FCC Radio Test Report

FCC ID: 2ATZF-PH4404XXA

Project No.	:	1905T002
Equipment	:	4-Port RJ45 and 4-Port RJ11 Connectors PanL Hub
Test Model	:	PH440700A
Series Model	:	PH440400A, PH440500A, PH440600A
Applicant	:	Bridgetek Pte. Ltd.
Address	:	178 Paya Lebar Road, #07-03 Singapore 409030

Date of Receipt	:	2019/5/23
Date of Test	:	2019/5/23 ~ 2019/8/19
Issued Date	:	2019/11/13
Tested by	:	BTL Inc.

Testing Engineer : (Jerry Chuang)

Technical Manager : (Pike Lee)

Authorized Signatory : (Andy Chiu)

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Testing Laboratory
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Declaration

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BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue	2019/10/23
R01	Revised report to address TCB's comments.	2019/11/13

1. CERTIFICATION

Equipment	:	4-Port RJ45 and 4-Port RJ11 Connectors PanL Hub
Brand Name	:	Bridgetek, PanL
Test Model	:	PH440700A
Series Model	:	PH440400A, PH440500A, PH440600A
Applicant	:	Bridgetek Pte. Ltd.
Manufacturer	:	Bridgetek Pte. Ltd.
Address	:	178 Paya Lebar Road, #07-03 Singapore 409030
Factory	:	Bridgetek Pte. Ltd.
Address	:	178 Paya Lebar Road, #07-03 Singapore 409030
Date of Test	:	2019/5/23 ~ 2019/8/19
Test Sample	:	Enginnering Sample No.:
Standard(s)	:	FCC Part15, Subpart C(15.231) ANSI C63.10-2013

The above equipment has been tested and found in compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-1-1905T002) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.231)			
Standard(s) Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.209 & 15.231(e)	Radiated Spurious Emission	PASS	
15.231(c)	20 dB Occupied Bandwidth	PASS	
15.231(e)	Timing Testing	PASS	

Note:

(1) “N/A” denotes test is not applicable to this device.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report:

C05: (FCC RN:674415; FCC DN:TW0659)
No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

CB15: (VCCI RN: R-20020; FCC RN:674415; FCC DN:TW0659; ISED Assigned Code:20088-5)
No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{cispr} requirement.

The reported uncertainty of measurement y ± U, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U,(dB)
C05	CISPR	150 kHz ~ 30MHz	3.44

B. Radiated emissions below 1 GHz test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U (dB)
CB15 (3m)	CISPR	30 MHz ~ 200 MHz	V	4.20
		30 MHz ~ 200 MHz	H	3.64
		200 MHz ~ 1,000 MHz	V	4.56
		200 MHz ~ 1,000 MHz	H	3.90

C. Radiated emissions above 1 GHz test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U (dB)
CB15 (3m)	CISPR	1 GHz ~ 6 GHz	V	4.46
		1 GHz ~ 6 GHz	H	4.40
		6 GHz ~18 GHz	V	3.88
		6 GHz ~18 GHz	H	4.00

Test Site	Method	Measurement Frequency Range	U (dB)
CB15 (1m)	CISPR	18 GHz ~ 26.5 GHz	4.62
		26.5 GHz ~ 40 GHz	5.12

NOTE:
Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.
Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.
Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

Conducted Disturbance (mains port) – 150 kHz – 30 MHz : 3.6 dB
Radiated Disturbance (electric field strength on an open area test site or alternative test site) – 30 MHz – 1000 MHz : 5.2 dB

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	4-Port RJ45 and 4-Port RJ11 Connectors PanL Hub
Brand Name	Bridgetek, PanL
Test Model	PH440700A
Series Model	PH440400A, PH440500A, PH440600A
Model Difference	Different model distribute to different area.
Power Source	DC Voltage supplied from AC/DC adapter.
Power Rating	I/P: AC 100-240V~2A, 50/60Hz O/P: DC 24V⎓ 2.5A, 60W Max
Products Covered	1 * Adapter: SSA-0601HE-24
Operation Frequency	433.92 MHz
Modulation Type	OOK
Number Of Channel	1CH, please see note 2.
Antenna Designation	Spring Antenna
Field Strength	71.43dBuV/m (AV Max.)

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. Channel List:

Channel	Frequency (MHz)
01	433.92

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1		TT01-2	Spring Antenna	Pad	2

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX CH 433.92 MHz
Mode 2	Normal

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Emission	
Final Test Mode	Description
Mode 2	Normal

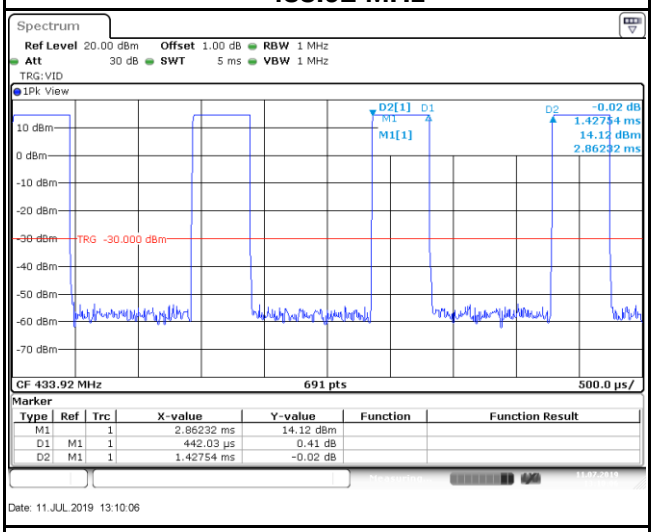
For Radiated Emission	
Final Test Mode	Description
Mode 1	TX CH 433.92 MHz

Note:
(1) The EUT is used new battery.
(2) The EUT is considered a portable unit, it was pre-tested on the positioned of each 3 axis. The worst case was found positioned on Z-plane. Therefore only the test data of this Z-plane was used for radiated emission measurement test.

3.3 DUTY CYCLE

If duty cycle is ≥ 98 %, duty factor is not required.
If duty cycle is < 98 %, duty factor shall be considered.

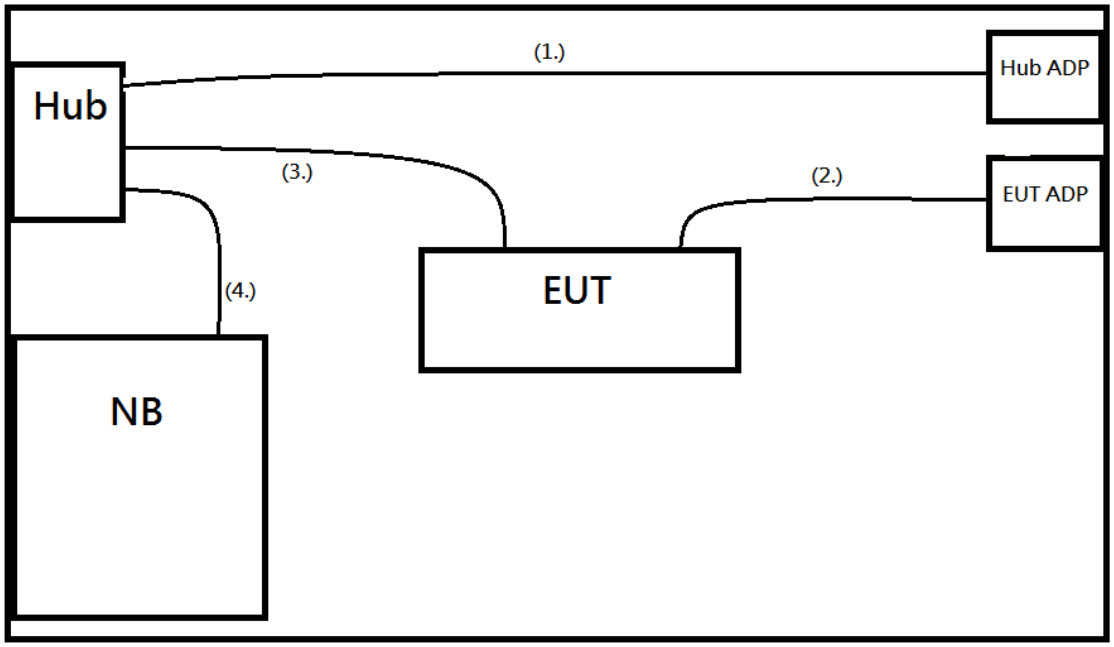
433.92 MHz



Duty cycle = 0.44203 ms / 1.42754 ms = 30.96 %
Duty Factor = 10 * log(1 / 0.3096) = 5.09

NOTE:
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz (Duty cycle < 98%).

3.4 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID	Series No.
-	NB	HP	240 G5	NA	NA
-	Hub	ASUS	RT-AC66U	NA	D6IAGGPB000C

Item	Shielded Type	Ferrite Core	Length	Note
1	NO	NO	1.2 M	Hub Adapter
2	NO	YES	1.5 M	EUT Adapter
3	NO	NO	45 CM	RJ45
4	NO	NO	45 CM	RJ45

4.EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSIONLIMITS (Frequency Range 150 kHz-30 MHz)

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56*	56 to 46*
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note:

(1) The limit of " * " decreases with the logarithm of the frequency

(2) The test result calculated as following:
Measurement Value = Reading Level + Correct Factor
Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
Margin Level = Measurement Value - Limit Value

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

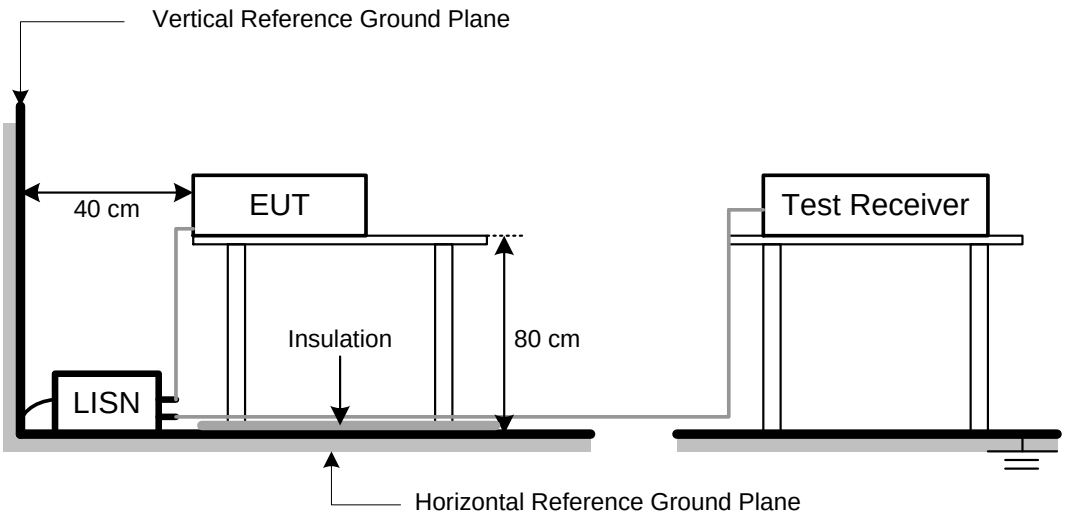
4.1.2 TEST PROCEDURE

a. The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the groundplane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral 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.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP



4.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it).The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

4.1.6 EUT TEST CONDITIONS

Temperature: 25°C
Relative Humidity: 45%
Test Voltage: AC 120V/60Hz

4.1.7 TEST RESULTS

Please refer to the Appendix A.

Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits,the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform.In this case, a " * " marked in AVG Mode column of Interference Voltage Measured.
(2) Measuring frequency range from 150 kHz to 30 MHz.
(3) "N/A" denotes test is not applicable to this device.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 FIELD STRENGTH OF FUNDAMENTAL EMISSIONS MEASUREMENT LIMIT

Frequency Band (MHz)	Fundamental EmissionsLimit(uV/m) at 3m
40.66-40.70	1000
70-130	500
130-174	500-1500(**)
174-260	1500
260-470	1500-5000(**)
Above 470	5000

**1. Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

(1) For the band 130 - 174 MHz, μV/m at 3 meters = 22.72727×(operating frequency, MHz) - 2454.545.

(2) For the band 260 - 470 MHz, μV/m at 3 meters =16.6667×(operating frequency, MHz) - 2833.3333.

So the field strength of emission limits has been calculated in below table.

Carrier Frequency (MHz)	Fundamental EmissionsLimit(dBuV/m) at 3m
433.92 MHz	72.87 (Average)
433.92 MHz	92.87 (Peak)

4.2.2 MEASURING INSTRUMENTS AND SETTING (FIELD STRENGTH OF FUNDAMENTAL EMISSIONS)

Receiver Parameter	Setting
Attenuation	Auto
Center Frequency	Fundamental Frequency
RBW	120 kHz
Detector	Peak / Average

4.2.3 RADIATED EMISSIONS MEASUREMENT

Devices complying with 47 CFR FCC part 15 subpart C, section 15.231(e). The field strength of emissions from intentional radiators at 3 meters operated under this Section shall not exceed the following:

Frequency Band (MHz)	Spurious EmissionsLimit(uV/m) at 3m
40.66-40.70	100
70-130	50
130-174	50-150(**)
174-260	150
260-470	150-500(**)
Above 470	500

**1. Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

(1) For the band 130 - 174 MHz, μV/m at 3 meters = 22.72727×(operating frequency, MHz) - 2454.545.

(2) For the band 260 - 470 MHz, μV/m at 3 meters = 16.6667×(operating frequency, MHz) - 2833.3333.

(3) The maximum permitted unwanted emissions level is 20 dB below the maximum permitted fundamental level. In addition field strength of any emissions which appear inside of the restriction band shall not exceed the general radiated emissions limits in Section 15.209(a).

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000MHz for QP detector

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, AV Mode with Dwell time

4.2.5 TEST PROCEDURE

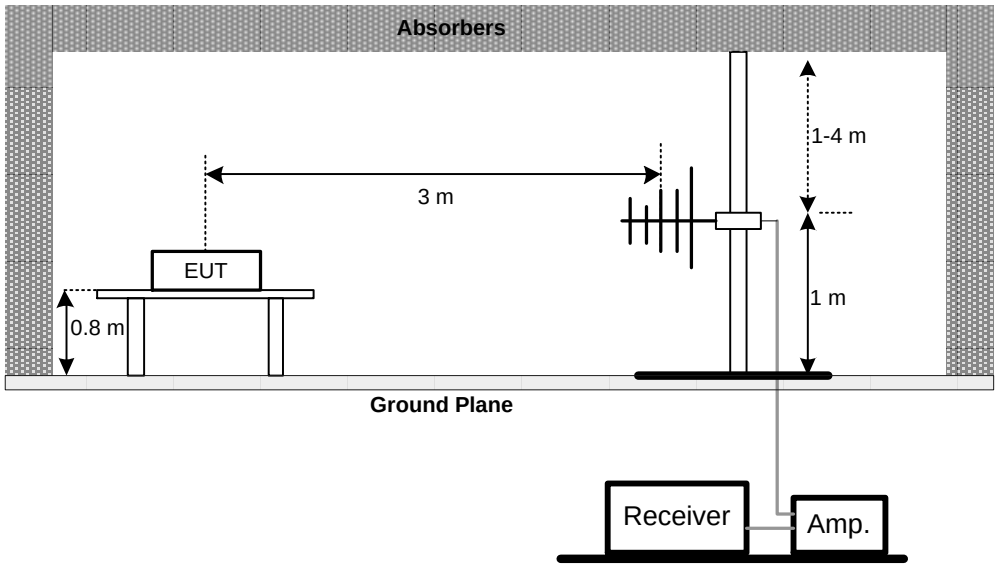
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
b. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1 GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1 GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.6 DEVIATION FROM TEST STANDARD

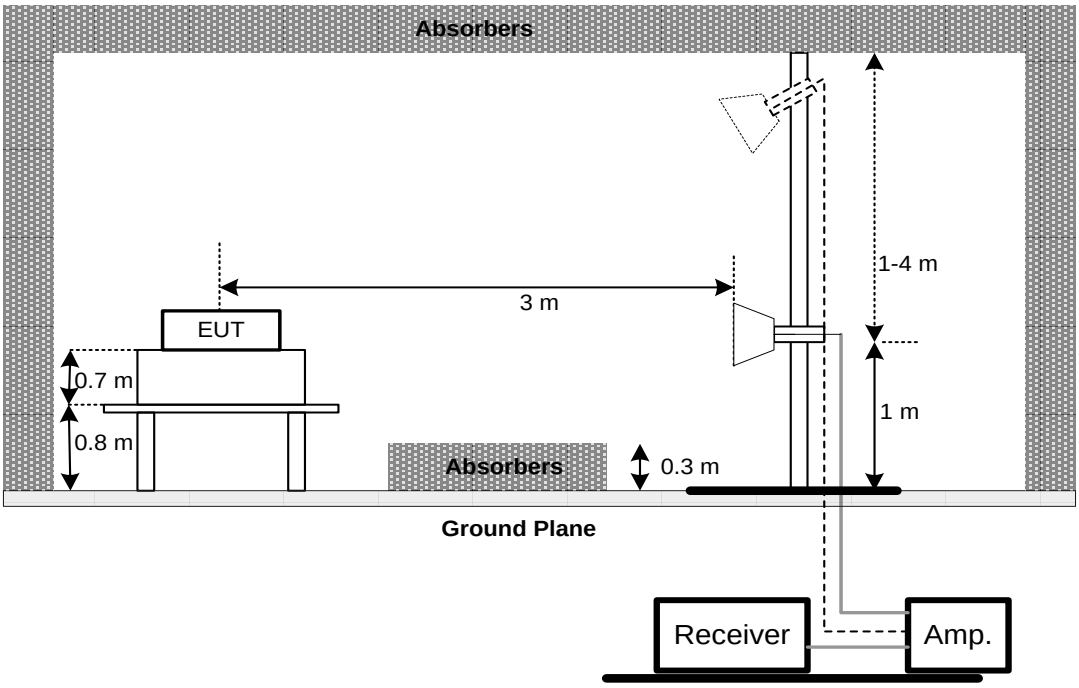
No deviation

4.2.7 TEST SETUP

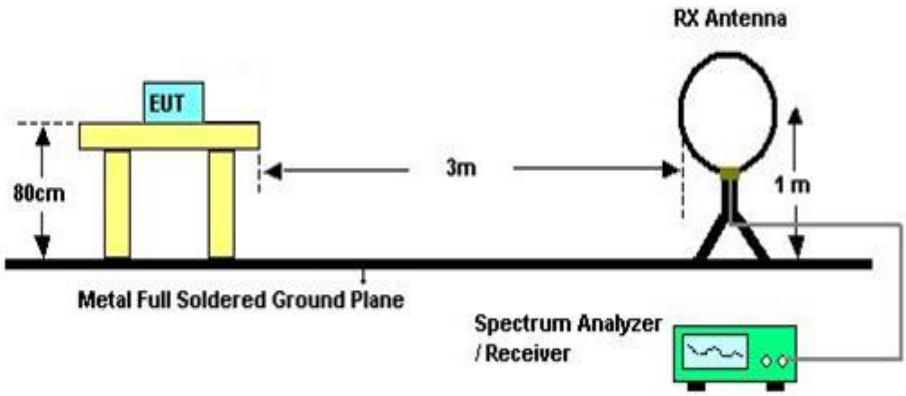
(A) Radiated Emission Test Set-Up Frequency 30 MHz-1000 MHz



(B) Radiated Emission Test Set-Up Frequency Above 1000 MHz



(C) For Radiated Emissions 9 kHz-30 MHz



4.2.8 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **4.1.5** unless otherwise a special operating condition is specified in the follows during the testing.

4.2.9 EUT TEST CONDITIONS

Temperature: 23°C
Relative Humidity: 70%
Test Voltage: AC 120V/60z

4.2.10 TEST RESULTS (9 kHz to 30 MHz)

Please refer to the Appendix B.

Remark:

(1) The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
(2) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.11 TEST RESULTS (30 MHz to 1000 MHz)

Please refer to the Appendix C.

Remark:

(1) Radiated emissions measured in frequency range above 1000 MHz were made with an instrument using Peak detector mode and AV detector mode of the emission.
(2) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
(3) EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand.
(4) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna.

4.2.12 TEST RESULTS (Above 1000 MHz)

Please refer to the Appendix D.

Remark:

(1) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission.
(2) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
(3) EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand.
(4) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna.

5. 20 dB SPECTRUM BANDWIDTH MEASUREMENT

Limit

The bandwidth of the emissions shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. So the emission bandwidth limits have been calcuated in below table.

Fundamental Frequency	20 dB Bandwidth Limits (MHz)
433.92 MHz	1.0848

5.1 MEASURING INSTRUMENTS AND SETTING

Please refer to section 5 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RB	10 kHz
VB	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 10 kHz and the video bandwidth of 10 kHz were used.
3. Measured the spectrum width with power higher than 20 dB below carrier.

5.3 TEST SETUP LAYOUT

5.4 TEST DEVIATION

There is no deviation with the original standard.

5.5 EUT OPERATION DURING TEST

The EUT was programmed to be in continuously transmitting mode.

5.6 EUT TEST CONDITIONS

Temperature: 23°C
Relative Humidity: 55%
Test Voltage: AC 120V/60z

5.7 TESTRESULTS

Please refer to the Appendix E.

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6. TIMING TESTING

Limit

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

6.1 MEASURING INSTRUMENTS AND SETTING

Please refer to section 6 in this report. The following table is the setting of the Spectrum Analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	Zero Span
RB	1 MHz
VB	1 MHz
Detector	Peak
Trace	Max Hold
Sweep Time	100 seconds

6.2 TEST PROCEDURES

1. The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
2. The resolution bandwidth of 1 MHz and the video bandwidth of 1 MHz were used.

6.3 TEST SETUP LAYOUT

6.4 TEST DEVIATION

There is no deviation with the original standard.

6.5 EUT OPERATION DURING TEST

The EUT was programmed to be in normal mode.

6.6 EUT OPERATION DURING TEST

Temperature: 23°C
Relative Humidity: 55%
Test Voltage: AC 120V/60z

6.7 TEST RESULTS

Please refer to the Appendix F.

7. MEASUREMENT INSTRUMENTS LIST AND SETTING

Conducted Emissions Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	TWO-LINE V-NETWORK	R&S	ENV216	101050	2020/3/16
2	Test Cable	EMCI	EMCCFD300-BM -BMR-6000	170715	2020/8/14
3	EMI Test Receiver	R&S	ESR7	101433	2019/12/4
4	Measurement Software	EZ	EZ_EMC (Version NB-03A)	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Preamplifier	EMCI	012645B	980267	2020/4/10
2	Preamplifier	EMCI	EMC02325	980217	2020/4/10
3	Preamplifier	EMCI	EMC2654045	980030	2020/4/10
4	Test Cable	EMCI	EMC104-SM-SM-8 000	8m	2020/4/10
5	Test Cable	EMCI	EMC104-SM-SM-8 00	150207	2020/4/10
6	Test Cable	EMCI	EEMC104-SM-SM-3000	151205	2020/4/10
7	MXE EMI Receiver	Agilent	N9038A	MY55420127	2020/3/24
8	Signal Analyzer	Agilent	N9010A	MY52220990	2020/4/15
9	Loop Ant	EMCO	6502	274	2019/7/5
10	Horm Ant	SCHWARZBE CK	BBHA 9120D	9120D-1342	2020/5/1
11	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	9168-548	2020/3/20
12	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0623	2020/3/20

20 dB Spectrum Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100129	2020/5/22

Timing Testing					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100129	2020/5/22

Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

8. EUT TEST PHOTO

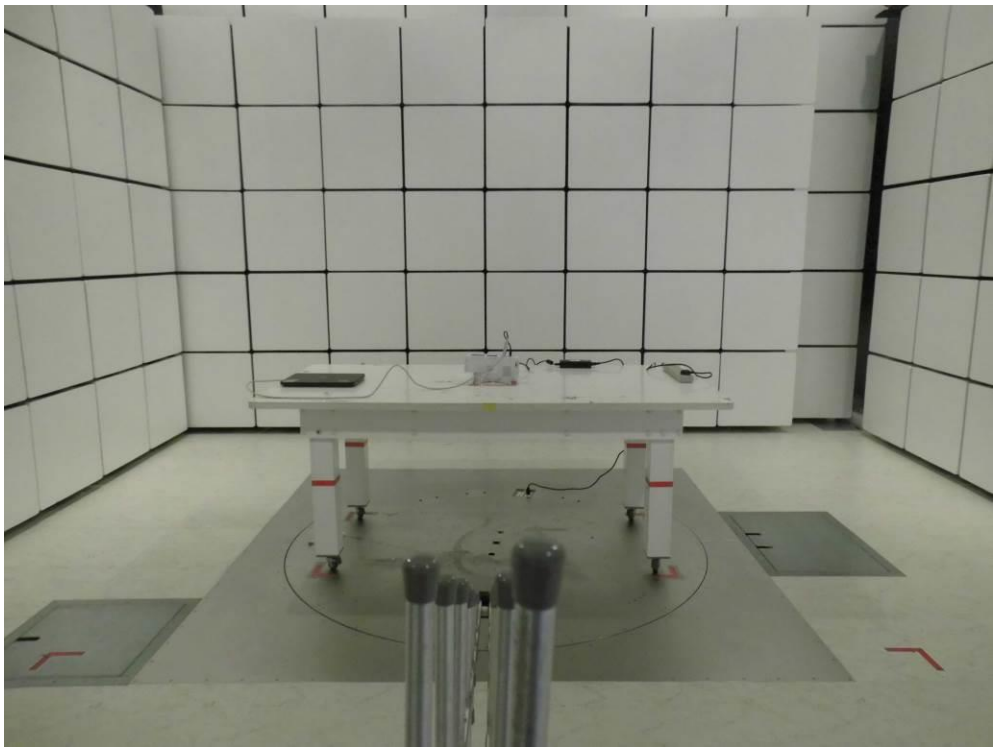
Conducted Measurement Photos

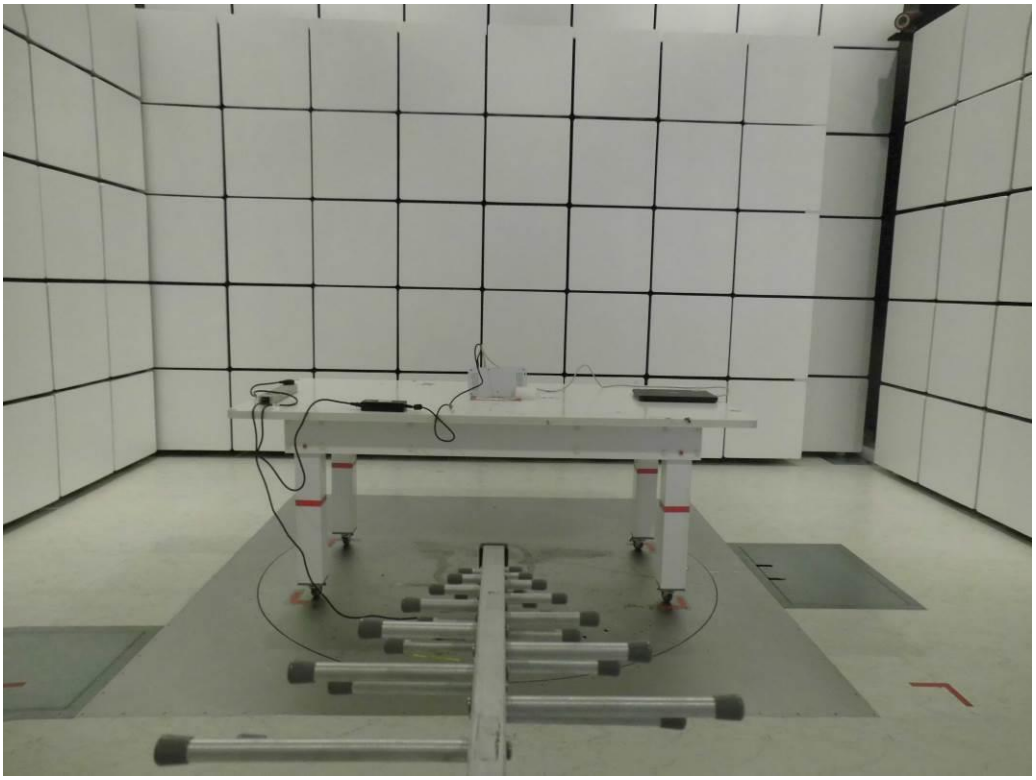
Radiated Measurement Photos

9 kHz to 30 MHz

Radiated Measurement Photos

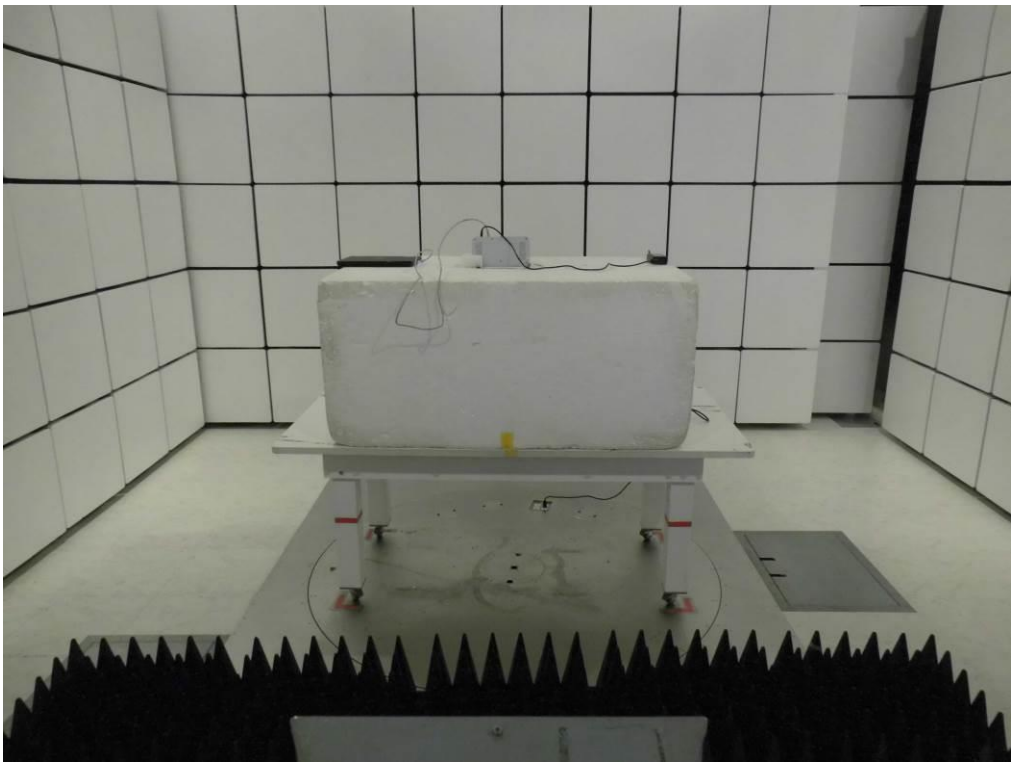
30 MHz to 1000 MHz

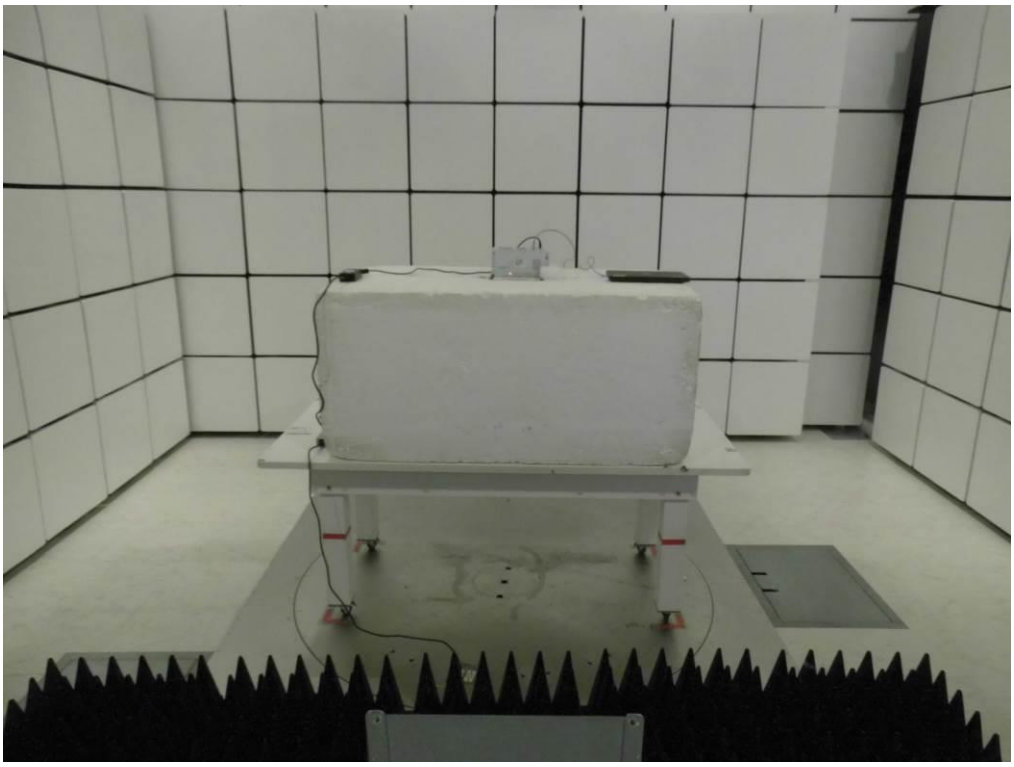




Radiated Measurement Photos

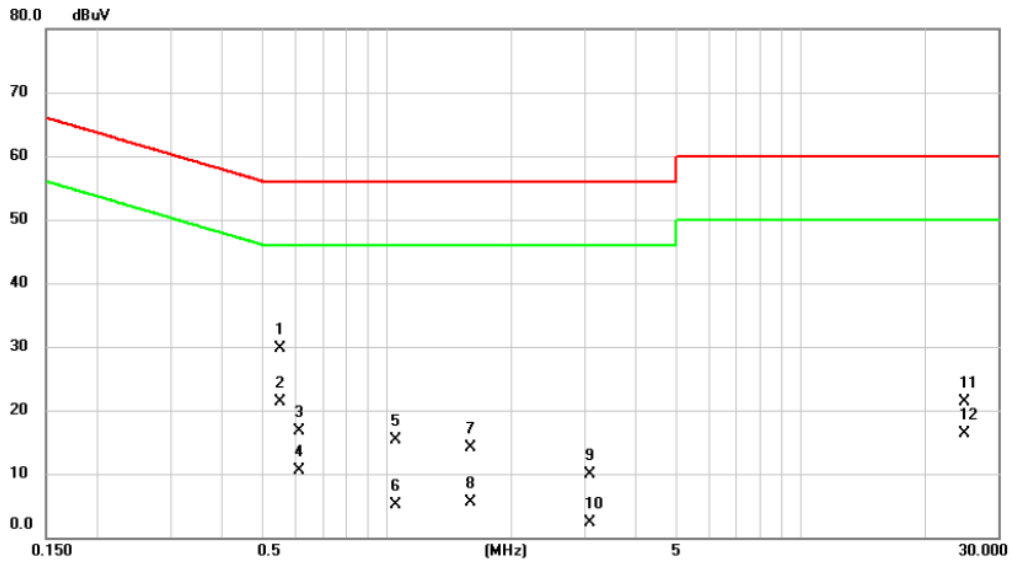
Above 1000 MHz





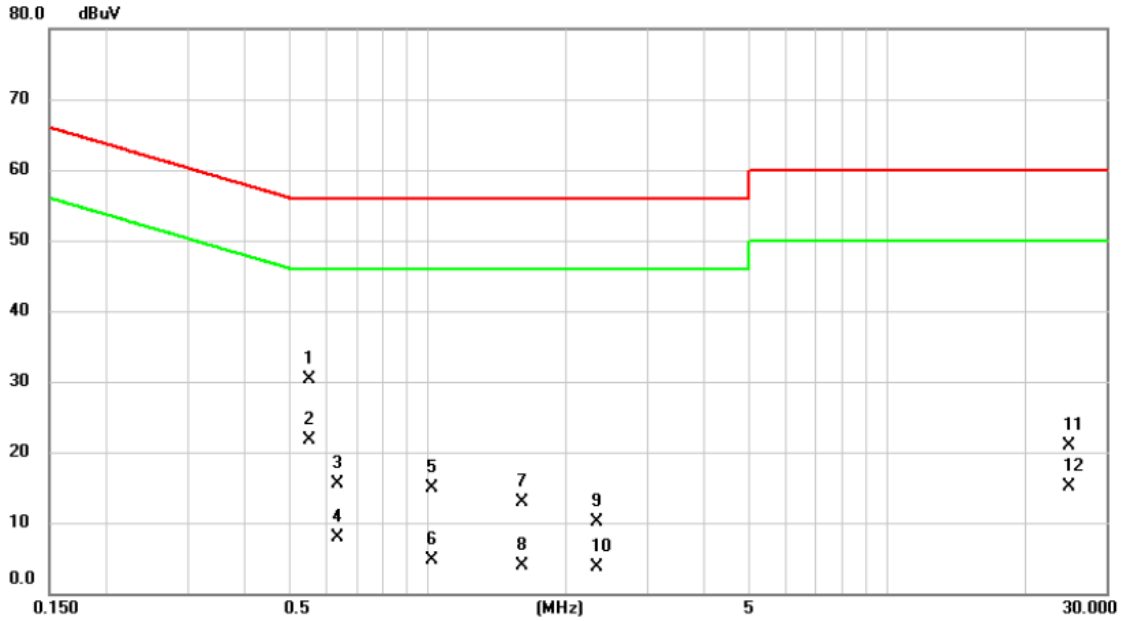
APPENDIX A - CONDUCTED EMISSION

Test Mode	Normal	Phase	Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.5527	29.64	0.02	29.66	56.00	-26.34	QP	
2	*	0.5527	21.19	0.02	21.21	46.00	-24.79	AVG	
3		0.6134	16.70	0.03	16.73	56.00	-39.27	QP	
4		0.6134	10.48	0.03	10.51	46.00	-35.49	AVG	
5		1.0500	15.17	0.05	15.22	56.00	-40.78	QP	
6		1.0500	4.96	0.05	5.01	46.00	-40.99	AVG	
7		1.5945	14.01	0.07	14.08	56.00	-41.92	QP	
8		1.5945	5.34	0.07	5.41	46.00	-40.59	AVG	
9		3.0953	9.87	0.13	10.00	56.00	-46.00	QP	
10		3.0953	2.14	0.13	2.27	46.00	-43.73	AVG	
11		24.9427	21.09	0.27	21.36	60.00	-38.64	QP	
12		24.9427	16.03	0.27	16.30	50.00	-33.70	AVG	

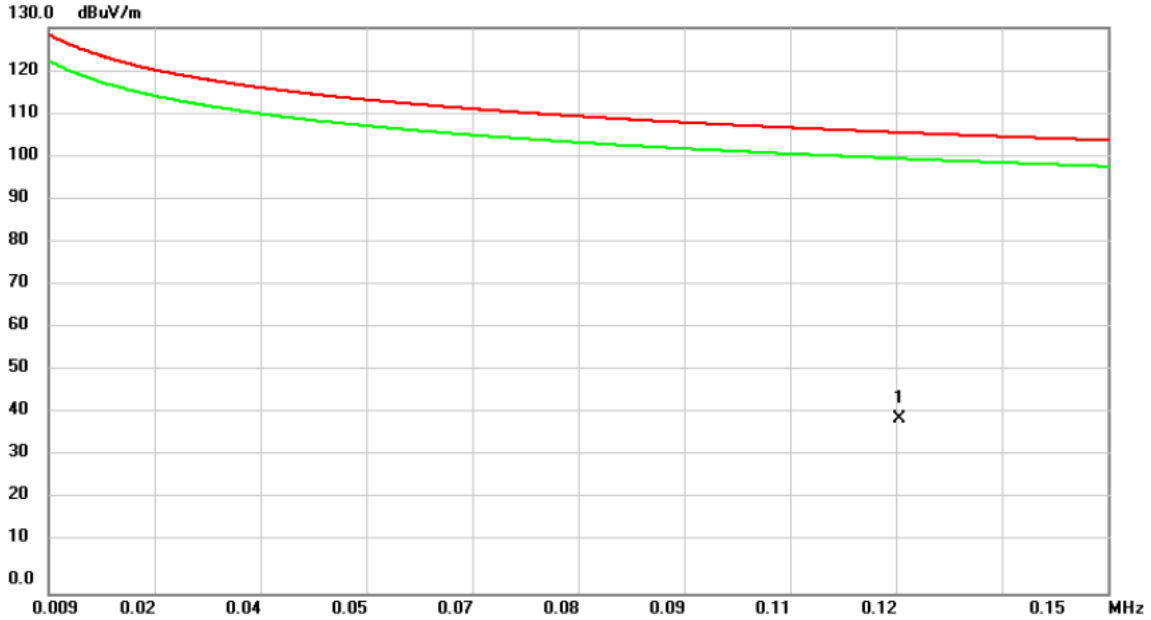
Test Mode	Normal	Phase	Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.5527	30.30	0.02	30.32	56.00	-25.68	QP	
2	*	0.5527	21.76	0.02	21.78	46.00	-24.22	AVG	
3		0.6360	15.47	0.03	15.50	56.00	-40.50	QP	
4		0.6360	7.81	0.03	7.84	46.00	-38.16	AVG	
5		1.0230	14.86	0.05	14.91	56.00	-41.09	QP	
6		1.0230	4.71	0.05	4.76	46.00	-41.24	AVG	
7		1.6103	12.82	0.07	12.89	56.00	-43.11	QP	
8		1.6103	3.81	0.07	3.88	46.00	-42.12	AVG	
9		2.3348	10.08	0.10	10.18	56.00	-45.82	QP	
10		2.3348	3.66	0.10	3.76	46.00	-42.24	AVG	
11		24.9450	20.68	0.27	20.95	60.00	-39.05	QP	
12		24.9450	14.80	0.27	15.07	50.00	-34.93	AVG	

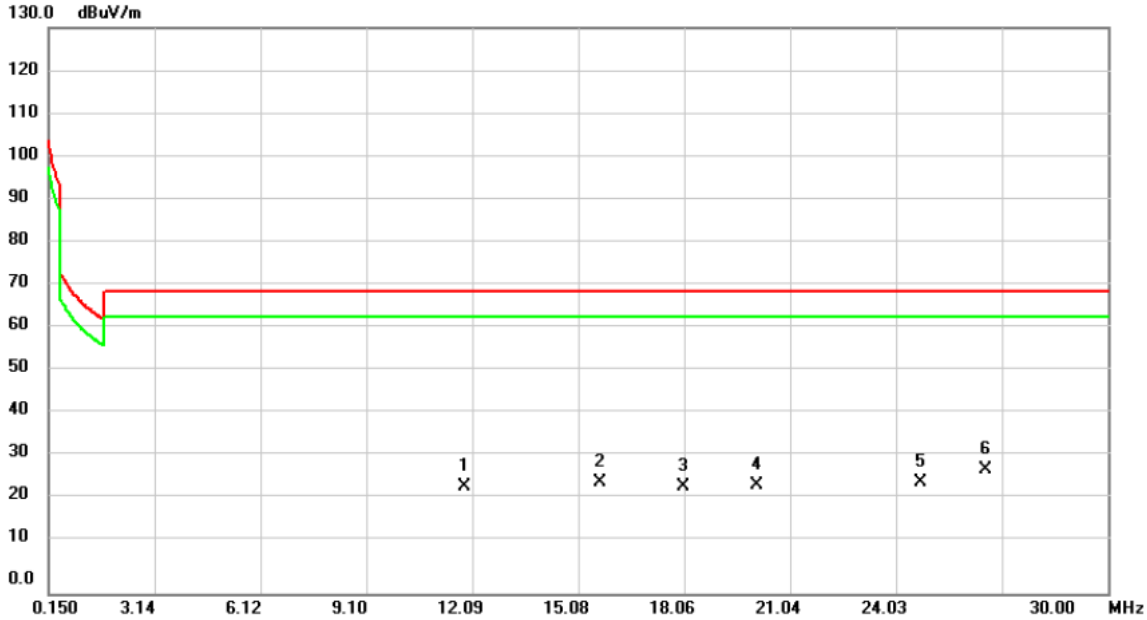
APPENDIX B - RADIATED EMISSION (9 KHZ TO 30 MHZ)

Test Mode	TX CH 433.92 MHz	Azimuth Angle	90°



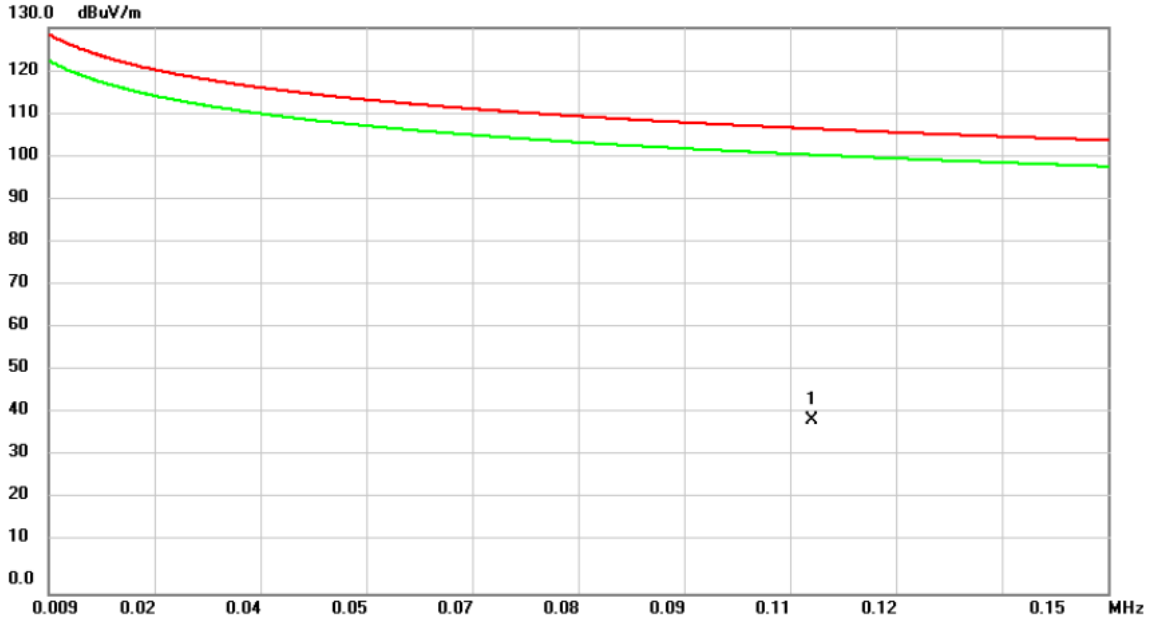
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.1222	25.29	15.01	40.30	105.86	-65.56	AVG	

Test Mode	TX CH 433.92 MHz	Azimuth Angle	90°



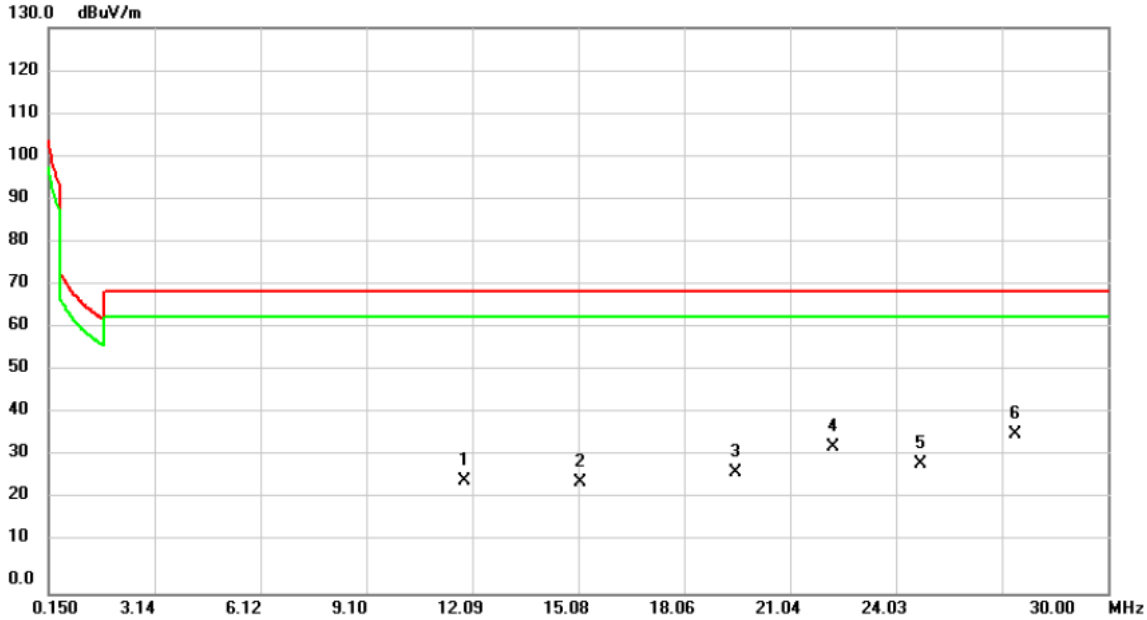
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11.8811	29.02	-4.41	24.61	69.54	-44.93	QP	
2		15.7020	30.20	-4.77	25.43	69.54	-44.11	QP	
3		18.0600	30.44	-5.74	24.70	69.54	-44.84	QP	
4		20.1197	30.85	-6.01	24.84	69.54	-44.70	QP	
5		24.7463	33.52	-7.97	25.55	69.54	-43.99	QP	
6	*	26.5673	36.29	-7.89	28.40	69.54	-41.14	QP	

Test Mode	TX CH 433.92 MHz	Azimuth Angle	0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.1107	24.29	15.66	39.95	106.72	-66.77	AVG	

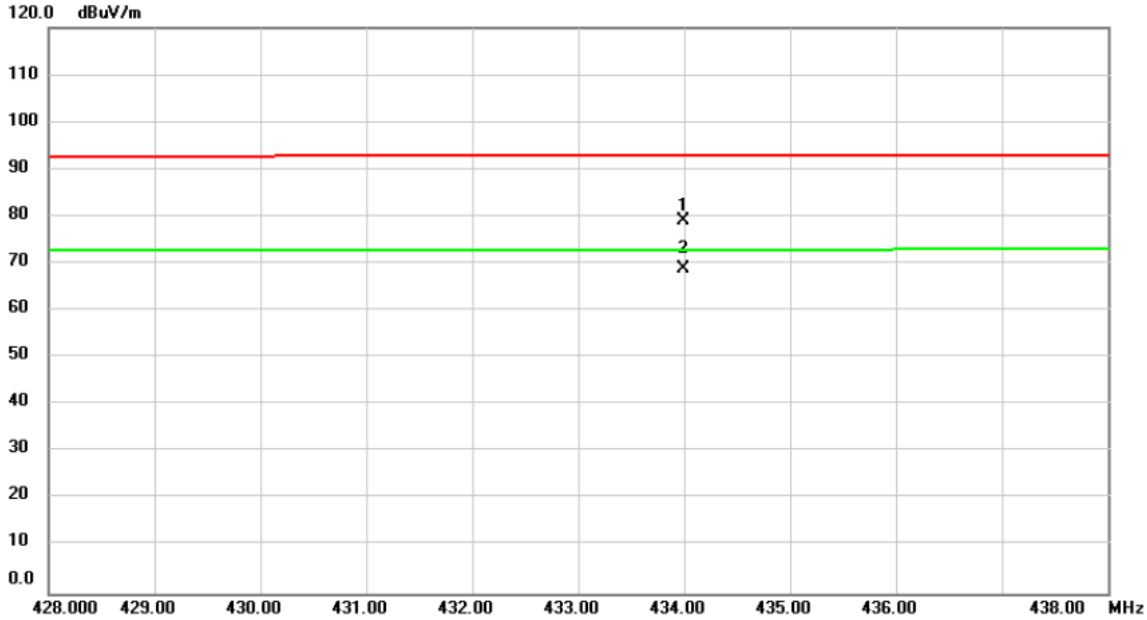
Test Mode	TX CH 433.92 MHz	Azimuth Angle	0°



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		11.8512	30.14	-4.41	25.73	69.54	-43.81	QP	
2		15.1347	30.10	-4.61	25.49	69.54	-44.05	QP	
3		19.5226	33.77	-5.97	27.80	69.54	-41.74	QP	
4		22.2690	39.98	-6.24	33.74	69.54	-35.80	QP	
5		24.7463	37.74	-7.97	29.77	69.54	-39.77	QP	
6	*	27.3732	43.69	-7.25	36.44	69.54	-33.10	QP	

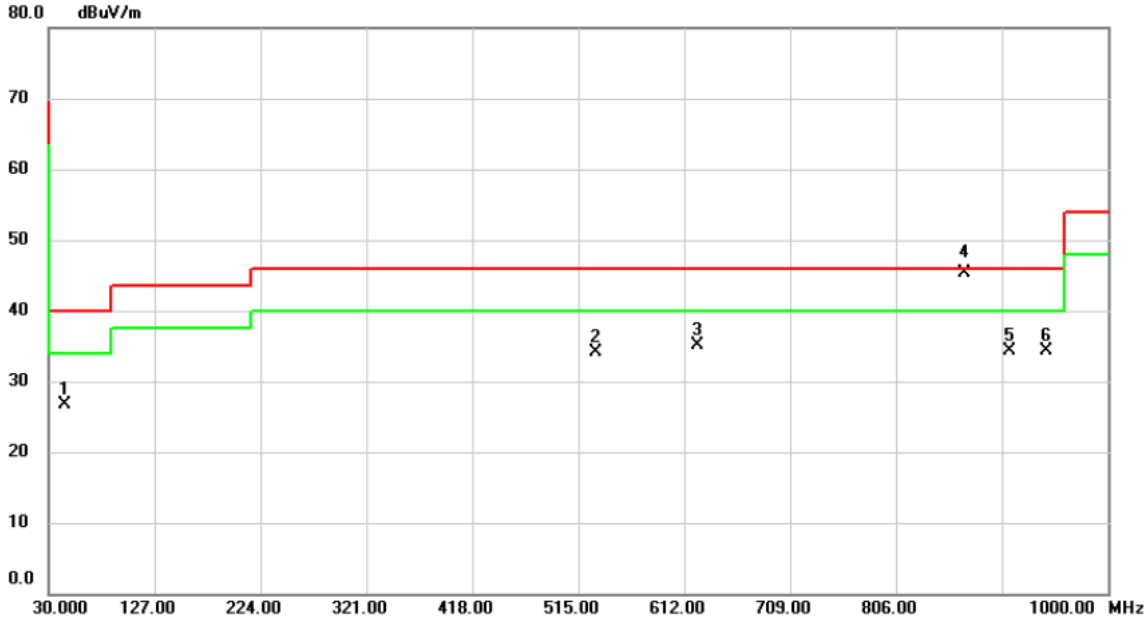
APPENDIX C - RADIATED EMISSION (30 MHZ TO 1000 MHZ)

Test Mode	TX CH 433.92 MHz	Polarization	Vertical



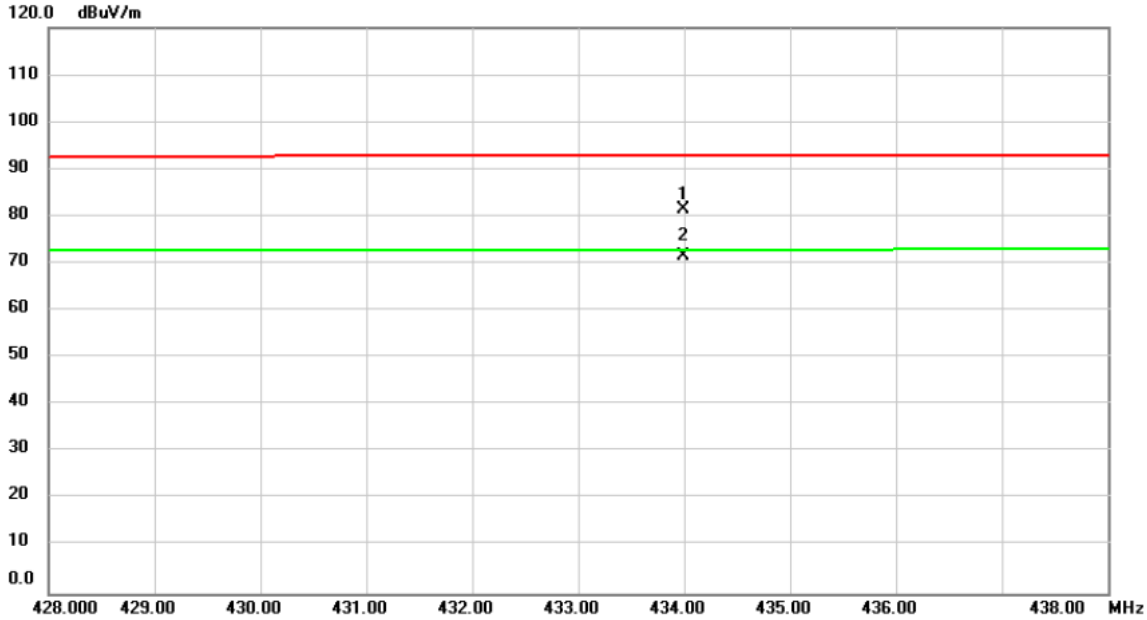
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		433.9900	55.08	23.95	79.03	92.83	-13.80	peak	
2	*	433.9900	45.04	23.95	68.99	72.83	-3.84	AVG	

Test Mode	TX CH 433.92 MHz	Polarization	Vertical



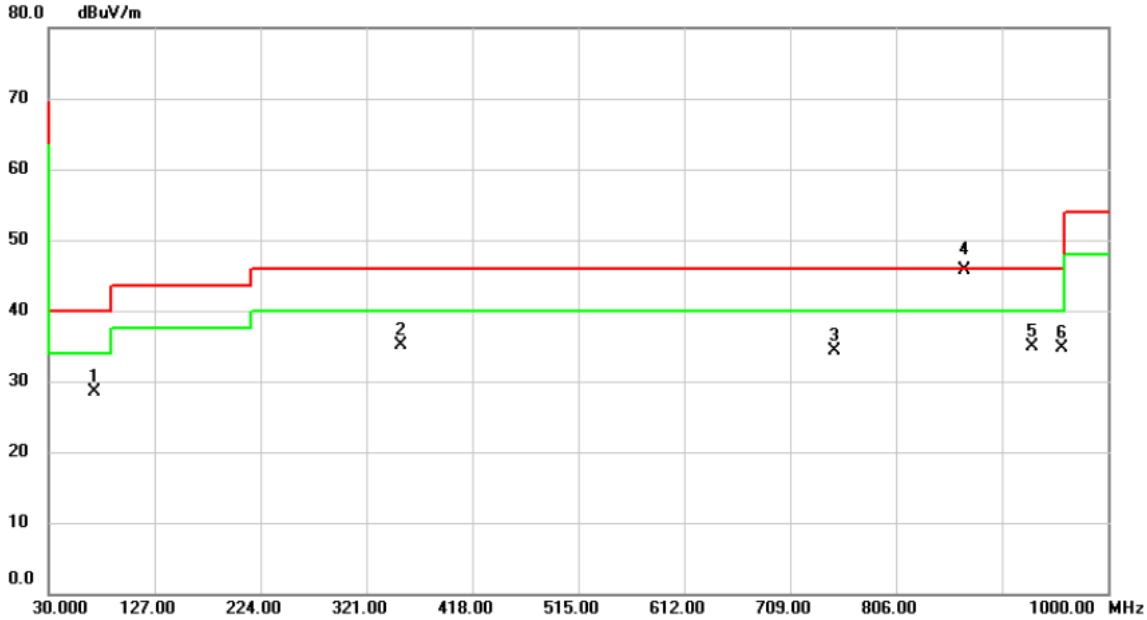
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		44.5500	35.01	-8.25	26.76	40.00	-13.24	peak	
2		530.5200	36.45	-2.37	34.08	46.00	-11.92	peak	
3		624.6100	35.19	-0.11	35.08	46.00	-10.92	peak	
4	*	868.0800	41.06	4.34	45.40	46.00	-0.60	QP	
5		909.7900	29.16	5.15	34.31	46.00	-11.69	peak	
6		943.7400	28.67	5.69	34.36	46.00	-11.64	peak	

Test Mode	TX CH 433.92 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		433.9900	57.52	23.95	81.47	92.83	-11.36	peak	
2	*	433.9900	47.48	23.95	71.43	72.83	-1.40	AVG	

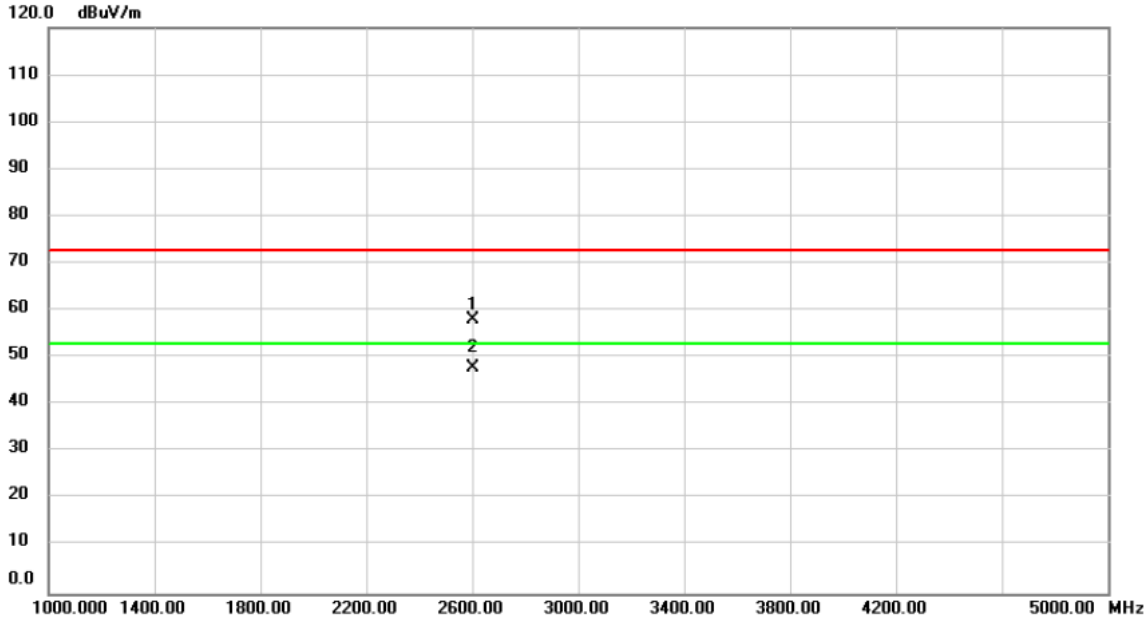
Test Mode	TX CH 433.92 MHz	Polarization	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		71.7100	39.59	-11.01	28.58	40.00	-11.42	peak	
2		352.0400	41.33	-6.16	35.17	46.00	-10.83	peak	
3		749.7400	32.09	2.31	34.40	46.00	-11.60	peak	
4	*	868.0800	41.44	4.34	45.78	46.00	-0.22	QP	
5		930.1600	29.40	5.47	34.87	46.00	-11.13	peak	
6		958.2900	28.76	5.86	34.62	46.00	-11.38	peak	

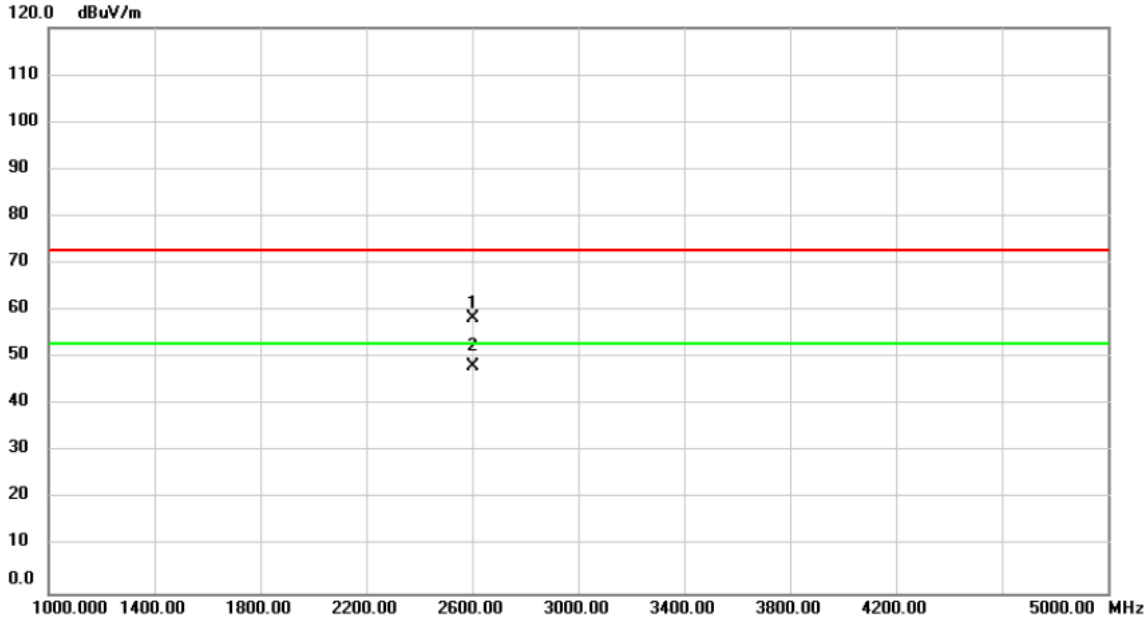
APPENDIX D - RADIATED EMISSION (ABOVE 1000 MHZ)

Test Mode	TX CH 433.92 MHz	Polarization	Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2604.000	74.06	-16.13	57.93	72.83	-14.90	peak	
2	*	2604.000	64.02	-16.13	47.89	52.83	-4.94	AVG	

Test Mode	TX CH 433.92 MHz	Polarization	Horizontal



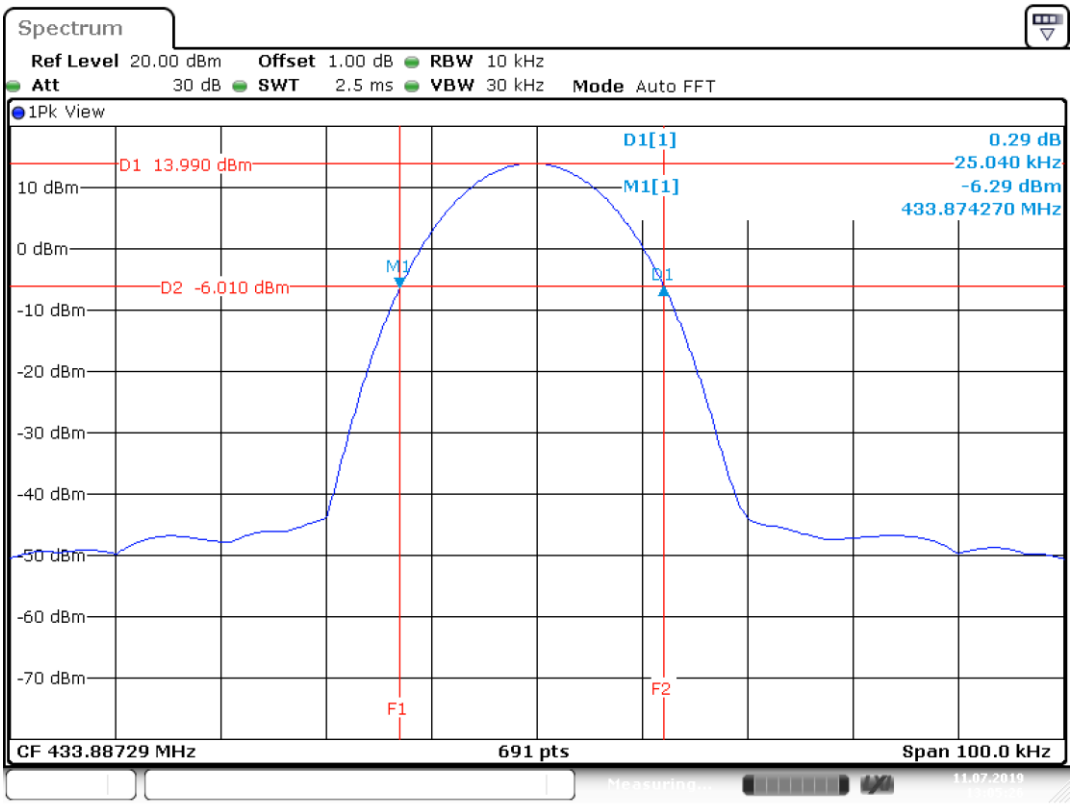
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2604.000	74.37	-16.13	58.24	72.83	-14.59	peak	
2	*	2604.000	64.33	-16.13	48.20	52.83	-4.63	AVG	

APPENDIX E – 20 dB SPECTRUM BANDWIDTH

Test Mode:	TX CH 433.92 MHz

Frequency (MHz)	20 dB Bandwidth (kHz)	20 dB BW Limits (MHz)
433.92	25.040	1.0848

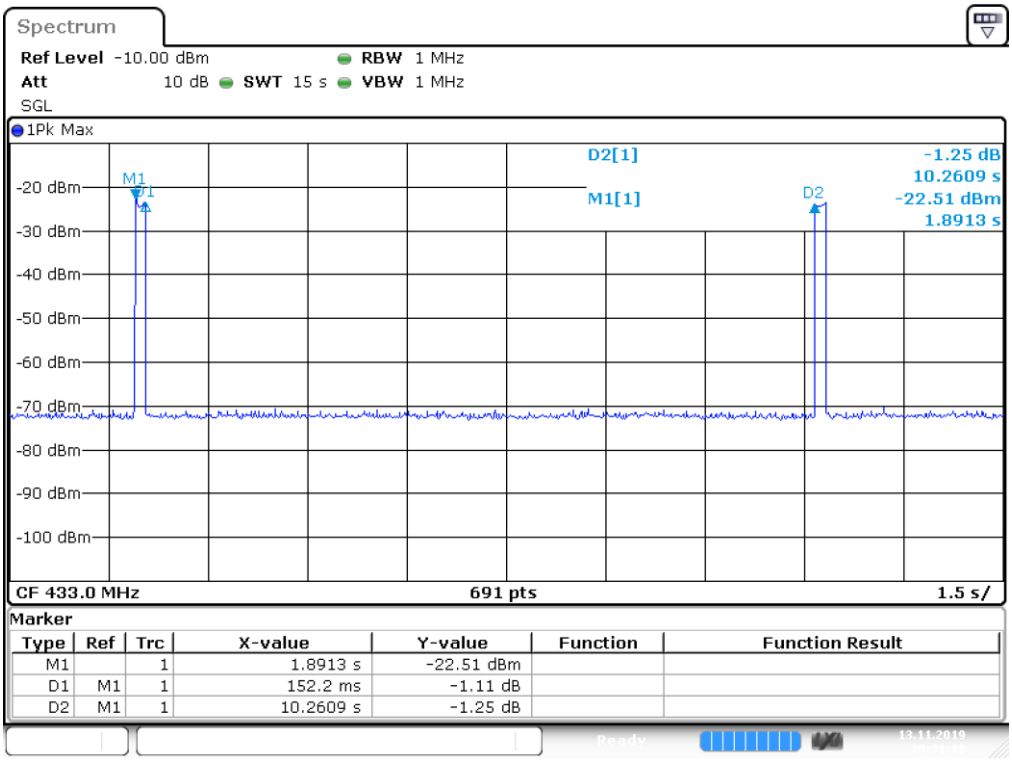
TX CH01



Date: 11.JUL.2019 13:05:26

APPENDIX F - TIMING TESTING

Test Mode:	TX CH 433.92 MHz



Date: 13.NOV.2019 10:31:18

End of Test Report