



RADIO TEST REPORT

FCC ID : W2Z-01000012
Equipment : HDMI Wireless 60G Extender
Brand Name : FUJIFILM Corporation
Model Name : HDV-W561 TX
Applicant : FUJIFILM Corporation
7-3, Akasaka 9-chome, Minato-ku, Tokyo 107-0052,
Japan
Manufacturer : Shenzhen HDCVT Technology Co.,Ltd
Floor 7,Building 5 ,Lihe industrial Park SongBai
Rd ,Nanshan District,Shenzhen ,GuangDong China
Standard : 47 CFR FCC Part 15.255

The product was received on Feb. 23, 2022, and testing was started from Feb. 25, 2022 and completed on Mar. 04, 2022. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 47 CFR FCC Part 15.255 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory

No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)



Table of Contents

History of this test report.....3

Summary of Test Result.....4

1 General Description5

1.1 Information.....5

1.2 Applicable Standards8

1.3 Testing Location8

2 Test Configuration of Equipment under Test.....9

2.1 Conformance Tests and Related Test Frequencies.....9

2.2 EUT Operation during Test10

2.3 Accessories10

2.4 Support Equipment.....11

2.5 Far Field Boundary Calculations11

2.6 Test Setup Diagram12

3 Transmitter Test Result14

3.1 AC Power Conducted Emissions14

3.2 Occupied Bandwidth19

3.3 EIRP Power.....27

3.4 Peak Conducted Power.....30

3.5 Transmitter Spurious Emissions.....32

3.6 Frequency Stability.....45

3.7 Operation Restriction and Group Installation48

4 Test Equipment and Calibration Data49

5 Measurement Uncertainty51

Appendix A. Test Photos

Photographs of EUT v01



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.207	AC Power Conducted Emissions	PASS	-
3.2	15.255(e)	Occupied Bandwidth	PASS	-
3.3	15.255(c)	EIRP Power	PASS	-
3.4	15.255(c)	Peak Conducted Power	PASS	-
3.5	15.255(d)	Transmitter Spurious Emissions	PASS	-
3.6	15.255(f)	Frequency Stability	PASS	-
3.7	15.255(a),(h)	Operation Restriction and Group Installation	PASS	-

Declaration of Conformity:

1. The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Measurement Uncertainty".

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen**Report Producer: Viola Huang**



1 General Description

1.1 Information

1.1.1 The Channel Plan(s)

Frequency Range	57-71 GHz
The Channel Plan(s)	
Low-rate PHY (LRP) Band and LRP Channel List	Channel 2 LRP: 60.16275-60.79725 GHz LRP CH0: 60.16275 GHz: LRP CH1: 60.32138 GHz: LRP CH2: 60.48000 GHz: LRP CH3: 60.63863 GHz: LRP CH4: 60.79725 GHz Channel 3 LRP: 62.32275-62.95725 GHz LRP CH0: 62.32275 GHz: LRP CH1: 62.48138 GHz: LRP CH2: 62.64000 GHz: LRP CH3: 62.79863 GHz: LRP CH4: 62.95725 GHz
Middle-rate PHY (MRP) Band	Channel 2 MRP: 60.48 GHz Channel 3 MRP: 62.64 GHz
High-rate PHY (HRP) Band	Channel 2 HRP: 60.48 GHz Channel 3 HRP: 62.64 GHz

1.1.2 Modulation

Modulation
The LRP modulation is BPSK. The MRP modulation is QPSK. The HRP modulation is QPSK, 16-QAM.

1.1.3 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Phase Array Antenna	N/A	18

Note: The above information was declared by manufacturer.



1.1.4 Power Levels

Worst Power Levels for LRP		
Applicable power levels	<input type="checkbox"/> Conducted <input checked="" type="checkbox"/> EIRP	
Frequency (GHz)	Highest (P_{high}):	
	AV Power (dBm)	Peak Power (dBm)
60.79725	14.43	22.13

Worst Power Levels for HRP		
Applicable power levels	<input type="checkbox"/> Conducted <input checked="" type="checkbox"/> EIRP	
Frequency (GHz)	Highest (P_{high}): (dBm)	
	AV Power (dBm)	Peak Power (dBm)
62.64	22.26	29.28

1.1.5 Operating Conditions

Operating Conditions	
<input checked="" type="checkbox"/> -20 °C to +50 °C	
<input type="checkbox"/> 0 °C to +40 °C	
<input type="checkbox"/> Other:	
EUT Power Type	From Adapter or host system
Test Software Version	SWAM3 (1.0.60255.2018-0403_05-45-23)
Supply Voltage	<input checked="" type="checkbox"/> AC State AC voltage 120 V
Supply Voltage	<input type="checkbox"/> DC State DC voltage V

1.1.6 Equipment Use Condition

Equipment Use Condition	
<input type="checkbox"/>	Fixed field disturbance sensors at 61-61.5GHz
<input type="checkbox"/>	Except fixed field disturbance sensors at 61-61.5GHz
<input checked="" type="checkbox"/>	Except fixed field disturbance sensors

1.1.7 User Condition

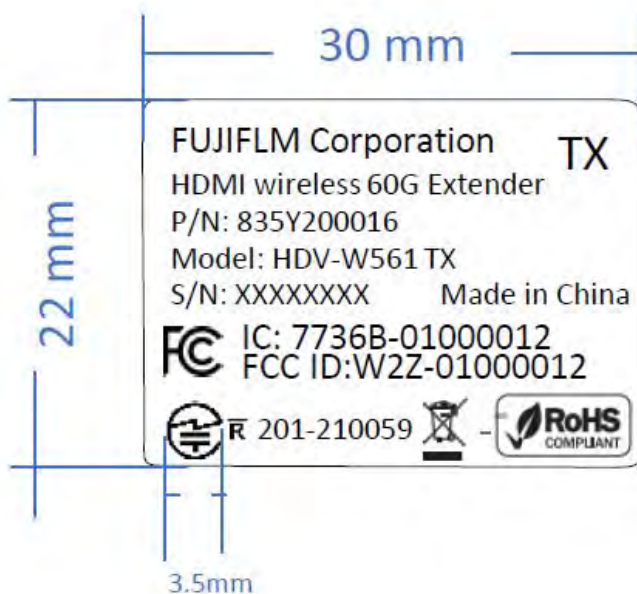
Intended Operation	
<input checked="" type="checkbox"/>	Indoor
<input type="checkbox"/>	Outdoor (except outdoor fixed Point to Point)
<input type="checkbox"/>	Outdoor fixed Point to Point

Note: The above information was declared by manufacturer.

1.1.8 Duty Cycle

Mode	Duty Cycle	Duty Cycle Factor (dB)
HRP	6.73 %	11.72
LRP	24.42 %	6.12

1.1.9 EUT Lable Information



Note: The above information was declared by manufacturer.



1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 15.255
- ♦ ANSI C63.10-2013 Section 9. "Procedures for testing millimeter-wave systems"

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ FCC KDB 414788 D01 v01r01

1.3 Testing Location

Testing Location Information	
Test Lab. : Sporton International Inc. Hsinchu Laboratory	
Hsinchu	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)
(TAF: 3787)	TEL: 886-3-656-9065 FAX: 886-3-656-9085
Test site Designation No. TW3787 with FCC.	
Conformity Assessment Body Identifier (CABID) TW3787 with ISED.	

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated (For Frequency Stability)	TH03-CB	Eddie Weng	18.7~20.4 / 63~65	Mar. 01, 2022
Radiated Below 1GHz	03CH05-CB	Brian Sun	21.5~22.3 / 60~62	Mar. 02, 2022~Mar. 04, 2022
Radiated Above 1GHz	03CH04-CB	Brian Sun	21.9~22.7 / 62~64	Mar. 02, 2022~Mar. 04, 2022
AC Conduction	CO02-CB	Peter Wu	20~21 / 50~51	Feb. 25, 2022



2 Test Configuration of Equipment under Test

2.1 Parameters of Test Software Setting

Channel Plan (GHz)	Low Channel (GHz)	High Channel (GHz)
Channel 2 LRP: 60.16275-60.79725	60.16275	60.79725
Software Setting	Default	Default
Channel 3 LRP: 62.32275-62.95725	-	62.95725
Software Setting	-	-
Channel 2 HRP: 60.48	60.48	-
Software Setting	Default	-
Channel 3 HRP: 62.64	62.64	-
Software Setting	Default	-

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)	
	Channel Plan 2&3	
	LRP	HRP
AC Power Conducted Emissions Test Voltage: 120Vac / 60Hz	Random Frequency	
Occupied Bandwidth	Channel 2 LRP: 60.16275, 60.79725 Channel 3 LRP: 62.95725	Channel 2 HRP: 60.48 Channel 3 HRP: 62.64
EIRP Power	Channel 2 LRP: 60.16275, 60.79725 Channel 3 LRP: 62.95725	Channel 2 HRP: 60.48 Channel 3 HRP: 62.64
Peak Conducted Power	Channel 2 LRP: 60.16275, 60.79725 Channel 3 LRP: 62.95725	Channel 2 HRP: 60.48 Channel 3 HRP: 62.64
Transmitter Spurious Emissions (below 1 GHz)	Random Frequency	
Transmitter Spurious Emissions (1 GHz-40 GHz)	-	62.64
Transmitter Spurious Emissions (above 40 GHz)	Channel 2 LRP: 60.16275, 60.79725 Channel 3 LRP: 62.95725	Channel 2 HRP: 60.48 Channel 3 HRP: 62.64
Frequency Stability	-	Channel 2 LRP: 60.79725



Note: The Adapter is for measurement only, would not be marketed.

Adapter information as below:

Power	Brand	Model
Adapter	SHENZHEN KEYU POWER SUPPLY TECHNOLOGY CO.,LTD	KA06E-0501000US

The following test modes were performed for all tests:

For AC Power Conducted Emissions test:

Mode 1: Normal Link-EUT - Powered from adapter

Mode 2: Normal Link-EUT - Powered from host system

Mode 1 generated the worst test result, so it was recorded in this report.

For Transmitter Spurious Emissions (below 1 GHz) test:

The EUT was performed at X axis, Y axis and Z axis for emissions in Transmitter Spurious Emissions (above 40GHz), and the worst case was found at Y axis. So the measurement will follow this same test configuration.

Mode 1: CTX-EUT in Y axis - Powered from adapter

Mode 2: CTX-EUT in Y axis - Powered from host system

Mode 2 generated the worst test result, so it was recorded in this report.

For Transmitter Spurious Emissions (1GHz~40 GHz) test:

1. The EUT was performed at X axis, Y axis and Z axis for emissions in Transmitter Spurious Emissions (above 40GHz), and the worst case was found at Y axis. So the measurement will follow this same test configuration.

2. 62.64 GHz was maximum power for EIRP Power test, thus the measurement for Transmitter Spurious Emissions (above 40GHz) will follow this same test configuration.

Mode 1: CTX-EUT in Y axis

For Transmitter Spurious Emissions (above 40GHz) test:

The EUT was performed at X axis, Y axis and Z axis, and the worst case was found at Y axis. So the measurement will follow this same test configuration.

Mode 1: CTX-EUT in Y axis

2.3 EUT Operation during Test

High Definition Audio / Video in the 1080p format was sent from the transmitter device to the receiver device via the wireless link.

2.4 Accessories

N/A



2.5 Support Equipment

For AC Conduction:

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	DVD Player	LG	DV298H	N/A
B	RX Device	FUJIFILM Corporation	HDV-W561 RX	N/A
C	TV	ASUS	VP28U	N/A
D	Base	N/A	N/A	N/A
E	Adapter	SHENZHEN KEYU POWER SUPPLY TECHNOLOGY CO.,LTD	KA06E-0501000US	N/A

For RF Radiated:

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	Notebook	DELL	E4300	N/A
B	4K Player	Panasonic	DP-UB320GTK	N/A
C	RX Device	FUJIFILM Corporation	HDV-W561 RX	N/A
D	Base	N/A	N/A	N/A

2.6 Far Field Boundary Calculations

The far-field boundary is given as:

$$\text{far field} = (2 * L^2) / \lambda$$

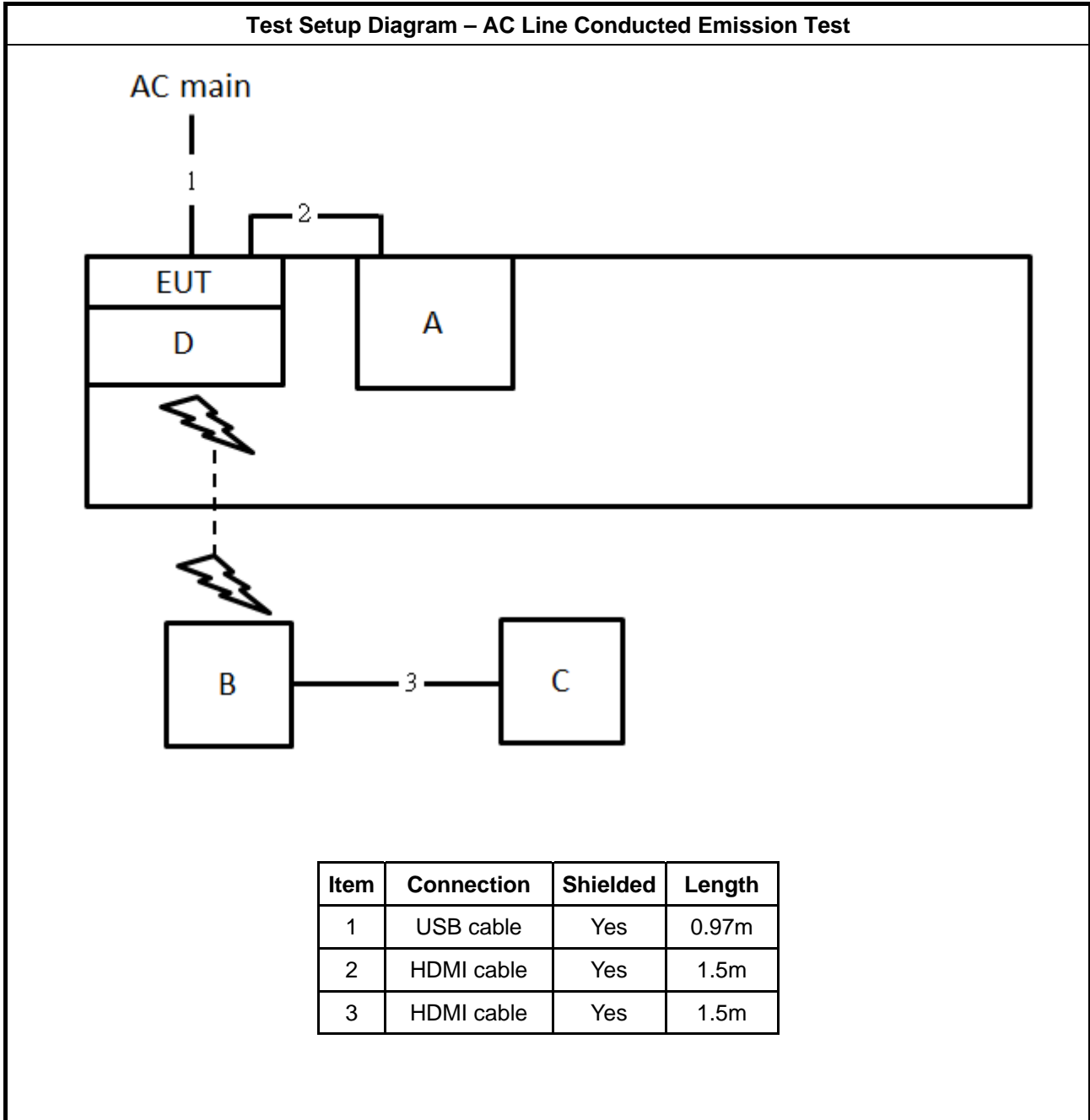
where:

L = Largest Antenna Dimension, including the reflector, in meters

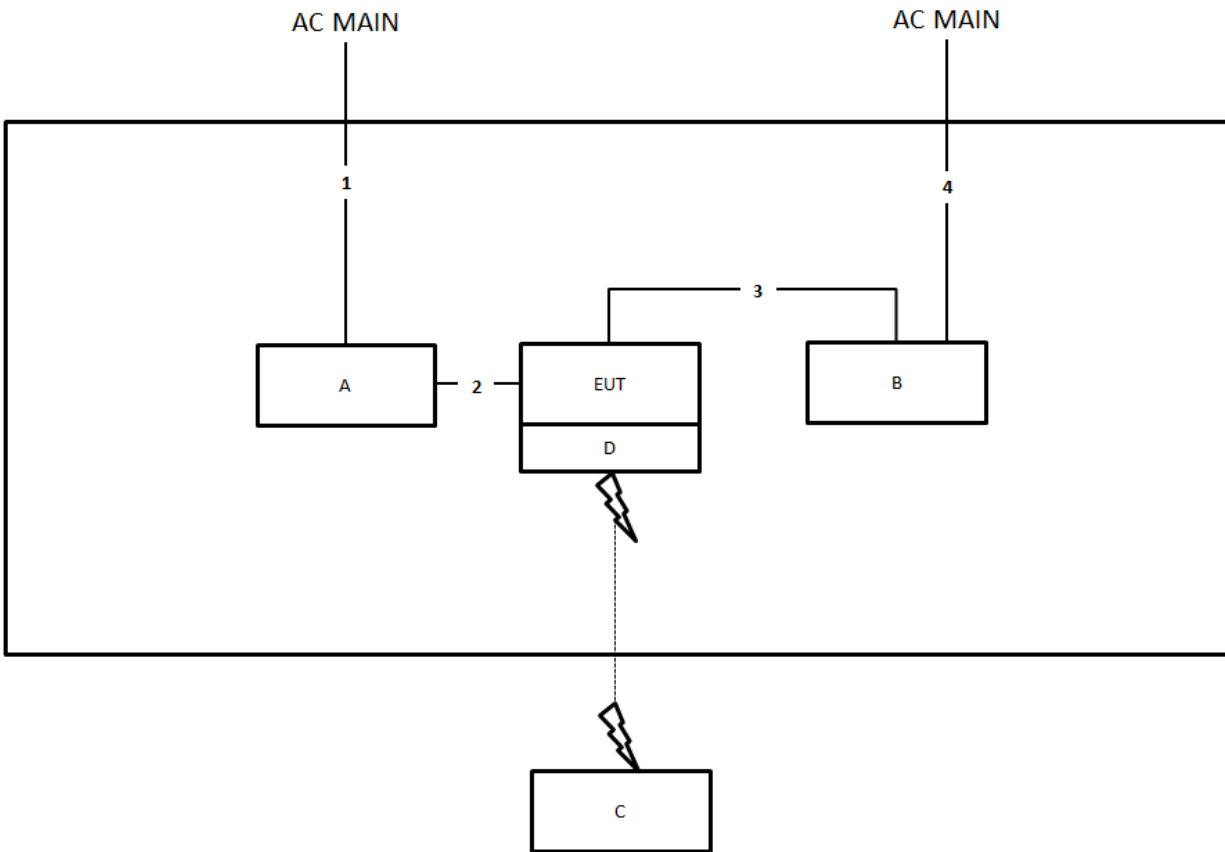
λ= wavelength in meters

Far Field (m)				
Frequency (GHz)	L (m)	Lambda (m)	d(Far Field) (m)	d(Far Field) (cm)
60.16275	0.02	0.0049865	0.160	16.04
60.79725	0.02	0.0049344	0.162	16.21
62.95725	0.02	0.0047651	0.168	16.79
60.48	0.02	0.0049603	0.161	16.13
62.64	0.02	0.0047893	0.167	16.70

2.7 Test Setup Diagram



Test Setup Diagram - Transmitter Spurious Emissions



Item	Connection	Shielded	Length
1	Power Cable	No	1.8m
2	USB Cable	Yes	0.97m
3	HDMI Cable	Yes	1.2m
4	Power Cable	No	1.5m



3 Transmitter Test Result

3.1 AC Power Conducted Emissions

3.1.1 Limit of AC Power Conducted Emissions

AC Power Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note: * Decreases with the logarithm of the frequency.

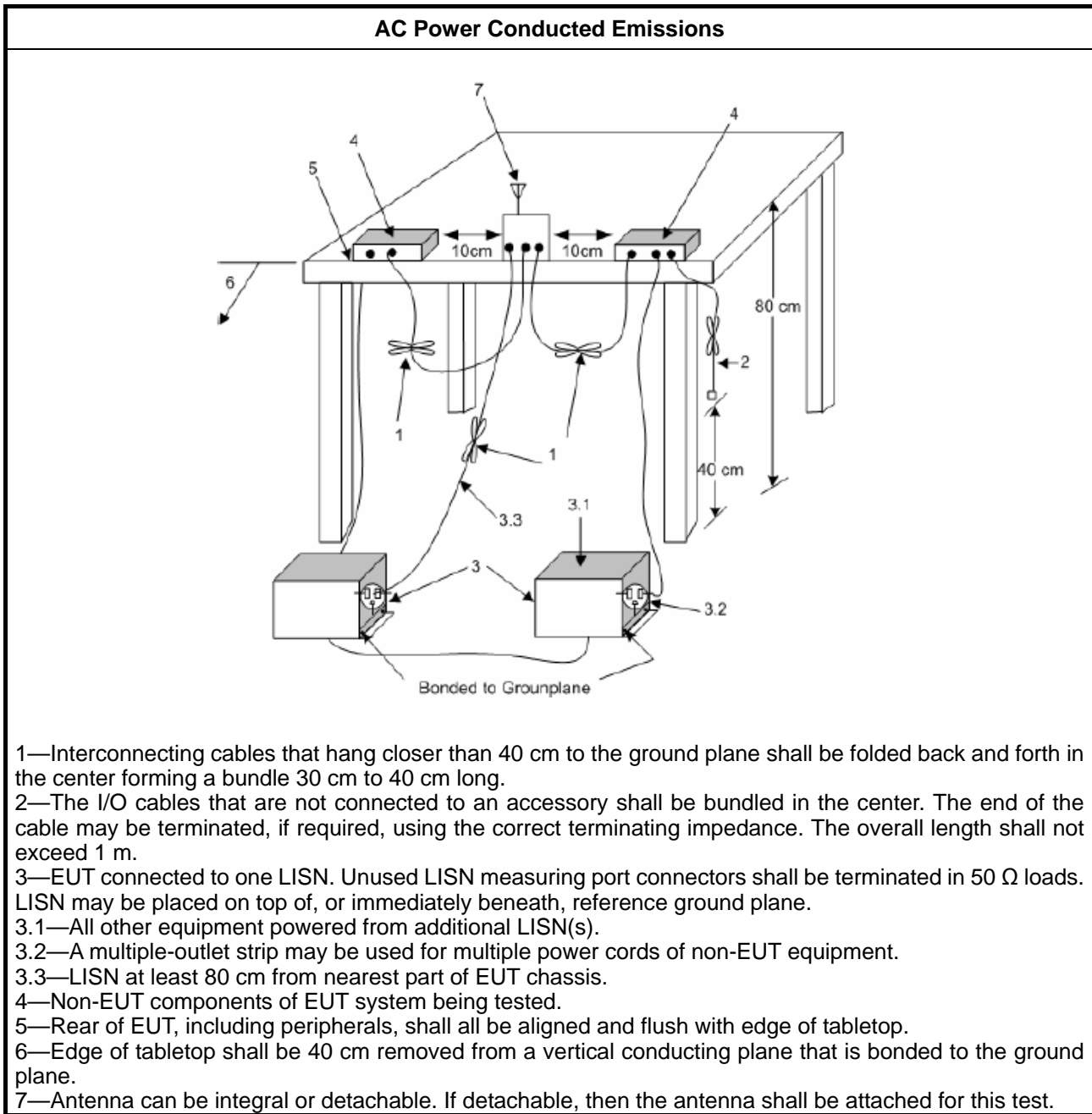
3.1.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.1.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 6.2.

3.1.4 Test Setup



3.1.5 Measurement Results Calculation

The measured Level is calculated using:

- a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level
- b. Margin = -Limit + Level



3.1.6 Test Result of AC Power Conducted Emissions

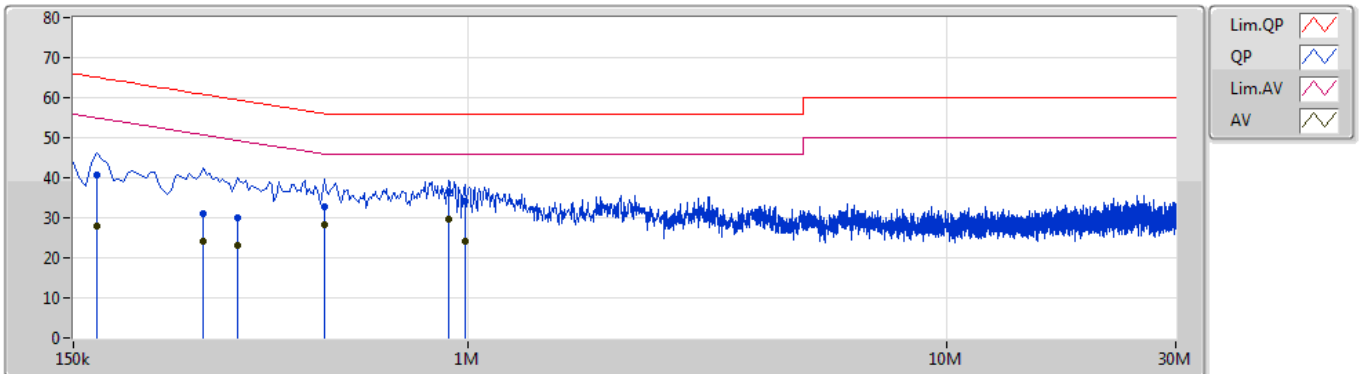
Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.2.3
<p>NOTE 1: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes. If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.12 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing.</p> <p>NOTE 2: ">20dB" means the tables in this clause should only list values of spurious emissions that exceed the level of 20 dB below the applicable limit, see ANSI C63.4, clause 10.1.8.1.</p>	



Phase	Neutral	Configuration	Normal Link
Test Mode	Mode 1		

Mode 1

25/02/2022



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Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	168k	40.68	65.06	-24.38	10.23	Neutral	-	30.45	0.06	0.02	10.15			
AV	168k	27.95	55.06	-27.11	10.23	Neutral	-	17.72	0.06	0.02	10.15			
QP	280.5k	31.13	60.80	-29.67	10.22	Neutral	-	20.91	0.06	0.02	10.14			
AV	280.5k	23.97	50.80	-16.50	10.22	Neutral	-	13.75	0.06	0.02	10.14			
QP	330k	30.05	59.44	-29.39	10.20	Neutral	-	19.85	0.06	0.02	10.12			
AV	330k	23.22	49.44	-26.22	10.20	Neutral	-	13.02	0.06	0.02	10.12			
QP	500k	32.64	56.00	-23.36	10.19	Neutral	-	22.45	0.06	0.02	10.11			
AV	500k	28.21	46.00	-17.79	10.19	Neutral	-	18.02	0.06	0.02	10.11			
QP	910.5k	36.53	56.00	-19.47	10.20	Neutral	-	26.33	0.08	0.02	10.10			
AV	910.5k	29.66	46.00	-16.34	10.20	Neutral	"Worst"	19.46	0.08	0.02	10.10			
QP	987k	34.22	56.00	-21.78	10.20	Neutral	-	24.02	0.08	0.02	10.10			
AV	987k	24.07	46.00	-21.93	10.20	Neutral	-	13.87	0.08	0.02	10.10			



3.2 Occupied Bandwidth

3.2.1 Limit of Occupied Bandwidth

6dBc Bandwidth (see Note 1)	None
99% Occupied Bandwidth (see Note 2)	None
NOTE 1: The 6dBc bandwidth is the frequency bandwidth of the signal power at the -6 dBc points when measured with a 100 kHz resolution bandwidth. These measurements shall also be performed at normal test conditions.	
NOTE 2: The 99% occupied bandwidth is the frequency bandwidth of the signal power at the 99% channel power of occupied bandwidth when resolution bandwidth should be approximately 1 % to 5 % of the occupied bandwidth (OBW). These measurements shall also be performed at normal test conditions.	

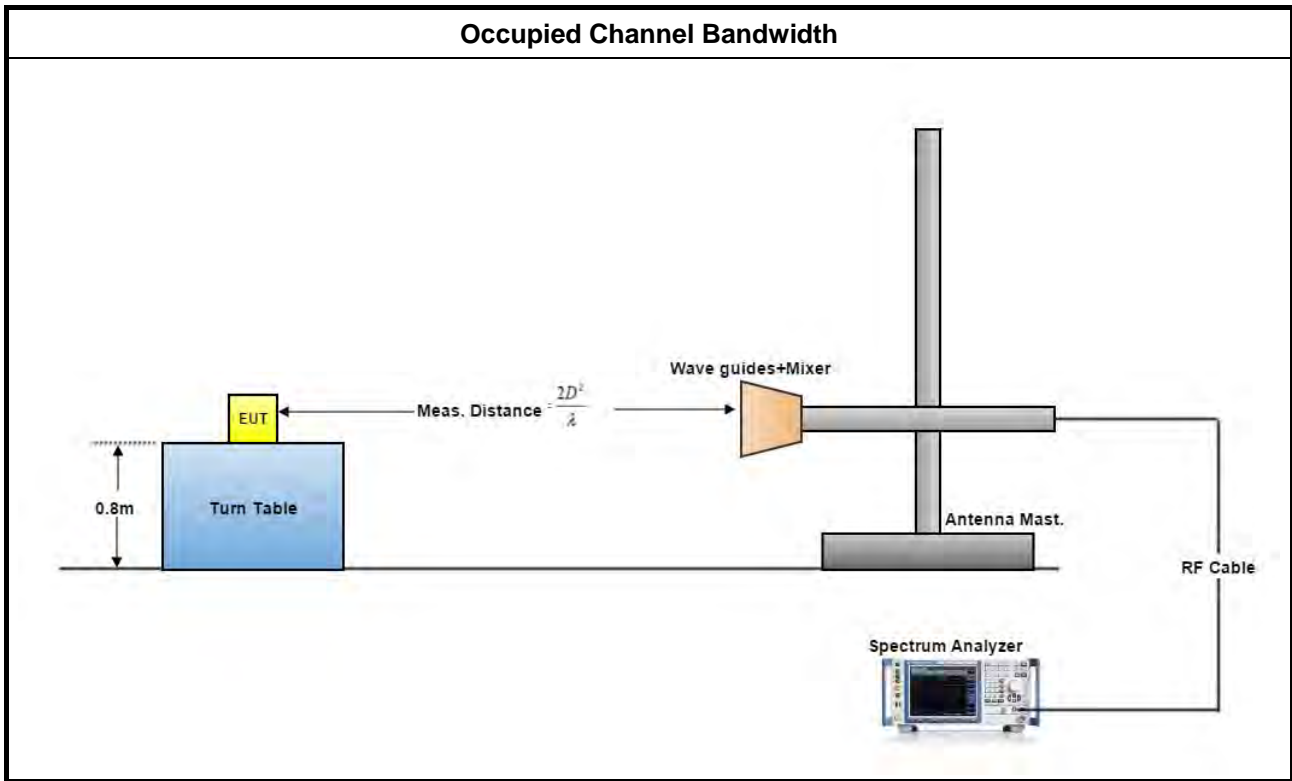
3.2.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.2.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 6.9.2.

3.2.4 Test Setup





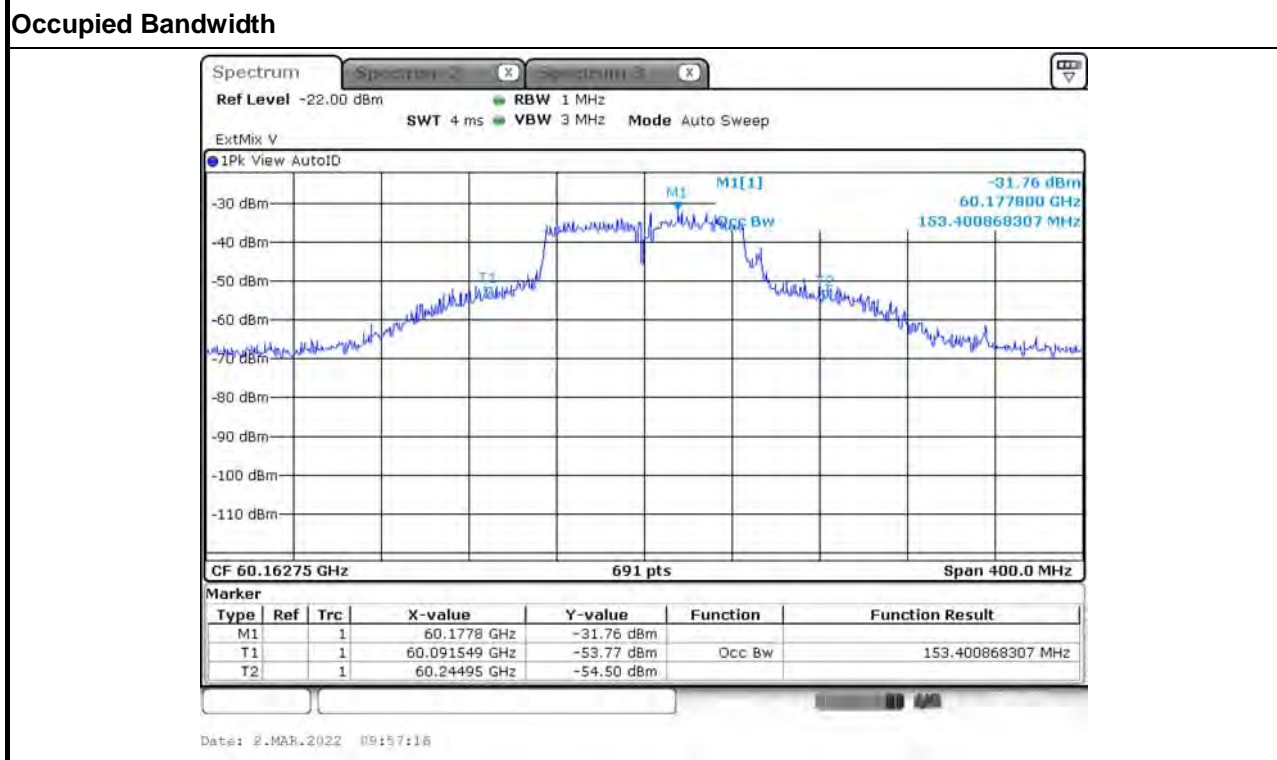
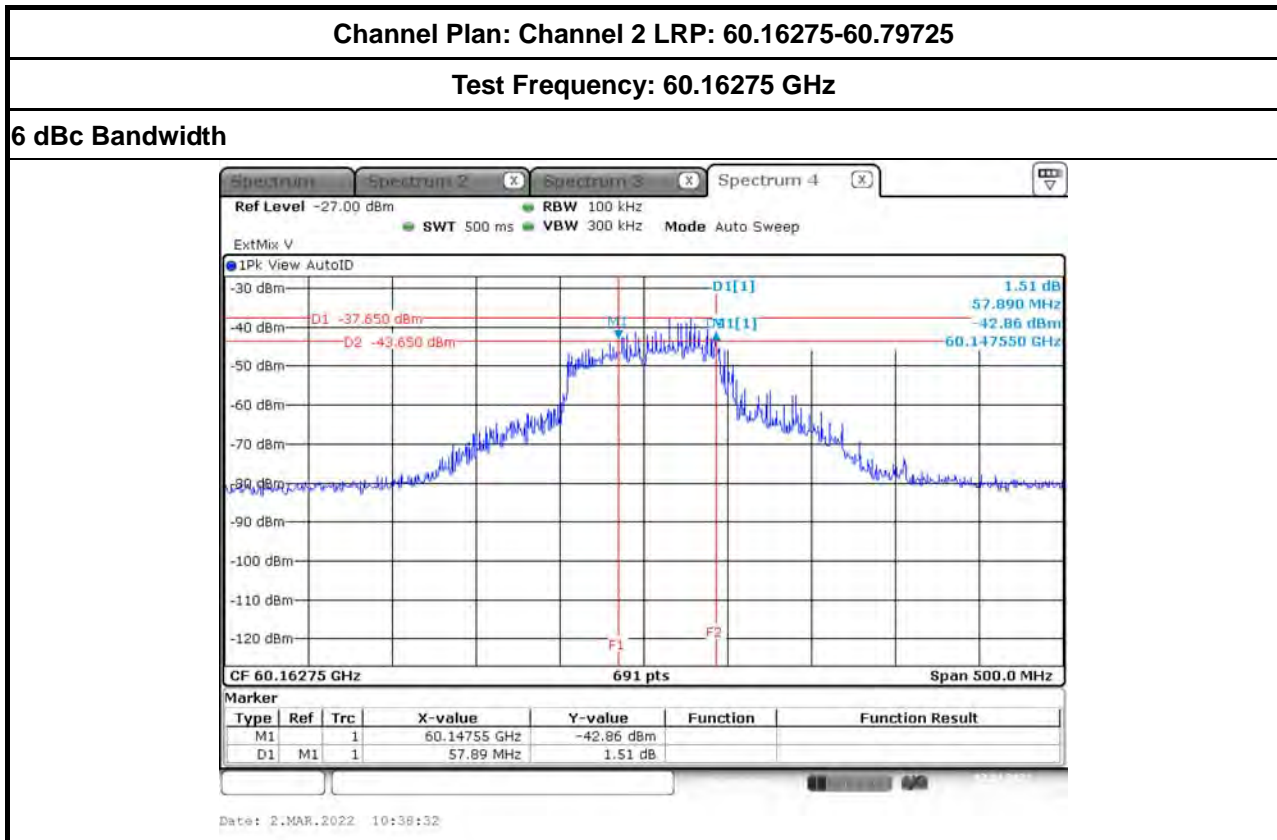
3.2.5 Test Result of Occupied Bandwidth

Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.9.2
<p>NOTE: If equipment having different transmit operating modes (see test report clause 1.1.2), the measurements are uninfluenced by different transmit operating modes, may not need to be repeated for all the operating modes. Similar, if the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worse case combination to be used for the conformance testing. Refer as ANSI C63.10, clause 15, observe and record with plotted graphs or photographs the worst-case (i.e., widest) occupied bandwidth produced by these different modulation sources.</p>	

Test Results				
Channel Plan (GHz)	Test Freq. (GHz)	6 dBc Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
Channel 2 LRP: 60.16275-60.79725	60.16275	57.89	153.40	N/A
	60.79725	77.42	110.70	N/A
Channel 3 LRP: 62.32275-62.95725	62.95725	63.68	123.73	N/A
Channel 2 HRP: 60.48	60.48	1461.6	1759.76	N/A
Channel 3 HRP: 62.64	62.64	1505.10	1823.44	N/A



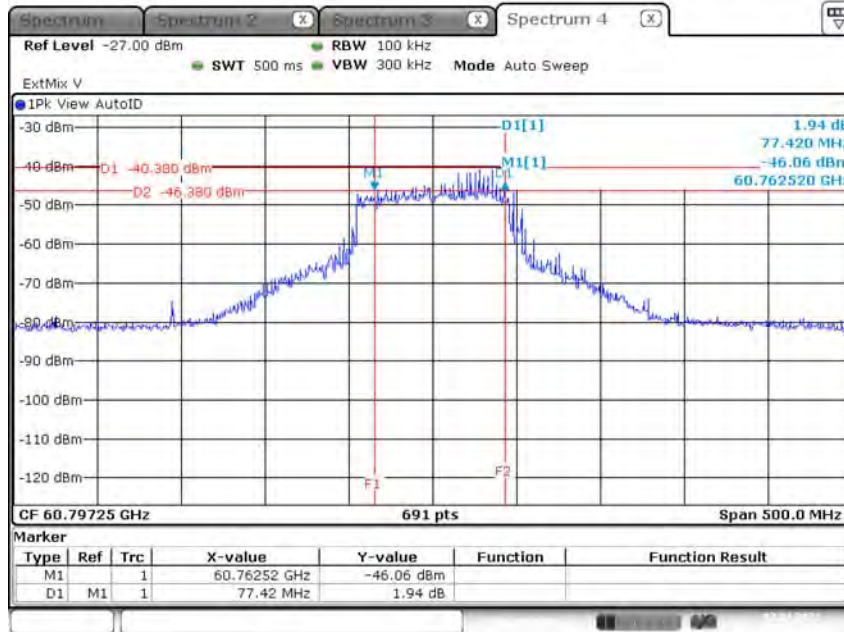
3.2.5.1 Bandwidth Plots





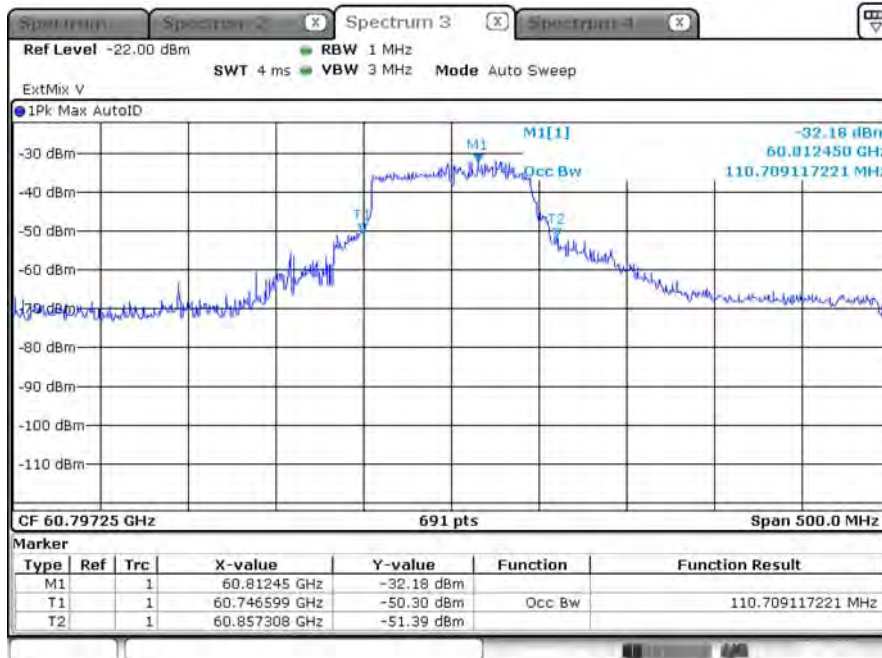
Test Frequency: 60.79725 GHz

6 dBc Bandwidth



Date: 2.MAR.2022 10:41:38

Occupied Bandwidth



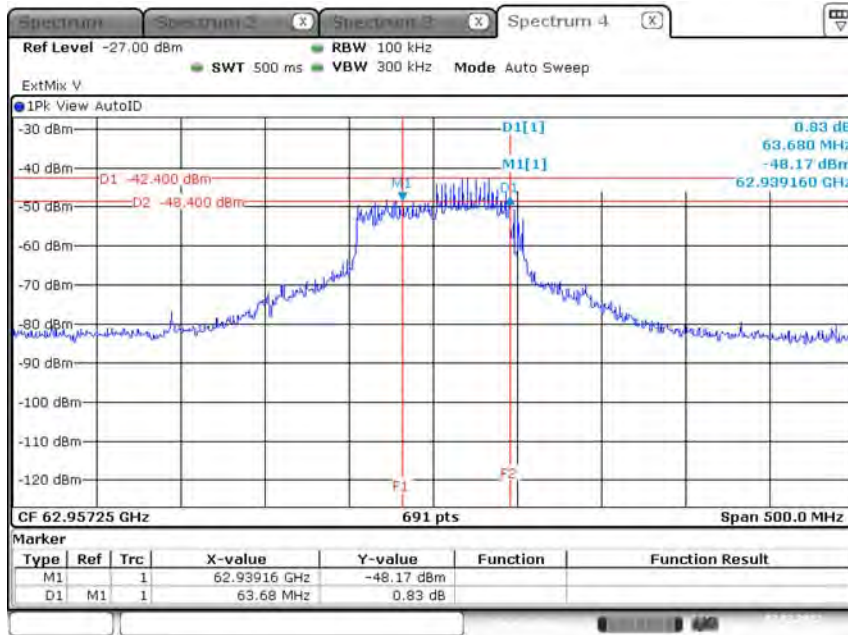
Date: 2.MAR.2022 10:43:24



Channel Plan: Channel 3 LRP: 62.32275-62.95725

Test Frequency: 62.95725 GHz

6 dBc Bandwidth



Date: 2.MAR.2022 10:59:00

Occupied Bandwidth



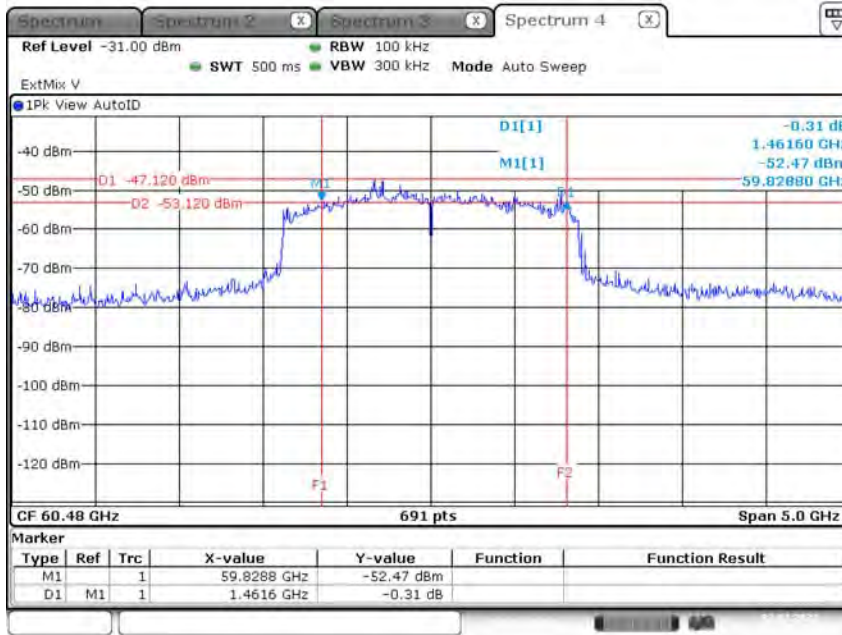
Date: 2.MAR.2022 10:56:02



Channel Plan: Channel 2 HRP: 60.48

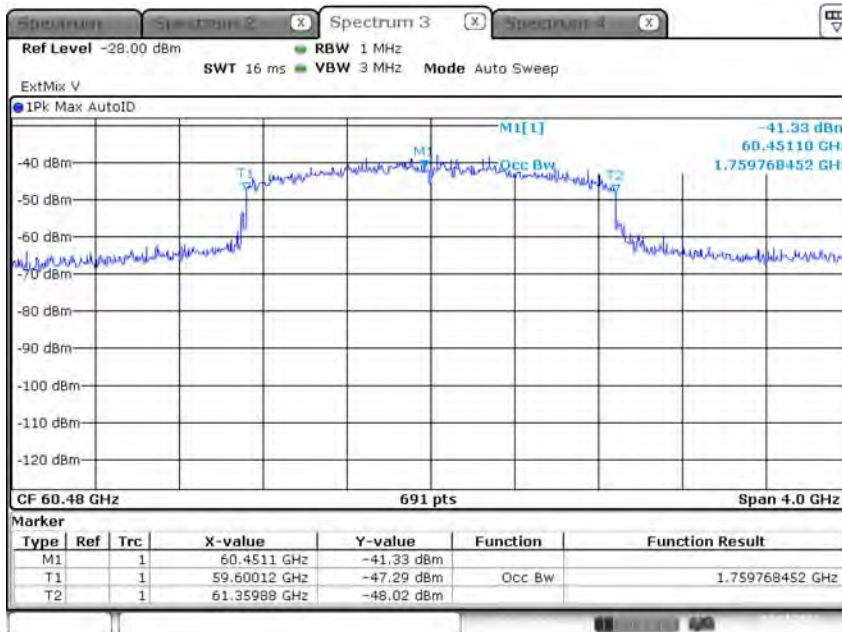
Test Frequency: 60.48 GHz

6 dBc Bandwidth



Date: 2.MAR.2022 15:30:38

Occupied Bandwidth



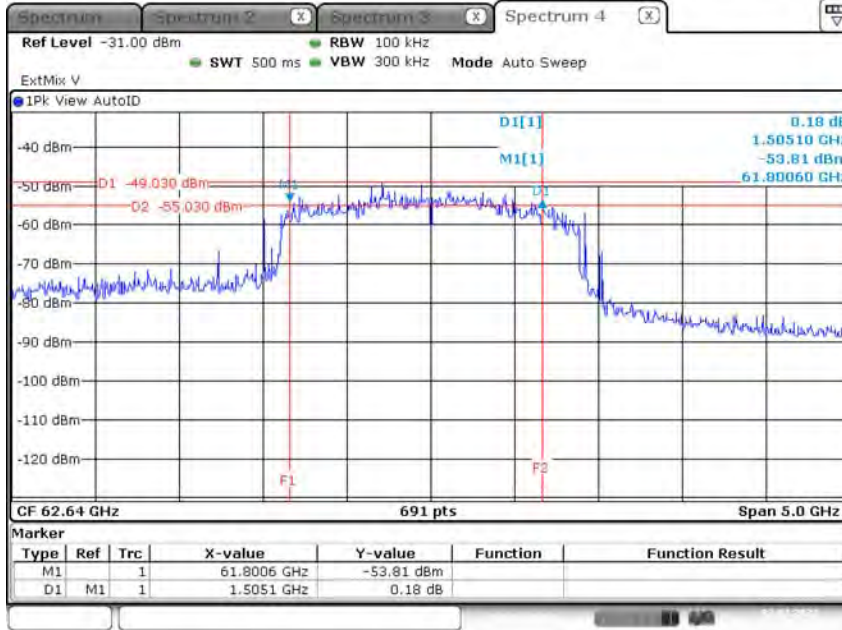
Date: 2.MAR.2022 15:27:36



Channel Plan: Channel 3 HRP: 62.64

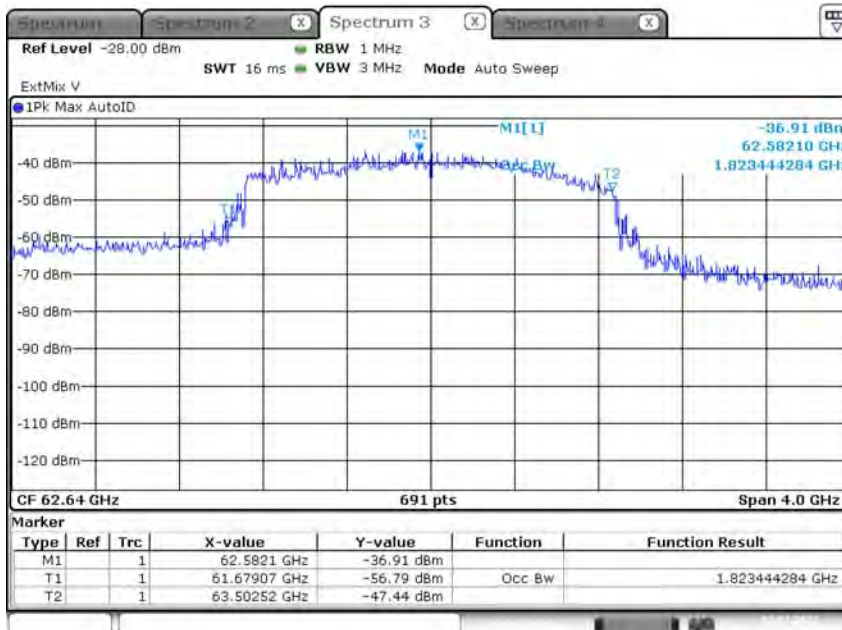
Test Frequency: 62.64 GHz

6 dBc Bandwidth



Date: 2.MAR.2022 15:36:44

Occupied Bandwidth



Date: 2.MAR.2022 15:39:36



3.3 EIRP Power

3.3.1 Limit of EIRP Power

EIRP Power Limit		
Use Condition	EIRP Average Power	EIRP Peak Power
Fixed field disturbance sensors at within the frequency band 61-61.5GHz	40 dBm	43 dBm
Fixed field disturbance sensors at outside of the band 61-61.5GHz	10 dBm	13 dBm
Except fixed field disturbance sensors at 61-61.5GHz	N/A	10 dBm
Except outdoor fixed Point to Point	40 dBm	43 dBm
Outdoor fixed Point to Point	82 dBm	85 dBm

Note: For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi.

NOTE: For the applicable limit, see 15.255 (c)

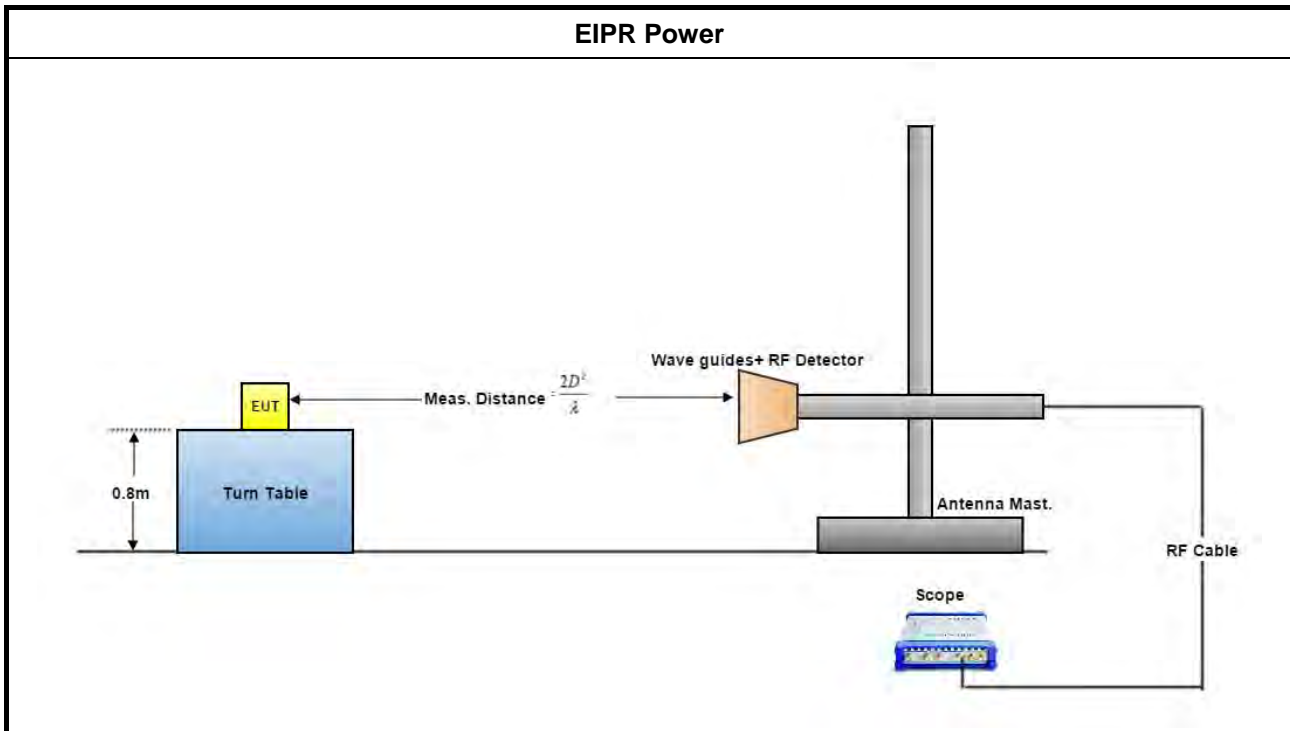
3.3.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.3.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013 clause 9.3 & 9.5.

3.3.4 Test Setup



3.3.5 Test Result of EIRP Power

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.11
<p>NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing.</p>	



3.3.5.1 Test Result of EIRP Power

Test Distance		0.5 m										
Test Results												
Channel Plan (GHz)	Test Freq. (GHz)	Rx Gain (dBi)	DSO (mV)		Power Measured (dBm)		E _{Meas} (dBuV/m)		EIRP (dBm)		EIRP Limit (dBm) (note 1)	
			Peak	AV	Peak	AV	Peak	AV	Peak	AV	Peak	AV
Channel 2 LRP: 60.16275-60.79725	60.16275	23.6	19.66	13.78	-16.62	-24.20	132.62	125.04	21.80	14.22	43	40
	60.79725	23.6	20.89	13.87	-16.38	-24.08	132.96	125.26	22.13	14.43	43	40
Channel 3 LRP: 62.32275-62.95725	62.95725	23.6	19.60	12.31	-19.77	-27.12	129.87	122.52	19.05	11.70	43	40
Channel 2 HRP: 60.48	60.48	23.6	28.31	18.18	-10.38	-17.46	138.91	131.83	28.09	21.01	43	40
Channel 3 HRP: 62.64	62.64	23.6	29.26	18.56	-9.49	-16.51	140.10	133.08	29.28	22.26	43	40

The measured power level is converted to EIRP using the Friis equation:
 For radiated emissions, calculate the field strength (E) in dBµV/meter.
 $E = 126.8 - 20\log(\lambda) + P - G$
 where:
 E : is the field strength of the emission at the measurement distance, in dBµV/m
 P : is the power measured at the output of the test antenna, in dBm
 λ : is the wavelength of the emission under investigation [300/fMHz], in m
 G : is the gain of the test antenna, in dBi For radiated emissions, calculate the EIRP (dBm). If the measurement was performed in the far field, calculate the EIRP.
 $EIRP = E\text{-meas} + 20\log(d\text{-meas}) - 104.7$
 where:
 EIRP : is the equivalent isotopically radiated power, in dBm
 E-meas. : is the field strength of the emission at the measurement distance, in dBµV/m
 d-meas. : is the measurement distance, in m
 NOTE 1: For the applicable limit, see 15.255 (c)
 NOTE 2: The comparison method which replaces EUT with a signal generator is used to find the correct conversion factor between “DSO(mV)” & “Power Measured(dBm)”.



3.4 Peak Conducted Power

3.4.1 Limit of Peak Conducted Power

Peak Conducted Power Limit			
Use Condition	6dBc Bandwidth	Occupied Bandwidth	Peak Conducted Power (note 1)
Fixed field disturbance sensors at within the frequency band 61-61.5GHz	> 100MHz	≤ 500MHz	500mW
	≤ 100MHz		500mW x (BW/100) (see note 2)
Fixed field disturbance sensors at outside of the band 61-61.5GHz and within 57 -71 GHz	> 100MHz	N/A	500mW
	≤ 100MHz		500mW x (BW/100) (see note 2)
Except fixed field disturbance sensors at 61-61.5GHz	N/A	> 500MHz	-10 dBm
Except outdoor fixed Point to Point,	> 100MHz	N/A	500mW
Outdoor fixed Point to Point	≤ 100MHz	N/A	500mW x (BW/100) (see note 2)

NOTE 1: For the applicable limit, see FCC 15.255(c)
NOTE 2: BW= 6dB bandwidth (measured at RBW 100kHz)

3.4.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.4.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 9.5

3.4.4 Test Result of Peak Conducted Power

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.11
NOTE: If the equipment supports different modulations and/or data rates, the measurements described in ANSI C63.10, clause 5.11 may not need to be repeated for all these modulations and data rates. Simple comparison of engineering test across all operating modes, modulations and data rates may need to be performed to define the worst case combination to be used for the conformance testing.	



3.4.4.1 Peak Conducted Power

Test Results							
Channel Plan (GHz)	Test Freq. (GHz)	EIRP (dBm)	Max. Ant. Gain (dBi)	Peak Power (dBm) (note1)	Peak Power (mW)	6dBc BW (MHz) (note2)	Peak Power Limit (mW) (note3)
Channel 2 LRP: 60.16275-60.79725	60.16275	21.80	18	3.80	2.401	57.89	289.45
	60.79725	22.13	18	4.13	2.591	77.42	387.10
Channel 3 LRP: 62.32275-62.95725	62.95725	19.05	18	1.05	1.273	63.68	318.40
Channel 2 HRP: 60.48	60.48	28.09	18	10.09	10.208	1461.60	500.00
Channel 3 HRP: 62.64	62.64	29.28	18	11.28	13.440	1505.10	500.00

NOTE 1: Because EUT used for the integral antenna without temporary RF connector provided. Therefore peak conducted power is equal to EIRP power subtract the antenna gain.

NOTE 2: For the 6dBc bandwidth, see test report clause 3.2.5.

NOTE 3: For the applicable limit, see FCC 15.255(c)

NOTE 4: For radiated emission measurements, calculate conducted transmitter output power P(cond)(dBm)

$P(\text{cond}) = \text{EIRP} - G(\text{dBi})$

where:

G(dBi) is gain of EUT antenna.



3.5 Transmitter Spurious Emissions

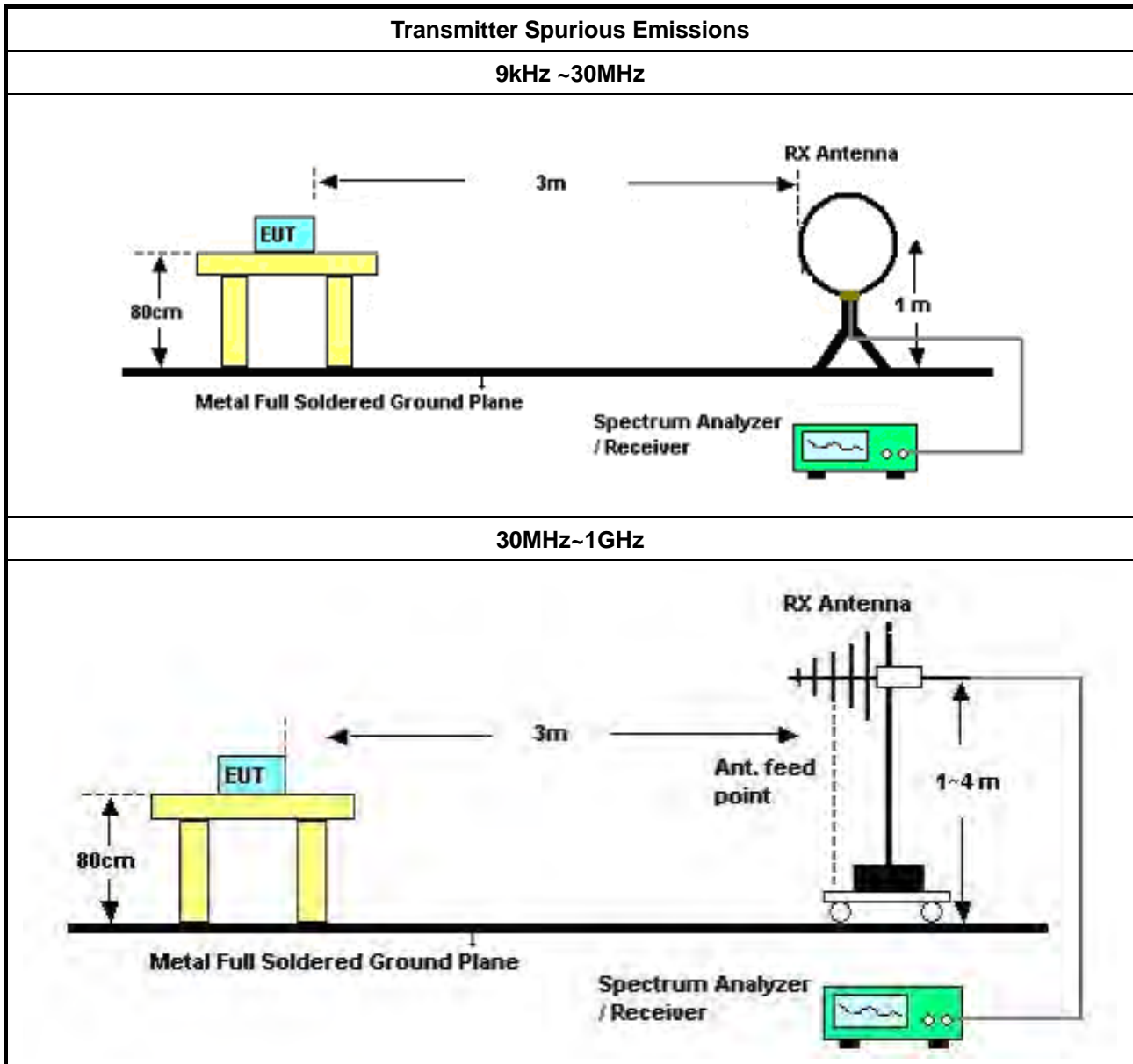
3.5.1 Limit of Transmitter Spurious Emissions

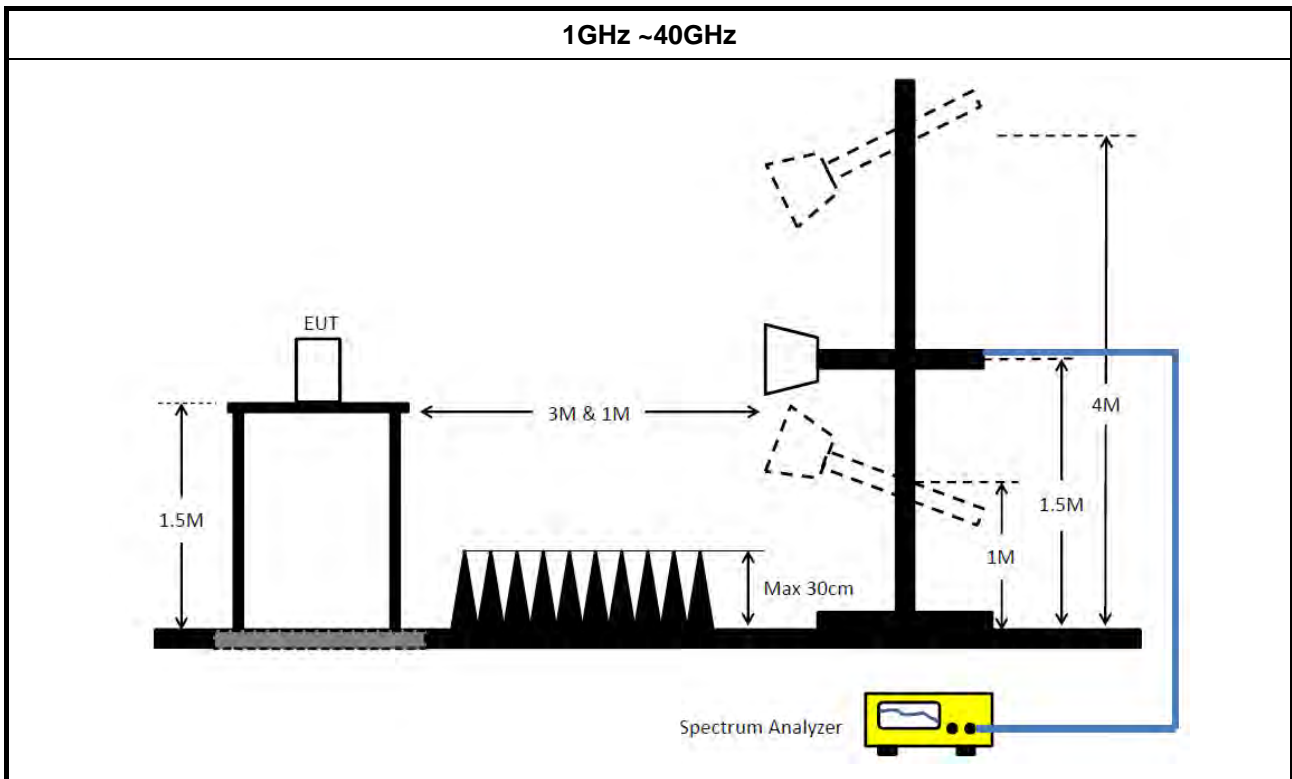
Frequency Range	Limit
Radiated emissions below 40 GHz	15.209
Radiated emissions above 40 GHz – 200GHz	90 pW/cm ² @ 3 m (Equivalent EIRP 102 μW, -9.91dBm)
NOTE 1: For the applicable limit, see 15.255(d)	
NOTE 2: Spurious emissions shall not exceed the level of the fundamental emission.	

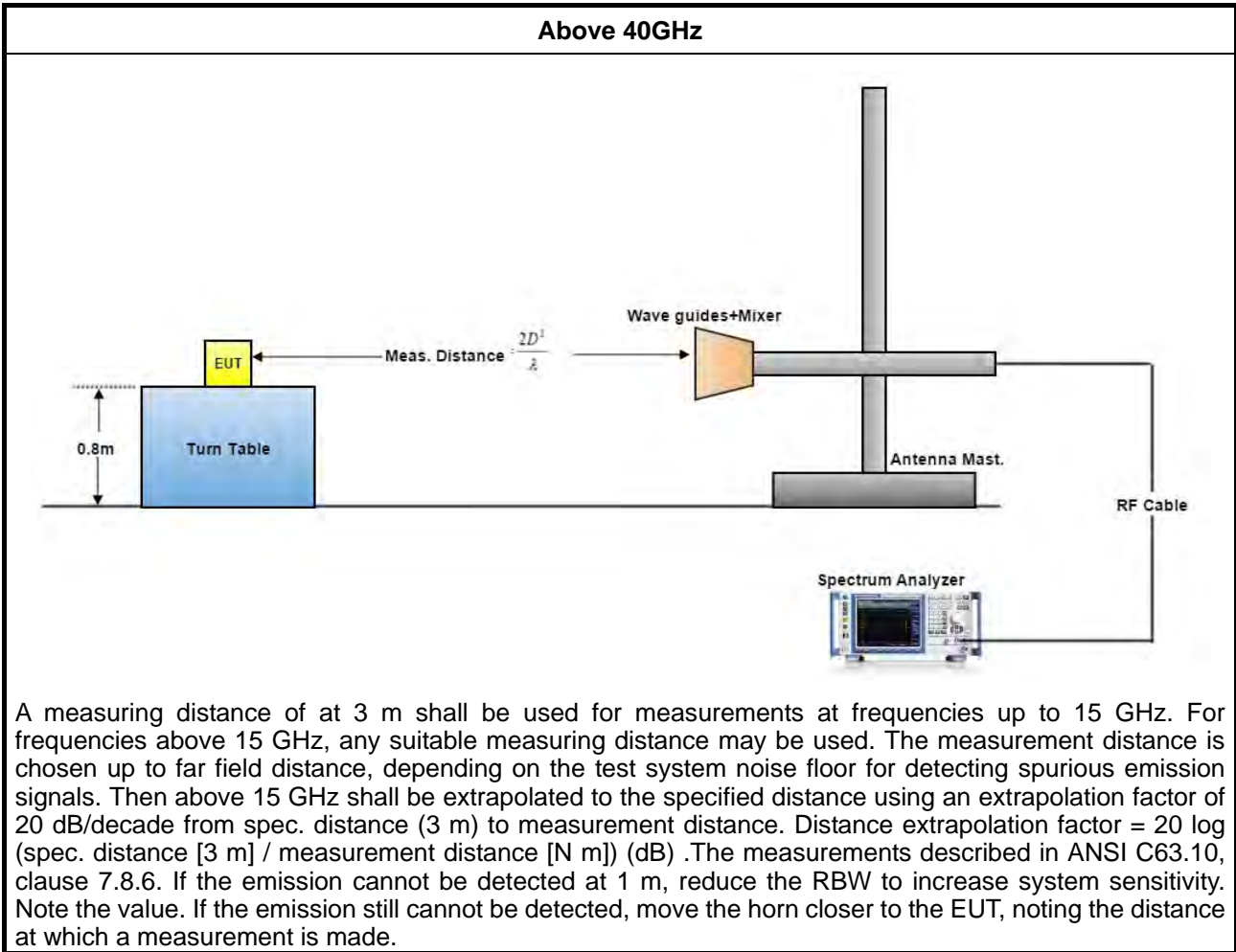
3.5.2 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clause 9.12

3.5.3 Test Setup







3.5.4 Measurement Results Calculation

The measured Level is calculated using:

For below 40GHz

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

For above 40GHz

$EIRP = \text{Meas. Level} - \text{RX Antenna Gain} + 20 \cdot \log(4 \cdot \pi \cdot (3.14159) \cdot D / (300 / (\text{Frequency} \cdot 1000)))$



3.5.5 Test Result of Transmitter Spurious Emissions

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.12 ~ 9.13
NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	

3.5.5.1 Test Result of Transmitter Spurious Emissions (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.



3.5.5.2 Test Result of Transmitter Spurious Emissions

Test Range	30 MHz – 1000 MHz	Test Distance	3 m
Test Configuration	Noraml Link	Test Mode	Mode 2

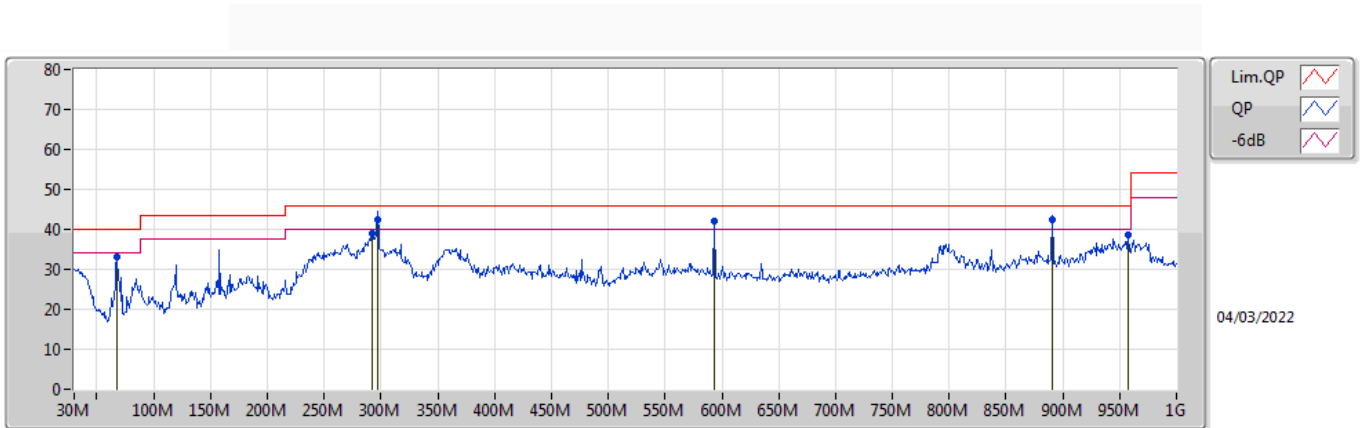
Vertical



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
QP	36.79M	35.81	40.00	-4.19	-10.19	3	Vertical	1	1.00	-	46.00	20.53	0.90	31.62
PK	49.4M	36.66	40.00	-3.34	-16.53	3	Vertical	296	1.00	-	53.19	14.14	1.09	31.76
QP	67.83M	35.43	40.00	-4.57	-18.57	3	Vertical	102	1.25	-	54.00	12.05	1.26	31.88
QP	296.75M	42.70	46.00	-3.30	-10.50	3	Vertical	165	1.25	"	53.20	18.89	2.69	32.08
PK	799.21M	42.99	46.00	-3.01	-2.22	3	Vertical	126	1.00	"Worst"	45.21	25.57	4.90	32.69
PK	890.39M	42.70	46.00	-3.30	-1.20	3	Vertical	169	1.00	-	43.90	26.19	5.26	32.65



Horizontal

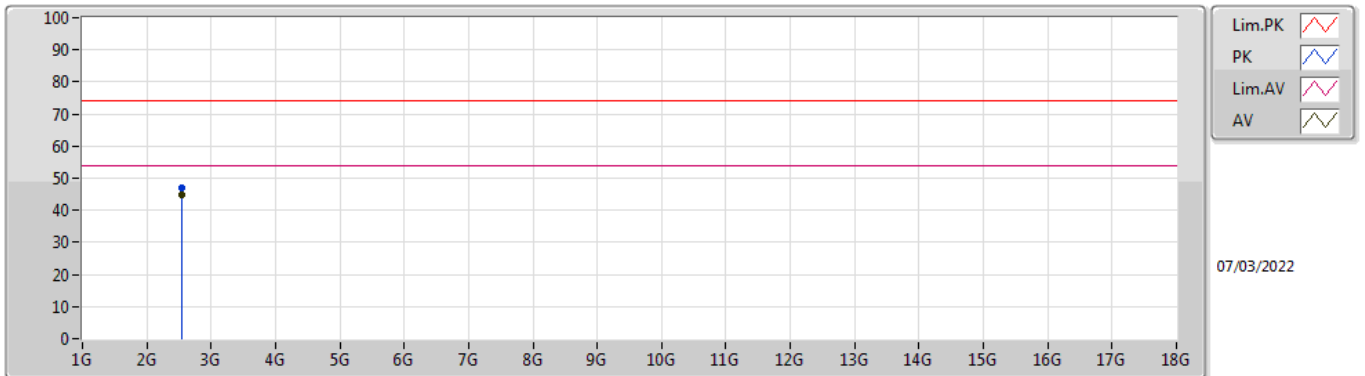


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	67.83M	33.13	40.00	-6.87	-18.57	3	Horizontal	200	3.00	-	51.70	12.05	1.26	31.88
PK	291.9M	39.02	46.00	-6.98	-10.59	3	Horizontal	242	1.00	-	49.61	18.81	2.67	32.07
QP	296.75M	42.50	46.00	-3.50	-10.50	3	Horizontal	191	1.00	"Worst"	53.00	18.89	2.69	32.08
PK	593.57M	42.13	46.00	-3.87	-4.23	3	Horizontal	120	1.00	-	46.36	24.30	3.97	32.50
QP	890.39M	42.30	46.00	-3.70	-1.20	3	Horizontal	124	1.50	-	43.50	26.19	5.26	32.65
PK	957.32M	38.65	46.00	-7.35	-0.41	3	Horizontal	117	1.00	-	39.06	26.56	5.60	32.57



Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	62.64		

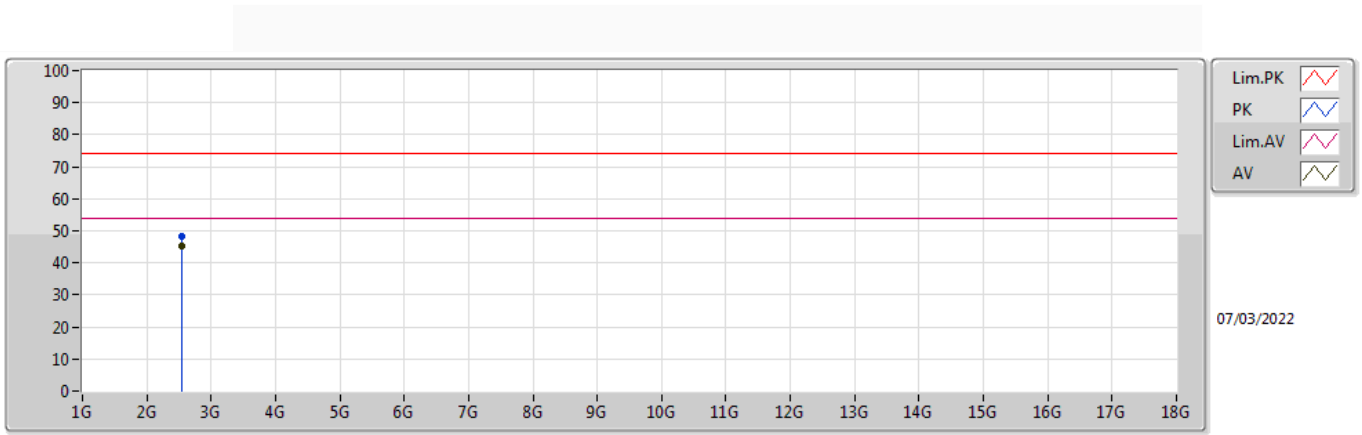
Vertical



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	2.538G	46.94	74.00	-27.06	-2.81	3	Vertical	137	1.53	-	49.75	28.13	3.40	34.34
AV	2.538G	44.79	54.00	-9.21	-2.81	3	Vertical	137	1.53	"Worst"	47.60	28.13	3.40	34.34



Horizontal

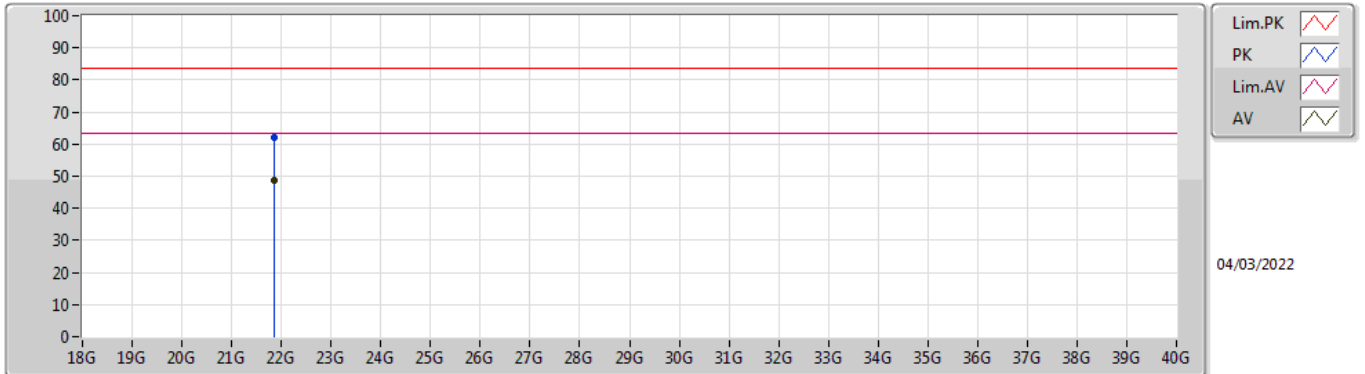


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	2.53804G	48.16	74.00	-25.84	-2.81	3	Horizontal	91	1.00	-	50.97	28.13	3.40	34.34
AV	2.53798G	45.10	54.00	-8.90	-2.81	3	Horizontal	91	1.00	"Worst"	47.91	28.13	3.40	34.34



Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	62.64		

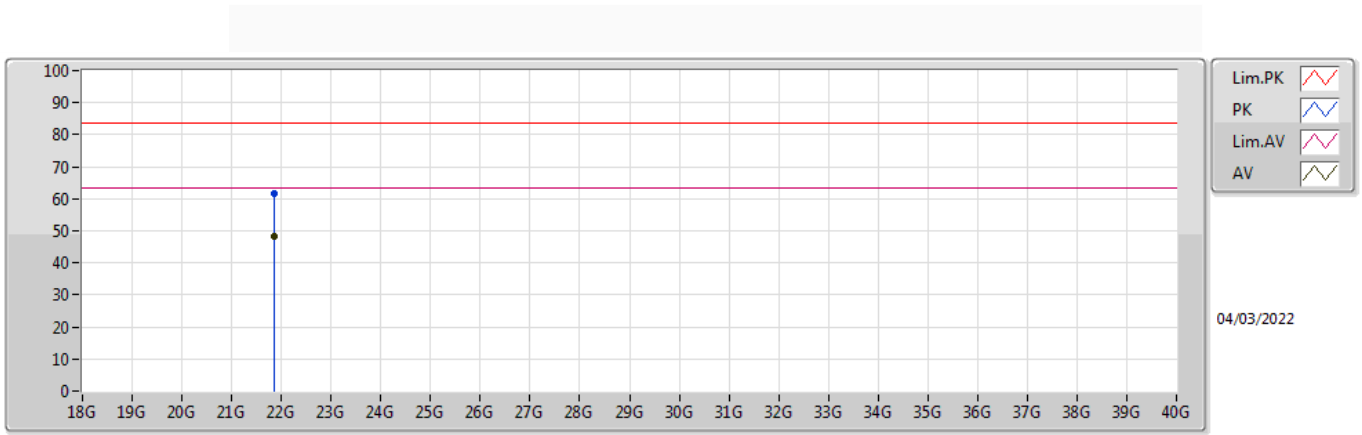
Vertical



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	21.85034G	61.90	83.54	-21.64	5.06	1	Vertical	22	1.00	-	56.84	38.12	16.33	49.39
AV	21.85009G	48.58	63.54	-14.96	5.06	1	Vertical	22	1.00	"Worst"	43.52	38.12	16.33	49.39



Horizontal



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	21.84643G	61.70	83.54	-21.84	5.06	1	Horizontal	44	1.00	-	56.64	38.12	16.33	49.39
AV	21.85155G	48.31	63.54	-15.23	5.06	1	Horizontal	44	1.00	"Worst"	43.25	38.12	16.33	49.39



Test Range	40GHz – 200GHz
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Test Plan: Channel 2 LRP: 60.16275-60.79725

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.16275	23.6	0.50	56.58	-78.33
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-40.46	3	0.0796	90.00	PASS

Test Plan: Channel 2 LRP: 60.16275-60.79725

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.79725	23.6	0.50	56.27	-78.17
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-40.34	3	0.0817	90.00	PASS

Test Plan: Channel 3 LRP: 62.32275-62.95725

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
62.95725	23.6	0.50	50.11	-75.35
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-38.53	3	0.1240	90.00	PASS



Test Plan: Channel 2 HRP: 60.48

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.48	23.6	0.50	56.21	-71.34
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-33.52	3	0.3929	90.00	PASS

Test Plan: Channel 3 HRP: 62.64

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
62.64	23.6	0.50	50.11	-61.73
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-24.91	3	2.8544	90.00	PASS

Note:

$EIRP = Prx - Grx + \text{Free Space Path Loss} = Prx - Grx + 20\text{Log}(4\pi d / \lambda)^2$

Which

Prx = Read Level.

Grx = Rx Antenna Gain.

A distance factor is offset and the formula is $20\text{LOG}(D1/D2)$

Which

D1 = Specification Distance

D2 = Measurement Distance

3.6 Frequency Stability

3.6.1 Limit of Frequency Stability

Frequency Stability	Limit
Refer as 15.255(f) and ANSI C63.10-2013, clause 9.14	within the frequency bands
Note: These measurements shall also be performed at normal and extreme test conditions.	

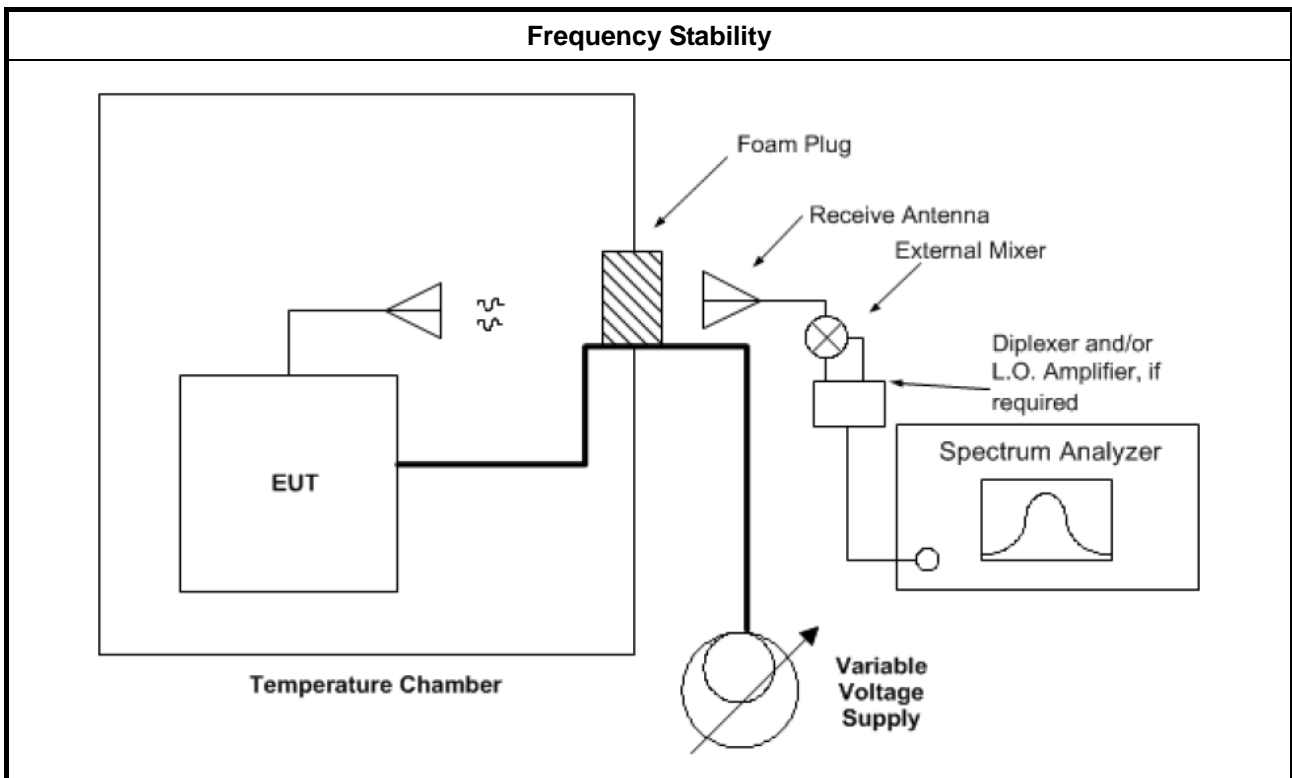
3.6.2 Measuring Instruments

Refer a measuring instruments list in this test report.

3.6.3 Test Procedures

Method of measurement: Refer as ANSI C63.10-2013, clauses 9.14.

3.6.4 Test Setup





3.6.5 Test Result of Frequency Stability

Test Conditions	see ANSI C63.10, clause 5.11 & clause 9
Test Setup	see ANSI C63.10, clause 9.14
NOTE: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, may not need to be repeated for all modes.	

3.6.5.1 Frequency Stability with Respect to Ambient Temperature

Frequency Stability with Respect to Ambient Temperature			
Test Results			
Test Temperature (°C)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (±kHz)
-20	60808.017	6063.5	within band
-10	60807.959	6005.5	within band
0	60808.017	6063.5	within band
10	60801.9535	0	within band
20	60801.9535	Reference	within band
30	60805.354	3400.5	within band
40	60805.522	3568.5	within band
50	60805.522	3568.5	within band



3.6.5.2 Frequency Stability When Varying Supply Voltage

Frequency Stability When Varying Supply Voltage			
Test Results			
Test Voltage: (Vdc)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (\pm kHz)
102	60168.2495	0	within band
120	60168.2495	Reference	within band
138	60168.2495	0	within band



3.7 Operation Restriction and Group Installation

3.7.1 Limit of Operation Restriction and Group Installation

Item	Limit
Operation Restriction	Operation is not permitted for the following products: <ul style="list-style-type: none">♦ Equipment used on aircraft or satellites. (Refer as 15.255 (a))♦ Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. (Refer as 15.255 (a))
Group Installation	Operation is not permitted for the following products: <ul style="list-style-type: none">♦ External phase-locking (Refer as 15.255 (h))

3.7.2 Result of Operation Restriction

Manufacturer declares that EUT will not be used on aircraft or satellites. Then user manual will include a statement to caution EUT is not permitted for use on aircraft or satellites.

3.7.3 Result of Group Installation

The frequency, amplitude and phase of the transmit signal are set within the EUT. There are no external phase-locking inputs or any other means of combining two or more units together to realize a beam-forming array.



4 Test Equipment and Calibration Data

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
LISN	Schwarzbeck	NSLK 8127	8127650	9kHz ~ 30MHz	Jan. 07, 2022	Jan. 06, 2023	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Dec. 22, 2021	Dec. 21, 2022	Conduction (CO02-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	May 05, 2021	May 04, 2022	Conduction (CO02-CB)
COND Cable	Woken	Cable	2	0.15MHz~30MHz	Oct. 19, 2021	Oct. 18, 2022	Conduction (CO02-CB)
Pulse Limiter	Schwarzbeck	VTSD 9561F-N	00378	9kHz ~ 30MHz	Mar. 18, 2021	Mar. 17, 2022	Conduction (CO02-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 14, 2021	Apr. 13, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 09, 2021	Aug. 08, 2022	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 26, 2021	Mar. 25, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 27, 2021	Apr. 26, 2022	Radiation (03CH05-CB)
Signal Analyzer	R&S	FSV40	101903	9kHz ~ 40GHz	Mar. 22, 2021	Mar. 21, 2022	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH04-CB	1GHz ~18GHz 3m	Feb. 24, 2022	Feb. 23, 2023	Radiation (03CH04-CB)
Horn Antenna	ETS · Lindgren	3115	00143147	750MHz~18GHz	Oct. 25, 2021	Oct. 24, 2022	Radiation (03CH04-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH04-CB)
Pre-Amplifier	Agilent	83017A	MY53270063	0.5GHz~26.5GHz	Jul. 12, 2021	Jul. 11, 2022	Radiation (03CH04-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH04-CB)
Signal Analyzer	R&S	FSV40	101904	9kHz ~ 40GHz	Apr. 15, 2021	Apr. 14, 2022	Radiation (03CH04-CB)



Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-16	1 GHz ~ 18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH04-CB)
RF Cable-high	Woken	RG402	High Cable-16+17	1 GHz ~ 18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH04-CB)
High Cable	Woken	WCA0929M	40G#5+7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH04-CB)
High Cable	Woken	WCA0929M	40G#5	1GHz ~ 40 GHz	Dec. 08, 2021	Dec. 07, 2022	Radiation (03CH04-CB)
High Cable	Woken	WCA0929M	40G#7	1GHz ~ 40 GHz	Dec. 14, 2021	Dec. 13, 2022	Radiation (03CH04-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH04-CB)
Mixer*	OML	M19HWA	U91113-1	40 ~ 60 GHz	Nov. 02, 2020	Nov. 01, 2022	Radiation (03CH04-CB)
Mixer*	OML	M15HWA	V91113-1	50 ~ 75 GHz	Nov. 13, 2020	Nov. 12, 2022	Radiation (03CH04-CB)
Mixer*	OML	M12HWA	E91113-1	60 ~ 90 GHz	Nov. 14, 2020	Nov. 13, 2022	Radiation (03CH04-CB)
Mixer*	OML	M08HWA	F91113-1	90 ~ 140 GHz	Nov. 02, 2020	Nov. 01, 2022	Radiation (03CH04-CB)
Mixer*	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Nov. 02, 2020	Nov. 01, 2022	Radiation (03CH04-CB)
Detector	Millitech	DET-15-RPFW 0	#A18185(074)	50 ~ 75 GHz	Apr. 02, 2020	Apr. 01, 2022	Radiation (03CH04-CB)
PC Oscilloscope	PICO TECH	6402C	CX372/002	N/A	Jul. 08, 2021	Jul. 07, 2022	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M15RH	V91113-A	50 ~ 75 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Standard Horn Antenna	Custom Microwave	M05RH	G91113-A	140 ~ 220 GHz	N.C.R	N.C.R	Radiation (03CH04-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Jan. 07, 2022	Jan. 06, 2023	Radiation (TH03-CB)
Temp. and Humidity Chamber	Gaint Force	GTH-408-40-C P-AR	MAA1410-011	-40~100 degree	Sep. 09, 2021	Sep. 08, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	SWI-03-P1	1 GHz ~26.5 GHz	Dec. 13, 2021	Dec. 12, 2022	Radiation (TH03-CB)

Note: Calibration Interval of instruments listed above is one year.

*** Calibration Interval of instruments listed above is two years.

N.C.R. means Non-Calibration required.



5 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	3.4 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.5 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	4.3 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	4.5 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	5.3 dB	Confidence levels of 95%
Conducted Emission	2.5 dB	Confidence levels of 95%