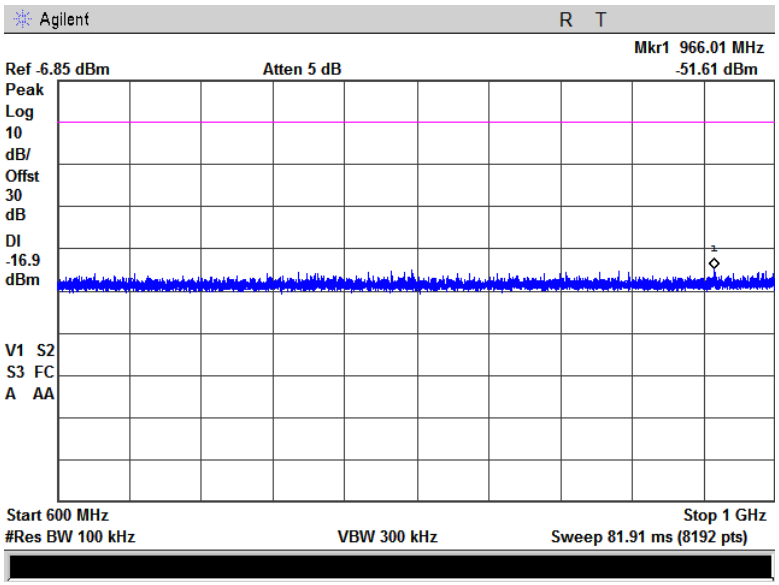


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.17 Spurious emission measurements in 600.0 - 1000 MHz range at low carrier frequency

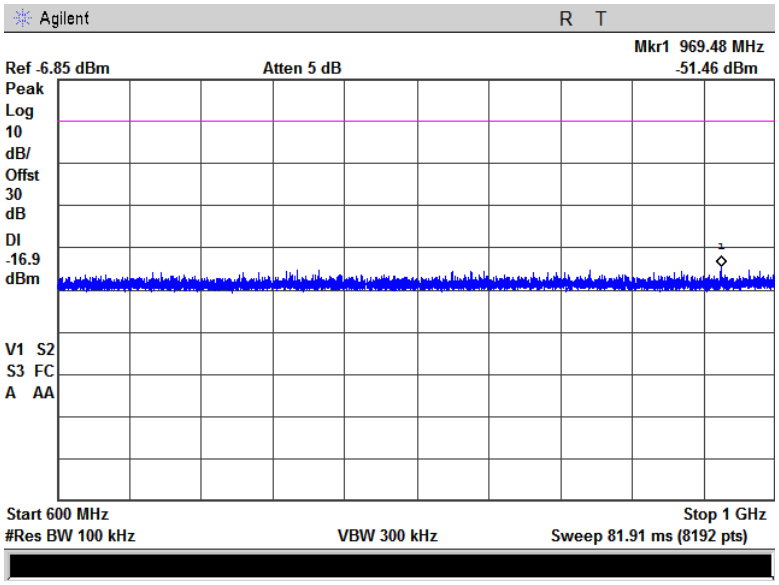
EUT CONFIGURATION: RISER-1 output via 18 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.18 Spurious emission measurements in 600.0 - 1000 MHz range at high carrier frequency

EUT CONFIGURATION: RISER-1 output via 18 dB splitter to ANT A port

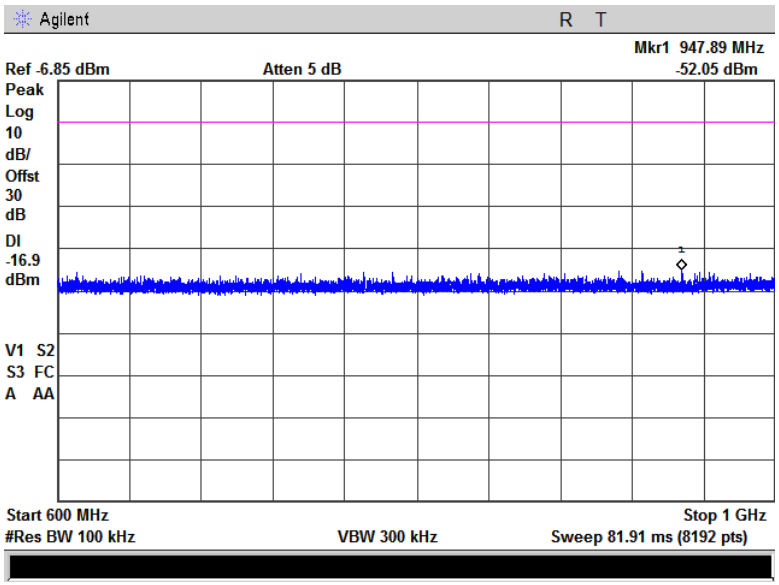


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.19 Spurious emission measurements in 600.0 - 1000 MHz range at low carrier frequency

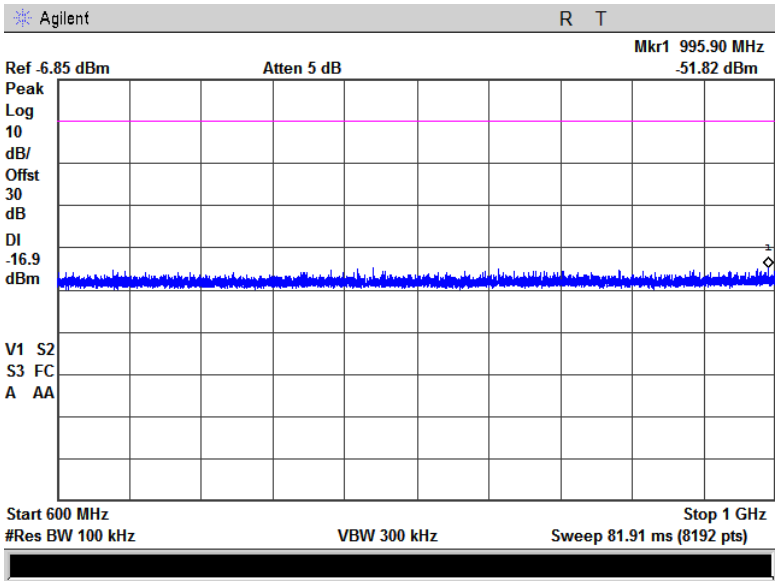
EUT CONFIGURATION: RISER-2 output via 13 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.20 Spurious emission measurements in 600.0 - 1000 MHz range at high carrier frequency

EUT CONFIGURATION: RISER-2 output via 13 dB splitter to ANT A port

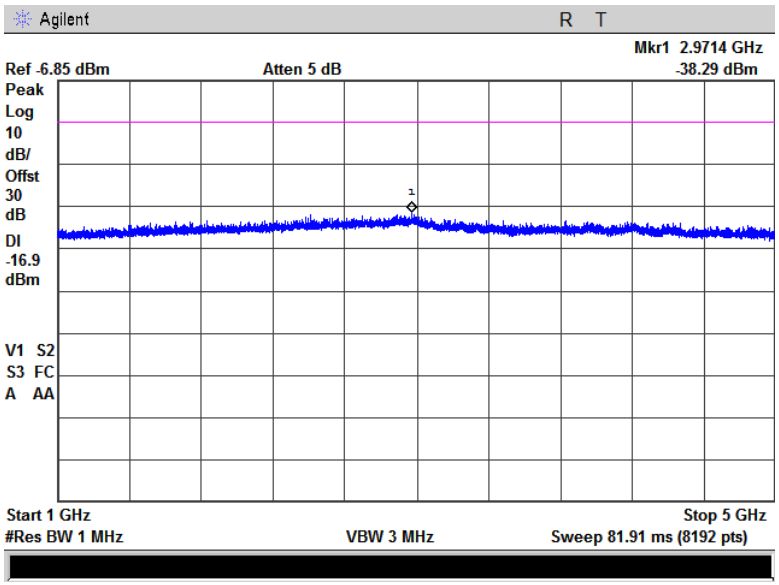


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.21 Spurious emission measurements in 1000 - 5000 MHz range at low carrier frequency

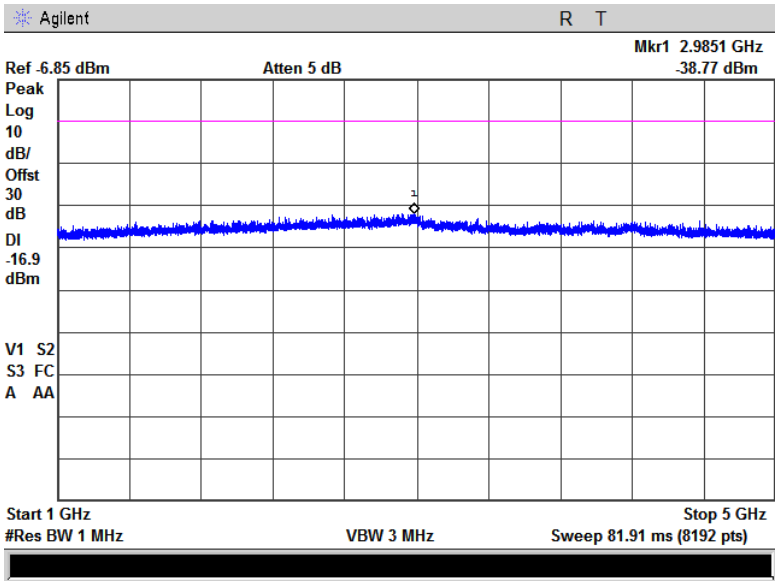
EUT CONFIGURATION: RISER-1 output via 18 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.22 Spurious emission measurements in 1000 - 5000 MHz at high carrier frequency

EUT CONFIGURATION: RISER-1 output via 18 dB splitter to ANT A port

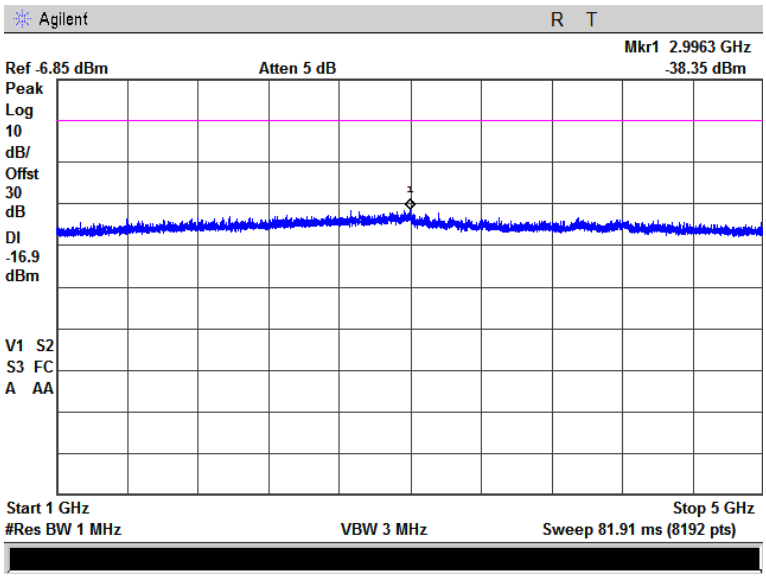


*Will be applied limit of -13 dBm

Test specification:	Section 90.210, Conducted spurious emissions		
Test procedure:	ANSI C63.26, Section 5.7.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Jun-21 - 10-Jun-21		
Temperature: 25.3 ºC	Relative Humidity: 51 %	Air Pressure: 1009 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.5.23 Spurious emission measurements in 1000 - 5000 MHz range at low carrier frequency

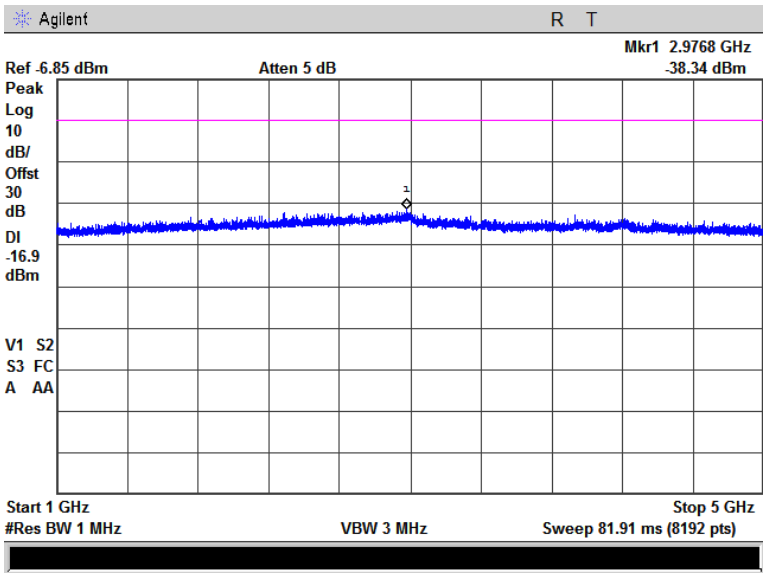
EUT CONFIGURATION: RISER-2 output via 13 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Plot 7.5.24 Spurious emission measurements in 1000 - 5000 MHz at high carrier frequency

EUT CONFIGURATION: RISER-2 output via 13 dB splitter to ANT A port



*Will be applied limit of -13 dBm

Test specification:	Section 90.213, Frequency stability		
Test procedure:	ANSI C63.26, Section 5.6.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	11-Jul-21 - 12-Jul-21		
Temperature: 23 ºC	Relative Humidity: 54 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.6 Frequency stability test

7.6.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.6.1. The test results are provided in Table 7.6.2.

Table 7.6.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
483.0125	2.5	1208
484.7625		1212

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 power was turned off. Temperature within test chamber was set to +30˚C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.

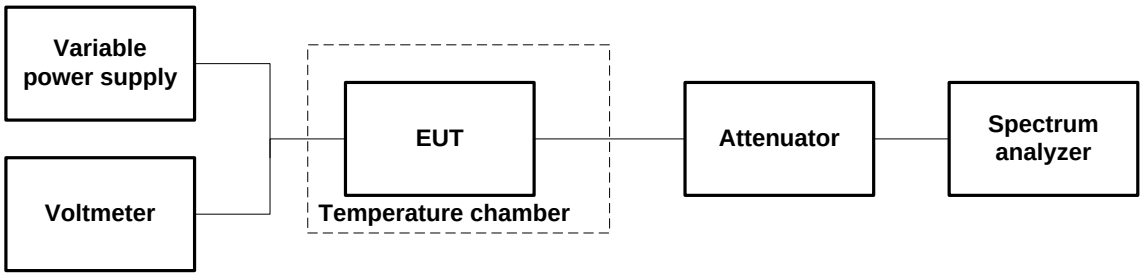
7.6.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

7.6.2.4 The above procedure was repeated at 0˚C and at the lowest test temperature.

7.6.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.

7.6.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.6.2.

Figure 7.6.1 Frequency stability test setup



Test specification:	**Section 90.213, Frequency stability**		
Test procedure:	ANSI C63.26, Section 5.6.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	11-Jul-21 - 12-Jul-21		
Temperature: 23 ºC	**Relative Humidity:** 54 %	**Air Pressure:** 1003 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY:	483.0125 MHz , 484.7625 MHz
NOMINAL POWER VOLTAGE:	120VAC
TEMPERATURE STABILIZATION PERIOD:	20 min
POWER DURING TEMPERATURE TRANSITION:	Off
SPECTRUM ANALYZER MODE:	Counter
RESOLUTION BANDWIDTH:	100Hz
VIDEO BANDWIDTH:	300Hz
MODULATION:	FM

T, ºC	Voltage, V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Margin, Hz	Verdict
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative			
Low frequency 483.0125 MHz													
-30	nominal	483.01241	483.01242	483.01242	483.01242	483.01241	483.01242	483.01246	0	-100	1208	-1208.0	Pass
-20	nominal	483.01248	NA	NA	NA	NA	NA	483.01245	0	-59		-1208.0	Pass
-10	nominal	483.01250	NA	NA	NA	NA	NA	483.01247	0	-39		-1208.0	Pass
0	nominal	483.01254	483.01254	483.01255	483.01254	483.01254	483.01252	483.01255	36	0		-1172.2	Pass
10	nominal	483.01255	NA	NA	NA	NA	NA	483.01255	40	0		-1168.1	Pass
20	+15%	483.01250	NA	NA	NA	NA	NA	483.01255	36	-12		-1172.3	Pass
20	nominal	483.01251	NA	NA	NA	NA	NA	483.01251	1	0		-1207.0	Pass
20	-15%	483.01250	NA	NA	NA	NA	NA	483.01253	15	-10		-1192.7	Pass
30	nominal	483.01250	483.01249	483.01249	483.01252	483.01253	483.01254	483.01255	36	-20		-1171.8	Pass
40	nominal	483.01255	NA	NA	NA	NA	NA	483.01251	32	-7		-1175.5	Pass
50	nominal	483.01253	NA	NA	NA	NA	NA	483.01256	51	0		-1157.2	Pass
High frequency 484.7625 MHz													
-30	nominal	484.76244	484.76244	484.76245	484.76245	484.76245	484.76245	484.76245	0	-122	1212	-1212.0	Pass
-20	nominal	484.76257	NA	NA	NA	NA	NA	484.76247	13	-90		-1199.3	Pass
-10	nominal	484.76249	NA	NA	NA	NA	NA	484.76248	0	-82		-1212.0	Pass
0	nominal	484.76255	484.76256	484.76256	484.76256	484.76256	484.76256	484.76257	15	-6		-1196.7	Pass
10	nominal	484.76254	NA	NA	NA	NA	NA	484.76257	13	-16		-1199.0	Pass
20	+15%	484.76253	NA	NA	NA	NA	NA	484.76254	0	-24		-1212.0	Pass
20	nominal	484.76254	NA	NA	NA	NA	NA	484.76256	0	-22		-1212.0	Pass
20	-15%	484.76254	NA	NA	NA	NA	NA	484.76257	8	-16		-1203.8	Pass
30	nominal	484.76254	484.76258	484.76259	484.76260	484.76260	484.76260	484.76260	46	-20		-1165.7	Pass
40	nominal	484.76258	NA	NA	NA	NA	NA	484.76259	37	0		-1174.5	Pass
50	nominal	484.76261	NA	NA	NA	NA	NA	484.76257	54	0		-1158.2	Pass

* - Reference frequency

Reference numbers of test equipment used

HL 0495	HL 3768	HL 4355	HL 5391	HL 5472	HL 5626	HL 5692	

Full description is given in Appendix A.

Test specification:	**Section 90.214, Transient frequency behaviour**		
Test procedure:	ANSI C63.26, section 6.5.2.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jun-21		
Temperature: 467 ºC	**Relative Humidity:** 46 %	**Air Pressure:** hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

7.7 Transient frequency behavior test

7.7.1 General

This test was performed to measure carrier frequency drift as function of time during transmitter start up and shut down. Specification test limits are given in Table 7.7.1. The test results are provided in the associated plots.

Table 7.7.1 Transient frequency limits

Channel bandwidth, kHz	Carrier frequency tolerance, kHz	Duration, ms	Time interval*
421.0 – 512.0 MHz band			
25.0	± 25.0	10.0	t_1
	± 12.5	25.0	t_2
	± 25.0	10.0	t_3

* - t_{on} is the instant when a 1 kHz test signal is completely suppressed;
t_1 is the time period immediately following t_{on};t_2 is the time period immediately following t_1;
t_3 is the time period from the instant when the transmitter is turned off until t_{off};
t_{off} is the instant when the 1 kHz test signal starts to rise.

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. Variable attenuator was adjusted to provide signal level approximately 40 dB below the FM receiver maximum allowed level as measured with RF power meter. The EUT was turned off.

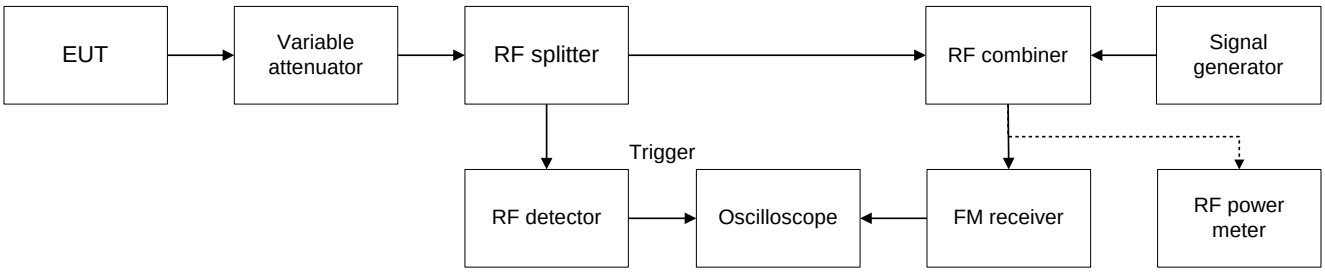
7.7.2.2 The signal generator was set to the assigned transmitter frequency modulated with 1 kHz tone at 25 kHz deviation and the output power was adjusted to provide the same as the EUT signal level at the FM receiver input as measured with power meter.

7.7.2.3 The storage oscilloscope was set to provide horizontal sweep rate 10 milliseconds per division. Amplitude control of the storage oscilloscope was adjusted to obtain 1 kHz sinusoidal signal vertically centered with ± 4 divisions amplitude.

7.7.2.4 The variable attenuator was adjusted to increase RF level supplied to splitter by 30 dB and the EUT was consequently turned on and off. Transient frequency during power switching was captured and shown in the associated plots.

Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	ANSI C63.26, section 6.5.2.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jun-21		
Temperature: 467 ºC	Relative Humidity: 46 %	Air Pressure: hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.7.1 Transient frequency test setup



Test specification:	**Section 90.214, Transient frequency behaviour**		
Test procedure:	ANSI C63.26, section 6.5.2.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	16-Jun-21		
Temperature: 467 ºC	**Relative Humidity:** 46 %	**Air Pressure:** hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.7.2 Transient frequency behaviour test results

Carrier frequency, MHz	Time interval	Duration, ms	Frequency tolerance, kHz	Limit, kHz	Margin, kHz	Verdict
Channel bandwidth 25.00 kHz						
483.0125	t_1	10.0	3.281	± 25.00	-21.719	Pass
	t_2	25.0	1.562	± 12.50	-10.938	
	t_3	10.0	0.468	± 25.00	-24.532	
484.7625	t_1	10.0	3.437	± 25.00	-21.563	Pass
	t_2	25.0	2.500	± 12.50	-10.000	
	t_3	10.0	2.500	± 25.00	-22.500	

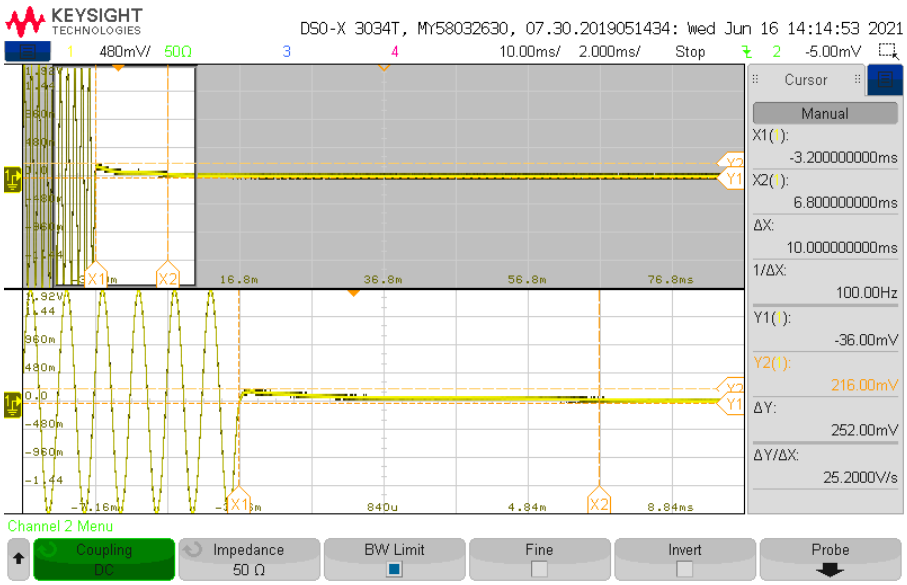
Reference numbers of test equipment used

HL 2017	HL 2227	HL 3433	HL 3434	HL 4366	HL 4785	HL 5369	HL 5372
HL 5472	HL 5692	HL 5977					

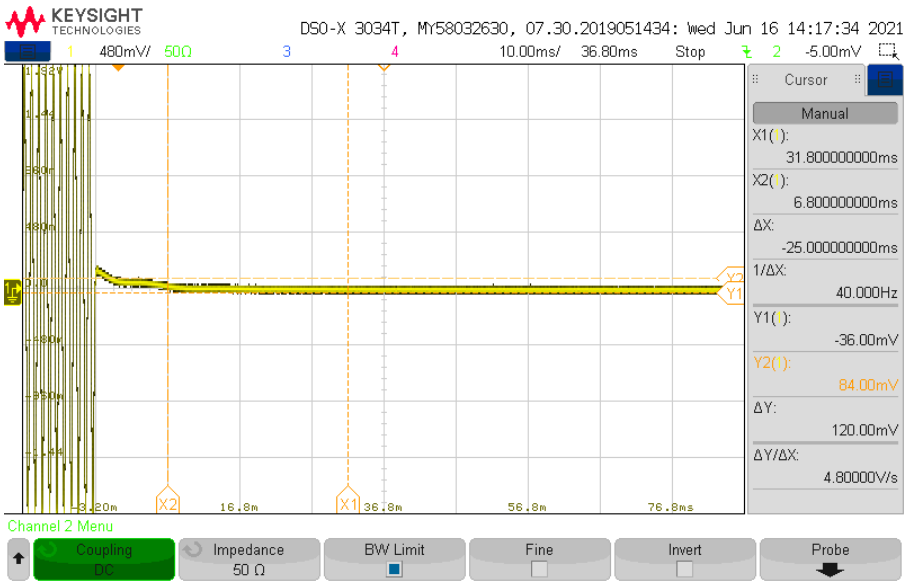
Full description is given in Appendix A.

Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	ANSI C63.26, section 6.5.2.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jun-21		
Temperature: 467 ºC	Relative Humidity: 46 %	Air Pressure: hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.7.1 Transient frequency behavior during power ON test results at low carrier frequency



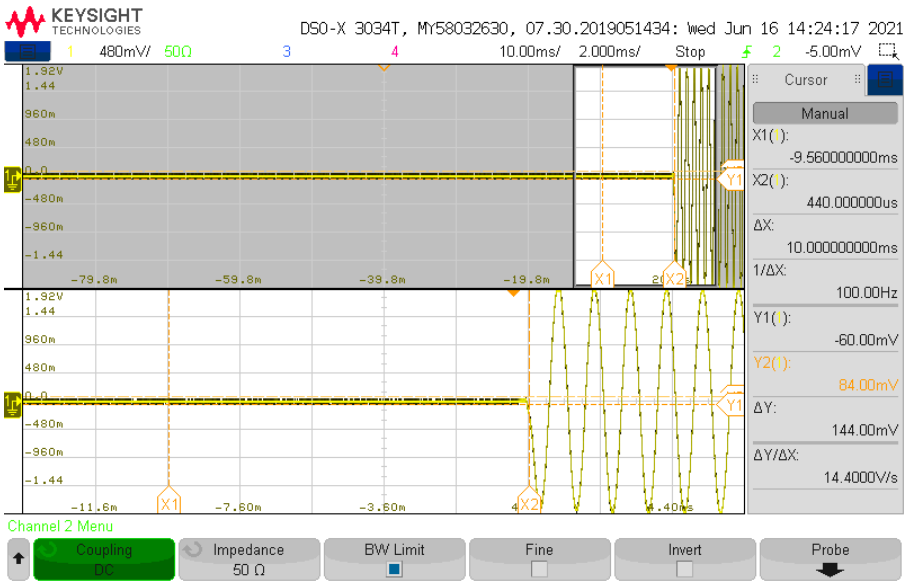
t_1 = 10ms



t_2 = 25 ms

Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	ANSI C63.26, section 6.5.2.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jun-21		
Temperature: 467 ºC	Relative Humidity: 46 %	Air Pressure: hPa	Power: 120 VAC, 60 Hz
Remarks:			

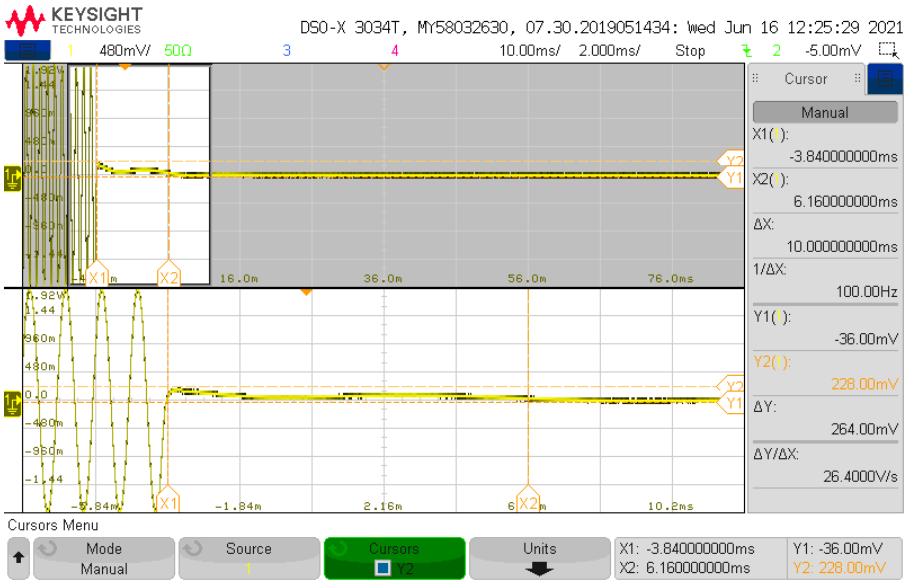
Plot 7.7.2 Transient frequency during power OFF test results at low carrier frequency



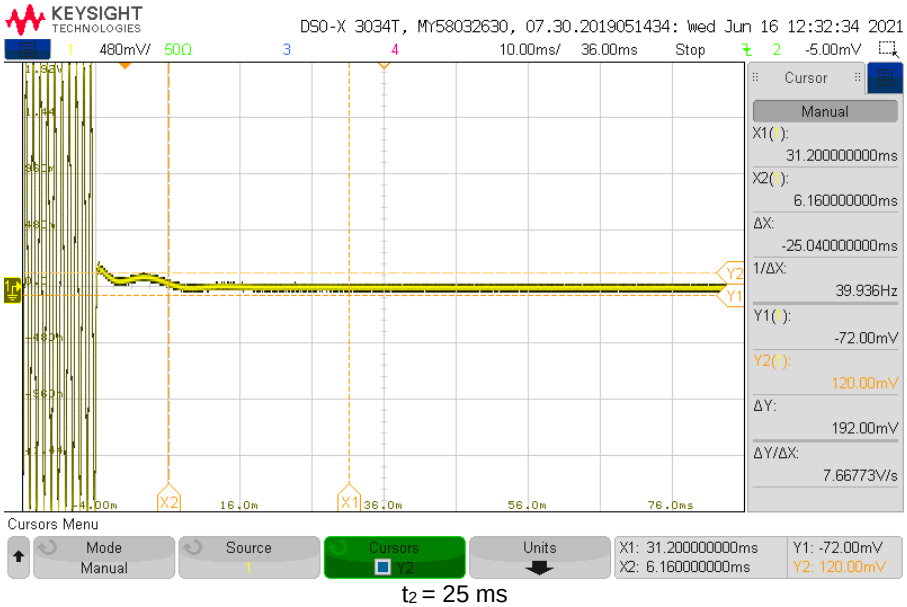
t_3 = 10ms

Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	ANSI C63.26, section 6.5.2.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jun-21		
Temperature: 467 ºC	Relative Humidity: 46 %	Air Pressure: hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.7.3 Transient frequency during power ON test results at high carrier frequency



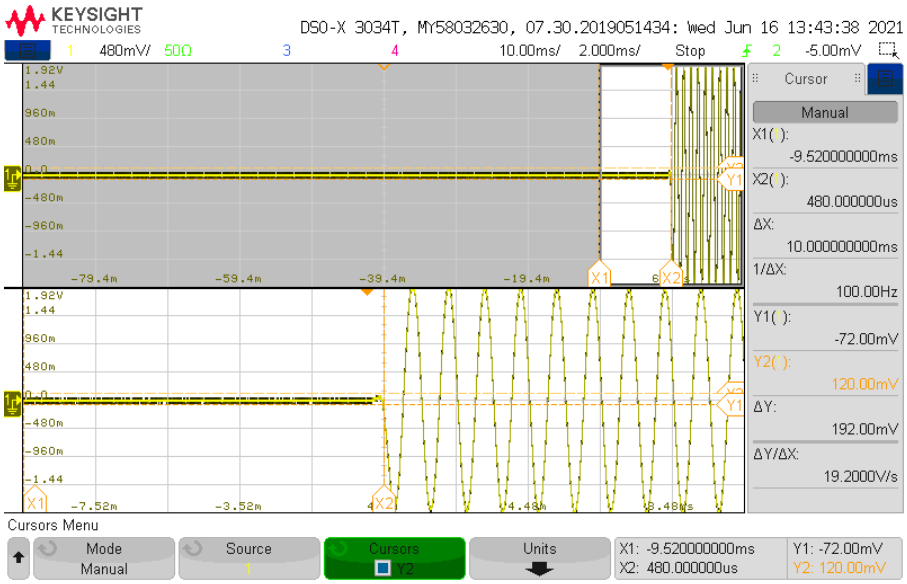
t_1 = 10 ms



t_2 = 25 ms

Test specification:	Section 90.214, Transient frequency behaviour		
Test procedure:	ANSI C63.26, section 6.5.2.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	16-Jun-21		
Temperature: 467 ºC	Relative Humidity: 46 %	Air Pressure: hPa	Power: 120 VAC, 60 Hz
Remarks:			

Plot 7.7.4 Transient frequency during power OFF test results at high carrier frequency



t_3 = 10ms

Test specification:	**Section 90.214, Audio frequency response**		
Test procedure:	ANSI C63.26, section 5.3.3.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	04-Jul-21		
Temperature: 26.8 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1002 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

7.8 Audio frequency response test

7.8.1 General

This test was performed to measure the frequency response of the audio modulation circuit over a range of 300 to 3000 Hz.

7.8.2 Test procedure

7.8.2.1 The EUT was set up as shown in Figure 7.9.1, energized and its proper operation was checked.

7.8.2.2 The receiver was set to measure peak positive deviations. The de-emphasis function was turned off.

7.8.2.3 The EUT was adjusted to provide full rated system deviation.

7.8.2.4 A 1000 Hz tone of audio generator was applied to the EUT and the level was adjusted to obtain 20% of full rated system deviation. .This level was used as a reference (0 dB).

7.8.2.5 The receiver was set to measure rms deviation and results were recorded as DEV_{ref} in Table 7.9.2.

7.8.2.6 The audio generator was set to the desired test frequencies between 300 Hz and 3000 Hz and the test receiver deviation reading was recorded as DEV_{freq} in Table 7.9.2.

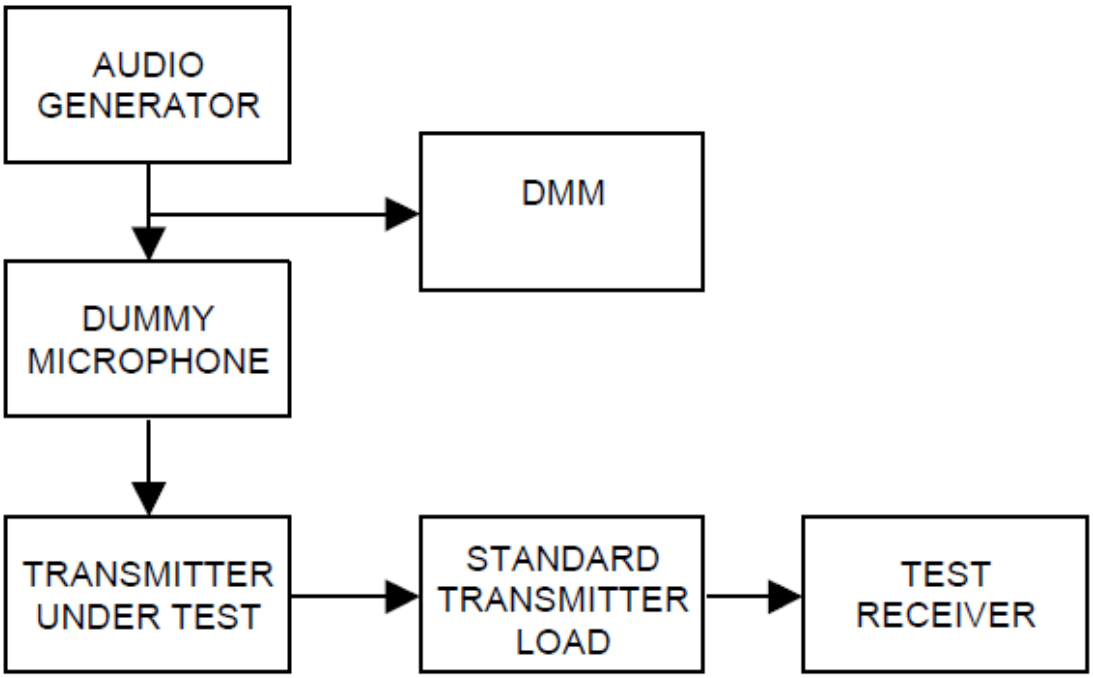
7.8.2.7 The audio frequency response at the present frequency was calculated according to the next equation:

$$\text{audio frequency response} = 20 \log_{10} (DEV_{FREQ} / DEV_{REF})$$

7.8.2.8 The test was repeated at 300 Hz, 2500 Hz and 3000 Hz and test results were recorded in Table 7.9.2.

Test specification:	Section 90.214, Audio frequency response		
Test procedure:	ANSI C63.26, section 5.3.3.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	04-Jul-21		
Temperature: 26.8 ºC	Relative Humidity: 46 %	Air Pressure: 1002 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Figure 7.8.1 Audio frequency response test setup



Test specification:	**Section 90.214, Audio frequency response**		
Test procedure:	ANSI C63.26, section 5.3.3.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	04-Jul-21		
Temperature: 26.8 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1002 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.8.1 Audio frequency response test results

Low carrier frequency 483.0125 MHz
REFERENCE DEVIATION 100%: 348 mV_{p-p}; 117.25 mV_{RMS}
REFERENCE DEVIATION 20%: 23.45 mV_{p-p}
High carrier frequency 484.7625 MHz
REFERENCE DEVIATION 100%: 271 mV_{p-p}; 90.31 mV_{RMS}
REFERENCE DEVIATION 20%: 18.06 mV_{p-p}

Carrier frequency, MHz	Frequency , Hz	Measured deviation, DEF_{freq}, Vrms ON DMM	Audio frequency response, dB	Limit range, dB	Verdict
RISER -2 to splitter 13dB at ANT A output port					
483.0125	300	7.2	-10.44	-18.0 - -9.4	Pass
	400	10.4	-7.28	-13.0 – 7.0	Pass
	500	12.7	-5.54	-9.1 - -5.1	Pass
	700	16.8	-3.04	-6.2 - -2.2	Pass
	1000	23.45	0.00	-3.0 - +1.0	Pass
	1500	33.9	3.54	0.5 – 4.5	Pass
	2000	41.7	5.82	3.0 – 7.0	Pass
	2500	45.0	7.04	5.0 – 9.0	Pass
	3000	38.5	6.37	5.0 – 11.0	Pass
484.7625	300	5.7	-10.20	-18.0 - -9.4	Pass
	400	8.0	-7.29	-13.0 – 7.0	Pass
	500	9.9	-5.44	-9.1 - -5.1	Pass
	700	13.0	-3.00	-6.2 - -2.2	Pass
	1000	18.06	0.00	-3.0 - +1.0	Pass
	1500	26.1	3.54	0.5 – 4.5	Pass
	2000	32.2	5.84	3.0 – 7.0	Pass
	2500	34.7	7.05	5.0 – 9.0	Pass
	3000	29.8	6.41	5.0 – 11.0	Pass

Reference numbers of test equipment used

HL 3234	HL 3520	HL 5371	HL 5372	HL 5589	HL 5662	HL 5916	HL 5971

Full description is given in Appendix A.

Test specification:	Section 90.207, Modulation limiting		
Test procedure:	ANSI C63.26, section 5.3.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jul-21		
Temperature: 25.4 ºC	Relative Humidity: 38 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
Remarks:			

7.9 Modulation limiting

7.9.1 General

This test was performed to check the ability of a transmitter circuit to limit the transmitter from producing deviations in excess of a rated system deviation.

7.9.2 Test procedure

7.9.2.1 The EUT was set up as shown in Figure 7.9.1, energized and its proper operation was checked.

7.9.2.2 The EUT was adjusted to provide full rated system deviation.

7.9.2.3 The test receiver was set to measure peak positive deviations. The de-emphasis function was turned off.

7.9.2.4 A 1000 Hz modulating signal of audio generator was applied to the EUT and the output level was adjusted to obtain 60% of the full rated system deviation. This level was used as a reference level (0 dB).

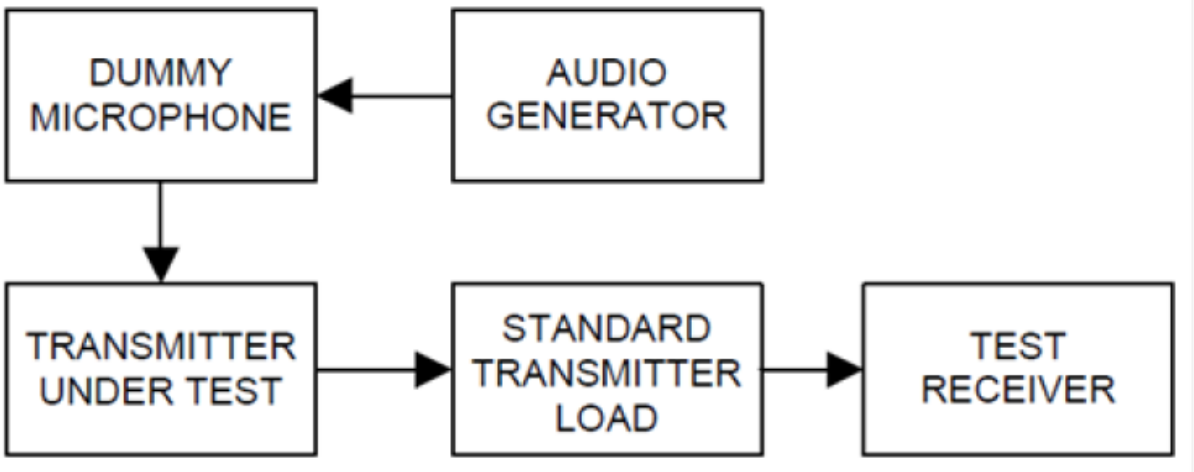
7.9.2.5 The level from audio generator was increased by 20 dB in 1 increment and the deviation in step was measured and recorded from the test receiver.

7.9.2.6 The audio signal was slowly varied between frequencies 300 - 3000 Hz at 20 dB.

7.9.2.7 The test receiver was set to measure peak negative deviation and the test was repeated at all frequencies.

7.9.2.8 The values recorded above are the modulation limiting and the frequency deviation was obtained as a percentage of deviation relative to the 0 dB reference point versus voltage (function of the input level) and provided in Table 7.9.1, Table 7.9.2.

Figure 7.9.1 Modulation limiting test setup



Test specification:	**Section 90.207, Modulation limiting**		
Test procedure:	ANSI C63.26, section 5.3.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Jul-21		
Temperature: 25.4 ºC	**Relative Humidity:** 38 %	**Air Pressure:** 1003 hPa	**Power:** 120 VAC, 60 Hz
Remarks:			

Table 7.9.1 Modulation limiting test results at RISER 1 at frequency 483.0125 MHz

Modulating signal	**Reference 1000 Hz and variation from 300 Hz to 3000 Hz**				
Level audio generator, 20dB	**Frequency, kHz**	**Positive deviation, kHz**	**Negative deviation, kHz**	**Limit range, kHz**	**Verdict**
3910 (mV)	300	2.959	-3.701	+-5.0	Pass
3910 (mV)	400	4.084	-3.843	+-5.0	Pass
3910 (mV)	500	4.266	-3.814	+-5.0	Pass
3910 (mV)	600	4.028	-3.729	+-5.0	Pass
3910 (mV)	700	4.056	-3.629	+-5.0	Pass
3910 (mV)	800	4.000	-3.572	+-5.0	Pass
3910 (mV)	900	3.971	-3.572	+-5.0	Pass
3910 (mV)	1000	4.014	-3.516	+-5.0	Pass
3910 (mV)	1500	4.463	-3.629	+-5.0	Pass
3910 (mV)	2000	4.042	-3.430	+-5.0	Pass
3910 (mV)	2500	3.733	-3.160	+-5.0	Pass
3910 (mV)	3000	3.761	-3.231	+-5.0	Pass
Rise time, msec					**Verdict**
2.96					Pass

*60% of full rate of system deviation is level audio generator 391mV. This is the 0 dB reference level.

*Rise Time need to be less then 0.1 Sec.

Test specification:	Section 90.207, Modulation limiting		
Test procedure:	ANSI C63.26, section 5.3.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	05-Jul-21		
Temperature: 25.4 ºC	Relative Humidity: 38 %	Air Pressure: 1003 hPa	Power: 120 VAC, 60 Hz
Remarks:			

Table 7.9.2 Modulation limiting test results at RISER 2 at frequency 484.7625 MHz

Modulating signal	Reference 1000 Hz and variation from 300 Hz to 3000 Hz				
Level audio generator, 20dB	Frequency, kHz	Positive deviation, kHz	Negative deviation, kHz	Limit range, kHz	Verdict
3910 (mV)	300	3.200	-3.072	+-5.0	Pass
3910 (mV)	400	3.671	-2.913	+-5.0	Pass
3910 (mV)	500	3.571	-2.898	+-5.0	Pass
3910 (mV)	600	3.500	-2.695	+-5.0	Pass
3910 (mV)	700	3.500	-2.768	+-5.0	Pass
3910 (mV)	800	3.314	-2.739	+-5.0	Pass
3910 (mV)	900	3.300	-2.710	+-5.0	Pass
3910 (mV)	1000	3.342	-2.652	+-5.0	Pass
3910 (mV)	1500	3.342	-2.652	+-5.0	Pass
3910 (mV)	2000	3.371	-2.623	+-5.0	Pass
3910 (mV)	2500	3.071	-2.420	+-5.0	Pass
3910 (mV)	3000	2.685	-2.231	+-5.0	Pass
Rise time, msec					Verdict
2.36					Pass

*60% of full rate of system deviation is level audio generator 404mV. This is the 0 dB reference level.
*Rise Time need to be less then 0.1 Sec.

Reference numbers of test equipment used

HL 1501	HL 3234	HL 4785	HL 5372	HL 5589	HL 5626	HL 5692	HL 5916
HL 5971							

Full description is given in Appendix A.

8 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 (9) kHz - 30 MHz	EMCO	6502	2857	28-Feb-21	28-Feb-22
0495	Autotransformer 0-255V, 10A	Variac	EMPL01	495	06-May-21	06-May-22
1205	One phase voltage regulator, 2kVA, 0-250V	Hermon Laboratories	TDGC-2	109	21-Apr-21	21-Apr-22
1501	Cable RF, 6 m, BNC/BNC	Belden	M17/167 MIL-C-17	1501	13-Sep-20	13-Sep-21
2017	Attenuator, Manual Step, 0-60/10 dB, 0-8.0 GHz	Midwest Microwave	1071	2017	13-Apr-21	13-Apr-22
2227	Crystal Detector 0.01-18 GHz, 100 mW	Hewlett Packard Co	8472A	NA	24-Dec-19	24-Dec-21
2834	DC Power Supply 0-20V, 0-130A	Xantrex	XFR 20-130 GPIB	E00115182	03-Nov-20	03-Nov-21
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	12-May-21	12-Jun-22
3234	Signal generator, 9 kHz - 3.3 GHz	Rohde & Schwarz	SML03	103387	15-Jul-20	15-Aug-21
3433	Test Cable , DC-18 GHz, 1.5 m, SMA - SMA	Mini-Circuits	CBL-5FT-SMSM+	25679	19-Apr-21	19-Apr-22
3434	Test Cable , DC-18 GHz, 1.5 m, SMA - SMA	Mini-Circuits	CBL-5FT-SMSM+	25683	19-Apr-21	19-Apr-22
3520	Multimeter	Fluke	115	95871342	20-Jul-20	20-Jul-21
3768	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	NA	17-Sep-20	17-Sep-21
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	06-Apr-21	06-Apr-22
4011	Temp. & Humidity Meter, (-50 - +70) deg, (20 - 99)% RH	Mad Electronics	HTC-1	NA	12-Aug-20	12-Aug-21
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	101630	09-Sep-20	09-Sep-21
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	19-Jan-21	19-Jan-22
4366	Directional coupler, 1 GHz to 18 GHz, 10 dB, SMA Female	Tiger Micro-Electronics Institute	TGD-A1101-10	01e-JSDE805-007	03-Jun-20	03-Jun-22
4785	Signal generator, 9 kHz - 3.2 GHz	Rohde & Schwarz	SMC 100A	103279	16-Nov-20	16-Nov-21
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	26-Jan-21	26-Jan-22
5085	Attenuator, 4 dB, DC - 6 GHz, 1 W	Mini-Circuits	UNAT-4+	NA	11-May-21	11-May-22
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	08-Feb-19	08-Feb-22
5369	Digital storage oscilloscope, 350 MHz	Keysight Technologies	DSOX3034T	MY58032630	01-Jun-20	01-Aug-21

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
5371	EXG Analog Signal Generator, 9 kHz - 40 GHz	Keysight Technologies	N5173B	MY57280540	25-Aug-20	25-Aug-21
5372	MXE EMI receiver, 3 Hz to 44 GHz	Keysight Technologies	N9038A	MY57290155	15-Mar-21	15-Mar-22
5391	Temperature/Humidity Cycle Chamber, -77 - +177 deg., Humidity Range 20% RH to 95% RH	Thermotron	SM-8C	27737	19-Aug-20	19-Aug-21
5472	Power Splitter / Combiner 0.5-1 GHz	Mini Circuits	ZAPD-1	NA	28-Jan-21	28-Jan-23
5589	Cable, 50 Ohm, DC to 18 GHz, 1.8 m, SMA/N	Mini Circuits	CBL-6FT-SMNM+	NA	27-Oct-20	27-Oct-21
5602	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18000 MHz	Mini Circuits	BW-N10W5+	NA	16-Sep-20	16-Sep-21
5626	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini Circuits	BW-N20W5+	NA	21-Sep-20	21-Sep-21
5662	DMM-Termination, 1.111 Mohm (+/- 0.5%)	EMC PARTNER	DMM-TERMINATION	1530	06-Aug-20	06-Aug-21
5672	Cable SF126EA/11N(x2)/2M, 18GHz	Huber-Suhner	SF126EA	506757/126EA	25-Oct-20	25-Oct-21
5692	Temp. & Humidity Meter, (-10 - +50) deg, (10 - 99)% RH	Mad Electronics	HTC-1	NA	13-Dec-20	13-Dec-21
5916	RF cable, 5.0m, BNC	Huber-Suhner	RG 58C/U		02-Dec-20	02-Dec-21
5971	Oscilloscope, 500 MHz, digital 4 channel	Rohde & Schwarz	RTM3004	104883	20-Feb-21	20-Jan-22
5977	Attenuator 40 dB, DC to 6 GHz, 150W	Aeroflex / Weinschel	57-40-33	NR309	14-Mar-21	14-Mar-22

9 APPENDIX B Test equipment correction factors

HL 0446: Active Loop Antenna
EMCO, model: 6502, s/n 2857

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB
10	-33.4	±1.0
20	-37.8	±1.0
50	-40.5	±1.0
75	-41.0	±1.0
100	-41.2	±1.0
150	-41.2	±1.0
250	-41.1	±1.0
500	-41.2	±1.0
750	-41.3	±1.0
1000	-41.3	±1.0

Frequency,	Measured antenna factor, dBS/m	Measurement uncertainty, dB
2000	-41.4	±1.0
3000	-41.4	±1.0
4000	-41.5	±1.0
5000	-41.5	±1.0
10000	-41.7	±1.0
15000	-42.1	±1.0
20000	-42.7	±1.0
25000	-44.2	±1.0
30000	-45.8	±1.0

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμA/m.

HL 4933: Active Horn Antenna
COM-POWER CORPORATION, model: AHA-118, s/n 701046

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
1000	-16.1
1500	-15.1
2000	-10.9
2500	-11.9
3000	-11.1
3500	-10.6
4000	-8.6
4500	-8.3
5000	-5.9
5500	-5.7
6000	-3.3
6500	-4.0
7000	-2.2
7500	-1.7
8000	1.1
8500	-0.8
9000	-1.5
9500	-0.2

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
10000	1.8
10500	1.0
11000	0.3
11500	-0.5
12000	3.1
12500	1.4
13000	-0.3
13500	-0.4
14000	2.5
14500	2.2
15000	1.9
15500	0.5
16000	2.1
16500	1.2
17000	0.6
17500	3.1
18000	4.2

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμV/m.

HL 5288: Trilog Antenna
Frankonia, model: ALX-8000E, s/n: 00809
30-1000 MHz

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
30	14.96	160	12.67
35	15.33	180	13.34
40	16.37	200	15.40
45	17.56	250	16.42
50	17.95	300	17.28
60	16.87	400	19.98
70	13.22	500	21.11
80	10.56	600	22.90
90	13.61	700	24.13
100	15.46	800	25.25
120	14.03	900	26.35
140	12.23	1000	27.18

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμV/m.

above 1000 MHz

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
1000	26.9	3600	38.9
1100	28.1	3700	39.4
1200	28.4	3800	39.4
1300	29.6	3900	39.6
1400	29.1	4000	39.7
1500	30.4	4100	39.8
1600	30.7	4200	40.5
1700	31.5	4300	40.9
1800	32.3	4400	41.1
1900	32.6	4500	41.4
2000	32.5	4600	41.3
2100	32.9	4700	41.6
2200	33.5	4800	41.9
2300	33.2	4900	42.3
2400	33.7	5000	42.7
2500	34.6	5100	43.0
2600	34.7	5200	42.9
2700	34.6	5300	43.5
2800	35.0	5400	43.6
2900	35.5	5500	44.3
3000	36.2	5600	44.7
3100	36.8	5700	45.0
3200	36.8	5800	45.0
3300	37.0	5900	45.3
3400	37.5	6000	45.9
3500	38.2		

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμV/m.

10 APPENDIX C Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
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
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency error	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Transient frequency behaviour	187 Hz ± 13.9 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Unintentional radiator tests	
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 D Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.
Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for relevant parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; Recognized by Innovation, Science and Economic Development Canada for wireless and terminal testing (ISED), ISED #2186A, CAB identifier is IL1001; Certified by VCCI, Japan (the registration numbers are R-10808 for OATS, R-1082 for anechoic chamber, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site and T-11606 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, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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12 APPENDIX E Specification references

FCC 47CFR part 90: 2020	Private land mobile radio services
FCC 47CFR part 2: 2020	Frequency allocations and radio treaty matters; general rules and regulations
ANSI C63.26: 2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
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
dBΩ	decibel referred to one Ohm
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
ITE	information technology equipment
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
NT	not tested
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

END OF DOCUMENT