FCC Radio Test Report

FCC ID: 2AC9W-CMC303

This report concerns: Original Grant

Project No.	:	1907C163
Equipment	:	UHF Module
Brand Name	:	CMCID
Test Model	:	CMC303
Series Model	:	N/A
Applicant	:	FUTAIHUA INDUSTRIAL (SHENZHENG) CO.,LTD.
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Address	:	B District,Foxconn Technology Park,Guanlan Town,Baoan,Shenzhen,Guangdong,China
Date of Receipt	:	Jul. 22, 2019
Date of Test	:	Jul. 22, 2019 ~ Oct. 14, 2019
Issued Date	:	Nov. 26, 2019
Report Version	:	R02
Test Sample	:	Engineering Sample No.: DG190723120-4 for Conducted, DG190723120-9 for Radiated.
Standard(s)	:	FCC Part15, Subpart C (15.247) ANSI C63.10-2013 KDB 558074 D01 15.247 Meas Guidance v05r02

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

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.	Oct. 16, 2019
R01	Updated the test photo.	Nov. 15, 2019
R02	Modified the comments of TCB.	Nov. 26, 2019

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.247)				
Standard(s) Section	**Test Item**	**Test Result**	**Judgment**	**Remark**
15.207	AC Power Line Conducted Emissions	APPENDIX A	PASS	------
15.247(d) 15.205(a) 15.209(a)	Radiated Emission	APPENDIX B APPENDIX C APPENDIX D	PASS	------
15.247(a)(1)(i)	Number of Hopping Frequency	APPENDIX E	PASS	------
15.247(a)(1)(i)	Average Time Of Occupancy	APPENDIX F	PASS	------
15.247(a)(1)	Hopping Channel Separation	APPENDIX G	PASS	------
15.247(a)(1)(i)	Bandwidth	APPENDIX H	PASS	------
15.247(b)(2)	Maximum Output Power	APPENDIX I	PASS	------
15.247(d)	Conducted Spurious Emission	APPENDIX J	PASS	------
15.203	Antenna Requirement	------	PASS	Note(2)

Note:

(1) “N/A” denotes test is not applicable in this test report

(2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China
BTL's Test Firm Registration Number for FCC: 357015
BTL's Designation Number for FCC: CN1240

1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))
The BTL measurement uncertainty as below table:

A. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	9kHz ~ 30MHz	V	3.79
		9kHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80
		1GHz ~ 6GHz	-	4.58
		6GHz ~ 18GHz	-	5.18
		18GHz ~ 26.5GHz	-	3.80
		26.5GHz ~ 40GHz	-	4.30

B. Other Measurement:

Test Item	Uncertainty
Conducted Spurious Emission	2.67 dB
Hopping Channel Separation	53.46 MHz
Output Power	0.95 dB
Number of Hopping Frequency	53.46 MHz
Temperature	0.08 °C
Humidity	1.5%

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	25°C	53%	DC 3.7V	Damon Deng
Radiated Emissions-9K-30MHz	25°C	60%	DC 3.7V	Damon Deng
Radiated Emissions-30 MHz to 1GHz	25°C	60%	DC 3.7V	Sheldon Ou
Radiated Emissions-Above 1000 MHz	24℃	68%	DC 3.7V	Sheldon Ou
Number of Hopping Frequency	24°C	60%	DC 3.7V	Jonas Chen
Average Time Of Occupancy	24°C	60%	DC 3.7V	Jonas Chen
Hopping Channel Separation	24°C	60%	DC 3.7V	Jonas Chen
Bandwidth	24°C	60%	DC 3.7V	Jonas Chen
Maximum Output Power	24°C	60%	DC 3.7V	Jonas Chen
Conducted Spurious Emission	24°C	60%	DC 3.7V	Jonas Chen

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	UHF Module
Brand Name	CMCID
Test Model	CMC303
Series Model	N/A
Model Difference(s)	N/A
Power Source	DC voltage supplied from external power supply.
Power Rating	DC 3.7V
Operation Frequency Bands	902 MHz ~ 928MHz
Modulation Type	ASK
Transfer Rate	62.5bps
Max. Output Power	16.48 dBm (0.0445 W)

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)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	902.75	17	911.25	34	919.75
01	903.25	18	911.75	35	920.25
02	903.75	19	912.25	36	920.75
03	904.25	20	912.75	37	921.25
04	904.75	21	913.25	38	921.75
05	905.25	22	913.75	39	922.25
06	905.75	23	914.25	40	922.75
07	906.25	24	914.75	41	923.25
08	906.75	25	915.25	42	923.75
09	907.25	26	915.75	43	924.25
10	907.75	27	916.25	44	924.75
11	908.25	28	916.75	45	925.25
12	908.75	29	917.25	46	925.75
13	909.25	30	917.75	47	926.25
14	909.75	31	918.25	48	926.75
15	910.25	32	918.75	49	927.25
16	910.75	33	919.25		

3. Table for Filed Antenna:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Ceramic	N/A	4

2.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX Mode **NOTE (1)**
Mode 2	TX Mode Channel 25

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test	
Final Test Mode	Description
Mode 2	TX Mode Channel 25

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 2	TX Mode Channel 25

Radiated emissions test - Above 1GHz	
Final Test Mode	Description
Mode 1	TX Mode **NOTE (1)**

Conducted test	
Final Test Mode	Description
Mode 1	TX Mode **NOTE (1)**

Note:

(1) The measurements are performed at the high, middle, low available channels.

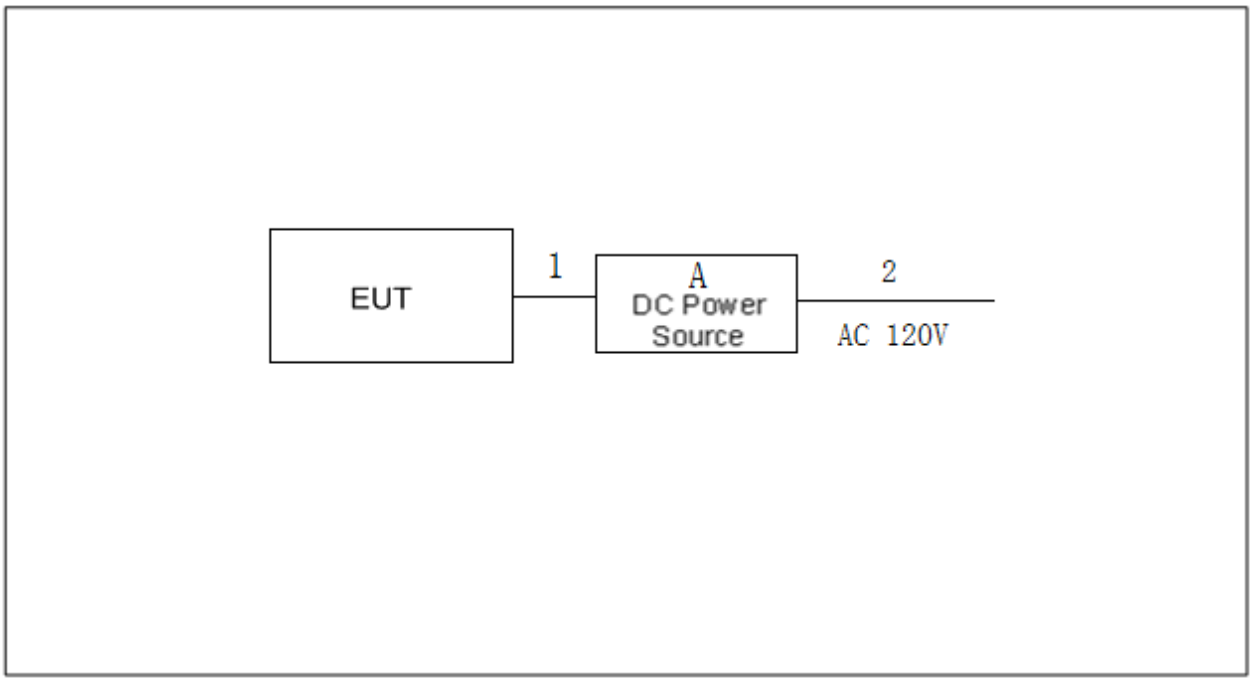
2.3 PARAMETERS OF TEST SOFTWARE

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of FHSS

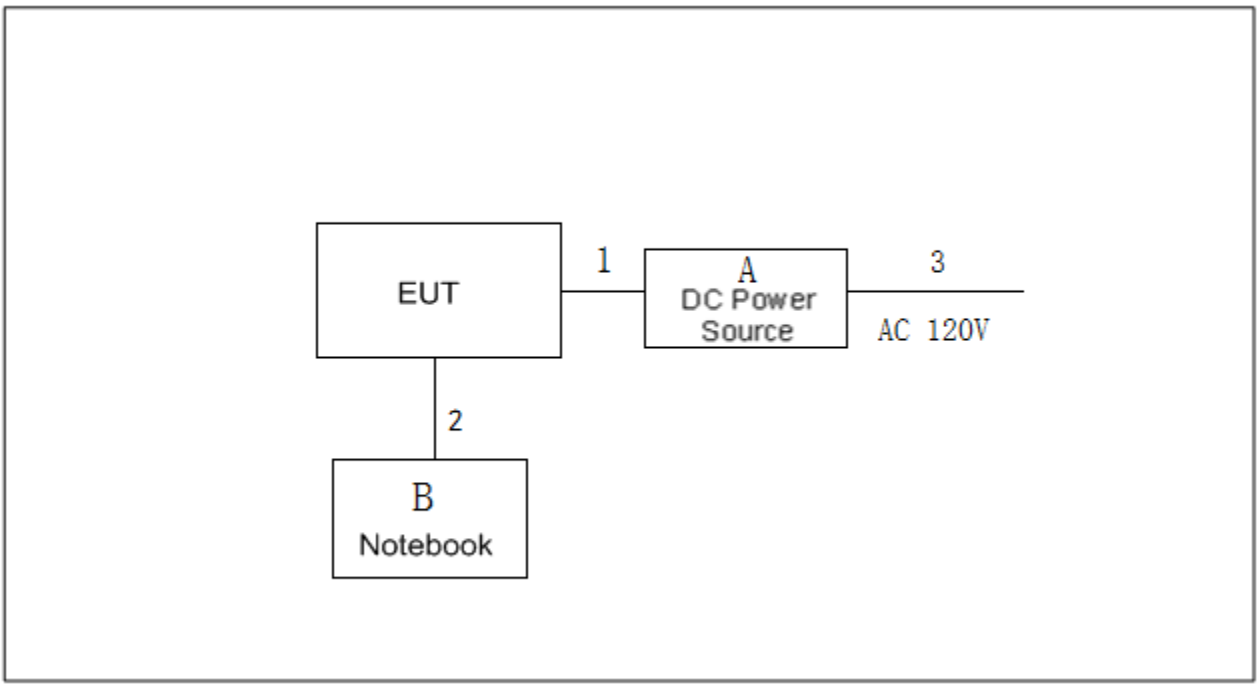
Test Software	RED Utility_v2.5.3_BETA7		
Frequency (MHz)	902.75	915.25	927.25
Parameters	8	10	10

2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

For AC power line conducted emissions test



For Radiated emissions test



2.5 SUPPORT UNITS

For AC power line conducted emissions test

Item	Equipment	Brand	Model No.	Series No.
A	DC Power source	GW Instek	GPC-3030DN	EK880675

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	Data Cable	NO	NO	1m
2	AC Cable	NO	NO	1.5m

For Radiated emissions test

Item	Equipment	Brand	Model No.	Series No.
A	DC Power source	GW Instek	GPC-3030DN	EK880675
B	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	0.3m
2	Data Cable	NO	NO	1m
3	AC Cable	NO	NO	1.5m

3. AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

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

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

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

3.2 TEST PROCEDURE

a. The EUT was placed 0.8 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 ground plane 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.

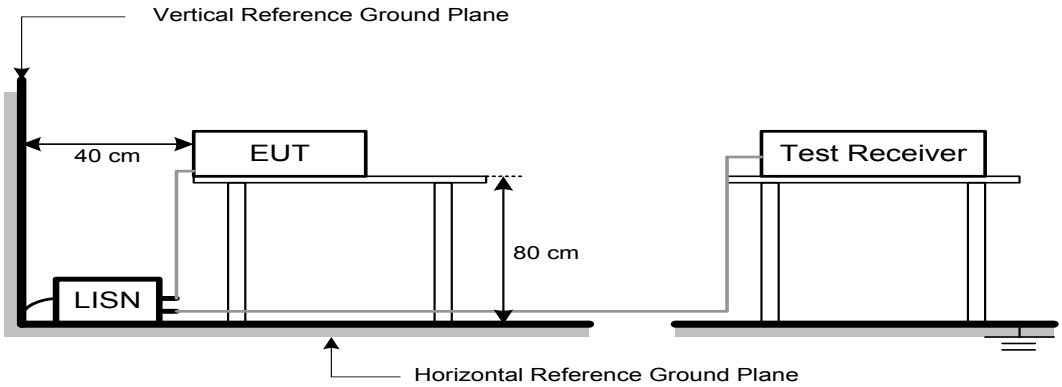
d. LISN at least 80 cm from nearest part of EUT chassis.

e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 DEVIATION FROM TEST STANDARD

No deviation

3.4 TEST SETUP



3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting data or hopping on mode.

3.6 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.

4. RADIATED EMISSION TEST

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.
LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

Frequency (MHz)	Field Strength (microvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	Band edge/ Harmonic at 3m (dBμV/m)		Harmonic at 1.5m (dBμV/m)	
	Peak	Average	Peak	Average
Above 1000	74	54	80 (Note 4)	60 (Note 4)

Note:
(1) The limit for radiated test was performed according to FCC PART 15C.
(2) The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	RBW 1 MHz VBW 3 MHz peak detector for Pk value RMS detector for AV value

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~1000 MHz for QP detector

4.2 TEST PROCEDURE

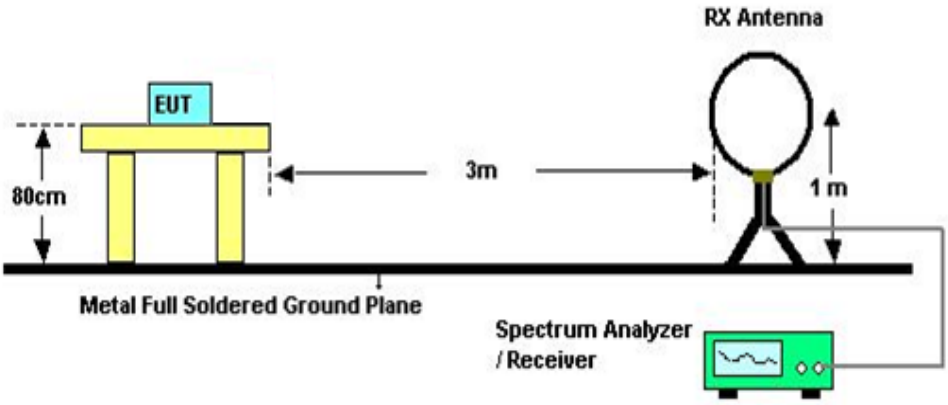
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
b. The measuring distance 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 0.8m or 1.5m; 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.

4.3 DEVIATION FROM TEST STANDARD

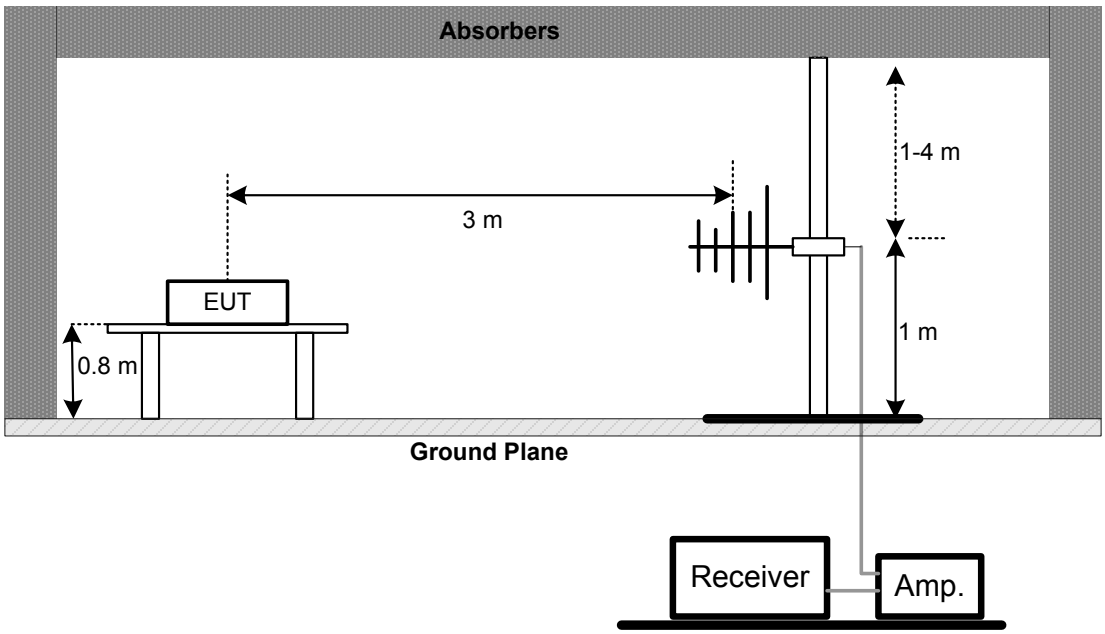
No deviation

4.4 TEST SETUP

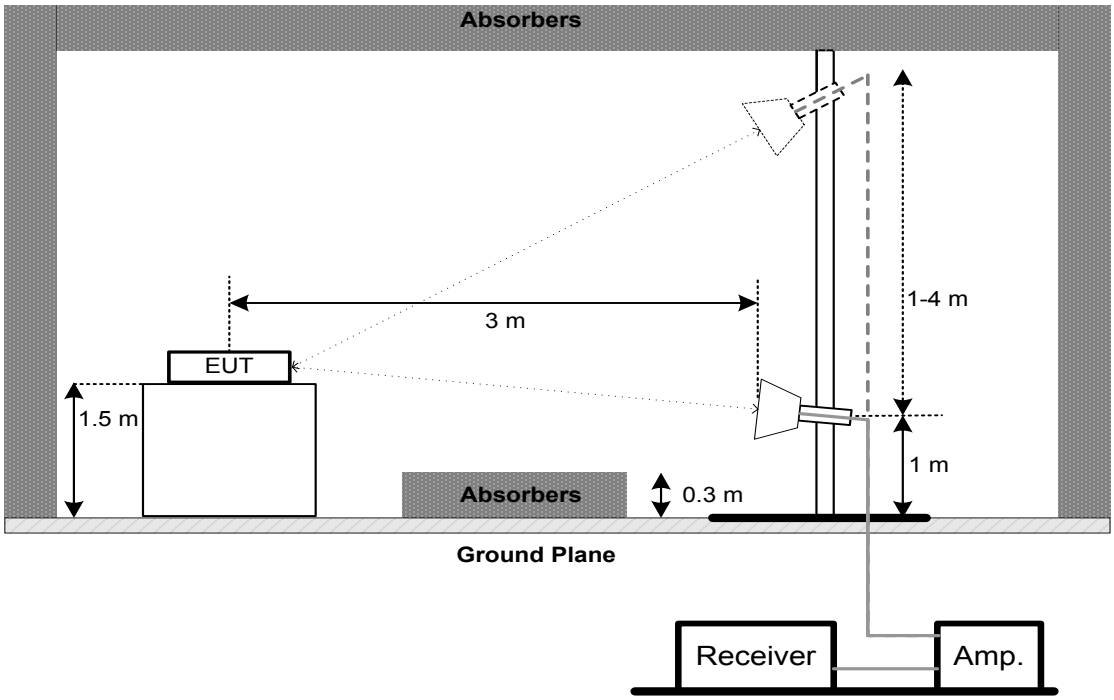
9 kHz-30 MHz



30 MHz to 1 GHz



Above 1 GHz



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULTS - 9 kHz TO 30 MHz

Please refer to the APPENDIX B

Remark:

(1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(2) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.7 TEST RESULTS - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

4.8 TEST RESULTS - ABOVE 1000 MHz

Please refer to the APPENDIX D.

Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. NUMBER OF HOPPING FREQUENCY

5.1 LIMIT

FCC Part15, Subpart C (15.247)	
Section	Test Item
15.247(a)(1)(i)	Number of Hopping Frequency

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

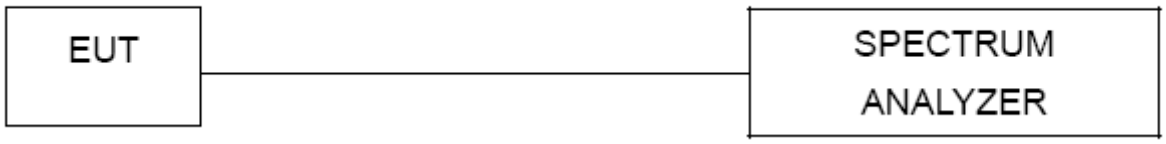
5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW=100 kHz, VBW=300 kHz, Sweep time = Auto.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Please refer to the APPENDIX E

6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

FCC Part15, Subpart C (15.247)		
Section	Test Item	Limit
15.247(a)(1)(i)	Average Time of Occupancy	0.4sec

6.2 TEST PROCEDURE

a. The transmitter output (antenna port) was connected to the spectrum analyzer
b. Set RBW of spectrum analyzer to 300 kHz and VBW to 1 MHz
c. Use a video trigger with the trigger level set to enable triggering only on full pulses
d. Sweep Time is more than once pulse time
e. Set the center frequency on any frequency would be measure and set the frequency span to zero span
f. Measure the maximum time duration of one single pulse
g. Set the EUT for DH1 packet transmitting
h. Measure the maximum time duration of one single pulse

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP

6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

Please refer to the APPENDIX F

7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

7.2 TEST PROCEDURE

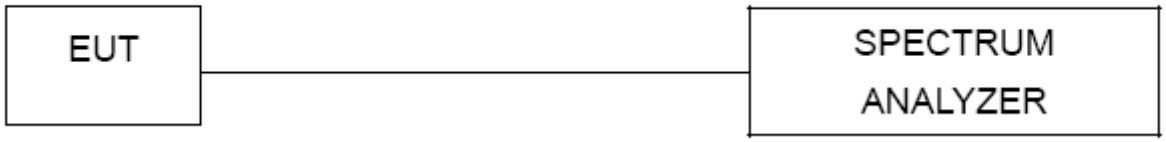
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

b. Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ RBW
Sweep = Auto
Detector function = Peak
Trace = Max Hold

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

Please refer to the APPENDIX G

8. BANDWIDTH TEST

8.1 LIMIT

FCC Part15, Subpart C (15.247)	
Section	Test Item
15.247(a)(1)(i)	20dB bandwidth

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth
RBW	3 kHz
VBW	10 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

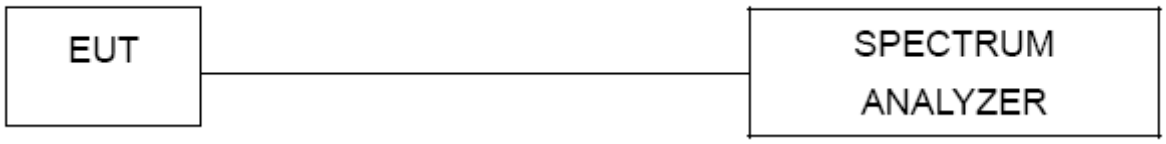
8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW= 3 kHz, VBW=10 kHz, Sweep Time = Auto.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

8.6 TEST RESULTS

Please refer to the APPENDIX H

9. MAXIMUM OUTPUT POWER

9.1 LIMIT

FCC Part15 , Subpart C (15.247)		
Section	Test Item	Limit
15.247(b)(2)	Maximum Output Power	1 Watt or 30 dBm

Note: For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

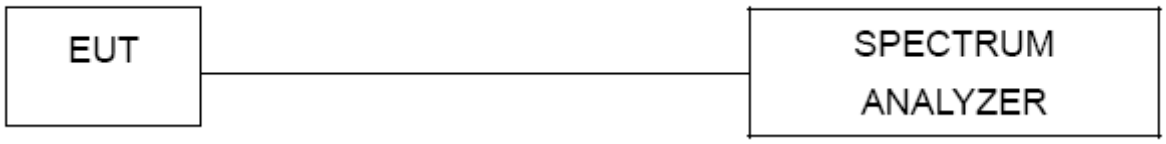
9.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW= 1 MHz/3 MHz, VBW= 1 MHz/3 MHz, Sweep time = Auto.

9.3 DEVIATION FROM STANDARD

No deviation.

9.4 TEST SETUP



9.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

9.6 TEST RESULTS

Please refer to the APPENDIX I

10. CONDUCTED SPURIOUS EMISSION

10.1 LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

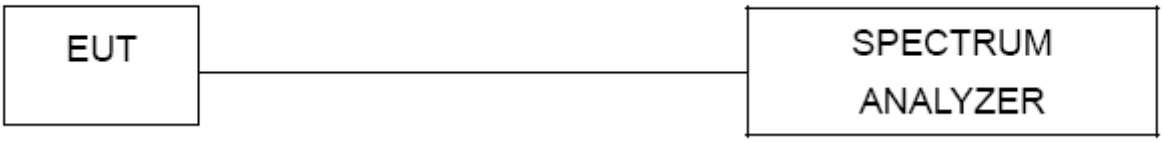
10.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting: RBW= 100 kHz, VBW=100 kHz, Sweep time = Auto.

10.3 DEVIATION FROM STANDARD

No deviation.

10.4 TEST SETUP



10.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

10.6 TEST RESULTS

Please refer to the APPENDIX J

11. MEASUREMENT INSTRUMENTS LIST

AC Power Line Conducted Emissions					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Mar. 10, 2020
2	LISN	EMCO	3816/2	52765	Mar. 10, 2020
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	May. 19, 2020
4	50Ω Terminator	SHX	TF5-3	15041305	Mar. 10, 2020
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 12, 2020

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Loop Antenna	EM	EM-6876-1	230	Jan. 15, 2020
2	Cable	N/A	RG 213/U	C-102	May 31, 2020
3	EMI Test Receiver	R&S	ESCI	100895	Mar. 10, 2020
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2020
2*	Amplifier	HP	8447D	2944A09673	Aug. 11, 2021
3	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
4	Cable	emci	LMR-400(30MHz-1GHz)(8m+5m)	N/A	May 24, 2020
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 09, 2020
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 23, 2020
3	Amplifier	Agilent	8449B	3008A02333	Mar. 10, 2020
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 10, 2020
5	Receiver	Agilent	N9038A	MY52130039	Aug. 03, 2020
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	mitron	B10-01-01-12M	18072744	Jun. 29, 2020
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Number of Hopping Frequency					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

Average Time of Occupancy					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

Hopping Channel Separation Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

Maximum Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

Antenna Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Aug. 03, 2020

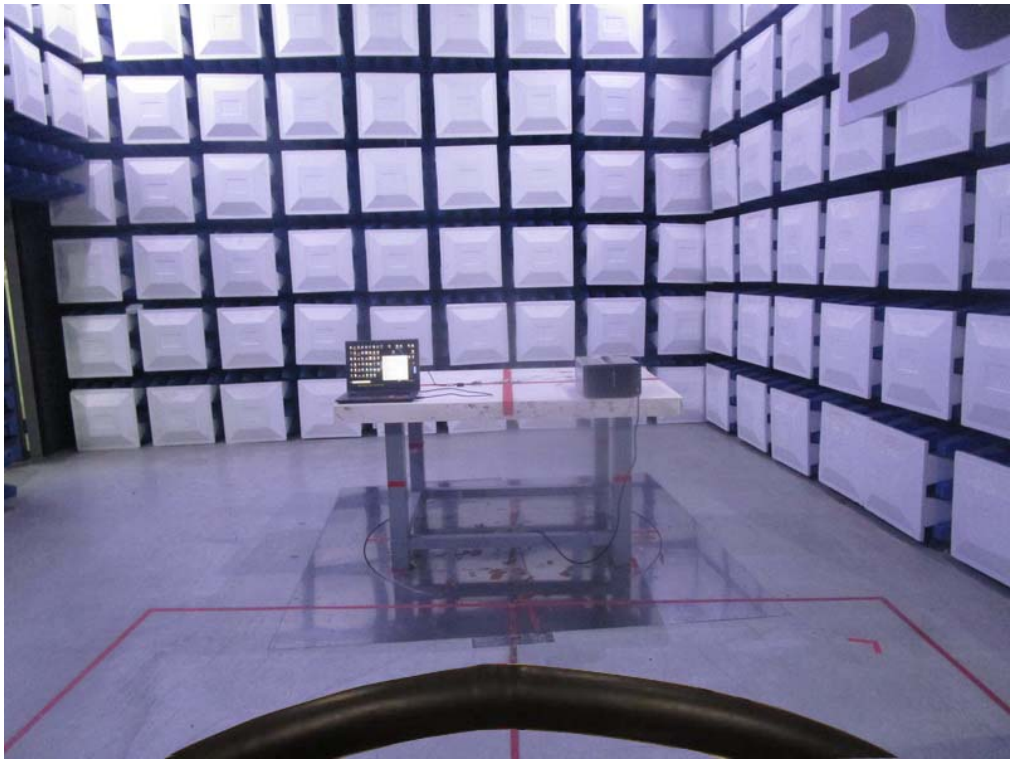
Remark "N/A" denotes no model name, serial no. or calibration specified.
"*" calibration period of equipment list is three year.
Except * item, all calibration period of equipment list is one year.

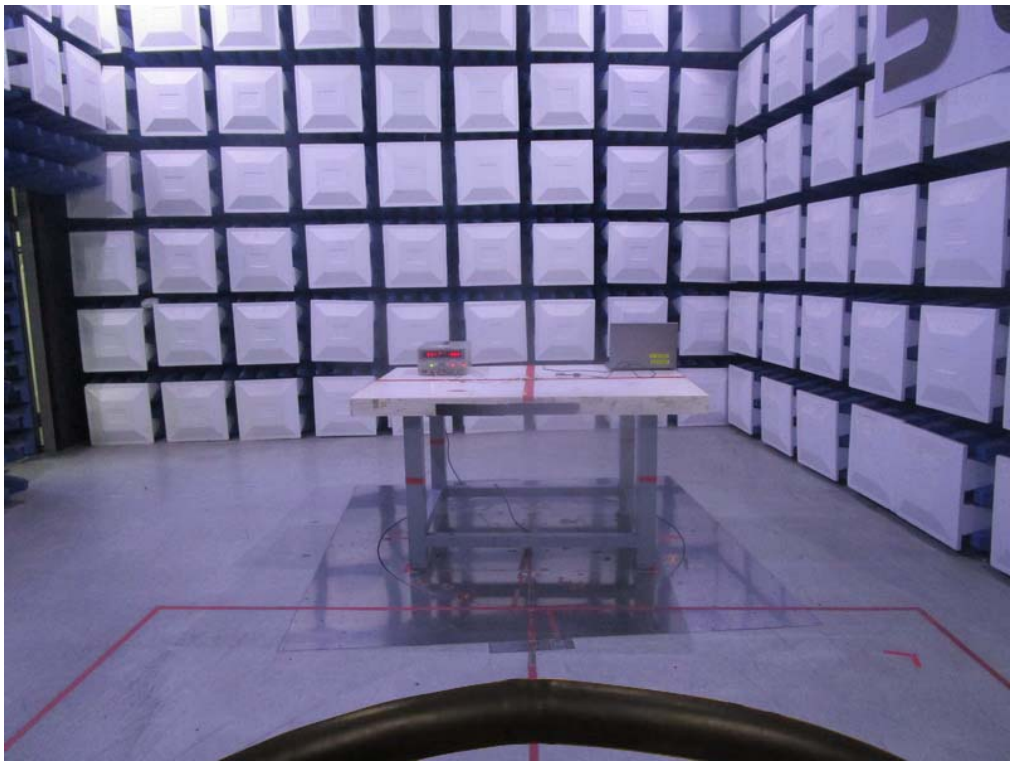
12. EUT TEST PHOTO

AC Power Line Conducted Emissions Test Photos

Radiated Emissions Test Photos

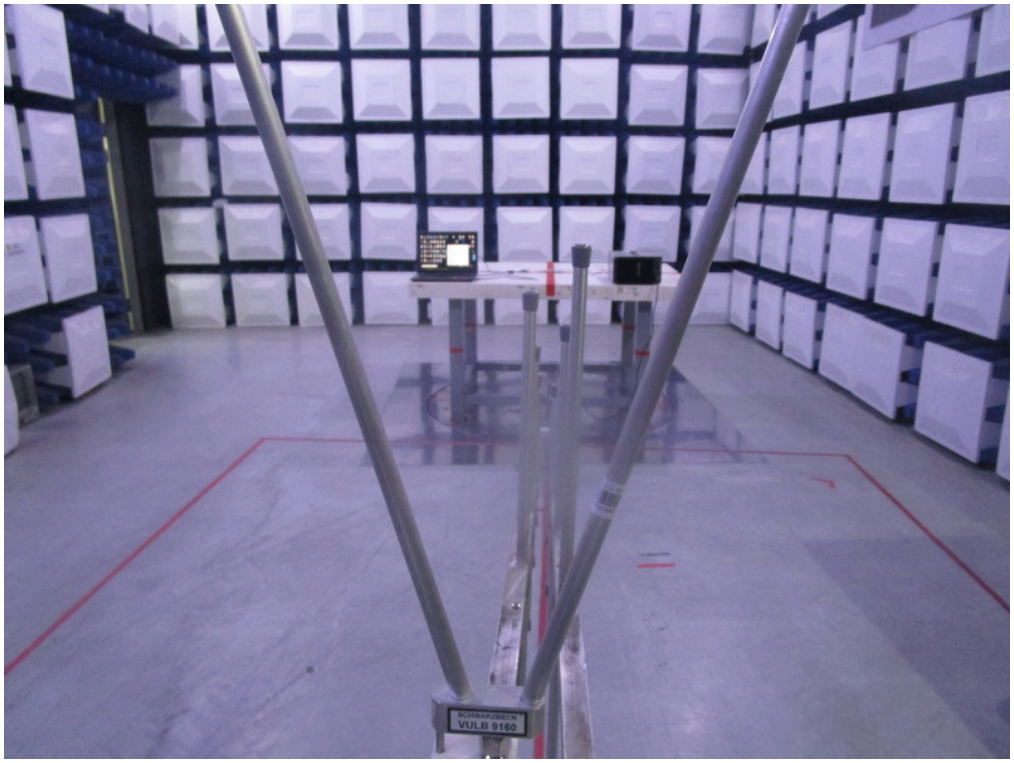
9 kHz to 30 MHz

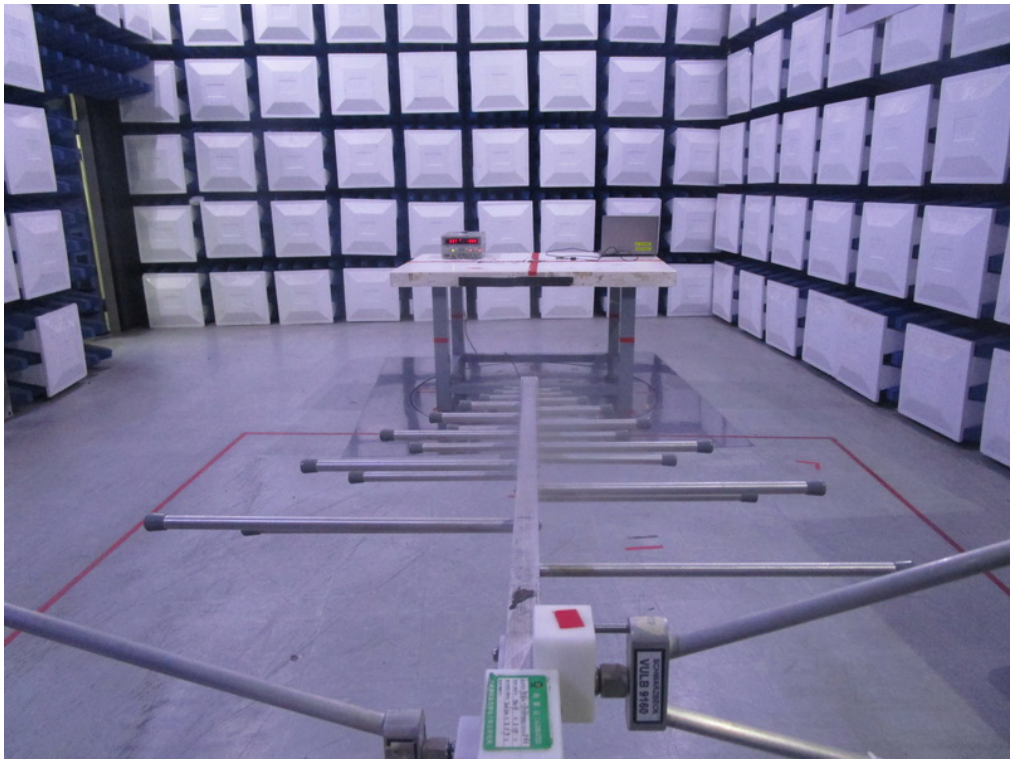




Radiated Emissions Test Photos

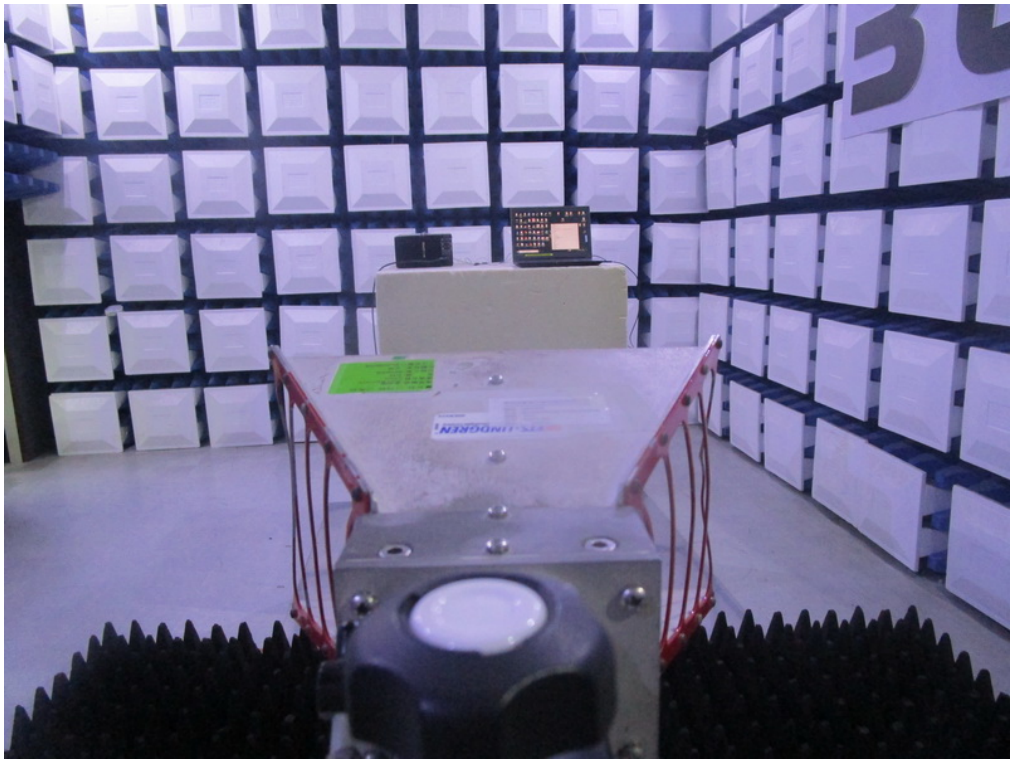
30 MHz to 1000 MHz

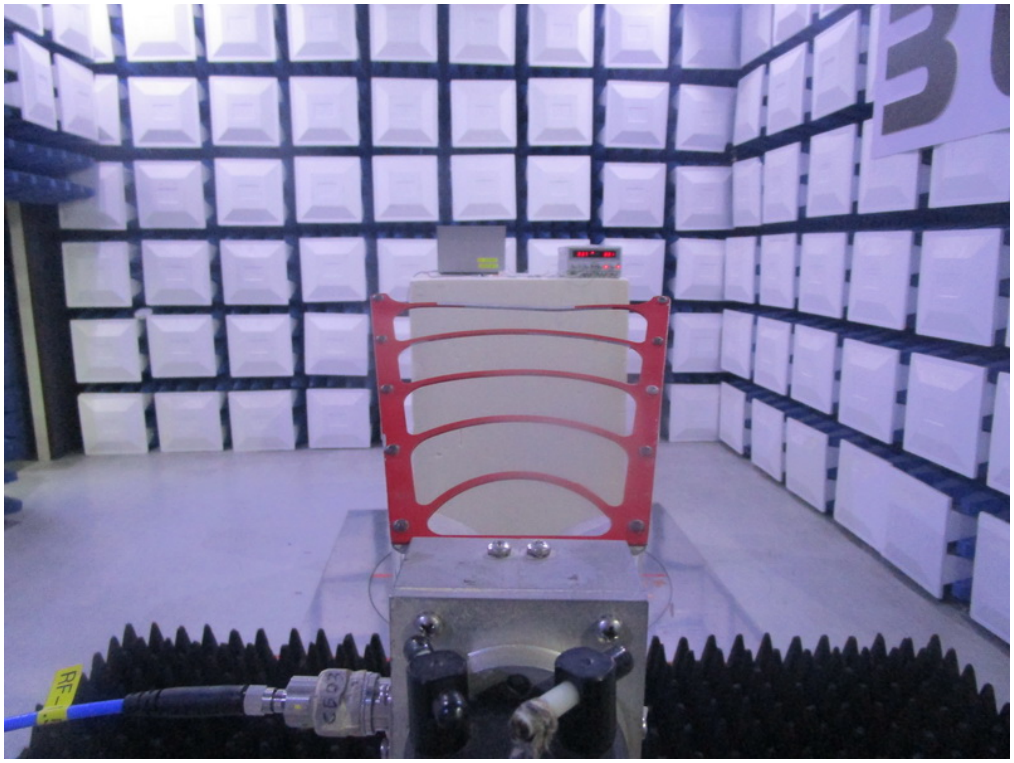


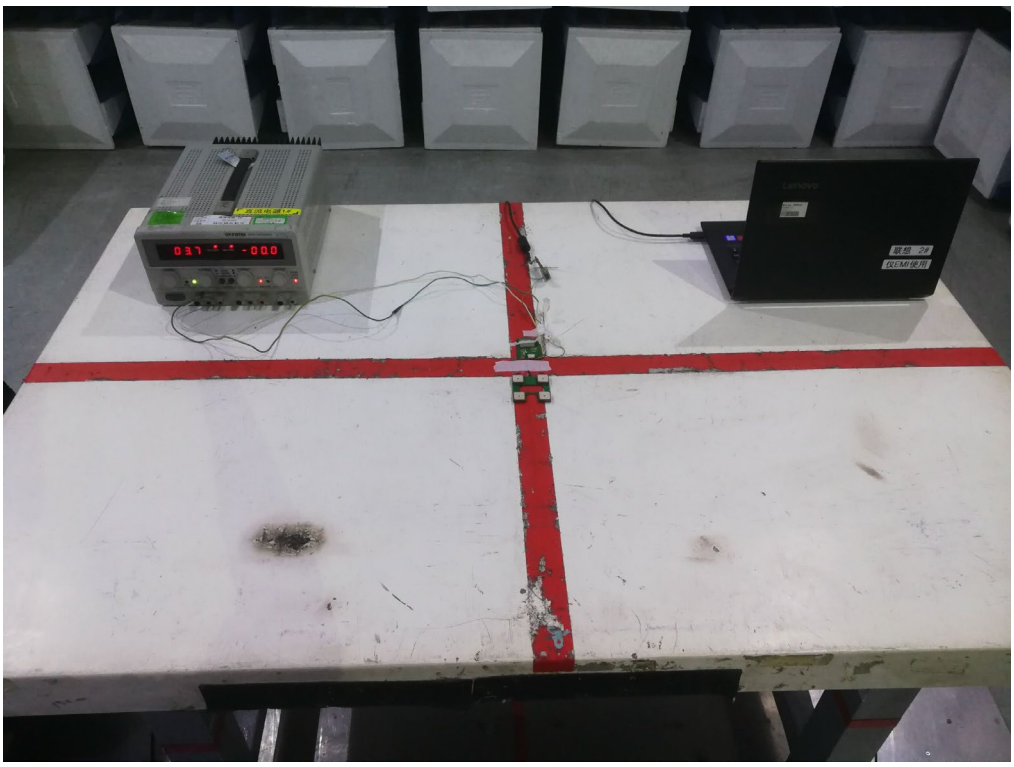


Radiated Emissions Test Photos

Above 1 GHz



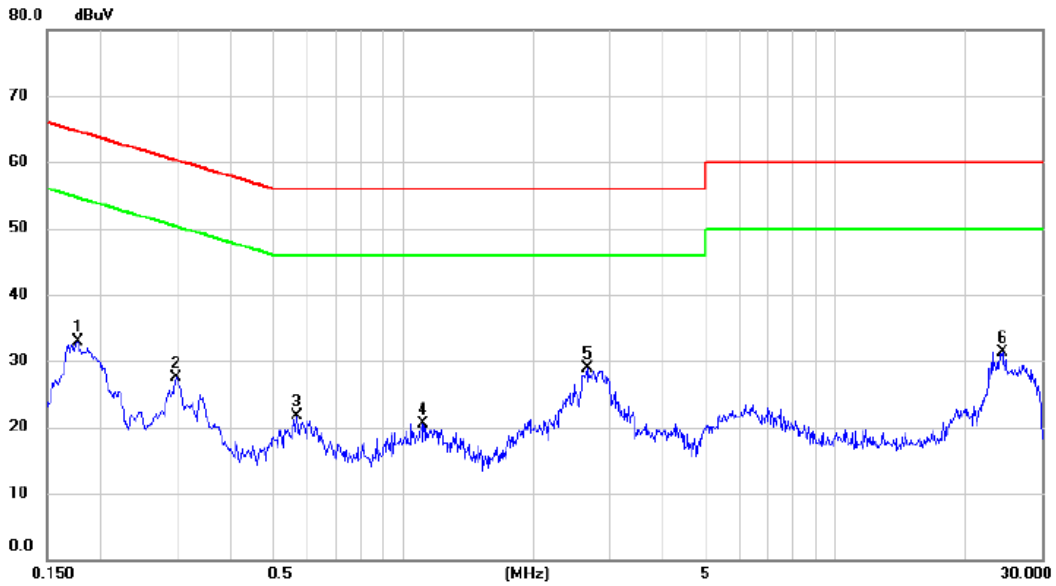




APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

Test Mode:	TX Mode Channel 25

Line

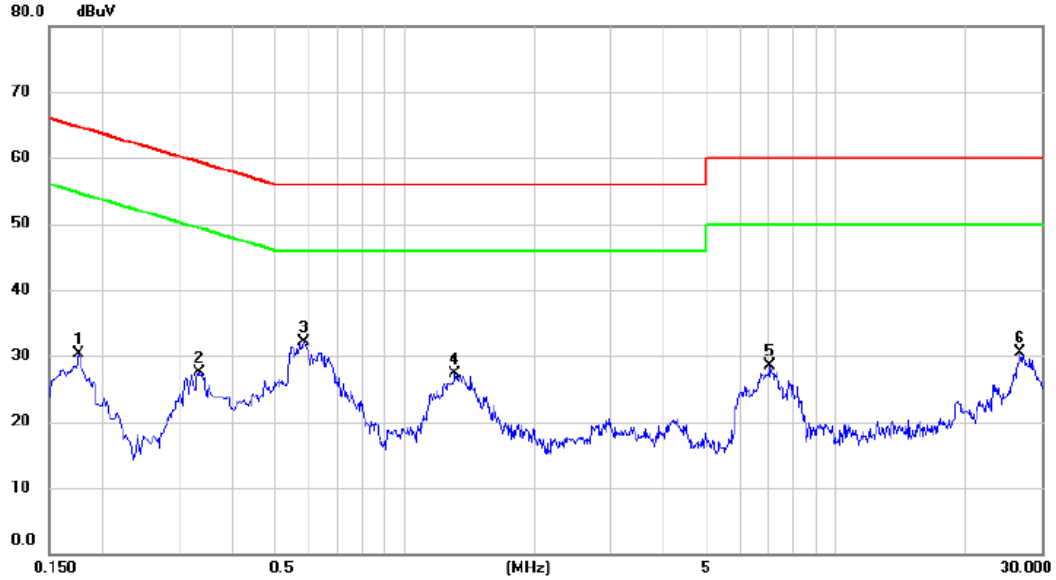


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.177	23.18	9.82	33.00	64.63	-31.63	peak	
2		0.298	17.65	9.84	27.49	60.28	-32.79	peak	
3		0.568	11.79	9.89	21.68	56.00	-34.32	peak	
4		1.108	10.54	9.93	20.47	56.00	-35.53	peak	
5	*	2.661	18.84	10.03	28.87	56.00	-27.13	peak	
6		24.279	20.23	11.14	31.37	60.00	-28.63	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode Channel 25

Neutral



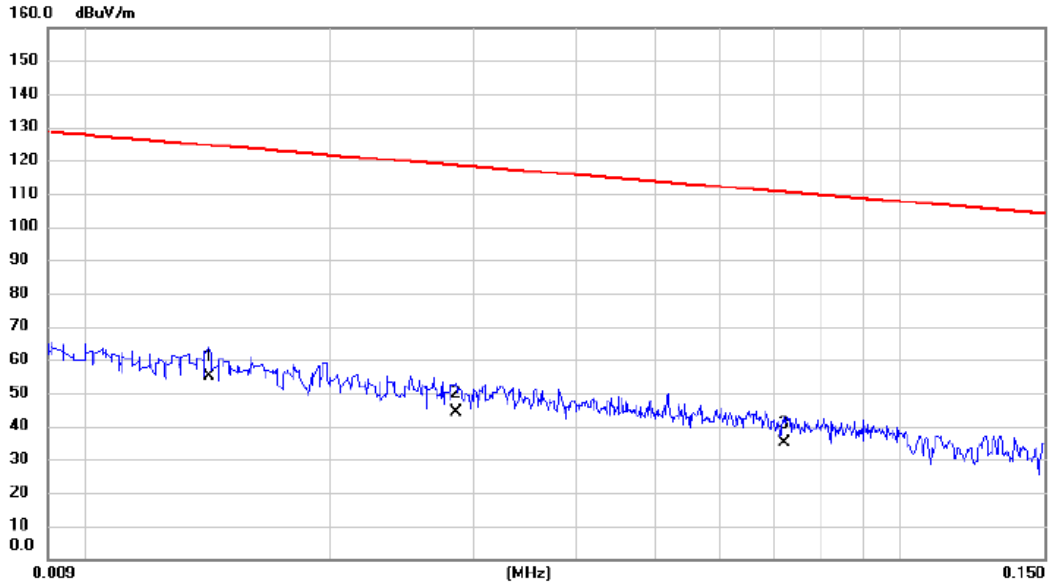
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.176	20.37	9.91	30.28	64.68	-34.40	peak	
2		0.335	17.46	9.98	27.44	59.34	-31.90	peak	
3	*	0.586	22.00	10.04	32.04	56.00	-23.96	peak	
4		1.311	17.07	10.14	27.21	56.00	-28.79	peak	
5		7.035	17.88	10.59	28.47	60.00	-31.53	peak	
6		26.646	19.07	11.49	30.56	60.00	-29.44	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX B - RADIATED EMISSION - 9 KHZ-30 MHZ

Test Mode:	TX Mode Channel 25

Ant 0°

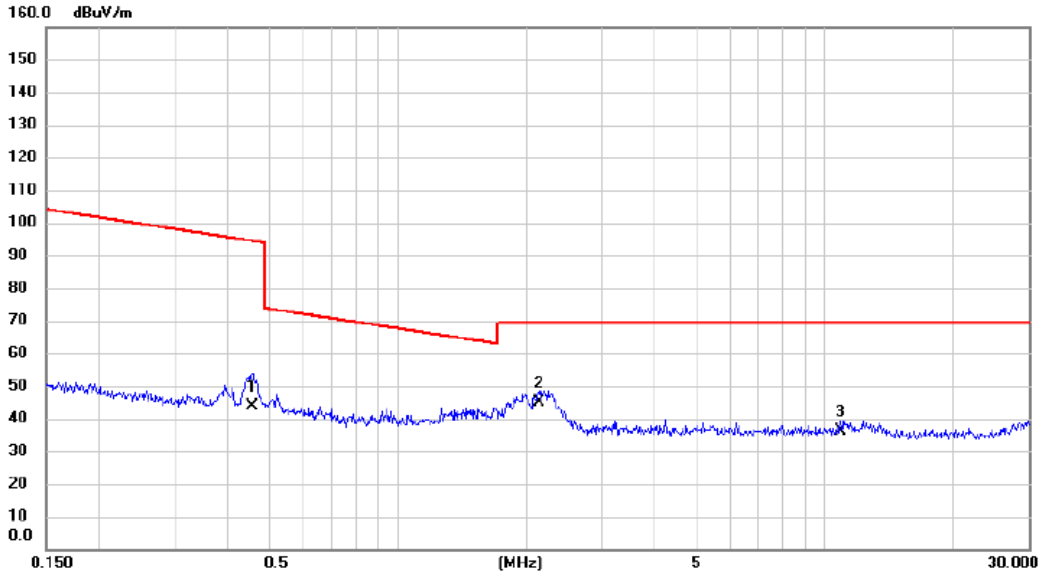


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.014	39.50	15.56	55.06	124.56	-69.50	AVG	
2		0.029	30.20	13.85	44.05	118.51	-74.46	AVG	
3		0.072	21.30	13.58	34.88	110.46	-75.58	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factr.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode Channel 25

Ant 0°

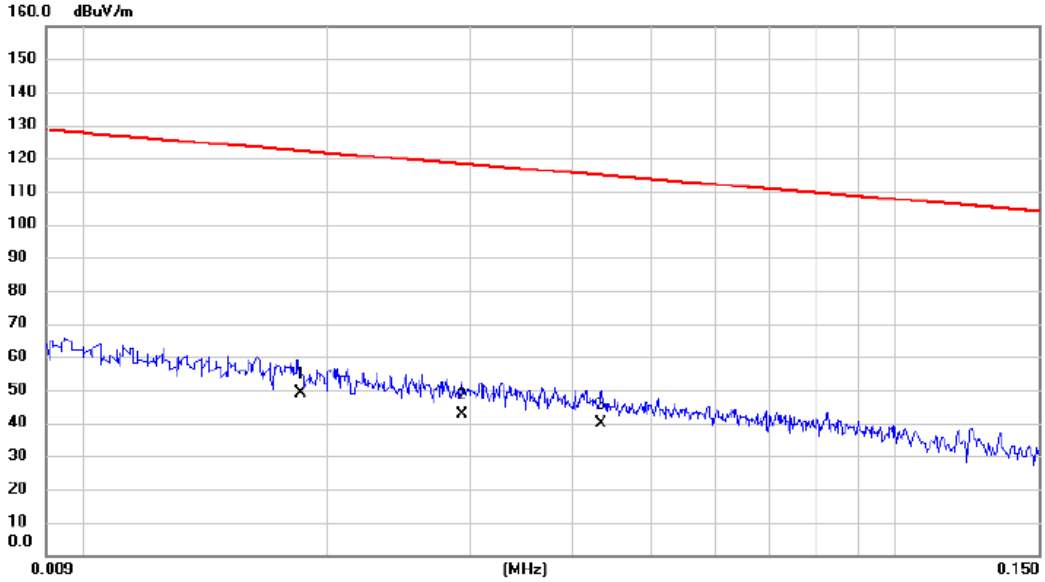


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.456	30.80	13.16	43.96	94.42	-50.46	AVG	
2	*	2.144	33.10	11.73	44.83	69.54	-24.71	QP	
3		10.905	24.40	11.62	36.02	69.54	-33.52	QP	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode Channel 25

Ant 90°

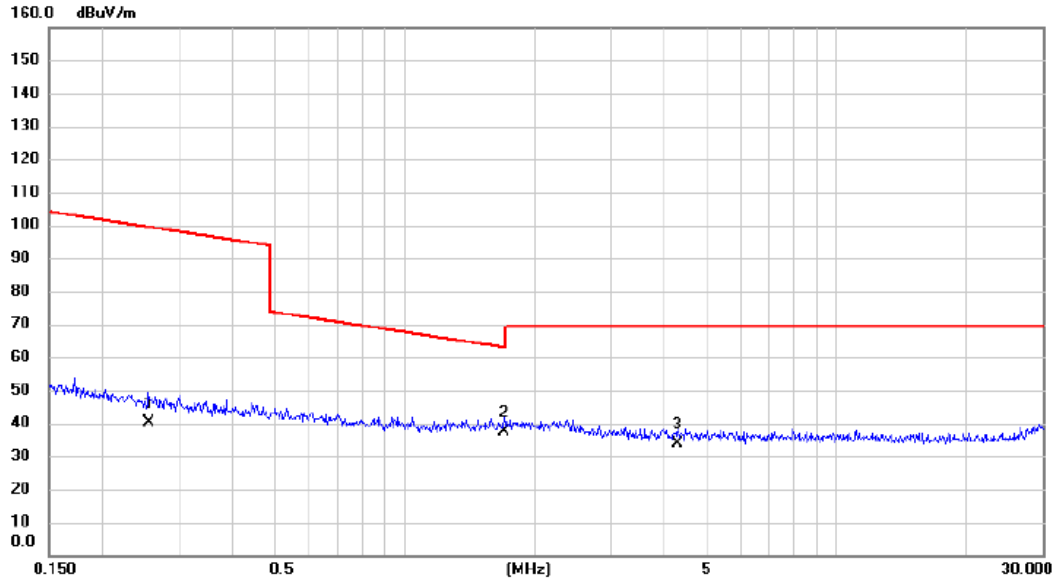


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.018	34.91	14.27	49.18	122.26	-73.08	AVG	
2		0.029	28.57	13.85	42.42	118.27	-75.85	AVG	
3		0.043	25.97	13.91	39.88	114.86	-74.98	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode Channel 25

Ant 90°



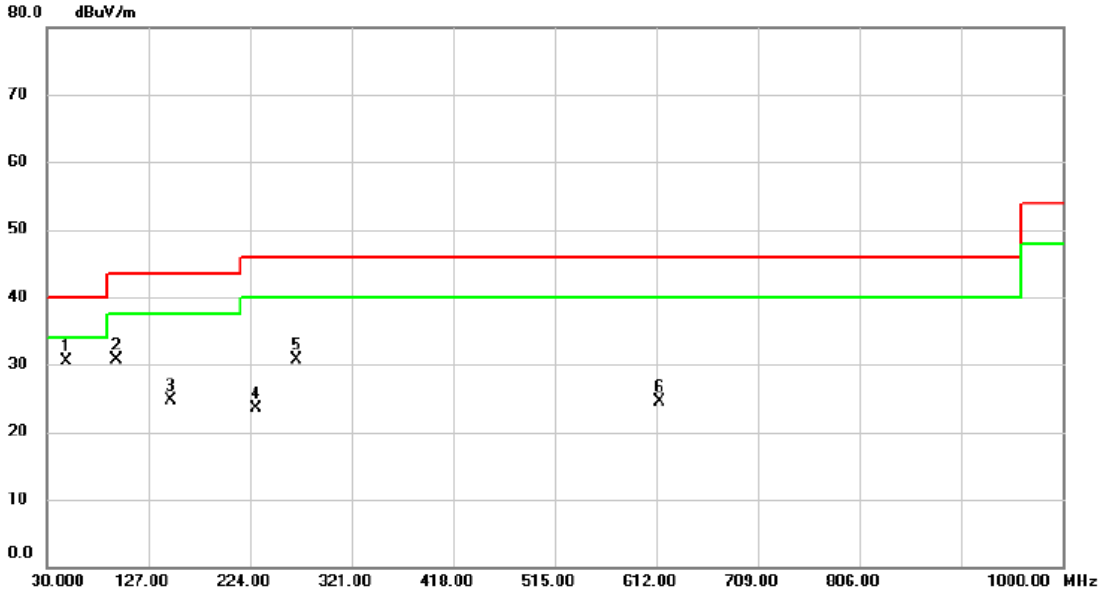
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.255	26.70	13.65	40.35	99.48	-59.13	AVG	
2	*	1.698	25.50	12.02	37.52	63.01	-25.49	QP	
3		4.292	22.80	10.92	33.72	69.54	-35.82	QP	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode:	TX Mode Channel 25

Vertical

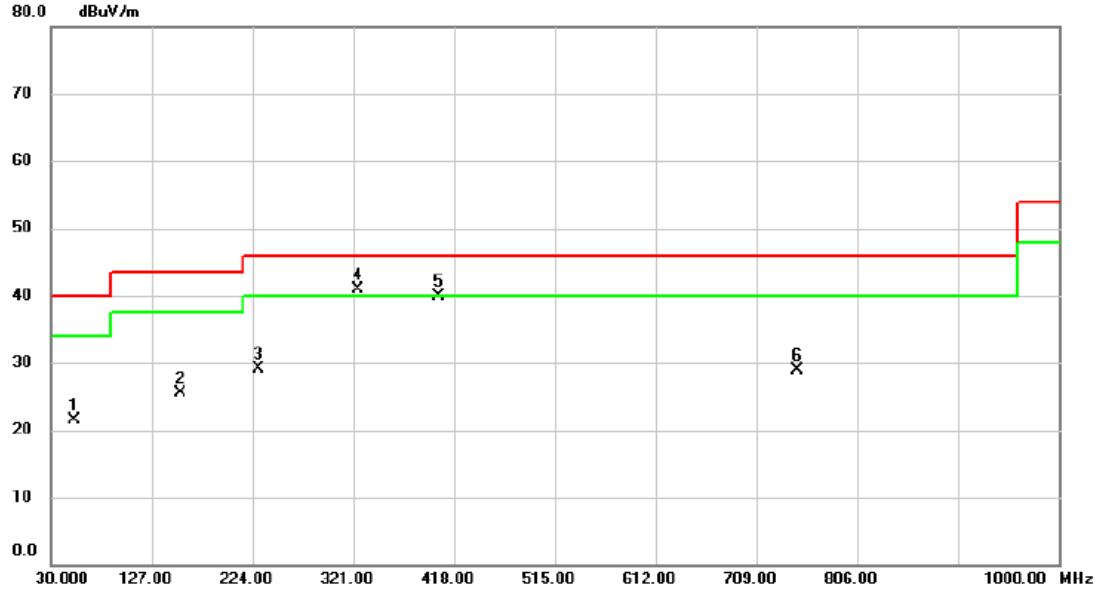


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	48.430	50.63	-20.19	30.44	40.00	-9.56	peak	
2		95.960	52.61	-21.89	30.72	43.50	-12.78	peak	
3		148.340	46.92	-22.22	24.70	43.50	-18.80	peak	
4		229.820	41.26	-17.83	23.43	46.00	-22.57	peak	
5		268.620	46.72	-16.10	30.62	46.00	-15.38	peak	
6		614.910	32.71	-8.19	24.52	46.00	-21.48	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode Channel 25

Horizontal



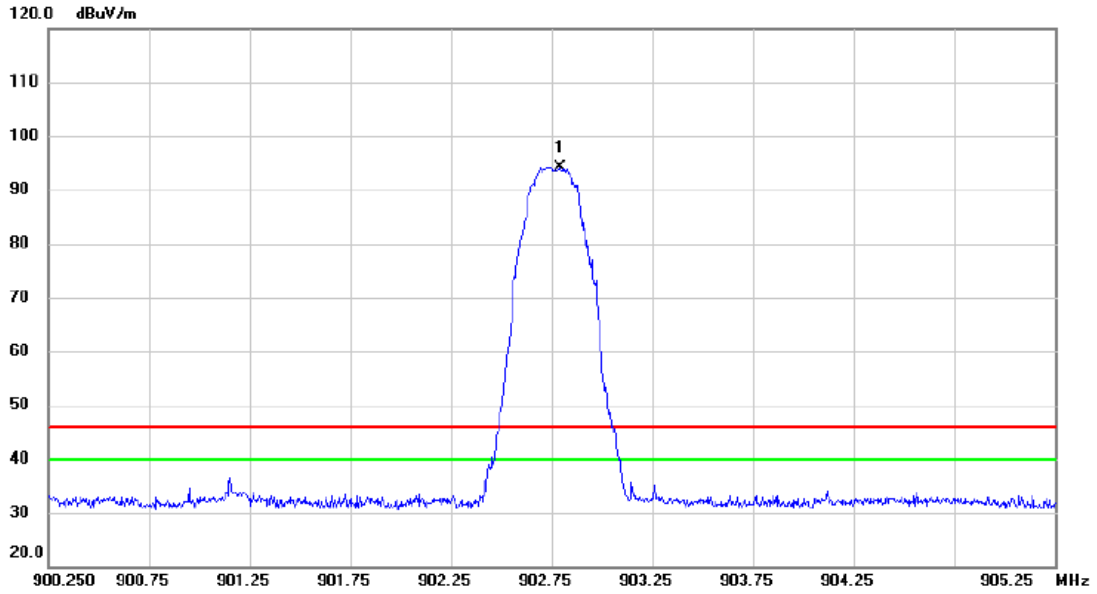
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		52.310	43.01	-21.55	21.46	40.00	-18.54	peak	
2		155.130	47.36	-21.84	25.52	43.50	-17.98	peak	
3		229.820	47.02	-17.83	29.19	46.00	-16.81	peak	
4	*	325.850	54.83	-13.95	40.88	46.00	-5.12	peak	
5		403.450	52.18	-12.36	39.82	46.00	-6.18	peak	
6		748.770	34.50	-5.53	28.97	46.00	-17.03	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

Test Mode:	TX Mode 902.75 MHz _CH00

Vertical

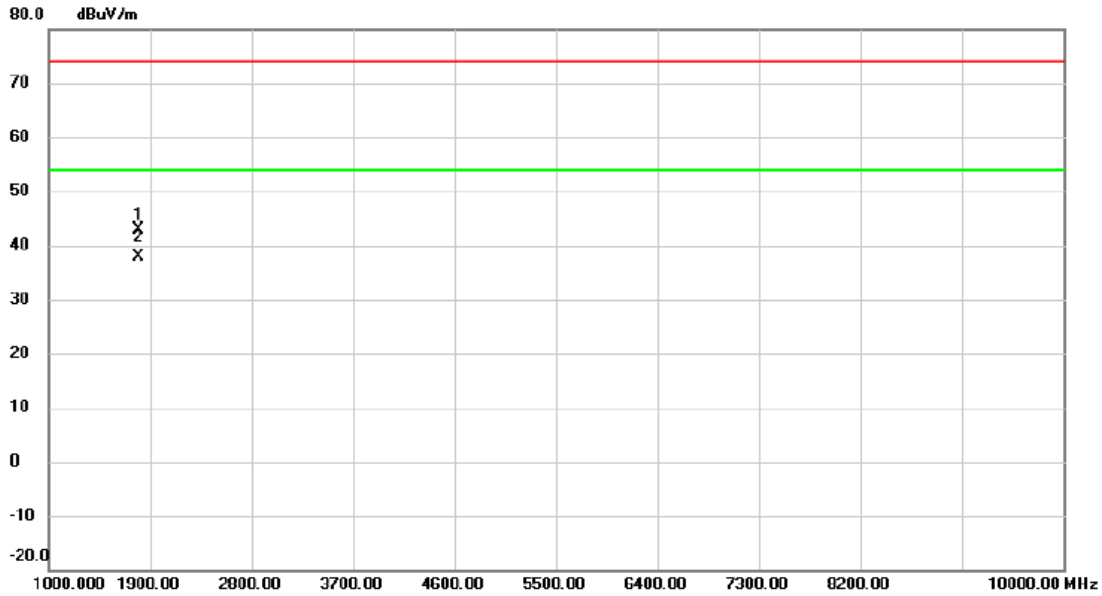


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	902.795	96.04	-1.80	94.24	46.00	48.24	QP	No Limit

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 902.75 MHz _CH00

Vertical

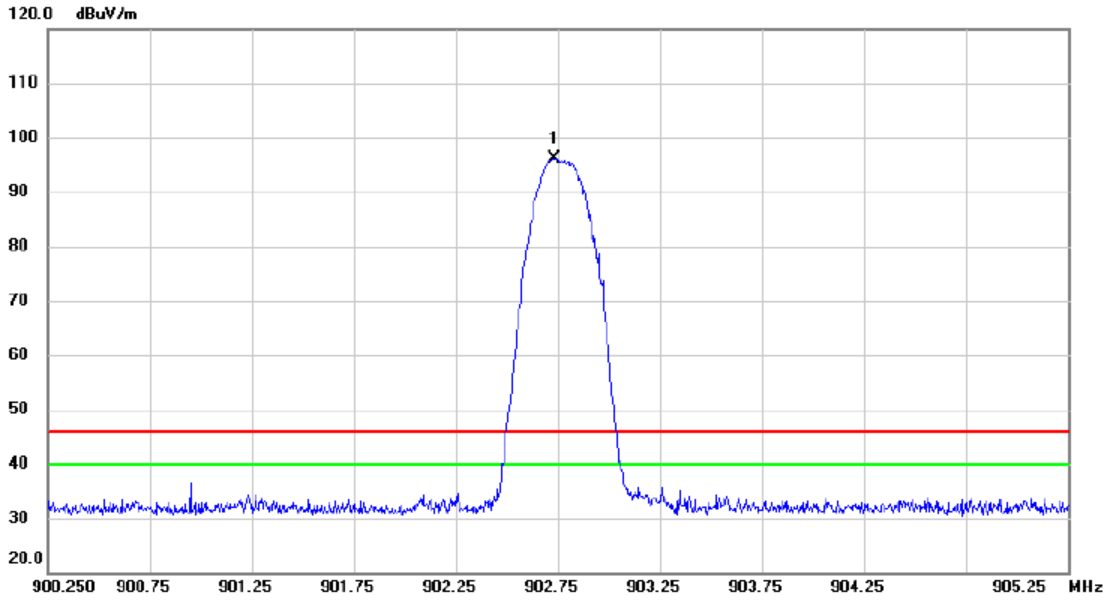


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1801.000	47.06	-4.26	42.80	74.00	-31.20	peak	
2	*	1801.000	42.13	-4.26	37.87	54.00	-16.13	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 902.75 MHz _CH00

Horizontal

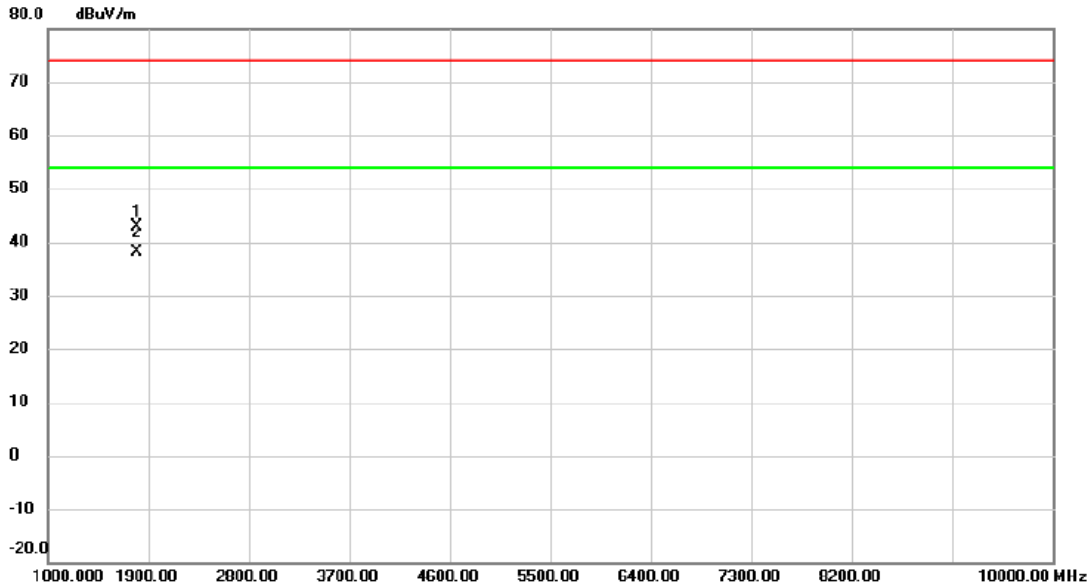


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	902.735	97.91	-1.81	96.10	46.00	50.10	QP	No Limit

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 902.75 MHz _CH00

Horizontal

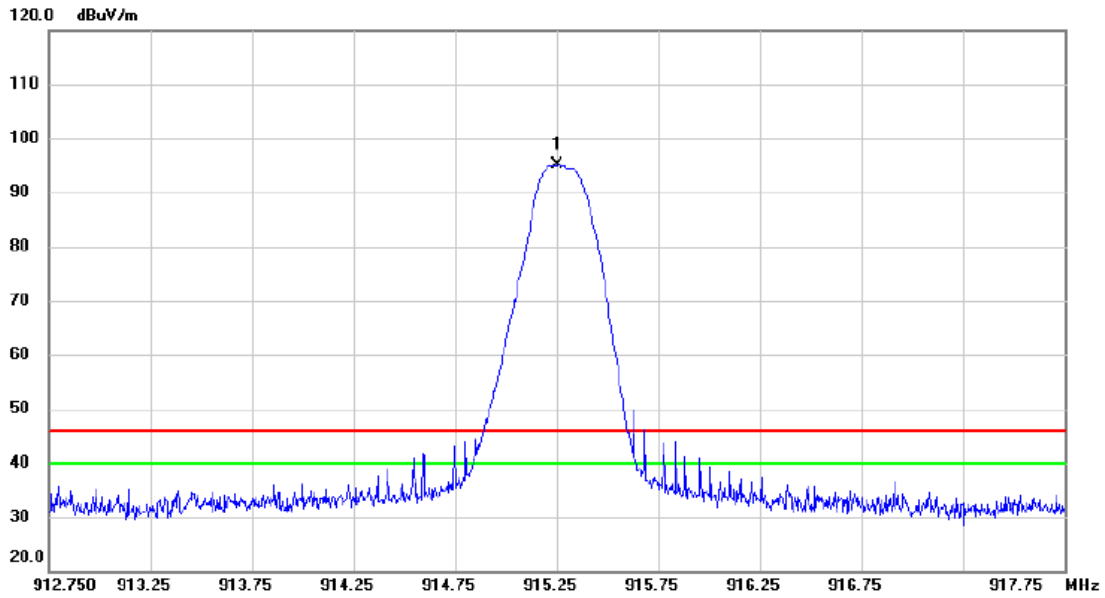


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1801.000	47.12	-4.26	42.86	74.00	-31.14	peak	
2	*	1801.000	42.44	-4.26	38.18	54.00	-15.82	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 915.25 MHz _CH25

Vertical

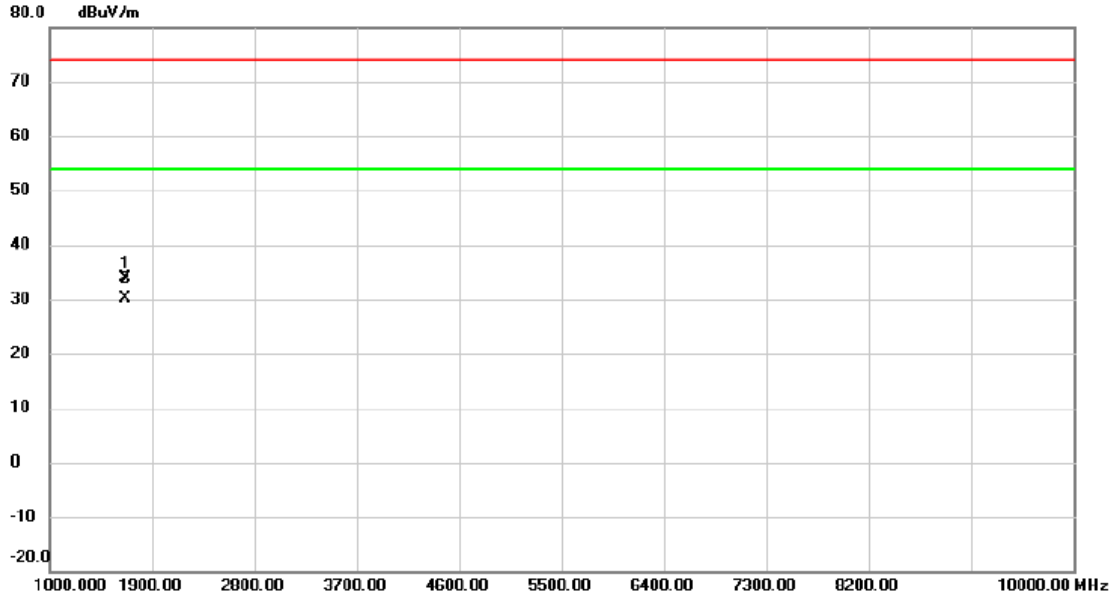


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	915.255	96.59	-1.57	95.02	46.00	49.02	QP	No Limit

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 915.25 MHz _CH25

Vertical

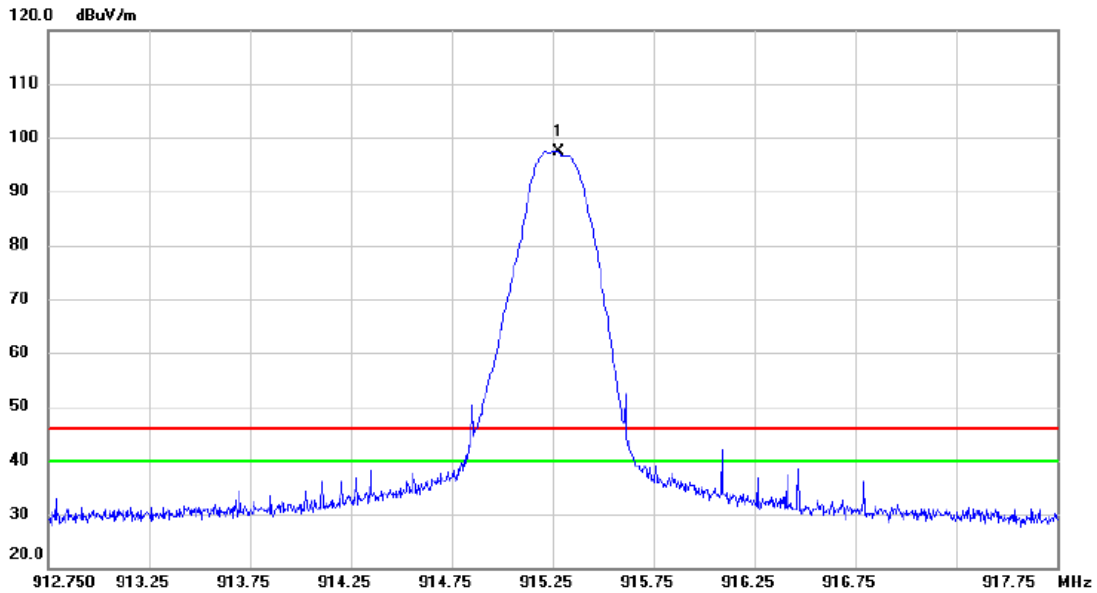


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1661.500	39.00	-5.12	33.88	74.00	-40.12	peak	
2	*	1661.500	35.32	-5.12	30.20	54.00	-23.80	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 915.25 MHz _CH25

Horizontal

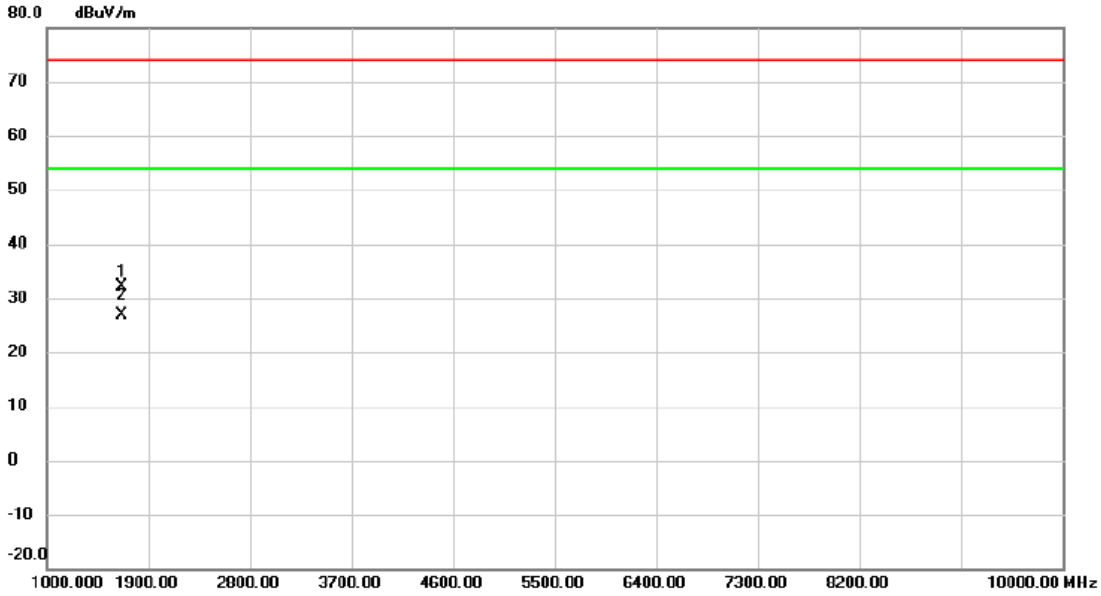


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	915.278	98.92	-1.57	97.35	46.00	51.35	QP	No Limit

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 915.25 MHz _CH25

Horizontal

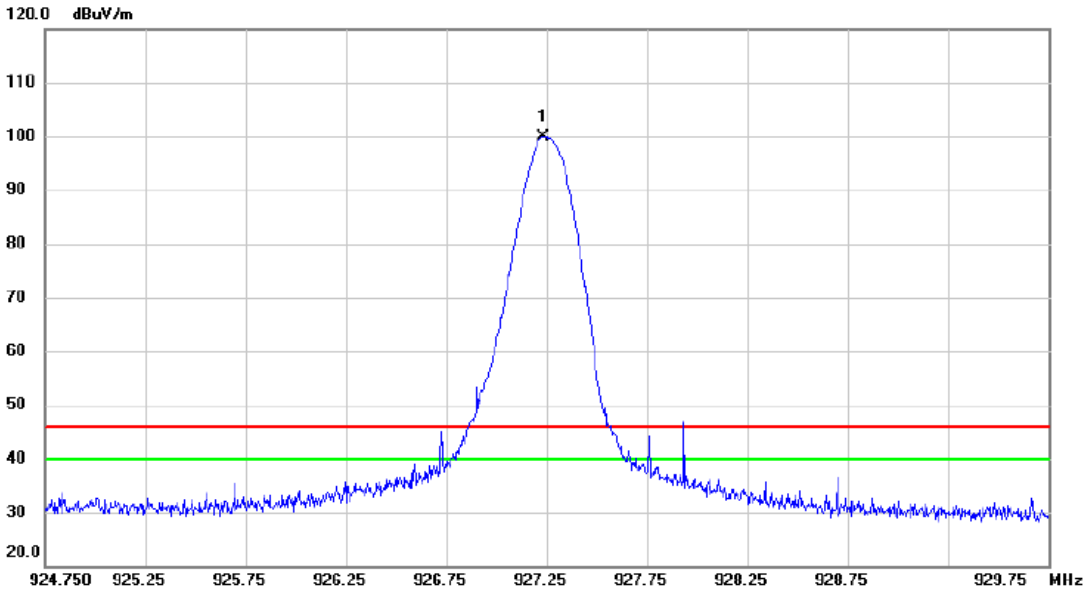


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1661.500	37.31	-5.12	32.19	74.00	-41.81	peak	
2	*	1661.500	32.12	-5.12	27.00	54.00	-27.00	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 927.25 MHz _CH49

Vertical

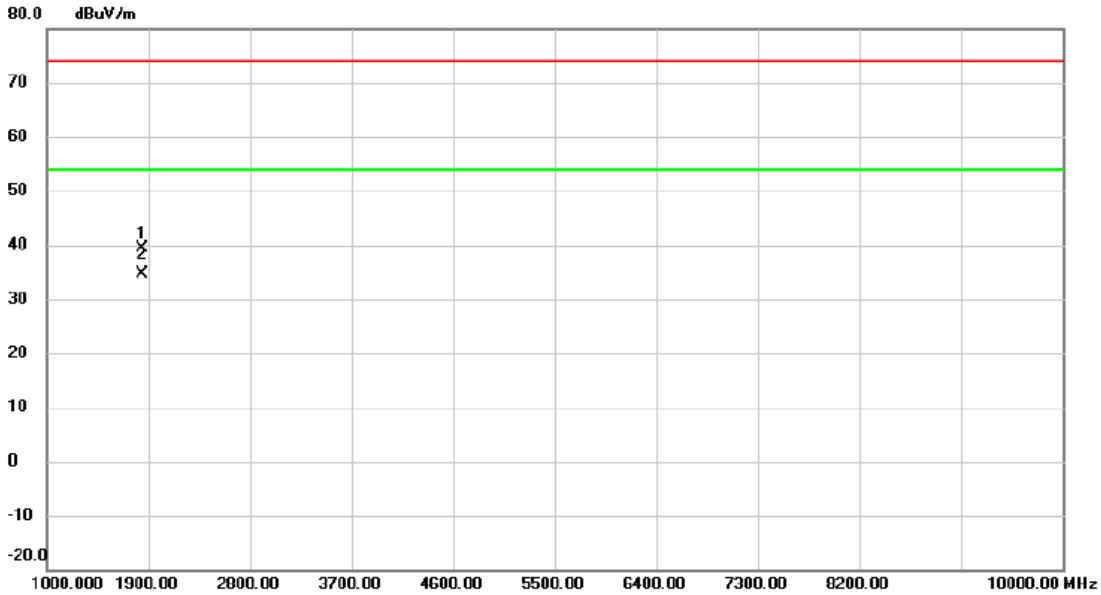


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	927.232	101.12	-1.30	99.82	46.00	53.82	QP	No Limit

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 927.25 MHz _CH49

Vertical

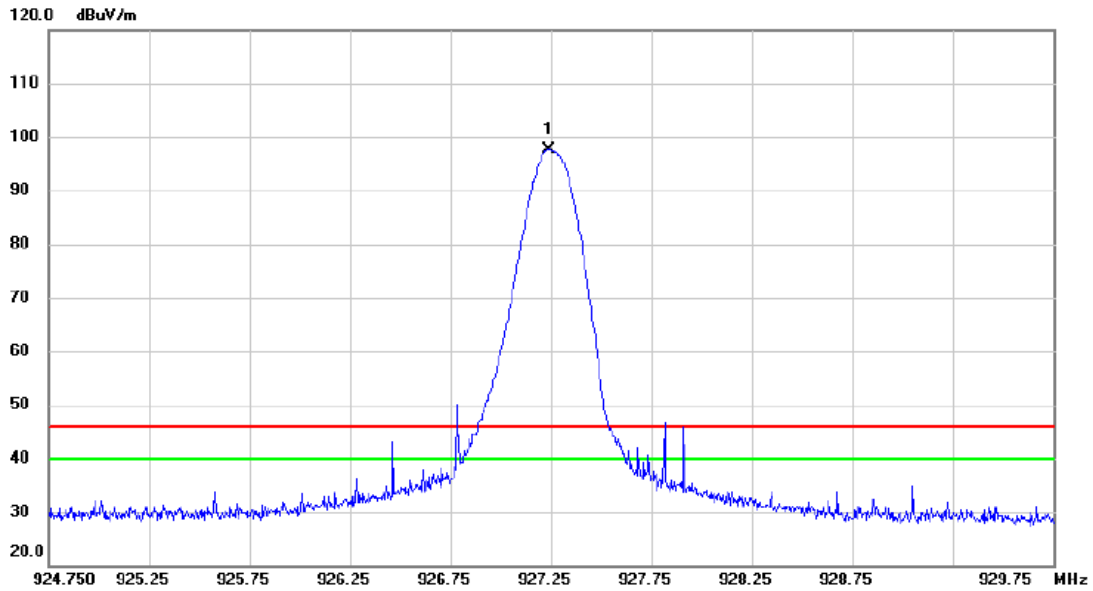


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1850.500	43.43	-3.96	39.47	74.00	-34.53	peak	
2	*	1850.500	38.54	-3.96	34.58	54.00	-19.42	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 927.25 MHz _CH49

Horizontal

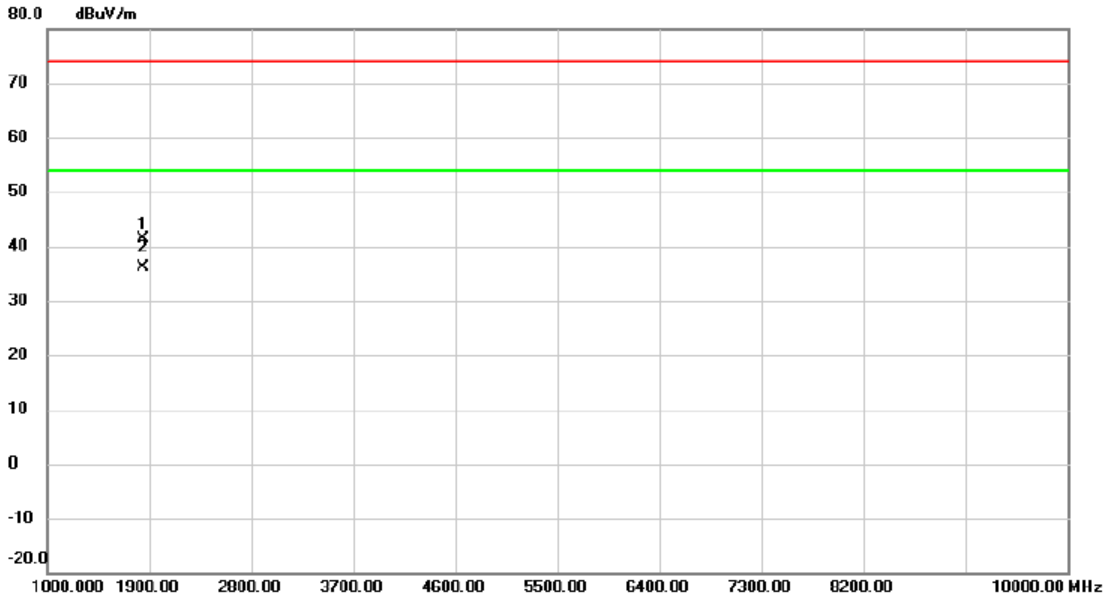


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	927.242	98.84	-1.30	97.54	46.00	51.54	QP	No Limit

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX Mode 927.25 MHz _CH49

Horizontal

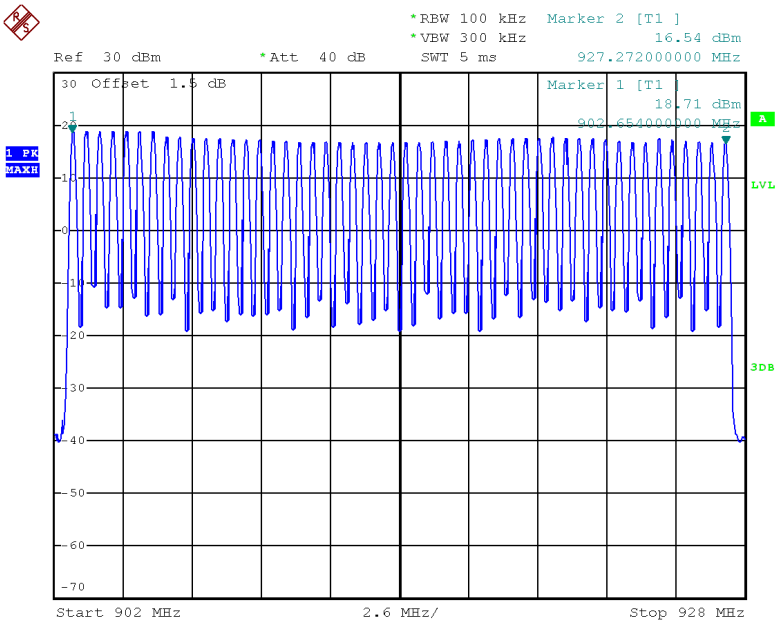


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1850.500	45.27	-3.96	41.31	74.00	-32.69	peak	
2	*	1850.500	40.18	-3.96	36.22	54.00	-17.78	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX E - NUMBER OF HOPPING FREQUENCY

Test Mode	Hopping Mode
Number of Hopping Frequency	50



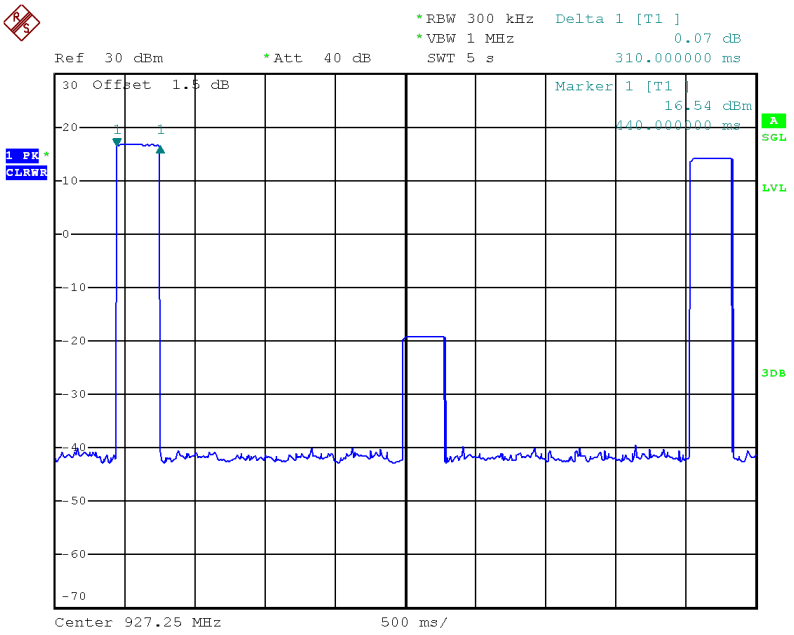
Date: 9.AUG.2019 16:14:55

APPENDIX F - AVERAGE TIME OF OCCUPANCY

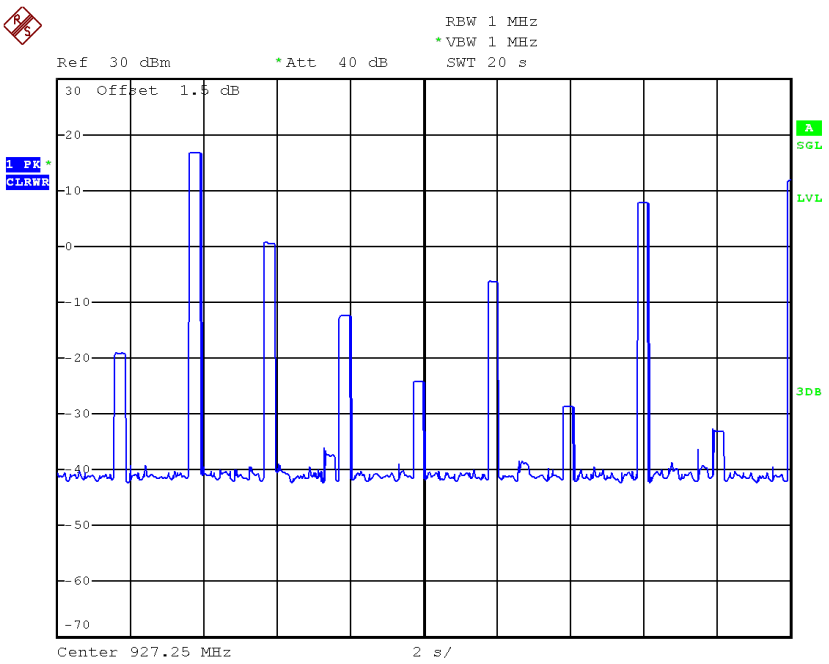
Test Mode:	Hopping on

Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
927.25	310	0.31	0.4000	Pass

CH49



Date: 9.AUG.2019 15:59:00



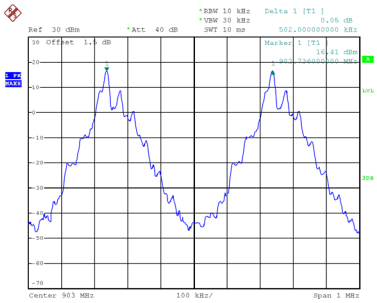
Date: 9.AUG.2019 16:00:57

APPENDIX G - HOPPING CHANNEL SEPARATION MEASUREMENT

Test Mode:	Hopping on

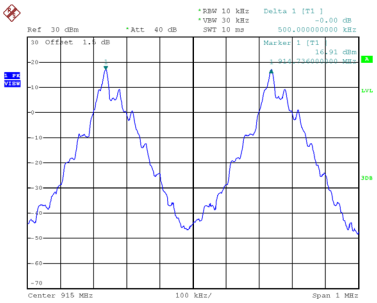
Channel	Frequency (MHz)	Channel Separation (MHz)	20 dB Bandwidth (MHz)	Test Result
00	902.75	0.50	0.126	Pass
25	915.25	0.50	0.125	Pass
49	927.25	0.50	0.129	Pass

CH00



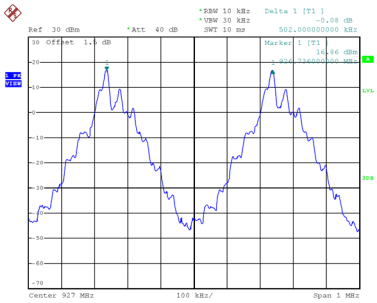
Date: 9.AUG.2019 15:37:03

CH25



Date: 9.AUG.2019 15:39:32

CH49



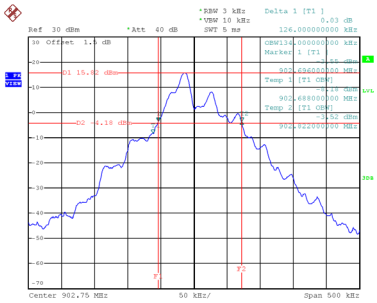
Date: 9.AUG.2019 15:43:01

APPENDIX H - BANDWIDTH

Test Mode:	TX Mode

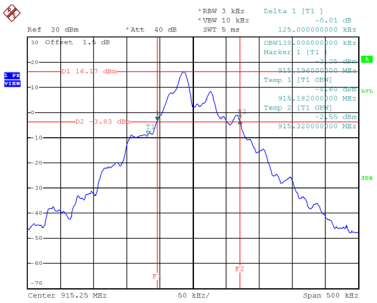
Channel	Frequency (MHz)	20 dB Bandwidth (MHz)	99 % Emission Bandwidth (MHz)
00	902.75	0.126	0.134
25	915.25	0.125	0.138
49	927.25	0.129	0.139

CH00



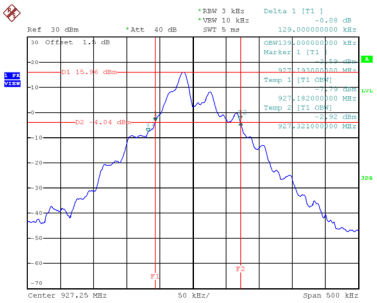
Date: 9.AUG.2019 15:04:20

CH25



Date: 9.AUG.2019 15:01:36

CH49



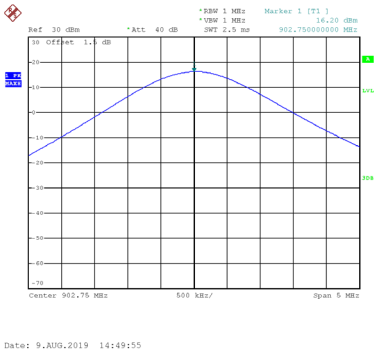
Date: 9.AUG.2019 14:58:50

APPENDIX I - MAXIMUM OUTPUT POWER

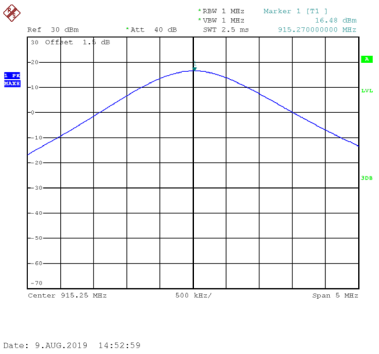
Test Mode:	TX Mode

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
00	902.75	16.20	0.0417	30.00	1.00	Pass
25	915.25	16.48	0.0445	30.00	1.00	Pass
49	927.25	16.21	0.0418	30.00	1.00	Pass

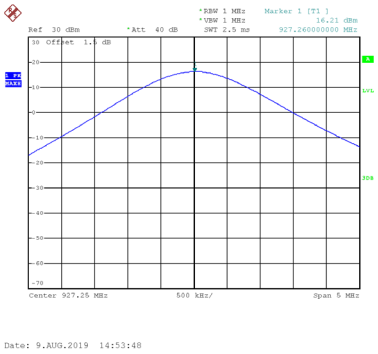
CH00



CH25



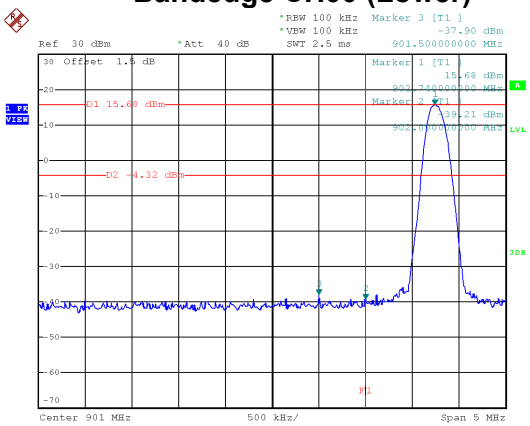
CH49



APPENDIX J - CONDUCTED SPURIOUS EMISSION

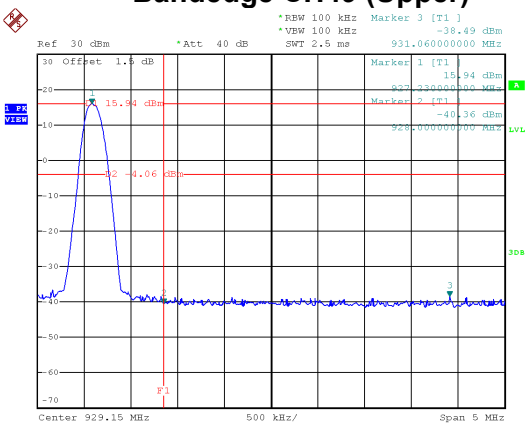
Test Mode : TX Mode _1Mbps

Bandedge CH00 (Lower)



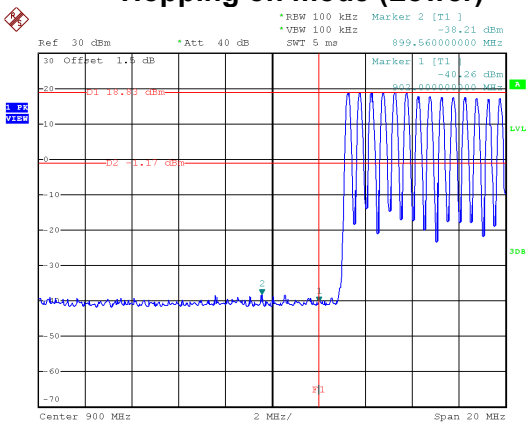
Date: 9.AUG.2019 15:10:38

Bandedge CH49 (Upper)



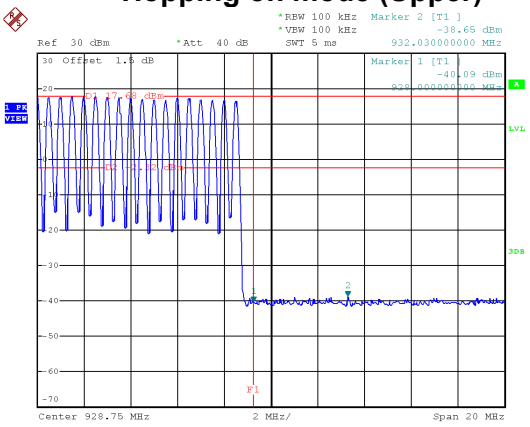
Date: 9.AUG.2019 15:17:08

Hopping on mode (Lower)



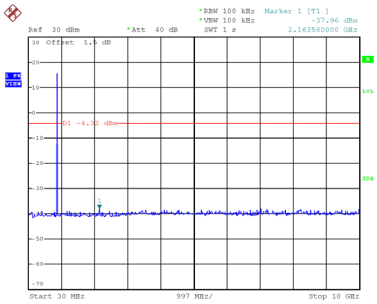
Date: 9.AUG.2019 16:06:54

Hopping on mode (Upper)

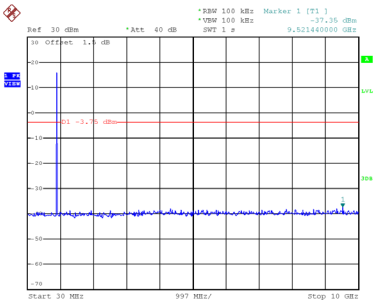


Date: 9.AUG.2019 16:09:41

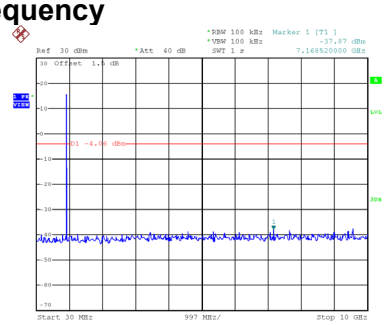
10th Harmonic of the fundamental frequency



Date: 9.AUG.2019 15:26:24



Date: 9.AUG.2019 15:24:04



Date: 9.AUG.2019 15:22:07

End of Test Report