

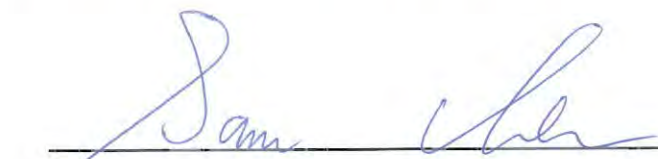


NCC RADIO TEST REPORT

Equipment : Vayyar Home
Brand Name : Vayyar
Model Name : Vayyar Home
Applicant : Vayyar Imaging Ltd.
26 Shabazi St., Yehud 5610103, Israel
Manufacturer : Vayyar Imaging Ltd.
26 Shabazi St., Yehud 5610103, Israel
Standard : NCC LP0002 (Jan. 10, 2018) Section 3.13

The product was received on Jul. 23, 2020, and testing was started from Aug. 19, 2020 and completed on Aug. 25, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 NCC LP0002 (Jan. 10, 2018) Section 3.13 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. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.


Approved by: Sam Chen

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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Appendix A. Test Photos

Photographs of EUT v01



TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A9_1 Ver1.2



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	LP0002 2.3	AC Power Conducted Emissions	PASS	-
3.2	LP0002 3.13.1.3(3)	Occupied Bandwidth	PASS	-
3.3	LP0002 3.13.1.1(3)	EIRP Power	PASS	-
3.4	LP0002 3.13.1.3	Peak Conducted Power	PASS	-
3.5	LP0002 3.13.1.2	Transmitter Spurious Emissions	PASS	-
3.6	LP0002 3.13.1.4	Frequency Stability	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: Wendy Pan



1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information			
Frequency Range (GHz)	Operating Frequency Range (GHz)	Test Frequency (GHz)	Modulation
57-66	62~63.1	62.55	Stepped-Frequency Continuous-Wave

1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	Vayyar	N/A	PCB-embedded antenna	N/A	16.5 (5.7 dBi + 10*log ₁₀ (12))

Note: The above information was declared by manufacturer.

**1.1.3 Power Levels**

Worst Power Levels	
Applicable power levels	☐ Conducted ☒ EIRP
Frequency (GHz)	Highest (P_{high}):
	Peak Power (dBm)
62.55	6.31

1.1.4 Operating Conditions

Operating Conditions	
☐ -20 °C to +50 °C	
☒ 0 °C to +40 °C	
☐ Other:	
EUT Power Type	From adapter or host system
Supply Voltage	☒ AC State AC voltage 110 V
Supply Voltage	☐ DC State DC voltage V

1.1.5 Equipment Use Condition

Equipment Use Condition
☐ Fixed field disturbance sensors at 61-61.5GHz
☒ Except fixed field disturbance sensors at 61-61.5GHz
☐ Except fixed field disturbance sensors

1.1.6 Duty Cycle

Duty Cycle	Duty Cycle Factor (dB)
19.425	7.12



1.2 Applicable Standards

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

- ♦ NCC LP0002 (Jan. 10, 2018) Section 3.13
- ♦ 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				
☐	HWA YA	ADD : No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)		
		TEL : 886-3-327-3456	FAX : 886-3-327-0973	
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.		
		TEL : 886-3-656-9065	FAX : 886-3-656-9085	

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO01-CB	Wei Li	24~25°C / 62~64%	Aug. 21, 2020
Radiated Intentional – CTX	03CH05-CB	Eason Chen	23.5-25.3°C / 53-57%	Aug. 19, 2020 ~ Aug. 25, 2020
Radiated Unintentional – CRX	03CH05-CB	Lucke Hsieh	23.5-25.3°C / 53-57%	Aug. 20, 2020
RF Radiated	TH03-CB	Eddie Weng	23.2-23.5°C / 57-60%	Aug. 20, 2020

Test site Designation No. TW0006 with FCC.

Test site registered number IC 4086D with Industry Canada.

2 Test Configuration of Equipment under Test

2.1 Parameters of Test Software Setting

Test Software Version	Xshell-6.0.0189p.exe
Channel Plan (GHz)	62.55
Setting	Default

2.2 Conformance Tests and Related Test Frequencies

Test Item	Test Frequencies (GHz)
AC Power Conducted Emissions	62.55
Occupied Bandwidth	62.55
EIRP Power	62.55
Peak Conducted Power	62.55
Transmitter Spurious Emissions (below 1 GHz)	62.55
Transmitter Spurious Emissions (1 GHz-40 GHz)	62.55
Transmitter Spurious Emissions (above 40 GHz)	62.55
Frequency Stability	62.55

Tests Item	AC Power Conducted Emissions
Operating Mode	Intentional – CTX
1	EUT with adapter
2	EUT with host system
For operating mode 1 is the worst case and it was record in this test report.	
Operating Mode	Unintentional – CRX
The EUT has two power supply one is adapter other is host system. EUT with adapter has been evaluated to be the worst case. Consequently, measurement for AC Power Conducted Emissions Unintentional – CRX test will follow this same test mode.	
1	EUT with adapter

Tests Item	Transmitter Spurious Emissions
Operating Mode <1GHz	Intentional – CTX
	The EUT was performed at Y axis, X axis and Z axis position for Transmitter Spurious Emissions Intentional above 1GHz test, and the worst case was found at X axis. So the measurement will follow this same test configuration.
1	EUT in X axis with adapter
2	EUT in X axis with host system
For operating mode 1 is the worst case and it was record in this test report.	
Operating Mode <1GHz	Unintentional – CRX
	Mode 1 generated the worst test result for Transmitter Spurious Emissions Intentional below 1 GHz test, thus the measurement for Transmitter Spurious Emissions Unintentional below 1 GHz test will follow this same test configuration.
1	EUT in X axis with adapter
Operating Mode >1GHz	Unintentional – CRX
	Mode 1 generated the worst test result for Transmitter Spurious Emissions Unintentional below 1 GHz test, thus the measurement for Transmitter Spurious Emissions Unintentional 1GHz~5th Harmonic test will follow this same test configuration.
1	EUT in X axis
Operating Mode >1GHz	Intentional – CTX
1	EUT in Y axis
2	EUT in X axis
3	EUT in Z axis
Mode 2 has been evaluated to be the worst case after evaluating. Consequently, measurement will follow this same test mode.	

2.3 EUT Operation during Test

During the test, executed the test program to control the EUT continuously transmit/receive RF signal.

2.4 Accessories

Accessories			
Equipment Name	Brand Name	Model Name	Rating
Adapter	RUIDIR	RD0502000-USBA-87MG	Input: 100-240V~50/60Hz, 300mA Output: 5V, 2000mA

2.5 Support Equipment

For AC Power Conducted Emissions test:

Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
A	Fixture	XAVi	V0.1-200515	N/A	Provided by applicant
B	NB	DELL	E6430	N/A	Provided by Lab
C	Earphone	e-Power	S90W	N/A	Provided by Lab
D	Mouse	Logitech	M-U0026	N/A	Provided by Lab

For others test:

Support Equipment					
No.	Equipment	Brand Name	Model Name	FCC ID	Remark
A	Notebook	DELL	E4300	N/A	Provided by Lab
B	Fixture	XAVi	V0.1-200515	N/A	Provided by applicant



2.6 Far Field Boundary Calculations

The far-field boundary is given as:

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

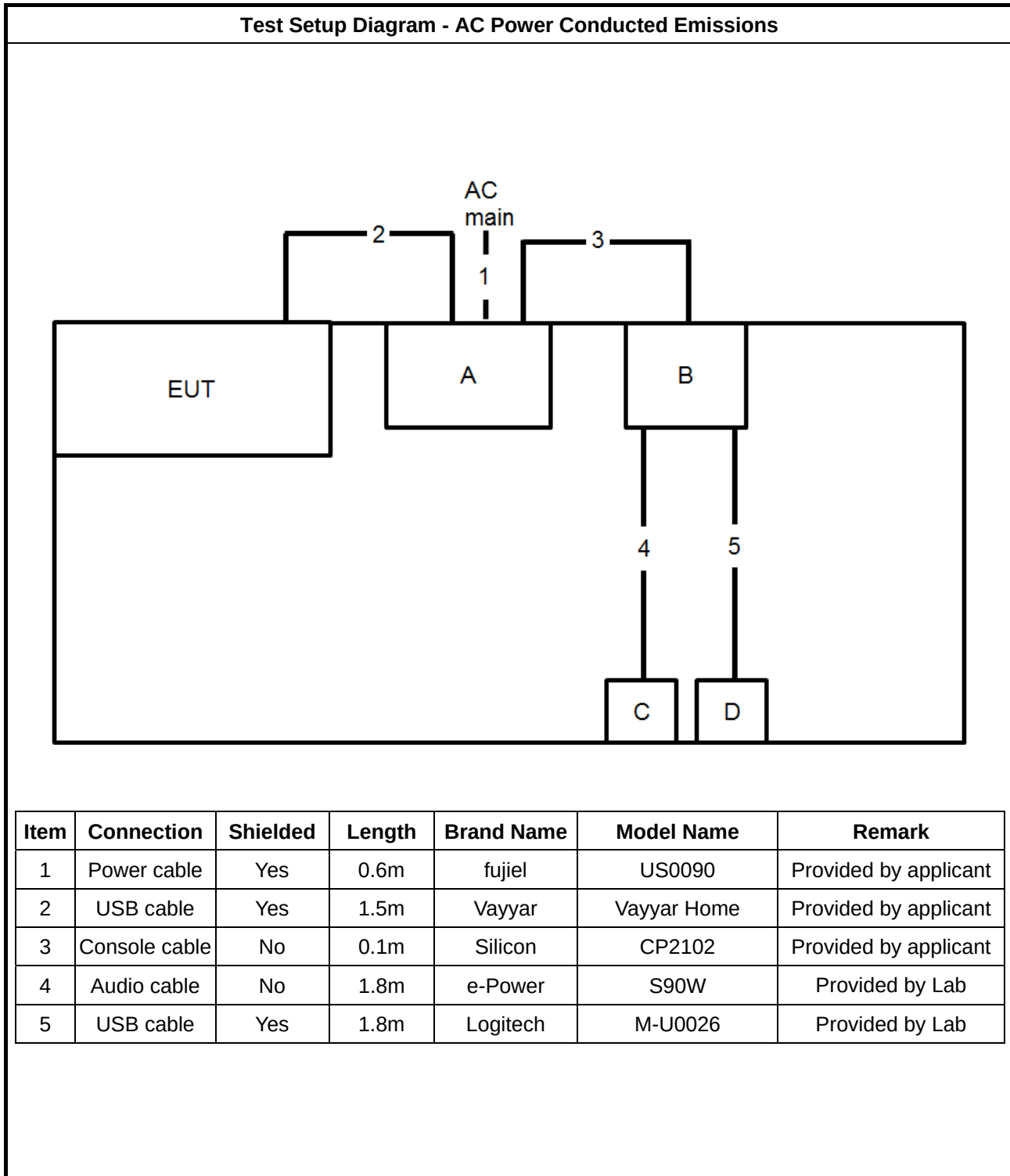
where:

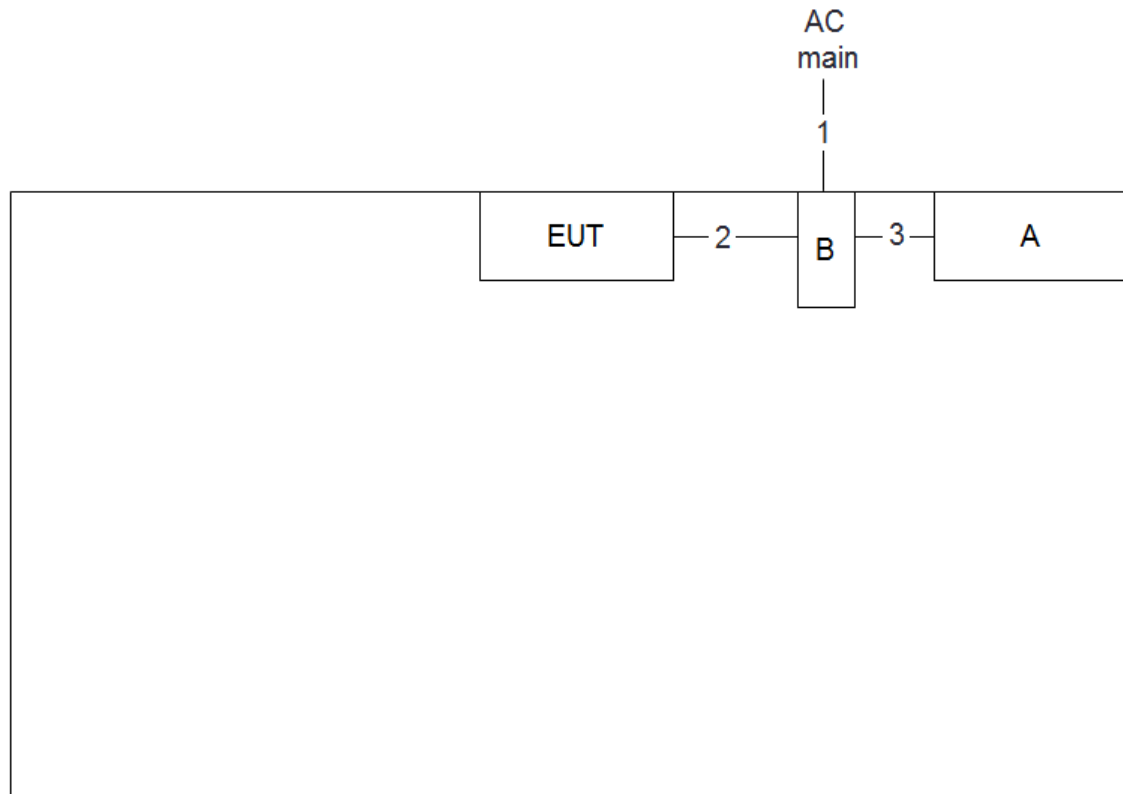
L = Largest Antenna Dimension, including the reflector, in meters

λ = wavelength in meters

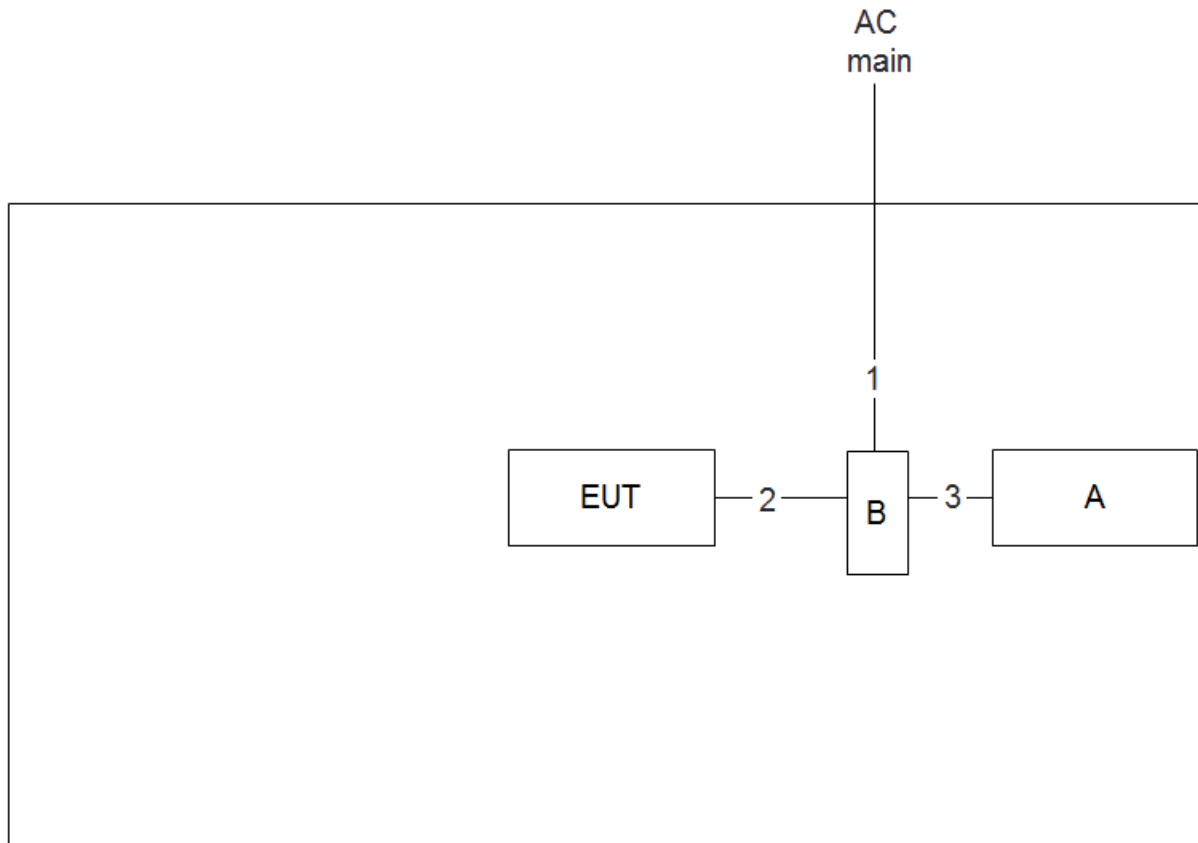
Far Field (m)				
Frequency (GHz)	L (m)	Lambda (m)	d(Far Field) (m)	d(Far Field) (cm)
62.55	0.047	0.0047544	0.929	92.93

2.7 Test Setup Diagram



Test Setup Diagram - Transmitter Spurious Emissions Unintentional – CRX


Item	Connection	Shielded	Length	Brand Name	Model Name	Remark
1	Power cable	Yes	0.6m	fujiei	US0090	Provided by applicant
2	USB cable	Yes	1.5m	Vayyar	Vayyar Home	Provided by applicant
3	Console cable	No	0.1m	Silicon	CP2102	Provided by applicant

Test Setup Diagram - Transmitter Spurious Emissions Intentional – CTX


Item	Connection	Shielded	Length	Brand Name	Model Name	Remark
1	Power cable	Yes	0.6m	fujiei	US0090	Provided by applicant
2	USB cable	Yes	1.5m	Vayyar	Vayyar Home	Provided by applicant
3	Console cable	No	0.1m	Silicon	CP2102	Provided by applicant



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.		

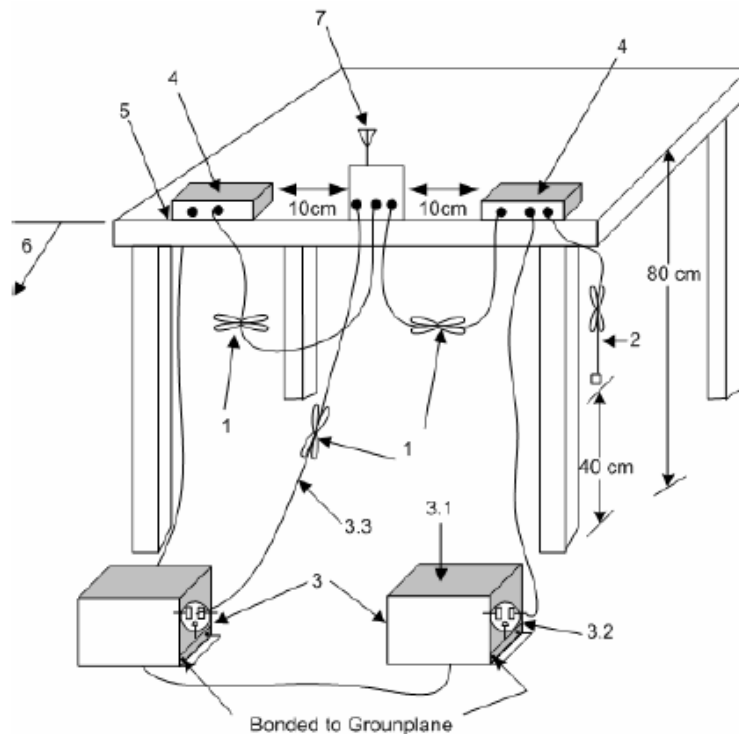
3.1.2 Measuring Instruments

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



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.

2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.

3.1—All other equipment powered from additional LISN(s).

3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.

3.3—LISN at least 80 cm from nearest part of EUT chassis.

4—Non-EUT components of EUT system being tested.

5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.

6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

3.1.5 Measurement Results Calculation

The measured Level is calculated using:

- a. $\text{Corrected Reading (dBuV)} = \text{LISN Factor} + \text{Cable Loss} + \text{Read Level} = \text{Level}$
- b. $\text{Margin} = -\text{Limit} + (\text{Read Level} + \text{LISN Factor} + \text{Cable Loss})$

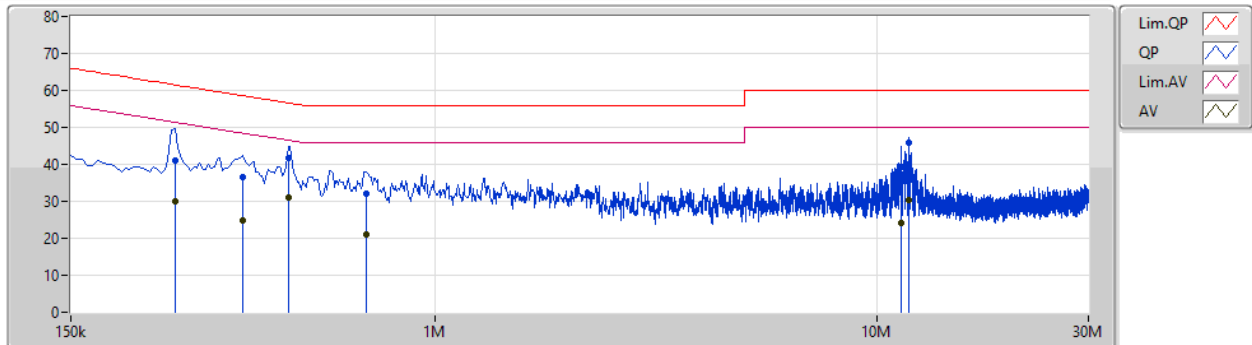


3.1.6 Test Result of AC Power Conducted Emissions

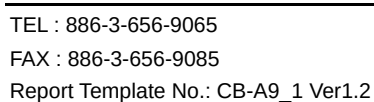
Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.2.3
NOTE 1: If equipment having different channel plan and nominal channel bandwidth modes (see test report clause 1.1.1), the measurements are uninfluenced by different channel plan and nominal channel bandwidth modes, 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. 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.	

Phase	Line	Configuration	Intentional – CTX
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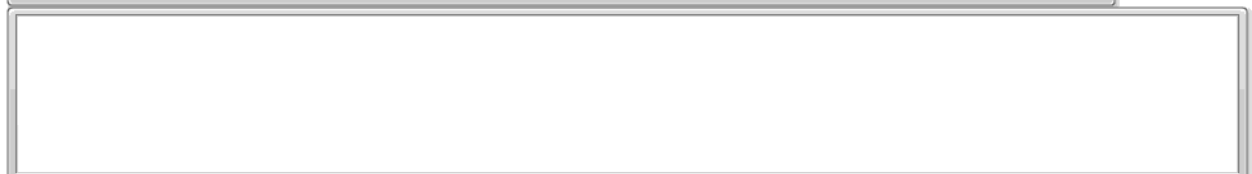
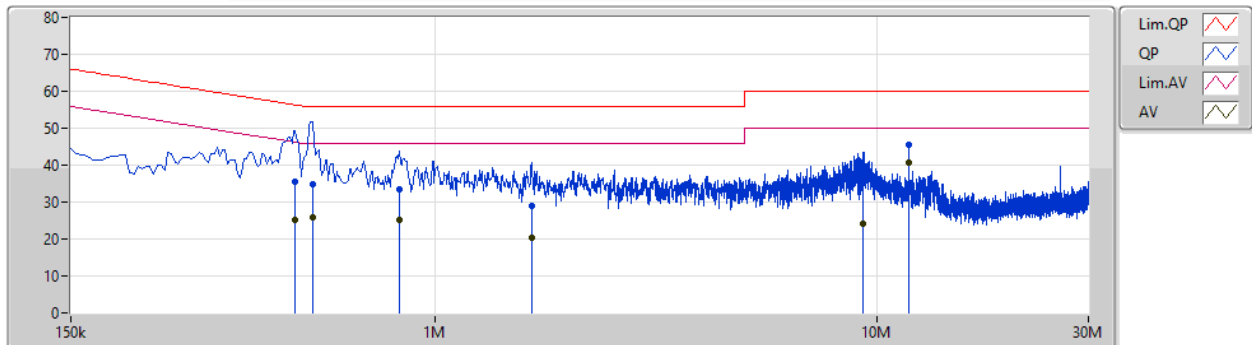
Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	AF (dB)	CL (dB)	AT (dB)			
QP	258k	41.16	61.49	-20.33	9.87	Line	-	31.29	0.04	0.03	9.80			
AV	258k	30.14	51.49	-21.35	9.87	Line	-	20.27	0.04	0.03	9.80			
QP	366k	36.58	58.60	-22.02	9.88	Line	-	26.70	0.04	0.03	9.81			
AV	366k	24.86	48.60	-23.74	9.88	Line	-	14.98	0.04	0.03	9.81			
QP	465k	41.72	56.61	-14.89	9.88	Line	-	31.84	0.04	0.03	9.81			
AV	465k	31.01	46.61	-15.60	9.88	Line	-	21.13	0.04	0.03	9.81			
QP	699k	32.18	56.00	-23.82	9.91	Line	-	22.27	0.05	0.04	9.82			
AV	699k	21.14	46.00	-24.86	9.91	Line	-	11.23	0.05	0.04	9.82			
QP	11.297M	39.34	60.00	-20.66	10.27	Line	-	29.07	0.18	0.17	9.92			
AV	11.297M	24.08	50.00	-25.92	10.27	Line	-	13.81	0.18	0.17	9.92			
QP	11.792M	45.92	60.00	-14.08	10.29	Line	"Worst"	35.63	0.19	0.18	9.92			
AV	11.792M	30.48	50.00	-19.52	10.29	Line	-	20.19	0.19	0.18	9.92			





Phase	Line	Configuration	Unintentional – CRX
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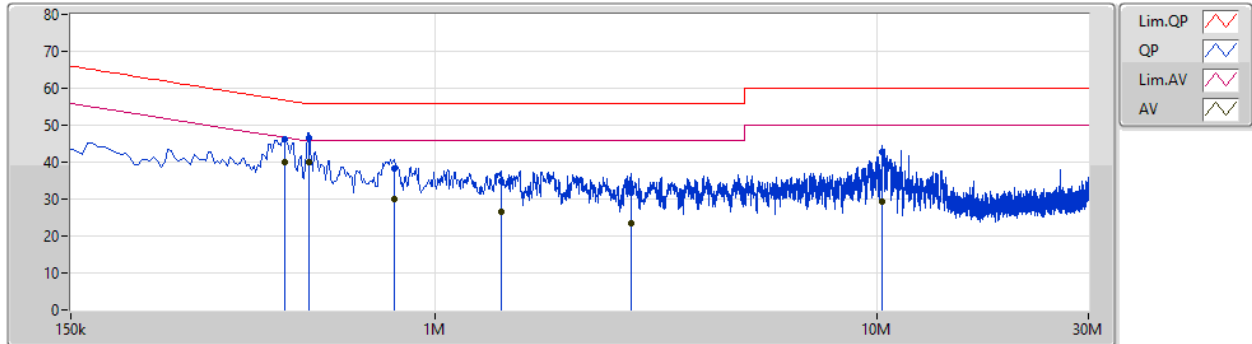


Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	AF (dB)	CL (dB)	AT (dB)			
QP	483k	35.39	56.29	-20.90	9.88	Line	-	25.51	0.04	0.03	9.81			
AV	483k	25.26	46.29	-21.03	9.88	Line	-	15.38	0.04	0.03	9.81			
QP	528k	34.92	56.00	-21.08	9.88	Line	-	25.04	0.04	0.03	9.81			
AV	528k	26.01	46.00	-19.99	9.88	Line	-	16.13	0.04	0.03	9.81			
QP	829.5k	33.61	56.00	-22.39	9.91	Line	-	23.70	0.05	0.04	9.82			
AV	829.5k	25.16	46.00	-20.84	9.91	Line	-	15.25	0.05	0.04	9.82			
QP	1.653M	29.12	56.00	-26.88	9.95	Line	-	19.17	0.06	0.06	9.83			
AV	1.653M	20.36	46.00	-25.64	9.95	Line	-	10.41	0.06	0.06	9.83			
QP	9.303M	35.06	60.00	-24.94	10.22	Line	-	24.84	0.16	0.15	9.91			
AV	9.303M	24.27	50.00	-25.73	10.22	Line	-	14.05	0.16	0.15	9.91			
QP	11.76M	45.38	60.00	-14.62	10.29	Line	-	35.09	0.19	0.18	9.92			
AV	11.76M	40.55	50.00	-9.45	10.29	Line	"Worst"	30.26	0.19	0.18	9.92			



Phase	Neutral	Configuration	Unintentional – CRX
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21/08/2020



Type	Freq (Hz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Factor (dB)	Condition	Comment	Raw (dBuV)	AF (dB)	CL (dB)	AT (dB)			
QP	456k	46.11	56.76	-10.65	9.88	Neutral	-	36.23	0.04	0.03	9.81			
AV	456k	40.07	46.76	-6.69	9.88	Neutral	-	30.19	0.04	0.03	9.81			
QP	519k	46.50	56.00	-9.50	9.89	Neutral	-	36.61	0.05	0.03	9.81			
AV	519k	39.98	46.00	-6.02	9.89	Neutral	"Worst"	30.09	0.05	0.03	9.81			
QP	807k	38.16	56.00	-17.84	9.92	Neutral	-	28.24	0.06	0.04	9.82			
AV	807k	30.17	46.00	-15.83	9.92	Neutral	-	20.25	0.06	0.04	9.82			
QP	1.41M	34.83	56.00	-21.17	9.93	Neutral	-	24.90	0.06	0.05	9.82			
AV	1.41M	26.60	46.00	-19.40	9.93	Neutral	-	16.67	0.06	0.05	9.82			
QP	2.774M	31.85	56.00	-24.15	10.00	Neutral	-	21.85	0.08	0.10	9.82			
AV	2.774M	23.50	46.00	-22.50	10.00	Neutral	-	13.50	0.08	0.10	9.82			
QP	10.248M	42.62	60.00	-17.38	10.24	Neutral	-	32.38	0.17	0.15	9.92			
AV	10.248M	29.22	50.00	-20.78	10.24	Neutral	-	18.98	0.17	0.15	9.92			



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.	

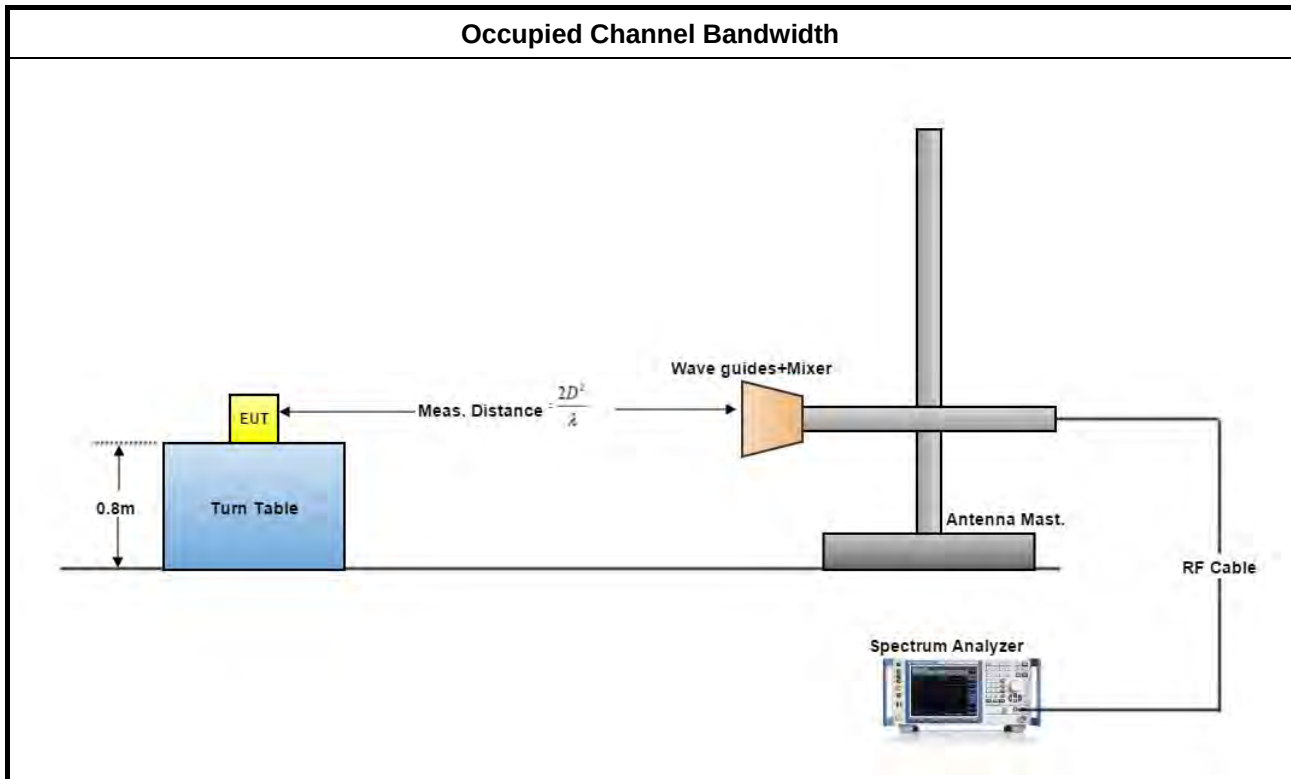
3.2.2 Measuring Instruments

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



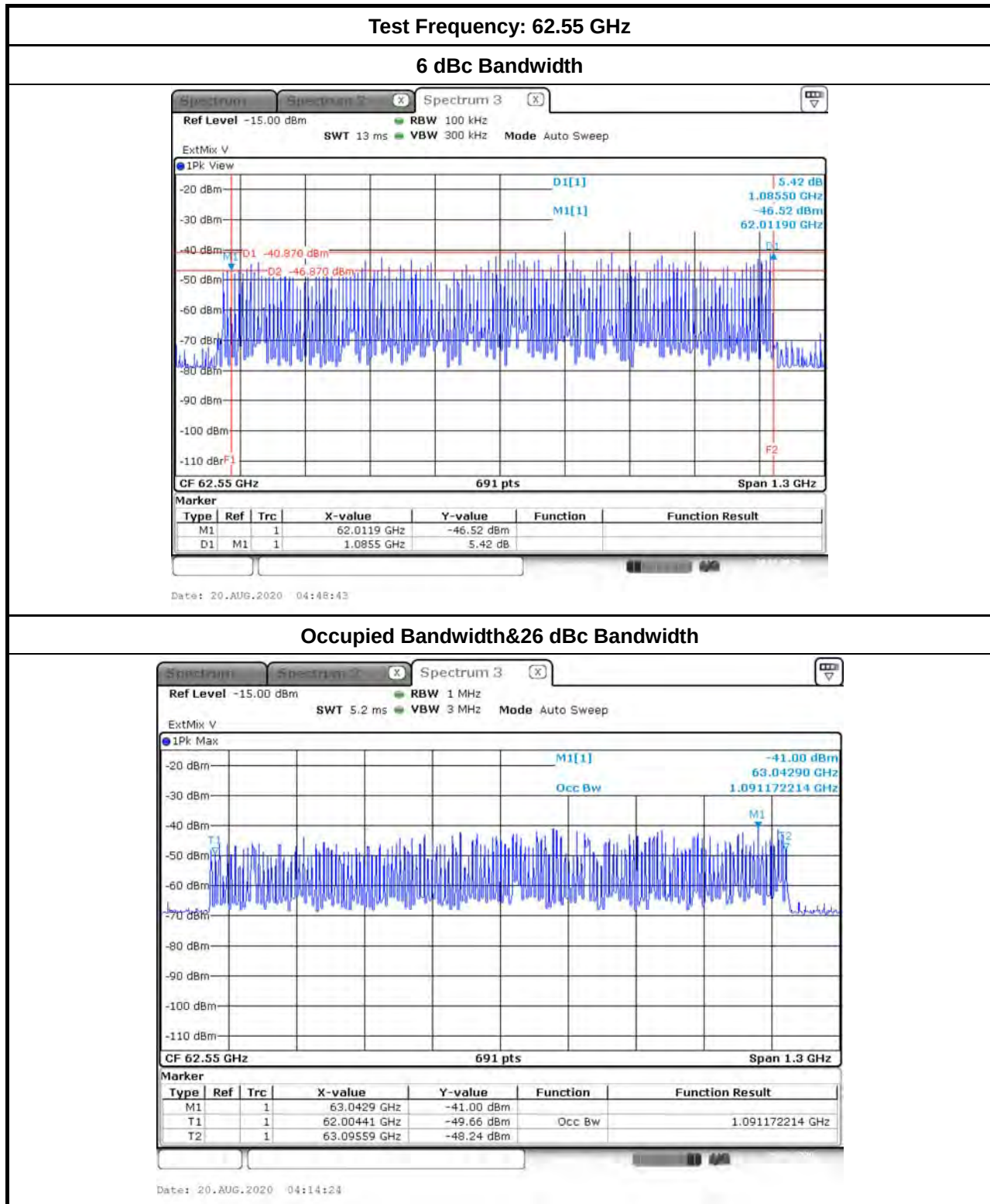
3.2.5 Test Result of Occupied Bandwidth

Test Conditions	see ANSI C63.10, clause 5.11
Test Setup	see ANSI C63.10, clause 6.9.2
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.	

Test Results			
Test Freq. (GHz)	6 dBc Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)
62.55	1085.50	1091.17	N/A



3.2.5.1 Bandwidth Plots



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.		

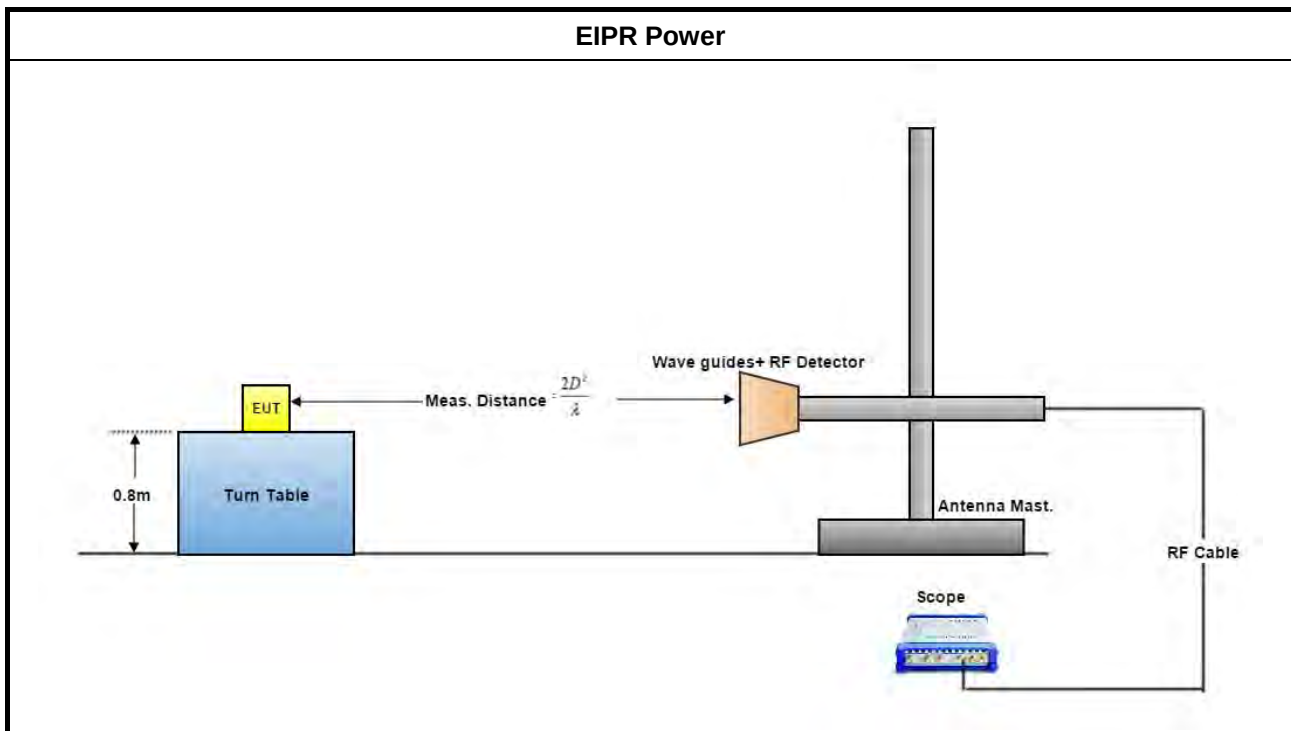
3.3.2 Measuring Instruments

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

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.

**3.3.5.1 Test Result of EIRP Power**

Freq. (GHz)	Rx Gain (dBi)	DSO Peak (mV)	P-Peak (dBm)	E-Meas-Peak (dBuV/m)	Test Distance (m)	EIRP-Peak (dBm)	EIRP-Peak Limit (dBm)	Test Result
62.55	23.6	8.12	-38.47	111.11	1.00	6.31	10	Pass

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.

$$\text{EIRP} = E\text{-meas} + 20\log(d\text{-meas}) - 104.7$$

where:

EIRP : is the equivalent isotopically radiated power, in dBm

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

d-meas. : is the measurement distance, in m

NOTE: 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	-	500mW
Outdoor fixed Point to Point	≤ 100MHz	-	500mW x (BW/100) (see note 2)
NOTE 1: For the applicable limit, see LP0002 3.13.1.3			
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					
Test Freq. (GHz)	EIRP-Peak (dBm)	Max. Ant. Gain (dBi)	Peak Power (dBm) (note1)	P-Cond Limit (dBm)	Test Result
62.55	6.31	16.50	-10.19	-10	Pass
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 applicable limit, see LP0002 3.13.1.1(2) NOTE 3: 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

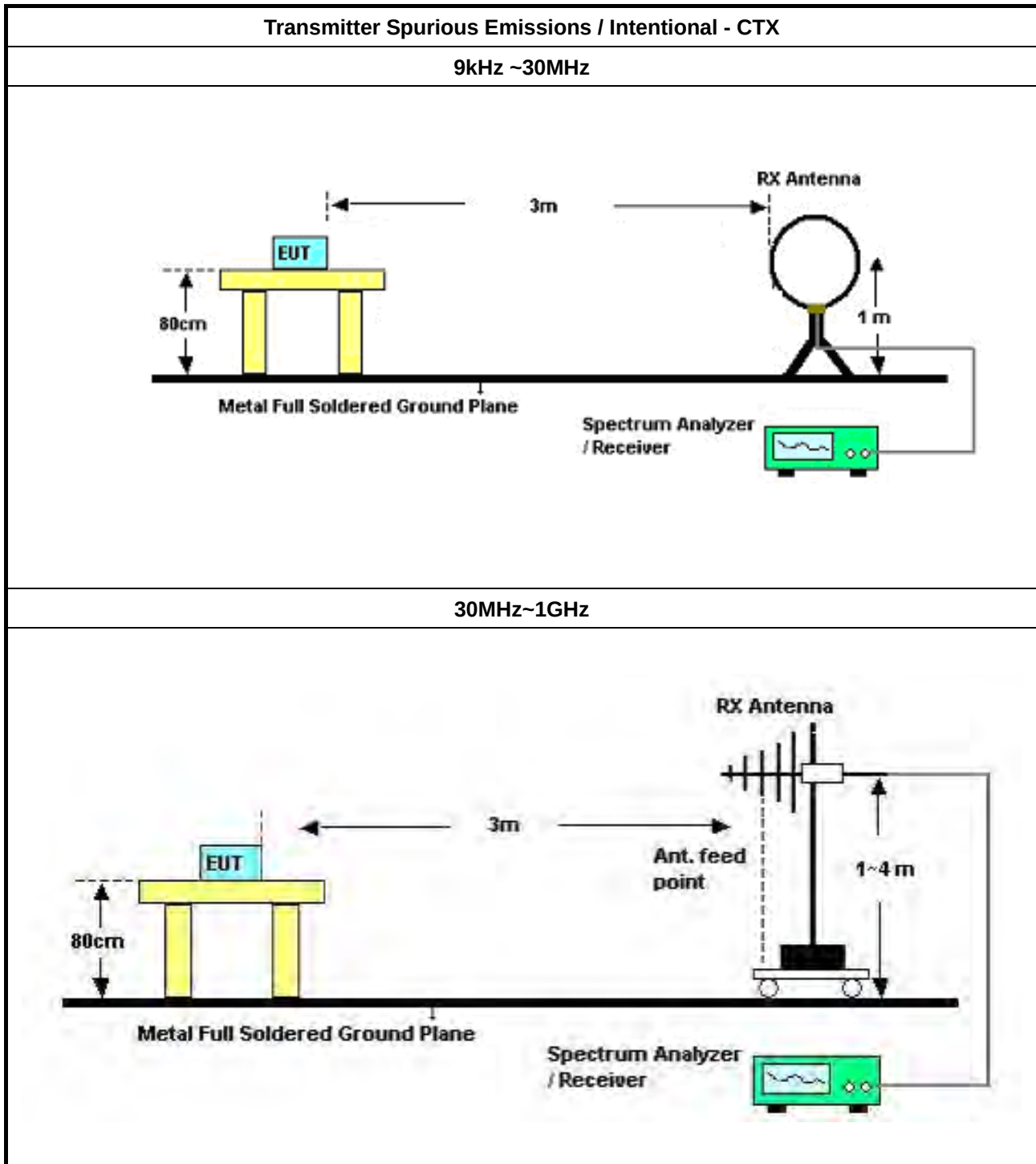
3.5.1 Limit of Transmitter Spurious Emissions

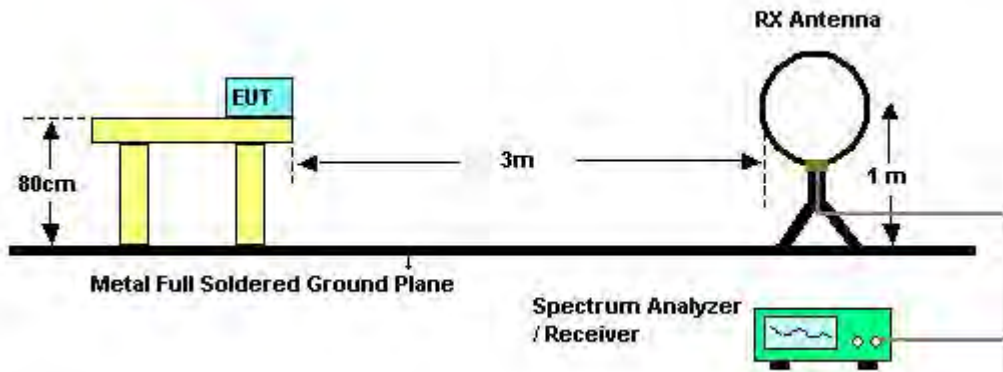
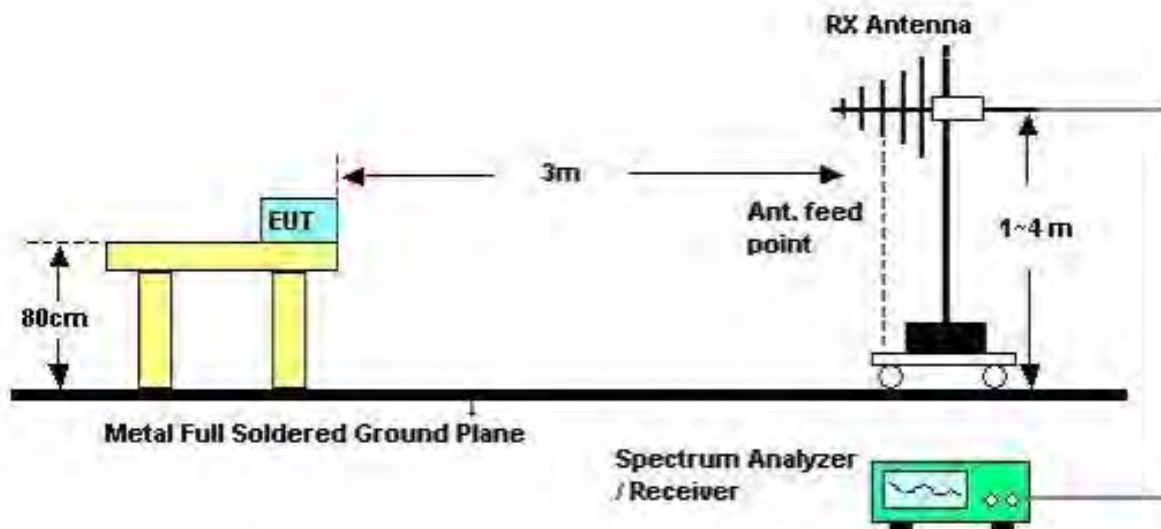
Frequency Range	Limit
Radiated emissions below 40 GHz	LP0002 2.8
Radiated emissions above 40 GHz – 200GHz	90 pW/cm ² @ 3 m (Equivalent EIRP 102 µW, -9.91dBm)
NOTE 1: For the applicable limit, see LP0002 3.13.1.2	
NOTE 2: Spurious emissions shall not exceed the level of the fundamental emission.	

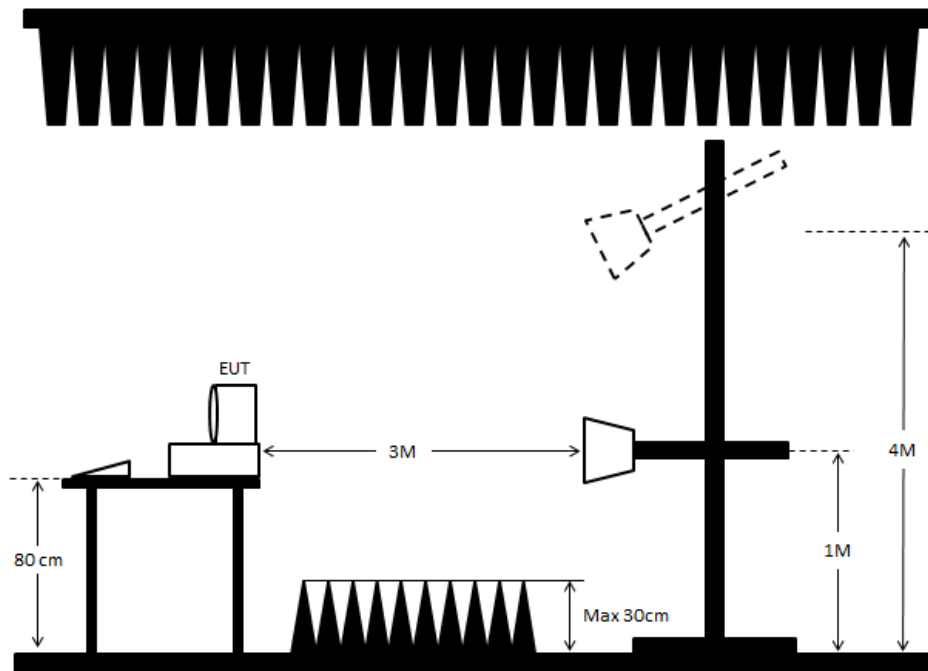
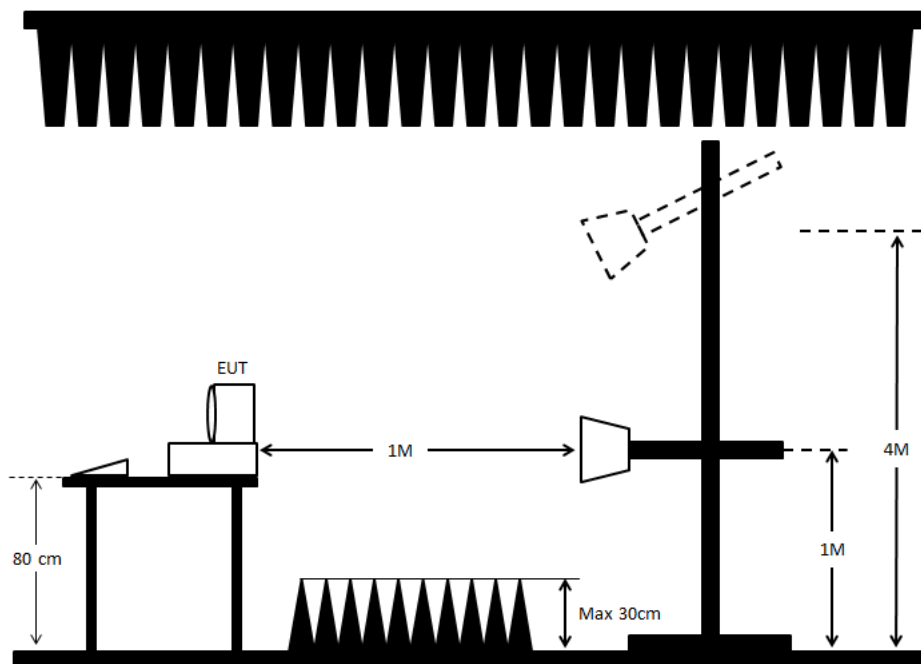
3.5.2 Test Procedures

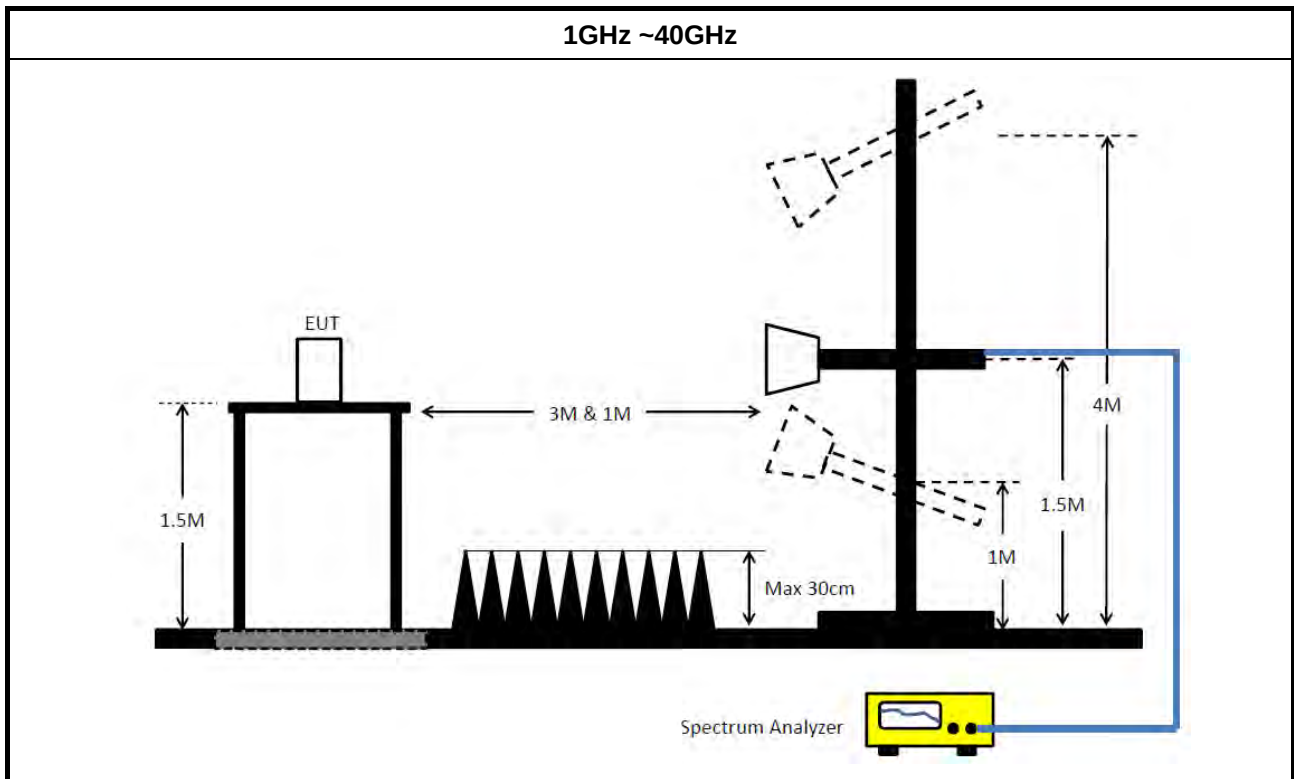
Method of measurement: Refer as ANSI C63.10-2013, clause 9.12

3.5.3 Test Setup

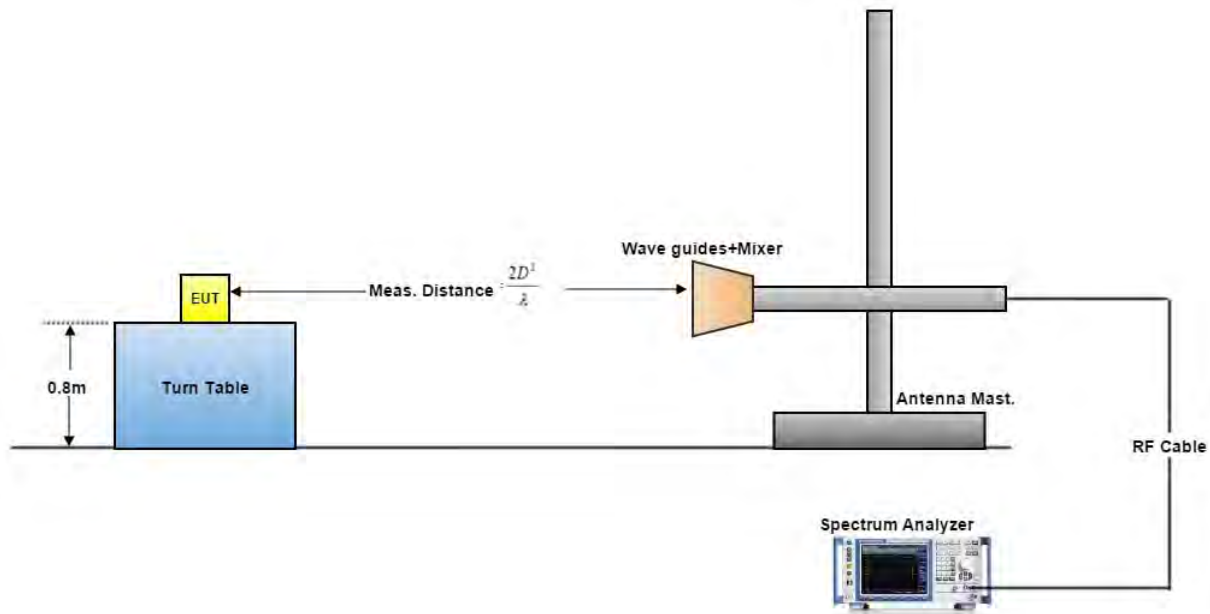


Transmitter Spurious Emissions / Unintentional - CRX
9kHz ~30MHz

30MHz~1GHz


1 GHz-40 GHz / Unintentional - CRX
1,000~18,000 MHz

18,000~40,000 MHz




Above 40GHz



A measuring distance of at 3 m shall be used for measurements at frequencies up to 15 GHz. For frequencies above 15 GHz, any suitable measuring distance may be used. The measurement distance is chosen up to far field distance, depending on the test system noise floor for detecting spurious emission signals. Then above 15 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from spec. distance (3 m) to measurement distance. Distance extrapolation factor = $20 \log (\text{spec. distance [3 m]} / \text{measurement distance [N m]})$ (dB). The measurements described in ANSI C63.10, clause 7.8.6. If the emission cannot be detected at 1 m, reduce the RBW to increase system sensitivity. Note the value. If the emission still cannot be detected, move the horn closer to the EUT, noting the distance at which a measurement is made.

3.5.4 Measurement Results Calculation

The measured Level is calculated using:

For below 40GHz

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamplifier Factor (if applicable) = Level.

For above 40GHz

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

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.

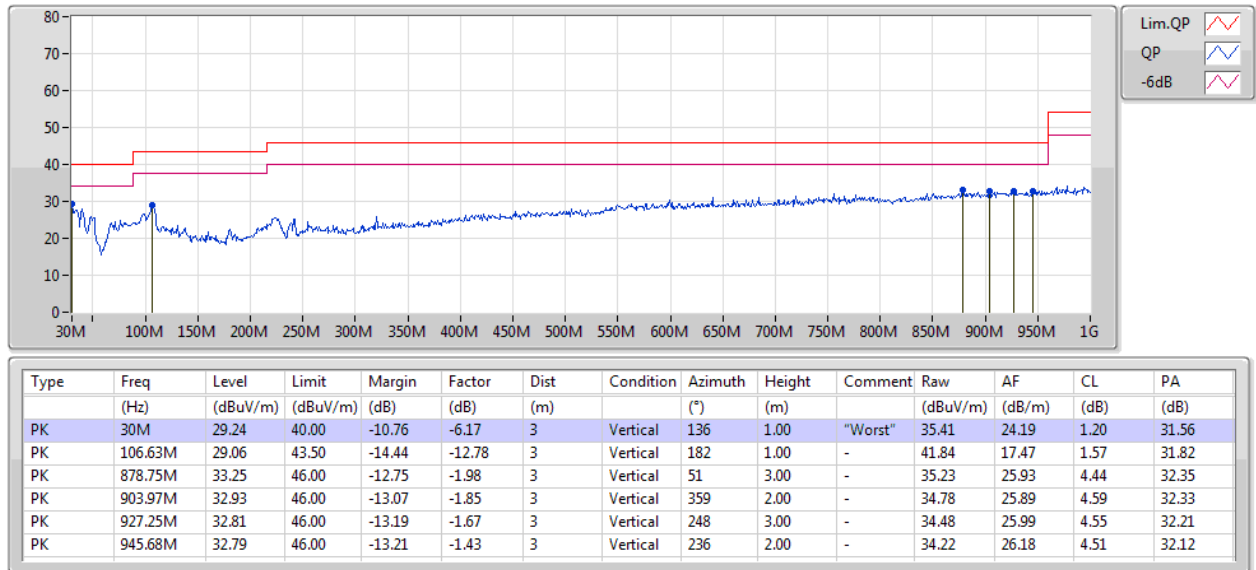
3.5.5.2 Test Result of Transmitter Spurious Emissions

Test Range	30 MHz – 1000 MHz	Test Distance	3 m
Test Configuration	Intentional – CTX		

Vertical

Mode 1

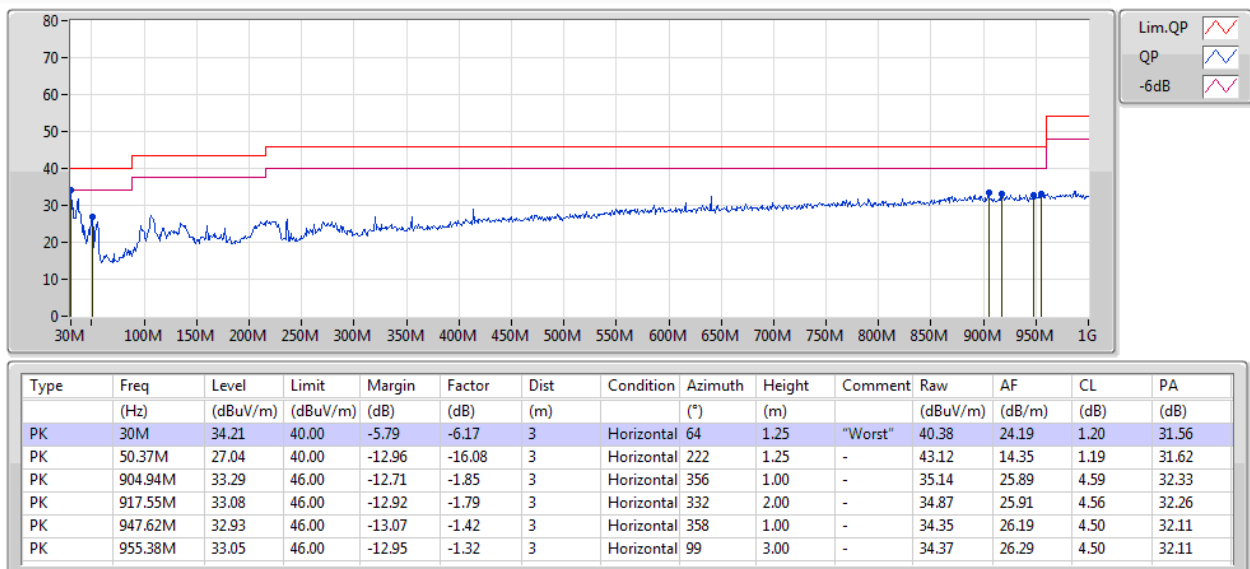
20/08/2020



Horizontal

Mode 1

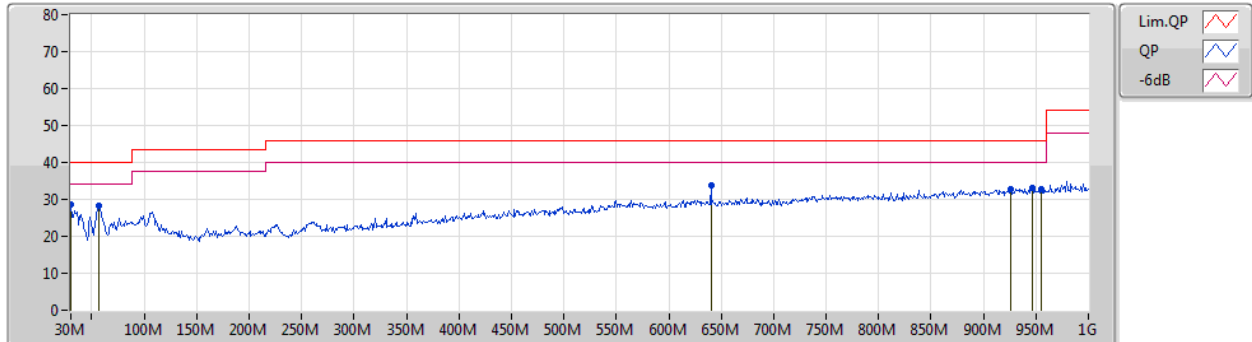
20/08/2020



Test Range	30 MHz – 1000 MHz	Test Distance	3 m
Test Configuration	Unintentional – CRX		

Vertical
Mode 1

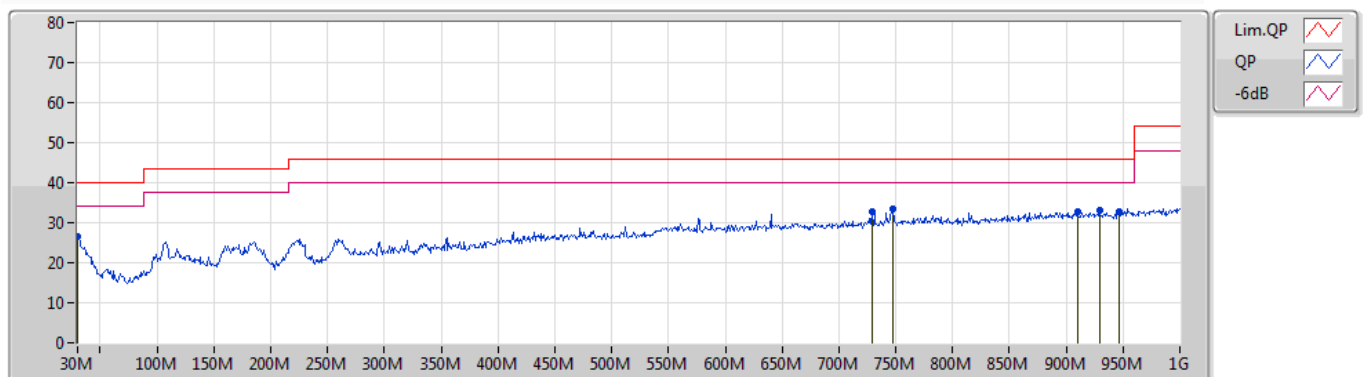
20/08/2020



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	30M	28.49	40.00	-11.51	-6.17	3	Vertical	334	1.25	"Worst"	34.66	24.19	1.20	31.56
PK	57.16M	28.36	40.00	-11.64	-17.84	3	Vertical	97	1.00	-	46.20	12.79	1.14	31.77
PK	640.13M	33.93	46.00	-12.07	-4.46	3	Vertical	173	1.00	-	38.39	24.44	3.58	32.48
PK	926.28M	32.79	46.00	-13.21	-1.69	3	Vertical	1	1.00	-	34.48	25.98	4.55	32.22
PK	946.65M	33.04	46.00	-12.96	-1.43	3	Vertical	223	2.00	-	34.47	26.18	4.51	32.12
PK	955.38M	32.66	46.00	-13.34	-1.32	3	Vertical	7	2.00	-	33.98	26.29	4.50	32.11

Horizontal
Mode 1

20/08/2020



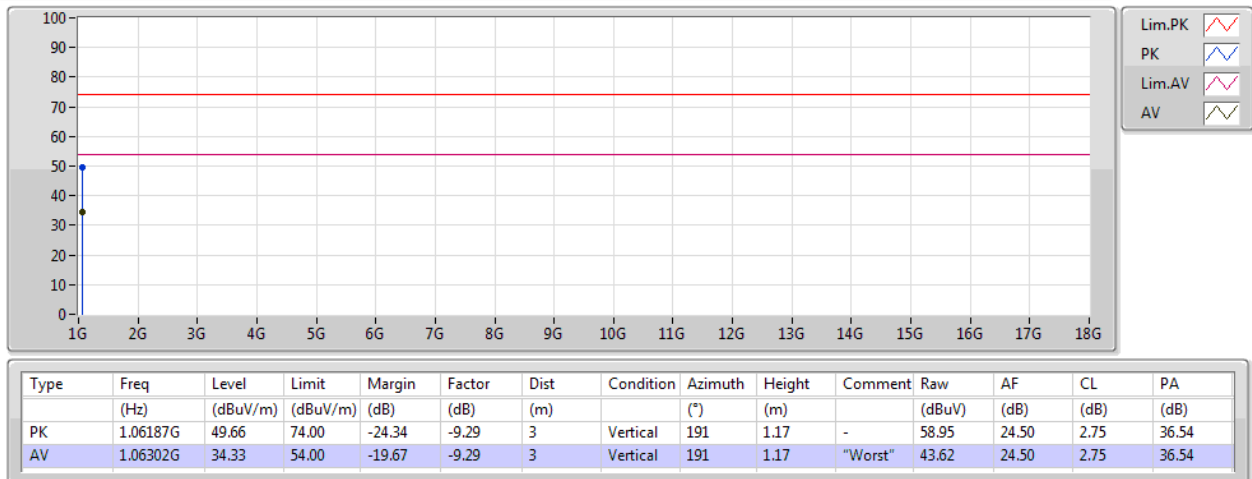
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV/m)	AF (dB/m)	CL (dB)	PA (dB)
PK	30M	26.62	40.00	-13.38	-6.17	3	Horizontal	92	1.00	-	32.79	24.19	1.20	31.56
PK	729.37M	32.89	46.00	-13.11	-3.62	3	Horizontal	258	1.00	-	36.51	24.81	3.92	32.35
PK	748M	33.33	46.00	-12.67	-3.27	3	Horizontal	186	1.00	"Worst"	36.60	25.04	3.99	32.30
PK	909.79M	32.67	46.00	-13.33	-1.85	3	Horizontal	203	3.00	-	34.52	25.87	4.58	32.30
PK	929.19M	32.95	46.00	-13.05	-1.65	3	Horizontal	0	2.00	-	34.60	26.01	4.54	32.20
PK	946.65M	32.66	46.00	-13.34	-1.43	3	Horizontal	333	2.00	-	34.09	26.18	4.51	32.12



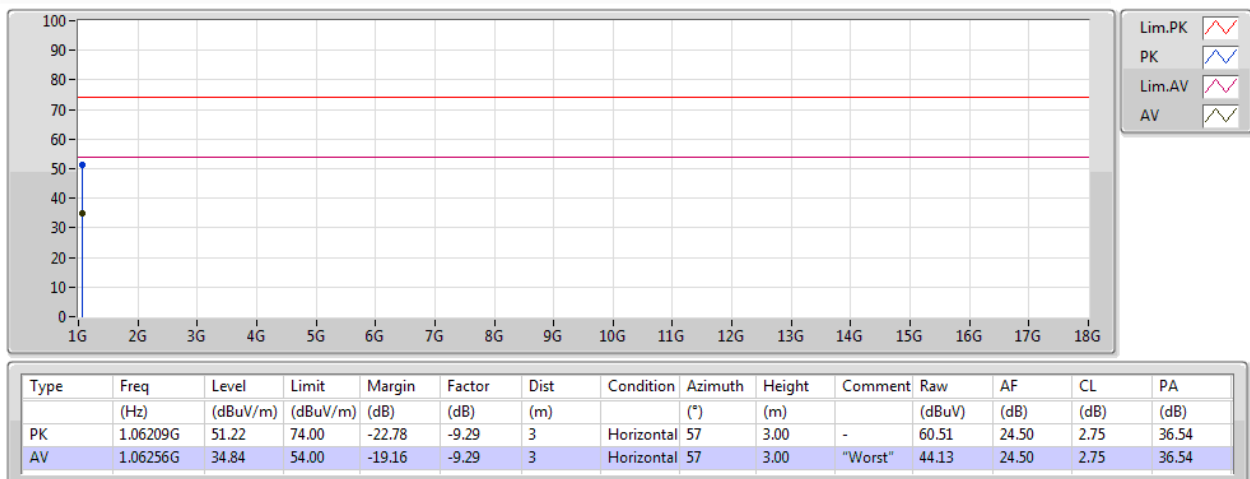
Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Configuration	Unintentional – CRX		

Vertical**Mode 1**

20/08/2020

**Horizontal****Mode 1**

20/08/2020

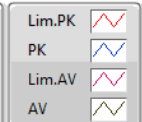
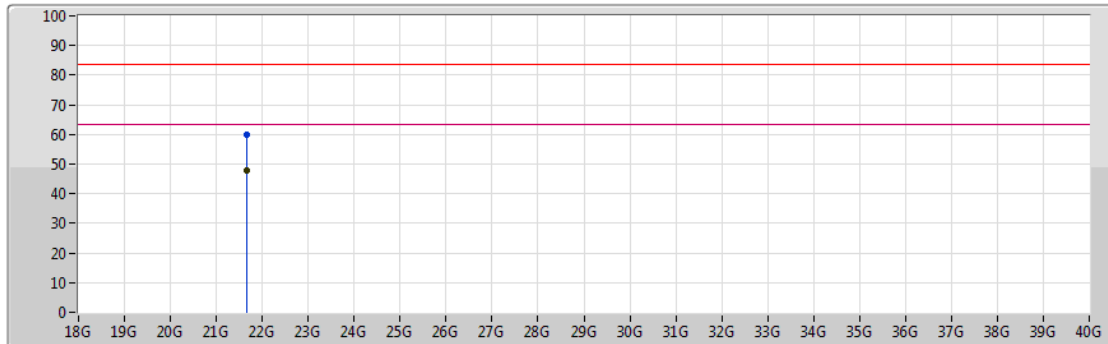




Test Range	18GHz – 40 GHz	Test Distance	1 m
Test Configuration	Unintentional – CRX		

Vertical**Mode 1**

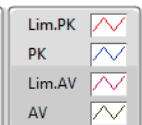
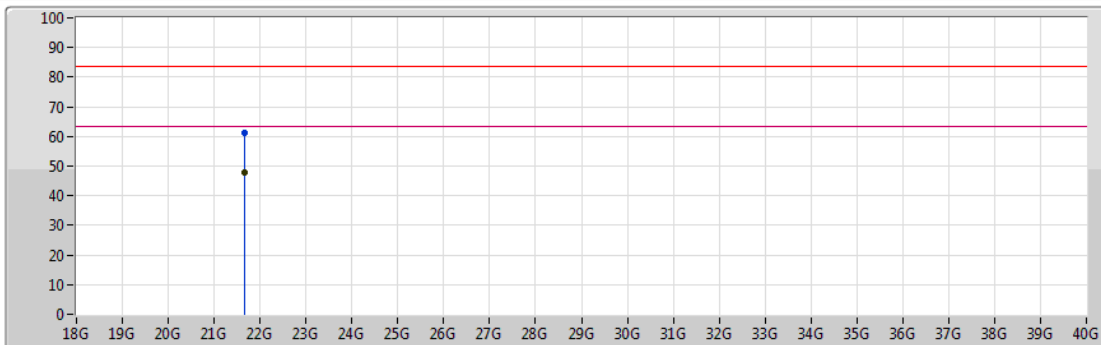
20/08/2020



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	21.66622G	59.99	83.54	-23.55	3.41	1	Vertical	160	1.00	-	56.58	37.77	15.17	49.53
AV	21.66279G	47.73	63.54	-15.81	3.41	1	Vertical	160	1.00	"Worst"	44.32	37.77	15.17	49.53

Horizontal**Mode 1**

20/08/2020



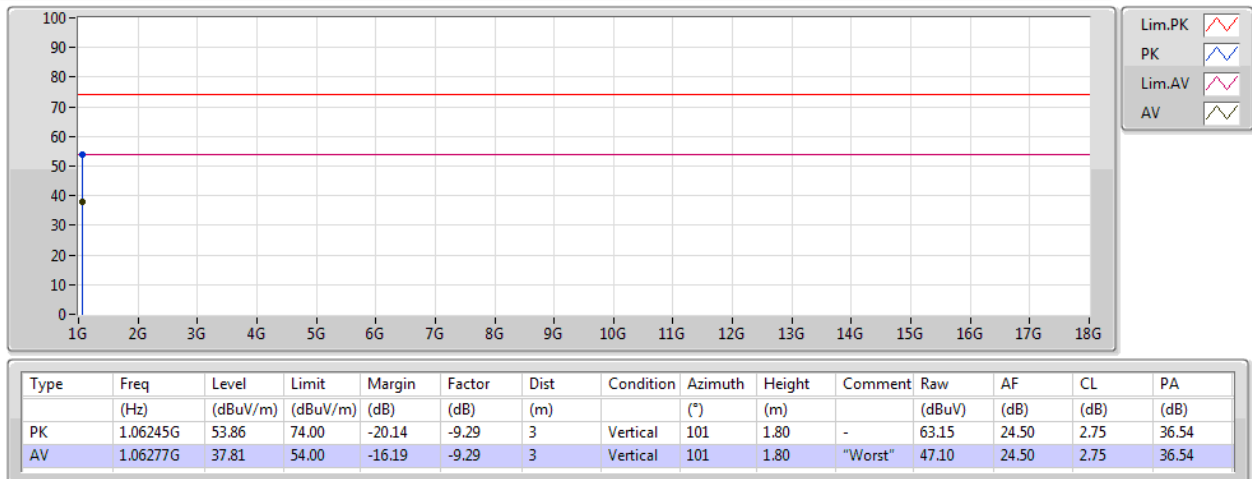
Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	21.6641G	61.00	83.54	-22.54	3.41	1	Horizontal	323	1.00	-	57.59	37.77	15.17	49.53
AV	21.6656G	47.68	63.54	-15.86	3.41	1	Horizontal	323	1.00	"Worst"	44.27	37.77	15.17	49.53



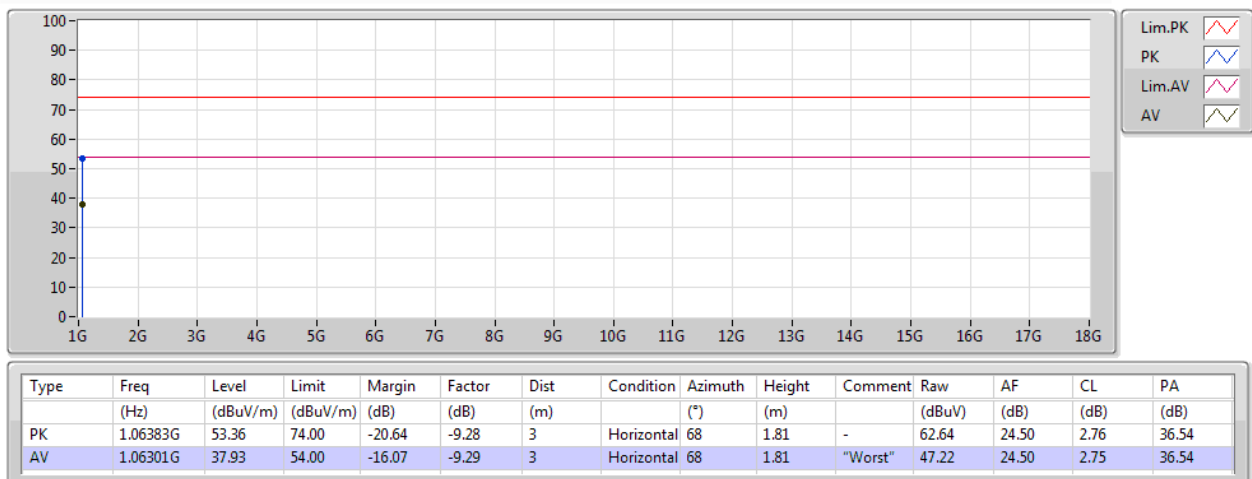
Test Range	1 GHz – 18 GHz	Test Distance	3 m
Test Configuration	Intentional – CTX		

Vertical**Mode 2**

19/08/2020

**Horizontal****Mode 2**

19/08/2020



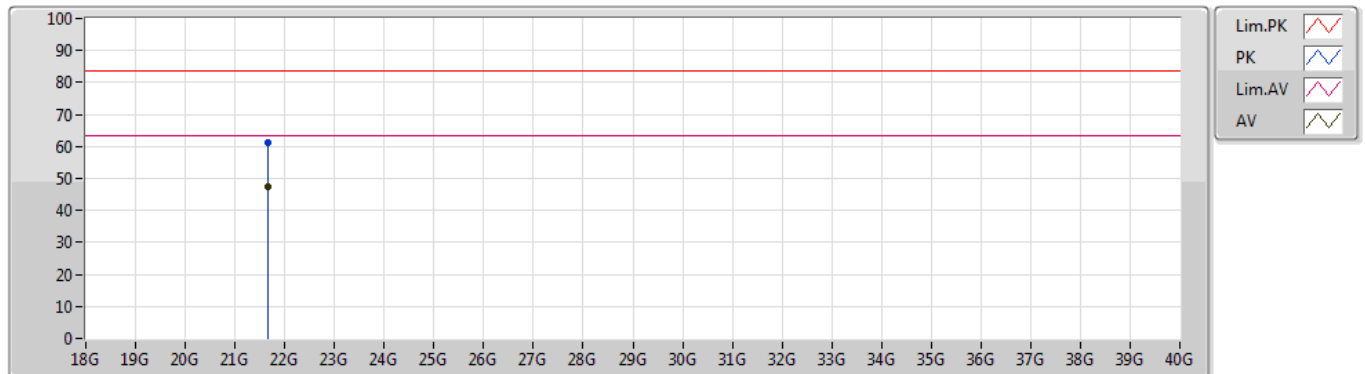


Test Range	18GHz – 40 GHz	Test Distance	1 m
Test Configuration	Intentional – CTX		

Vertical

Mode 2

20/08/2020

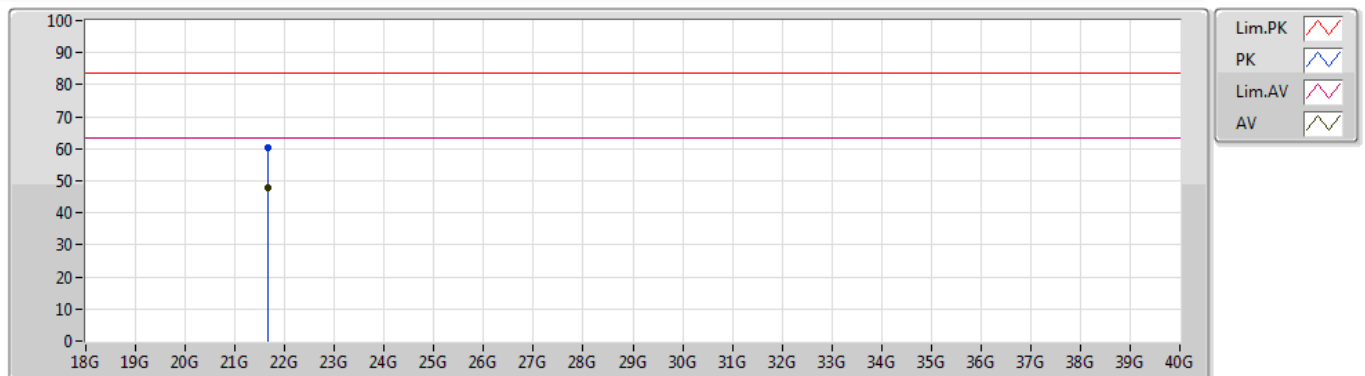


Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	21.66055G	61.35	83.54	-22.19	3.40	1	Vertical	158	1.55	-	57.95	37.77	15.17	49.54
AV	21.66054G	47.62	63.54	-15.92	3.40	1	Vertical	158	1.55	"Worst"	44.22	37.77	15.17	49.54

Horizontal

Mode 2

20/08/2020



Type	Freq (Hz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Factor (dB)	Dist (m)	Condition	Azimuth (°)	Height (m)	Comment	Raw (dBuV)	AF (dB)	CL (dB)	PA (dB)
PK	21.66188G	60.27	83.54	-23.27	3.40	1	Horizontal	328	1.55	-	56.87	37.77	15.17	49.54
AV	21.653G	48.05	63.54	-15.49	3.39	1	Horizontal	328	1.55	"Worst"	44.66	37.77	15.16	49.54



Test Range	40GHz – 200GHz
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Test Frequency (GHz)	Rx Antenna Gain (dBi)	Measurement Distance (m)	Read Worse Frequency (GHz)	Read Level (dBm)
62.55	23.6	1.00	50.35	-91.23
EIRP (dBm)	Specification Distance (m)	Power Density (pW/cm²)	Limit (pW/cm²)	Test Result
-48.35	3	0.0129	90	PASS

Note:

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

Which

$Prx = \text{Read Level.}$

$Grx = \text{Rx Antenna Gain.}$

A distance factor is offset and the formula is $20\log(D1/D2)$

Which

$D1 = \text{Specification Distance}$

$D2 = \text{Measurement Distance}$

3.6 Frequency Stability

3.6.1 Limit of Frequency Stability

Frequency Stability	Limit
Refer as LP0002 3.13.1.4 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.	

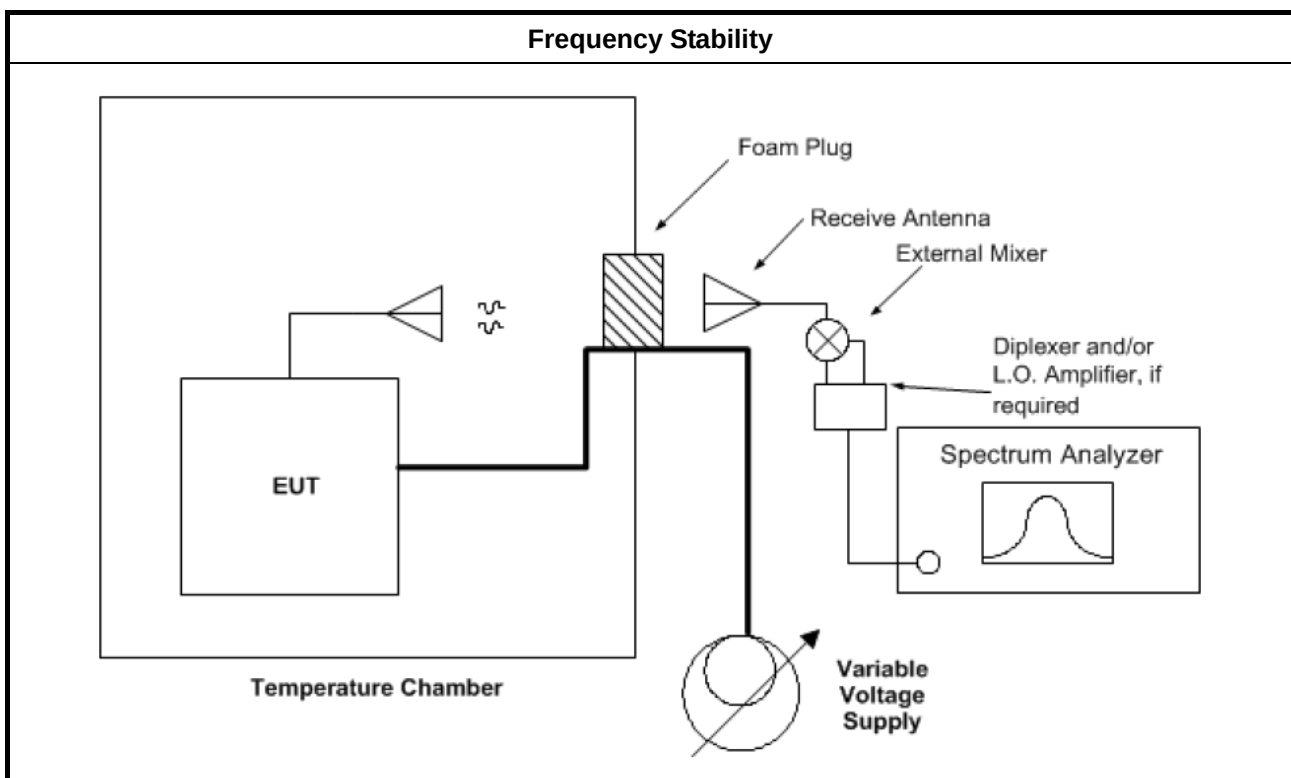
3.6.2 Measuring Instruments

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)
0	62549.95	130	Within band
10	62549.82	0	Within band
20	62549.82	Reference	Within band
30	62547.58	-2240	Within band
40	62546.22	-3600	Within band
NOTE: The manufacturer's specified temperature range of 0 to 40°C.			

**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 (±kHz)
93.5	62549.12	-700	Within band
110	62549.82	Reference	Within band
126.5	62549.36	-460	Within band



4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.45GHz	Feb. 26, 2020	Feb. 25, 2021	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Dec. 25, 2019	Dec. 24, 2020	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Feb. 25, 2020	Feb. 24, 2021	Conduction (CO01-CB)
Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 31, 2020	Jan. 30, 2021	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 20, 2020	May 19, 2021	Conduction (CO01-CB)
Software	Audix	E3	6.120210n	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 13, 2020	Apr. 12, 2021	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 27, 2020	Mar. 26, 2021	Radiation (03CH05-CB)
Horn Antenna	SCHWARZBECK	BBHA9120D	BBHA 9120D-1291	1GHz~18GHz	Oct. 05, 2019	Oct. 04, 2020	Radiation (03CH05-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 21, 2020	Jul. 20, 2021	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 28, 2020	Apr. 27, 2021	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC12630SE	980287	1GHz ~ 26.5GHz	Jul. 03, 2020	Jul. 02, 2021	Radiation (03CH05-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 08, 2020	Jul. 07, 2021	Radiation (03CH05-CB)
Signal Analyzer	R&S	FSV40	101904	9kHz ~ 40GHz	May. 12, 2020	May. 11, 2021	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	May 13, 2020	May 12, 2021	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	LOW Cable-04+23	30MHz~1GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-28	1GHz~18GHz	Oct. 07, 2019	Oct. 06, 2020	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-04+28	1GHz~18GHz	Feb. 01, 2020	Jan. 31, 2021	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH05-CB)
RF Cable-high	Woken	RG402	High Cable-40G#2	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (03CH05-CB)



Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Oct. 01 2019	Sep. 30, 2020	Radiation (03CH05-CB)
Mixer	OML	M15HWA	V91113-1	50 ~ 75 GHz	Oct. 25 2019	Oct. 24, 2020	Radiation (03CH05-CB)
Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Oct. 25 2019	Oct. 24, 2020	Radiation (03CH05-CB)
Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Oct. 25 2019	Oct. 24, 2020	Radiation (03CH05-CB)
Mixer	OML	M05HW/A	G91113-1	140 ~ 220 GHz	Oct. 25 2019	Oct. 24, 2020	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M15RH	V91113-A	50 ~ 75 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Standard Horn Antenna	Custom Microwave	M05RH	G91113-A	140 ~ 220 GHz	N.C.R	N.C.R	Radiation (03CH05-CB)
Detector	Millitech	DET-15-RPF W0	#A18185(074)	50 ~ 75 GHz	Apr. 02, 2020	Apr. 01, 2021	Radiation (03CH05-CB)
PC Oscilloscope	PICO TECH	6402C	CX372/002	N/A	Jul. 10, 2020	Jul. 09, 2021	Radiation (03CH05-CB)
Temp. and Humidity Chamber	Gaint Force	GTH-408-40-CP-AR	MAA1410-011	-40~100 degree	Sep. 12, 2019	Sep. 11, 2020	Radiation (TH03-CB)

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

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



5 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	5.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	4.9 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	4.6 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	3.9 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%
Temperature	0.9°C	Confidence levels of 95%