

FCC Radio Test Report

FCC ID: 2AC9W-CMC181

This report concerns (check one): ☒Original Grant ☐Class II Change

Project No. : 1406C001
Equipment : UHF Reader
Model Name : CMC181
Applicant : FUTAIHUA INDUSTRIAL (SHENZHEN) CO.,LTD.
Address : B District, Foxconn Technology Park, Guanlan
Town, Baoan, Shenzhen, Guangdong, China

Date of Receipt : Jun. 09, 2014
Date of Test : Jun. 09, 2014 ~ Nov. 14, 2014
Issued Date : Nov. 17, 2014
Tested 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 the standards traceable to National Measurement Laboratory (**NML**) of **CHINA**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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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.

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCCP-1-1406C001	Original Issue.	Nov. 17, 2014

1. CERTIFICATION

Equipment : UHF Reader
Trade Name : CMCID
Model Name : CMC181
Applicant : FUTAIHUA INDUSTRIAL (SHENZHEN) CO.,LTD.
Manufacturer : FUTAIHUA INDUSTRIAL (SHENZHEN) CO.,LTD.
Address : B District, Foxconn Technology Park, Guanlan Town, Baoan, Shenzhen,
Guangdong, China
Factory : FUTAIHUA INDUSTRIAL (SHENZHEN) CO.,LTD.
Address : B District, Foxconn Technology Park, Guanlan Town, Baoan, Shenzhen,
Guangdong, China
Date of Test : Jun. 09, 2014 ~ Nov. 14, 2014
Test Sample : ENGINEERING SAMPLE
Standard(s) : FCC Part15, Subpart C: 2013 (15.247) / ANSI C63.4 : 2009 /
FCC Public Notice DA 00-705, March 30, 2000.

The above equipment has been tested and found 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-1-1406C001) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

Applied Standard(s): 47 CFR Part 15, Subpart C: 2013;			
Standard(s) Section	Test Item	Judgment	Remark
FCC			
15.207	Conducted Emission	PASS	
15.247(d)	Antenna conducted Spurious Emission	PASS	
15.247 (a)(1)	Hopping Channel Separation	PASS	
15.247 (b)(1)	Peak Output Power	PASS	
15.247(d) 15.209	Radiated Spurious Emission	PASS	
15.247 (a)(1)(iii)	Number of Hopping Frequency	PASS	
15.247 (a)(1)(iii)	Dwell Time	PASS	
15.205	Restricted Bands	PASS	
15.203	Antenna Requirement	PASS	

Note:

- (1) "N/A" denotes test is not applicable in this test report
- (2) According to FCC Public Notice DA 00-705, March 30, 2000.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **DG-C02/DG-CB03** at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dong Guan, Guangdong, China.523792
BTL's test firm number for FCC: 319330

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 reported uncertainty of measurement $y \pm U$, 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. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U , (dB)	Note
DG-C02	CISPR	150 KHz ~ 30MHz	1.94	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U , (dB)	Note
DG-CB03	CISPR	9KHz~30MHz	V	3.79	
		9KHz~30MHz	H	3.57	
		30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	
		1GHz~18GHz	V	3.12	
		1GHz~18GHz	H	3.68	
		18GHz~40GHz	V	4.15	
		18GHz~40GHz	H	4.14	

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	UHF Reader	
Trade Name	CMCID	
Model Name	CMC181	
Model Difference	N/A	
Output Power (Max.)	Operation Frequency	902-928MHz
	Modulation Technology	ASK(62.5 Kbps)
	Bit Rate of Transmitter	
	Output Power Max.	28.57 dBm
Power Source	DC Voltage supplied from AC/DC adapter. (Support unit)	
Power Rating	I/P:120-240V 50/60Hz 900mA O/P:12V/2500mA	

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

3 Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	N/A	N/A	TNC	N/A	5	
2	N/A	N/A	TNC	N/A	5	
3	N/A	N/A	TNC	N/A	5	
4	N/A	N/A	TNC	N/A	5	

Note: Smart antenna system with 4 or more transmit/receive chains, but operating in a mode where only 1 transmit/receive chain is used.

3.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base 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 Mode Note (1)

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 1	TX Mode Note (1)

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode Note (1)

Note:

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

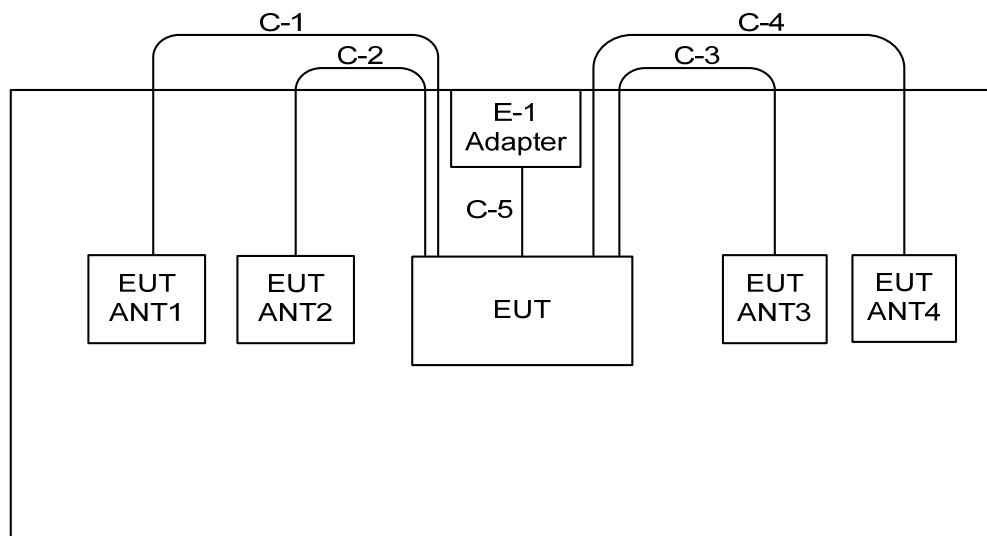
3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

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 Version	CMC181 Test Demo		
Frequency (MHz)	902.75	915.25	927.25
Power Parameters (1Mbps)	63	40	22

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated TX Mode:



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/IC	Series No.	Note
E-1	ADAPTER	IHOME	KSS35-1200	N/A	N/A	-

Item	Shielded Type	Ferrite Core	Length	Note
C-1	YES	NO	2.2m	Ant port Cable
C-2	YES	NO	2.2m	Ant port Cable
C-3	YES	NO	2.2m	Ant port Cable
C-4	YES	NO	2.2m	Ant port Cable
C-5	YES	NO	1m	AC Cable

4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

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 = Antenna Factor + Cable Loss - Amplifier Gain(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

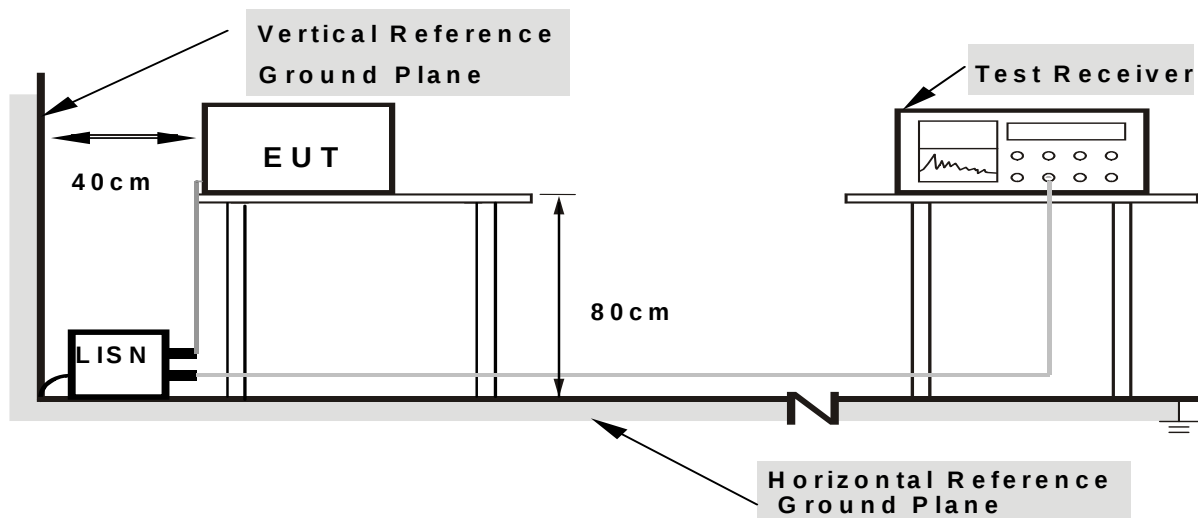
4.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments 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.

4.1.3 DEVIATION FROM TEST STANDARD

No deviation

4.1.4 TEST SETUP



Note: 1.Support units were connected to second LISN.
 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

4.1.5 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/receiving data or hopping on mode.

4.1.6 EUT TEST CONDITIONS

Temperature: 25°C
 Relative Humidity: 55%
 Test Voltage: AC 120V/60Hz

4.1.7 TEST RESULTS

Please refer to the Attachment 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 150KHz to 30MHz.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 RADIATED EMISSION LIMITS (Frequency Range 9KHz -1000MHz)

20dB in any 100 KHz bandwidth outside the operating frequency band. 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.

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
960~1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

Frequency (MHz)	dB(uV/m) (at 3 meters)	
	Peak	Average
Above 1000	74	54

Notes:

- (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)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

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

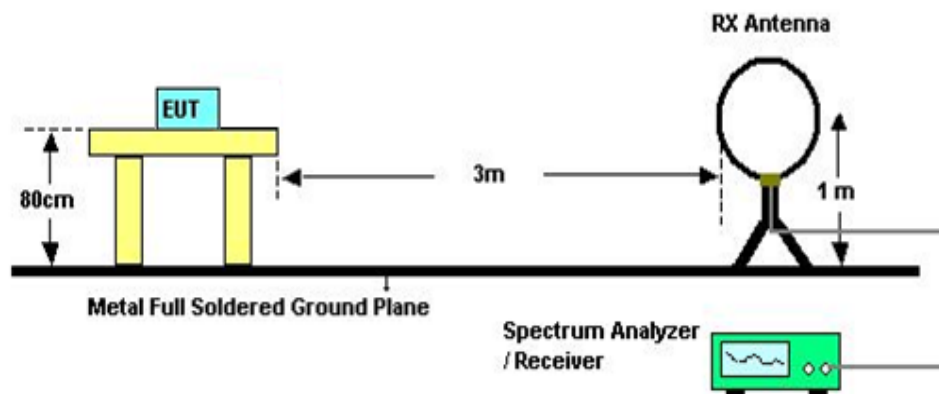
4.2.2 TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meters 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 1GHz)
- b. The EUT was placed on the top of a rotating table 0.8 meters 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 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8 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. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

No deviation

(C) For radiated emissions below 30MHz



4.2.5 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

4.2.6 EUT TEST CONDITIONS

Temperature: 25°C

Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

4.2.7 TEST RESULTS (9KHZ TO 30MHZ)

Please refer to the Attachment 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 = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (3) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.2.8 TEST RESULTS (BETWEEN 30MHZ TO 1000 MHZ)

Please refer to the Attachment C.

Remark:

- (1) Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz ; SPA setting in RBW=120KHz, VBW =120KHz, Swp. Time = 0.3 sec./MHz.
- (2) 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.
- (3) Measuring frequency range from 30MHz to 1000MHz.
- (4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table.

4.2.9 TEST RESULTS (ABOVE 1000 MHZ)

Please refer to the Attachment D.

Remark:

- (1) 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.
- (2) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission
- (3) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (4) EUT Orthogonal Axis:
"X" - denotes Laid on Table ; "Y" - denotes Vertical Stand ; "Z" - denotes Side Stand
- (5) 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
- (6) 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 CHANNEL

5.1 APPLIED PROCEDURES

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.247(a)(1)(iii)	Number of Hopping Channel	902-928	PASS

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

5.1.1 TEST PROCEDURE

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

5.1.2 DEVIATION FROM STANDARD

No deviation.

5.1.3 TEST SETUP



5.1.4 EUT OPERATION 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.

5.1.5 EUT TEST CONDITIONS

Temperature: 25°C
 Relative Humidity: 55%
 Test Voltage: AC 120V/60Hz

5.1.6 TEST RESULTS

Please refer to the Attachment E

6. AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(1)(iii)	Average Time of Occupancy	0.4sec	902-928	PASS

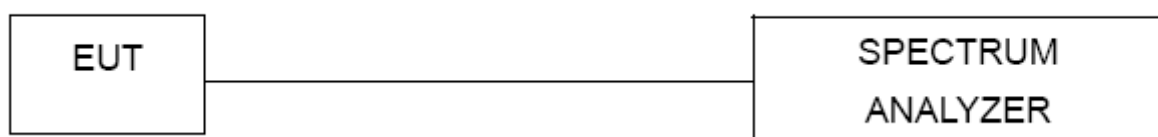
6.1.1 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyzer
- Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.
- Set the EUT for DH5, DH3 and DH1 packet transmitting.
- Measure the maximum time duration of one single pulse.
- DH5 Packet permit maximum $1600 / 79 / 6 = 3.37$ hops per second in each channel (5 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times $3.37 \times 31.6 = 106.6$ within 31.6 seconds.
- DH3 Packet permit maximum $1600 / 79 / 4 = 5.06$ hops per second in each channel (3 time slots TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds.
- DH1 Packet permit maximum $1600 / 79 / 2 = 10.12$ hops per second in each channel (1 time slot TX, 1 time slot RX). So, the dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds.

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION 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.

6.1.5 EUT TEST CONDITIONS

Temperature: 25°C

Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

6.1.6 TEST RESULTS

Please refer to the Attachment F

7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems operating in the 902-928 MHz band may have hopping channel carrier frequencies that are separated by 25 KHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	30 KHz
VBW	100 KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

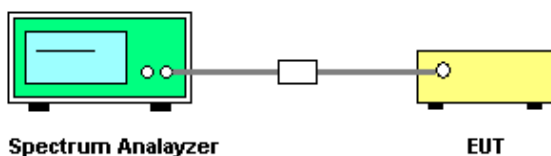
7.1.1 TEST PROCEDURE

- a. The EUT must have its hopping function enabled
- b. Span = wide enough to capture the peaks of two adjacent channels
 - Resolution (or IF) Bandwidth (RBW) $\geq$ 1% of the span
 - Video (or Average) Bandwidth (VBW) $\geq$ RBW
 - Sweep = Auto
 - Detector function = Peak
 - Trace = Max Hold

7.1.2 DEVIATION FROM STANDARD

No deviation.

7.1.3 TEST SETUP



7.1.4 EUT TEST CONDITIONS

Temperature: 25°C

Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

7.1.5 TEST RESULTS

Please refer to the Attachment G

8. BANDWIDTH TEST

8.1 APPLIED PROCEDURES

FCC Part15 (15.247) , Subpart C		
Section	Test Item	Frequency Range (MHz)
15.247(a)(2)	Bandwidth	902-928

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	30 KHz (20dB Bandwidth) / 30 KHz (Channel Separation)
VBW	100 KHz (20dB Bandwidth) / 100 KHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.1.1 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep Time = Auto.

8.1.2 DEVIATION FROM STANDARD

No deviation.

8.1.3 TEST SETUP



8.1.4 EUT OPERATION 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.

8.1.5 EUT TEST CONDITIONS

Temperature: 25°C

Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

8.1.6 TEST RESULTS

Please refer to the Attachment H

9. PEAK OUTPUT POWER TEST

9.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(1)	Peak Output Power	1 Watt or 30dBm	902-928	PASS

9.1.1 TEST PROCEDURE

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

9.1.2 DEVIATION FROM STANDARD

No deviation.

9.1.3 TEST SETUP



9.1.4 EUT OPERATION 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.

9.1.5 EUT TEST CONDITIONS

Temperature: 25°C

Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

9.1.6 TEST RESULTS

Please refer to the Attachment I

10. ANTENNA CONDUCTED SPURIOUS EMISSION

10.1 APPLIED PROCEDURES / 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 measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

10.1.1 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= 100KHz, VBW=100KHz, Sweep time = Auto.

10.1.2 DEVIATION FROM STANDARD

No deviation.

10.1.3 TEST SETUP



10.1.4 EUT OPERATION 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.

10.1.5 EUT TEST CONDITIONS

Temperature: 25°C

Relative Humidity: 55%

Test Voltage: AC 120V/60Hz

10.1.6 TEST RESULTS

Please refer to the Attachment J

11. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	EMCO	3816/2	00052765	Mar. 29, 2015
2	LISN	R&S	ENV216	101447	Mar. 29, 2015
3	Test Cable	N/A	C_17	N/A	Mar. 14, 2015
4	EMI TEST RECEIVER	R&S	ESCS30	833364/017	Mar. 29, 2015
5	50Ω Terminator	SHX	TF2-3G-A	08122902	Mar. 29, 2015
6	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarbeck	VULB9160	9160-3232	Mar. 29, 2015
2	Amplifier	HP	8447D	2944A09673	Mar. 29, 2015
3	Receiver	AGILENT	N9038A	MY5213003 9	Sep. 30, 2015
4	Test Cable	N/A	C-01_CB03	N/A	Jul. 01, 2015
5	Controller	CT	SC100	N/A	N/A
6	Antenna	ETS	3115	00075789	Mar. 29, 2015
7	Amplifier	Agilent	8449B	3008A02274	Mar. 29, 2015
8	Receiver	AGILENT	N9038A	MY5213003 9	Sep. 30, 2015
9	Test Cable	HUBER+SUHNER	C-48	N/A	Apr. 30, 2015
10	Controller	CT	SC100	N/A	N/A
11	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Feb. 22, 2015
12	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Feb. 22, 2015
13	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Mar. 29, 2015
14	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Number of Hopping Channel

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

Average Time of Occupancy

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

Hopping Channel Separation Measurement

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

Bandwidth

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

Peak Output Power

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

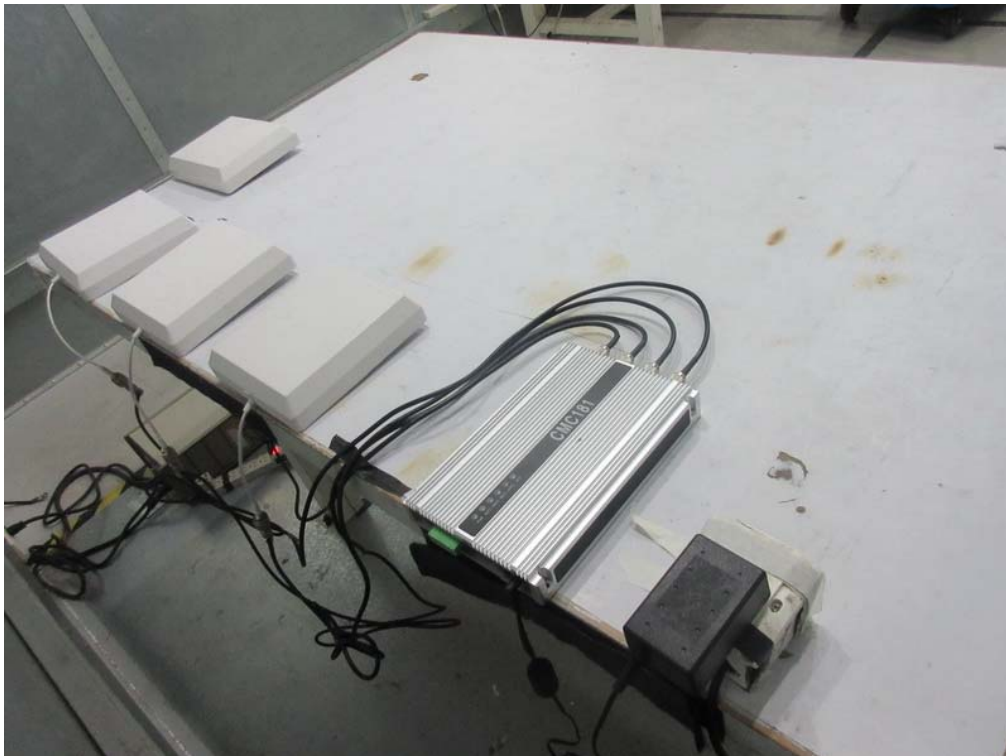
Antenna Conducted Spurious Emission

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Nov. 02, 2015

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

12. EUT TEST PHOTO

Conducted Measurement Photos



Radiated Measurement Photos

9KHz to 30MHz



Radiated Measurement Photos

30MHz to 1000MHz



Radiated Measurement Photos

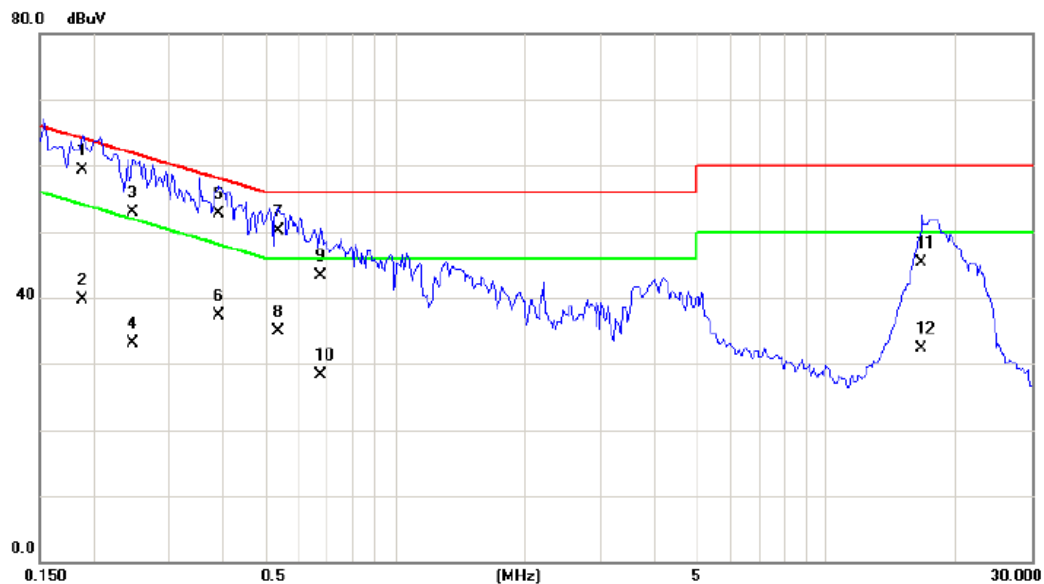
Above 1000MHz



ATTACHMENT A - CONDUCTED EMISSION

Test Mode: TX Mode

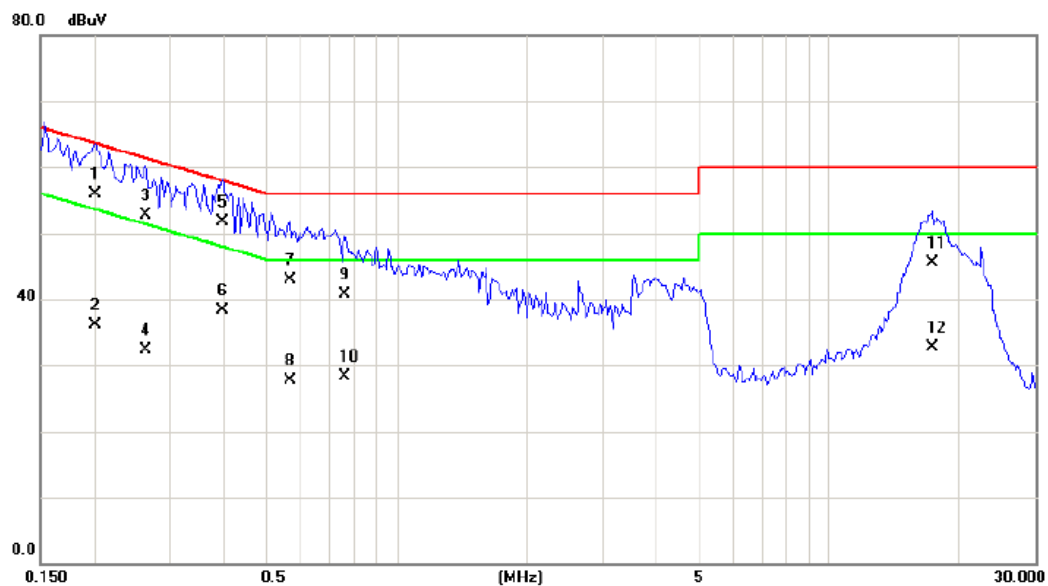
Line



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1 *	0.1891	49.70	9.54	59.24	64.08	-4.84	QP	
2	0.1891	30.10	9.54	39.64	54.08	-14.44	AVG	
3	0.2477	43.30	9.56	52.86	61.83	-8.97	QP	
4	0.2477	23.60	9.56	33.16	51.83	-18.67	AVG	
5	0.3922	43.10	9.64	52.74	58.02	-5.28	QP	
6	0.3922	27.70	9.64	37.34	48.02	-10.68	AVG	
7	0.5367	40.50	9.68	50.18	56.00	-5.82	QP	
8	0.5367	25.30	9.68	34.98	46.00	-11.02	AVG	
9	0.6734	33.70	9.63	43.33	56.00	-12.67	QP	
10	0.6734	18.60	9.63	28.23	46.00	-17.77	AVG	
11	16.7422	34.90	10.31	45.21	60.00	-14.79	QP	
12	16.7422	21.90	10.31	32.21	50.00	-17.79	AVG	

Test Mode: TX Mode

Neutral



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2008	46.20	9.61	55.81	63.58	-7.77	QP	
2		0.2008	26.50	9.61	36.11	53.58	-17.47	AVG	
3		0.2633	43.10	9.62	52.72	61.33	-8.61	QP	
4		0.2633	22.60	9.62	32.22	51.33	-19.11	AVG	
5	*	0.3961	42.10	9.63	51.73	57.93	-6.20	QP	
6		0.3961	28.70	9.63	38.33	47.93	-9.60	AVG	
7		0.5680	33.30	9.65	42.95	56.00	-13.05	QP	
8		0.5680	18.10	9.65	27.75	46.00	-18.25	AVG	
9		0.7594	31.10	9.67	40.77	56.00	-15.23	QP	
10		0.7594	18.60	9.67	28.27	46.00	-17.73	AVG	
11		17.4180	35.20	10.36	45.56	60.00	-14.44	QP	
12		17.4180	22.40	10.36	32.76	50.00	-17.24	AVG	

ATTACHMENT B - RADIATED EMISSION (9KHZ-30MHZ)

Test Mode: TX Mode

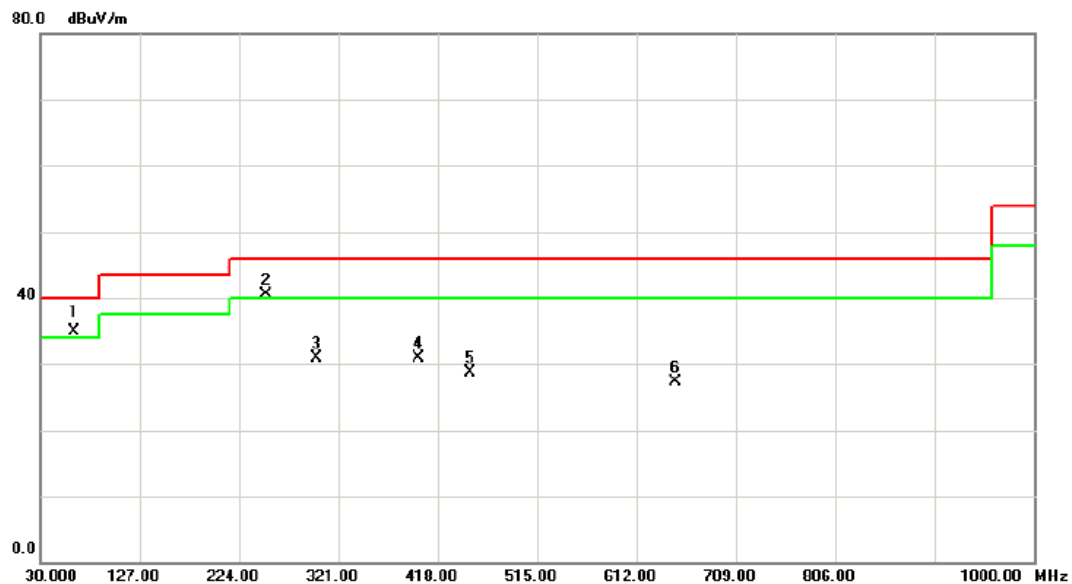
Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
0.0156	0°	13.53	24.58	38.11	103.74	-65.63	AVG
0.0156	0°	14.41	24.58	38.99	123.74	-84.75	PEAK
0.0347	0°	6.82	23.37	30.19	96.80	-66.61	AVG
0.0347	0°	7.45	23.37	30.82	116.80	-85.98	PEAK
0.0371	0°	3.68	23.22	26.90	96.22	-69.32	AVG
0.0371	0°	5.28	23.22	28.50	116.22	-87.72	PEAK
0.0458	0°	0.98	22.67	23.65	94.39	-70.74	AVG
0.0458	0°	2.97	22.67	25.64	114.39	-88.75	PEAK
2.0639	0°	30.71	19.46	50.17	69.54	-19.37	QP
3.3663	0°	21.58	18.94	40.52	69.54	-29.02	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
0.0142	90°	13.43	24.30	37.73	124.56	-86.83	AVG
0.0142	90°	14.37	24.30	38.67	144.56	-105.89	PEAK
0.0346	90°	6.42	23.38	29.80	116.82	-87.03	AVG
0.0346	90°	8.63	23.38	32.01	136.82	-104.82	PEAK
0.0362	90°	3.51	23.27	26.78	116.43	-89.65	AVG
0.0362	90°	5.28	23.27	28.55	136.43	-107.88	PEAK
0.0686	90°	0.53	22.03	22.56	110.88	-88.32	AVG
0.0686	90°	2.86	22.03	24.89	130.88	-105.99	PEAK
2.0551	90°	30.73	19.47	50.20	69.54	-19.34	QP
3.2482	90°	21.53	18.92	40.45	69.54	-29.09	QP

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

Test Mode: TX 902.75MHz _CH00

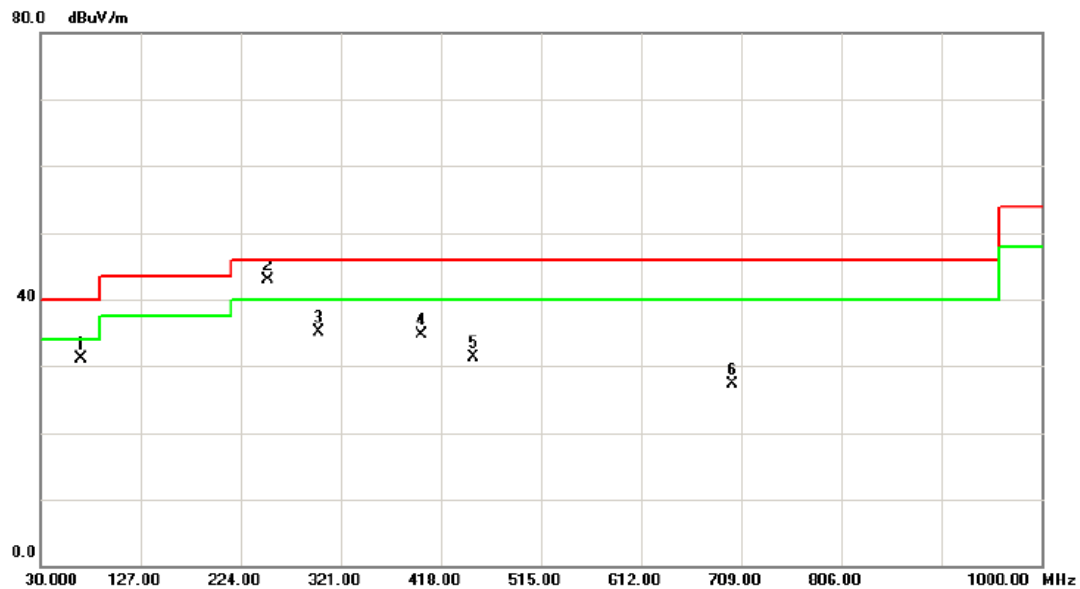
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	62.9800	50.35	-15.39	34.96	40.00	-5.04	QP	
2	!	250.1900	54.56	-14.02	40.54	46.00	-5.46	peak	
3		299.6600	41.98	-10.99	30.99	46.00	-15.01	peak	
4		399.5700	40.41	-9.55	30.86	46.00	-15.14	peak	
5		450.0100	37.34	-8.62	28.72	46.00	-17.28	peak	
6		649.8300	32.40	-5.16	27.24	46.00	-18.76	peak	

Test Mode: TX 902.75MHz _CH00

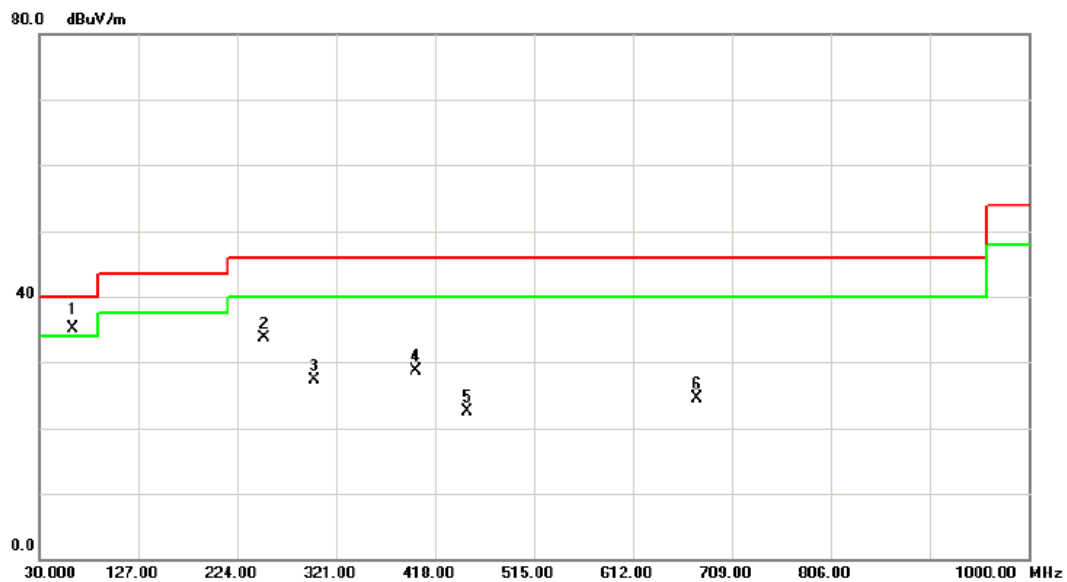
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		68.8000	47.20	-16.08	31.12	40.00	-8.88	peak	
2	*	250.1900	56.93	-14.02	42.91	46.00	-3.09	peak	
3		299.6600	46.04	-10.99	35.05	46.00	-10.95	peak	
4		399.5700	44.28	-9.55	34.73	46.00	-11.27	peak	
5		450.0100	39.86	-8.62	31.24	46.00	-14.76	peak	
6		700.2700	32.27	-4.93	27.34	46.00	-18.66	peak	

Test Mode: TX 915.25MHz _CH19

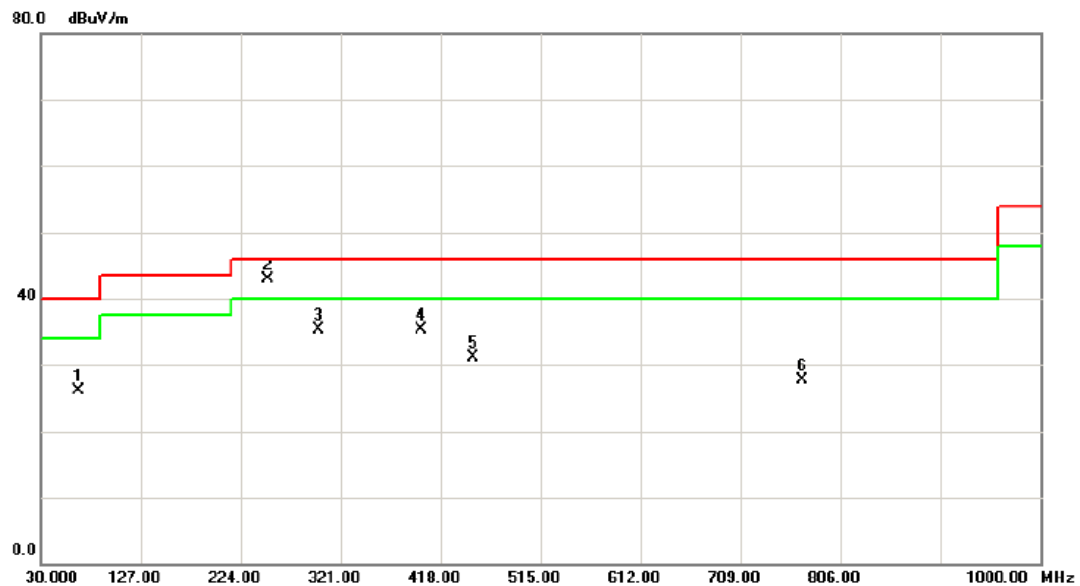
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	62.9800	50.42	-15.39	35.03	40.00	-4.97	QP	
2		250.1900	47.71	-14.02	33.69	46.00	-12.31	peak	
3		299.6600	38.22	-10.99	27.23	46.00	-18.77	peak	
4		399.5700	38.19	-9.55	28.64	46.00	-17.36	peak	
5		450.0100	31.22	-8.62	22.60	46.00	-23.40	peak	
6		675.0500	29.60	-5.04	24.56	46.00	-21.44	peak	

Test Mode: TX 915.25MHz _CH19

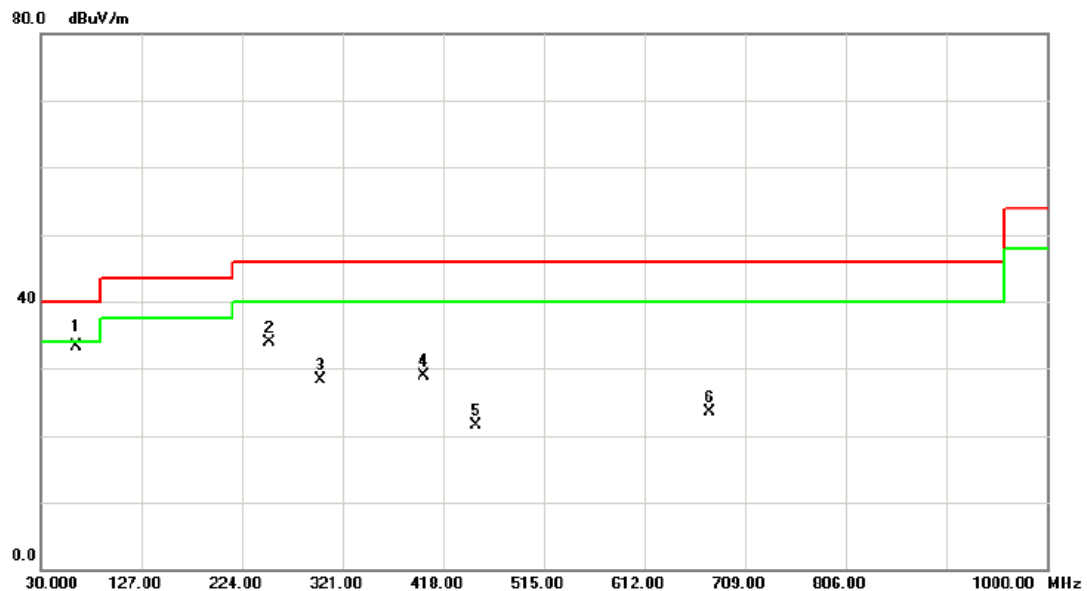
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		66.8600	41.87	-15.81	26.06	40.00	-13.94	peak	
2	*	250.1900	56.99	-14.02	42.97	46.00	-3.03	peak	
3		299.6600	46.29	-10.99	35.30	46.00	-10.70	peak	
4		399.5700	44.78	-9.55	35.23	46.00	-10.77	peak	
5		450.0100	39.74	-8.62	31.12	46.00	-14.88	peak	
6		769.1400	31.74	-3.96	27.78	46.00	-18.22	peak	

Test Mode: TX 927.25MHz _CH49

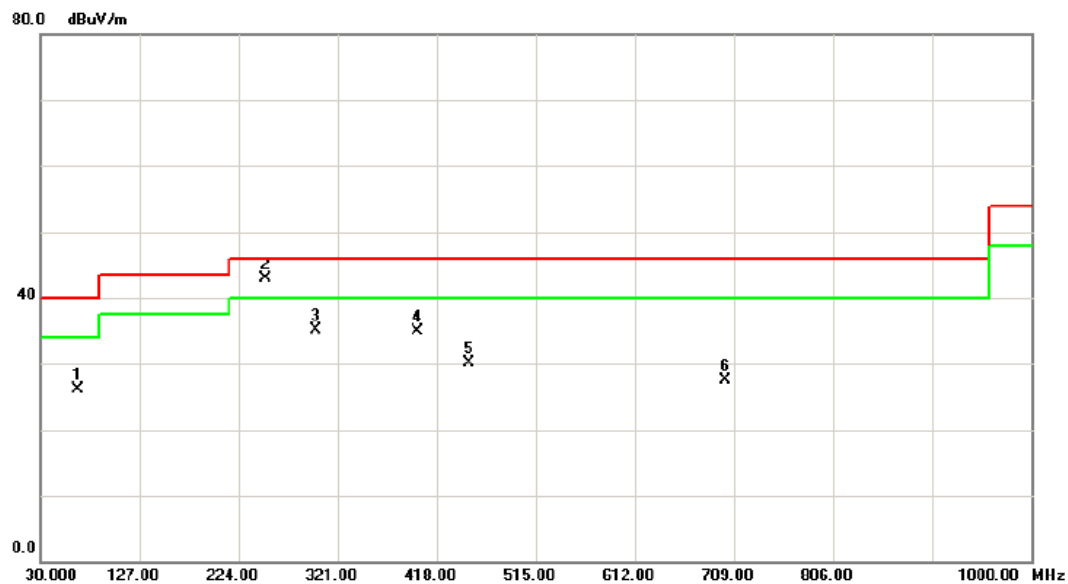
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	63.9500	48.72	-15.47	33.25	40.00	-6.75	QP	
2		250.1900	47.95	-14.02	33.93	46.00	-12.07	peak	
3		299.6600	39.24	-10.99	28.25	46.00	-17.75	peak	
4		399.5700	38.46	-9.55	28.91	46.00	-17.09	peak	
5		450.0100	30.16	-8.62	21.54	46.00	-24.46	peak	
6		675.0500	28.58	-5.04	23.54	46.00	-22.46	peak	

Test Mode: TX 927.25MHz _CH49

Horizontal

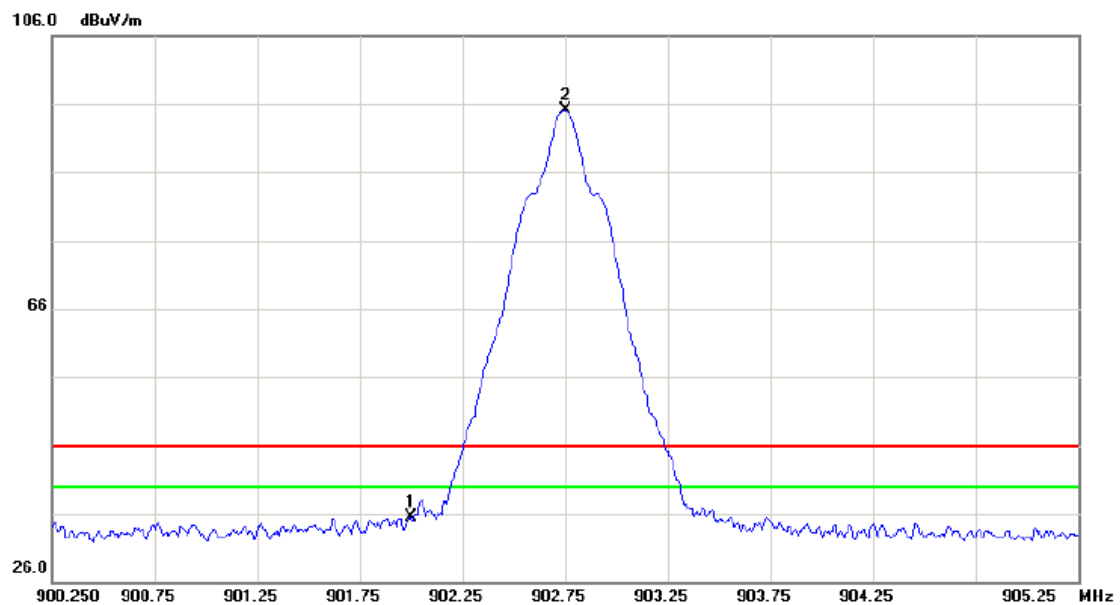


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		66.8600	41.96	-15.81	26.15	40.00	-13.85	peak	
2	*	250.1900	56.93	-14.02	42.91	46.00	-3.09	peak	
3		299.6600	46.11	-10.99	35.12	46.00	-10.88	peak	
4		399.5700	44.44	-9.55	34.89	46.00	-11.11	peak	
5		450.0100	38.79	-8.62	30.17	46.00	-15.83	peak	
6		700.2700	32.44	-4.93	27.51	46.00	-18.49	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _CH00

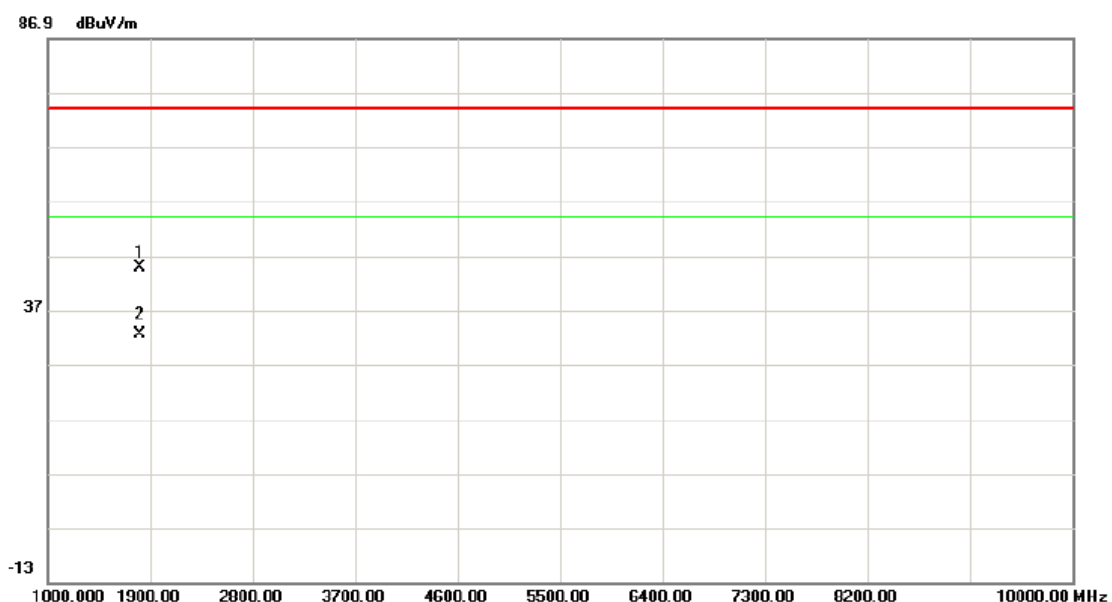
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		902.0000	36.89	-1.48	35.41	46.00	-10.59	peak	
2	*	902.7500	96.52	-1.45	95.07	46.00	49.07	peak	no limit

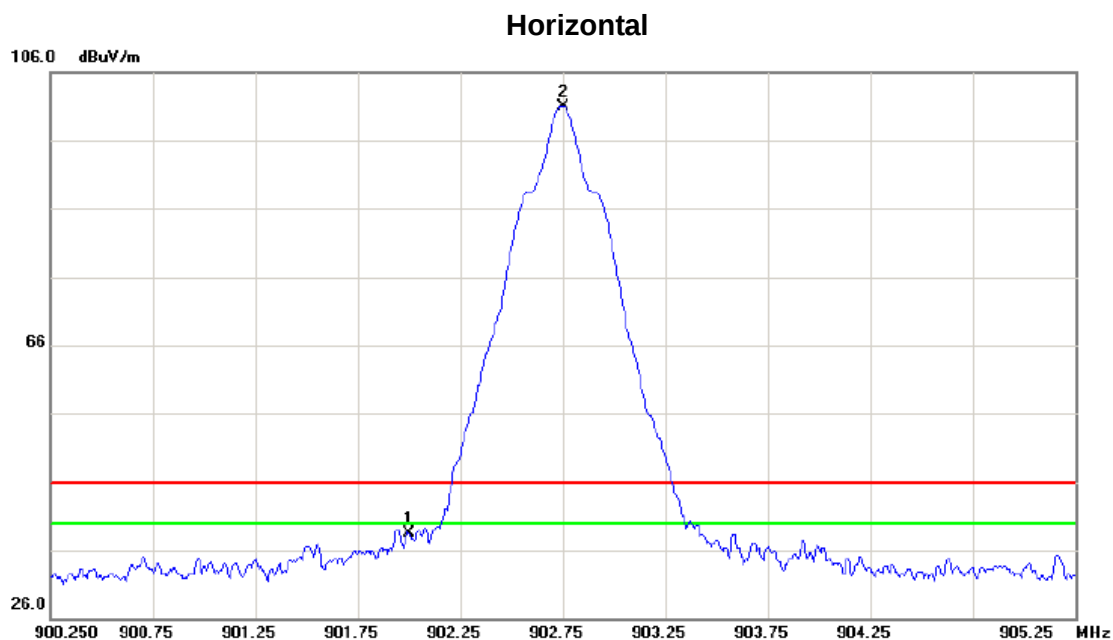
Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _CH00

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		1810.000	48.86	-4.01	44.85	74.00	-29.15	peak	
2	*	1810.000	36.53	-4.01	32.52	54.00	-21.48	AVG	

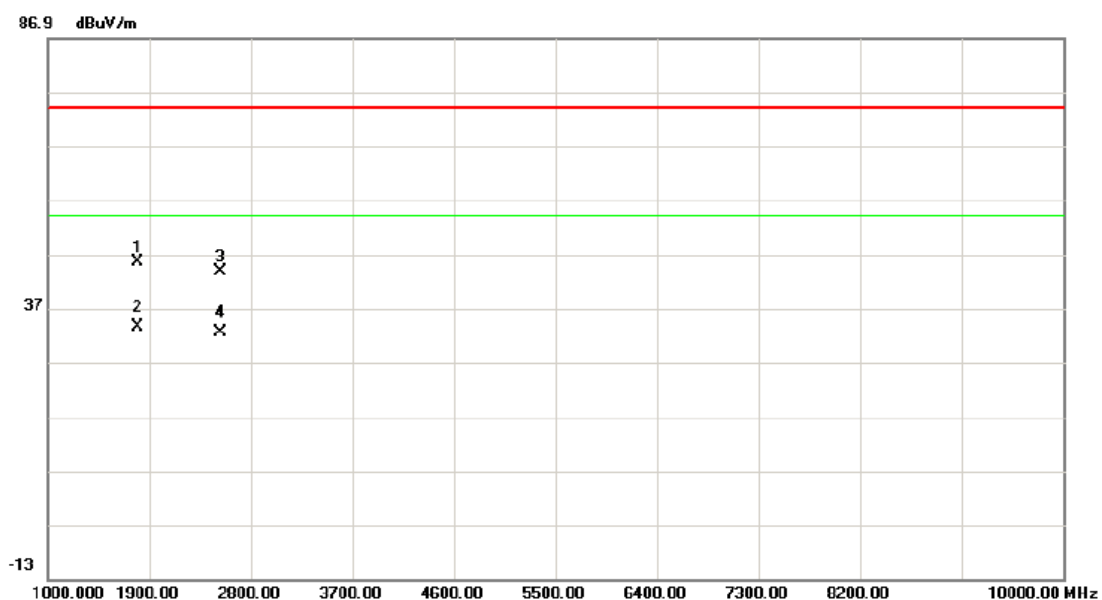
Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _CH00



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		902.0000	40.07	-1.48	38.59	46.00	-7.41	peak	
2	*	902.7500	102.4	-1.45	100.98	46.00	54.98	peak	no limit

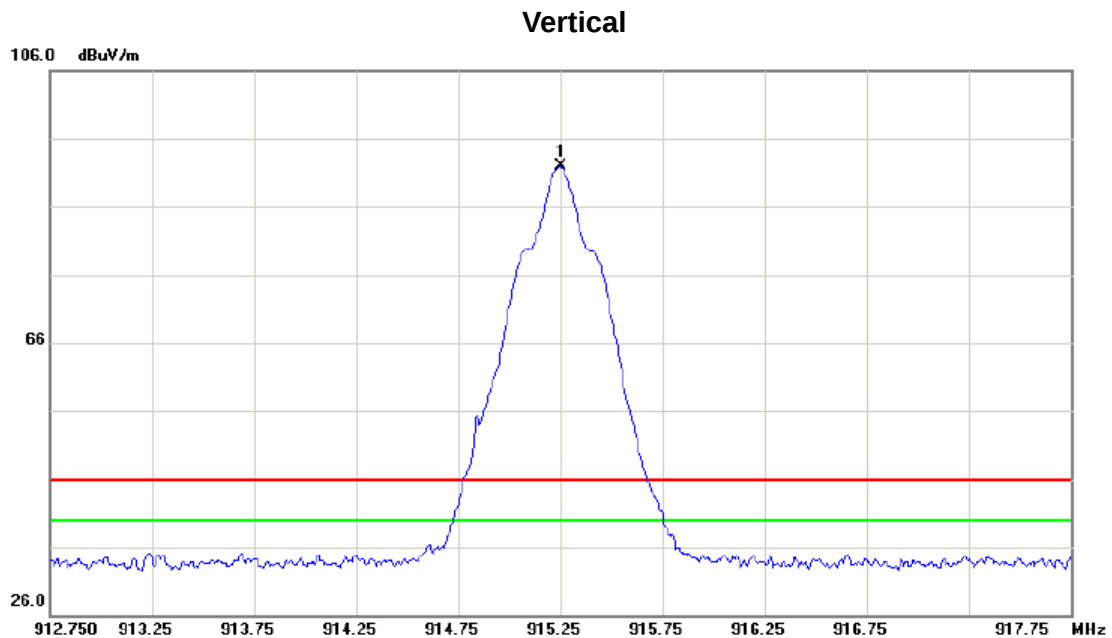
Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _CH00

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		1801.000	49.60	-4.07	45.53	74.00	-28.47	peak	
2	*	1801.000	37.56	-4.07	33.49	54.00	-20.51	AVG	
3		2530.000	45.95	-2.19	43.76	74.00	-30.24	peak	
4		2530.000	34.76	-2.19	32.57	54.00	-21.43	AVG	

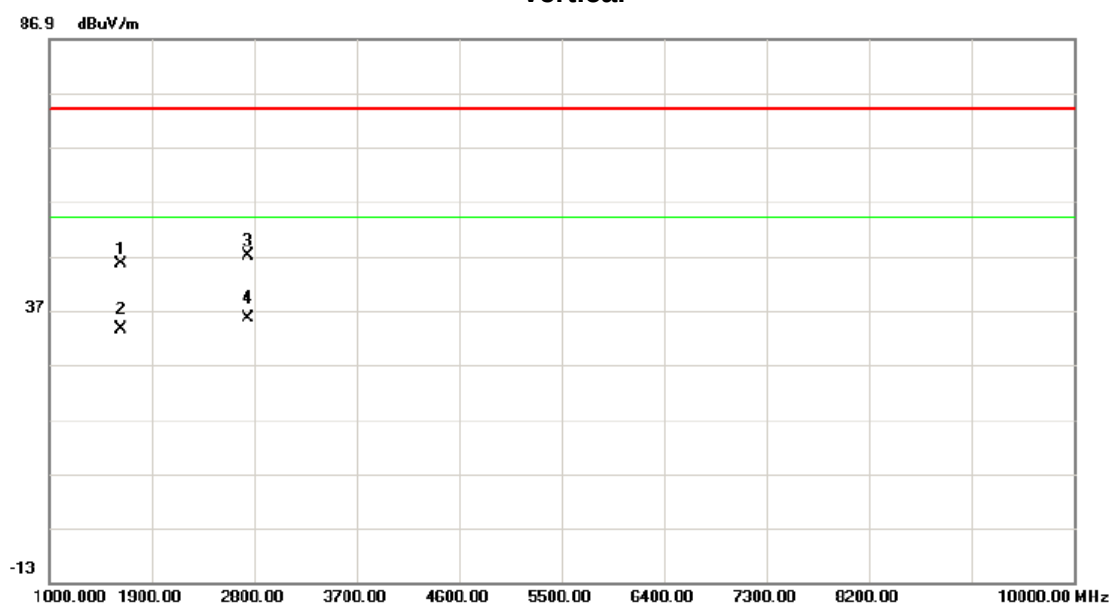
Orthogonal Axis :	X
Test Mode :	TX 915.25MHz _CH19



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	915.2500	92.94	-1.12	91.82	46.00	45.82	peak	no limit

Orthogonal Axis :	X
Test Mode :	TX 915.25MHz _CH19

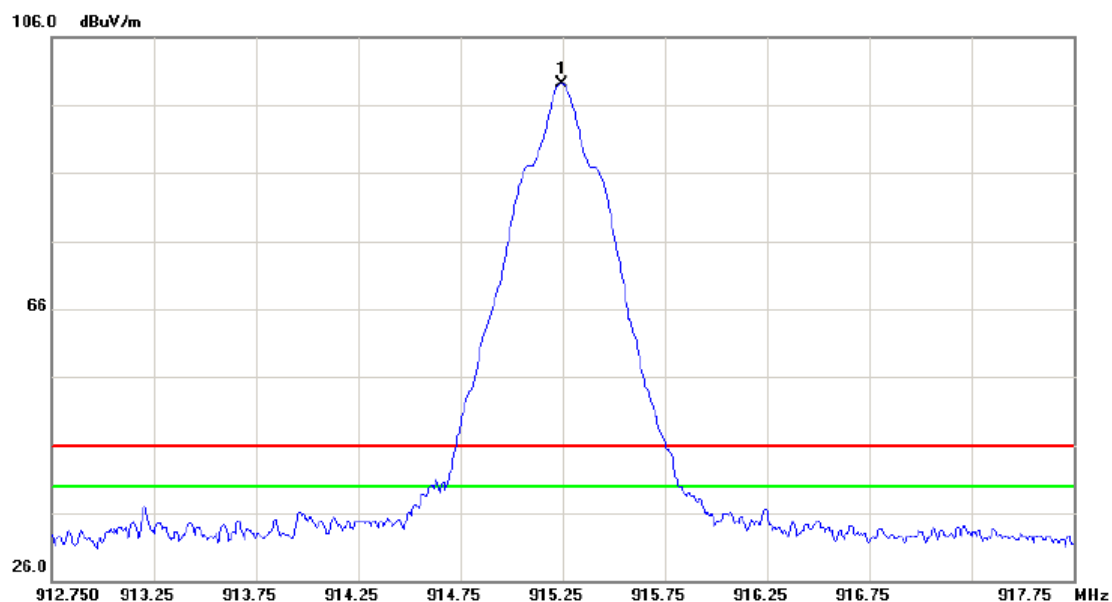
Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		1630.000	50.61	-5.01	45.60	74.00	-28.40	peak	
2		1630.000	38.42	-5.01	33.41	54.00	-20.59	AVG	
3		2746.000	48.31	-1.25	47.06	74.00	-26.94	peak	
4	*	2746.000	36.75	-1.25	35.50	54.00	-18.50	AVG	

Orthogonal Axis :	X
Test Mode :	TX 915.25MHz _CH19

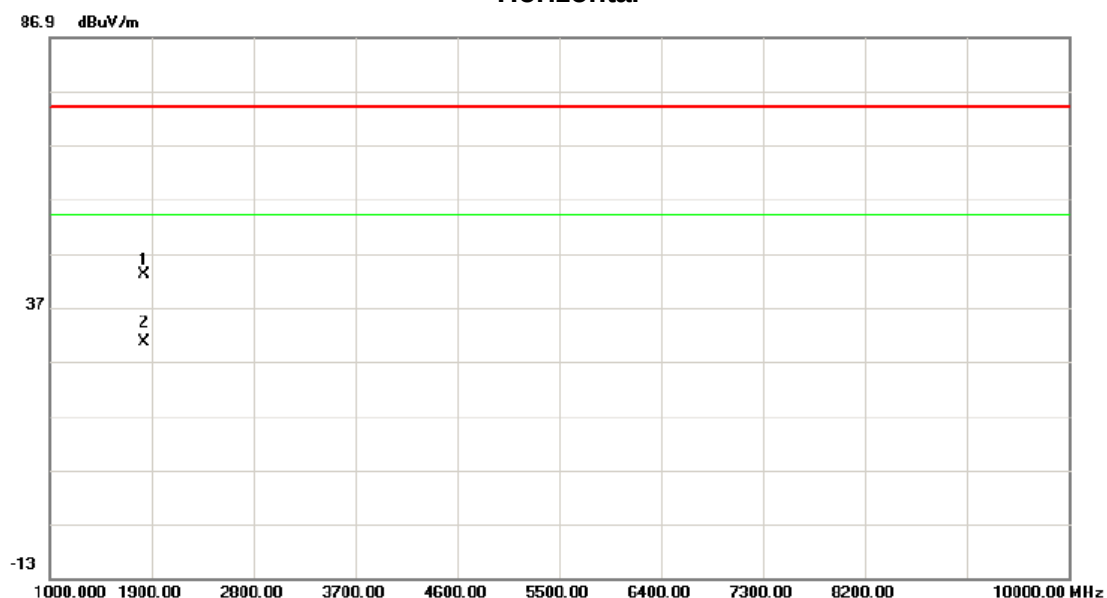
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	915.2450	100.1	-1.13	99.01	46.00	53.01	peak	no limit

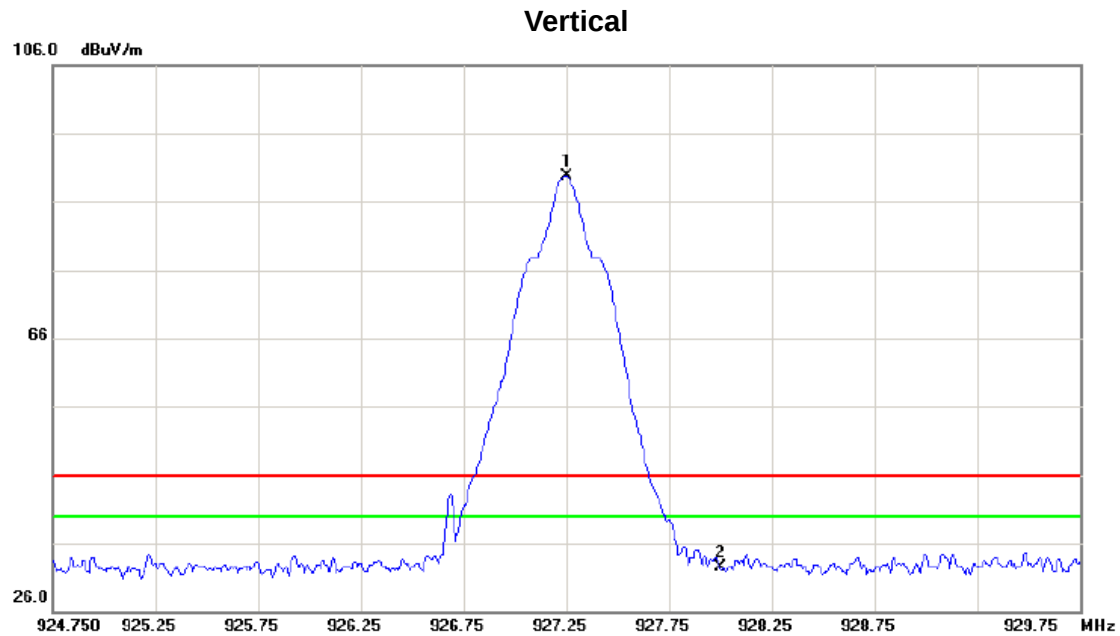
Orthogonal Axis :	X
Test Mode :	TX 915.25MHz _CH19

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		1828.000	46.93	-3.91	43.02	74.00	-30.98	peak	
2	*	1828.000	34.52	-3.91	30.61	54.00	-23.39	AVG	

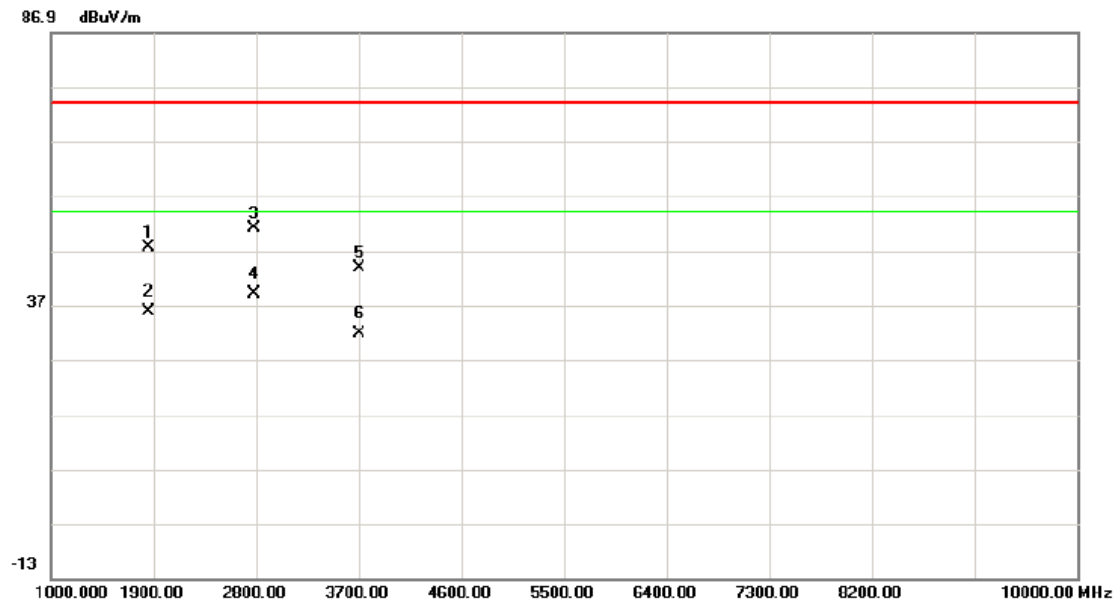
Orthogonal Axis :	X
Test Mode :	TX 927.25MHz _CH49



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	927.2500	90.51	-0.80	89.71	46.00	43.71	peak	no limit
2		928.0000	33.33	-0.79	32.54	46.00	-13.46	peak	

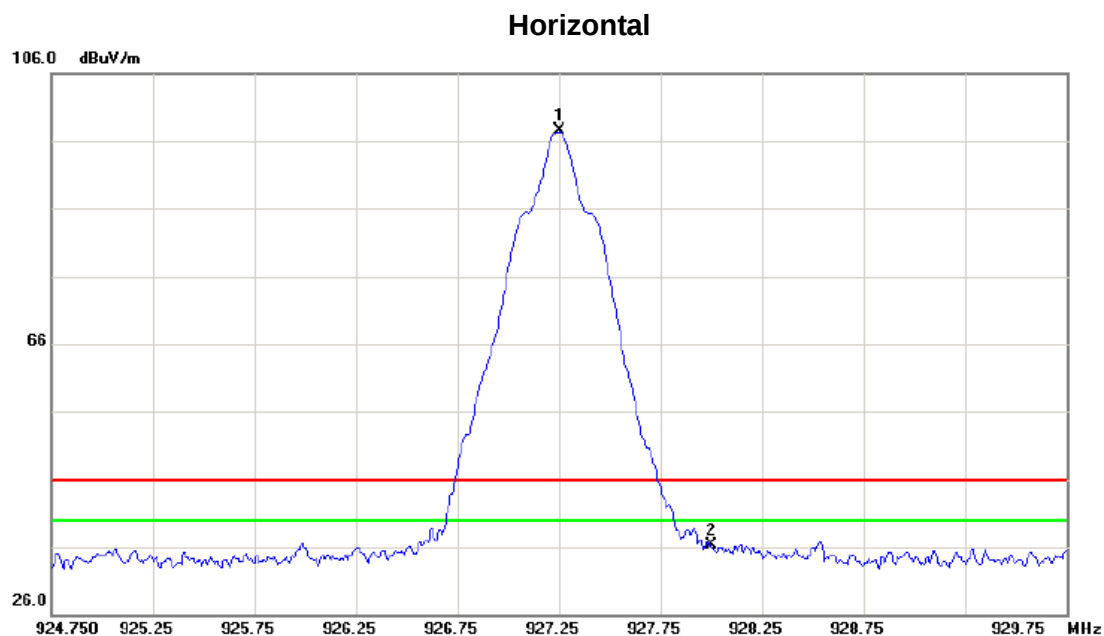
Orthogonal Axis :	X
Test Mode :	TX 927.25MHz _CH49

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		1855.000	51.21	-3.76	47.45	74.00	-26.55	peak	
2		1855.000	39.49	-3.76	35.73	54.00	-18.27	AVG	
3		2782.000	52.10	-1.10	51.00	74.00	-23.00	peak	
4	*	2782.000	40.24	-1.10	39.14	54.00	-14.86	AVG	
5		3709.000	41.89	1.98	43.87	74.00	-30.13	peak	
6		3709.000	29.68	1.98	31.66	54.00	-22.34	AVG	

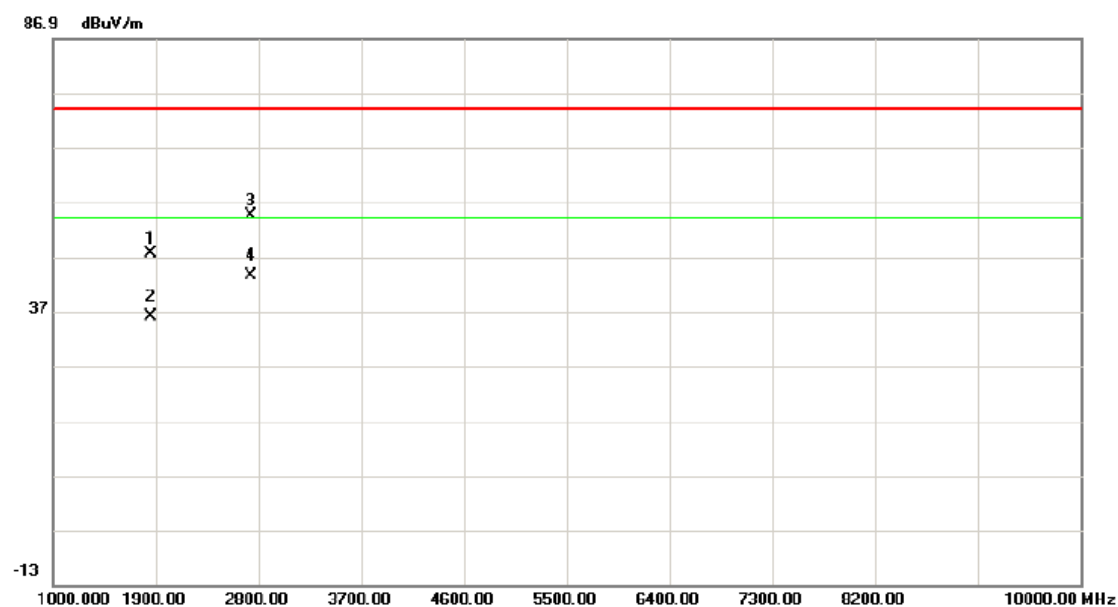
Orthogonal Axis :	X
Test Mode :	TX 927.25MHz _CH49



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	927.2500	98.21	-0.80	97.41	46.00	51.41	peak	no limit
2		928.0000	37.16	-0.79	36.37	46.00	-9.63	peak	

Orthogonal Axis :	X
Test Mode :	TX 927.25MHz _CH49

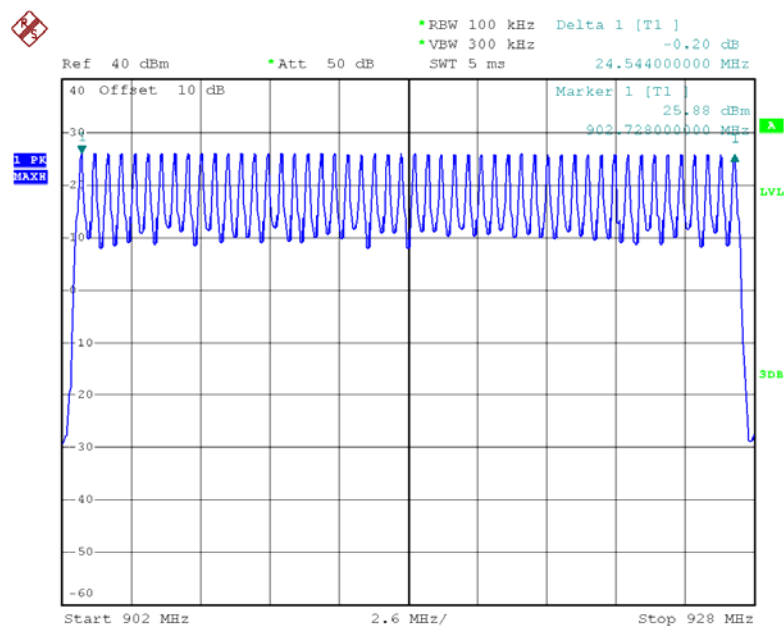
Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		1855.000	51.31	-3.76	47.55	74.00	-26.45	peak	
2		1855.000	39.72	-3.76	35.96	54.00	-18.04	AVG	
3		2728.000	55.91	-1.33	54.58	74.00	-19.42	peak	
4	*	2728.000	44.83	-1.33	43.50	54.00	-10.50	AVG	

ATTACHMENT E - NUMBER OF HOPPING CHANNEL

Test Mode	Hopping Mode
Number of Hopping Channel	50



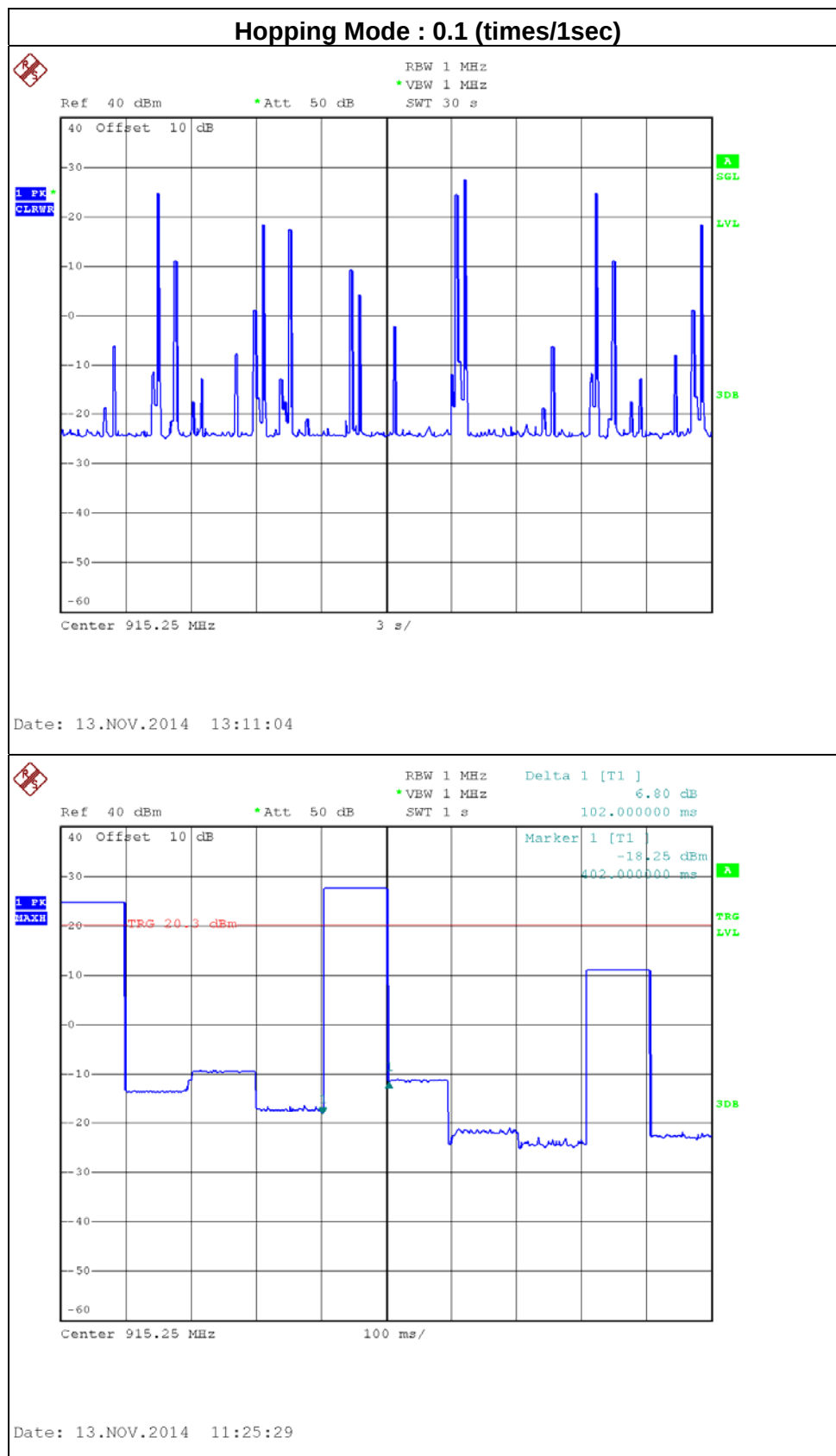
Date: 10.NOV.2014 15:14:19

ATTACHMENT F - AVERAGE TIME OF OCCUPANCY

Test Mode: Hopping Mode			
Number of transmission in a 20(50Hopping*0.4)	Length of transmission time (msec)	Result (msec)	Limit (msec)
(0.1/1) *20=2 times Note1	102	204	400

Note1: 0.1 times of occupied channels per second

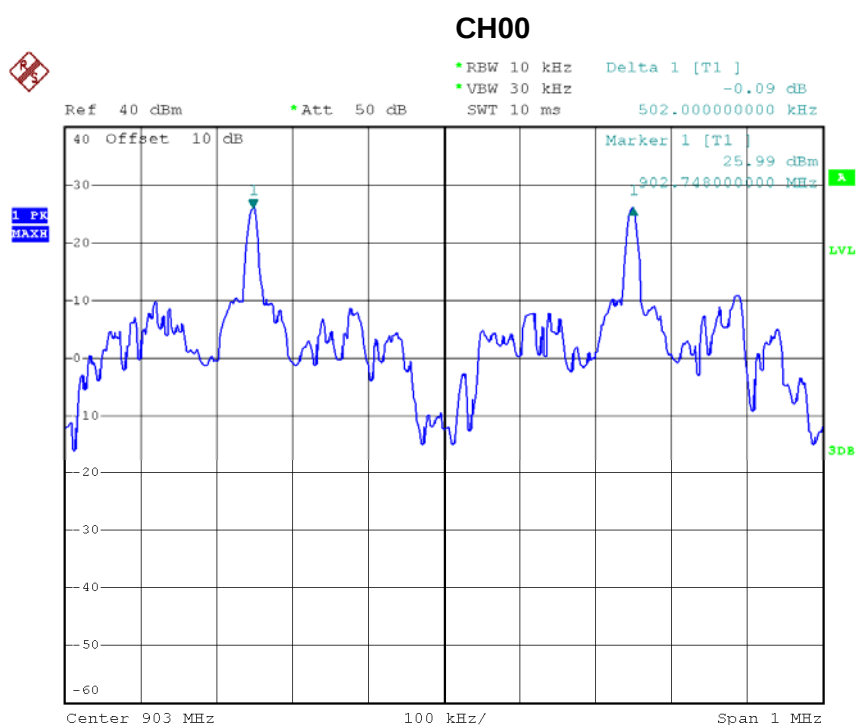
	Results
Measured cycle (sec)	50 CH*0.4=20
The total number of frequency-hopping per second	((0.1/1)*20)=2
The number of occupied channels per second	2/20=0.1 (number/sec)
occupied time for each channel(1)	102 ms
The total number of channels occupied within one cycle (2)	(0.1/1) *20=2 times
The average time of occupancy within one cycle(1)*(2)	204 msec
LIMIT (msec)	400msec



ATTACHMENT G - HOPPING CHANNEL SEPARATION MEASUREMENT

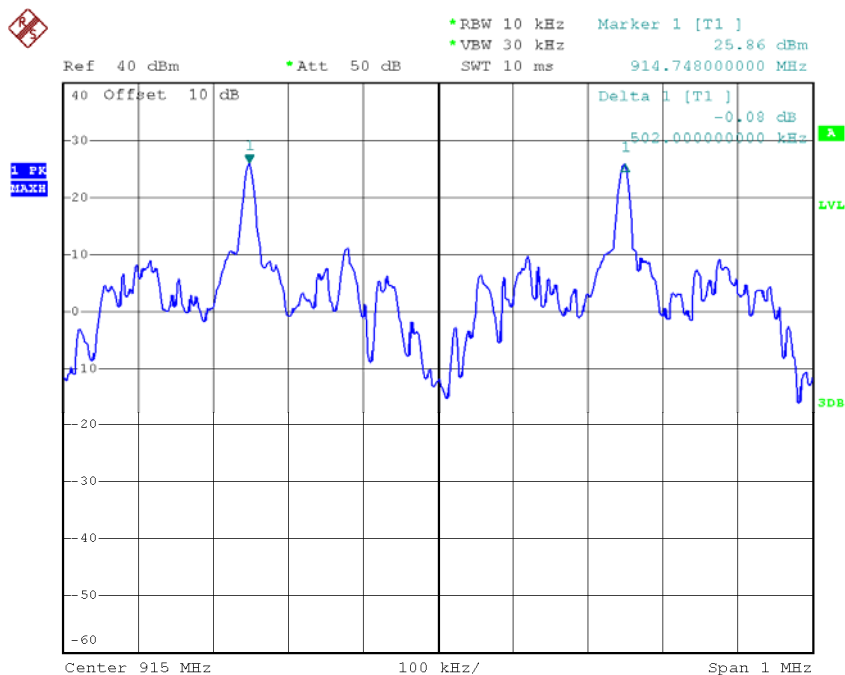
Test Mode :	Hopping on
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Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
902.75	0.502	0.256	Complies
915.25	0.502	0.240	Complies
927.25	0.504	0.241	Complies



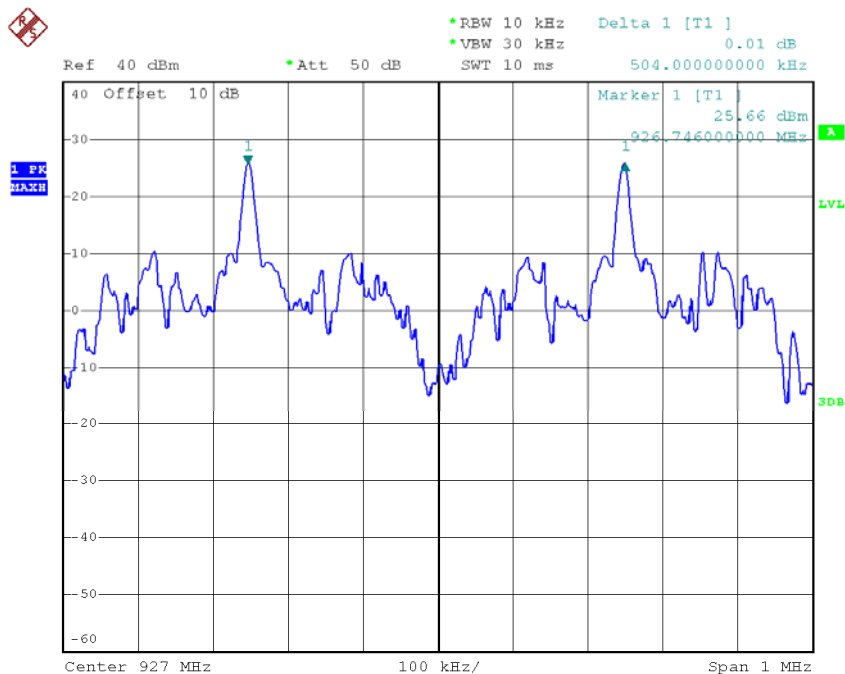
Date: 10.NOV.2014 15:15:55

CH19



Date: 10.NOV.2014 15:17:41

CH49

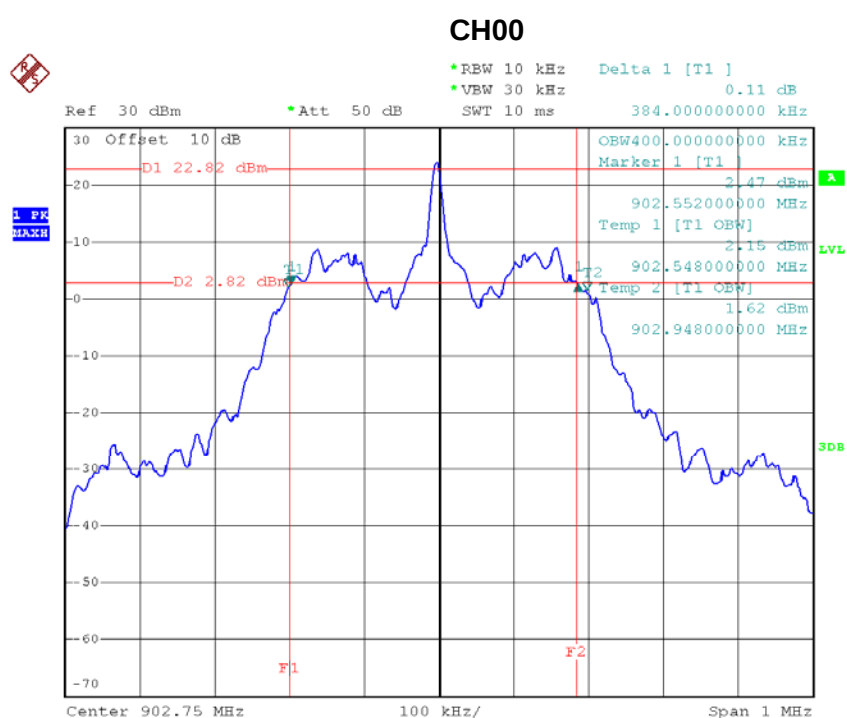


Date: 10.NOV.2014 15:19:00

ATTACHMENT H - BANDWIDTH

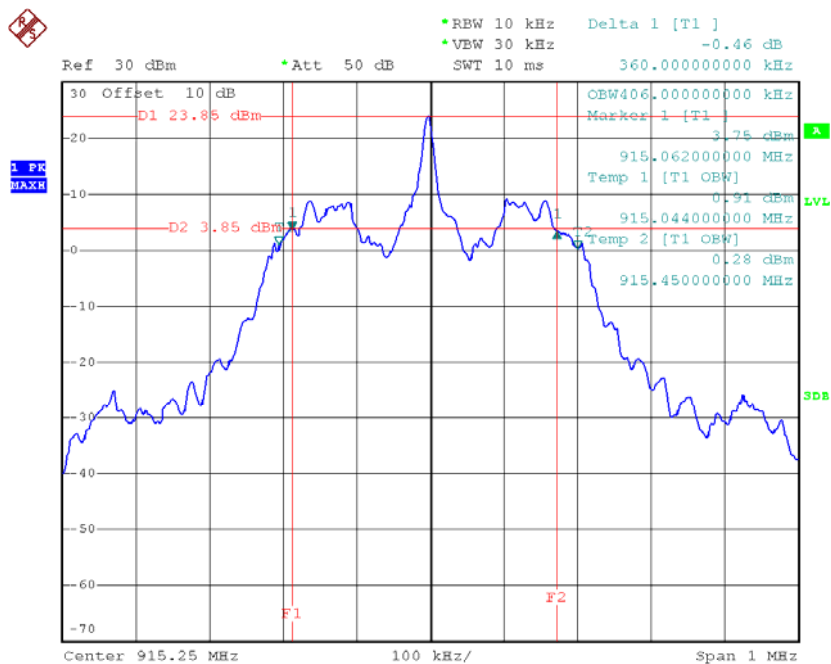
Test Mode :	TX Mode
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Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
902.75	0.384	0.400	Complies
915.25	0.360	0.406	Complies
927.25	0.362	0.392	Complies



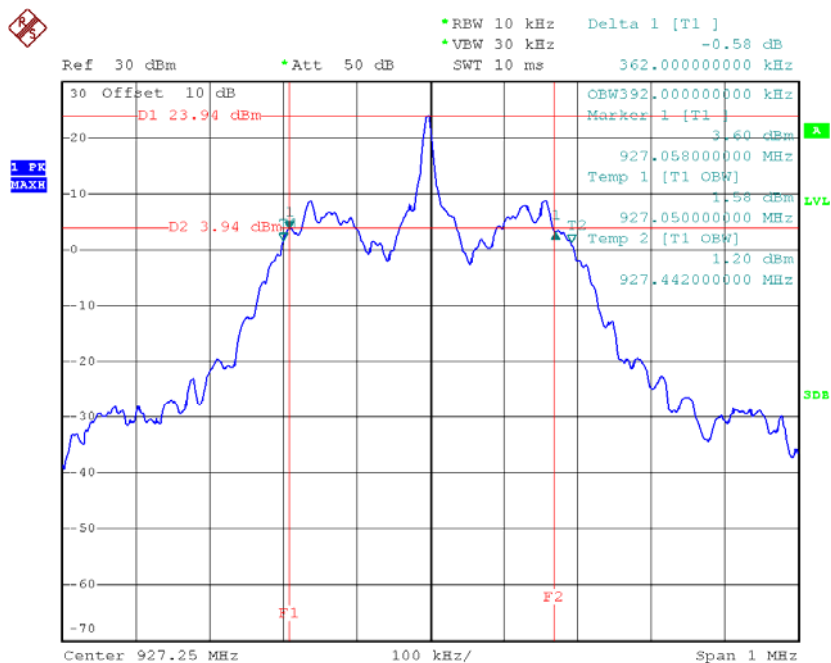
Date: 24.OCT.2014 16:27:55

CH19



Date: 24.OCT.2014 16:29:27

CH49

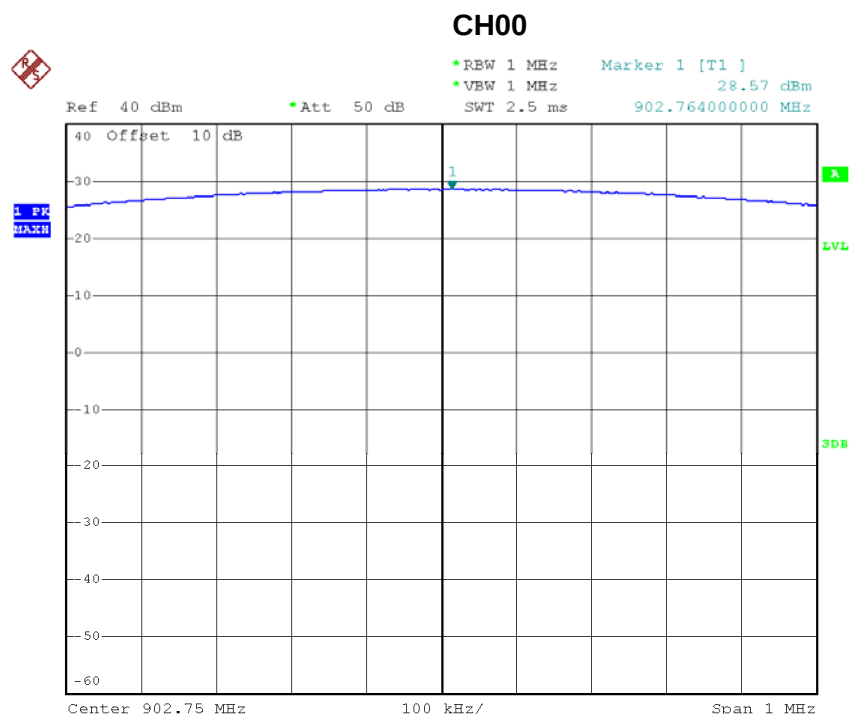


Date: 24.OCT.2014 16:30:41

ATTACHMENT I - PEAK OUTPUT POWER

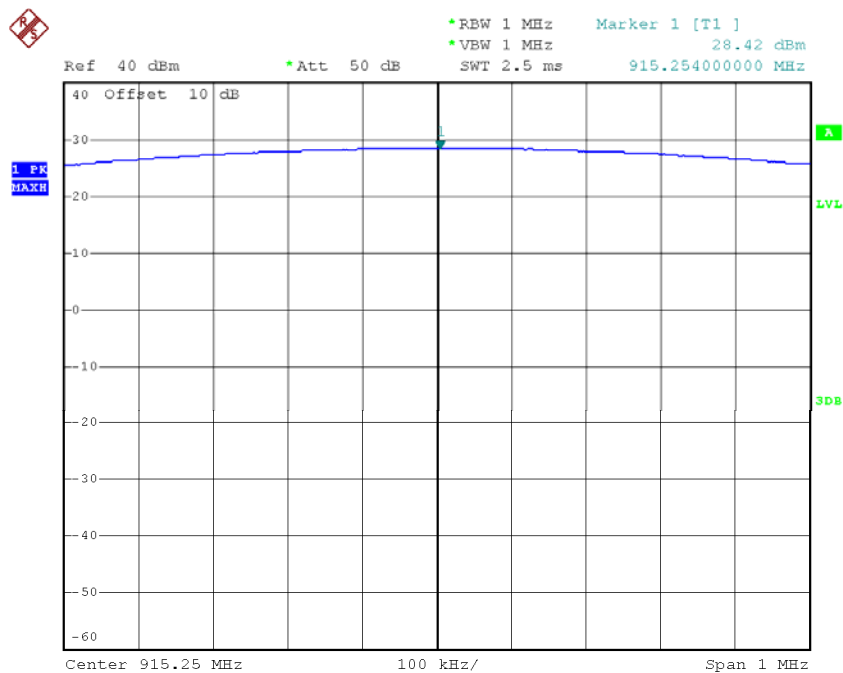
Test Mode :	TX Mode
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Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watt)	Max. Limit (dBm)	Max. Limit (Watt)	Test Result
902.75	28.57	0.7194	30.00	1.0000	Complies
915.25	28.42	0.6950	30.00	1.0000	Complies
927.25	28.41	0.6934	30.00	1.0000	Complies



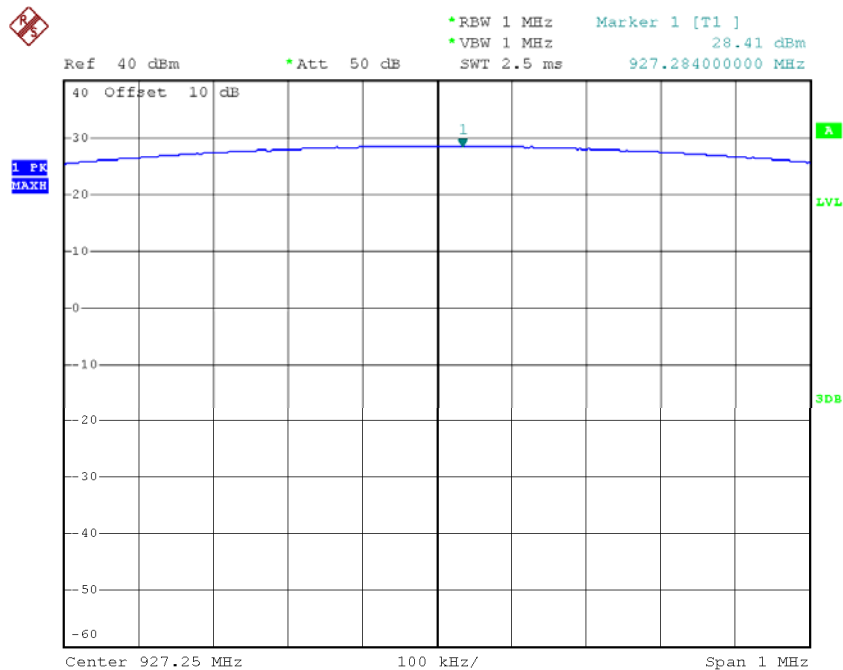
Date: 10.NOV.2014 15:22:56

CH19



Date: 10.NOV.2014 15:23:16

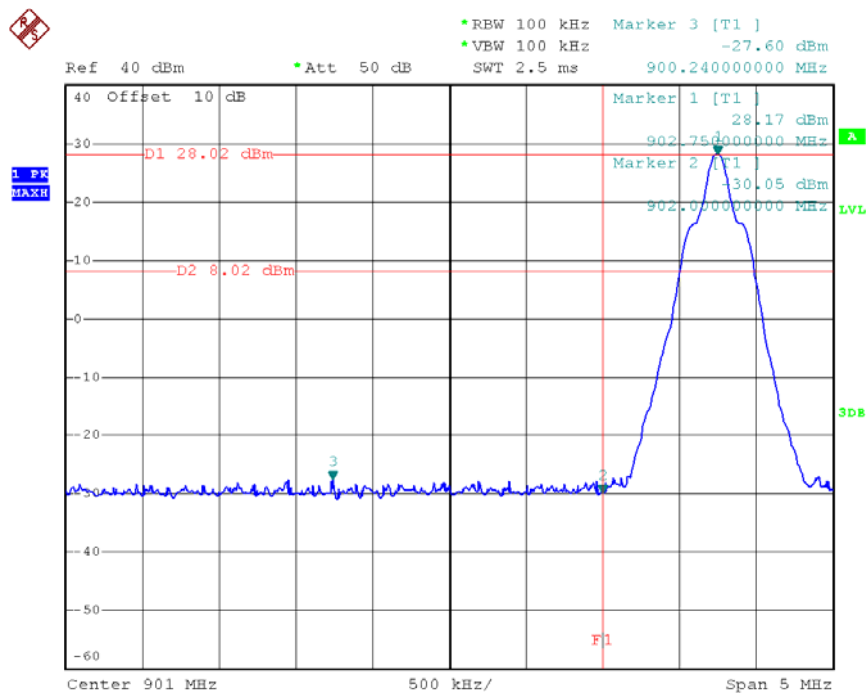
CH49



Date: 10.NOV.2014 15:23:56

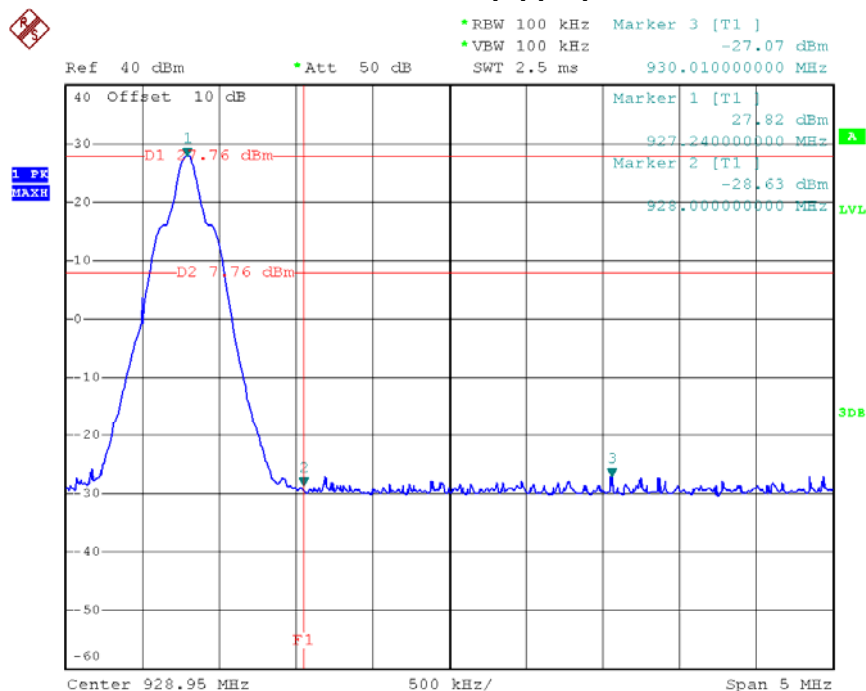
ATTACHMENT J - ANTENNA CONDUCTED SPURIOUS EMISSION

CH00 (Lower)



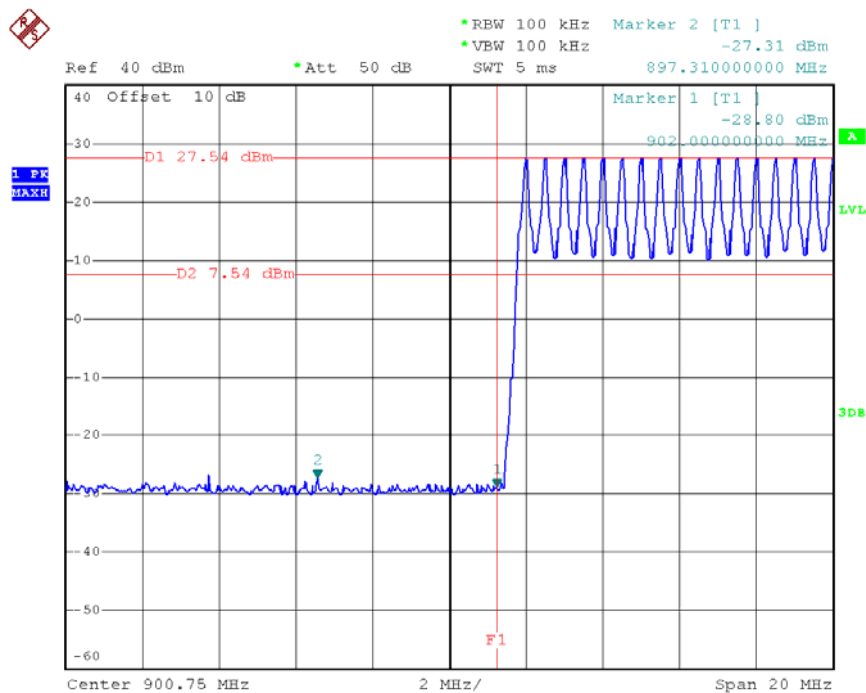
Date: 13.NOV.2014 13:27:01

CH49 (Upper)



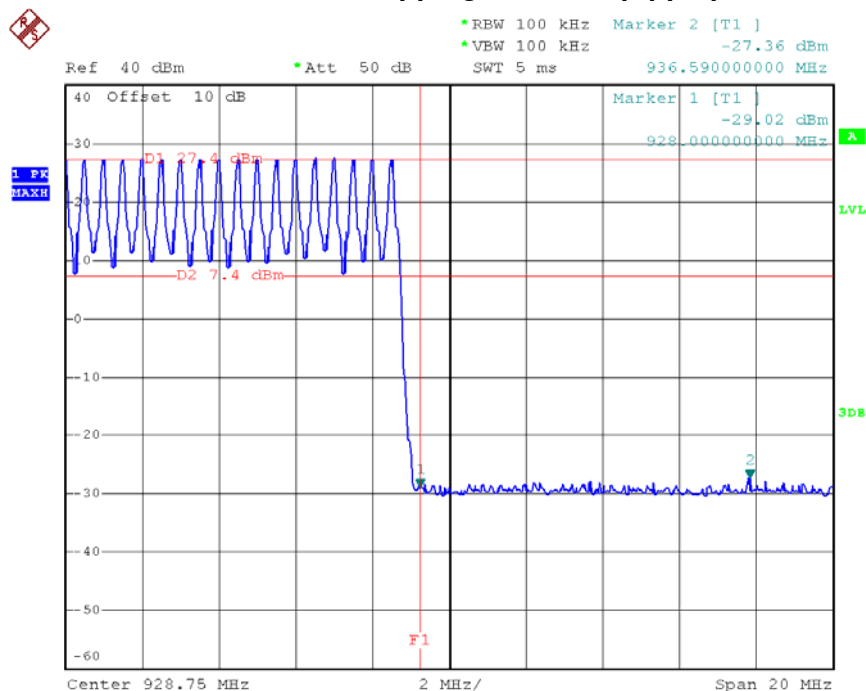
Date: 13.NOV.2014 13:29:02

CH00 Hopping on mode (Lower)



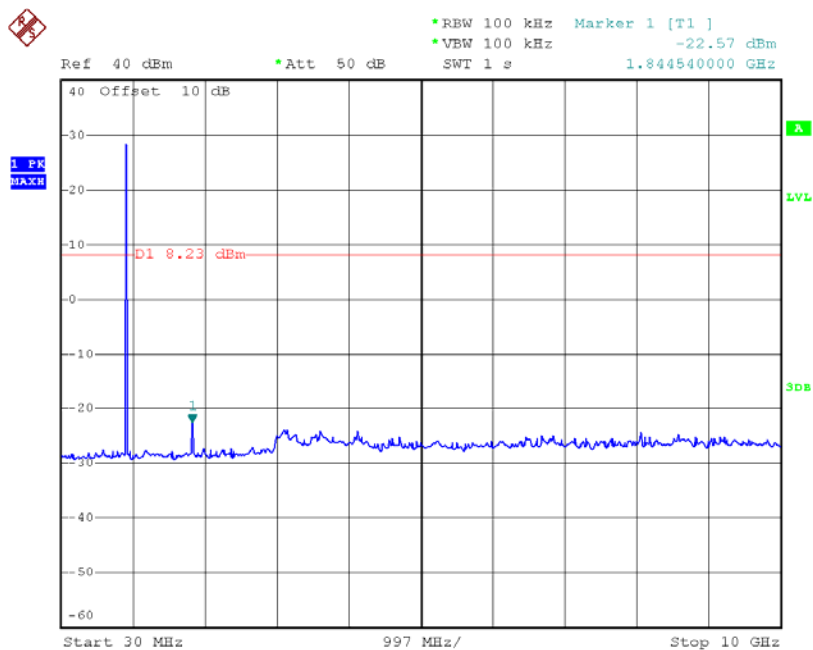
Date: 13.NOV.2014 13:20:50

CH49 Hopping on mode (Upper)



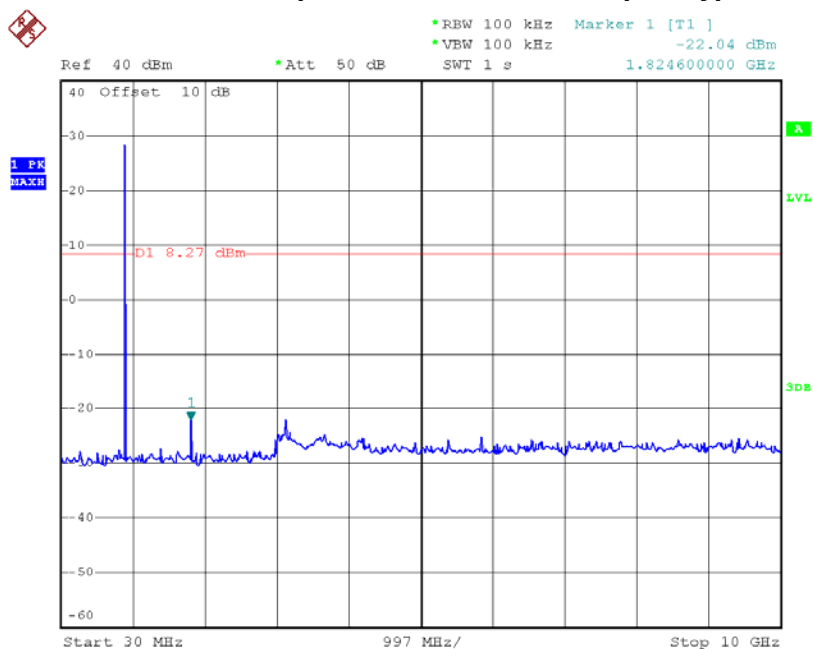
Date: 13.NOV.2014 13:22:23

CH00 (10 Harmonic of the frequency)



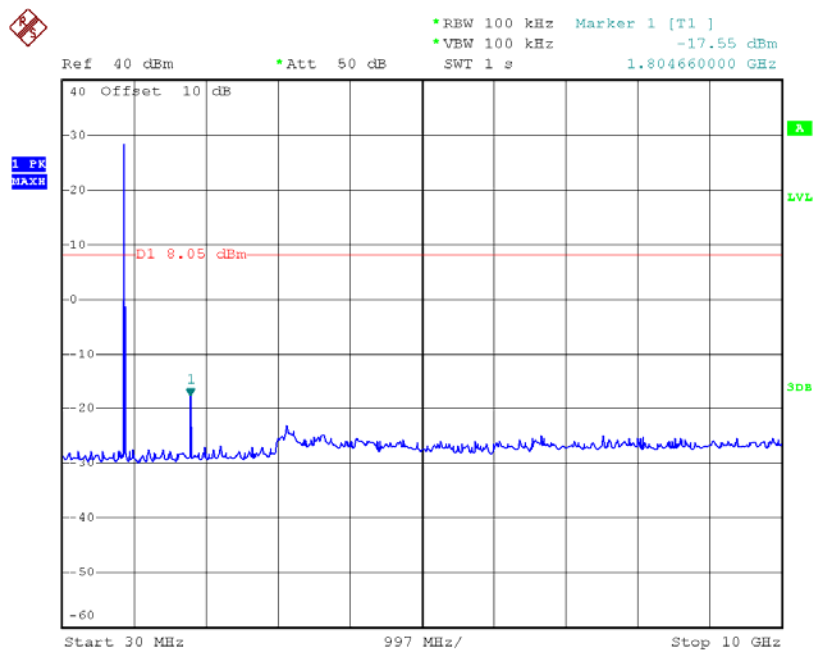
Date: 10.NOV.2014 15:38:56

CH19 (10 Harmonic of the frequency)



Date: 10.NOV.2014 15:39:44

CH49 (10 Harmonic of the frequency)



Date: 10.NOV.2014 15:43:38