



RADIO TEST REPORT

FCC ID : TV7CB5A60Y
Equipment : CubeG-5ac60ay
Brand Name : MikroTik
Model Name : CubeG-5ac60ay-US, CubeG-5ac60ay-SA-US
Applicant : Mikrotikls SIA
Brivibas gatve 214i, Riga, LV-1039 Latvia
Manufacturer : MIKROTIKLS SIA
Brivibas gatve 214i, Riga, LV-1039 Latvia
Standard : 47 CFR FCC Part 15.255

The product was received on Mar. 03, 2021, and testing was started from Oct. 04, 2021 and completed on Nov. 23, 2021. 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 Standards9

1.3 Testing Location9

2 Test Configuration of Equipment under Test.....10

2.1 Parameters of Test Software Setting10

2.2 Conformance Tests and Related Test Frequencies.....10

2.3 EUT Operation during Test11

2.4 Accessories11

2.5 Support Equipment.....12

2.6 Far Field Boundary Calculations12

2.7 Test Setup Diagram13

3 Transmitter Test Result16

3.1 AC Power Conducted Emissions16

3.2 Occupied Bandwidth21

3.3 EIRP Power30

3.4 Peak Conducted Power.....34

3.5 Transmitter Spurious Emissions.....37

3.6 Frequency Stability72

3.7 Operation Restriction and Group Installation75

4 Test Equipment and Calibration Data76

5 Measurement Uncertainty78

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:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

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)	Channel 1: 58.32 GHz Channel 2: 60.48 GHz Channel 3: 62.64 GHz

1.1.2 Modulation

IEEE 802.11ad Modulation Scheme

MCS Index	Modulation	Code rate	Data rate (Mbit/s)
0	$\pi/2$ -BPSK	1/2	27.5
1	$\pi/2$ -BPSK	1/2	385
2	$\pi/2$ -BPSK	1/2	770
3	$\pi/2$ -BPSK	5/8	962.5
4	$\pi/2$ -BPSK	3/4	1155
5	$\pi/2$ -BPSK	13/16	1251.25
6	$\pi/2$ -QPSK	1/2	1540
7	$\pi/2$ -QPSK	5/8	1925
8	$\pi/2$ -QPSK	3/4	2310
9	$\pi/2$ -QPSK	13/16	2502.5
10	$\pi/2$ -16QAM	1/2	3080
11	$\pi/2$ -16QAM	5/8	3850
12	$\pi/2$ -16QAM	3/4	4620
12.1	$\pi/2$ -16QAM	13/16	5005



1.1.3 Antenna Information

For EUT 1

For WLAN 5GHz

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	MikroTik	CubeG-5ac60ay	Onboard Patch Antenna	I-PEX	11.5

Note1: For WLAN function (1TX, 1RX):

Only port 1 can be used as transmitting/receiving functions.

For WiGig 60GHz

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	MikroTik	60G-phased-array	60G-patch antenna array	N/A	30

Note2: The above information was declared by manufacturer.

For GPS

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	MikroTik	LHG GPS	inverted F antenna	N/A	2.2

Note3: The above information was declared by manufacturer.

For EUT 2

For WLAN 5GHz

Ant.	Port	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	1	MikroTik	CubeG-5ac60ay-SA	Onboard Patch Antenna	N/A	11.5

Note1: For WLAN function (1TX, 1RX):

Only port 1 can be used as transmitting/receiving functions.

For WiGig 60GHz

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	MikroTik	60G-phased-array	60G-patch antenna array	N/A	15

Note2: The above information was declared by manufacturer.

For GPS

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	MikroTik	LHG GPS	inverted F antenna	N/A	2.2

Note3: The above information was declared by manufacturer.



1.1.4 Power Levels

For EUT 1

Applicable power levels	<input type="checkbox"/> Conducted <input checked="" type="checkbox"/> EIRP	
Frequency (GHz)	Highest (P _{high}):	
	AV Power (dBm)	Peak Power (dBm)
58.32	28.87	30.68
60.48	30.72	32.16
62.64	29.71	31.80

For EUT 2

Applicable power levels	<input type="checkbox"/> Conducted <input checked="" type="checkbox"/> EIRP	
Frequency (GHz)	Highest (P _{high}):	
	AV Power (dBm)	Peak Power (dBm)
58.32	29.77	31.84
60.48	32.70	33.69
62.64	33.00	34.39

1.1.5 Operating Conditions

Operating Conditions	
<input type="checkbox"/> -20 °C to +50 °C	
<input type="checkbox"/> 0 °C to +40 °C	
<input checked="" type="checkbox"/> Other: -30 °C to +50 °C	
EUT Power Type	From PoE with Power Adapter
Test Software Version	WinBox v3.31
Supply Voltage	<input checked="" type="checkbox"/> AC State AC voltage 110 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 checked="" type="checkbox"/>	Outdoor (except outdoor fixed Point to Point)
<input checked="" type="checkbox"/>	Outdoor fixed Point to Point

Note: The above information was declared by manufacturer.

1.1.8 Duty Cycle

Duty Cycle	Duty Cycle Factor (dB)
100 %	0

1.1.9 Table for Multiple Listing

The model names in the following table are all refer to the identical product.

EUT No.	Model Name	Antenna Gain (dBi)	Description
		WiGig 60GHz	
1	CubeG-5ac60ay-US	30	The different model names equip with different 60GHz antennas.
2	CubeG-5ac60ay-SA-US	15	

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	TH03-CB	Eddie Weng	22.9~23.6 / 55~59	Nov. 23, 2021
Radiated	03CH01-CB	Ken Yeh	23.7~24.8 / 56~59	Nov. 23, 2021
AC Conduction	CO02-CB	Peter Wu	24~25 / 55~57	Oct. 08, 2021



2 Test Configuration of Equipment under Test

2.1 Parameters of Test Software Setting

Channel Plan (GHz)	Low Channel (GHz)	Middle Channel (GHz)	High Channel (GHz)
	58.32	60.48	62.64
Software Setting	Default	Default	Default

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
AC Power Conducted Emissions Test Voltage: 120Vac / 60Hz	CTX-60.48
Occupied Bandwidth	For mode 1~moed 2: 58.32, 60.48, 62.64
EIRP Power	For mode 1~moed 2: 58.32, 60.48, 62.64
Peak Conducted Power	For mode 1~moed 2: 58.32, 60.48, 62.64
Transmitter Spurious Emissions (below 1 GHz)	For mode 1: CTX-60.48 For moed 2: CTX-62.64
Transmitter Spurious Emissions (1 GHz-18 GHz)	For mode 1: 58.32, 60.48, 62.64 For mode 2: 58.32, 60.48, 62.64
Transmitter Spurious Emissions (18 GHz-40 GHz)	For mode 1: 58.32, 60.48, 62.64 For mode 2: 58.32, 60.48, 62.64
Transmitter Spurious Emissions (above 40 GHz)	For moed 1: 58.32, 60.48, 62.64
Frequency Stability	For moed 1: 60.48

The following test modes were performed for all tests:

For AC Power Conducted Emissions test:

Mode 1: CTX-EUT 1 + 5GHz

Mode 2: CTX-EUT 1 + 60GHz

Mode 3: CTX-EUT 2 + 60GHz

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

For Occupied Bandwidth/EIRP Power/Peak Conducted Power

Mode 1: CTX-EUT 1 in Y axis + 60GHz

Mode 2: CTX-EUT 2 in Y axis + 60GHz



For Transmitter Spurious Emissions (below 40 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 1 in Y axis + 60GHz

Mode 2: CTX-EUT 2 in Y axis + 60GHz

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 2 in Y axis + 60GHz (EIRP worst case)

For Frequency Stability

Mode 1: CTX-EUT 2 in Y axis + 60GHz (EIRP worst case)

2.3 EUT Operation during Test

During the test, "WinBox v3.31" under WIN 7 was executed the test program to control the EUT continuously transmit RF signal.

2.4 Accessories

Accessories				
Equipment Name	Brand Name	Model Name	Rating	Remark
Adapter	CULLPOWER	SAW30-240-0 800U A	INPUT: 100-240V ~ 50/60Hz, 0.8A OUTPUT: 24V, 800mA	Non-shielded, 1.5m
PoE	MikroTik	RBGPOE	-	Power cable: Non-shielded, 0.2m RJ-45 cable: Shielded, 0.1m



2.5 Support Equipment

For AC Conduction:

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
B	NB	DELL	E6430	N/A
C	Device	Mikrotikls SIA	CubeG-5ac60ay-SA-US	N/A
E	Device NB	DELL	E6430	N/A
F	GPS Simulator	WELNAVIGATE	GS-100	N/A

For RF Radiated:

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
A	Notebook	DELL	E4300	N/A

2.6 Far Field Boundary Calculations

The far-field boundary is given as:

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

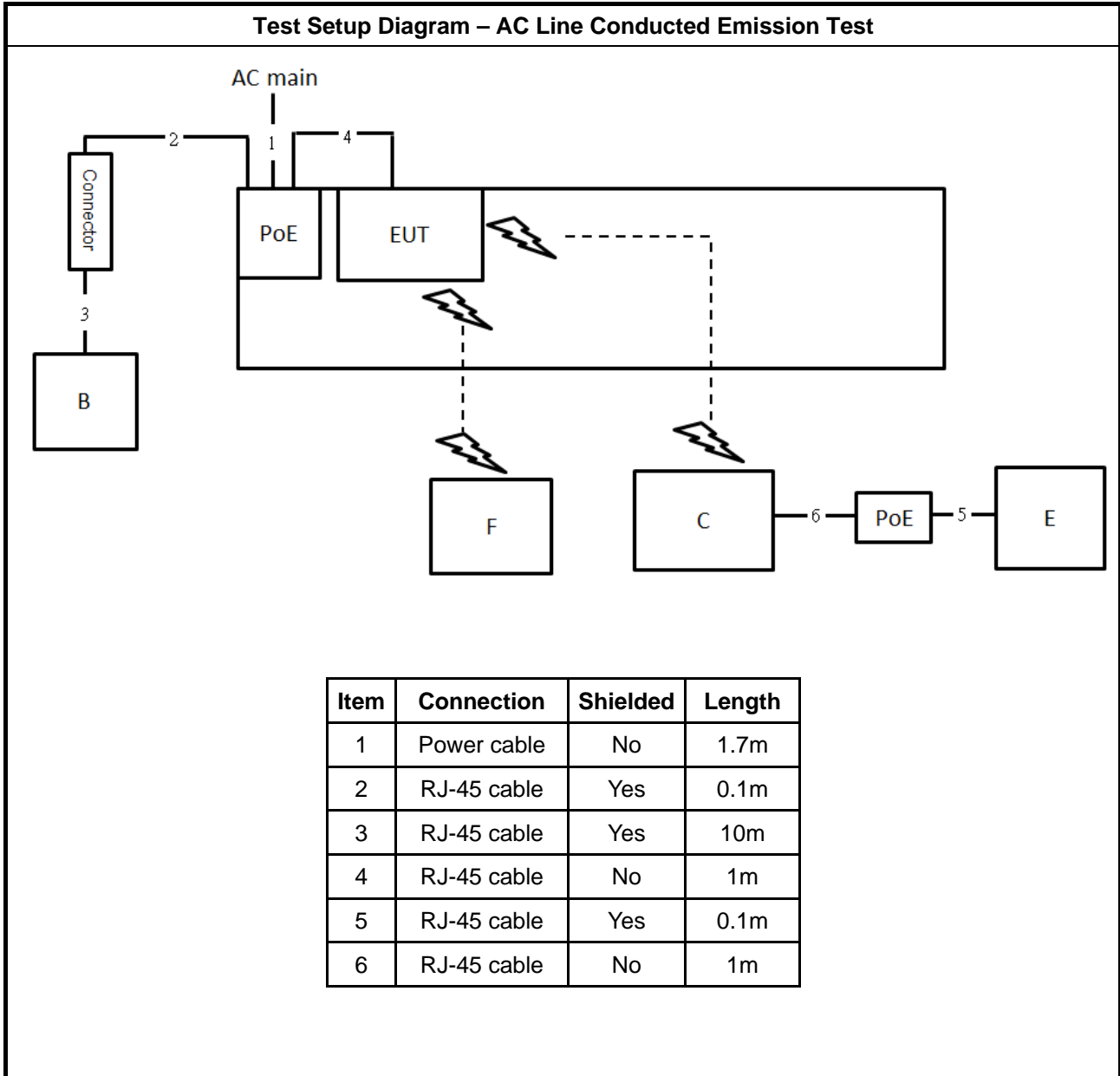
where:

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

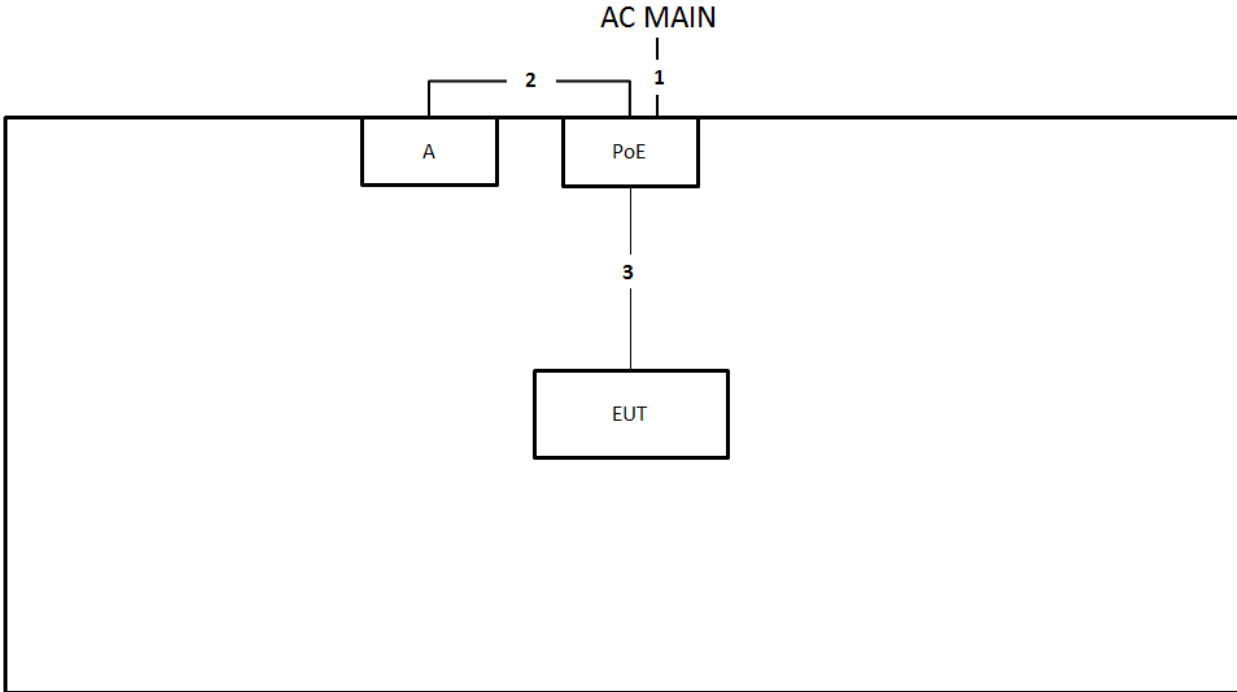
 λ = wavelength in meters

Far Field (m)				
Frequency (GHz)	L (m)	Lambda (m)	d(Far Field) (m)	d(Far Field) (cm)
58.32	0.1	0.0051440	3.888	388.80
60.48	0.1	0.0049603	4.032	403.20
62.64	0.1	0.0047893	4.176	417.60

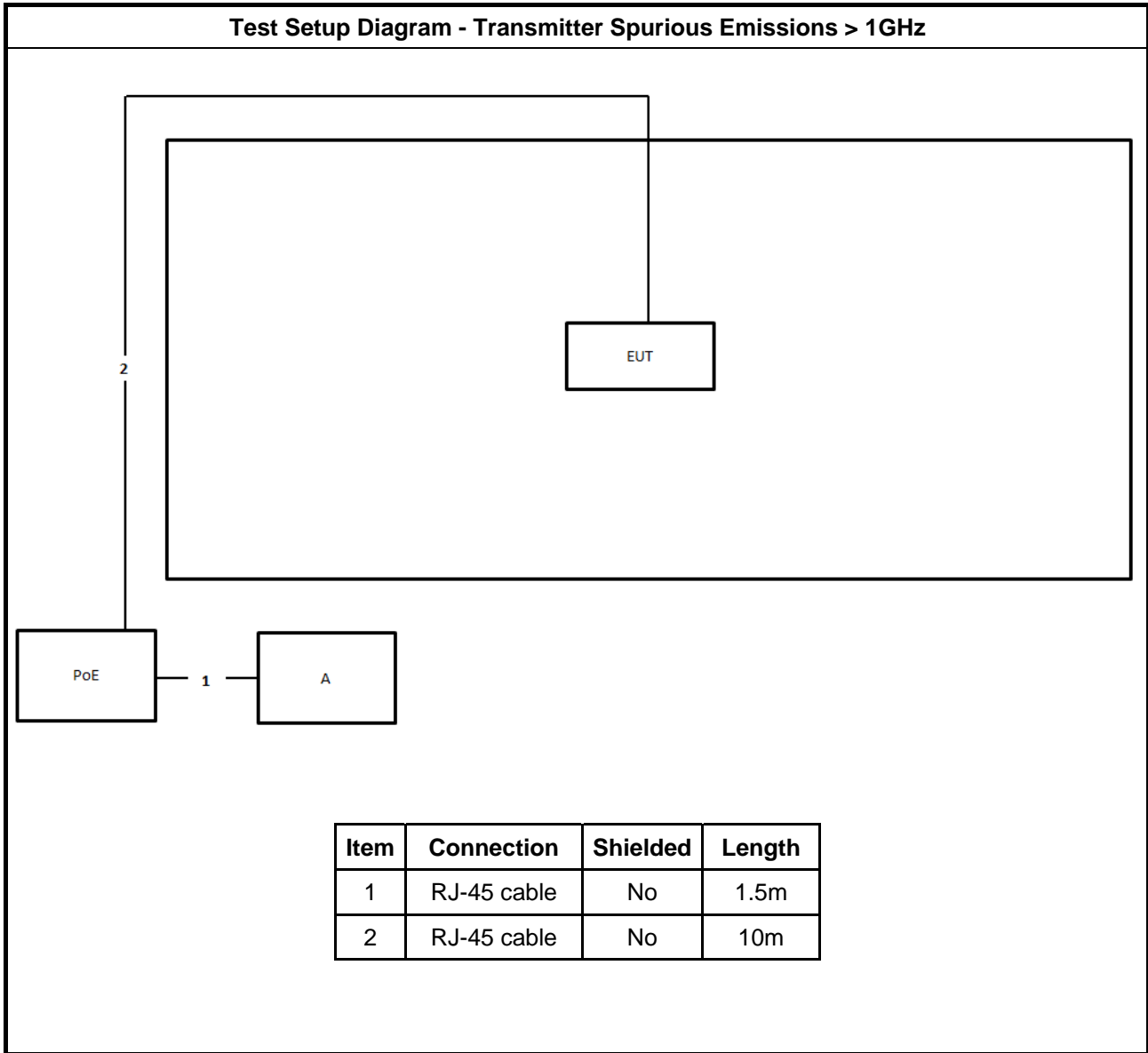
2.7 Test Setup Diagram



Test Setup Diagram - Transmitter Spurious Emissions < 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	1.7m
2	RJ-45 cable	Yes	0.1m
3	RJ-45 cable	No	0.4m





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.

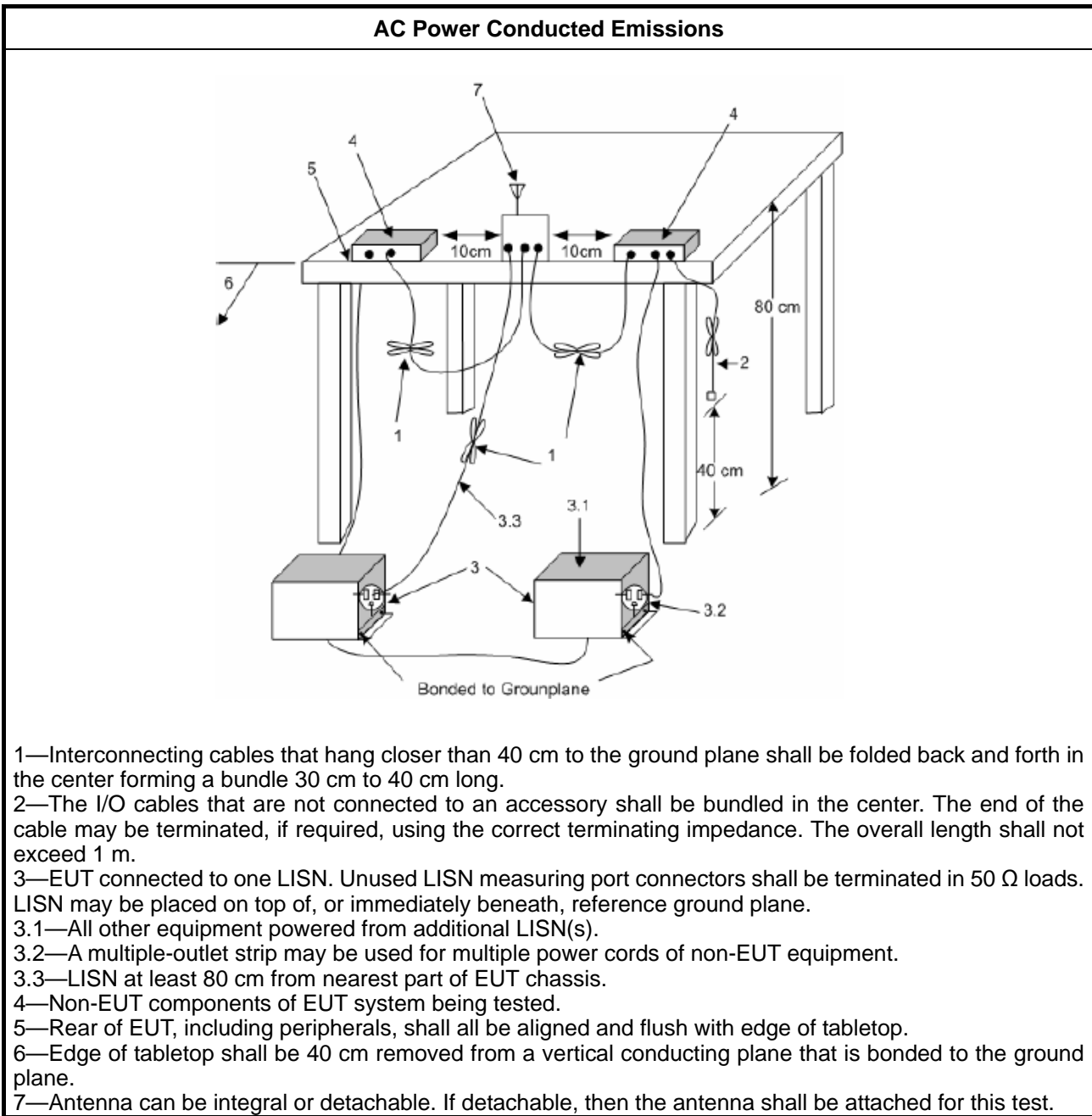
3.1.2 Measuring Instruments

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



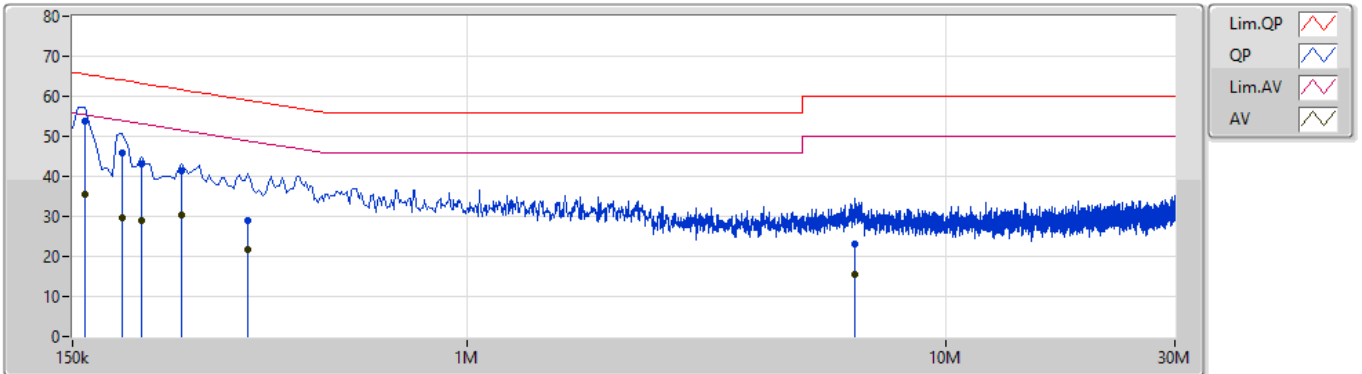
3.1.6 Test Result of AC Power Conducted Emissions

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	Line	Configuration	CTX
Test Mode	Mode 2		

29/11/2021



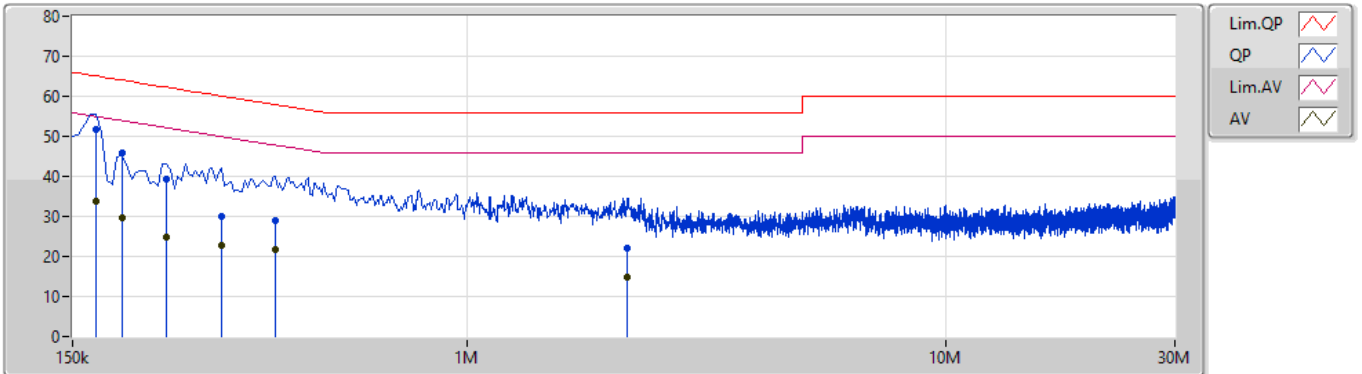
--	--	--	--	--	--	--	--	--	--	--	--

Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)
QP	159k	53.75	65.52	-11.77	9.89	Line	"Worst"	43.86	0.04	0.04	9.81
AV	159k	35.37	55.52	-20.15	9.89	Line	-	25.48	0.04	0.04	9.81
QP	190.5k	45.90	64.01	-18.11	9.89	Line	-	36.01	0.04	0.04	9.81
AV	190.5k	29.70	54.01	-24.31	9.89	Line	-	19.81	0.04	0.04	9.81
QP	208.5k	43.22	63.27	-20.05	9.89	Line	-	33.33	0.04	0.04	9.81
AV	208.5k	28.87	53.27	-24.40	9.89	Line	-	18.98	0.04	0.04	9.81
QP	253.5k	41.41	61.64	-20.23	9.89	Line	-	31.52	0.04	0.04	9.81
AV	253.5k	30.22	51.64	-21.42	9.89	Line	-	20.33	0.04	0.04	9.81
QP	348k	29.11	59.00	-29.89	9.90	Line	-	19.21	0.04	0.04	9.82
AV	348k	21.68	49.00	-27.32	9.90	Line	-	11.78	0.04	0.04	9.82
QP	6.437M	23.12	60.00	-36.88	10.21	Line	-	12.91	0.18	0.14	9.89
AV	6.437M	15.62	50.00	-34.38	10.21	Line	-	5.41	0.18	0.14	9.89



Phase	Neutral	Configuration	CTX
Test Mode	Mode 2		

29/11/2021



--	--	--	--	--	--	--	--	--	--	--	--	--

Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	LISN (dB)	CL (dB)	AT (dB)			
QP	168k	51.67	65.06	-13.39	9.88	Neutral	"Worst"	41.79	0.03	0.04	9.81			
AV	168k	33.87	55.06	-21.19	9.88	Neutral	-	23.99	0.03	0.04	9.81			
QP	190.5k	45.96	64.01	-18.05	9.88	Neutral	-	36.08	0.03	0.04	9.81			
AV	190.5k	29.49	54.01	-24.52	9.88	Neutral	-	19.61	0.03	0.04	9.81			
QP	235.5k	39.18	62.25	-23.07	9.88	Neutral	-	29.30	0.03	0.04	9.81			
AV	235.5k	24.86	52.25	-27.39	9.88	Neutral	-	14.98	0.03	0.04	9.81			
QP	307.5k	29.96	60.03	-30.07	9.89	Neutral	-	20.07	0.03	0.04	9.82			
AV	307.5k	22.80	50.03	-27.23	9.89	Neutral	-	12.91	0.03	0.04	9.82			
QP	397.5k	28.91	57.91	-29.00	9.89	Neutral	-	19.02	0.03	0.04	9.82			
AV	397.5k	21.67	47.91	-26.24	9.89	Neutral	-	11.78	0.03	0.04	9.82			
QP	2.162M	22.09	56.00	-33.91	9.98	Neutral	-	12.11	0.07	0.08	9.83			
AV	2.162M	14.75	46.00	-31.25	9.98	Neutral	-	4.77	0.07	0.08	9.83			



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.

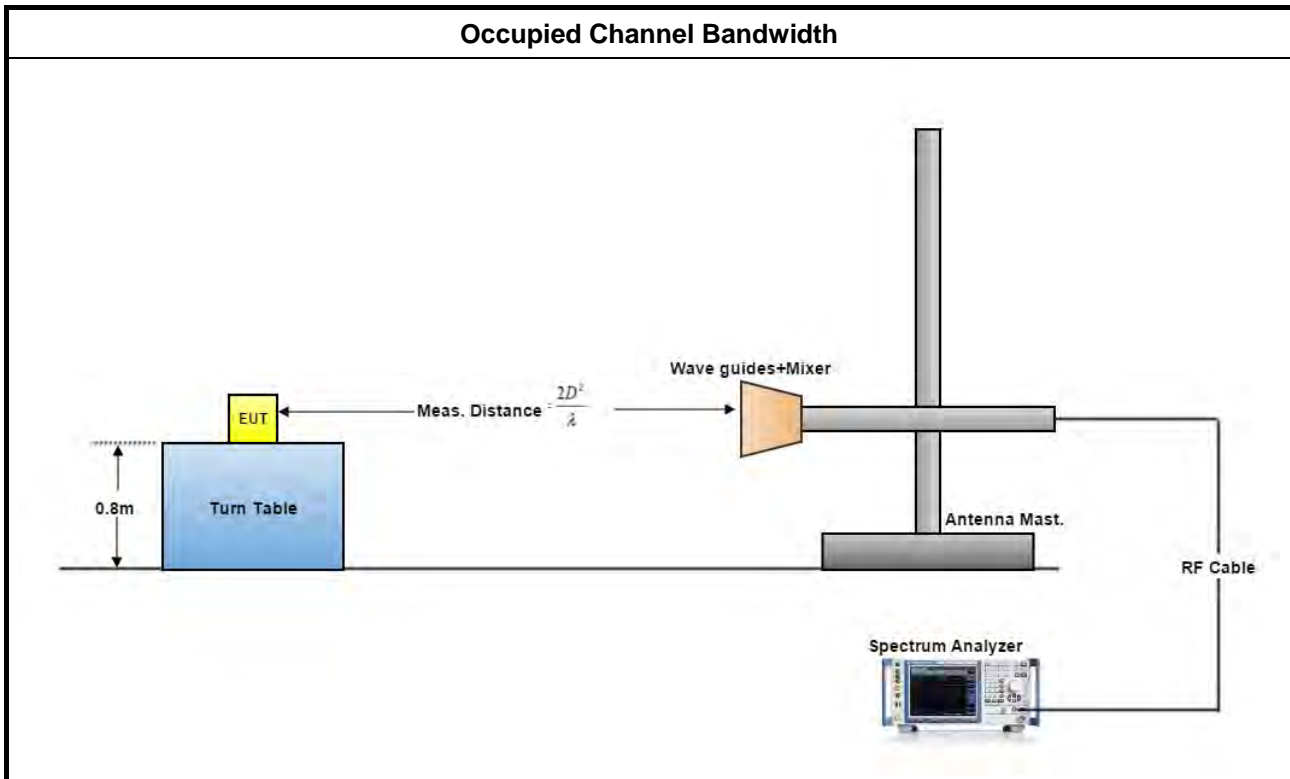
3.2.2 Measuring Instruments

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>	

For mode 1

Test Results				
Channel Plan (GHz)	Test Freq. (GHz)	6 dBc Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
Channel 1	58.32	1555.70	2800.28	N/A
Channel 2	60.48	1085.40	2098.40	N/A
Channel 3	62.64	933.40	2040.52	N/A

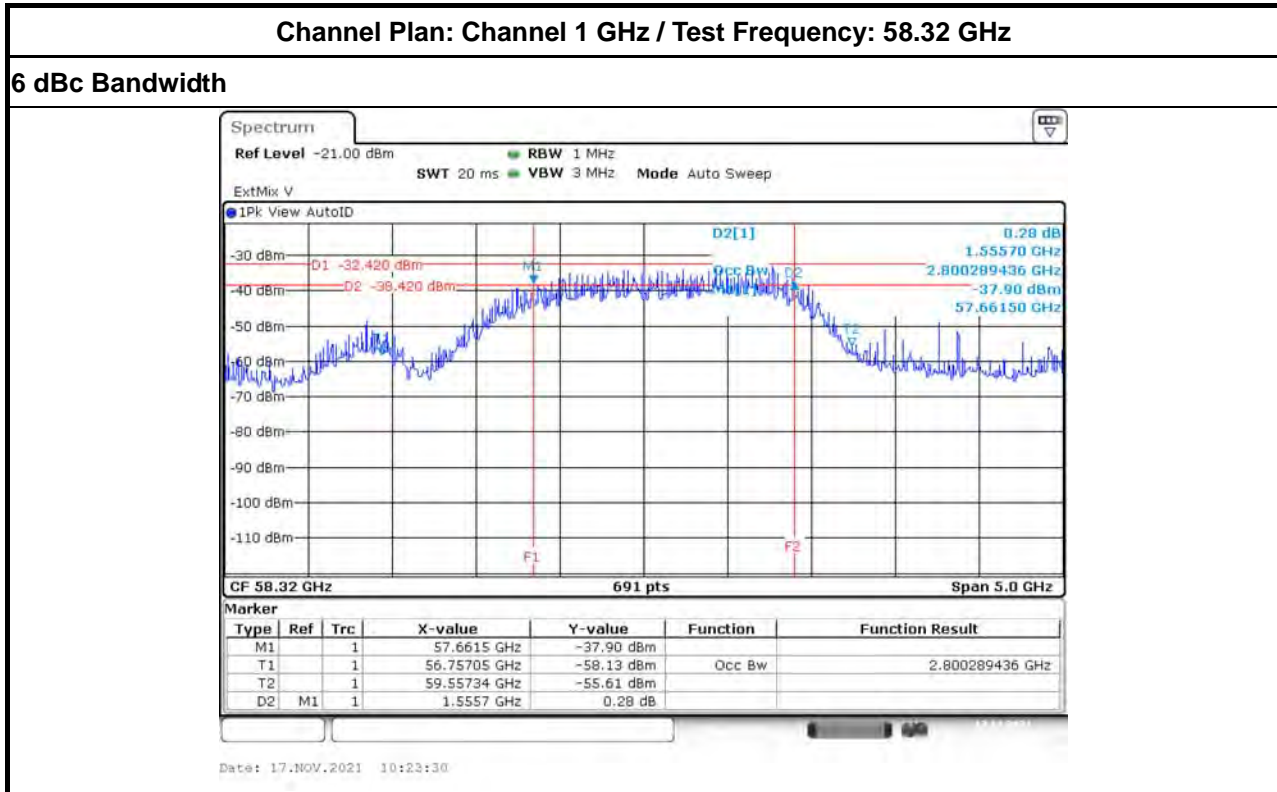
For mode 2

Test Results				
Channel Plan (GHz)	Test Freq. (GHz)	6 dBc Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
Channel 1	58.32	1237.30	2930.53	N/A
Channel 2	60.48	448.6	2047.75	N/A
Channel 3	62.64	868.30	2018.81	N/A



3.2.5.1 Bandwidth Plots

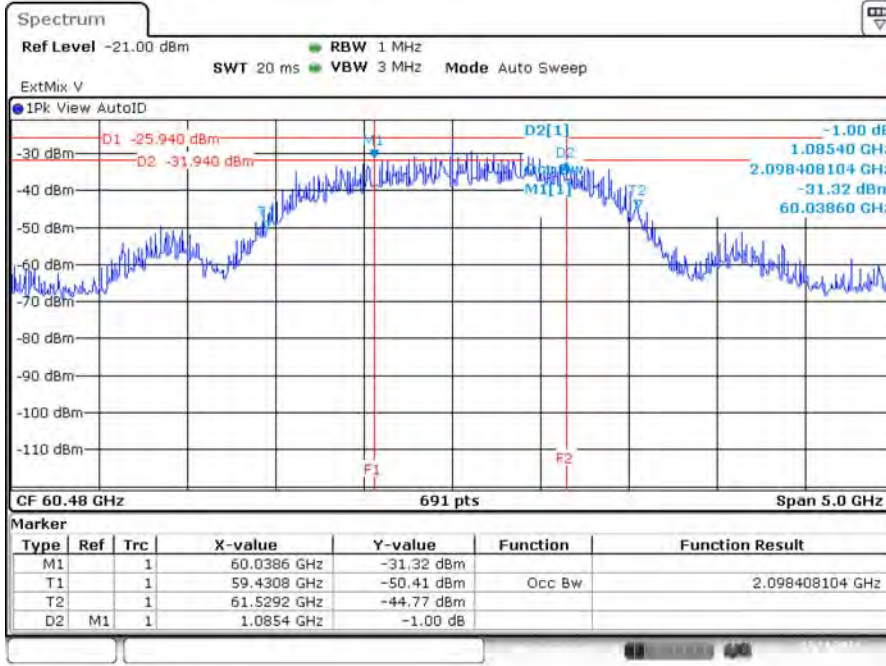
For mode 1





Channel Plan: Channel 2 GHz / Test Frequency: 60.48 GHz

6 dBc Bandwidth

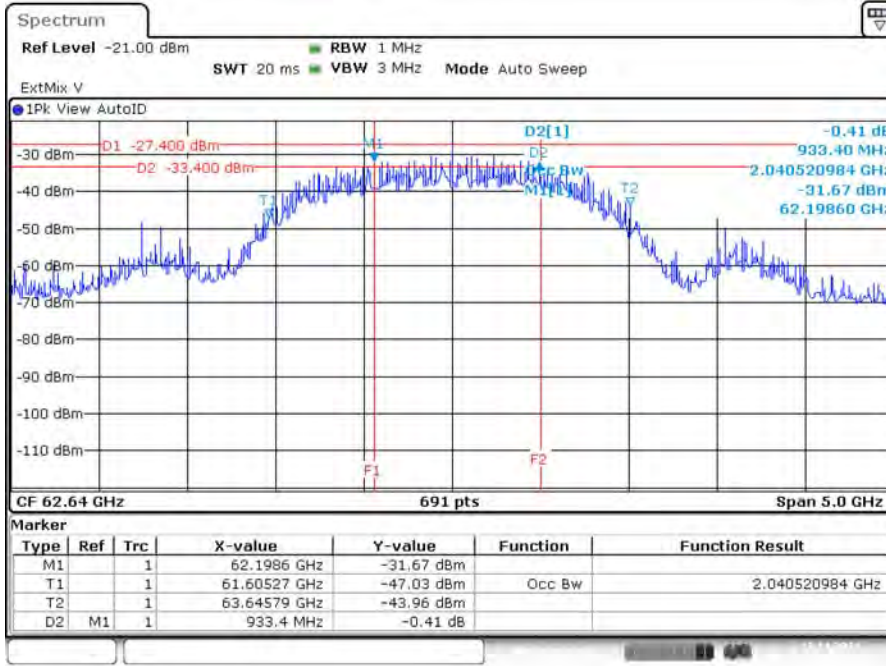


Date: 17.NOV.2021 10:21:30



Channel Plan: Channel 3 GHz / Test Frequency: 62.64 GHz

6 dBc Bandwidth



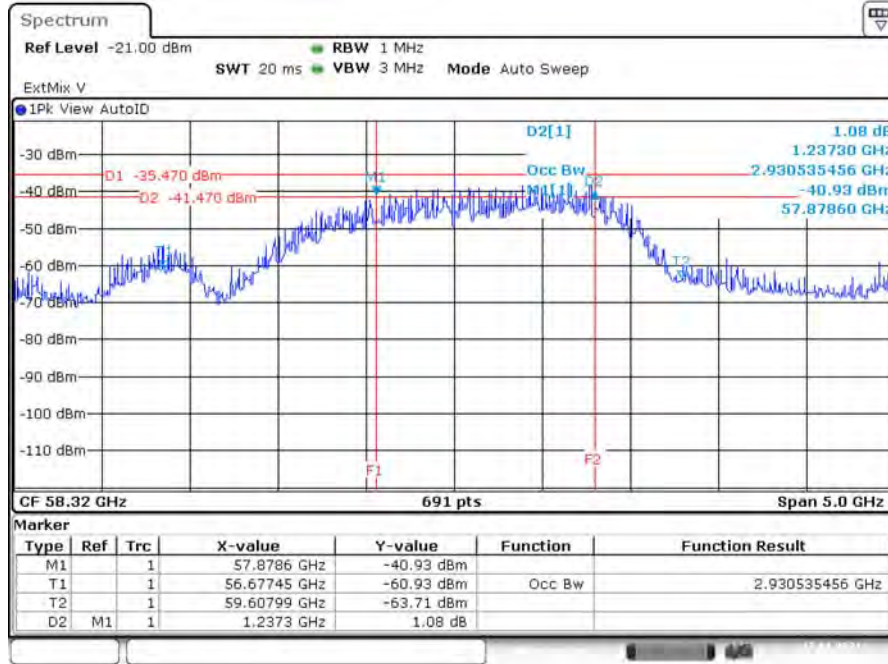
Date: 17.NOV.2021 10:19:02



For mode 2

Channel Plan: Channel 1 GHz / Test Frequency: 58.32 GHz

6 dBc Bandwidth

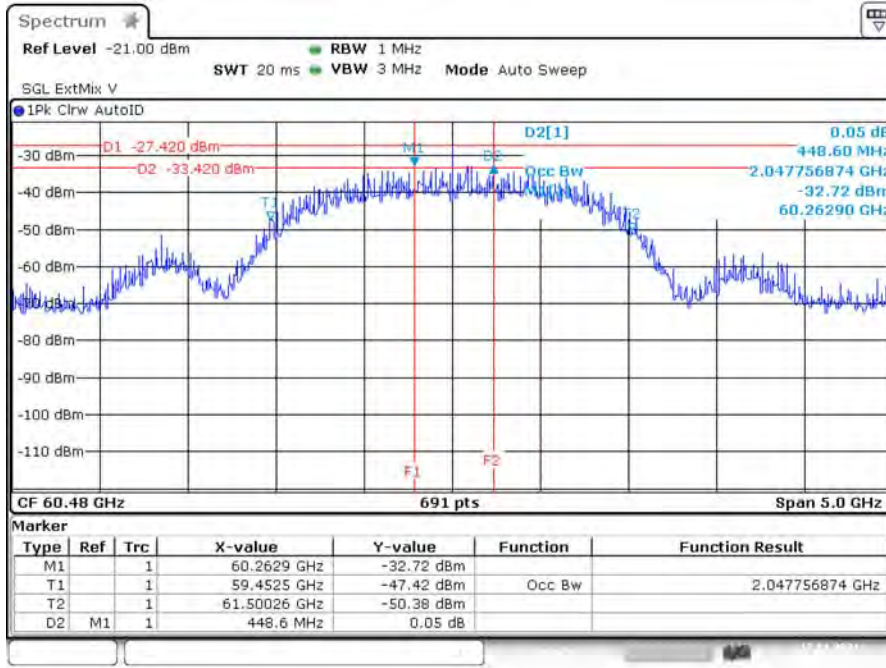


Date: 17.NOV.2021 12:47:30



Channel Plan: Channel 2 GHz / Test Frequency: 60.48 GHz

6 dBc Bandwidth

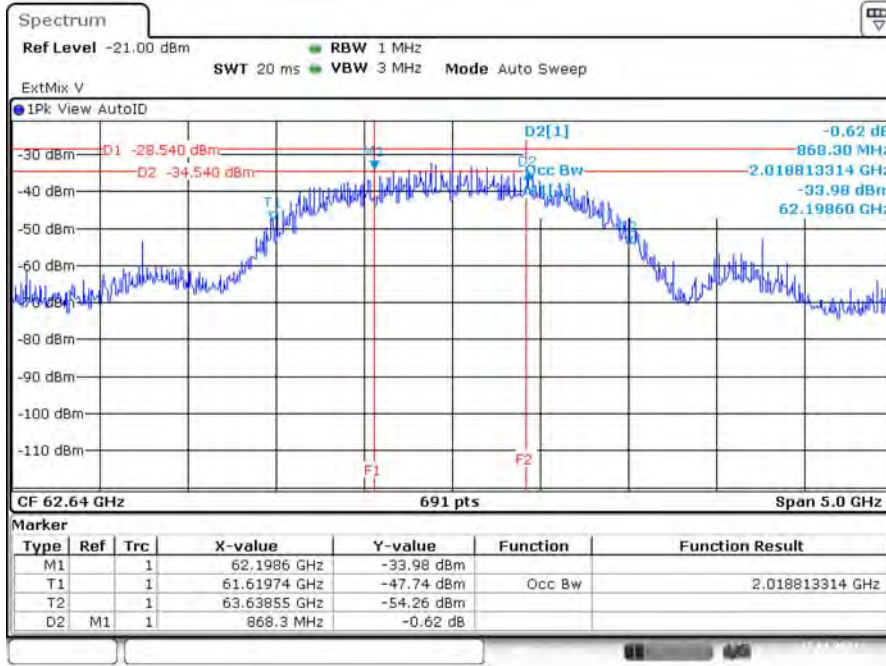


Date: 17.NOV.2021 13:08:45



Channel Plan: Channel 3 GHz / Test Frequency: 62.64 GHz

6 dBc Bandwidth



Date: 17.NOV.2021 13:18:46



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)

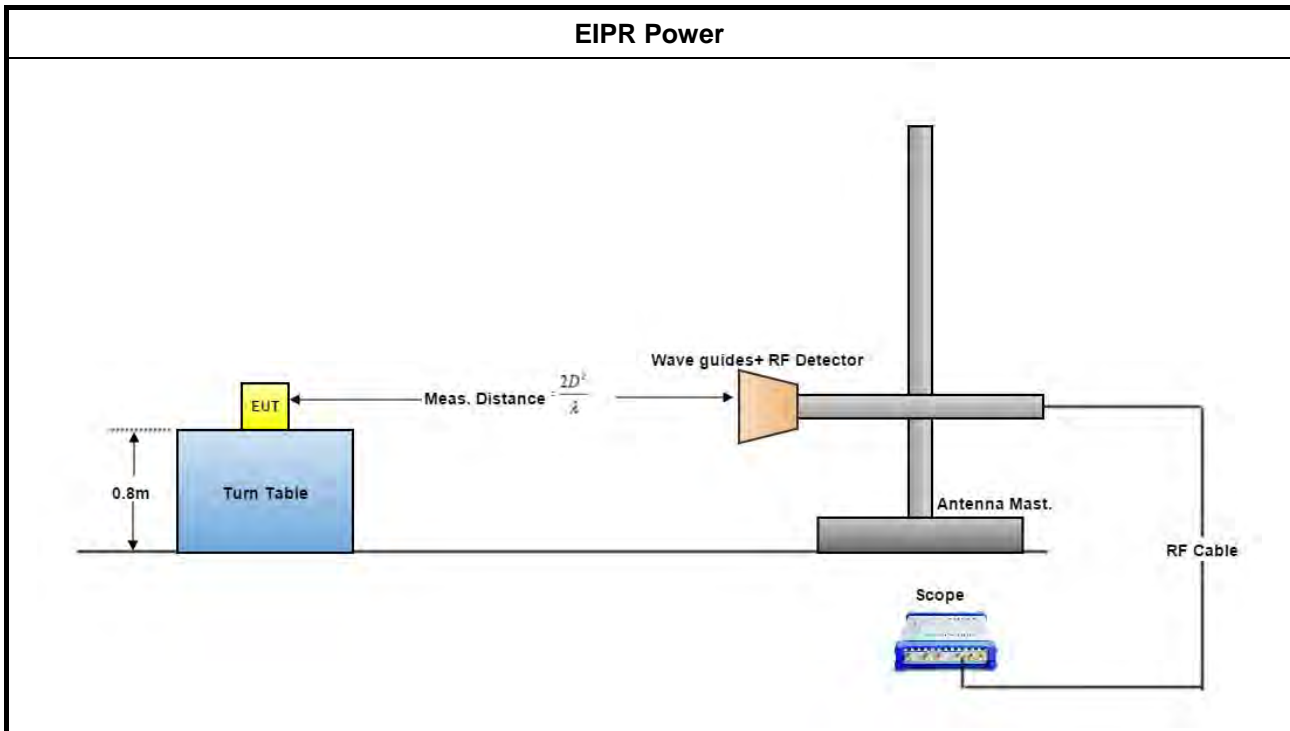
3.3.2 Measuring Instruments

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

For mode 1

Test Distance		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 1	58.32	23.6	4.331	3.03	-27.47	-29.28	121.50	119.69	30.68	28.87	43	40
Channel 2	60.48	23.6	5.512	4.118	-26.31	-27.75	122.98	121.54	32.16	30.72	43	40
Channel 3	62.64	23.6	4.725	3.118	-26.97	-29.06	122.62	120.53	31.80	29.71	43	40

For mode 2

Test Distance		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 1	58.32	23.6	5.51	3.62	-26.31	-28.38	122.66	120.59	31.84	29.77	43	40
Channel 2	60.48	23.6	7.48	6.15	-24.78	-25.77	124.51	123.52	33.69	32.70	43	40
Channel 3	62.64	23.6	8.26	6.15	-24.38	-25.77	125.21	123.82	34.39	33.00	43	40



The measured power level is converted to EIRP using the Friis equation:

For radiated emissions, calculate the field strength (E) in dB μ V/meter.

$$E = 126.8 - 20\log(\lambda) + P - G$$

where:

E : is the field strength of the emission at the measurement distance, in dB μ V/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 isotropically radiated power, in dBm

E-meas. : is the field strength of the emission at the measurement distance, in dB μ V/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

For mode 1

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 1	58.32	30.68	30	0.68	1.170	1555.70	500.00
Channel 2	60.48	32.16	30	2.16	1.644	1085.40	500.00
Channel 3	62.64	31.80	30	1.80	1.515	933.40	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.



For mode 2

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 1	58.32	31.84	15	16.84	48.343	1237.30	500.00
Channel 2	60.48	33.69	15	18.69	73.947	448.60	500.00
Channel 3	62.64	34.39	15	19.39	86.976	868.30	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

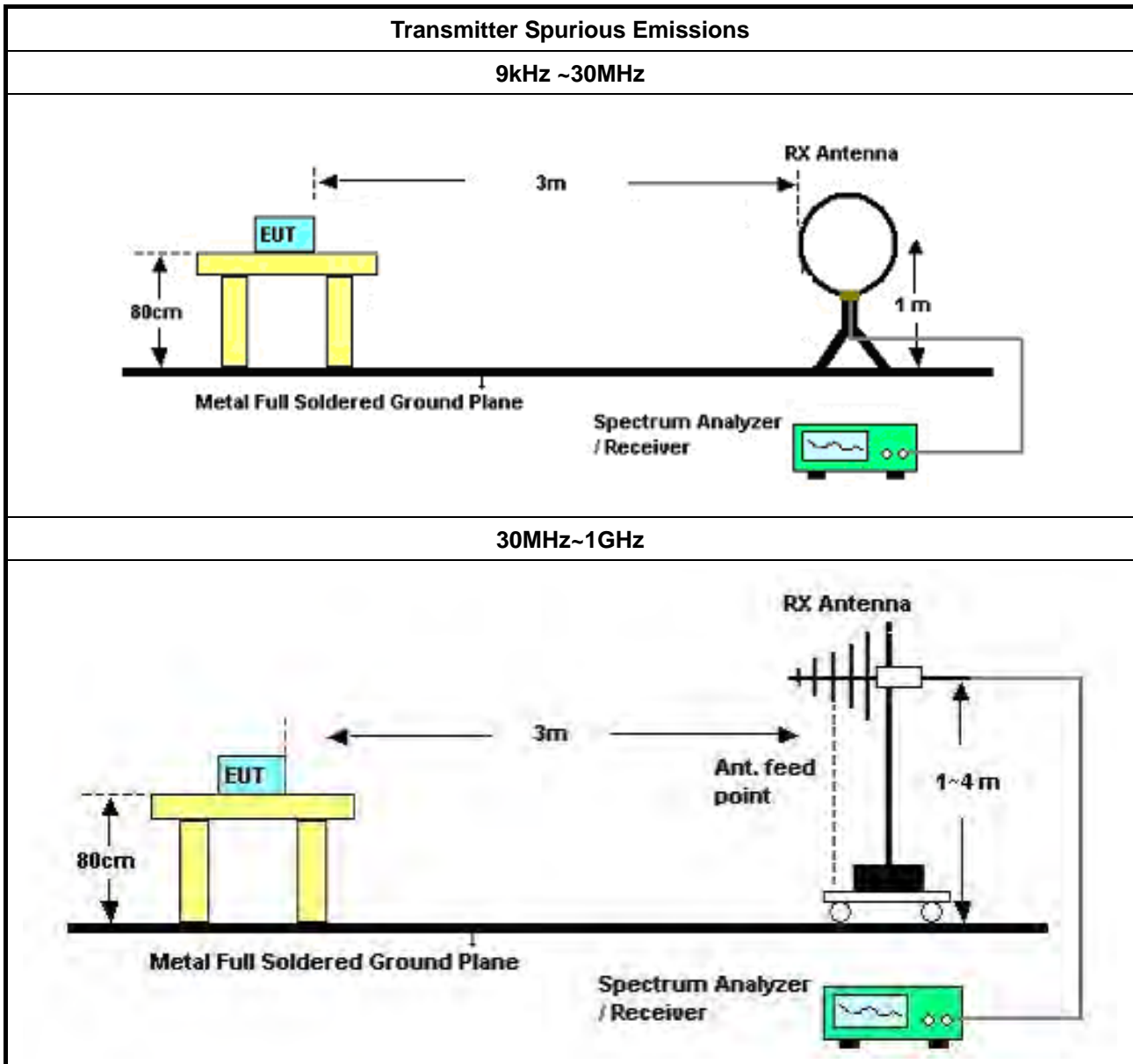
3.5.1 Limit of Transmitter Spurious Emissions

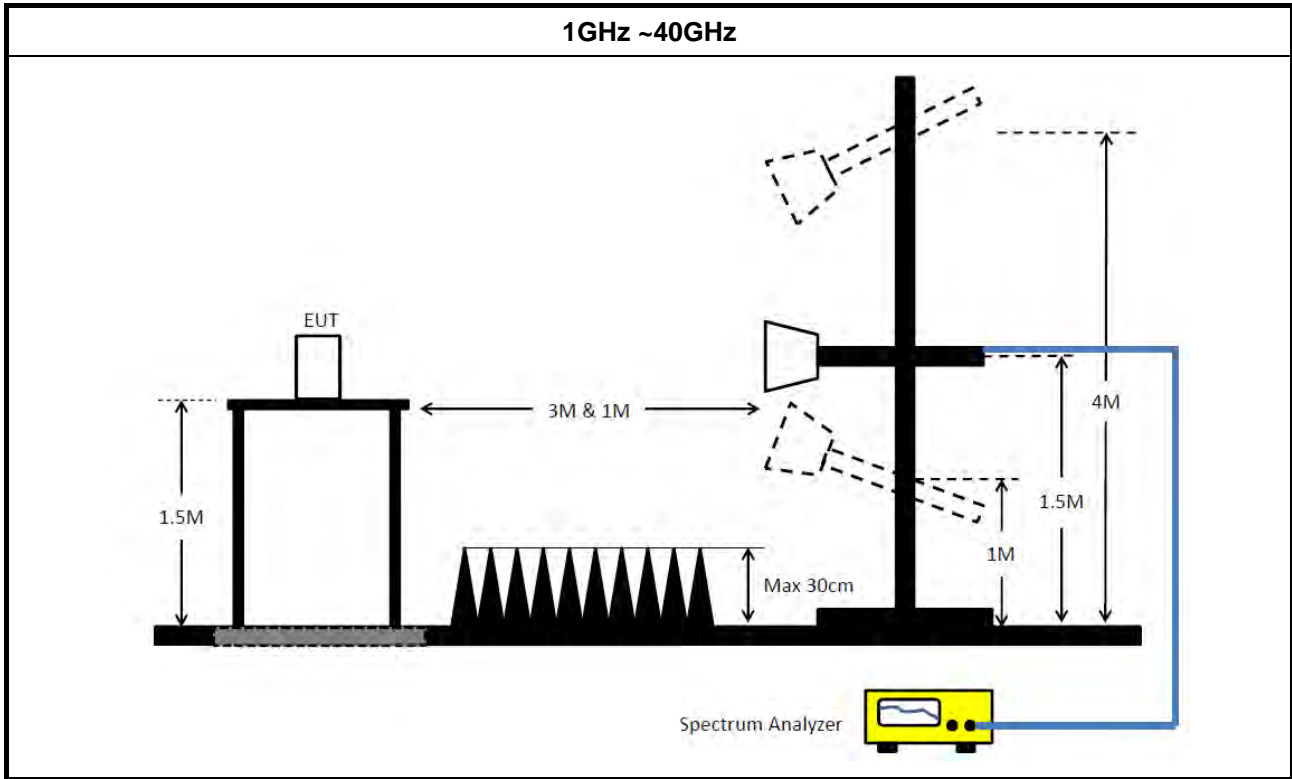
Frequency Range	Limit
Radiated emissions below 40 GHz	15.209
Radiated emissions above 40 GHz – 200GHz	90 pW/cm ² @ 3 m (Equivalent EIRP 102 μW, -9.91dBm)
NOTE 1: For the applicable limit, see 15.255(d)	
NOTE 2: Spurious emissions shall not exceed the level of the fundamental emission.	

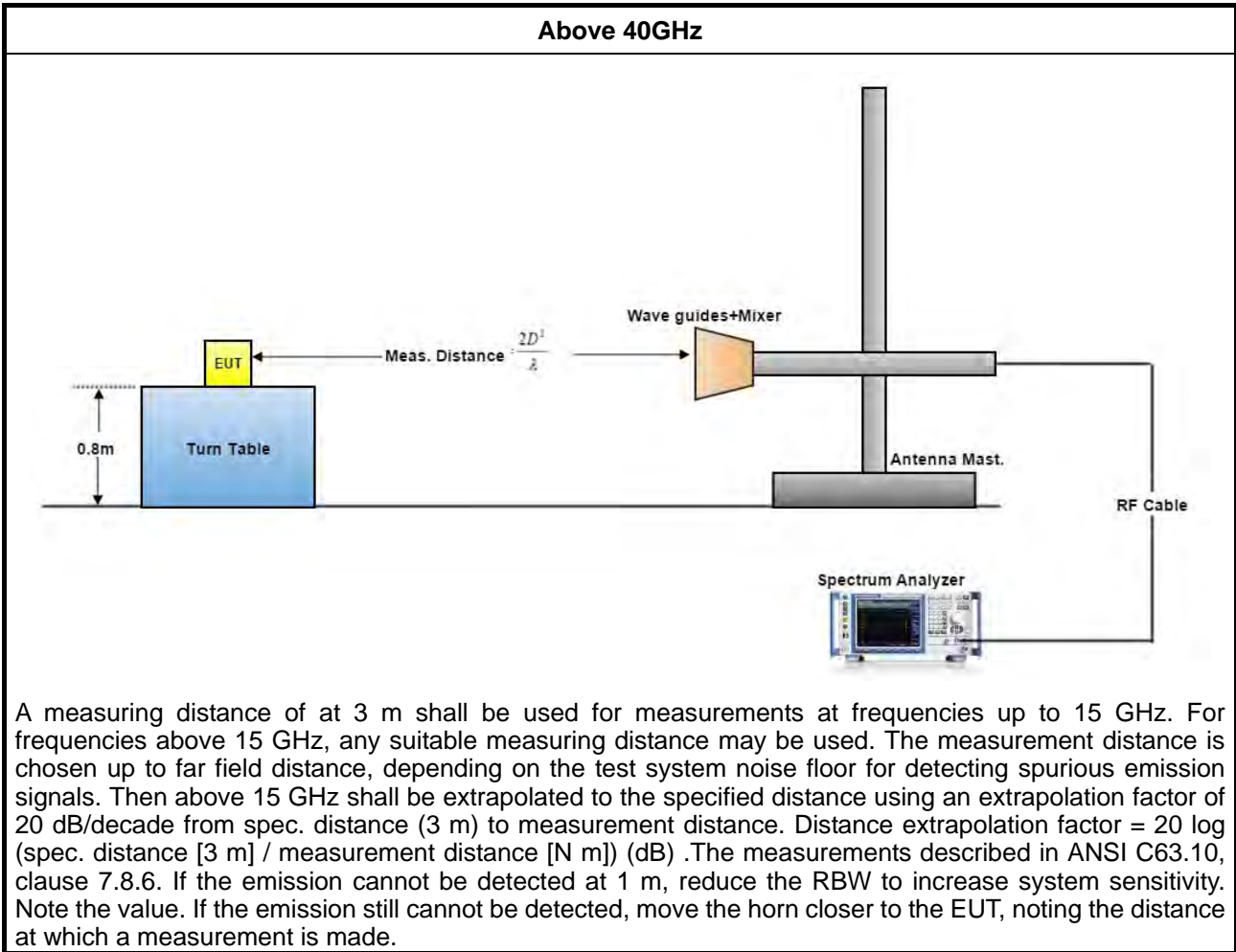
3.5.2 Test Procedures

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.

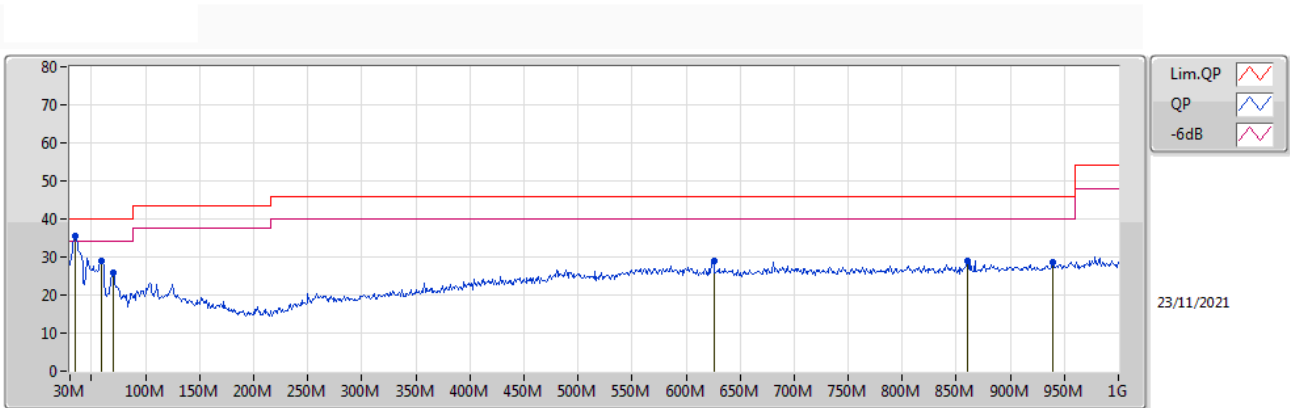
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.



3.5.5.2 Test Result of Transmitter Spurious Emissions

Test Range	30 MHz – 1000 MHz	Test Distance	3 m
Test Configuration	CTX	Test Mode	Mode 1

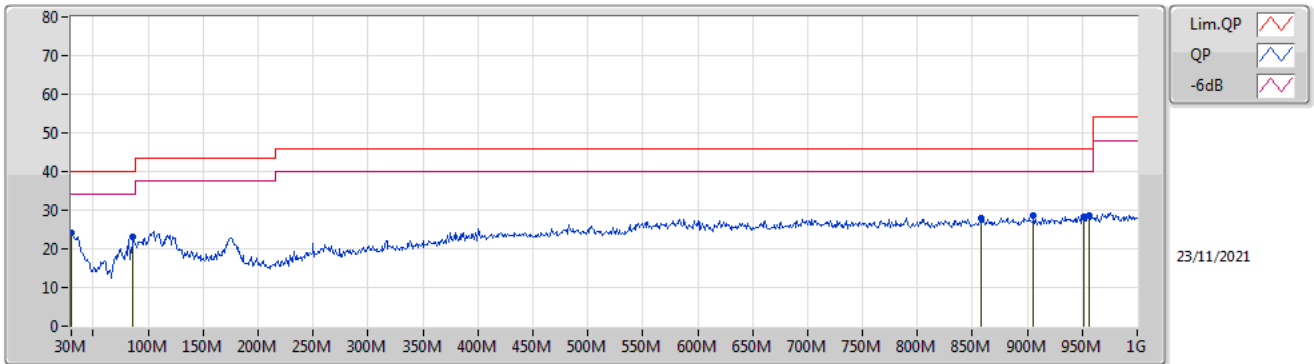
Vertical



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	34.85M	35.48	40.00	-4.52	-10.25	3	Vertical	322	1.00	"Worst"	45.73	20.92	0.50	31.67
PK	59.1M	28.89	40.00	-11.11	-19.59	3	Vertical	219	1.00	-	48.48	11.58	0.70	31.87
PK	69.77M	25.97	40.00	-14.03	-19.71	3	Vertical	185	2.00	-	45.68	11.49	0.70	31.90
PK	625.58M	29.07	46.00	-16.93	-6.17	3	Vertical	14	1.25	-	35.24	24.13	2.00	32.30
PK	860.32M	29.07	46.00	-16.93	-4.64	3	Vertical	351	1.50	-	33.71	25.29	2.32	32.25
PK	939.86M	28.64	46.00	-17.36	-4.00	3	Vertical	84	2.00	-	32.64	25.62	2.56	32.18



Horizontal

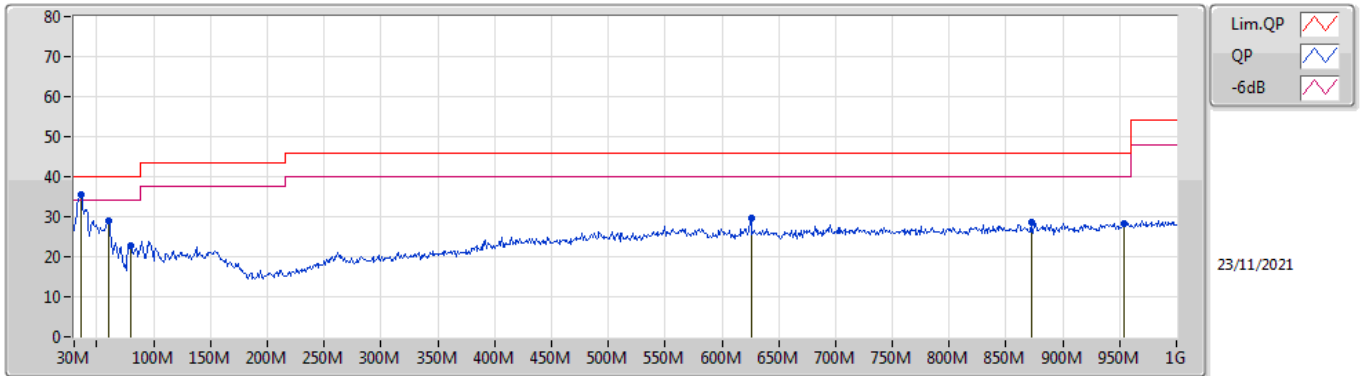


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB/m)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	30M	24.21	40.00	-15.79	-7.55	3	Horizontal	64	1.00	"Worst"	31.76	23.49	0.50	31.54
PK	86.26M	22.97	40.00	-17.03	-18.09	3	Horizontal	246	2.00	-	41.06	13.02	0.80	31.91
PK	857.41M	28.03	46.00	-17.97	-4.68	3	Horizontal	181	2.00	-	32.71	25.26	2.31	32.25
PK	905.91M	28.45	46.00	-17.55	-4.41	3	Horizontal	359	1.50	-	32.86	25.40	2.42	32.23
PK	951.5M	28.34	46.00	-17.66	-3.80	3	Horizontal	168	1.00	-	32.14	25.77	2.60	32.17
PK	956.35M	28.60	46.00	-17.40	-3.71	3	Horizontal	231	1.50	-	32.31	25.86	2.60	32.17



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

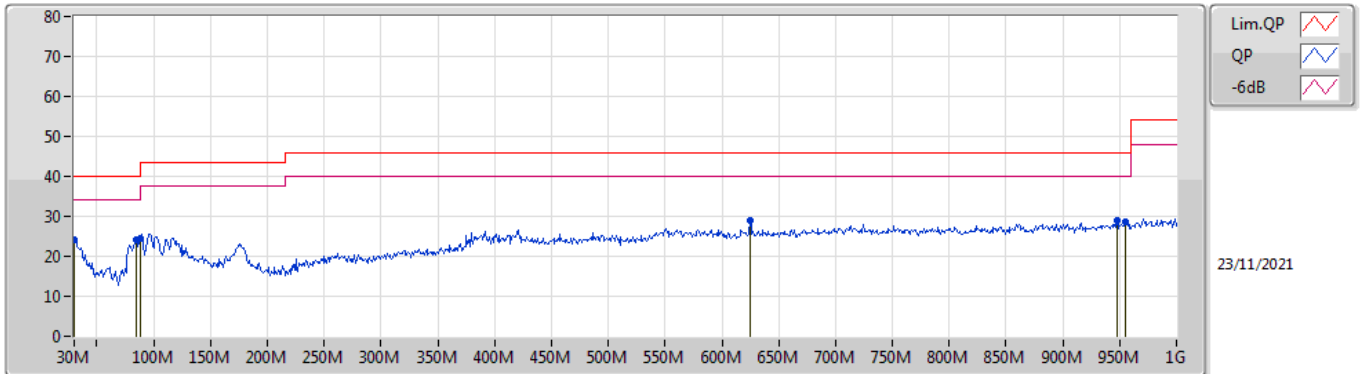
Vertical



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)
PK	35.82M	35.37	40.00	-4.63	-10.84	3	Vertical	176	1.00	"Worst"	46.21	20.32	0.52	31.68
PK	60.07M	29.12	40.00	-10.88	-19.66	3	Vertical	238	1.00	-	48.78	11.51	0.70	31.87
PK	79.47M	22.66	40.00	-17.34	-19.24	3	Vertical	199	1.50	-	41.90	11.96	0.71	31.91
PK	625.58M	29.56	46.00	-16.44	-6.17	3	Vertical	59	1.00	-	35.73	24.13	2.00	32.30
PK	871.96M	28.67	46.00	-17.33	-4.61	3	Vertical	170	1.00	-	33.28	25.30	2.34	32.25
PK	954.41M	28.33	46.00	-17.67	-3.74	3	Vertical	54	1.50	-	32.07	25.83	2.60	32.17



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	30M	24.23	40.00	-15.77	-7.55	3	Horizontal	194	2.00	"Worst"	31.78	23.49	0.50	31.54
PK	84.32M	24.21	40.00	-15.79	-18.39	3	Horizontal	65	2.00	-	42.60	12.73	0.79	31.91
PK	88M	24.61	43.50	-18.89	-17.59	3	Horizontal	283	2.00	-	42.20	13.52	0.80	31.91
PK	624.61M	29.07	46.00	-16.93	-6.19	3	Horizontal	332	1.50	-	35.26	24.10	2.00	32.29
PK	947.62M	28.96	46.00	-17.04	-3.87	3	Horizontal	267	2.00	-	32.83	25.71	2.59	32.17
PK	955.38M	28.73	46.00	-17.27	-3.73	3	Horizontal	228	2.00	-	32.46	25.84	2.60	32.17

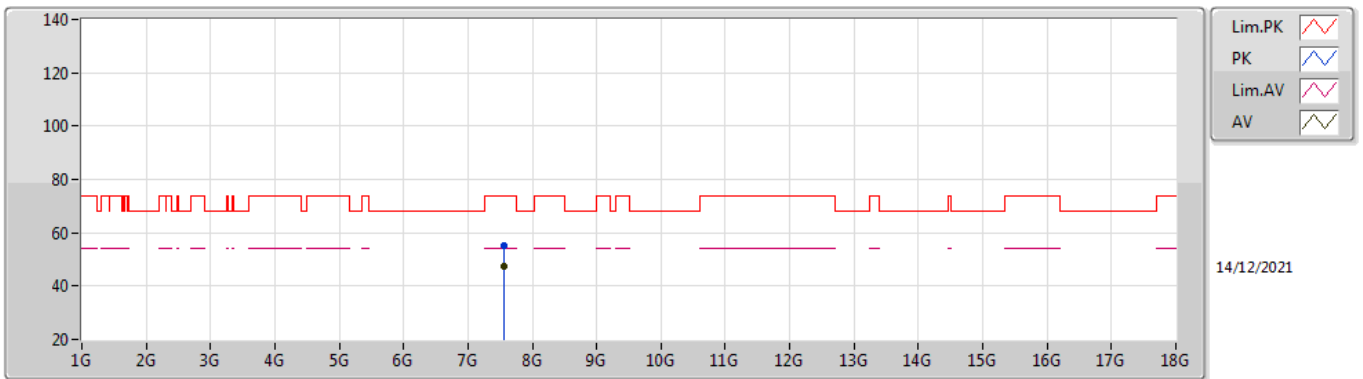


Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	58.32	Test Mode	Mode 1

Vertical

802.11ad

58320MHz_



EUT Y_1TX
Setting Default
05-M-E-2

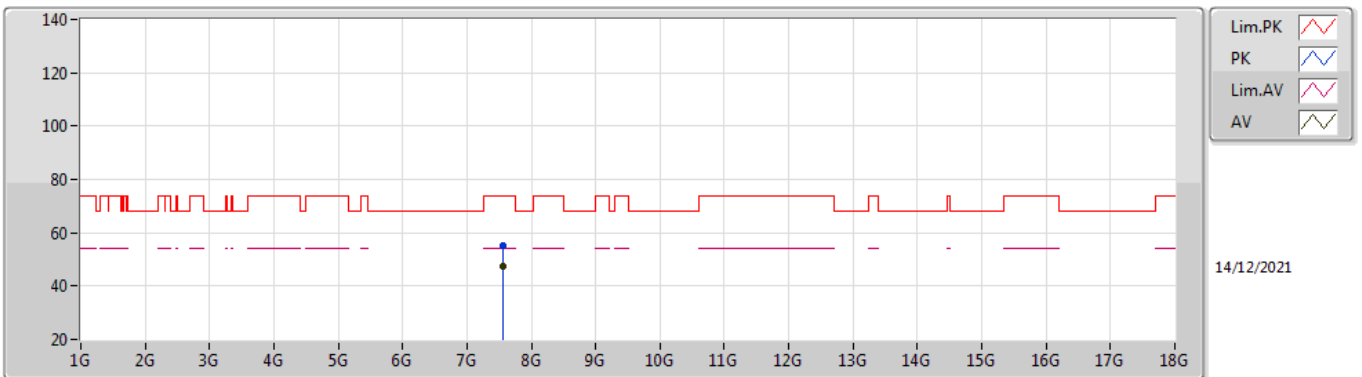
Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	7.55982G	55.01	74.00	-18.99	45.19	3	Vertical	278	1.32	-	36.68	7.60	34.46
AV	7.5575G	47.27	54.00	-6.73	37.44	3	Vertical	278	1.32	-	36.69	7.60	34.46



Horizontal

802.11ad

58320MHz_



EUT_Y_1TX
Setting Default
05-M-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	7.56125G	55.09	74.00	-18.91	45.27	3	Horizontal	0	1.06	-	36.68	7.60	34.46
AV	7.5575G	47.33	54.00	-6.67	37.50	3	Horizontal	0	1.06	-	36.69	7.60	34.46

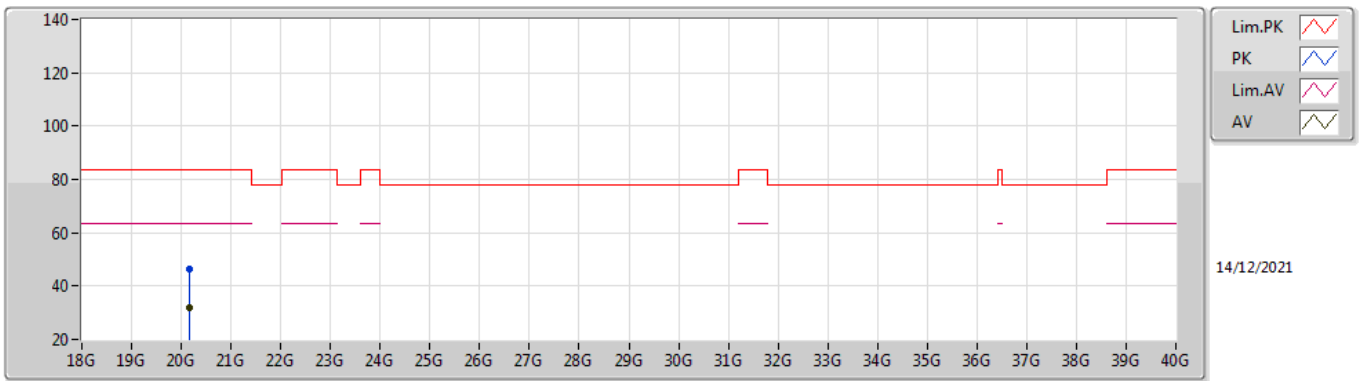


Test Range	18 GHz – 40 GHz	Test Distance	3 m
Test Freq. (GHz)	58.32	Test Mode	Mode 1

Vertical

802.11ad

58320MHz



EUT Y_1TX
 Setting Default
 05-M-E-2

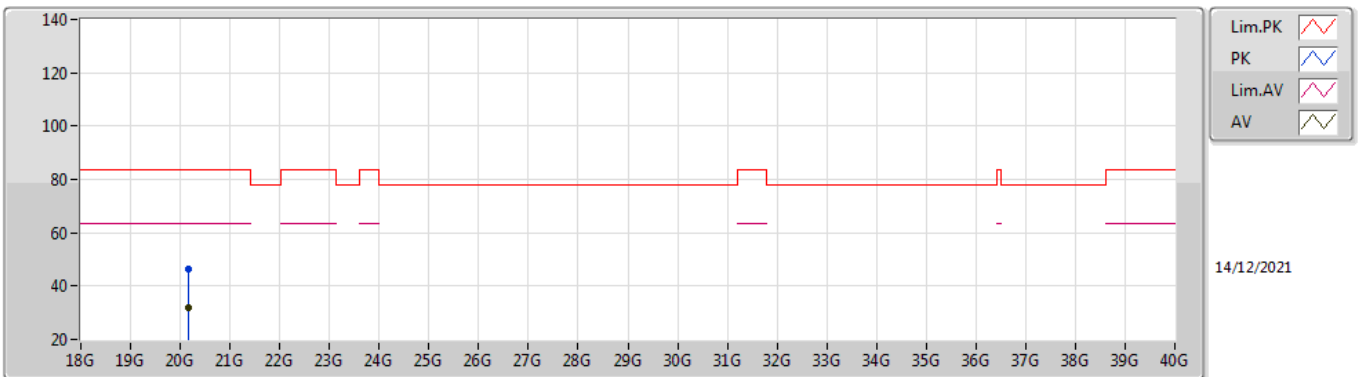
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.15829G	46.60	83.54	-36.94	44.71	1	Vertical	251	1.50	-	37.53	14.12	49.76
AV	20.1611G	31.66	63.54	-31.88	29.77	1	Vertical	251	1.50	-	37.53	14.12	49.76



Horizontal

802.11ad

58320MHz



EUT_Y_1TX
 Setting Default
 05-M-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.15892G	46.34	83.54	-37.20	44.45	1	Horizontal	31	1.50	-	37.53	14.12	49.76
AV	20.1611G	31.66	63.54	-31.88	29.77	1	Horizontal	31	1.50	-	37.53	14.12	49.76

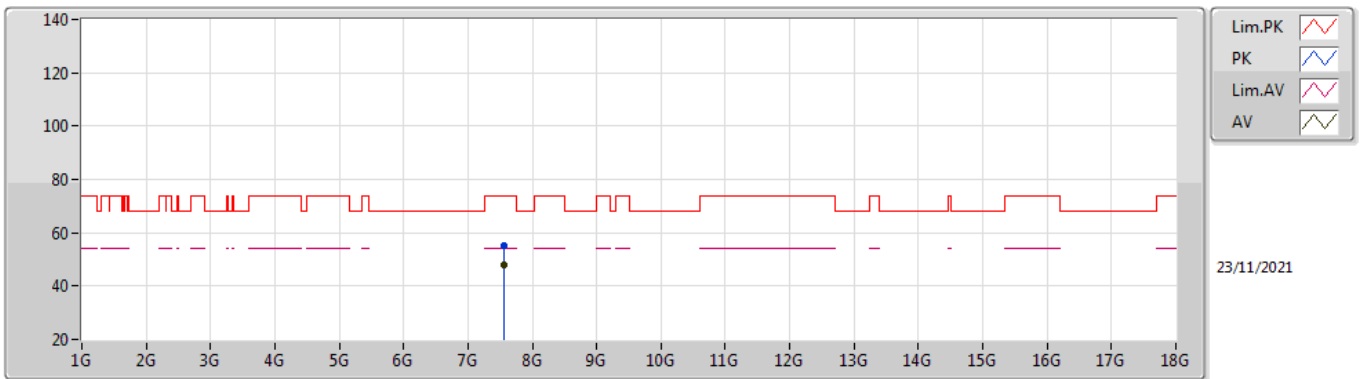


Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	60.48	Test Mode	Mode 1

Vertical

802.11ad

60480MHz



EUT Y_1TX
Setting Default
01-A-E-2

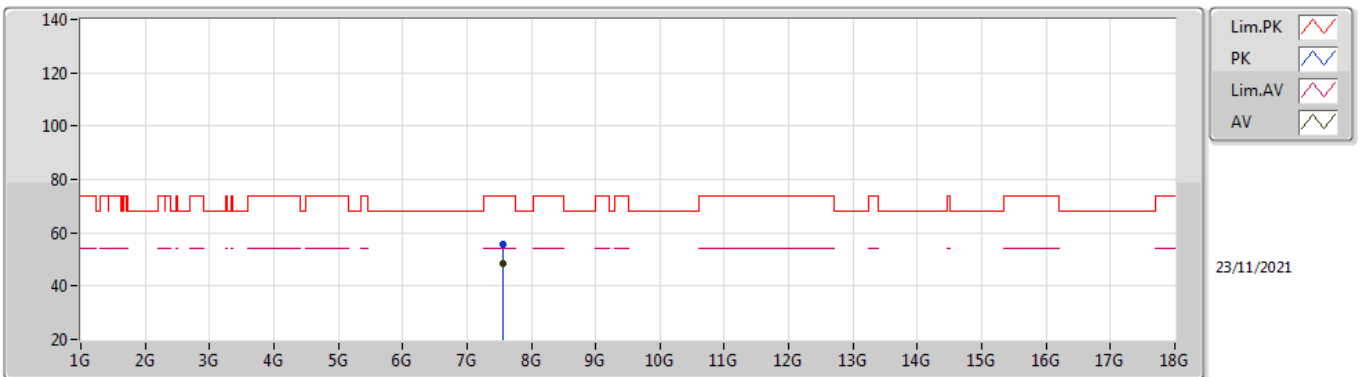
Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	7.56004G	55.14	74.00	-18.86	44.45	3	Vertical	206	1.17	-	36.40	7.32	33.03
AV	7.560G	47.84	54.00	-6.16	37.15	3	Vertical	206	1.17	-	36.40	7.32	33.03



Horizontal

802.11ad

60480MHz



EUT_Y_1TX
Setting Default
01-A-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	7.56014G	55.87	74.00	-18.13	45.18	3	Horizontal	326	1.33	-	36.40	7.32	33.03
AV	7.55998G	48.50	54.00	-5.50	37.81	3	Horizontal	326	1.33	-	36.40	7.32	33.03

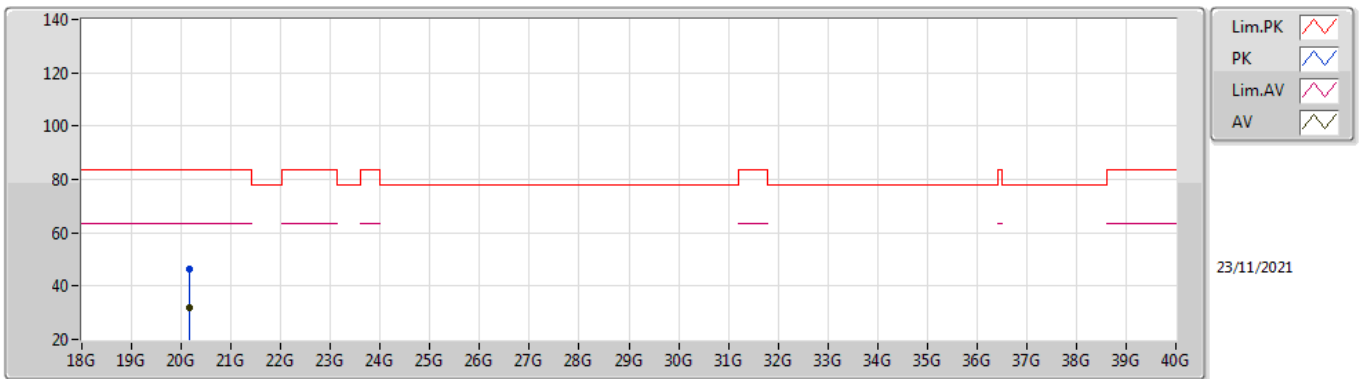


Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	60.48	Test Mode	Mode 1

Vertical

802.11ad

60480MHz



EUT Y_1TX
Setting Default
01-A-E-2

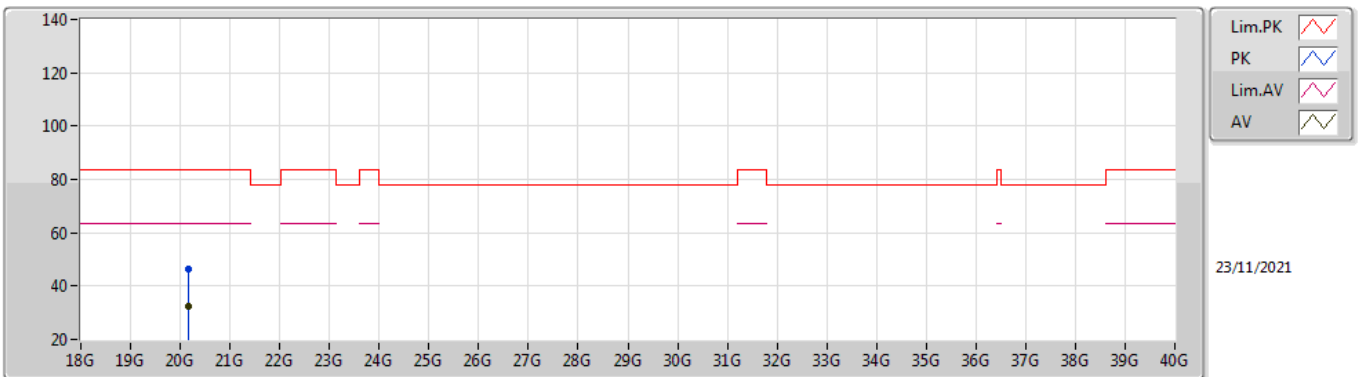
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.1602G	46.17	83.54	-37.37	44.28	1	Vertical	68.2	1.50	-	37.53	14.12	49.76
AV	20.15724G	32.04	63.54	-31.50	30.15	1	Vertical	68.2	1.50	-	37.53	14.12	49.76



Horizontal

802.11ad

60480MHz



EUT_Y_1TX
 Setting Default
 01-A-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.16332G	46.48	83.54	-37.06	44.60	1	Horizontal	333	1.50	-	37.53	14.12	49.77
AV	20.16016G	32.38	63.54	-31.16	30.49	1	Horizontal	333	1.50	-	37.53	14.12	49.76

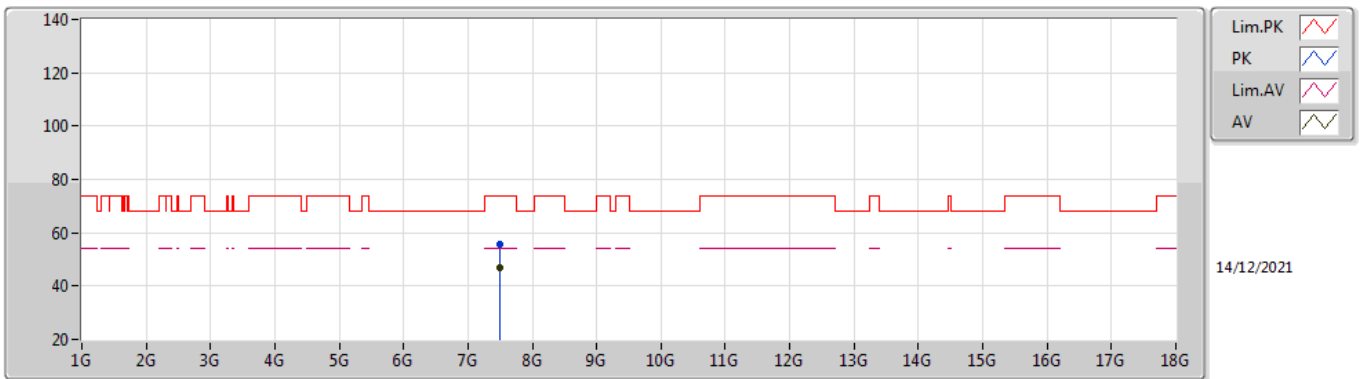


Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	62.64	Test Mode	Mode 1

Vertical

802.11ad

62640MHz



EUT Y_1TX
Setting Default
05-M-E-2

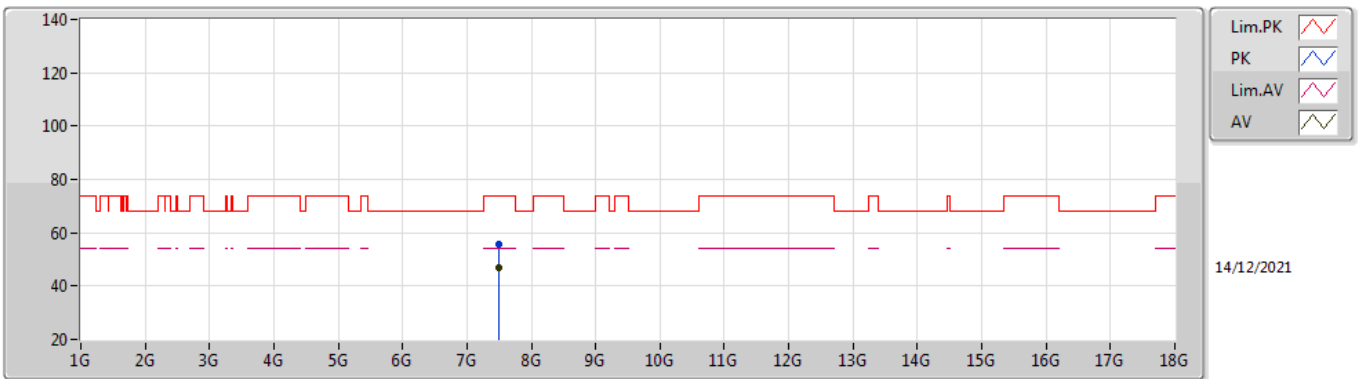
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	7.49946G	55.77	74.00	-18.23	45.92	3	Vertical	86	1.18	-	36.70	7.60	34.45
AV	7.4982G	47.14	54.00	-6.86	37.29	3	Vertical	86	1.18	-	36.70	7.60	34.45



Horizontal

802.11ad

62640MHz



EUT_Y_1TX
Setting Default
05-M-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	7.49906G	55.82	74.00	-18.18	45.97	3	Horizontal	197	1.92	-	36.70	7.60	34.45
AV	7.49844G	46.93	54.00	-7.07	37.08	3	Horizontal	197	1.92	-	36.70	7.60	34.45

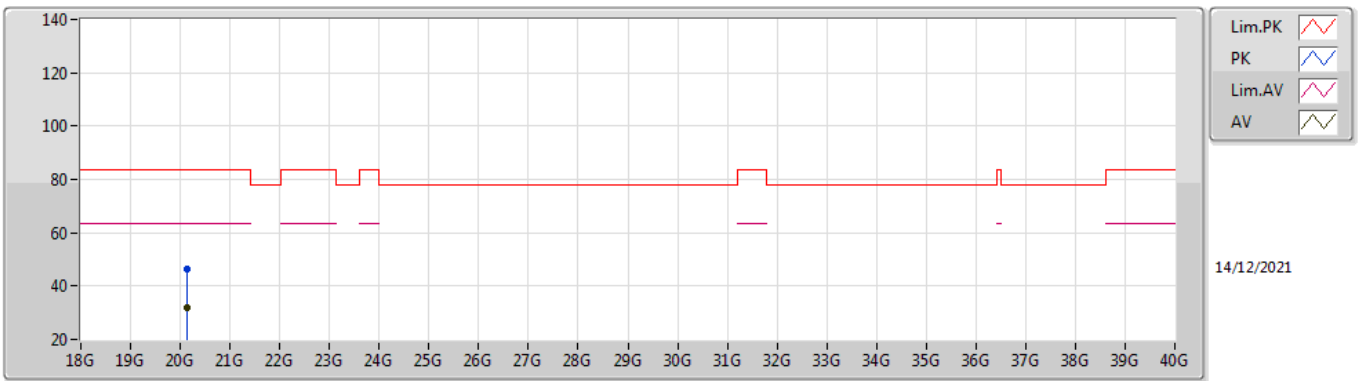


Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	62.64	Test Mode	Mode 1

Vertical

802.11ad

62640MHz



EUT Y_1TX
 Setting Default
 05-M-E-2

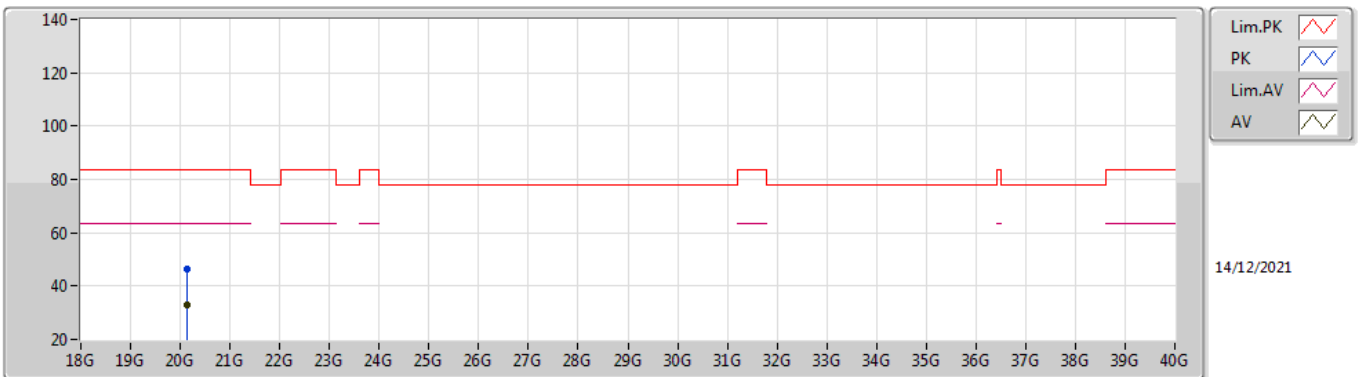
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.15G	46.34	83.54	-37.20	44.47	1	Vertical	77	1.50	-	37.52	14.11	49.76
AV	20.15G	31.75	63.54	-31.79	29.88	1	Vertical	77	1.50	-	37.52	14.11	49.76



Horizontal

802.11ad

62640MHz



EUT_Y_1TX
 Setting Default
 05-M-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.15G	46.39	83.54	-37.15	44.52	1	Horizontal	194	1.50	-	37.52	14.11	49.76
AV	20.15G	32.75	63.54	-30.79	30.88	1	Horizontal	194	1.50	-	37.52	14.11	49.76

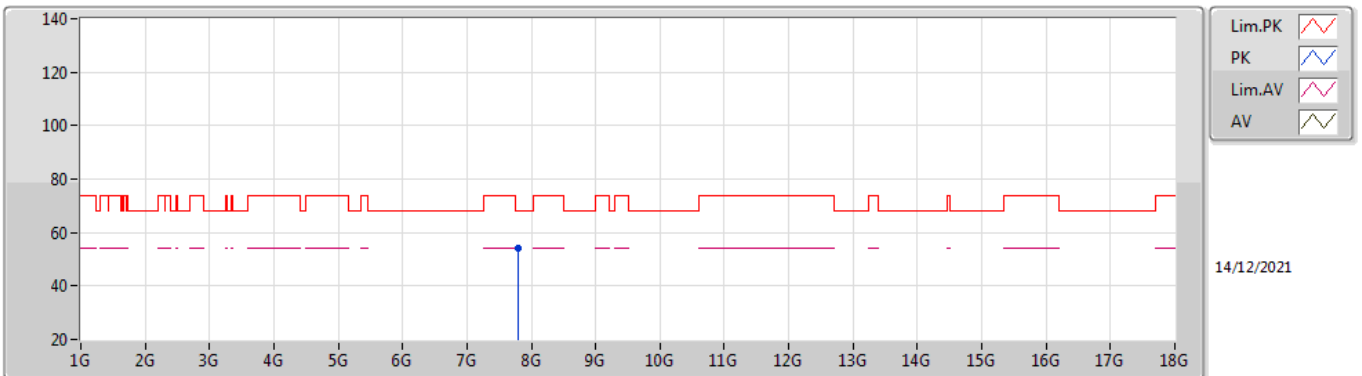


Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	58.32	Test Mode	Mode 2

Vertical

802.11ad

58320MHz



EUT_Y_1TX
Setting Default
05-M-E-2

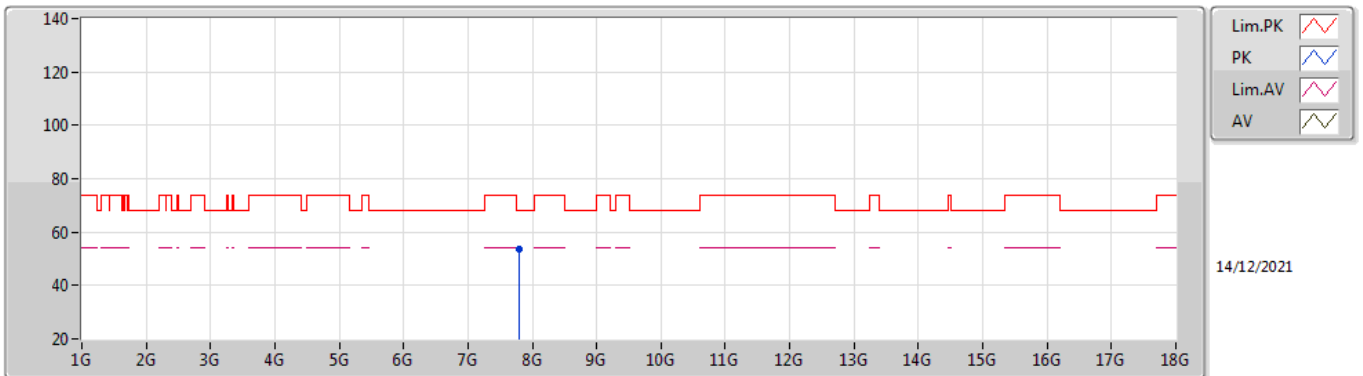
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	7.80219G	54.04	68.20	-14.16	44.32	3	Vertical	234	1.33	-	36.52	7.70	34.50



Horizontal

802.11ad

58320MHz



EUT_Y_1TX
Setting Default
05-M-E-2

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	7.79954G	53.71	68.20	-14.49	44.01	3	Horizontal	240	2.82	-	36.50	7.70	34.50

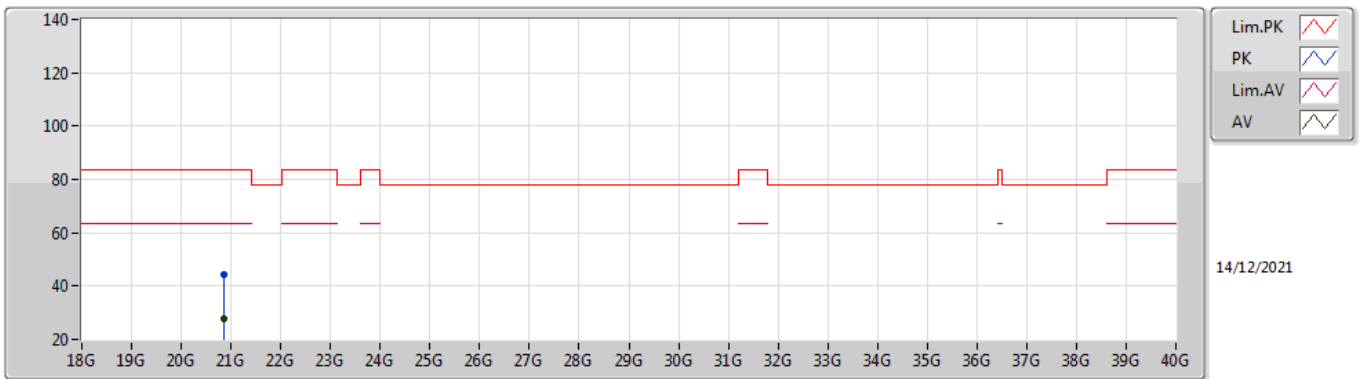


Test Range	18 GHz – 40 GHz	Test Distance	3 m
Test Freq. (GHz)	58.32	Test Mode	Mode 2

Vertical

802.11ad

58320MHz



EUT Y_1TX
 Setting Default
 05-M-E-2

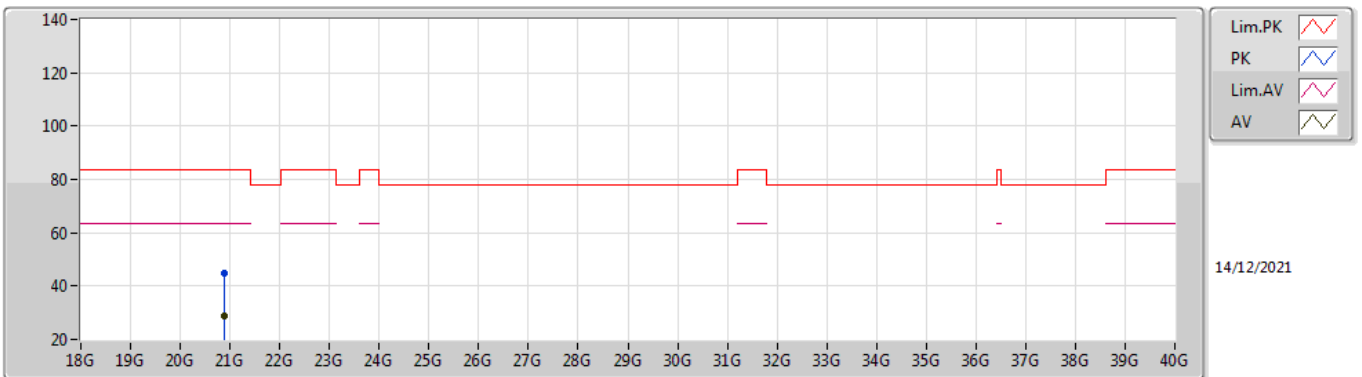
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.86664G	44.27	83.54	-39.27	41.56	1	Vertical	153	1.50	-	37.81	14.65	49.75
AV	20.86106G	27.89	63.54	-35.65	25.18	1	Vertical	153	1.50	-	37.82	14.65	49.76



Horizontal

802.11ad

58320MHz



EUT_Y_1TX
Setting Default
05-M-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.88404G	44.76	83.54	-38.78	42.06	1	Horizontal	210	1.50	-	37.79	14.66	49.75
AV	20.8799G	28.82	63.54	-34.72	26.12	1	Horizontal	210	1.50	-	37.79	14.66	49.75

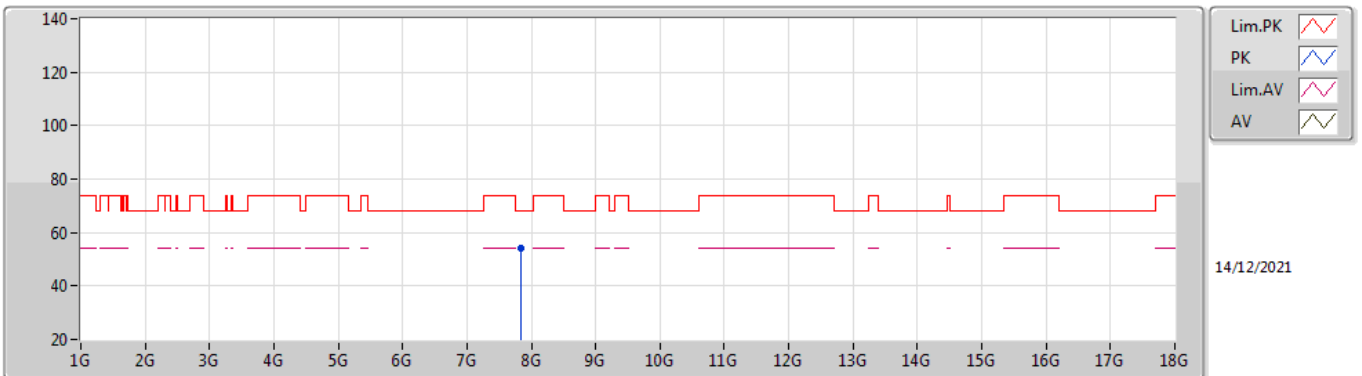


Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	60.48	Test Mode	Mode 2

Vertical

802.11ad

60480MHz



EUT_Y_1TX
Setting Default
05-M-E-2

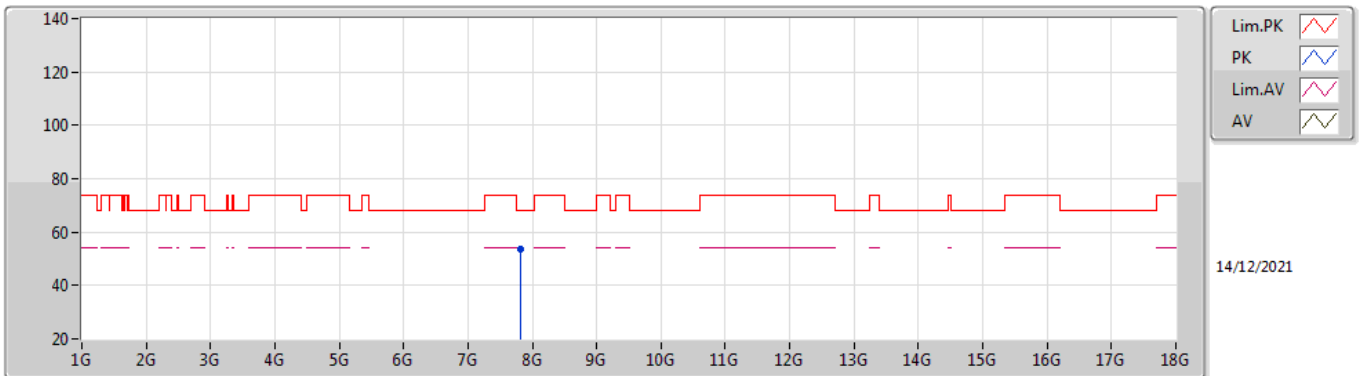
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	7.82998G	54.15	68.20	-14.05	44.20	3	Vertical	8	2.24	-	36.74	7.71	34.50



Horizontal

802.11ad

60480MHz



EUT Y_1TX
Setting Default
05-M-E-2

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	7.81702G	53.66	68.20	-14.54	43.81	3	Horizontal	360	1.43	-	36.64	7.71	34.50

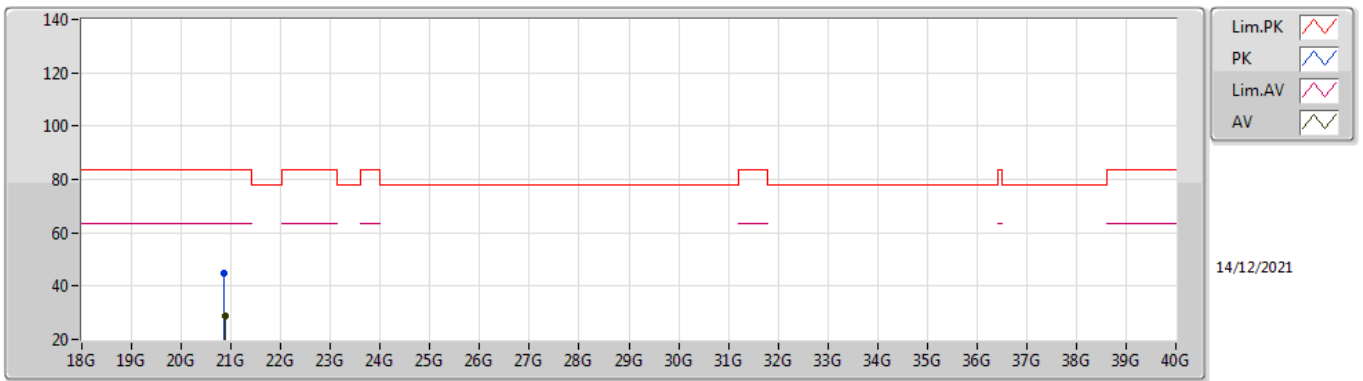


Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	60.48	Test Mode	Mode 2

Vertical

802.11ad

60480MHz



EUT Y_1TX
 Setting Default
 05-M-E-2

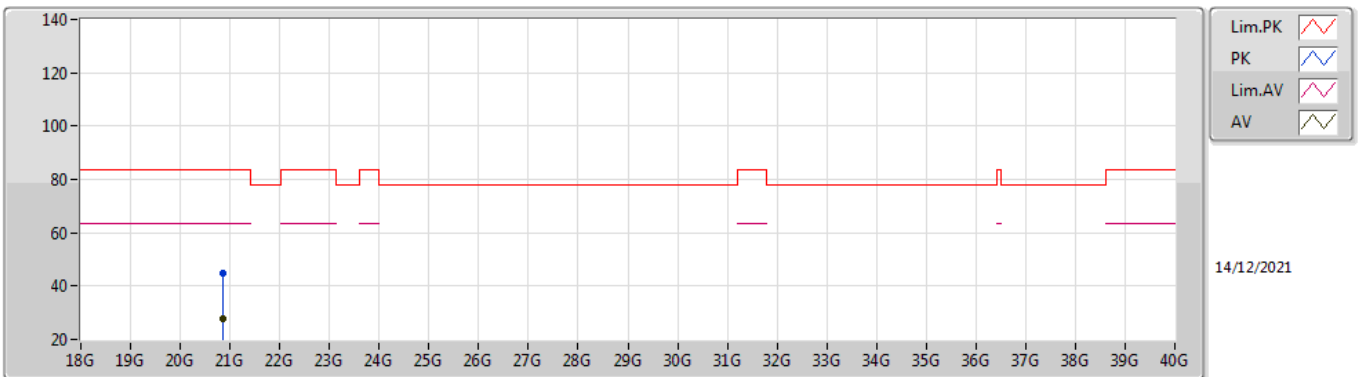
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.86058G	44.96	83.54	-38.58	42.25	1	Vertical	126	1.50	-	37.82	14.65	49.76
AV	20.88008G	28.82	63.54	-34.72	26.12	1	Vertical	126	1.50	-	37.79	14.66	49.75



Horizontal

802.11ad

60480MHz



EUT_Y_1TX
Setting Default
05-M-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.8604G	44.66	83.54	-38.88	41.95	1	Horizontal	297	1.50	-	37.82	14.65	49.76
AV	20.8631G	27.90	63.54	-35.64	25.18	1	Horizontal	297	1.50	-	37.82	14.65	49.75

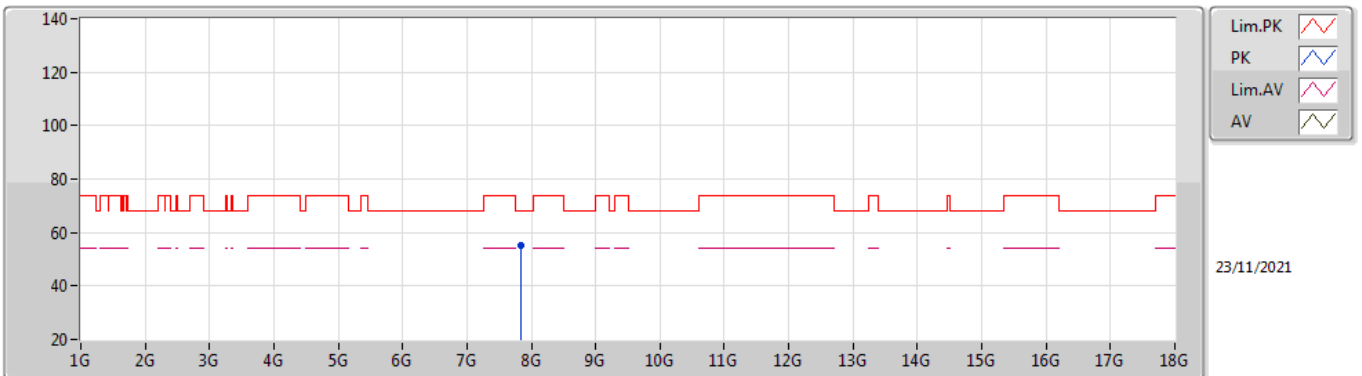


Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Freq. (GHz)	62.64	Test Mode	Mode 2

Vertical

802.11ad

62640MHz



EUT Y_1TX
Setting Default
01-A-E-2

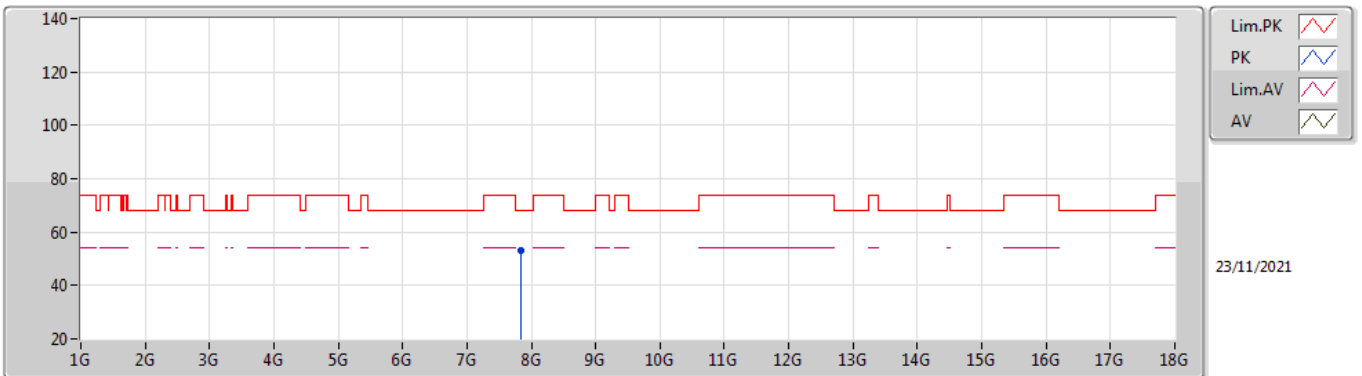
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	7.83012G	55.19	68.20	-13.01	44.36	3	Vertical	201	1.00	-	36.46	7.50	33.13



Horizontal

802.11ad

62640MHz



EUT Y_1TX
 Setting Default
 01-A-E-2

Type	Freq	Level	Limit	Margin	Raw	Dist	Condition	Azimuth	Height	Comment	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dBuV)	(m)		(°)	(m)		(dB)	(dB)	(dB)
PK	7.8302G	52.97	68.20	-15.23	42.14	3	Horizontal	43	2.29	-	36.46	7.50	33.13

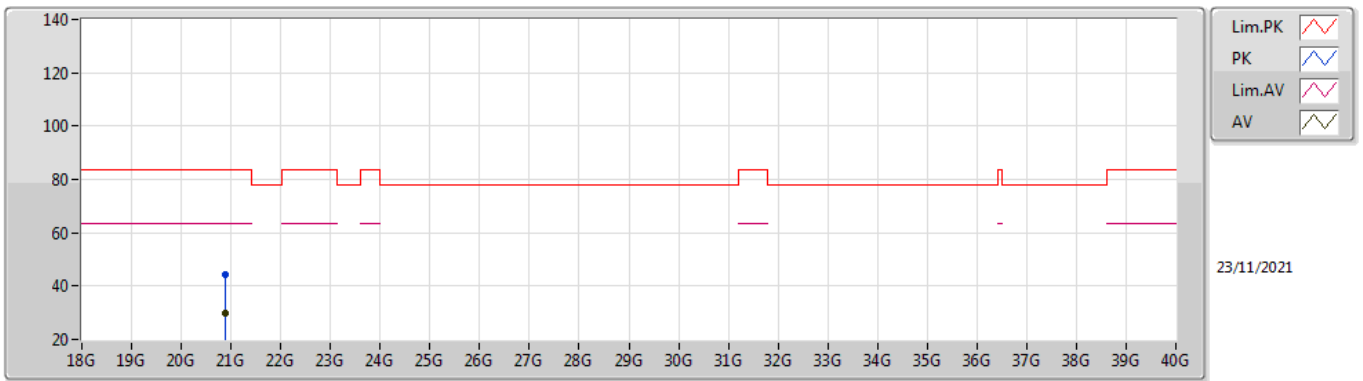


Test Range	18 GHz – 40 GHz	Test Distance	1 m
Test Freq. (GHz)	62.64	Test Mode	Mode 2

Vertical

802.11ad

62640MHz



EUT Y_1TX
Setting Default
01-A-E-2

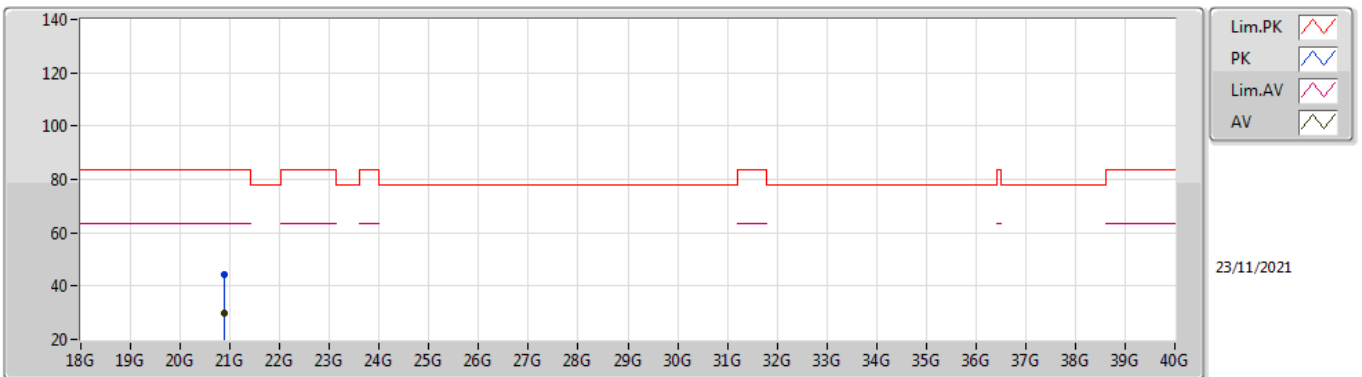
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.87552G	44.14	83.54	-39.40	41.43	1	Vertical	242	1.50	-	37.80	14.66	49.75
AV	20.87886G	29.90	63.54	-33.64	27.20	1	Vertical	244	1.50	-	37.79	14.66	49.75



Horizontal

802.11ad

62640MHz



EUT_Y_1TX
Setting Default
01-A-E-2

Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Raw (dBuV)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	AF (dB)	CL (dB)	PA (dB)
PK	20.87922G	44.17	83.54	-39.37	41.47	1	Horizontal	139	1.50	-	37.79	14.66	49.75
AV	20.8761G	29.85	63.54	-33.69	27.14	1	Horizontal	139	1.50	-	37.80	14.66	49.75



Test Range	40GHz – 200GHz
-------------------	----------------

For mode 1

Test Plan: Channel 1

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
58.32	23.6	5.00	56.79	-85.63
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-27.72	3	1.4936	90.00	PASS

Test Plan: Channel 2

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
60.48	23.6	5.00	56.63	-90.69
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-32.81	3	0.4632	90.00	PASS

Test Plan: Channel 3

Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
62.64	23.6	5.00	56.70	-83.04
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm ²)	Limit (pW/cm ²)	Test Result
-25.15	3	2.7030	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.	

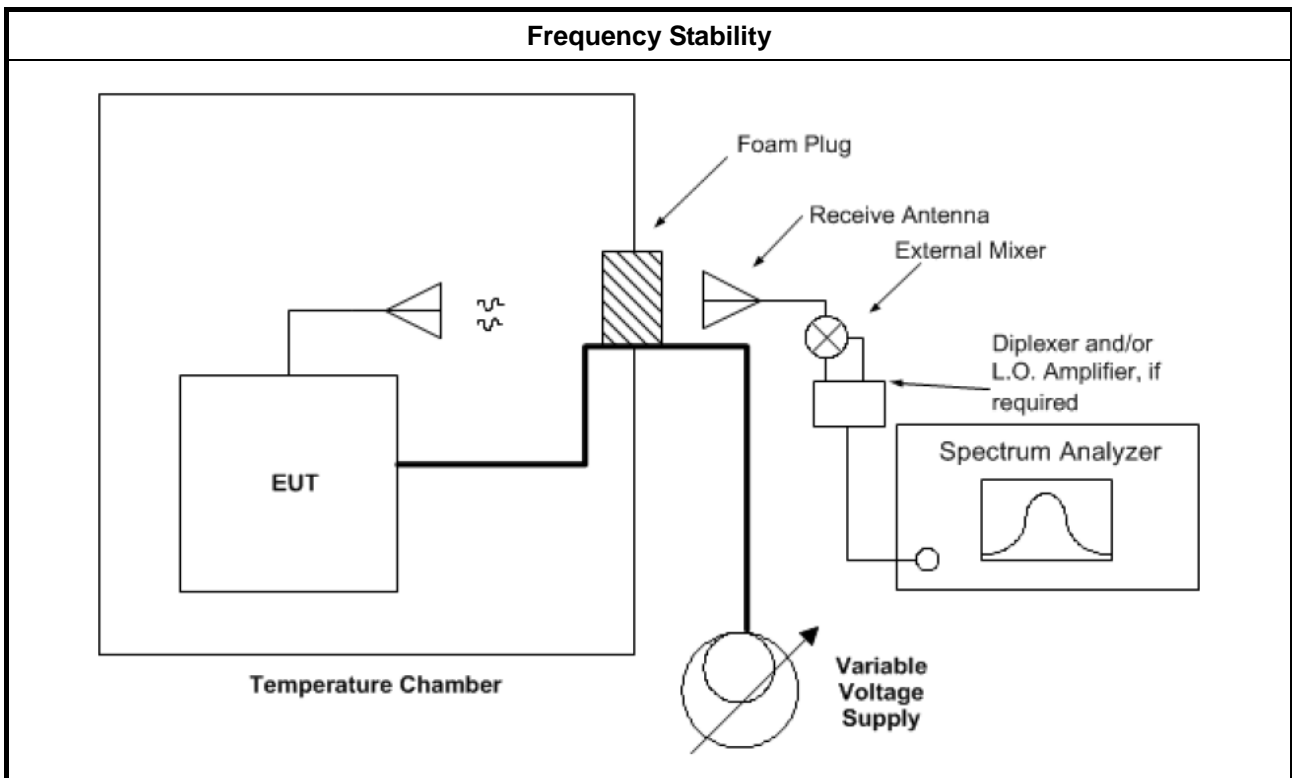
3.6.2 Measuring Instruments

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

For mode 1

Frequency Stability with Respect to Ambient Temperature			
Test Results			
Test Temperature (°C)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (±kHz)
-30	60476.24	-110	Within band
-20	60476.35	0	Within band
-10	60476.24	-110	Within band
0	60477.52	1170	Within band
10	60477.52	1170	Within band
20	60476.35	Reference	Within band
30	60477.82	1470	Within band
40	60477.82	1470	Within band
50	60476.35	0	Within band
NOTE: The manufacturer's specified temperature range of -30 to 50°C.			



3.6.5.2 Frequency Stability When Varying Supply Voltage

For mode 1

Frequency Stability When Varying Supply Voltage			
Test Results			
Test Voltage: (Vdc)	Measured Frequency (MHz)	Delta Frequency (kHz)	Limit (\pm kHz)
93.5	60477.52	1170	within band
110	60476.35	Reference	within band
126.5	60477.82	1470	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	Dec. 04, 2020	Dec. 03, 2021	Conduction (CO02-CB)
LISN	Schwarzbeck	NSLK 8127	8127478	9kHz ~ 30MHz	Nov. 20, 2020	Nov. 19, 2021	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. 20, 2020	Oct. 19, 2021	Conduction (CO02-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO02-CB)
Pulse Limiter	Schwarzbeck	VTSD 9561F-N	00378	9kHz ~ 30MHz	Mar. 18, 2021	Mar. 17, 2022	Conduction (CO02-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 14, 2021	Apr. 13, 2022	Radiation (03CH01-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH01-CB	30 MHz ~ 1 GHz	Jan. 26, 2021	Jan. 25, 2022	Radiation (03CH01-CB)
3m Semi Anechoic Chamber VSWR	TDK	SAC-3M	03CH01-CB	1GHz ~18GHz 3m	May 07, 2021	May 06, 2022	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Feb. 22, 2021	Feb. 21, 2022	Radiation (03CH01-CB)
Horn Antenna	ETS-LINDG REN	3115	00075790	750MHz~18GHz	Nov. 06, 2020	Nov. 05, 2021	Radiation (03CH01-CB)
Horn Antenna	SCHWARZB ECK	BBHA 9120 D	BBHA 9120 D 1370	1GHz~18GHz	Sep. 14, 2021	Sep. 13, 2022	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Aug. 05, 2021	Aug. 04, 2022	Radiation (03CH01-CB)
Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	Jul. 02, 2021	Jul. 01, 2022	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02121	1GHz ~ 26.5GHz	May 20, 2021	May 19, 2022	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-H G	1864479	18GHz ~ 40GHz	Jul. 13, 2021	Jul. 12, 2022	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	May 03, 2021	May 02, 2022	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH01-CB)
RF Cable-low	Woken	RG402	Low Cable-16+17	30 MHz ~ 1 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH01-CB)
RF Cable-high	Woken	RG402	High Cable-16	1 GHz ~ 18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH01-CB)



Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
RF Cable-high	Woken	RG402	High Cable-16+17	1 GHz ~ 18 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (03CH01-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH01-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (03CH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH01-CB)
Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Nov. 02, 2020*	Nov. 01, 2022*	Radiation (03CH01-CB)
Mixer	OML	M15HWA	V91113-1	50 ~ 75 GHz	Nov. 13, 2020*	Nov. 12, 2022*	Radiation (03CH01-CB)
Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Nov. 14, 2020*	Nov. 13, 2022*	Radiation (03CH01-CB)
Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Nov. 02, 2020*	Nov. 01, 2022*	Radiation (03CH01-CB)
Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Nov. 02, 2020*	Nov. 01, 2022*	Radiation (03CH01-CB)
Detector	Millitech	DET-15-RPFW 0	#A18185(074)	50 ~ 75 GHz	Apr. 02, 2020*	Apr. 01, 2022*	Radiation (03CH01-CB)
PC Oscilloscope	PICO TECH	6402C	CX372/002	N/A	Jul. 08, 2021	Jul. 07, 2022	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M15RH	V91113-A	50 ~ 75 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Standard Horn Antenna	Custom Microwave	M05RH	G91113-A	140 ~ 220 GHz	N.C.R	N.C.R	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV40	101028	9kHz~40GHz	Dec. 31, 2020	Dec. 30, 2021	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	High Cable-06	1 GHz~26.5 GHz	Oct. 04, 2021	Oct. 03, 2022	Radiation (TH03-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (TH03-CB)

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

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

*Calibration Interval of instruments listed above is two year.



5 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 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)	4.2 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	5.1 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	4.2 dB	Confidence levels of 95%
Temperature	1.7°C	Confidence levels of 95%