FCC Radio Test Report

FCC ID: OXM000066

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

Project No.	:	1502C066
Equipment	:	Bluetooth Wireless Keyboard
Model Name	:	AKB45
Applicant	:	Targus Group International Inc..
Address	:	1211 North Miller Street, Anaheim, California 92806 United States

Date of Receipt	:	Feb. 10, 2015
Date of Test	:	Feb. 10, 2015~Mar. 05, 2015
Issued Date	:	Mar. 06, 2015
Tested by	:	BTL Inc.

Testing Engineer : Rush Kao
(Rush Kao)

Technical Manager : Jeff Yang
(Jeff Yang)

Authorized Signatory : Andy Chiu
(Andy Chiu)

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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.**

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 Guide 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

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-1-1502C066	Original Issue.	Mar. 06, 2015

1. CERTIFICATION

Equipment	:	Bluetooth Wireless Keyboard
Brand Name	:	Targus
Model Name	:	AKB45
Applicant		Targus Group International Inc.
Manufacturer	:	Targus Group International Inc.
Address	:	1211 North Miller Street, Anaheim, California 92806 United States
Factory	:	DARFON ELECTRONICS(SUZHOU) CO. LTD
Address	:	99 ZHU YUAN RD, NEW DISTRICT, SUZHOU, JIANGSU 215011, China
Date of Test	:	Feb. 10, 2015~Mar. 05, 2015
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-1-1502C066) 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 **FCC**	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) According to FCC Public Notice DA 00-705, March 30, 2000.

2.1TEST FACILITY

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

Conducted emission Test:

C02: (VCCI RN: C-3477; FCC RN: 614388; FCC DN: TW1054)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Radiated emission Test (Below 1 GHz):

CB08: (FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

CB08: (VCCI RN: G-91; FCC RN: 614388; FCC DN: TW1054; IC Assigned Code: 4428C-1)
1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

2.2MEASUREMENT UNCERTAINTY

The measurement uncertainty is not specified by FCC rules for reference only.
The reported uncertainty of measurement **y ± U**,where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**,providing a level of confidence of approximately **95**%.
The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

A. Conducted emission test:

Test Site	Measurement Frequency Range	U,(dB)	NOTE
C02	150 kHz ~ 30 MHz	2.59	

B. Radiated emission test:

Test Site	Item	Measurement Frequency Range		Uncertainty	NOTE
CB08	Radiated emission at 3m	Horizontal Polarization	30 - 200MHz	3.35 dB	
			200 - 1000MHz	3.11 dB	
			1 - 18GHz	3.97 dB	
			18 - 40GHz	4.01 dB	
		Vertical Polarization	30 - 200MHz	3.22 dB	
			200 - 1000MHz	3.24 dB	
			1 - 18GHz	4.05 dB	
			18 - 40GHz	4.04 dB	

Our calculated Measurement Instrumentation Uncertainty is shown in the tables above. These are our U_{lab} values in CISPR 16-4-2 terminology.
Since Table 1 of CISPR 16-4-2 has values of measurement instrumentation uncertainty, called U_{CISPR}, as follows:

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

It can be seen that our U_{lab} values are smaller than U_{CISPR}.
If U_{lab} is less than or equal to U_{CISPR}, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{CISPR}, then:

- compliance is deemed to occur if no measured disturbance level, increased by (U_{lab} - U_{CISPR}), exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} - U_{CISPR}), exceeds the disturbance limit.

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Bluetooth Wireless Keyboard	
Brand Name	Targus	
Model Name	AKB45	
Model Difference	N/A	
Output Power (Max.)	Operation Frequency	2402~2480 MHz
	Modulation Technology	GFSK(1Mbps)
	Bit Rate of Transmitter	
	Output Power Max.	-1.92 dBm (1Mbps)
Power Source	#1 Supplier from Li-ion battery. #2 Supplier from USB Port	
Power Rating	#1 I/P: DC 3.7V 5.55Wh O/P: DC 5V #2 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	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

3 Table for Filed Antenna

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Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	N/A	N/A	Printed	N/A	0.49	-

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)**
Mode 2	Normal Link

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

For Conducted Emission	
Final Test Mode	Description
Mode 2	Normal Link

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.

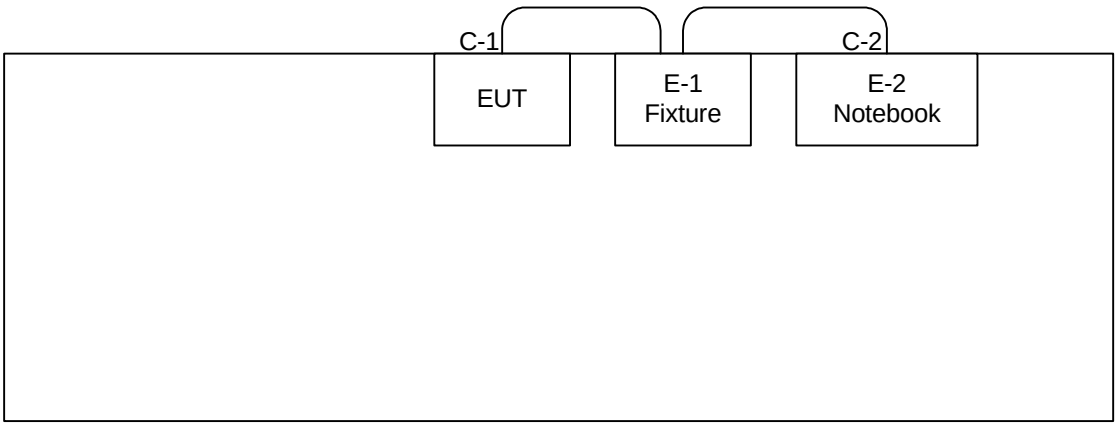
3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

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

1Mbps

Test Software Version	bluetool1.6.8.6		
Frequency (MHz)	2402	2441	2480
Parameters	0dBm	0dBm	0dBm

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



C-1 DATA Cable
C-2 USB Cable

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	Fixture	N/A	N/A	N/A	N/A	
E-2	Notebook	Acer	MS2351	DOC	NXV7JTA005334 043D42000	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1m	
C-2	NO	NO	1m	

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

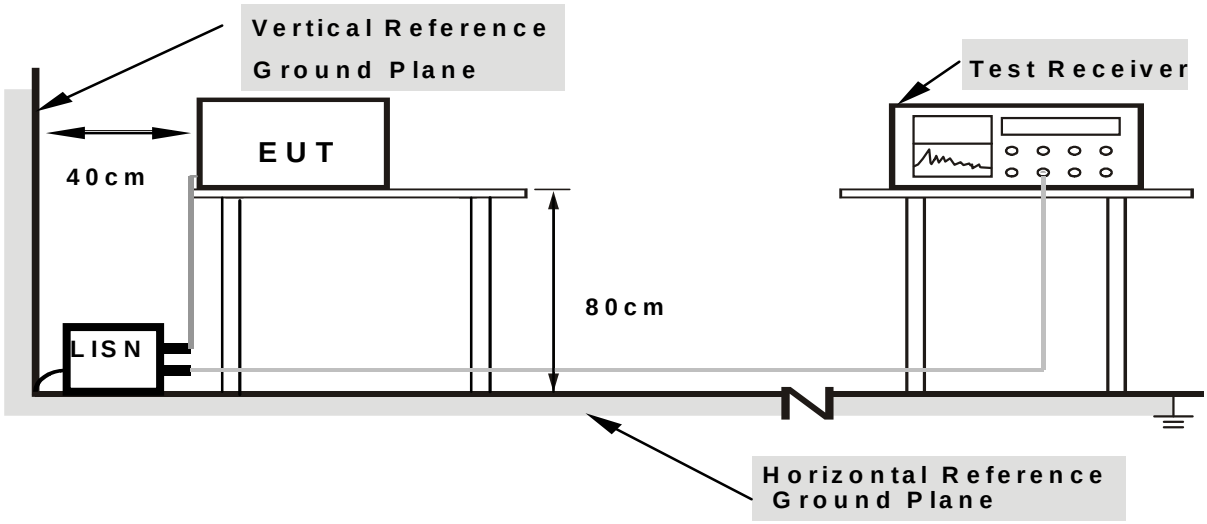
4.1.2 TEST PROCEDURE

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: 24°C
Relative Humidity: 59%
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

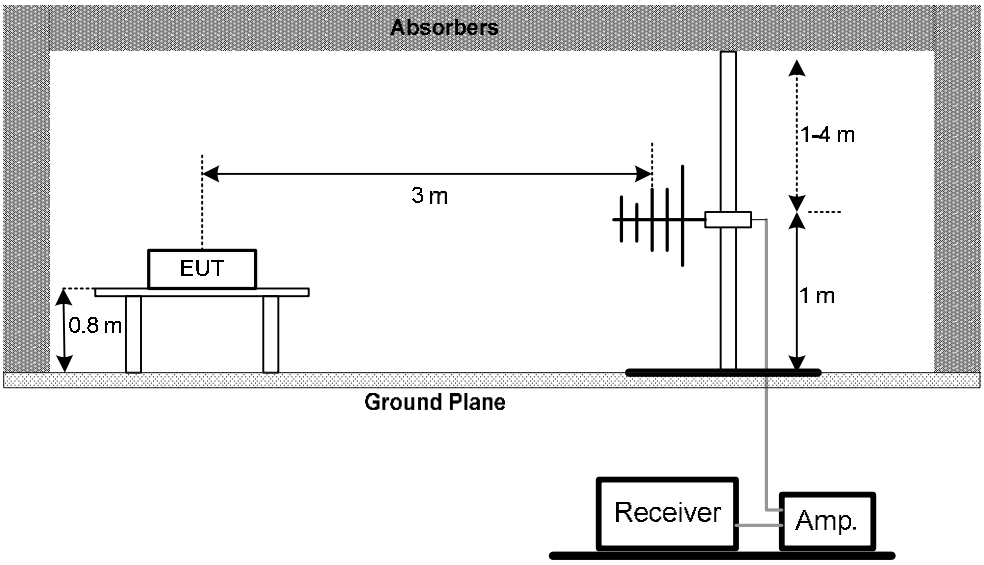
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 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

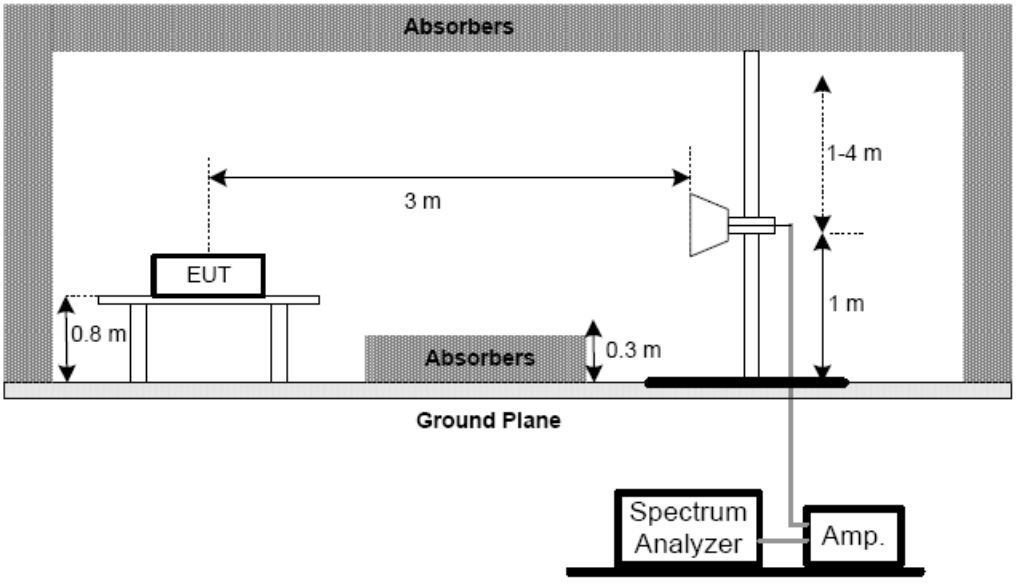
No deviation

4.2.4 TEST SETUP

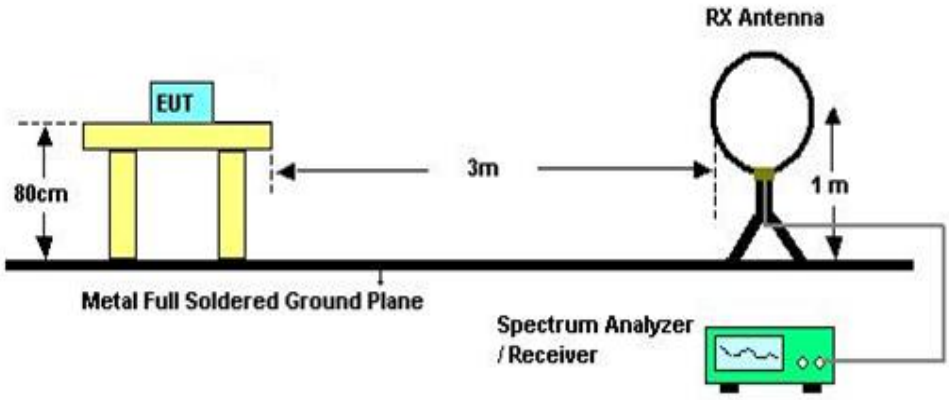
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(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: 24°C
Relative Humidity: 60%
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 (specific distance / 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	2400-2483.5	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

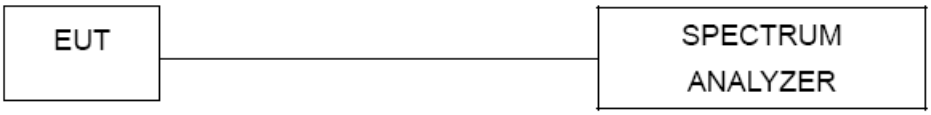
5.1.1 TEST PROCEDURE

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.

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	2400-2483.5	PASS

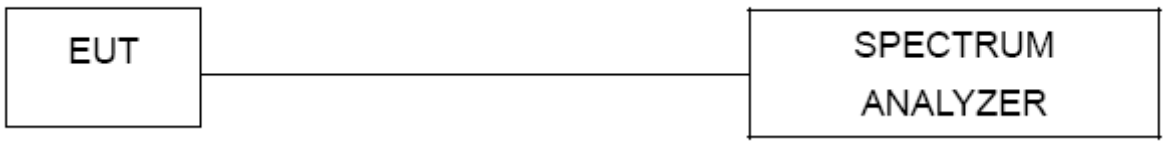
6.1.1 TEST PROCEDURE

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. Set the EUT for DH5, DH3 and DH1 packet transmitting.
h. Measure the maximum time duration of one single pulse.
i. 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 x 31.6 = 106.6 within 31.6 seconds.
j. 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 x 31.6 = 160 within 31.6 seconds.
k. 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 x 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 2400-2483.5 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

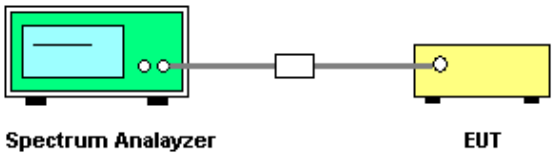
a. The EUT must have its hopping function enabled

b. Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span
Video (or Average) Bandwidth (VBW) ≥ 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	2400-2483.5

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

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= 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	2400-2483.5	PASS

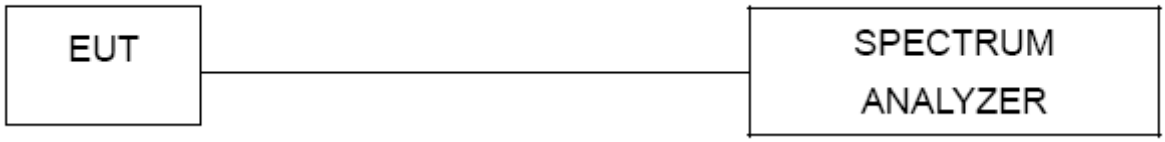
9.1.1 TEST PROCEDURE

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= 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.

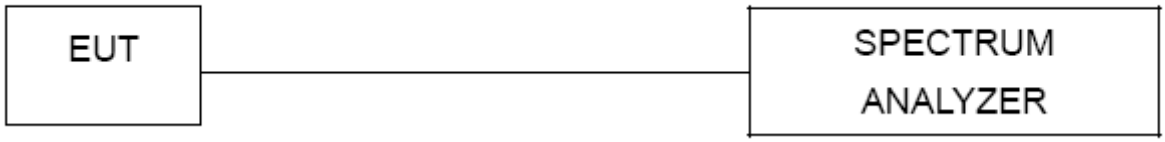
10.1.1 TEST PROCEDURE

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	R&S	ENV216	100087	Nov. 22, 2015
2	Test Cable	TIMES	CFD300-NL	C01	Jun. 15, 2015
3	EMI Test Receiver	R&S	ESCI	100082	Apr. 13, 2015
4	Measurement Software	EZ	EZ_EMC (Version NB-02A)	N/A	N/A

Radiated Emission Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 13, 2015
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Jun. 14, 2015
3	Microwave Pre_amplifier	Agilent	8449B	3008A01714	Apr. 15, 2015
4	Microflex Cable	Harbour industries	27478LL142	1m	May. 12, 2015
5	Microflex Cable	EMC	S104-SMA	8m	May. 14, 2015
6	Microflex Cable	Harbour industries	27478LL142	3m	May. 12, 2015
7	Test Cable	LMR	LMR-400	12m	May. 13, 2015
8	Test Cable	LMR	LMR-400	3m	May. 13, 2015
9	Pre-Amplifier	Anritsu	MH648A	M92649	Jun. 17, 2015
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	July. 10, 2015

Number of Hopping Channel					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 13, 2015

Average Time of Occupancy					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 13, 2015

Hopping Channel Separation Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 13, 2015

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 13, 2015

Peak Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 13, 2015

Antenna Conducted Spurious Emission					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP-40	100129	Oct. 13, 2015

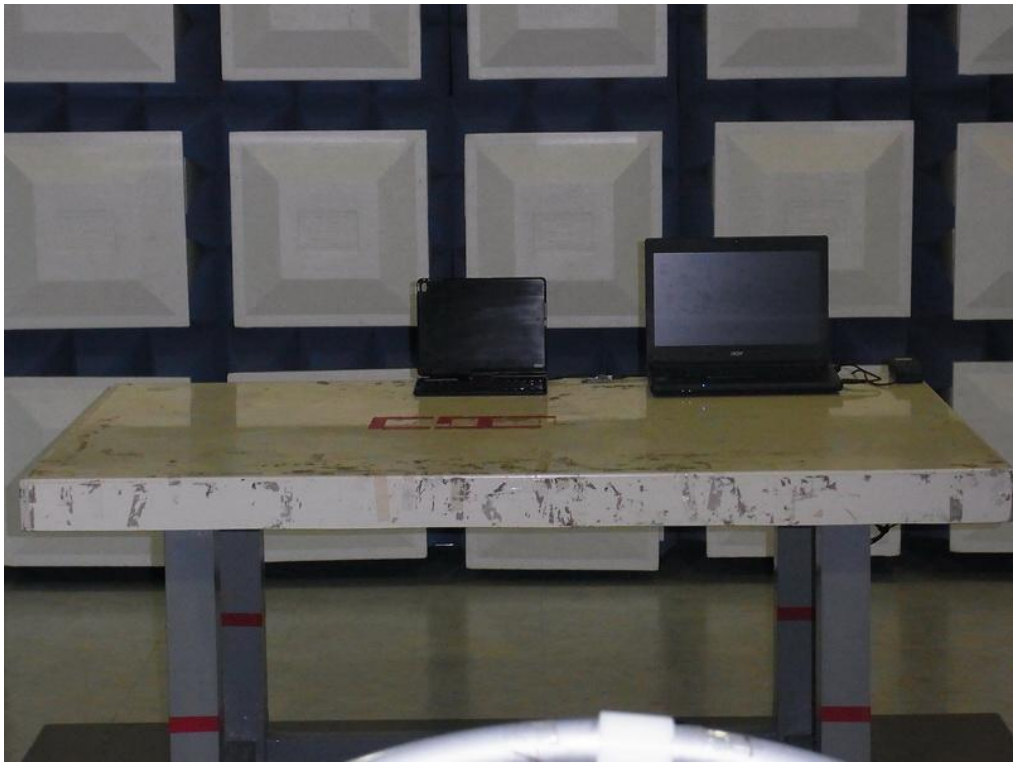
Remark: “N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

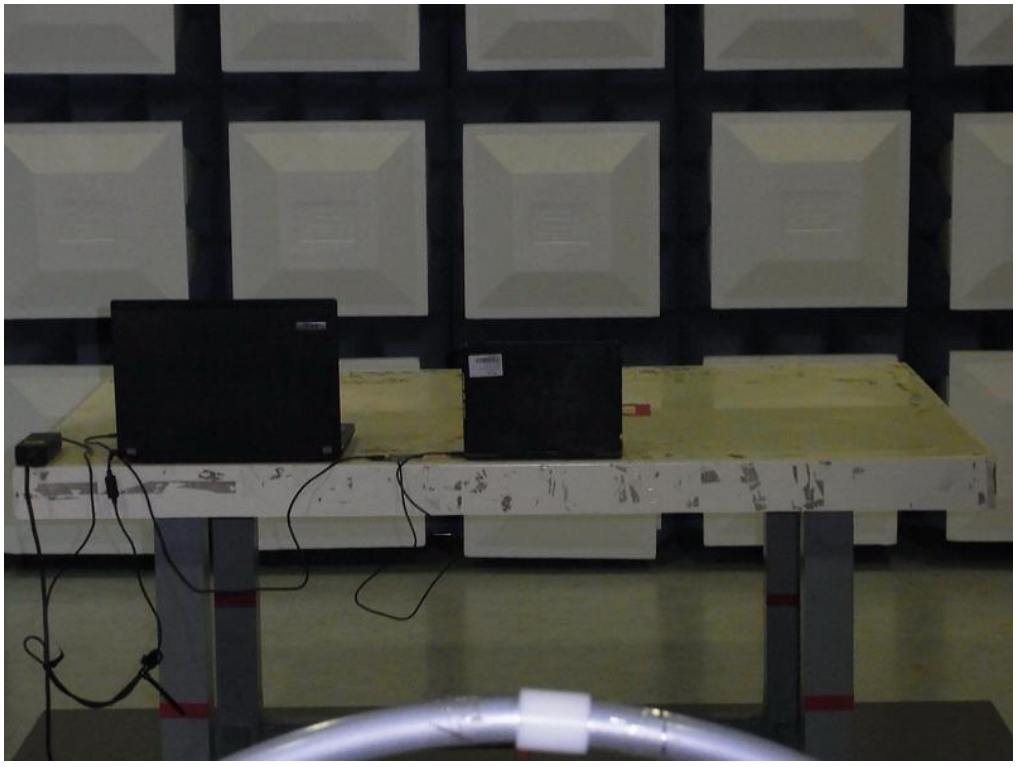
12. EUT TEST PHOTO

Conducted Measurement Photos

Radiated Measurement Photos

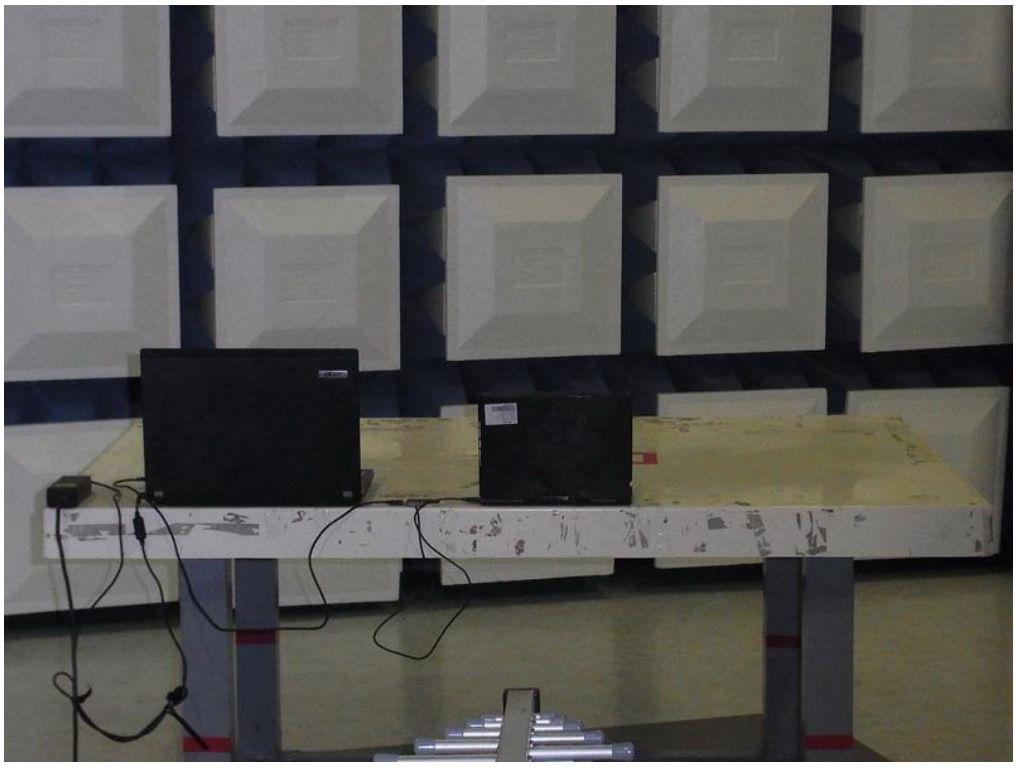
9K-30MHz





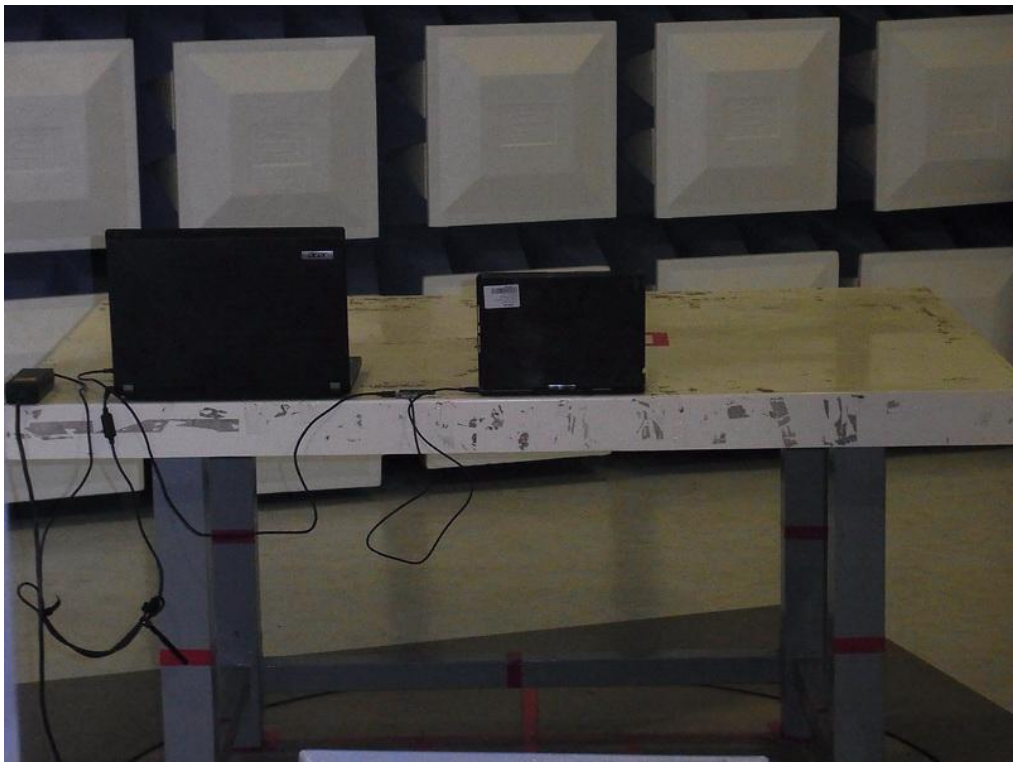
Radiated Measurement Photos

30MHz-1G



Radiated Measurement Photos

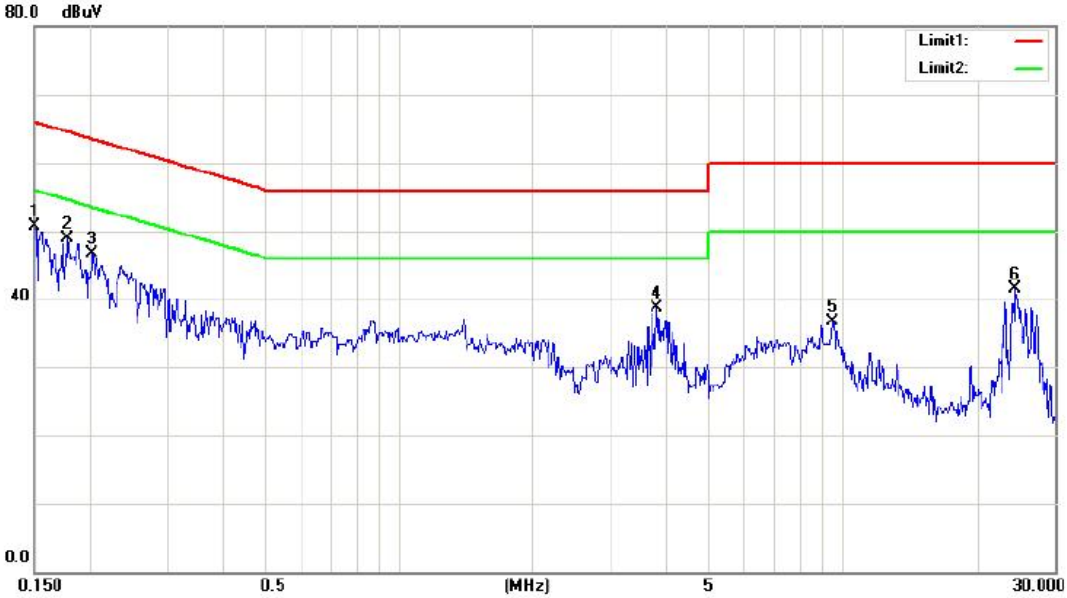
Above 1G



ATTACHMENT A - CONDUCTED EMISSION

Test Mode :	Normal Link

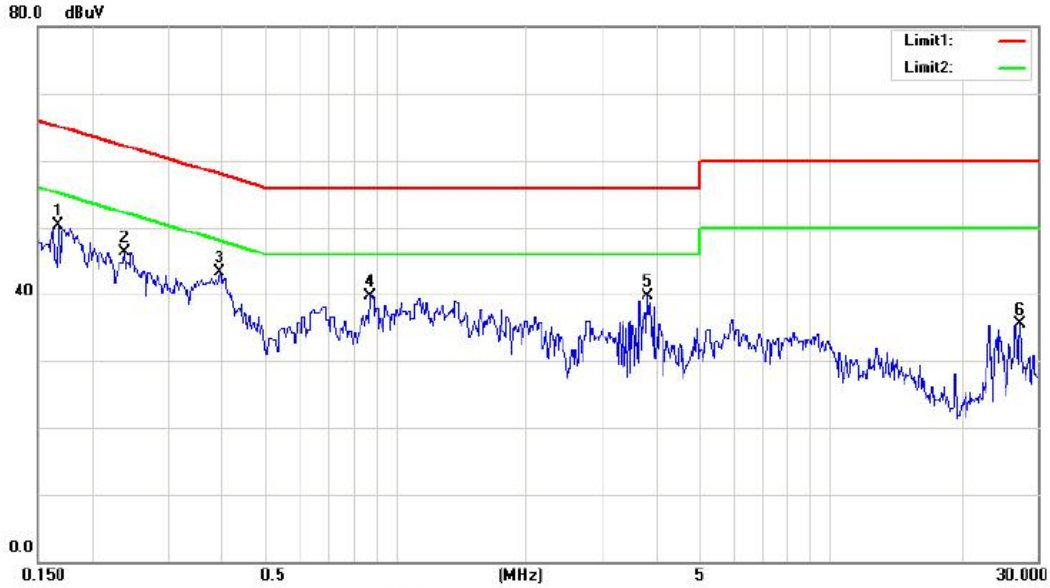
Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1514	40.96	9.65	50.61	65.92	-15.31	peak	
2		0.1785	39.23	9.65	48.88	64.56	-15.68	peak	
3		0.2031	37.07	9.65	46.72	63.48	-16.76	peak	
4		3.7938	28.75	9.87	38.62	56.00	-17.38	peak	
5		9.5000	26.64	10.06	36.70	60.00	-23.30	peak	
6		24.3500	31.07	10.43	41.50	60.00	-18.50	peak	

Test Mode :	Normal Link

Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1668	40.50	9.77	50.27	65.12	-14.85	peak	
2		0.2378	36.54	9.77	46.31	62.17	-15.86	peak	
3	*	0.3933	33.47	9.77	43.24	57.99	-14.75	peak	
4		0.8757	29.87	9.81	39.68	56.00	-16.32	peak	
5		3.7993	29.84	9.95	39.79	56.00	-16.21	peak	
6		27.2711	25.35	10.13	35.48	60.00	-24.52	peak	

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
0.2520	0°	46.29	11.40	57.69	79.58	-21.89	AVG
0.2520	0°	53.42	11.40	64.82	99.58	-34.76	PK
0.3780	0°	37.66	11.14	48.80	76.05	-27.25	AVG
0.3780	0°	47.02	11.14	58.16	96.05	-37.89	PK
0.4320	0°	39.58	11.18	50.76	74.89	-24.14	AVG
0.4320	0°	49.51	11.18	60.69	94.89	-34.21	PK
0.7450	0°	44.02	11.30	55.32	90.55	-35.23	QP
0.7820	0°	42.33	11.33	53.66	69.74	-16.08	QP
1.3670	0°	41.87	11.53	53.40	64.89	-11.49	QP

Freq. (MHz)	Ant. 0°/90°	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
0.2590	90°	46.22	11.36	57.58	79.34	-21.76	AVG
0.2590	90°	53.01	11.36	64.37	99.34	-34.97	PK
0.3710	90°	38.46	11.14	49.60	76.22	-26.62	AVG
0.3710	90°	47.22	11.14	58.36	96.22	-37.86	PK
0.4300	90°	39.56	11.18	50.74	74.93	-24.20	AVG
0.4300	90°	49.45	11.18	60.63	94.93	-34.31	PK
0.7510	90°	44.25	11.30	55.55	90.55	-35.00	QP
0.7930	90°	42.16	11.34	53.50	69.62	-16.12	QP
1.3520	90°	41.83	11.52	53.35	64.98	-11.63	QP

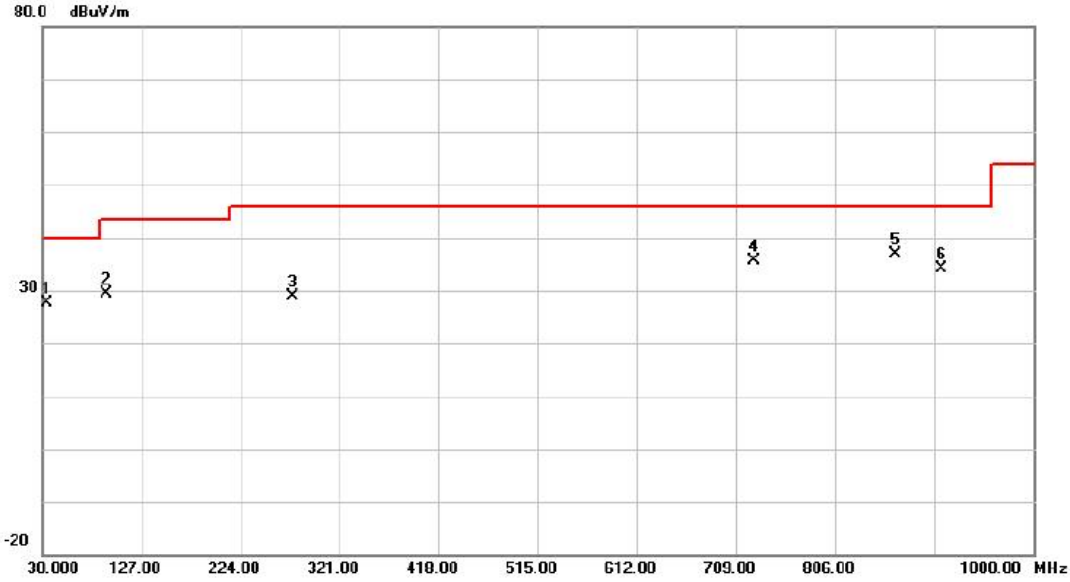
Remark:

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

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

Test Mode:	TX 2441MHz _CH39_1Mbps

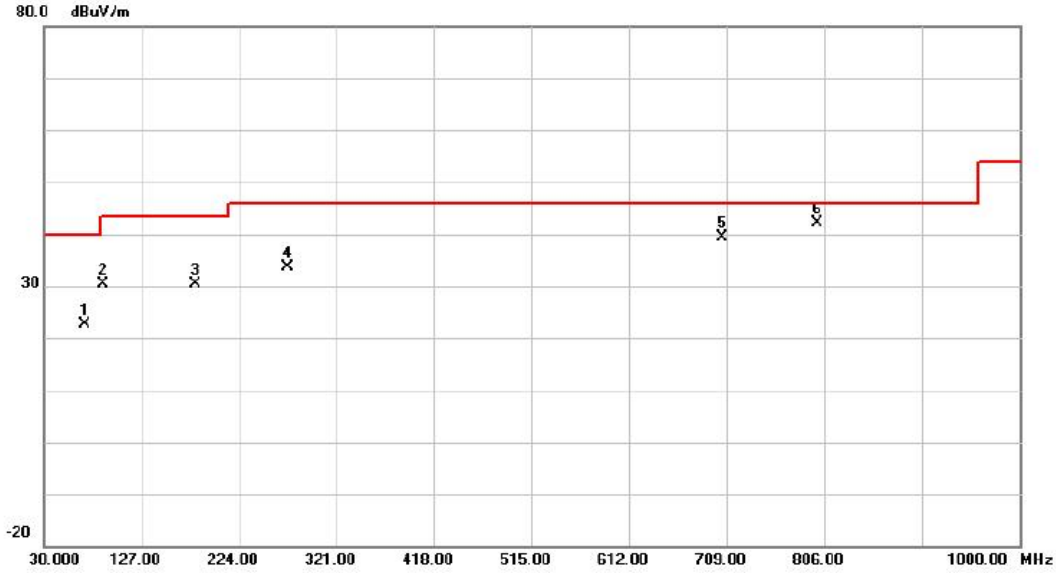
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		34.8500	42.90	-15.15	27.75	40.00	-12.25	peak	
2		93.0500	49.28	-19.86	29.42	43.50	-14.08	peak	
3		274.9250	42.89	-14.08	28.81	46.00	-17.19	peak	
4		725.9750	40.80	-5.21	35.59	46.00	-10.41	peak	
5	*	864.2000	40.52	-3.55	36.97	46.00	-9.03	peak	
6		910.2750	36.81	-2.62	34.19	46.00	-11.81	peak	

Test Mode:	TX 2441MHz _CH39_1Mbps

Horizontal

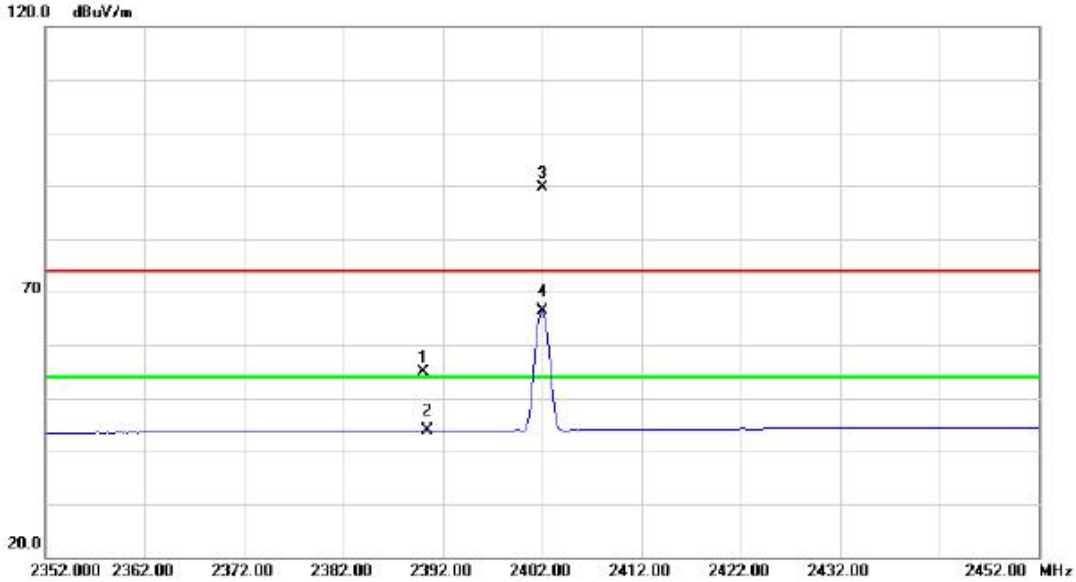


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		71.2250	39.20	-16.48	22.72	40.00	-17.28	peak	
2		88.2000	50.26	-19.92	30.34	43.50	-13.16	peak	
3		180.3500	45.78	-15.47	30.31	43.50	-13.19	peak	
4		272.5000	47.81	-14.15	33.66	46.00	-12.34	peak	
5		704.1500	44.75	-5.39	39.36	46.00	-6.64	peak	
6	*	798.7250	46.79	-4.75	42.04	46.00	-3.96	peak	

ATTACHMENT D - RADIATED EMISSION (ABOVE 1000MHZ)

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

Vertical

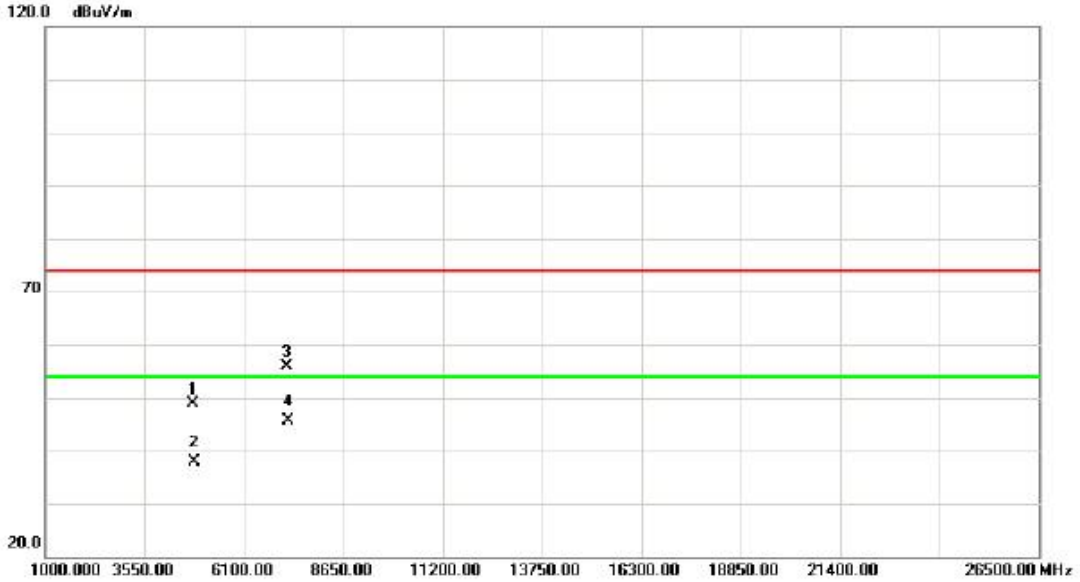


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	23.80	31.02	54.82	74.00	-19.18	peak	
2		2390.000	12.85	31.02	43.87	54.00	-10.13	AVG	
3	*	2402.000	58.57	31.08	89.65	74.00	15.65	peak	No Limit
4	X	2402.000	35.26	31.08	66.34	54.00	12.34	AVG	No Limit

no limit: This is a fundamental signal, the judgment is not applicable. For fundamental signal judgment please refer to Peak output power test (ATTACHMENT I).

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

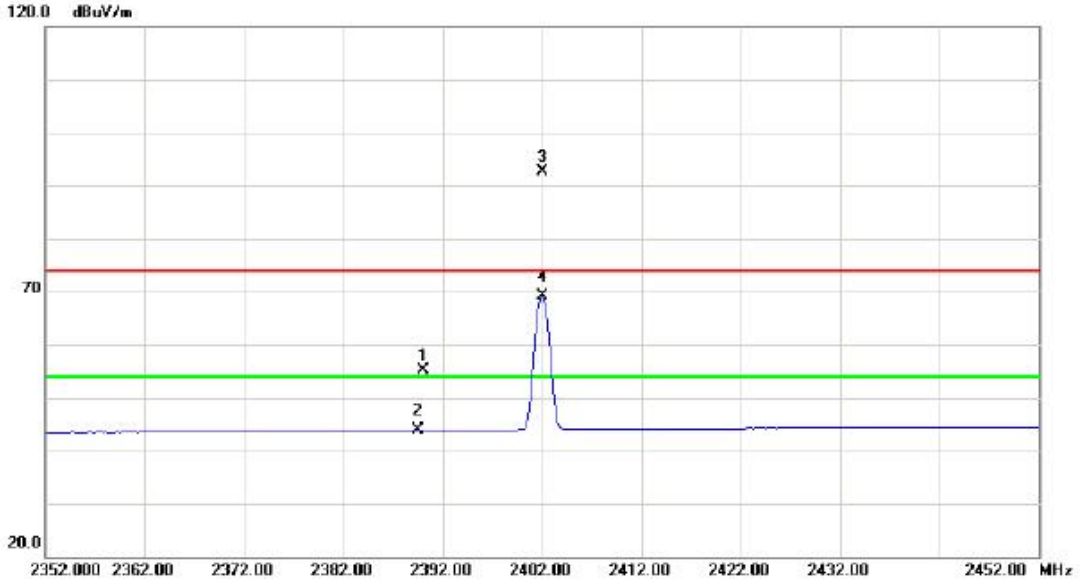
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4803.938	41.98	6.78	48.76	74.00	-25.24	peak	
2		4803.938	30.99	6.78	37.77	54.00	-16.23	AVG	
3		7206.625	40.88	15.01	55.89	74.00	-18.11	peak	
4	*	7206.625	30.69	15.01	45.70	54.00	-8.30	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2390.000	24.12	31.02	55.14	74.00	-18.86	peak	
2		2390.000	12.81	31.02	43.83	54.00	-10.17	AVG	
3	*	2402.000	61.51	31.08	92.59	74.00	18.59	peak	No Limit
4	X	2402.000	38.05	31.08	69.13	54.00	15.13	AVG	No Limit

no limit: This is a fundamental signal, the judgment is not applicable. For fundamental signal judgment please refer to Peak output power test (ATTACHMENT I).

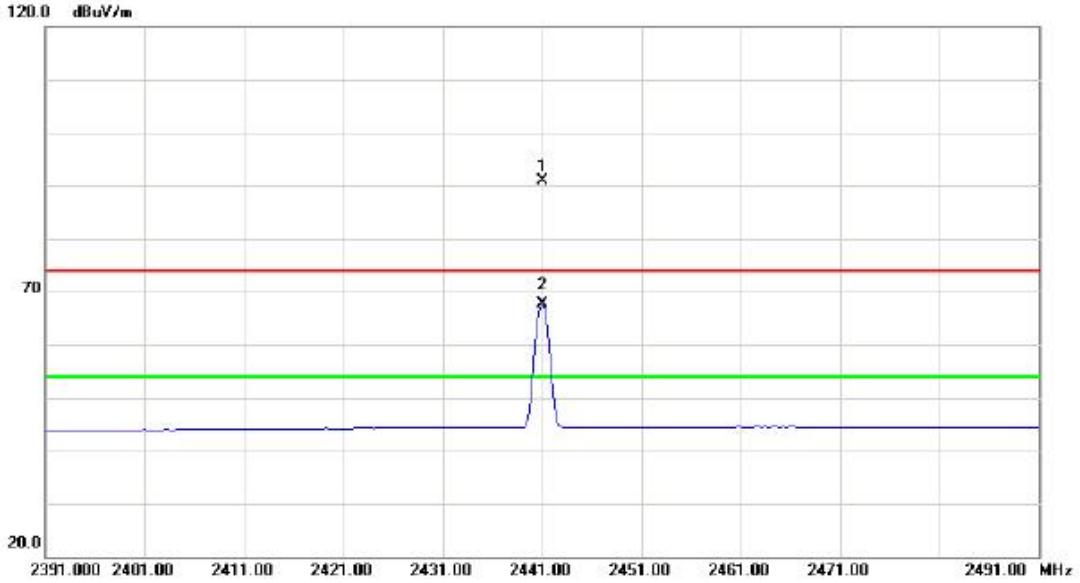
Orthogonal Axis :	X
Test Mode :	TX 2402MHz _CH00_1Mbps

Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4804.000	41.42	6.78	48.20	74.00	-25.80	peak	
2		4804.000	30.75	6.78	37.53	54.00	-16.47	AVG	
3		7209.100	41.58	15.03	56.61	74.00	-17.39	peak	
4	*	7209.100	30.63	15.03	45.66	54.00	-8.34	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH39_1Mbps

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2441.000	59.70	31.26	90.96	74.00	16.96	peak	No Limit
2	X	2441.000	36.34	31.26	67.60	54.00	13.60	AVG	No Limit

no limit: This is a fundamental signal, the judgment is not applicable. For fundamental signal judgment please refer to Peak output power test (ATTACHMENT I).

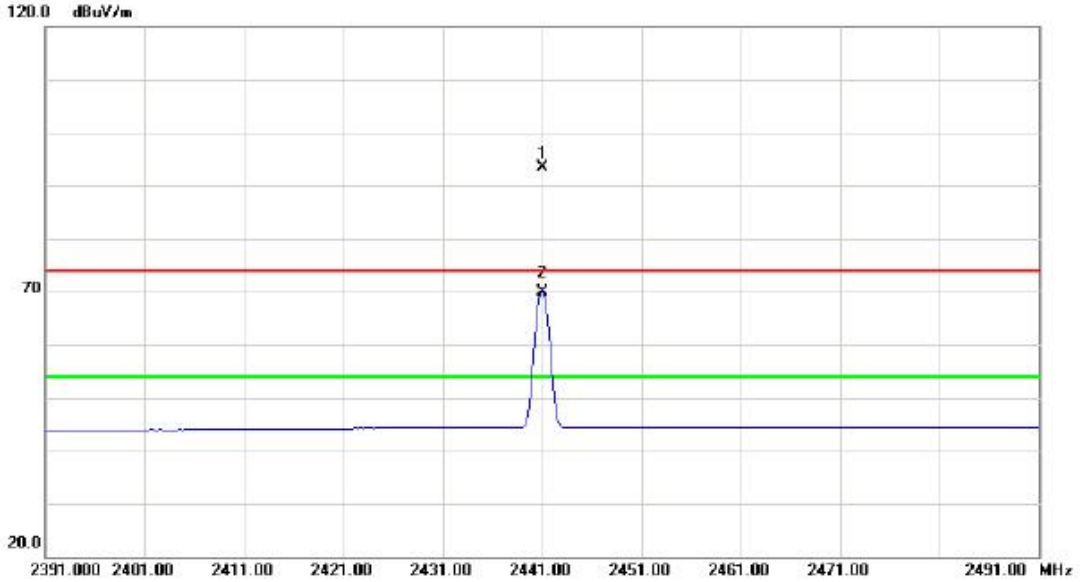
Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH39_1Mbps

Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4882.125	42.95	6.77	49.72	74.00	-24.28	peak	
2		4882.125	30.93	6.77	37.70	54.00	-16.30	AVG	
3		7323.262	42.17	15.65	57.82	74.00	-16.18	peak	
4	*	7323.262	30.75	15.65	46.40	54.00	-7.60	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH39_1Mbps

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2441.000	62.17	31.26	93.43	74.00	19.43	peak	No Limit
2	X	2441.000	38.69	31.26	69.95	54.00	15.95	AVG	No Limit

no limit: This is a fundamental signal, the judgment is not applicable. For fundamental signal judgment please refer to Peak output power test (ATTACHMENT I).

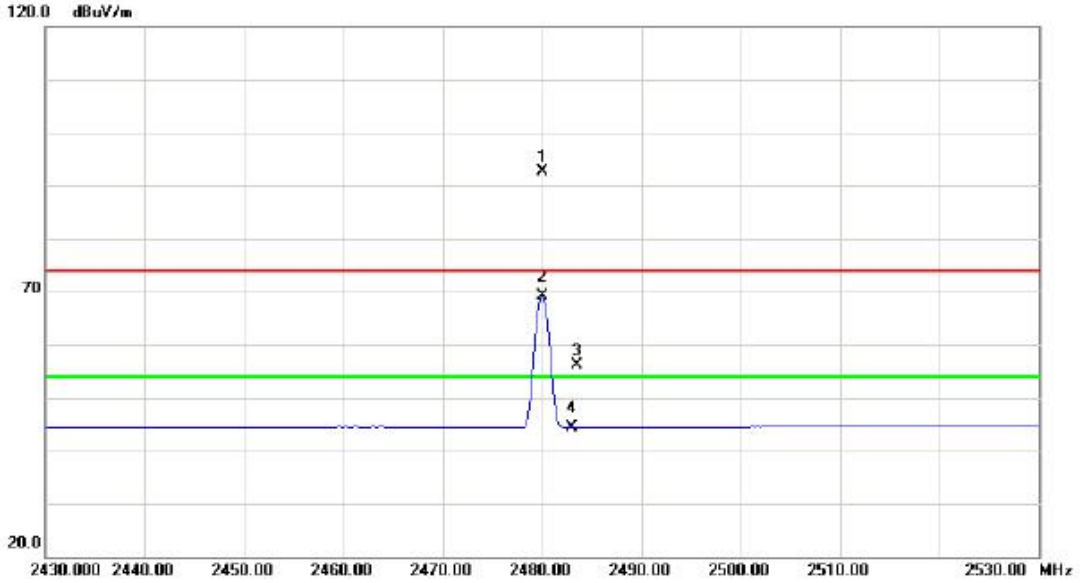
Orthogonal Axis :	X
Test Mode :	TX 2441MHz _CH39_1Mbps

Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4882.438	40.94	6.77	47.71	74.00	-26.29	peak	
2		4882.438	30.53	6.77	37.30	54.00	-16.70	AVG	
3		7323.363	41.25	15.65	56.90	74.00	-17.10	peak	
4	*	7323.363	30.73	15.65	46.38	54.00	-7.62	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH78_1Mbps

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2480.000	61.10	31.44	92.54	74.00	18.54	peak	No Limit
2	X	2480.000	37.66	31.44	69.10	54.00	15.10	AVG	No Limit
3		2483.500	24.70	31.46	56.16	74.00	-17.84	peak	
4		2483.500	12.84	31.46	44.30	54.00	-9.70	AVG	

no limit: This is a fundamental signal, the judgment is not applicable. For fundamental signal judgment please refer to Peak output power test (ATTACHMENT I).

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH78_1Mbps

Vertical

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4960.100	41.35	6.76	48.11	74.00	-25.89	peak	
2		4960.100	30.52	6.76	37.28	54.00	-16.72	AVG	
3		7440.250	42.78	16.28	59.06	74.00	-14.94	peak	
4	*	7440.250	31.54	16.28	47.82	54.00	-6.18	AVG	

Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH78_1Mbps

Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	2480.000	62.16	31.44	93.60	74.00	19.60	peak	No Limit
2	X	2480.000	38.68	31.44	70.12	54.00	16.12	AVG	No Limit
3		2483.500	23.70	31.46	55.16	74.00	-18.84	peak	
4		2483.500	12.84	31.46	44.30	54.00	-9.70	AVG	

no limit: This is a fundamental signal, the judgment is not applicable. For fundamental signal judgment please refer to Peak output power test (ATTACHMENT I).

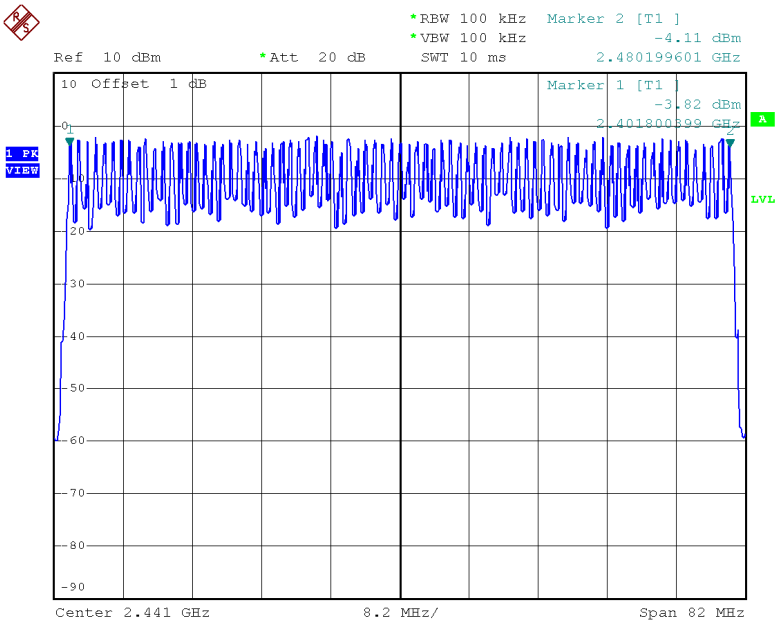
Orthogonal Axis :	X
Test Mode :	TX 2480MHz _CH78_1Mbps

Horizontal

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		4959.938	41.52	6.76	48.28	74.00	-25.72	peak	
2		4959.938	30.44	6.76	37.20	54.00	-16.80	AVG	
3		7440.212	43.58	16.28	59.86	74.00	-14.14	peak	
4	*	7440.212	31.43	16.28	47.71	54.00	-6.29	AVG	

ATTACHMENT E - NUMBER OF HOPPING CHANNEL

Test Mode	Hopping Mode_1Mbps
Number of Hopping Channel	79



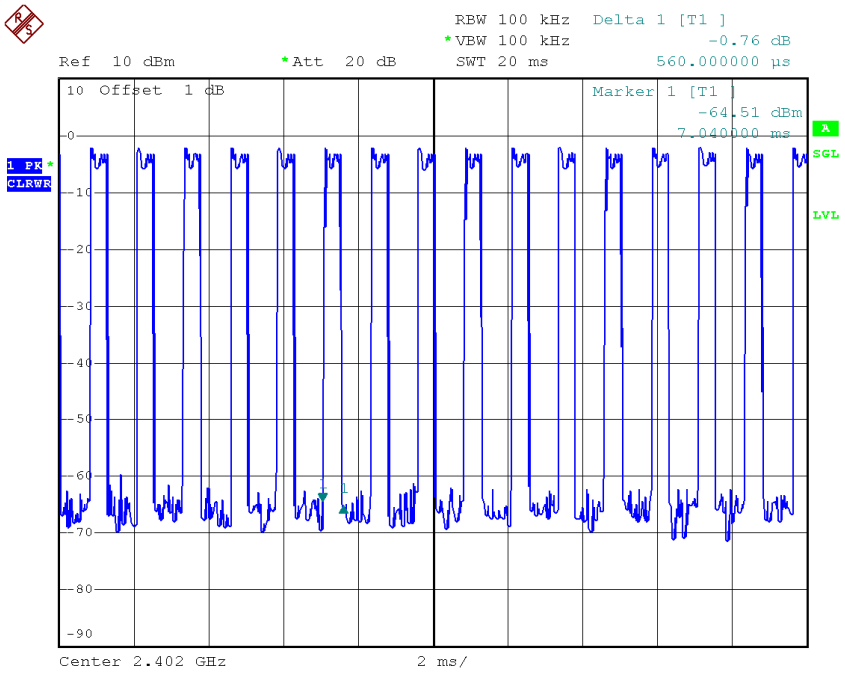
Date: 3.MAR.2015 15:16:46

ATTACHMENT F - AVERAGE TIME OF OCCUPANCY

Test Mode :	TX Mode_1Mbps

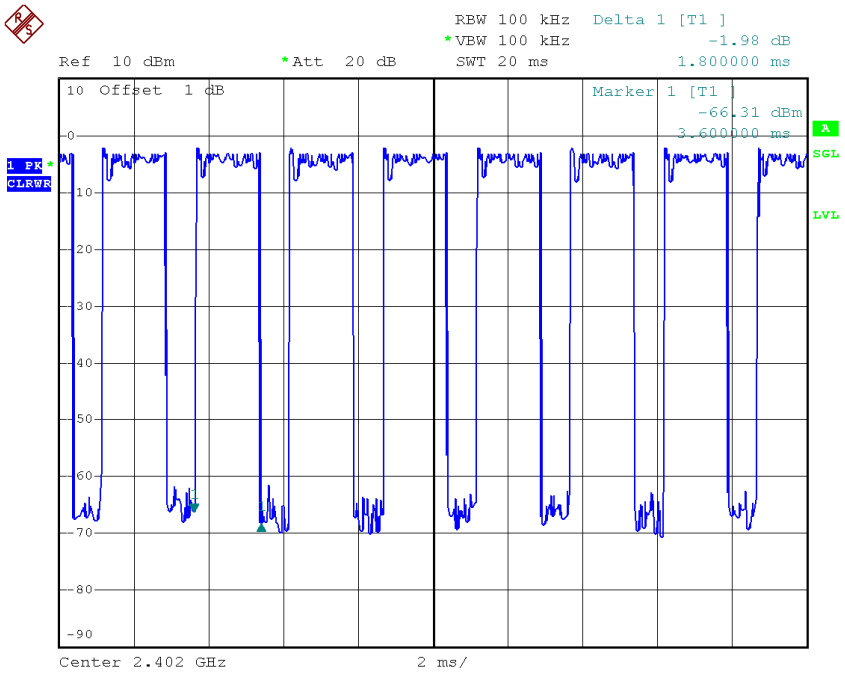
Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Result
DH5	2402	3.0400	0.3243	0.4000	Complies
DH3	2402	1.8000	0.2880	0.4000	Complies
DH1	2402	0.5600	0.1792	0.4000	Complies
DH5	2441	3.0400	0.3243	0.4000	Complies
DH3	2441	1.8000	0.2880	0.4000	Complies
DH1	2441	0.5600	0.1792	0.4000	Complies
DH5	2480	3.0400	0.3243	0.4000	Complies
DH3	2480	1.8000	0.2880	0.4000	Complies
DH1	2480	0.6400	0.2048	0.4000	Complies

CH00-DH1



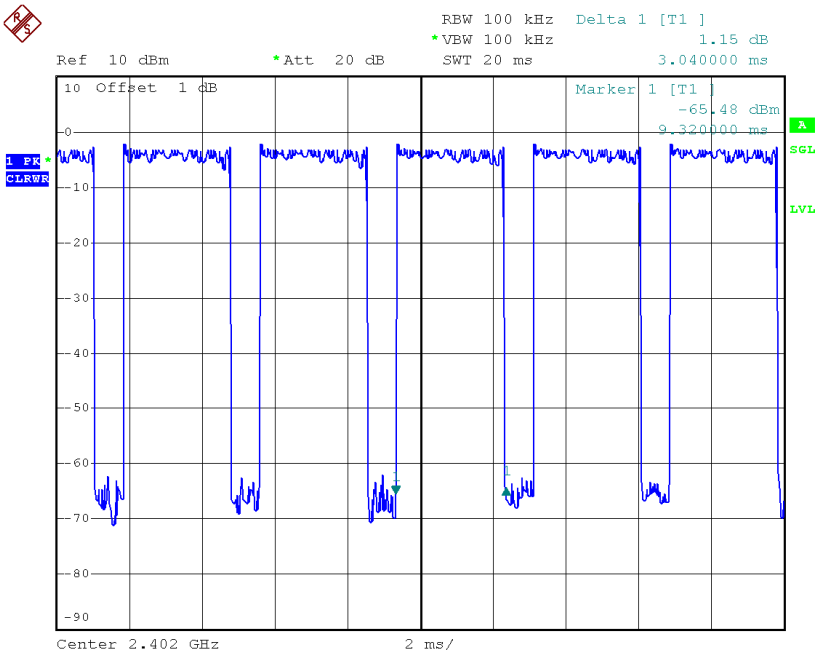
Date: 3.MAR.2015 15:18:51

CH00-DH3



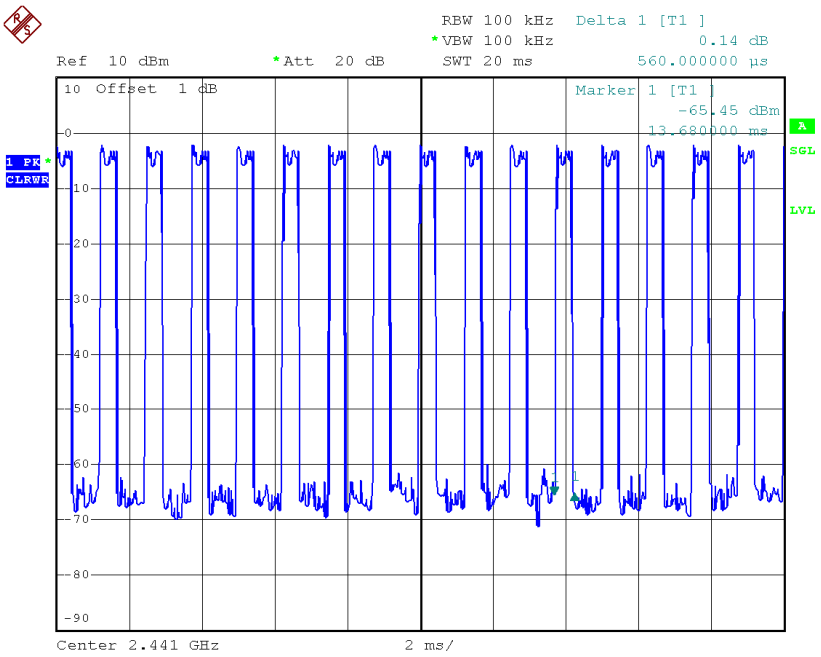
Date: 3.MAR.2015 15:22:50

CH00-DH5



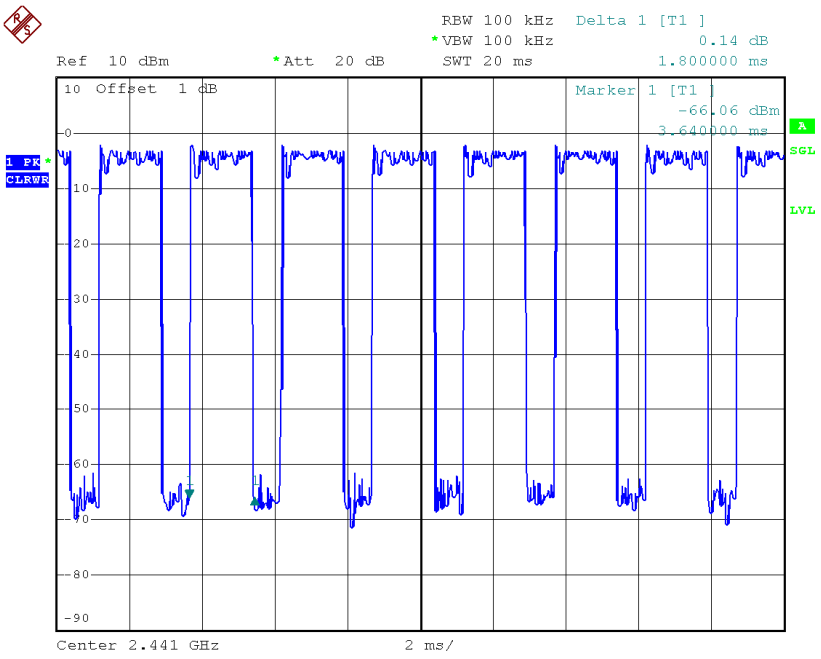
Date: 3.MAR.2015 15:03:48

CH39-DH1



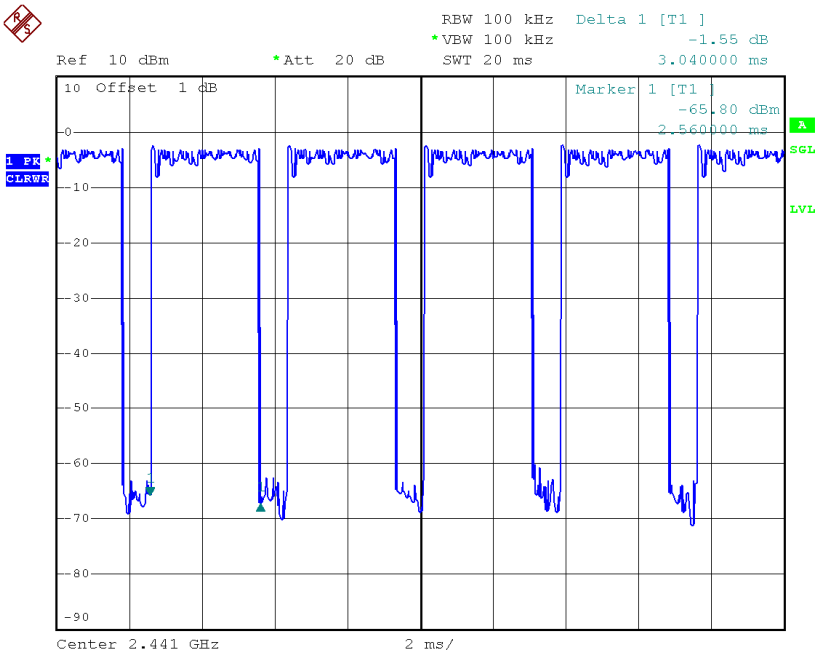
Date: 3.MAR.2015 15:19:42

CH39-DH3



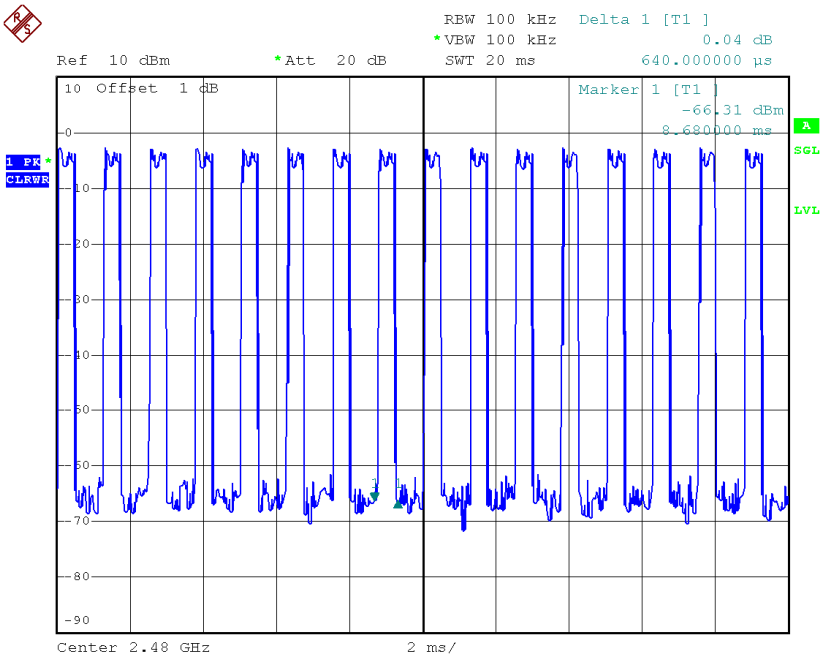
Date: 3.MAR.2015 15:23:28

CH39-DH5



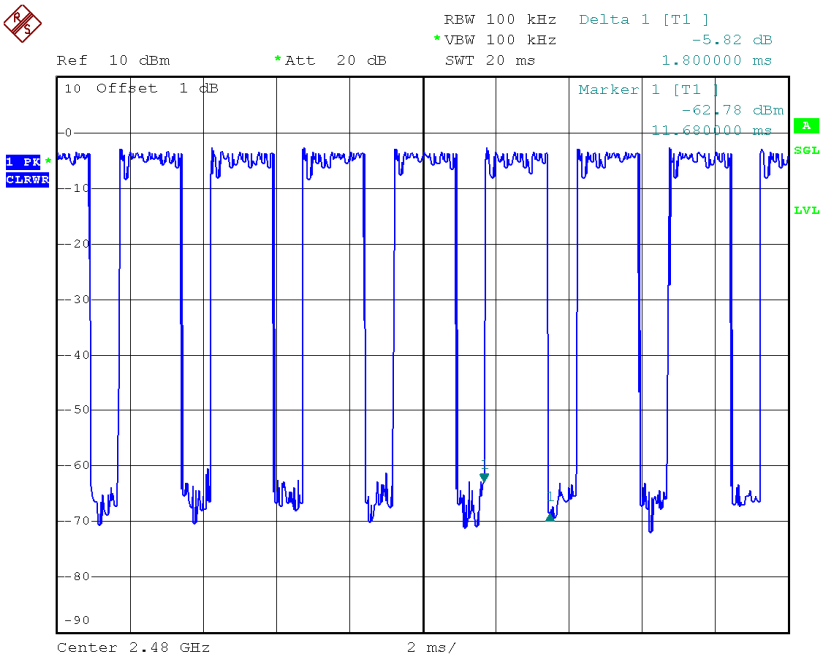
Date: 3.MAR.2015 15:08:50

CH78-DH1



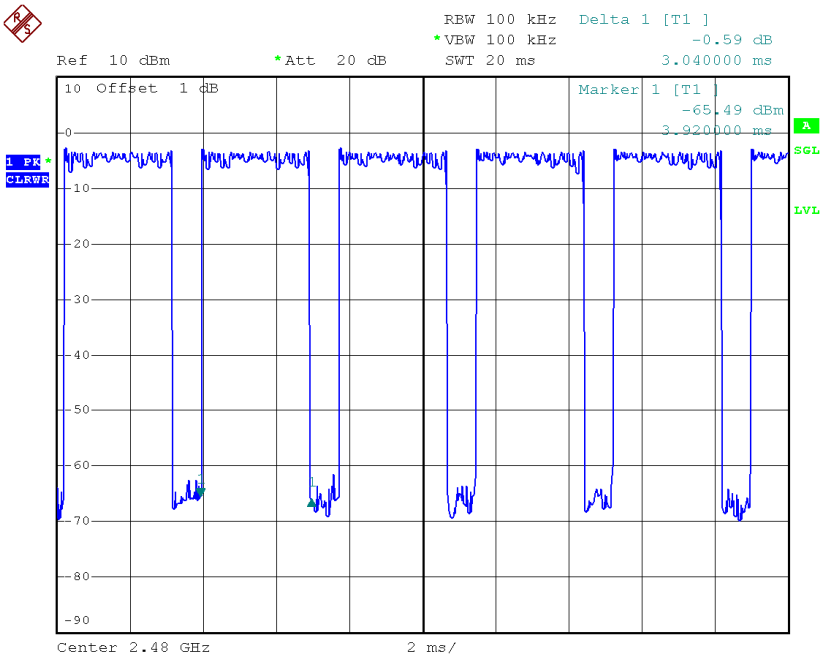
Date: 3.MAR.2015 15:21:09

CH78-DH3



Date: 3.MAR.2015 15:24:16

CH78-DH5



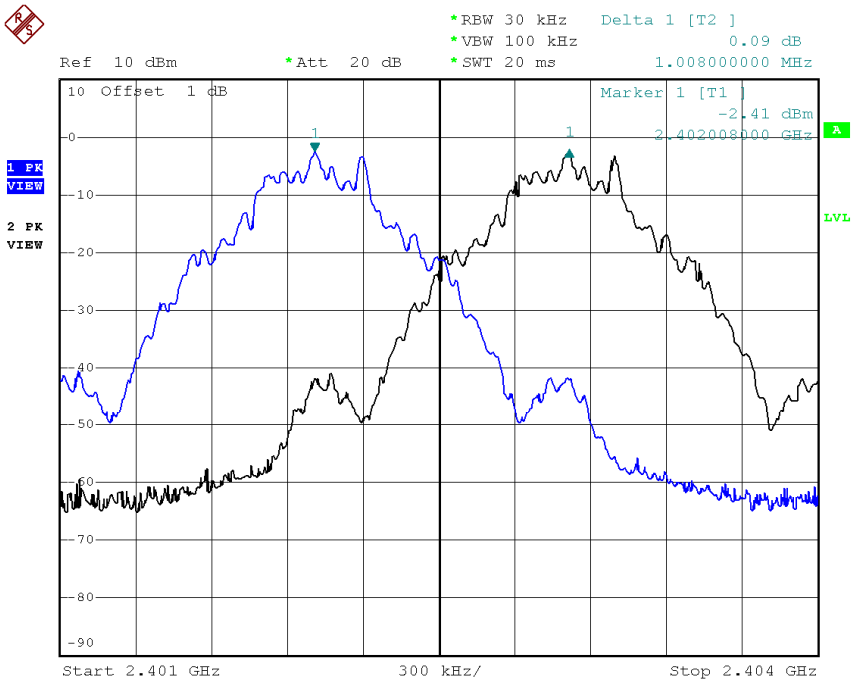
Date: 3.MAR.2015 15:15:22

ATTACHMENT G - HOPPING CHANNEL SEPARATION MEASUREMENT

Test Mode :	Hopping on _1Mbps

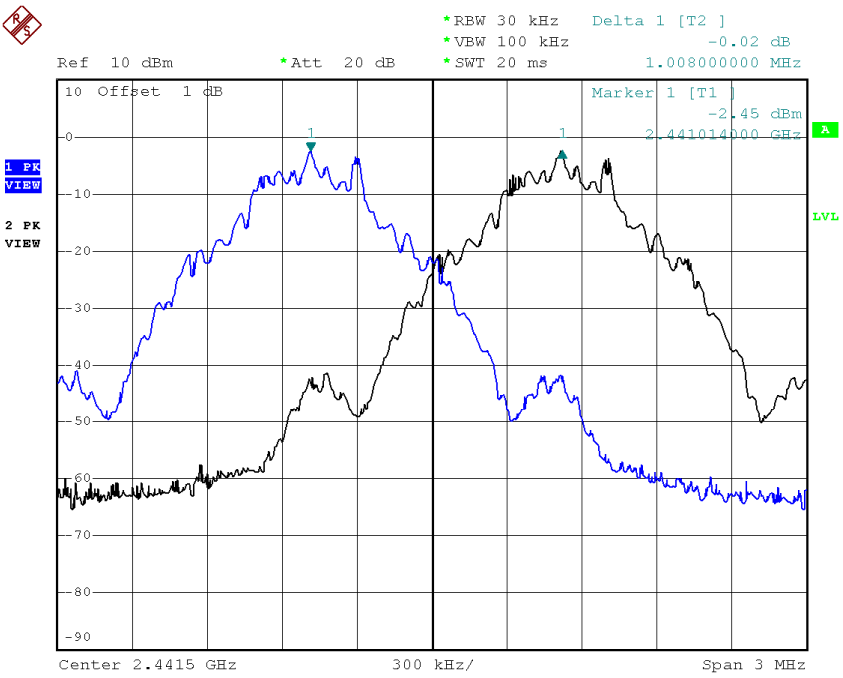
Frequency (MHz)	Channel Separation (MHz)	2/3 of 20dB Bandwidth (MHz)	Test Result
2402	1.008	0.676	Complies
2441	1.008	0.676	Complies
2480	1.002	0.633	Complies

CH00



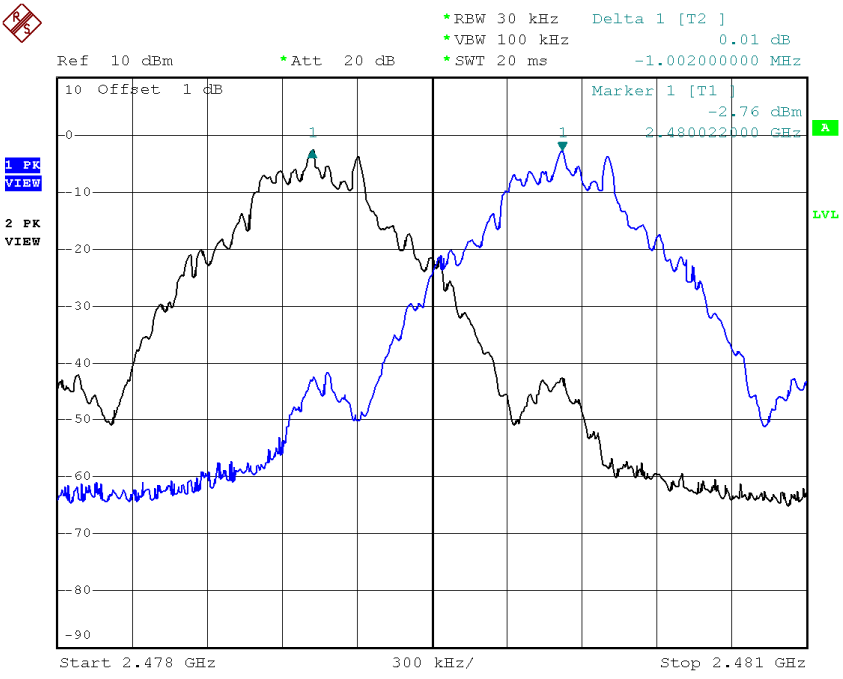
Date: 3.MAR.2015 15:06:32

CH39



Date: 3.MAR.2015 15:10:55

CH78



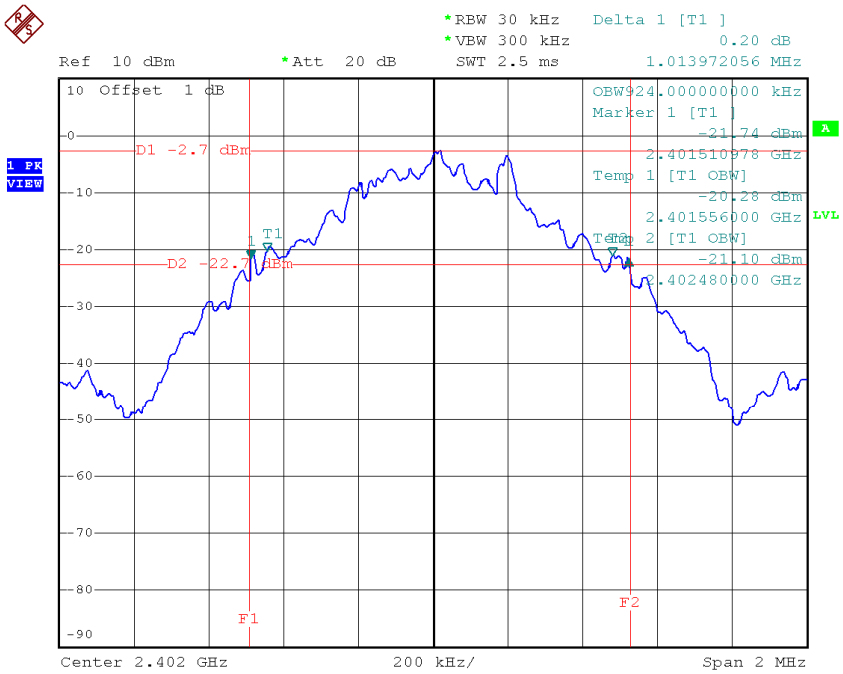
Date: 3.MAR.2015 15:16:04

ATTACHMENT H - BANDWIDTH

Test Mode :	TX Mode _1Mbps

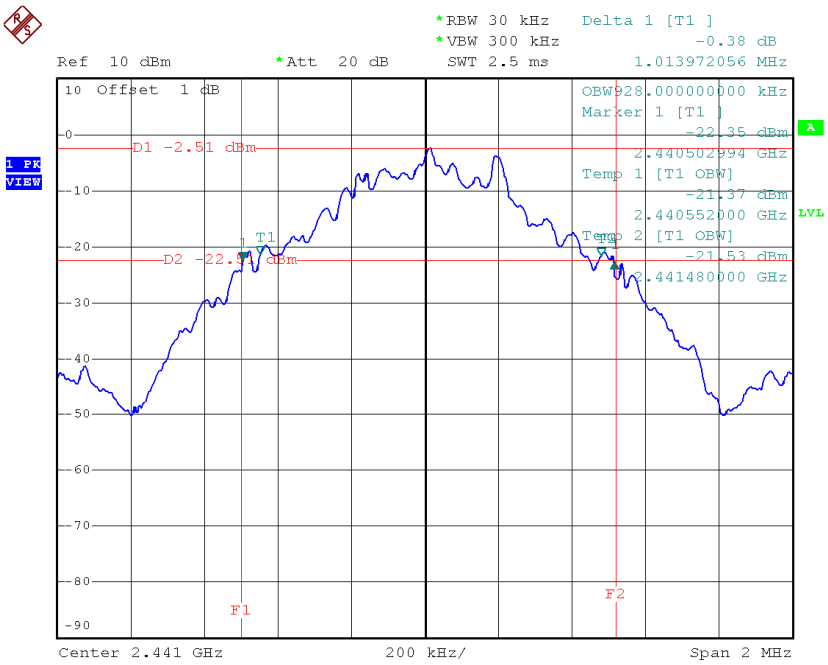
Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Test Result
2402	1.014	0.924	Complies
2441	1.014	0.928	Complies
2480	0.950	0.916	Complies

CH00



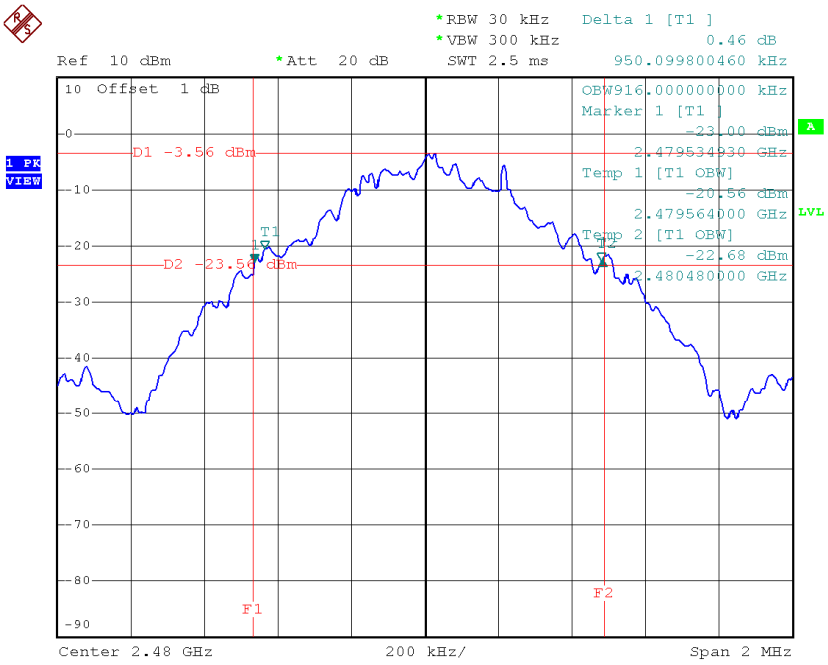
Date: 3.MAR.2015 15:07:09

CH39



Date: 3.MAR.2015 15:08:05

CH78



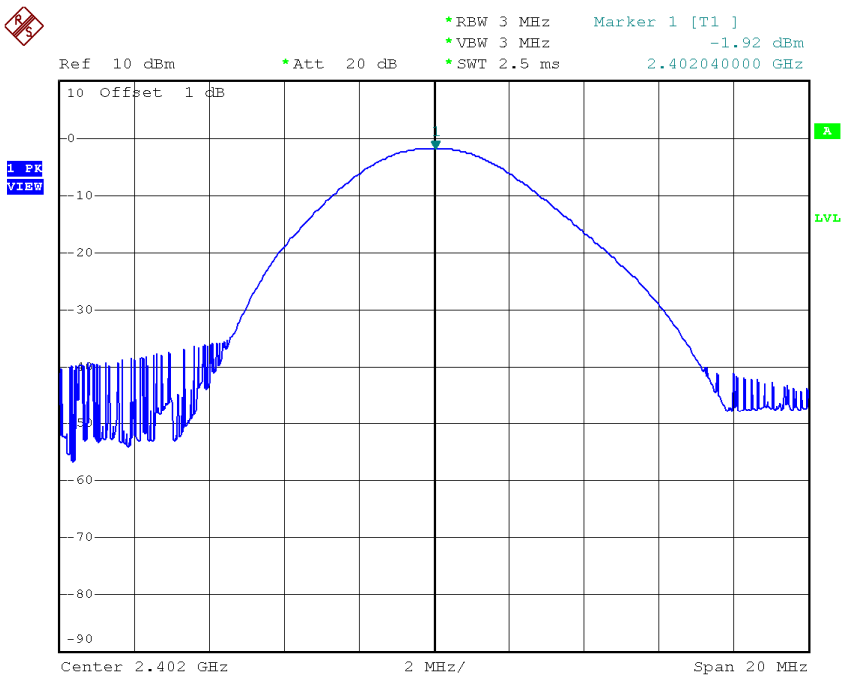
Date: 3.MAR.2015 15:11:54

ATTACHMENT I - PEAK OUTPUT POWER

Test Mode :	TX Mode _1Mbps

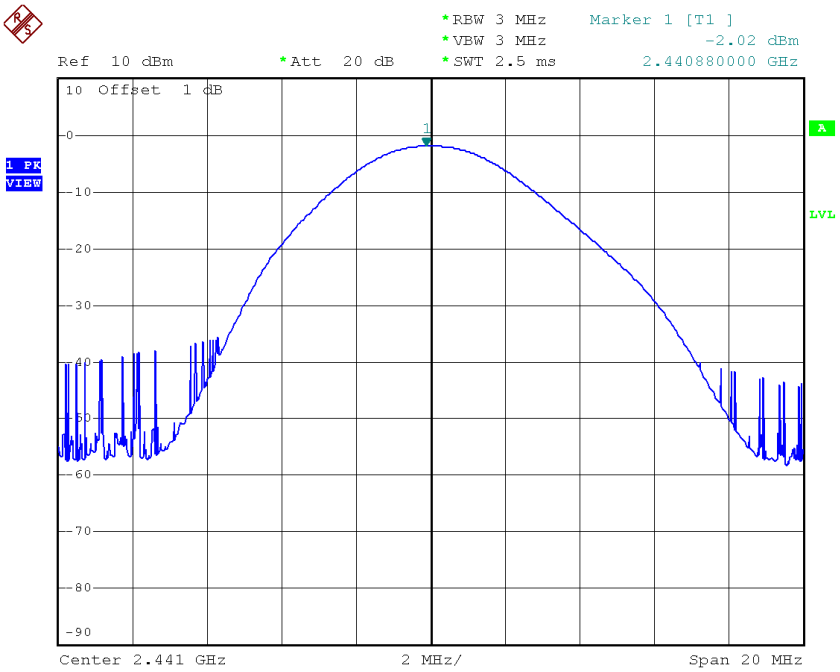
Frequency (MHz)	Conducted Power (dBm)	Conducted Power (Watt)	Max. Limit (dBm)	Max. Limit (Watt)	Test Result
2402	-1.92	0.0006	30.00	1.0000	Complies
2441	-2.02	0.0006	30.00	1.0000	Complies
2480	-2.33	0.0006	30.00	1.0000	Complies

CH00



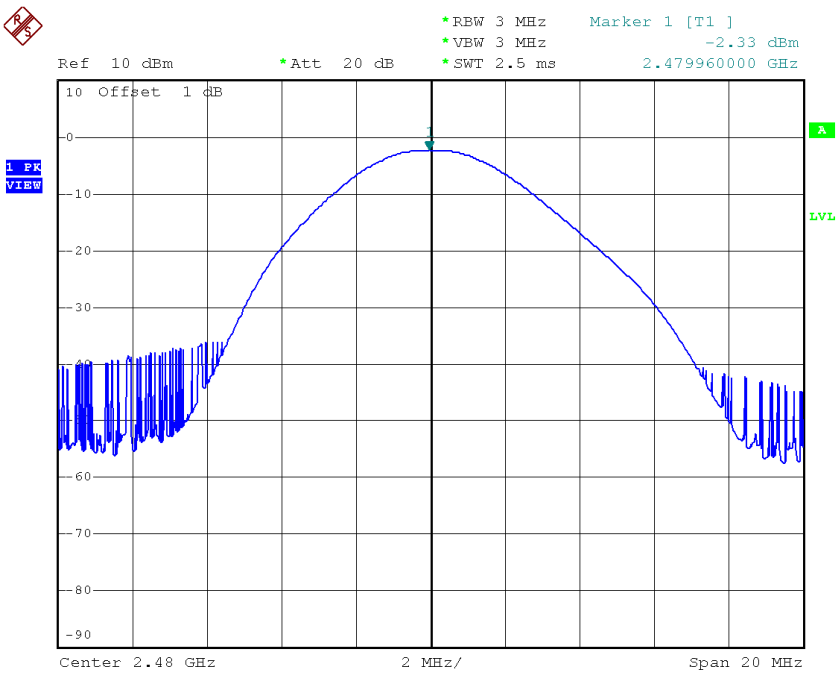
Date: 3.MAR.2015 15:05:04

CH39



Date: 3.MAR.2015 15:10:29

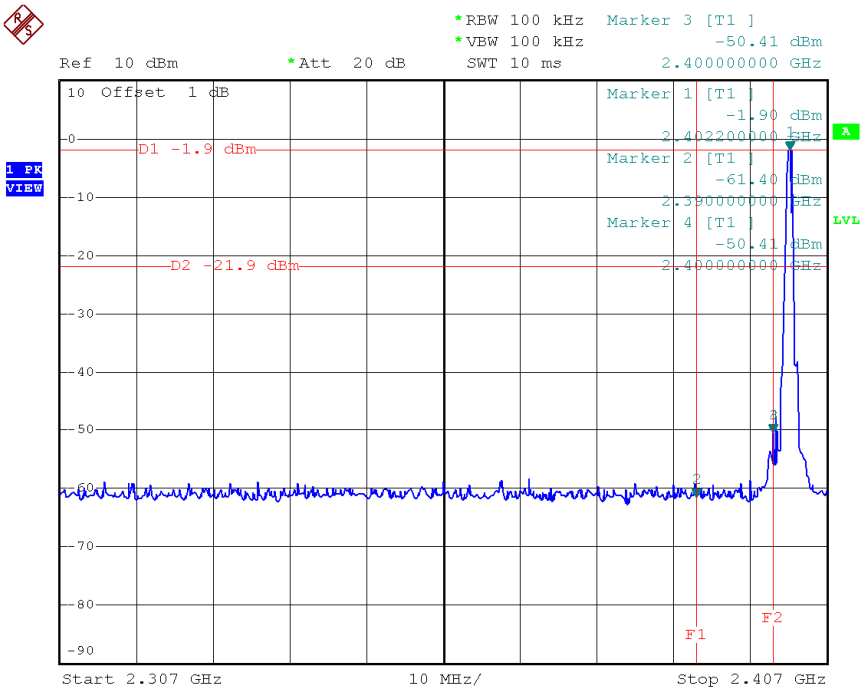
CH78



Date: 3.MAR.2015 15:15:37

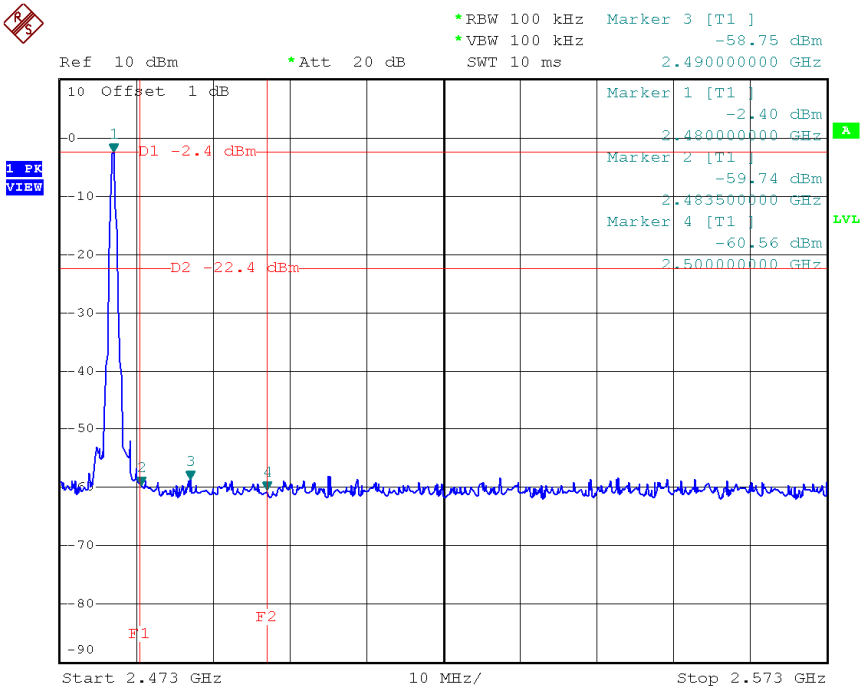
ATTACHMENT J - ANTENNA CONDUCTED SPURIOUS EMISSION

CH00 (Lower)_1Mbps



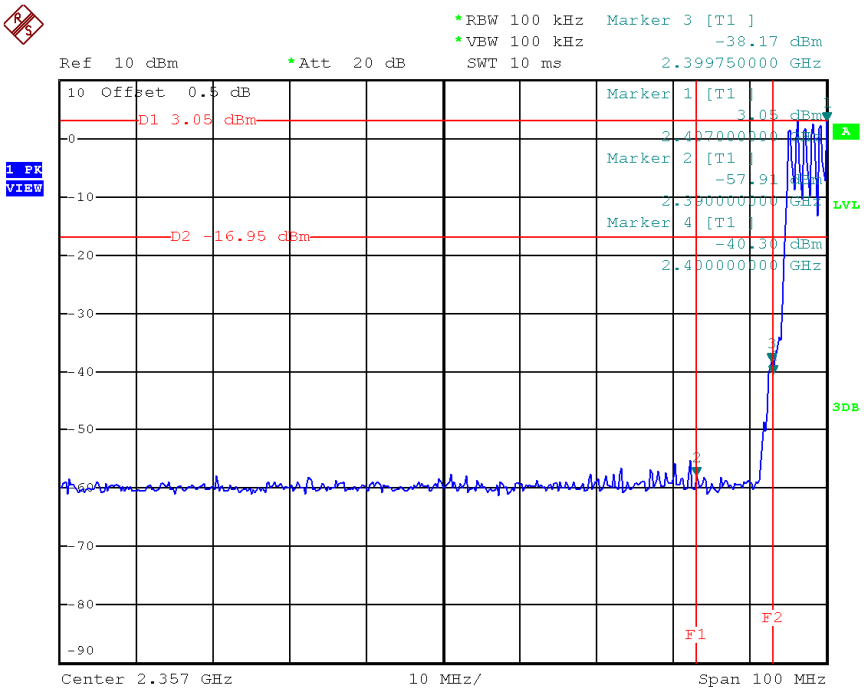
Date: 3.MAR.2015 15:04:16

CH78 (Upper) _1Mbps



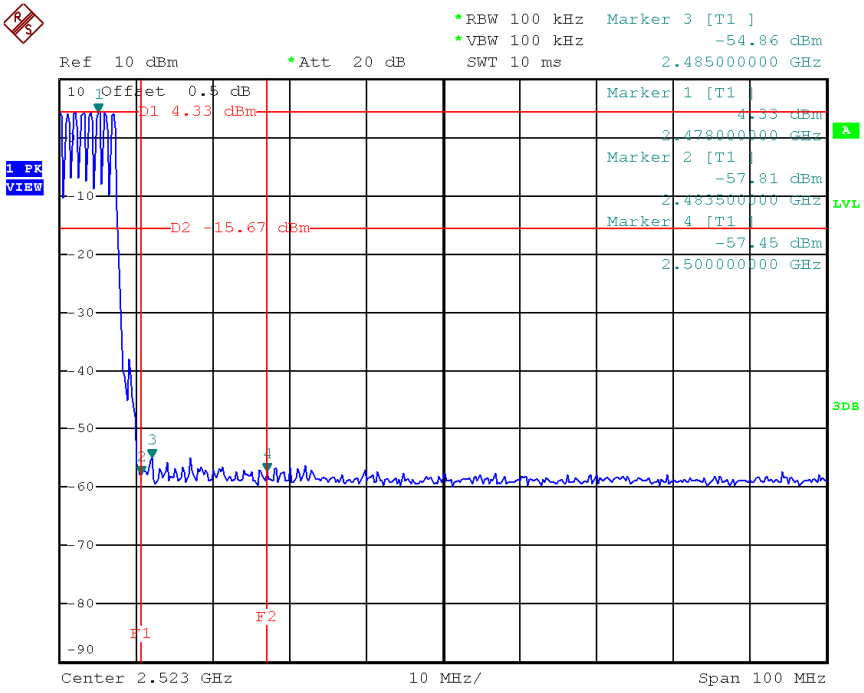
Date: 3.MAR.2015 15:14:31

CH00 Hopping on mode (Lower)_1Mbps



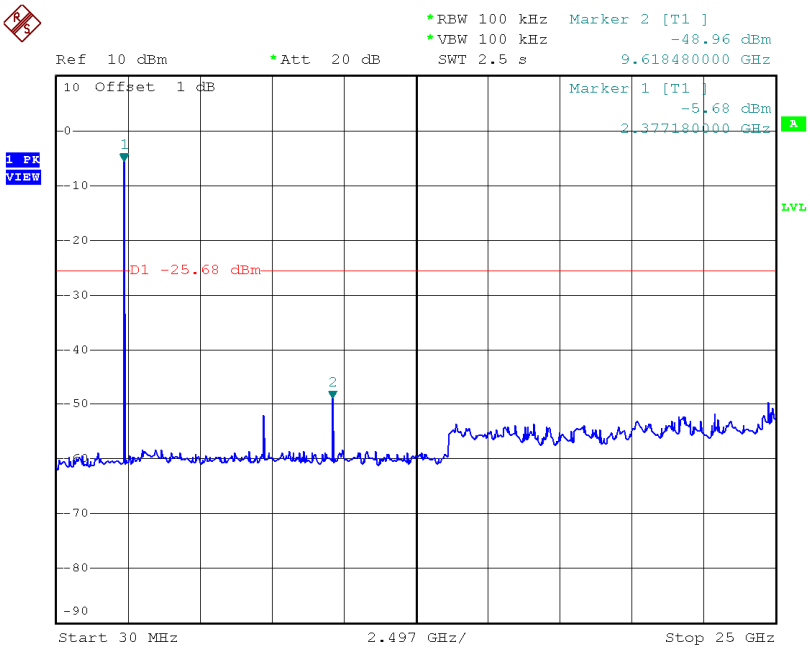
Date: 24.NOV.2014 11:12:36

CH78 Hopping on mode (Upper) _1Mbps



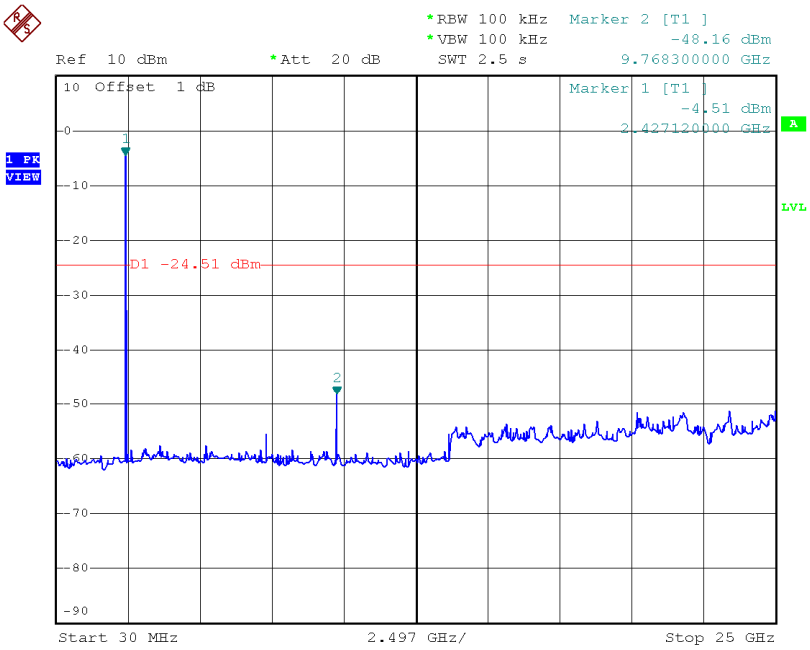
Date: 24.NOV.2014 11:26:37

CH00 (10 Harmonic of the frequency) _1Mbps



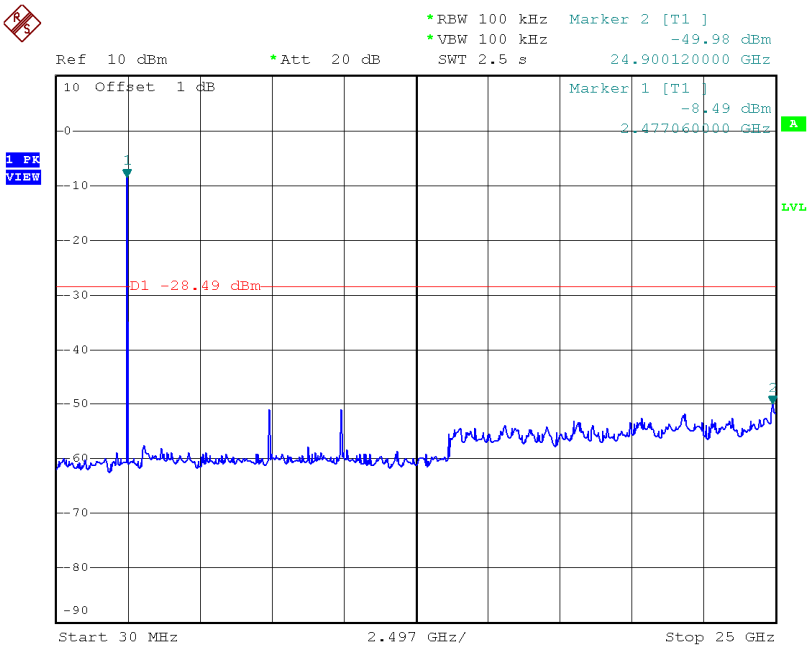
Date: 3.MAR.2015 15:04:02

CH39 (10 Harmonic of the frequency) _1Mbps



Date: 3.MAR.2015 15:07:47

CH78 (10 Harmonic of the frequency) _1Mbps



Date: 3.MAR.2015 15:11:38