

FCC Radio Test Report

FCC ID: 2AC9W-CMC187

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

Project No. : 1605C201
Equipment : UHF Card Issuer
Model Name : CMC187
Applicant : FUTAIHUA INDUSTRIAL (SHENZHEN) CO.,LTD.
Address : B District, Foxconn Technology Park, Guanlan
Town, Baoan, Shenzhen, GuangDong, China

Date of Receipt : May 24, 2016
Date of Test : May 24, 2016 ~ Aug. 19, 2016
Issued Date : Aug. 22, 2016
Tested by : BTL Inc.

Testing Engineer : Shawn Xiao
(Shawn Xiao)

Technical Manager : David Mao
(David Mao)

Authorized Signatory : Steven Lu
(Steven Lu)

B T L I N C .

No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan,
Guangdong, China.

TEL: +86-769-8318-3000 FAX: +86-769-8319-6000

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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-1-1605C201	Original Issue.	Aug. 22, 2016

1. CERTIFICATION

Equipment : UHF Card Issuer
Trade Name : CMCID
Model Name : CMC187
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 : May 24, 2016 ~ Aug. 19, 2016
Test Sample : ENGINEERING SAMPLE
Standard(s) : FCC Part15, Subpart C (15.247)/ ANSI C63.10-2013

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-1-1605C201) 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			
Standard(s) Section	Test Item	Judgment	Remark
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

2.1 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 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 measurement instrumentation uncertainty considerations contained 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)
DG-C02	CISPR	150 KHz ~ 30MHz	2.32

B. Radiated Measurement :

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	3.82
		30MHz ~ 200MHz	H	3.78
		200MHz ~ 1,000MHz	V	4.10
		200MHz ~ 1,000MHz	H	4.06
		1GHz~18GHz	V	3.12
		1GHz~18GHz	H	3.68
		18GHz~40GHz	V	4.15
		18GHz~40GHz	H	4.14

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	UHF Card Issuer	
Trade Name	CMCID	
Model Name	CMC187	
Model Difference	N/A	
Output Power (Max.)	Operation Frequency	902-928MHz
	Modulation Technology	ASK(62.5 Kbps)
	Bit Rate of Transmitter	
	Output Power Max.	15.89dBm
Power Source	Supplied from USB port.	
Power Rating	EUT I/P: DC 5V	

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)
1	N/A	N/A	Internal	N/A	0

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:

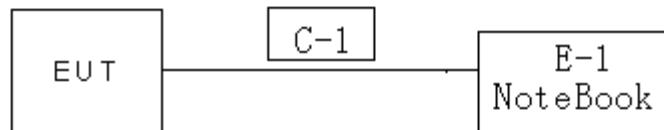
- (1) The measurements are performed at the high, middle, low available channels.

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	CMC187-PL2303-Driver		
Frequency (MHz)	902.75	915.25	927.25
Power Parameters	14	14	14

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.5 DESCRIPTION OF SUPPORT UNITS

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

Item	Equipment	Mfr/Brand	Model/Type No.	FCC ID/IC	Series No.
E-1	NOTEBOOK	DELL	INSPIRON 1420	N/A	JX193A01SDC2

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1.25m	USB 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 (dB μ V)	
	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

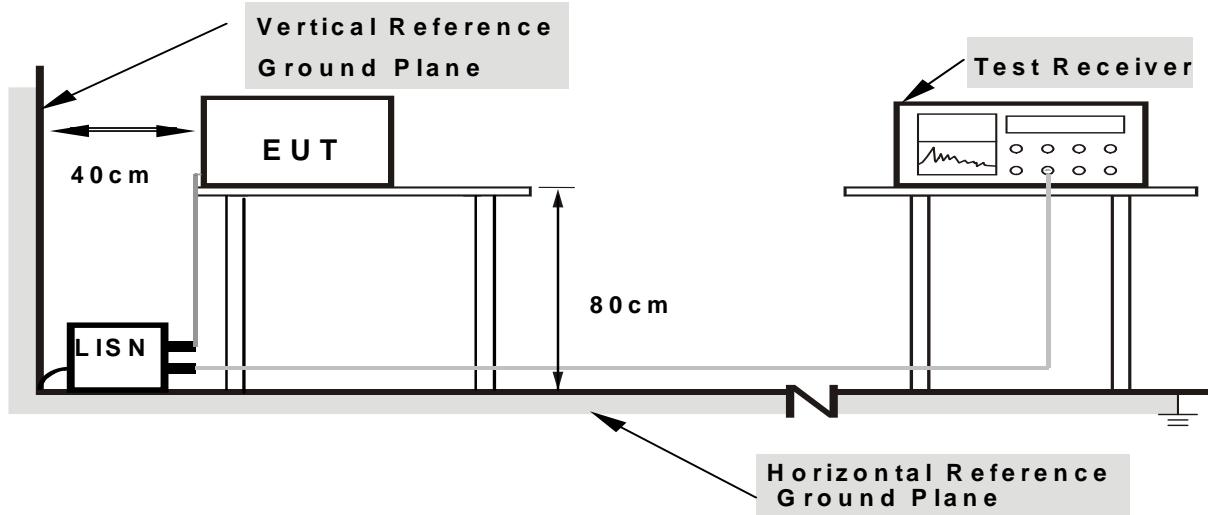
4.1.2 TEST PROCEDURE

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

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 (dB_BuV/m) = 20log Emission level (uV/m).
- (4) 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

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

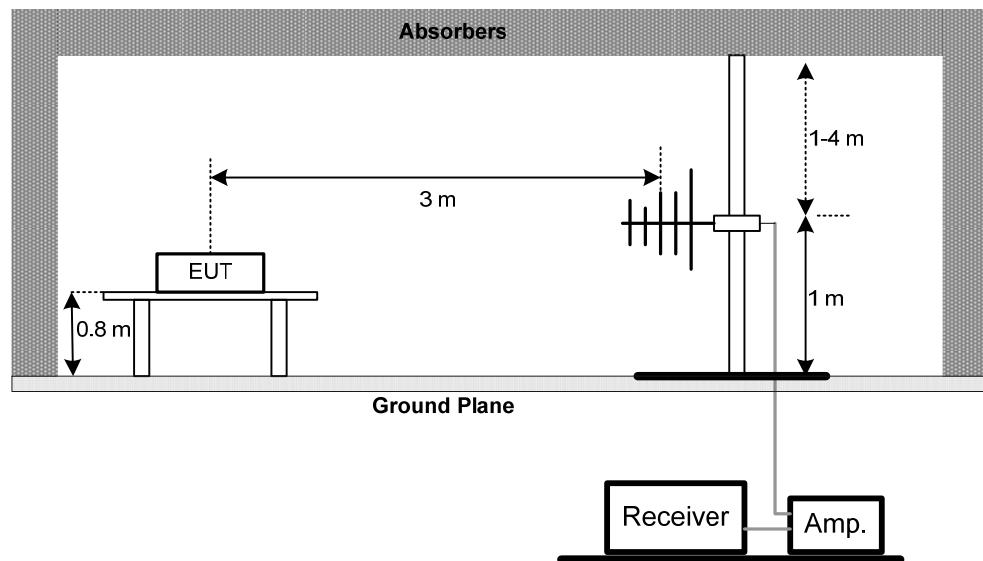
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 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 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8 m 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.
- 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).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- 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.
- 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 1GHz)
- 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 1GHz)
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.2.3 DEVIATION FROM TEST STANDARD

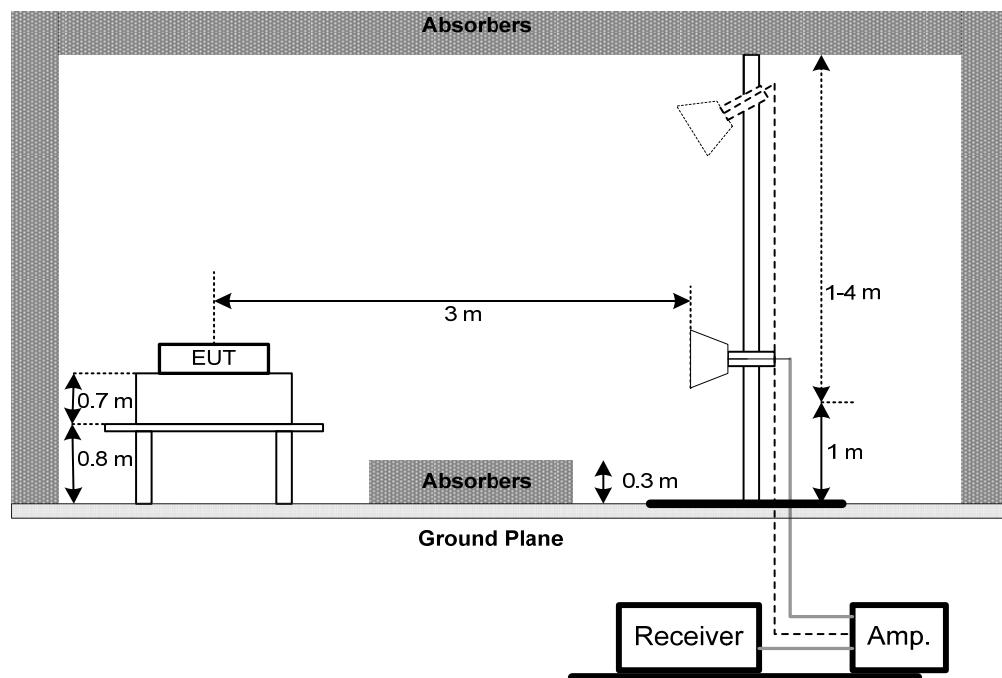
No deviation

4.2.4 TEST SETUP

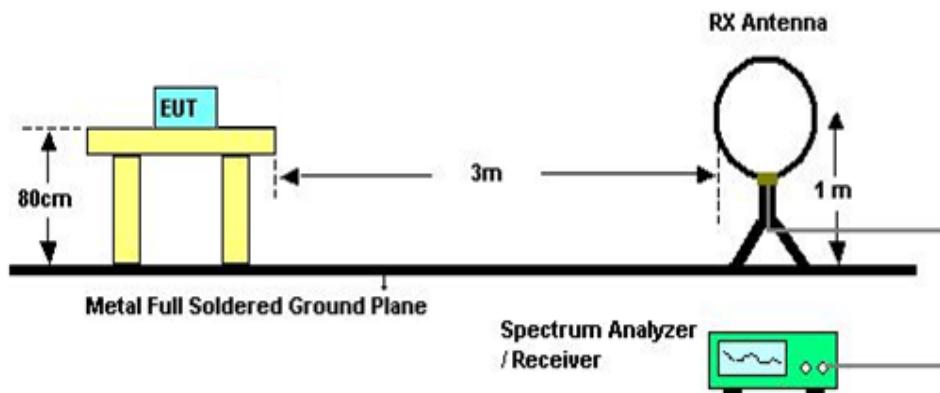
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



(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 (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) Radiated emissions measured in frequency range above 1000MHz were made with an instrument using Peak detector mode and AV detector mode of the emission
- (2) A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.
- (3) EUT Orthogonal Axis:
"X" - denotes Laid on Table; "Y" - denotes Vertical Stand; "Z" - denotes Side Stand
- (4) During the measurements above 1 GHz it is taken care of that the EUT is always within the 3 dB cone of radiation BW of the used antenna
- (5) 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

- a. The transmitter output (antenna port) was connected to the spectrum analyzer
- b. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
- 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. Measure the maximum time duration of one single pulse.

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

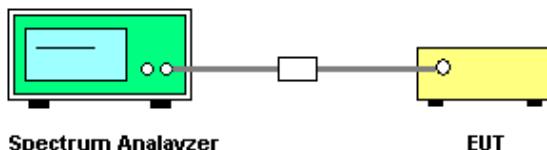
7.1.1 TEST PROCEDURE

- The EUT must have its hopping function enabled
- 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 (hopping channel >75) 0.125Watt or 21dBm (hopping channel <75)	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.

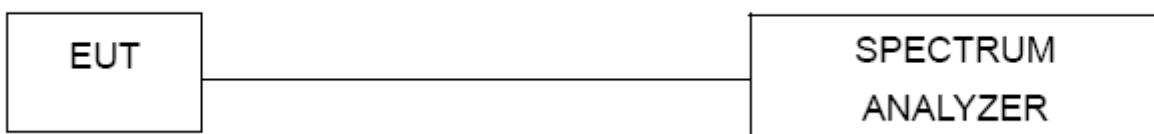
10.1.1 TEST PROCEDURE

- 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.
- c. Offset=antenna gain+cable loss

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	0052765	Mar. 27, 2017
2	LISN	R&S	ENV216	101447	Mar. 27, 2017
3	Test Cable	emci	RG223(9KHz-30 MHz)	C_17	Mar. 10, 2017
4	EMI Test Receiver	R&S	ESCI	100382	Mar. 27, 2017
5	50Ω Terminator	SHX	TF2-3G-A	08122901	Mar. 27, 2017
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. 27, 2017
2	Amplifier	HP	8447D	2944A09673	Nov. 09, 2016
3	Receiver	AGILENT	N9038A	MY5213003 9	Oct. 11, 2016
4	Test Cable	emci	LMR-400(30 MHz-1GHz)	C-01	Jun. 27, 2017
5	Control	CT	SC100	N/A	N/A
6	Position Control	MF	MF-7802	MF78020841 6	N/A
7	Antenna	ETS	3115	00075789	Mar. 27, 2017
8	Amplifier	Agilent	8449B	3008A02274	Nov. 01, 2016
9	Receiver	AGILENT	N9038A	MY5213003 9	Oct. 11, 2016
10	Test Cable	emci	EMC104-SM- SM-10000(1 GHz— 26.5GHz)	C-68	Jun. 27, 2017
11	Controller	CT	SC100	N/A	N/A
12	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Apr. 23, 2017
13	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 27, 2017
14	Active Loop Antenna	R&S	HFH2-Z2	830749/020	Sep. 07, 2016
15	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	Oct. 11, 2016

Average Time of Occupancy

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Oct. 11, 2016

Hopping Channel Separation Measurement

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Oct. 11, 2016

Bandwidth

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Oct. 11, 2016

Peak Output Power

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Oct. 11, 2016

Antenna Conducted Spurious Emission

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP 40	100185	Oct. 11, 2016

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**

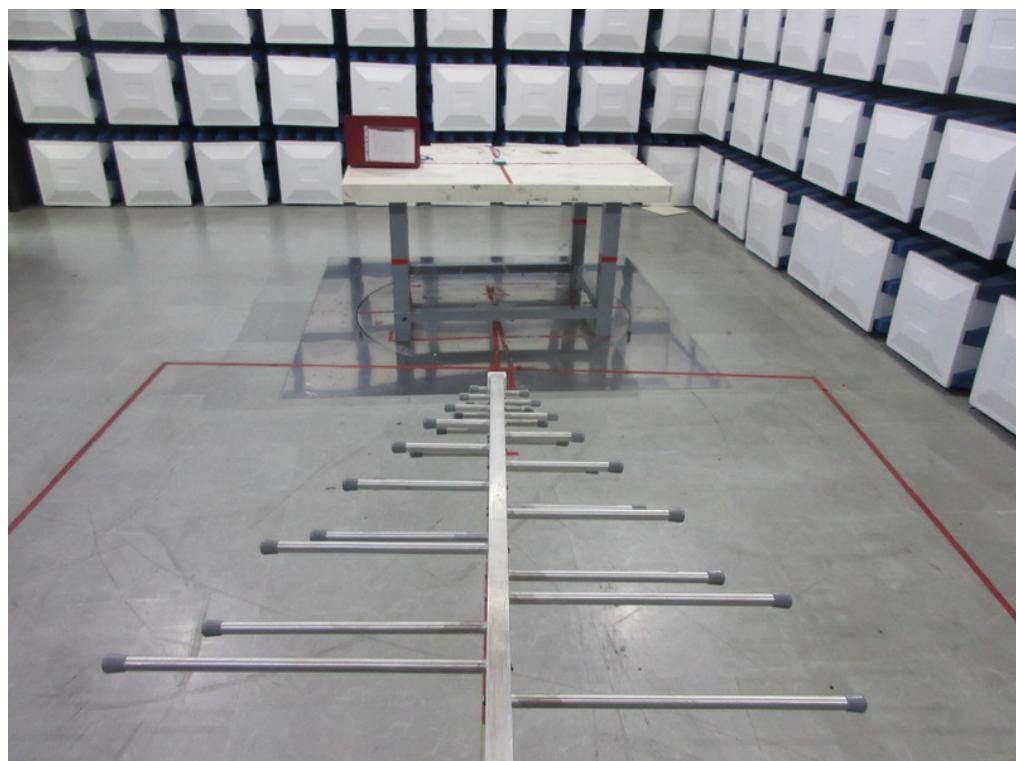
Radiated Measurement Photos

9KHz to 30MHz



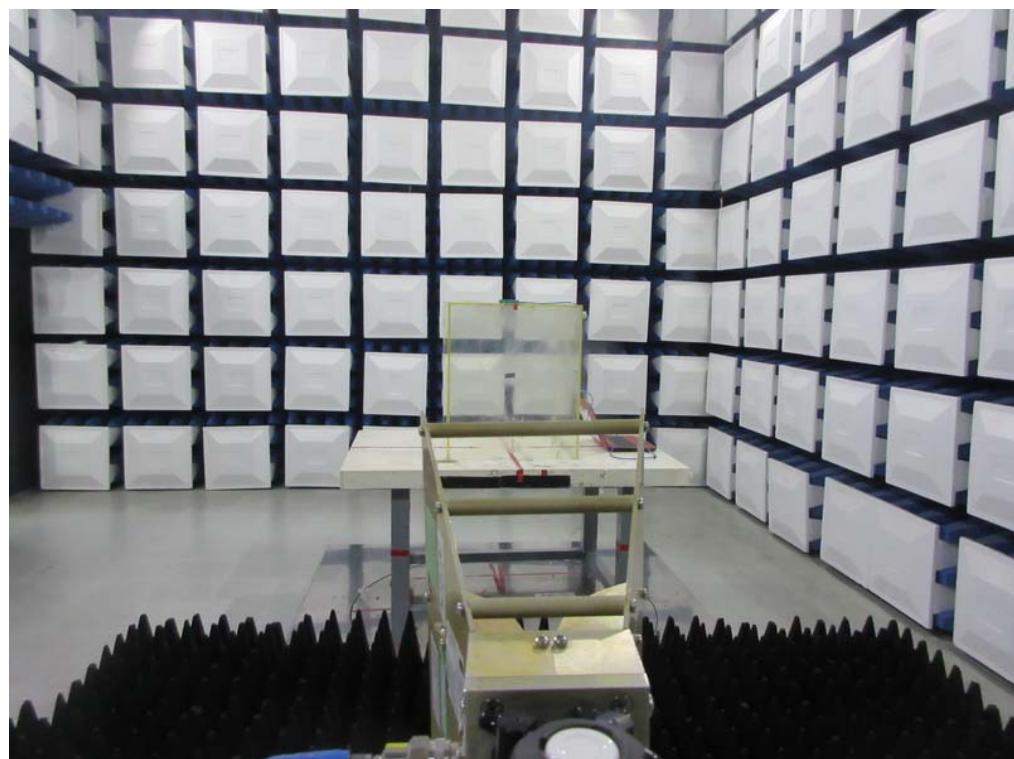
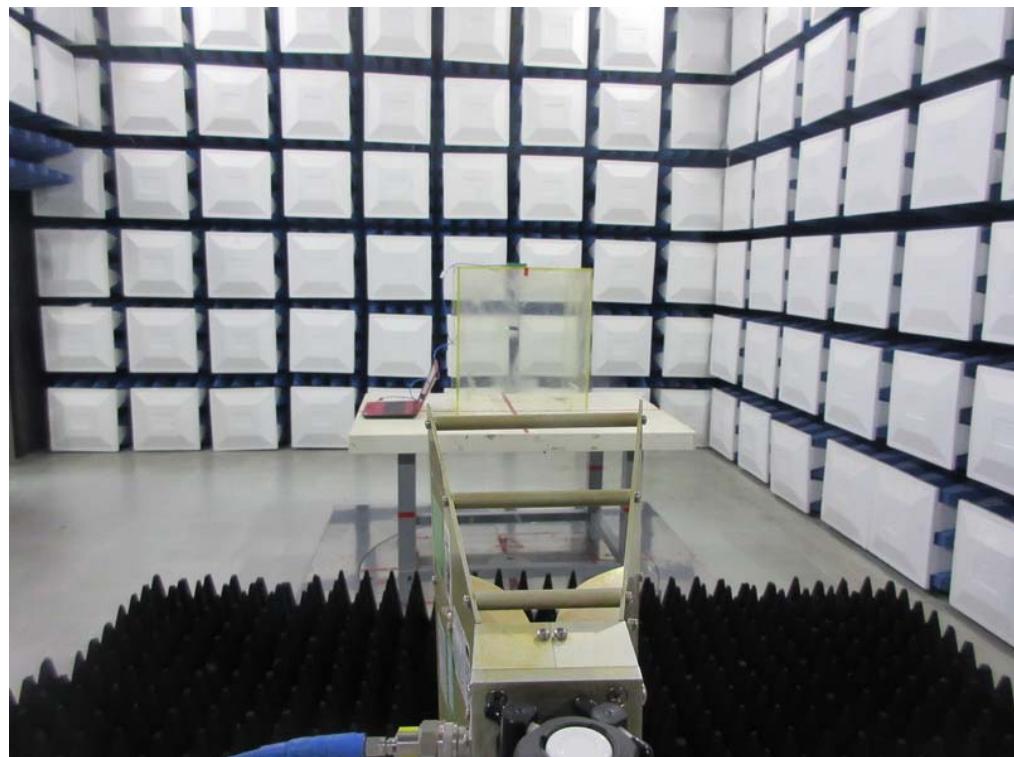
Radiated Measurement Photos

30MHz to 1000MHz



Radiated Measurement Photos

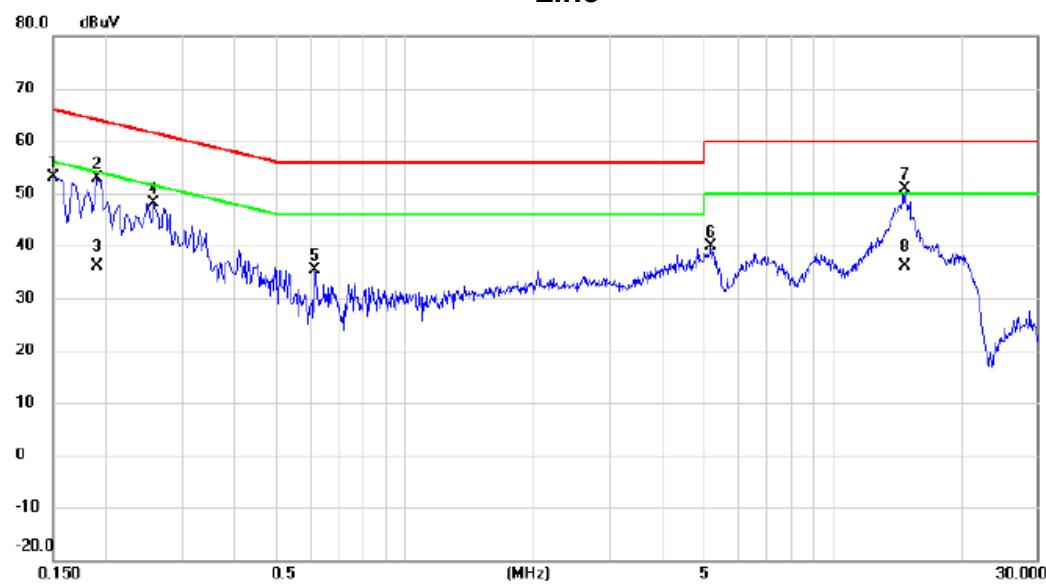
Above 1000MHz



ATTACHMENT A - CONDUCTED EMISSION

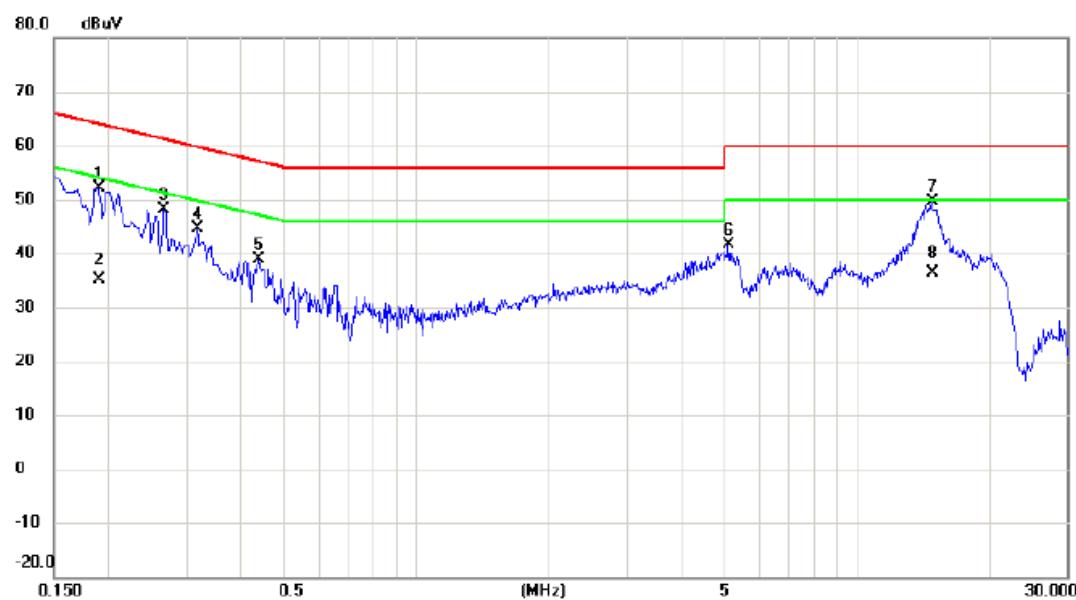
Test Mode: TX Mode

Line



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Detector	Comment
			Level						
		MHz	dBuV	dB	dBuV	dB	dB		
1		0.1500	43.60	9.52	53.12	66.00	-12.88	peak	
2		0.1900	43.29	9.50	52.79	64.04	-11.25	peak	
3		0.1900	26.73	9.50	36.23	54.04	-17.81	AVG	
4		0.2580	38.55	9.53	48.08	61.50	-13.42	peak	
5		0.6140	25.96	9.44	35.40	56.00	-20.60	peak	
6		5.1900	29.96	9.99	39.95	60.00	-20.05	peak	
7	*	14.7980	40.42	10.36	50.78	60.00	-9.22	peak	
8		14.7980	25.70	10.36	36.06	50.00	-13.94	AVG	

Test Mode: TX Mode

Neutral

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment
			MHz	Level	Factor			
1		0.1900	42.70	9.50	52.20	64.04	-11.84	peak
2		0.1900	25.60	9.50	35.10	54.04	-18.94	AVG
3		0.2660	38.66	9.53	48.19	61.24	-13.05	peak
4		0.3180	35.05	9.53	44.58	59.76	-15.18	peak
5		0.4380	29.43	9.44	38.87	57.10	-18.23	peak
6		5.1060	31.68	9.98	41.66	60.00	-18.34	peak
7	*	14.8100	39.20	10.36	49.56	60.00	-10.44	peak
8		14.8100	25.90	10.36	36.26	50.00	-13.74	AVG

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

Test Mode:	TX Mode
------------	---------

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0093	0°	13.36	24.98	38.34	128.23	-89.90	AVG
0.0093	0°	14.27	24.98	39.25	148.23	-108.99	PEAK
0.0282	0°	6.70	23.78	30.48	118.60	-88.12	AVG
0.0282	0°	8.22	23.78	32.00	138.60	-106.60	PEAK
0.0364	0°	3.25	23.26	26.51	116.38	-89.87	AVG
0.0364	0°	5.54	23.26	28.80	136.38	-107.58	PEAK
0.0578	0°	1.36	22.24	23.60	112.37	-88.76	AVG
0.0578	0°	2.50	22.24	24.74	132.37	-107.62	PEAK
0.5090	0°	19.41	19.83	39.24	73.47	-34.23	QP
1.9527	0°	23.70	19.50	43.20	69.54	-26.34	QP

Frequency (MHz)	Ant 0°/90°	Read level dBuV/m	Factor (dB)	Measured(FS) (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Note
0.0178	90°	13.25	24.30	37.55	122.60	-85.05	AVG
0.0178	90°	14.75	24.30	39.05	142.60	-103.55	PEAK
0.0258	90°	7.20	23.93	31.13	119.37	-88.24	AVG
0.0258	90°	8.89	23.93	32.82	139.37	-106.55	PEAK
0.0430	90°	5.23	22.84	28.07	114.93	-86.86	AVG
0.0430	90°	6.21	22.84	29.05	134.93	-105.88	PEAK
0.0578	90°	1.50	22.24	23.74	112.37	-88.62	AVG
0.0578	90°	2.78	22.24	25.02	132.37	-107.34	PEAK
0.6219	90°	22.26	20.19	42.45	71.73	-29.28	QP
2.0541	90°	24.50	19.47	43.97	69.54	-25.57	QP

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

Test Mode: TX 902.75MHz_CH00

Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1		49.4000	32.82	-12.09	20.73	40.00	-19.27	peak
2		127.0000	30.72	-11.54	19.18	43.50	-24.32	peak
3		402.9650	30.42	-7.21	23.21	46.00	-22.79	peak
4		527.6100	29.92	-6.04	23.88	46.00	-22.12	peak
5		649.8300	29.05	-1.89	27.16	46.00	-18.84	peak
6	*	809.3950	28.03	0.18	28.21	46.00	-17.79	peak

Test Mode: TX 902.75MHz _CH00

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	
1	*	42.6100	33.49	-11.91	21.58	40.00	-18.42	peak
2		171.1350	29.96	-10.84	19.12	43.50	-24.38	peak
3		407.8150	30.56	-7.19	23.37	46.00	-22.63	peak
4		582.4150	30.18	-4.94	25.24	46.00	-20.76	peak
5		647.8900	28.07	-2.01	26.06	46.00	-19.94	peak
6		729.8550	28.25	-1.11	27.14	46.00	-18.86	peak

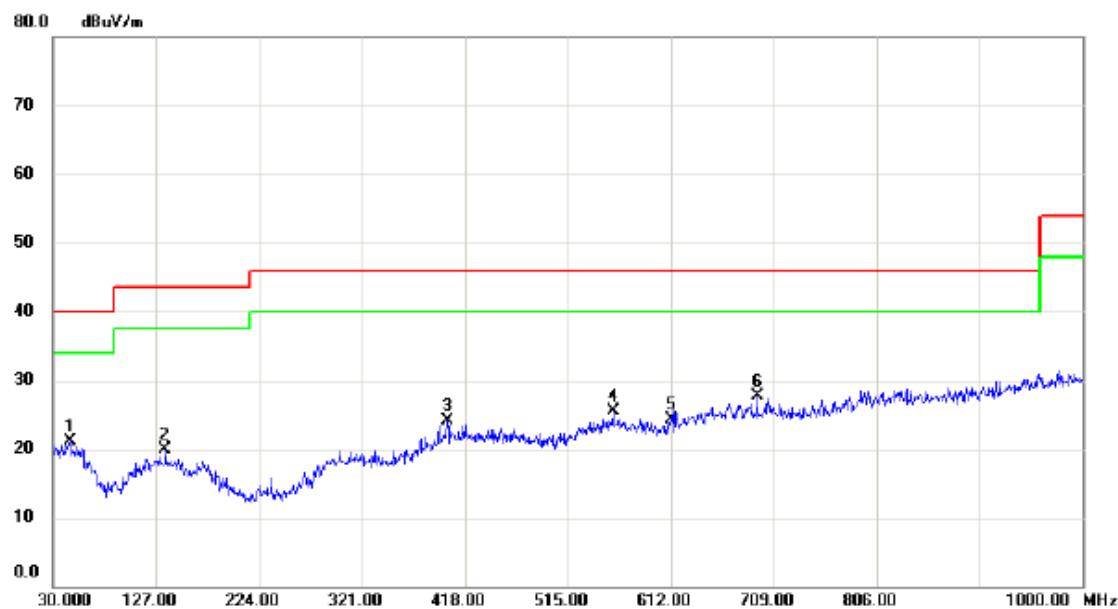
Test Mode: TX 915.25MHz _CH25

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1		40.1850	33.77	-12.42	21.35	40.00	-18.65	peak
2		130.8800	30.17	-11.16	19.01	43.50	-24.49	peak
3		379.6850	31.17	-8.66	22.51	46.00	-23.49	peak
4		564.9550	29.41	-4.78	24.63	46.00	-21.37	peak
5		688.1450	28.28	-1.12	27.16	46.00	-18.84	peak
6	*	787.5700	28.73	-0.16	28.57	46.00	-17.43	peak

Test Mode: TX 915.25MHz _CH25

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		46.0050	33.06	-12.00	21.06	40.00	-18.94	peak	
2		135.7300	31.41	-11.52	19.89	43.50	-23.61	peak	
3		401.9950	31.27	-7.20	24.07	46.00	-21.93	peak	
4		558.1650	30.12	-4.71	25.41	46.00	-20.59	peak	
5		612.4850	28.58	-4.30	24.28	46.00	-21.72	peak	
6	*	693.4800	28.67	-1.01	27.66	46.00	-18.34	peak	

Test Mode: TX 927.25MHz _CH49

Vertical

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	
1	*	48.4300	33.03	-12.29	20.74	40.00	-19.26	peak
2		170.1650	29.54	-10.70	18.84	43.50	-24.66	peak
3		321.0000	31.37	-10.31	21.06	46.00	-24.94	peak
4		391.8100	30.28	-7.80	22.48	46.00	-23.52	peak
5		549.9200	29.56	-4.64	24.92	46.00	-21.08	peak
6		630.4300	29.20	-3.15	26.05	46.00	-19.95	peak

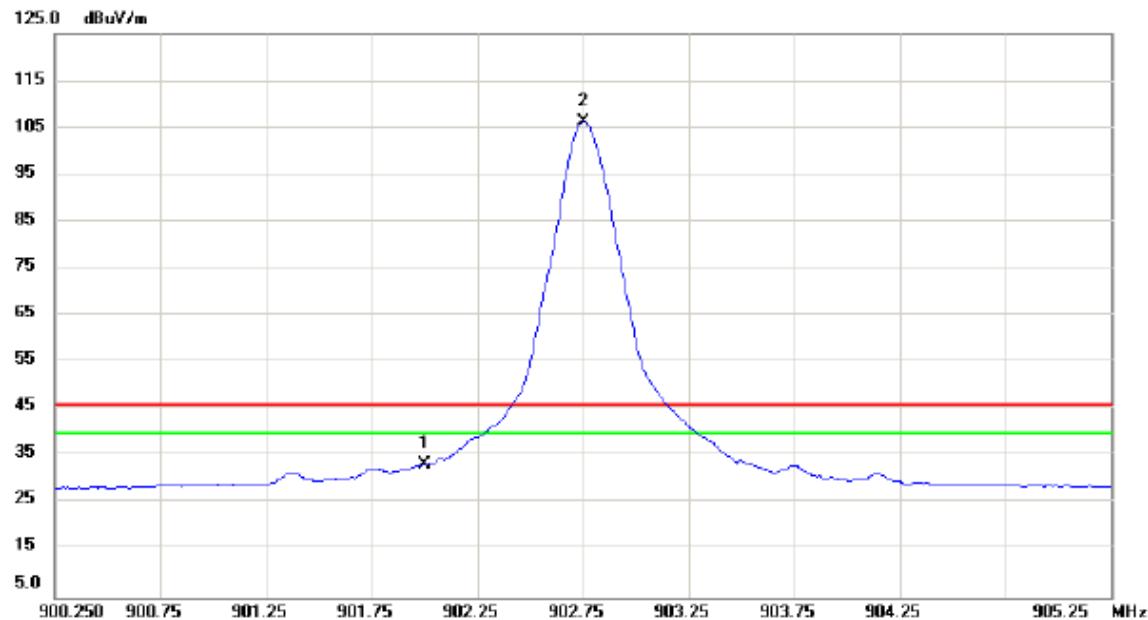
Test Mode: TX 927.25MHz _CH49

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dB			
1		115.3600	32.13	-13.13	19.00	43.50	-24.50	peak	
2		406.3600	30.11	-7.19	22.92	46.00	-23.08	peak	
3		485.9000	30.76	-7.57	23.19	46.00	-22.81	peak	
4		656.1350	27.83	-1.76	26.07	46.00	-19.93	peak	
5		770.1100	28.61	-0.68	27.93	46.00	-18.07	peak	
6	*	825.4000	29.44	0.14	29.58	46.00	-16.42	peak	

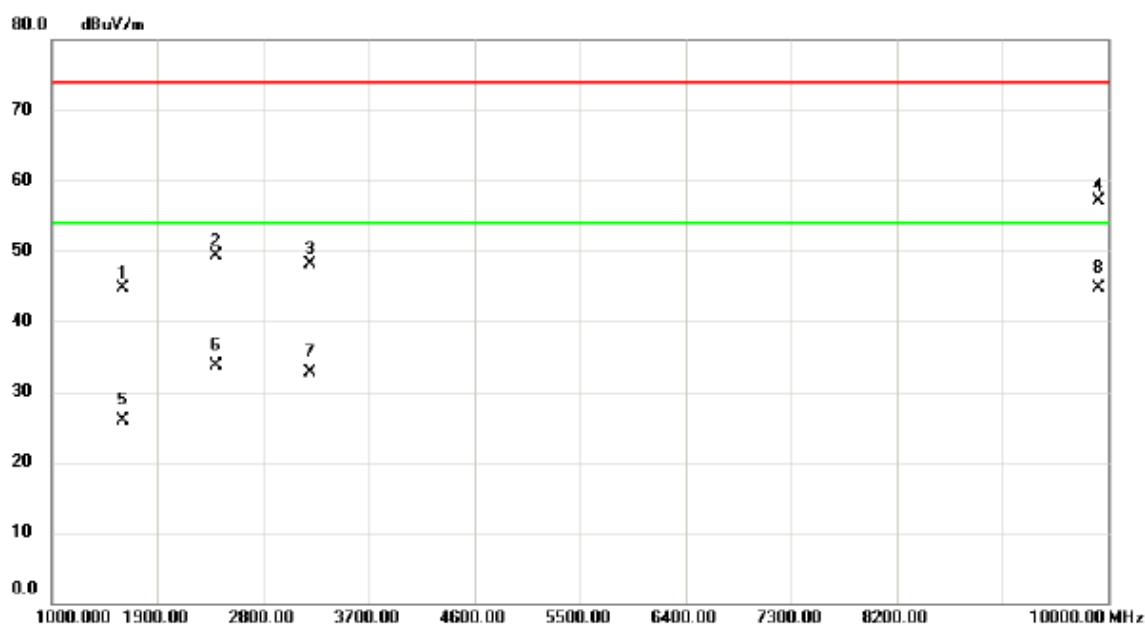
ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _ CH00

Vertical

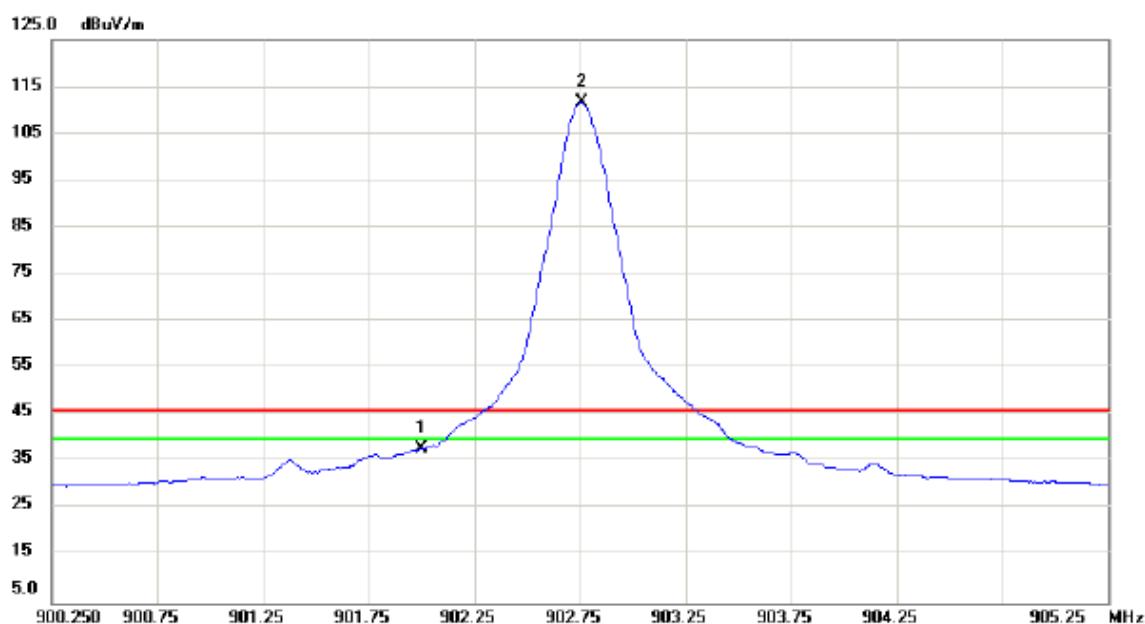
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		902.0000	32.23	1.11	33.34	46.00	-12.66	QP	
2	*	902.7500	105.1	1.12	106.22	46.00	60.22	QP	NO LIMIT

Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _CH00

Vertical

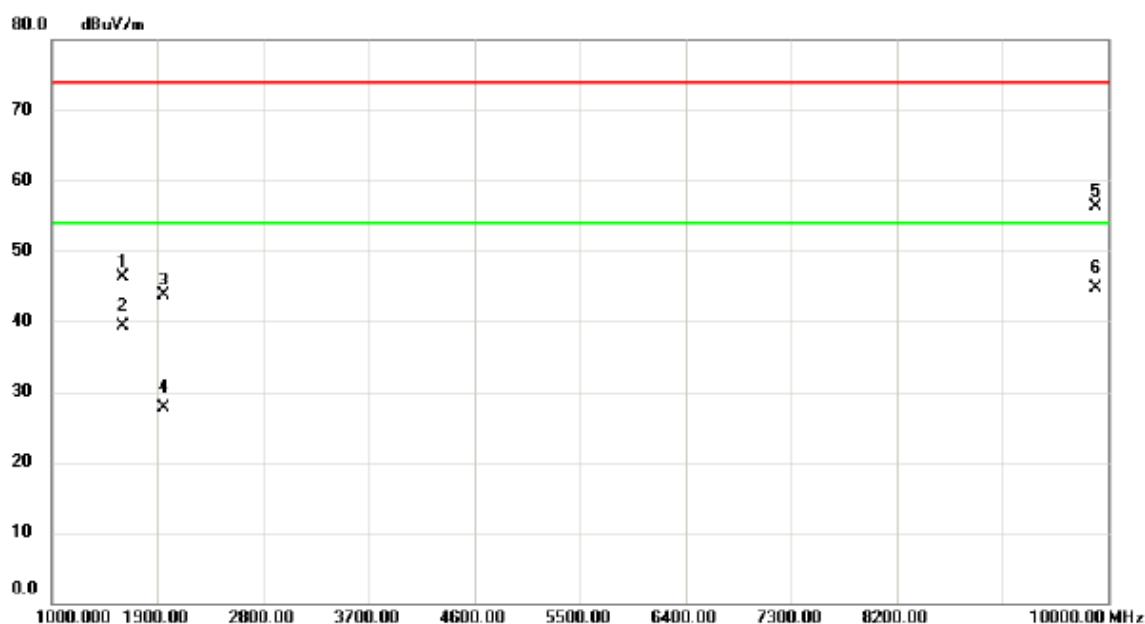
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		1603.000	49.45	-4.68	44.77	74.00	-29.23	peak
2		2395.000	50.22	-0.85	49.37	74.00	-24.63	peak
3		3196.000	46.24	1.94	48.18	74.00	-25.82	peak
4		9919.000	42.41	14.61	57.02	74.00	-16.98	peak
5		1603.000	30.59	-4.68	25.91	54.00	-28.09	AVG
6		2395.000	34.48	-0.85	33.63	54.00	-20.37	AVG
7		3196.000	30.81	1.94	32.75	54.00	-21.25	AVG
8	*	9919.000	30.14	14.61	44.75	54.00	-9.25	AVG

Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _CH00

Horizontal

No.	Mk.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector Comment
1	902.0000	36.84	1.11	37.95	46.00	-8.05	QP
2 *	902.7575	110.4	1.12	111.61	46.00	65.61	QP NO LIMIT

Orthogonal Axis :	X
Test Mode :	TX 902.75MHz _CH00

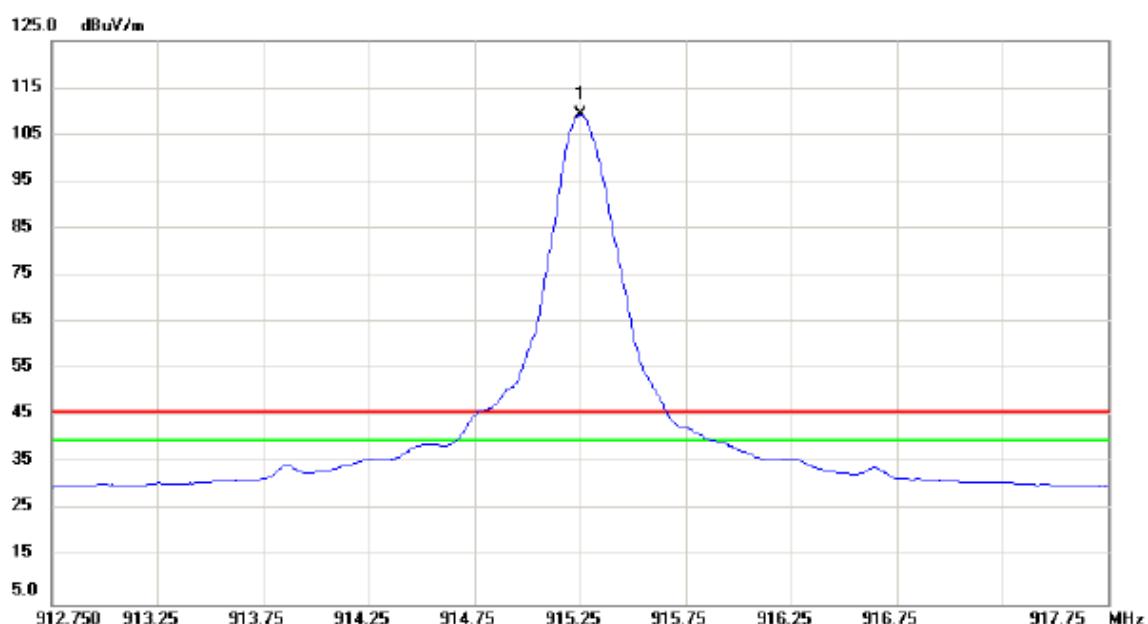
Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment	
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		1603.000	50.91	-4.68	46.23	74.00	-27.77	peak	
2		1603.000	43.89	-4.68	39.21	54.00	-14.79	AVG	
3		1954.000	46.79	-3.06	43.73	74.00	-30.27	peak	
4		1954.000	30.68	-3.06	27.62	54.00	-26.38	AVG	
5		9892.000	41.82	14.54	56.36	74.00	-17.64	peak	
6	*	9892.000	30.07	14.54	44.61	54.00	-9.39	AVG	

Orthogonal Axis : X

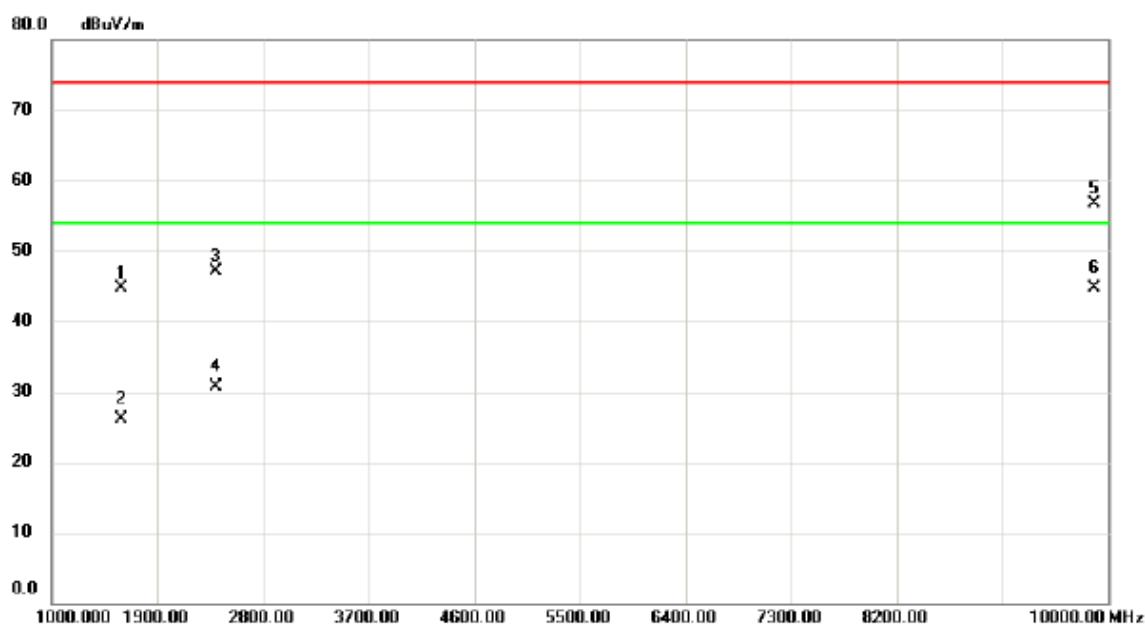
Test Mode : TX 915.25MHz _CH25

Vertical



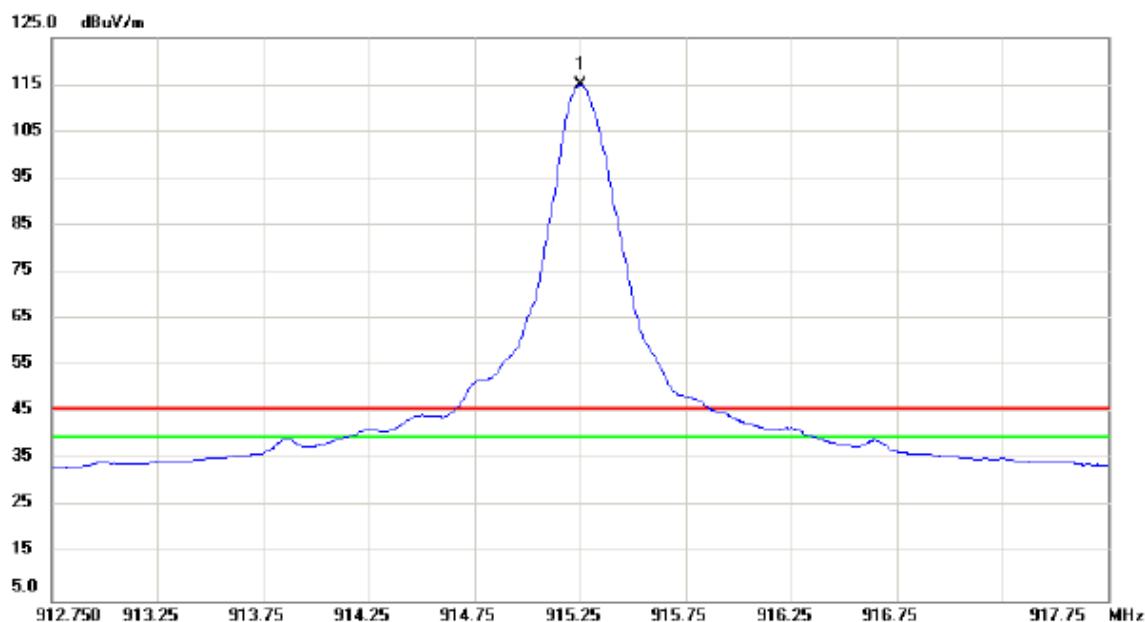
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1	*	915.2550	107.9	1.41	109.35	46.00	63.35	QP NO LIMIT

Orthogonal Axis :	X
Test Mode :	TX 915.25MHz _CH25

Vertical

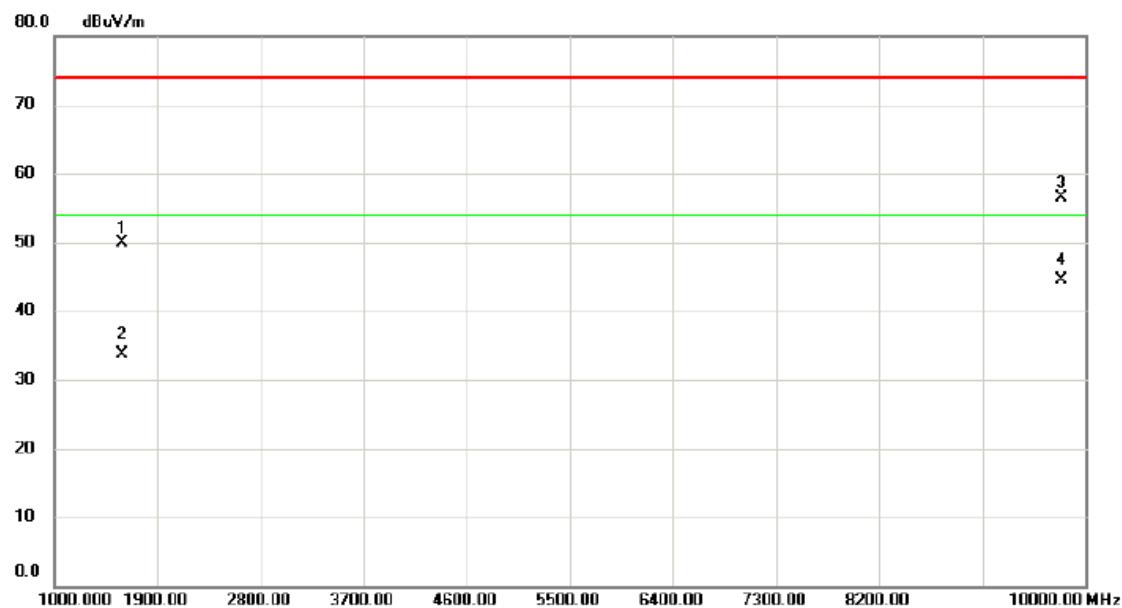
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			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		1594.000	49.47	-4.72	44.75	74.00	-29.25	peak
2		1594.000	30.87	-4.72	26.15	54.00	-27.85	AVG
3		2395.000	47.88	-0.85	47.03	74.00	-26.97	peak
4		2395.000	31.47	-0.85	30.62	54.00	-23.38	AVG
5		9883.000	42.19	14.51	56.70	74.00	-17.30	peak
6	*	9883.000	30.25	14.51	44.76	54.00	-9.24	AVG

Orthogonal Axis :	X
Test Mode :	TX 915.25MHz _CH25

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1	*	915.2525	113.6	1.41	115.09	46.00	69.09	QP NO LIMIT

Orthogonal Axis :	X
Test Mode :	TX 915.25MHz _CH25

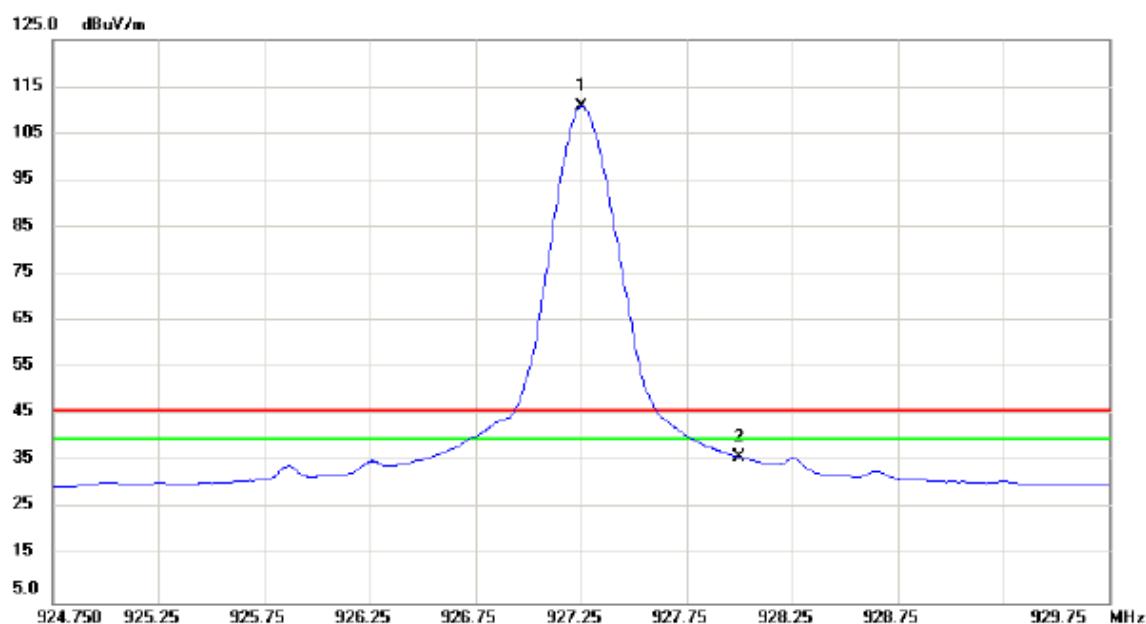
Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	
1		1594.000	54.59	-4.72	49.87	74.00	-24.13	peak
2		1594.000	38.34	-4.72	33.62	54.00	-20.38	AVG
3		9784.000	42.24	14.27	56.51	74.00	-17.49	peak
4	*	9784.000	30.21	14.27	44.48	54.00	-9.52	AVG

Orthogonal Axis : X

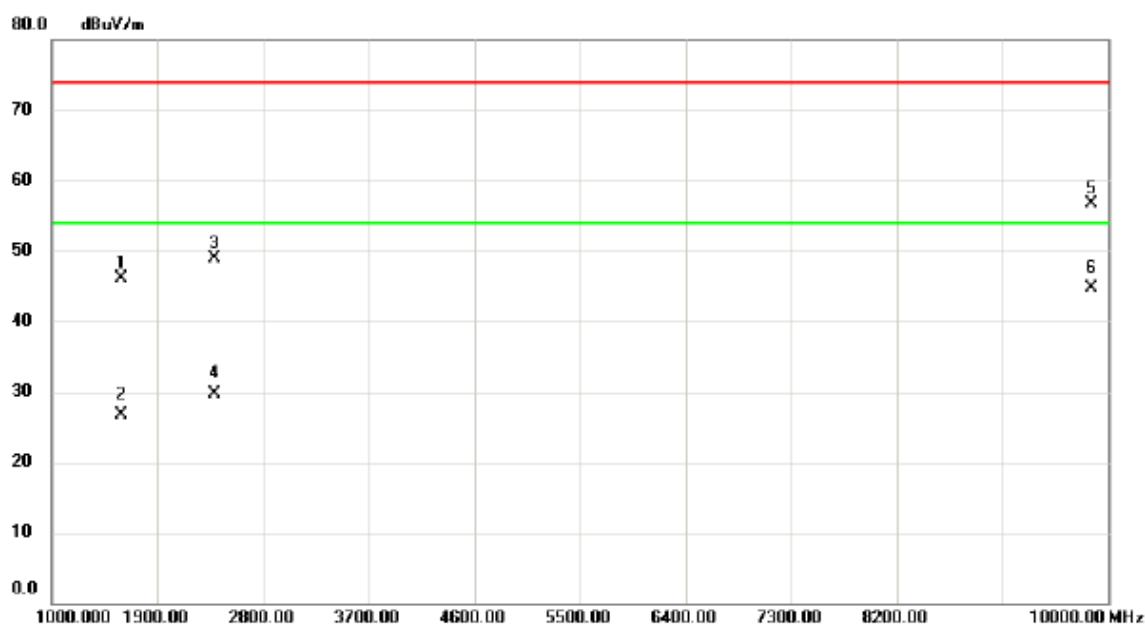
Test Mode : TX 927.25MHz _CH49

Vertical



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1	*	927.2525	109.1	1.69	110.82	46.00	64.82	QP NO LIMIT
	2	928.0000	34.41	1.71	36.12	46.00	-9.88	QP

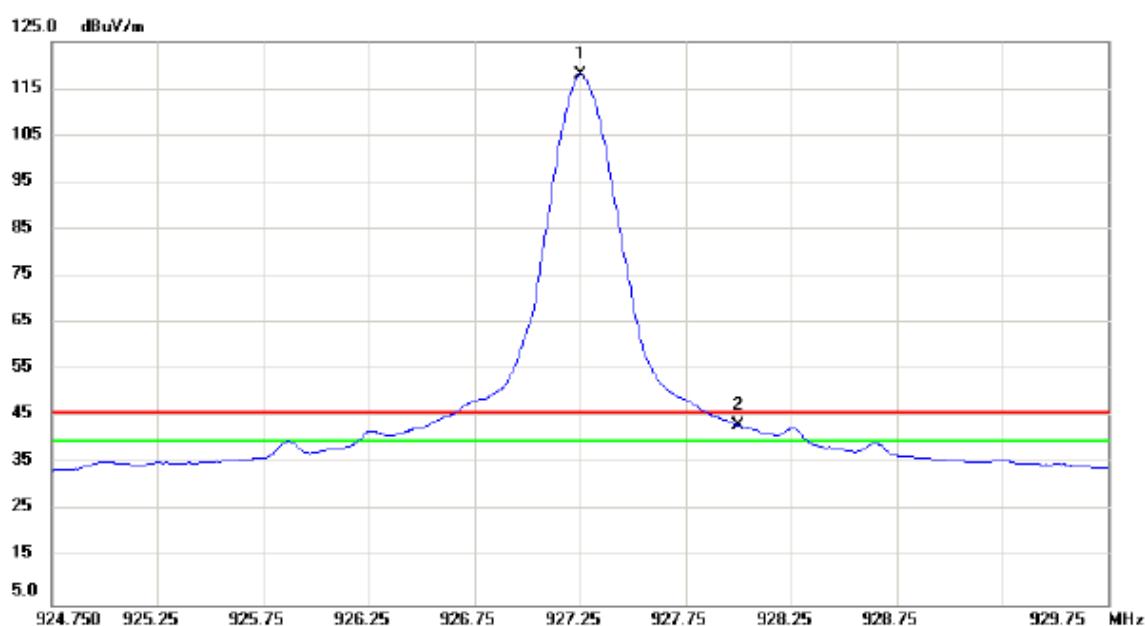
Orthogonal Axis :	X
Test Mode :	TX 927.25MHz _CH49

Vertical

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Comment
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		1594.000	50.80	-4.72	46.08	74.00	-27.92	peak
2		1594.000	31.46	-4.72	26.74	54.00	-27.26	AVG
3		2386.000	49.85	-0.89	48.96	74.00	-25.04	peak
4		2386.000	30.57	-0.89	29.68	54.00	-24.32	AVG
5		9865.000	42.15	14.47	56.62	74.00	-17.38	peak
6	*	9865.000	30.24	14.47	44.71	54.00	-9.29	AVG

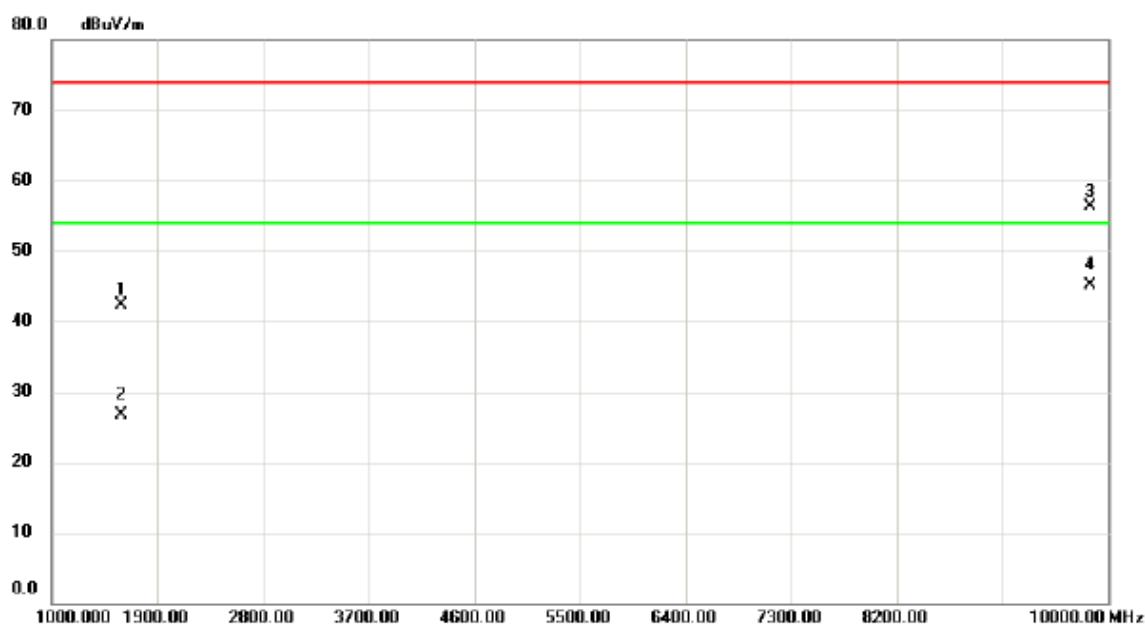
Orthogonal Axis : X

Test Mode : TX 927.25MHz _CH49

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
			Level	Factor	ment			
		MHz	dBuV	dB	dBuV/m	dB	Detector	Comment
1	*	927.2525	116.4	1.69	118.09	46.00	72.09	QP NO LIMIT
2	!	928.0000	41.56	1.71	43.27	46.00	-2.73	QP

Orthogonal Axis :	X
Test Mode :	TX 927.25MHz _CH49

Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Detector	Comment
			Level	Factor	ment				
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB		
1		1594.000	47.09	-4.72	42.37	74.00	-31.63	peak	
2		1594.000	31.43	-4.72	26.71	54.00	-27.29	AVG	
3		9847.000	41.97	14.43	56.40	74.00	-17.60	peak	
4	*	9847.000	30.68	14.43	45.11	54.00	-8.89	AVG	

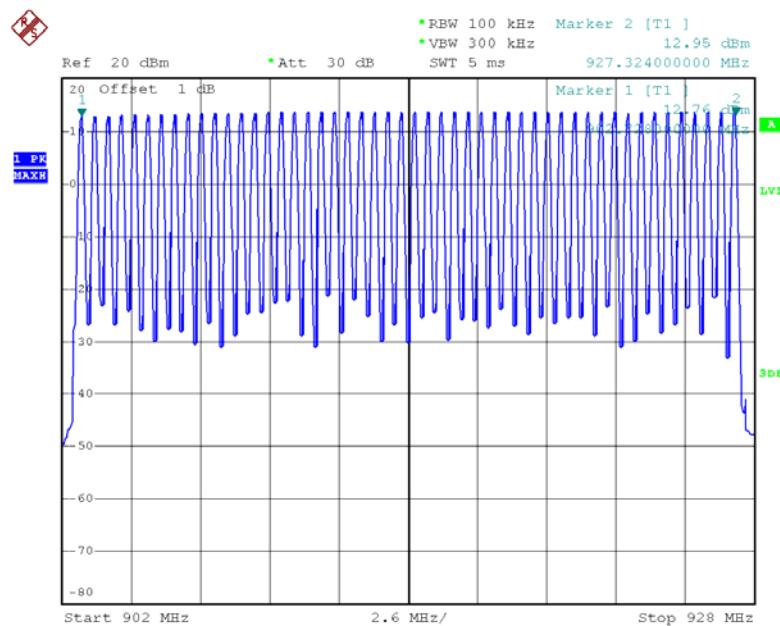
ATTACHMENT E - NUMBER OF HOPPING CHANNEL

Test Mode

Number of Hopping Channel

Hopping Mode

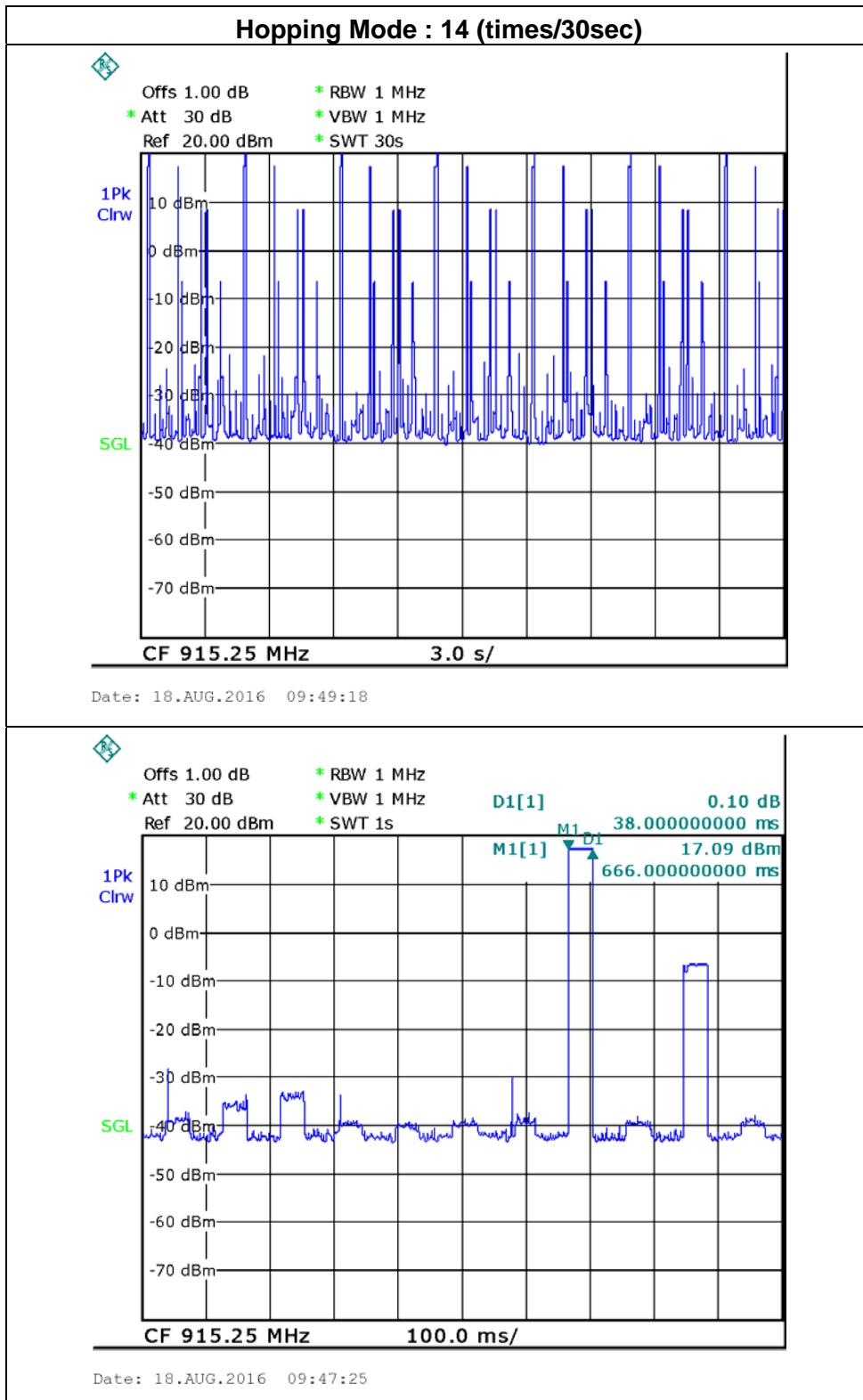
50



Date: 23.AUG.2016 14:41:16

ATTACHMENT F - AVERAGE TIME OF OCCUPANCY

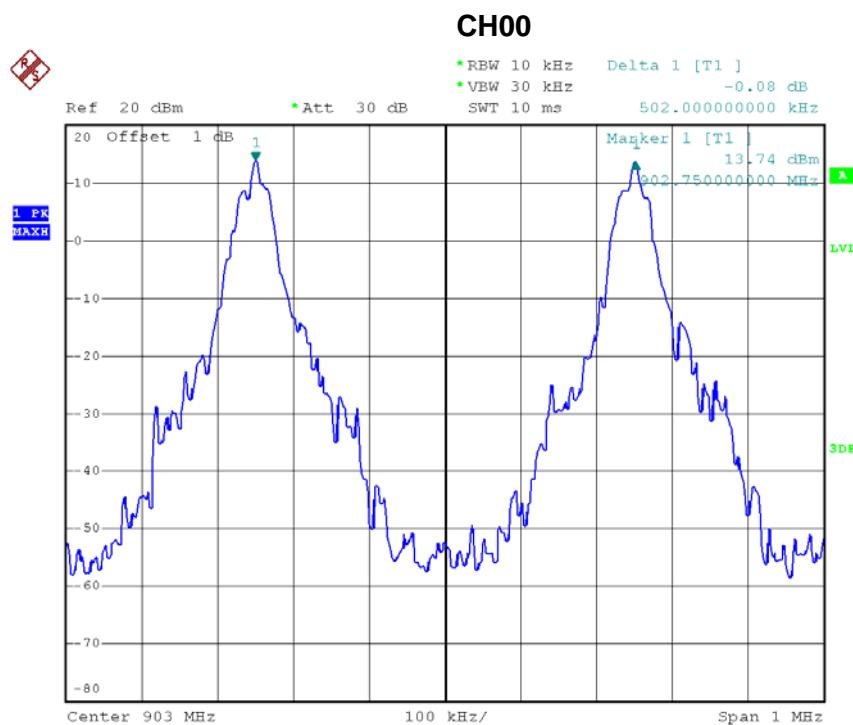
Test Mode: Hopping Mode	Results
Measured cycle (sec) (1)	$50 \text{ CH} \times 0.4 = 20$
The number of occupied channels per second (2)	$14/30 = 0.467(\text{number/sec})$
occupied time for each channel(3)	0.038
Dwell time (1)*(2)*(3)	0.355s
LIMIT (msec)	400msec



ATTACHMENT G - HOPPING CHANNEL SEPARATION MEASUREMENT

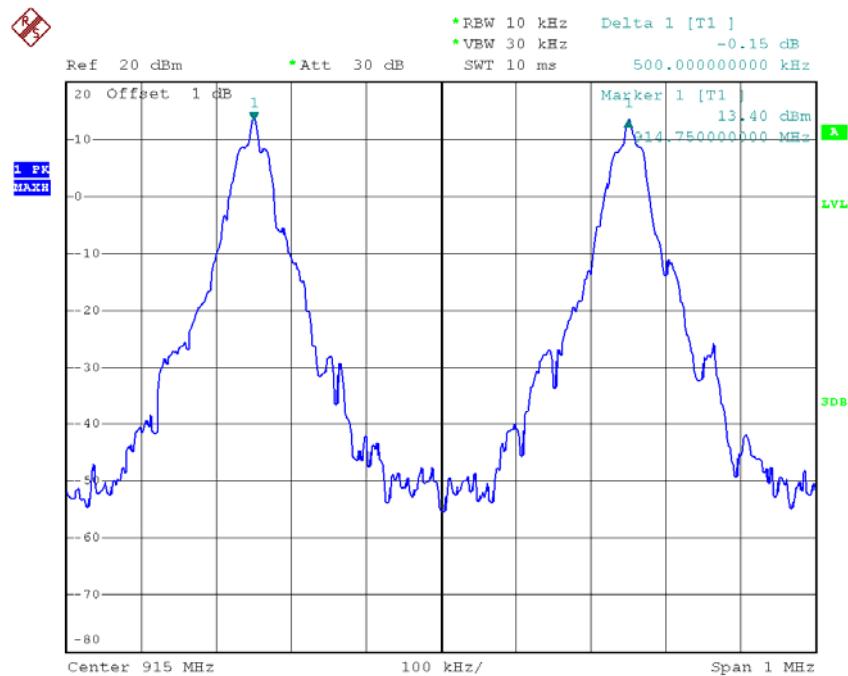
Test Mode : Hopping on

Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
902.75	0.502	0.057	Complies
915.25	0.500	0.056	Complies
927.25	0.502	0.055	Complies



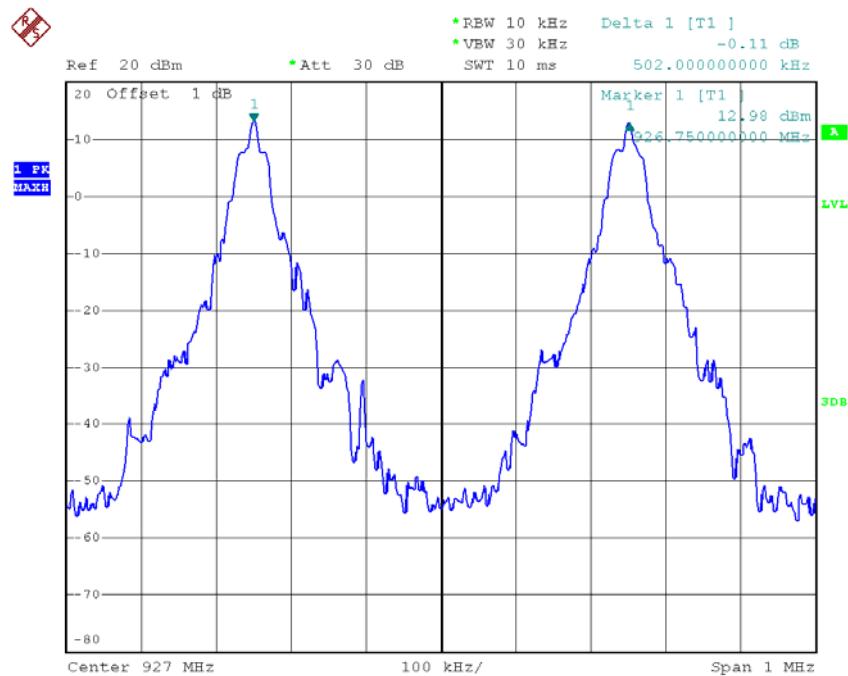
Date: 15.JUN.2016 11:29:04

CH25



Date: 15.JUN.2016 11:33:22

CH49

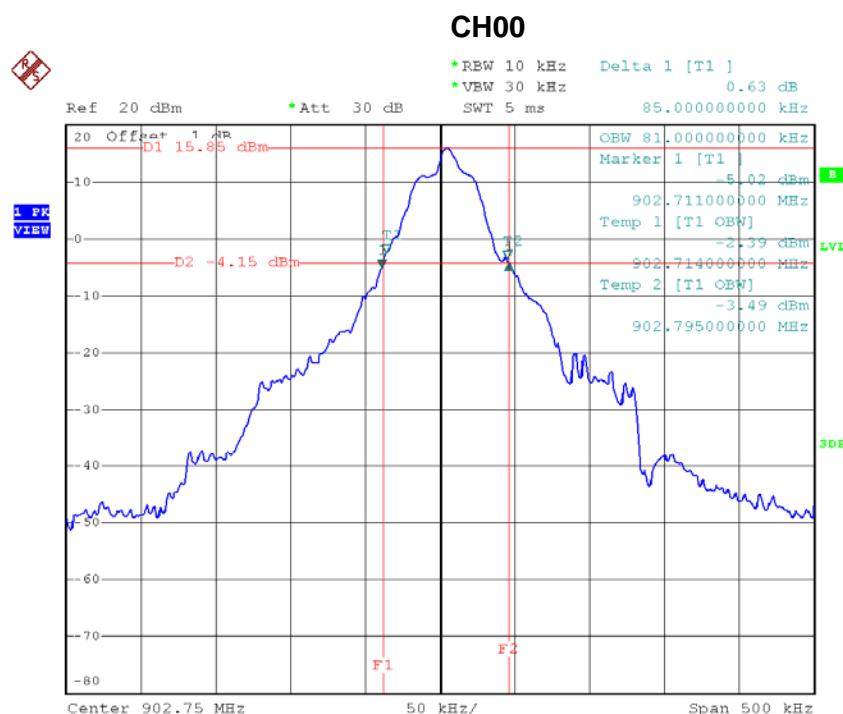


Date: 15.JUN.2016 11:31:01

ATTACHMENT H - BANDWIDTH

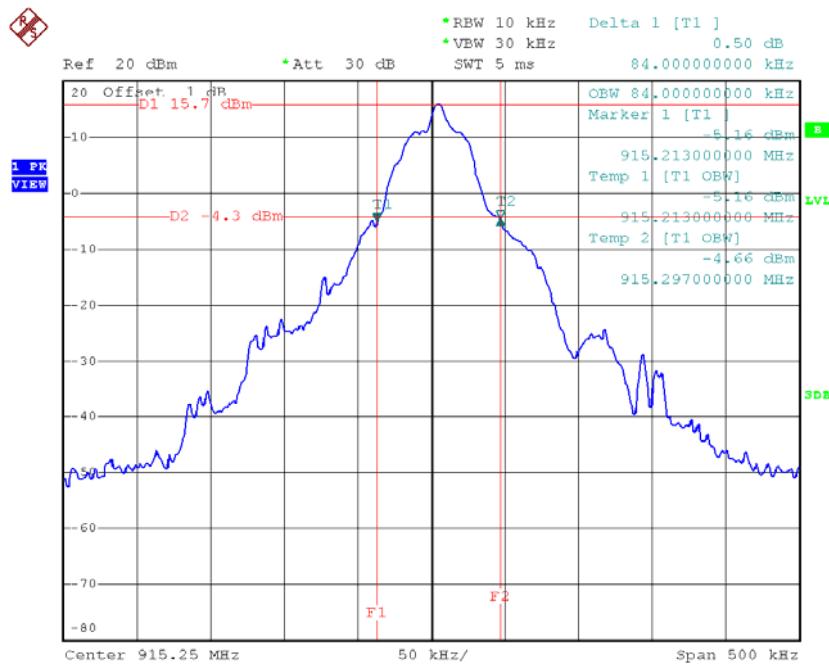
Test Mode : TX Mode

Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
902.75	0.085	0.081	Complies
915.25	0.084	0.084	Complies
927.25	0.083	0.084	Complies



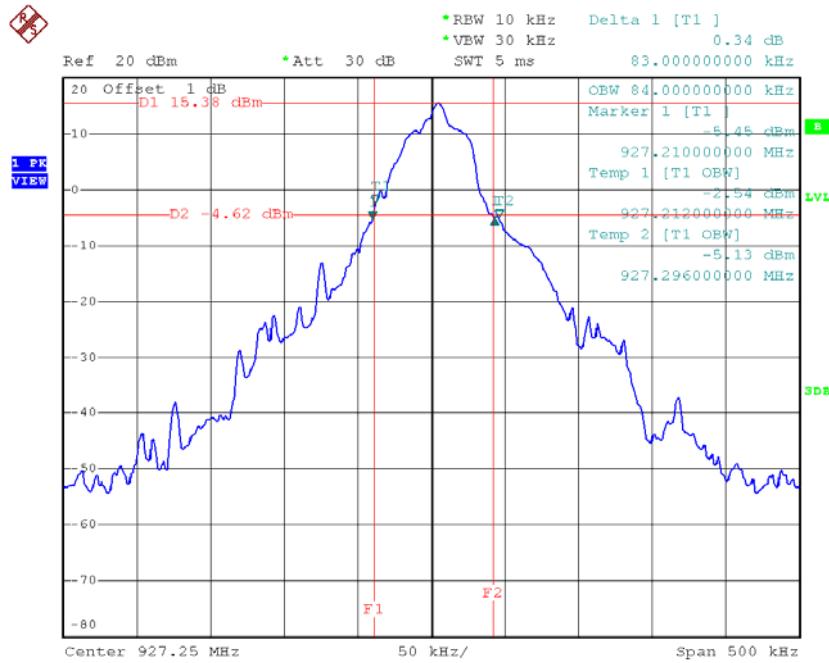
Date: 15.JUN.2016 10:42:31

CH25



Date: 15.JUN.2016 10:47:22

CH49

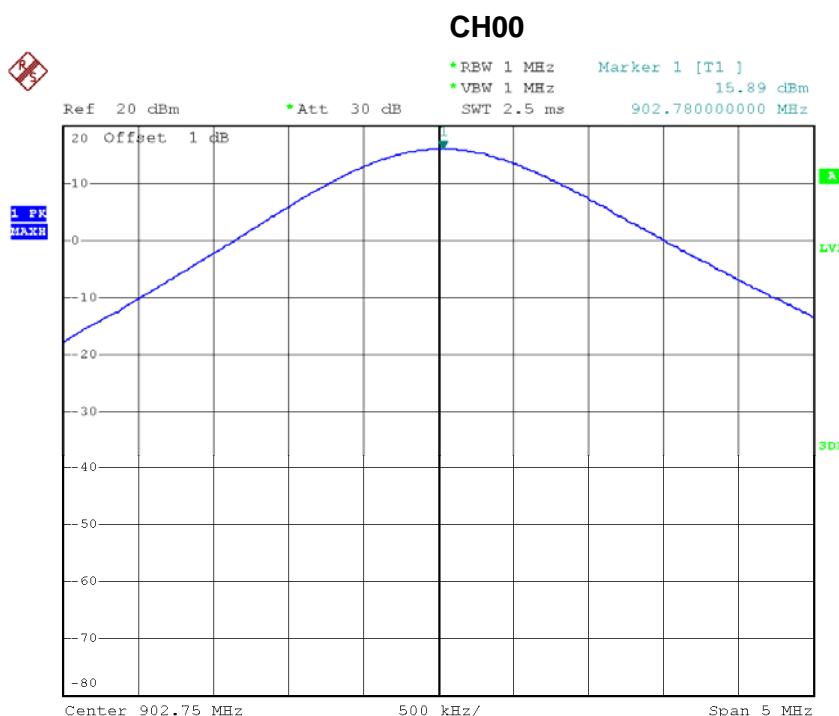


Date: 15.JUN.2016 10:50:20

ATTACHMENT I - PEAK OUTPUT POWER

Test Mode : TX Mode

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watt)	Max. Limit (dBm)	Max. Limit (Watt)	Test Result
902.75	15.89	0.0388	21	0.125	Complies
915.25	15.60	0.0363	21	0.125	Complies
927.25	15.30	0.0339	21	0.125	Complies



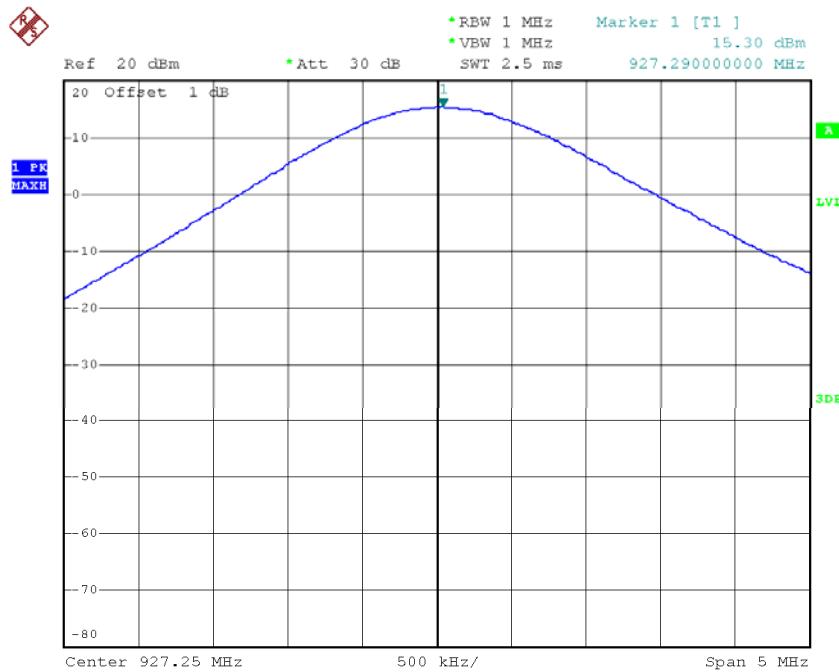
Date: 15.JUN.2016 10:44:18

CH25



Date: 15.JUN.2016 10:45:34

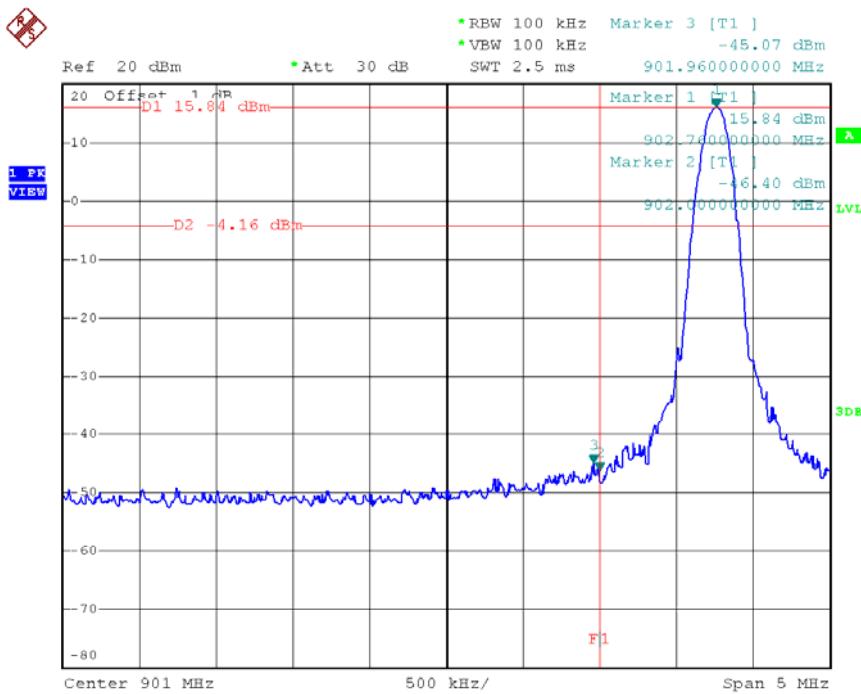
CH49



Date: 15.JUN.2016 10:48:45

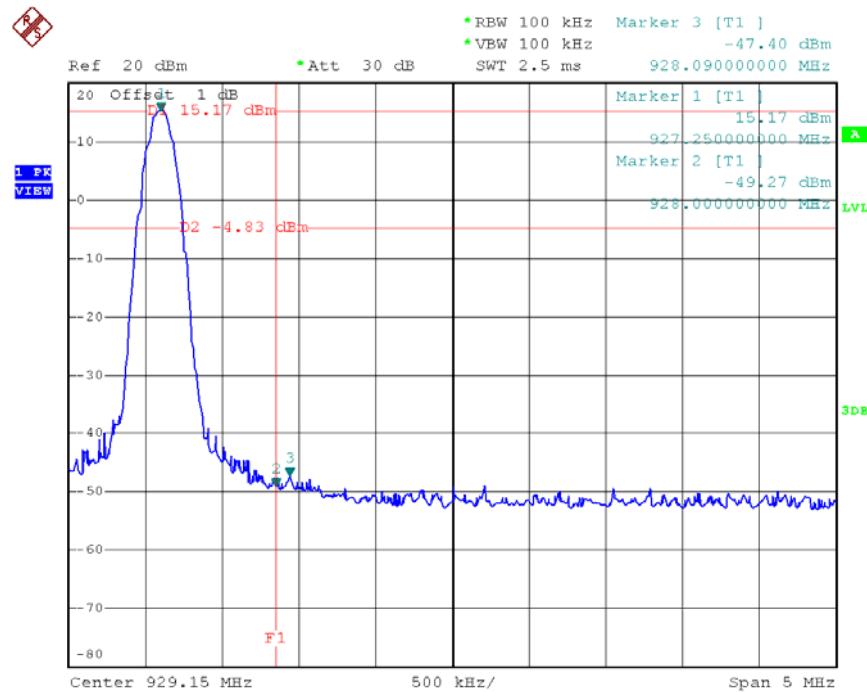
ATTACHMENT J - ANTENNA CONDUCTED SPURIOUS EMISSION

CH00 (Lower)



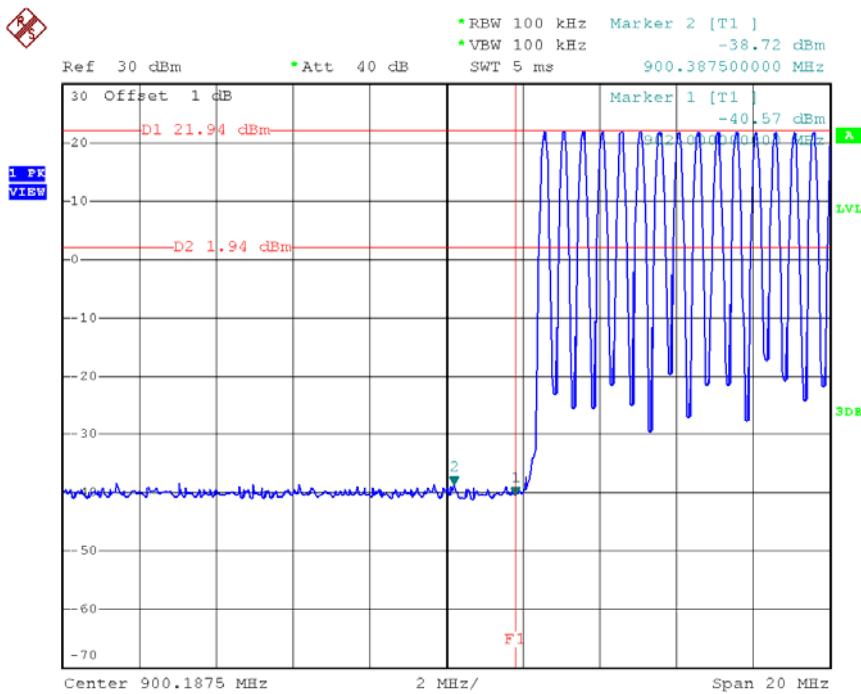
Date: 15.JUN.2016 11:00:39

CH49 (Upper)



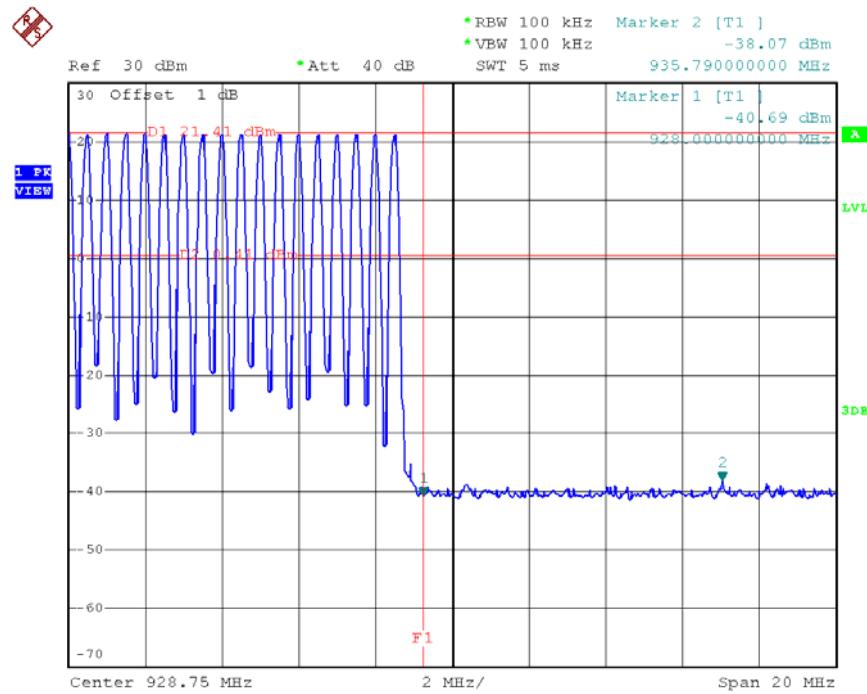
Date: 15.JUN.2016 11:02:38

CH00 Hopping on mode (Lower)

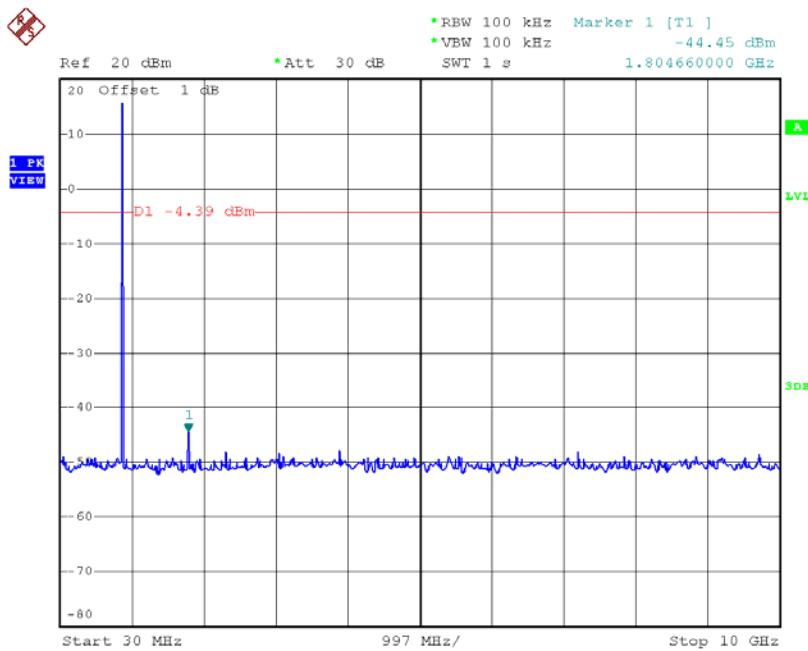


Date: 15.JUN.2016 11:48:51

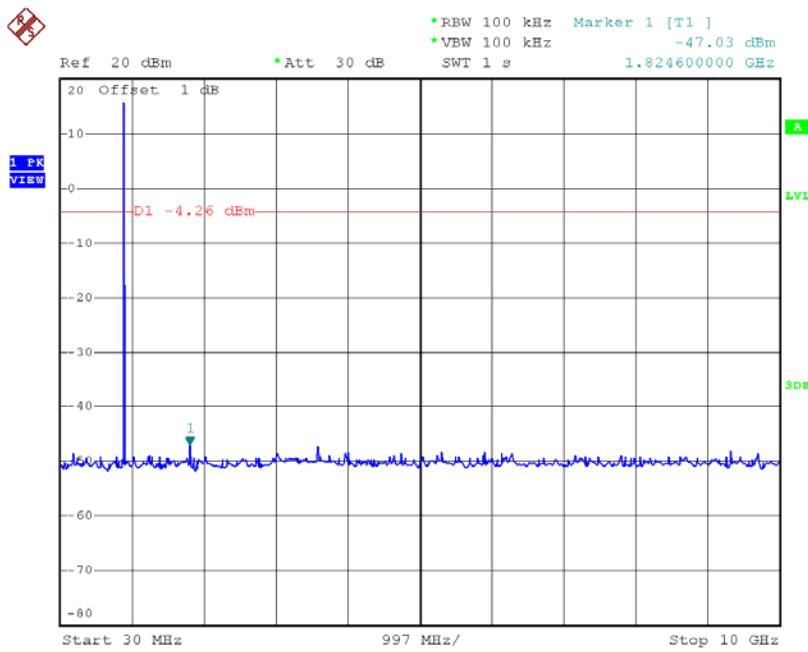
CH49 Hopping on mode (Upper)



Date: 15.JUN.2016 11:51:40

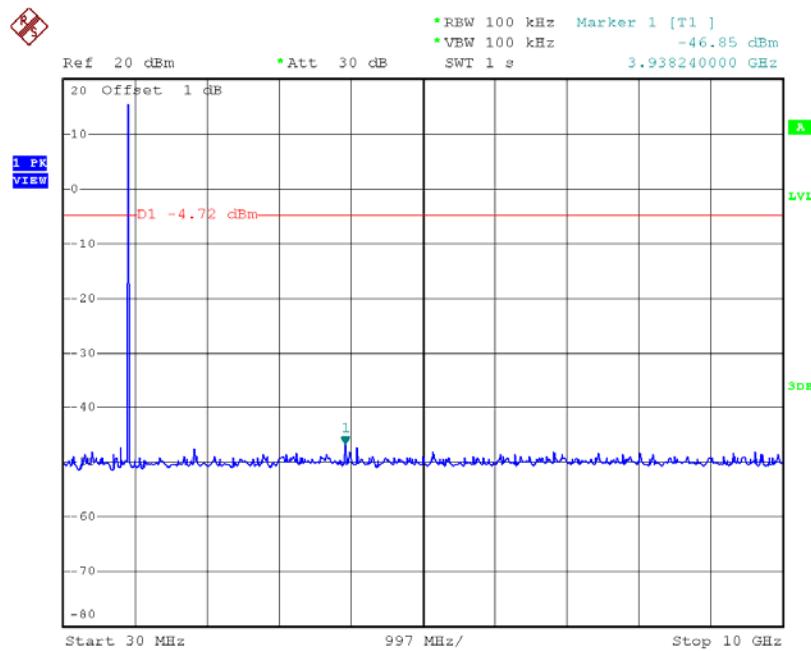
CH00 (10 Harmonic of the frequency)

Date: 15.JUN.2016 10:56:14

CH25 (10 Harmonic of the frequency)

Date: 15.JUN.2016 10:54:47

CH49 (10 Harmonic of the frequency)



Date: 15.JUN.2016 10:53:10