



Neutron Engineering Inc.

Radio Test Report

FCC ID: Q3N-8660

IC: 5121A-8660

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

Issued Date : Nov. 13, 2013

Project No. : 1310198

Equipment : Mobile Computer

Model Name : 8660

Applicant : CIPHERLAB CO., LTD.

Address : 12F, 333, Dunhua S. Rd., Sec. 2, Taipei,
Taiwan

Tested by: Neutron Engineering Inc. EMC Laboratory

Date of Receipt: Nov. 04, 2013

Date of Test: Nov. 04, 2013 ~ Nov. 11, 2013

Testing Engineer: Josh Lin
(Josh Lin)

Technical Manager: Jeff Yang
(Jeff Yang)

Authorized Signatory: Andy Chiu
(Andy Chiu)

Neutron Engineering Inc.
B1, No. 37, Lane 365, YangGuang St.,
NeiHu District 114, Taipei, Taiwan.
TEL: +886-2-2657-3299
FAX: +886-2-2657-3331



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Neutron 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 **R.O.C.**, or National Institute of Standards and Technology (**NIST**) of **U.S.A.**

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1. CERTIFICATION

Equipment : Mobile Computer
Brand Name : CIPHERLAB
Model Name : 8660
Applicant : CIPHERLAB CO., LTD.
Date of Test : Nov. 04, 2013 ~ Nov. 11, 2013
Standards : RSS-210, Issue 8: 2010
FCC Part 15, Subpart C: 2012
ANSI C63.4: 2009

The above equipment has been tested and found compliance with the requirement of the relative standards by Neutron Engineering Inc. EMC Laboratory.

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. NEI-FCCP-6-1310198) 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

RSS-210, Issue 8: 2010; FCC Part 15, Subpart C: 2012			
Standard Clause		Test Item	Result
RSS-210	FCC Part 15, Subpart C		
NOTE (2)	15.207	Conducted Emission	PASS
A8.5	15.247(d)	Antenna conducted Spurious Emission	PASS
A8.2 (a)	15.247(a)(2)	6 dB Bandwidth	PASS
A8.4 (4)	15.247(b)(3)	Maximum Peak Conducted Output Power	PASS
NOTE (3)	15.209/15.205	Radiated Spurious Emission	PASS
A8.2 (b)	15.247(e)	Power Spectral Density	PASS
NOTE (4)	15.205	Restricted Bands	PASS
NOTE (5)	15.203	Antenna Requirement	PASS
NOTE (6)	1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	PASS

NOTE:

- (1) N/A: denotes test is not applicable in this Test Report
- (2) Reference standerads is RSS-GEN 7.2.4
- (3) Reference standerads is RSS-GEN 7.2.5
- (4) Reference standerads is RSS-GEN 7.2.2
- (5) Reference standerads is RSS-GEN 7.1.2
- (6) Reference standerads is RSS-102
- (7) The test follows FCC KDB Publication No. 558074 D01 DTS Meas Guidance v03r01 (Measurement Guidelines of DTS)



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2.1 TEST FACILITY

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

Conducted emission Test:

C02: 1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Radiated emission Test (Below 1 GHz):

CB08: 1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

Radiated emission Test (Above 1 GHz):

CB08: 1F., No. 61, Ln. 77, Sing-ai Rd., Neihu Dist., Taipei City 114, Taiwan (R.O.C.)

2.2 MEASUREMENT UNCERTAINTY

The measurement uncertainty is not specified by FCC/Industry Canada rules and for reference only.

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%**.

The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2.

A. Conducted emission test:

Test Site	Measurement Frequency Range	U , (dB)	NOTE
C01	150 kHz ~ 30 MHz	1.94	

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} .



3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	Mobile Computer	
Brand Name	CIPHERLAB	
Model Name	8660	
Model Difference	N/A	
Product Description	Operation Frequency	2402 MHz ~2480 MHz
	Modulation Technology	GFSK
	Bit Rate of Transmitter	1 Mbps
	Number of Channel	40CH
	Antenna Designation	Please see note 3.(Page 9)
	Antenna Gain(Peak)	
	Maximum Conducted Output Power	5.35 dBm
	More details of EUT technical specification, please refer to the User's Manual.	
Power Source	1. Battery supplied. 2. DC Voltage supplied from External Power Supply.	
Power Rating	1. Li-ion BATTERY PACK: 3.7V 2. External Power Supply: I/P: AC 100-240V 47-63Hz 0.58A MAX / O/P: DC 5V 4A 20W MAX	
Connecting I/O Port(s)	Please refer to the User's Manual	
Products Covered	1 * Keypad (optional): 29 Keys or 39 Keys 1 * Li-ion BATTERY PACK (optional): (1) CIPHERLAB, BA-0072A2, 3.7V 2200mAh, 8.14Wh (2) CIPHERLAB, BA-0071A1, 3.7V 1100mAh, 4.07Wh 1 * Reader (optional): 2D, CCD or Laser 1 * Snap-On Cable (optional): (1) RS-232 Type (2) USB Type 1 * External Power Supply: ADAPTER TECH., STD-05040V 1 * Pistol (optional)	
Connecting I/O Port(s)	Please refer to the User's Manual	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.



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2.

Channel List			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	20	2442
01	2404	21	2444
02	2406	22	2446
03	2408	23	2448
04	2410	24	2450
05	2412	25	2452
06	2414	26	2454
07	2416	27	2456
08	2418	28	2458
09	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	CIPHERLAB	20130716_neptune	PIFA	I-PEX	1.52



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)

For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode NOTE (1)

Note:

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

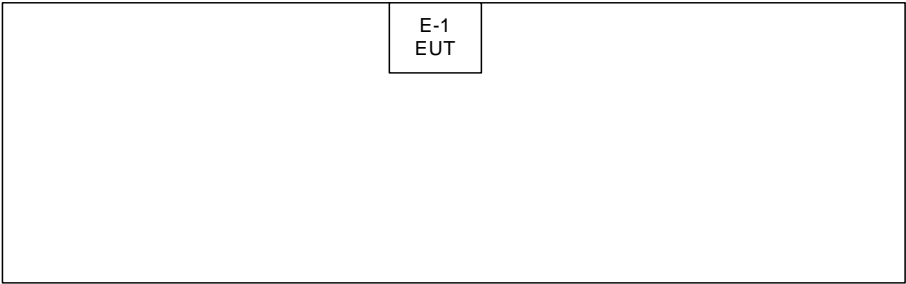
**3.3 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING**

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 WLAN

Test software version	V1.00		
Frequency	2402 MHz	2440 MHz	2480 MHz
GFSK	def.	def.	def.



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.	Note
E-1	Mobile Computer	CIPHERLAB	8660	FCC ID: Q3N-8660 IC: 5121A-8660	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note
N/A	-	-	-	-

Note:

- (1) For detachable type I/O cable should be specified the length in m in 『Length』 column.



4. EMC EMISSION TEST

4.1 CONDUCTED EMISSION

4.1.1 LIMIT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 - 5.0	73.00	60.00	56.00	46.00
5.0 - 30.0	73.00	60.00	60.00	50.00

NOTE:

1. The tighter limit applies at the band edges.
2. The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
3. The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value – Limit Value

4.1.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	LISN	Schwarzbeck	NSLK 8127	8127685	Feb. 24, 2014
2	Test Cable	TIMES	CFD300-NL	C01	Jun. 16, 2014
3	EMI Test Receiver	Agilent	N9038A	MY51210215	Mar. 21, 2014
4	Measurement Software	EZ	EZ EMC (Version NB-02A)	N/A	N/A

NOTE: **N/A:** denotes No Model Name, No Serial No. or No Calibration specified.



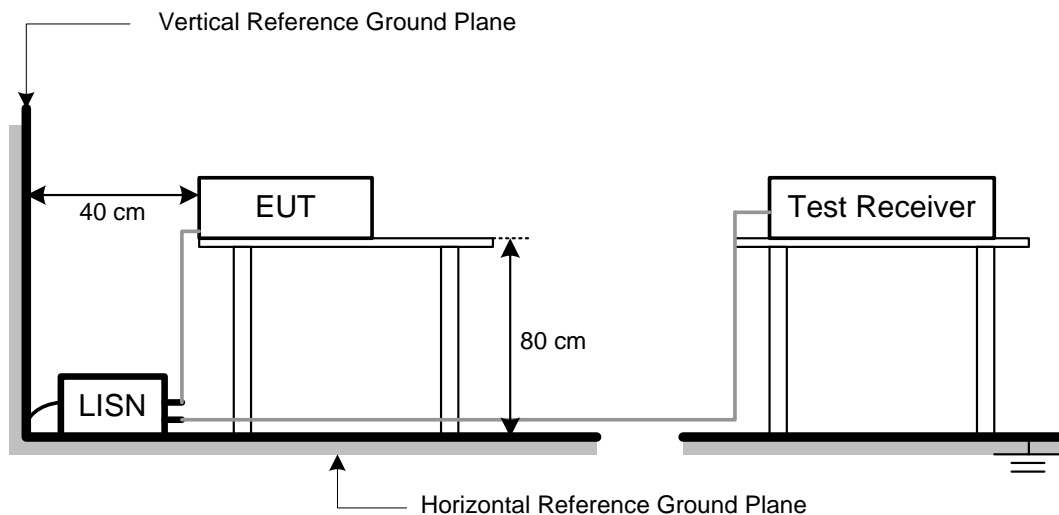
4.1.3 TEST PROCEDURES

- 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.

NOTE:

- Reading in which marked as Peak, QP or AVG means measurements by using are Quasi-Peak or Average Mode with Detector BW=9 kHz (6 dB Bandwidth).
- All readings are Peak Mode value unless otherwise stated QP or AVG in column of Note. If the Peak or 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 Peak or QP Mode was measured, but AVG Mode didn't perform.

4.1.4 TEST SETUP LAYOUT



4.1.5 DEVIATION FROM TEST STANDARD

No deviation



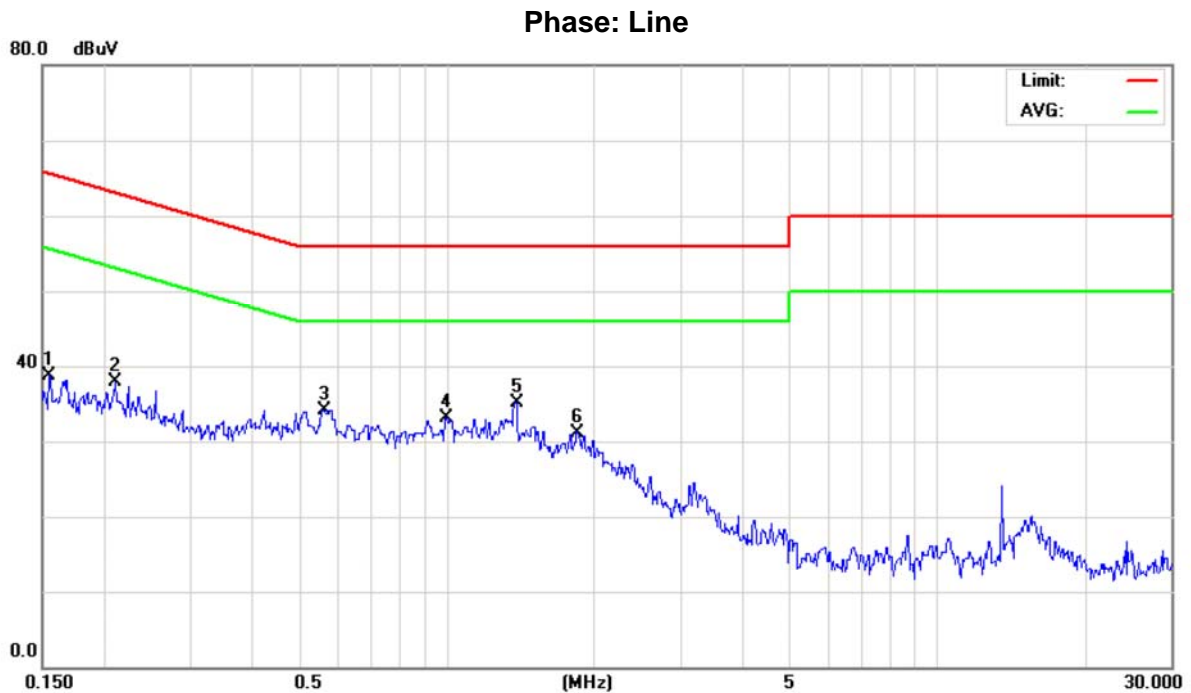
4.1.6 EUT OPERATING CONDITIONS

The EUT used during radiated and/or conducted emission measurement was designed to exercise in a manner similar to a typical use.



4.1.7 TEST RESULTS

EUT	Mobile Computer	Model Name	8660
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz		
Test Mode	Bluetooth/2440 MHz		

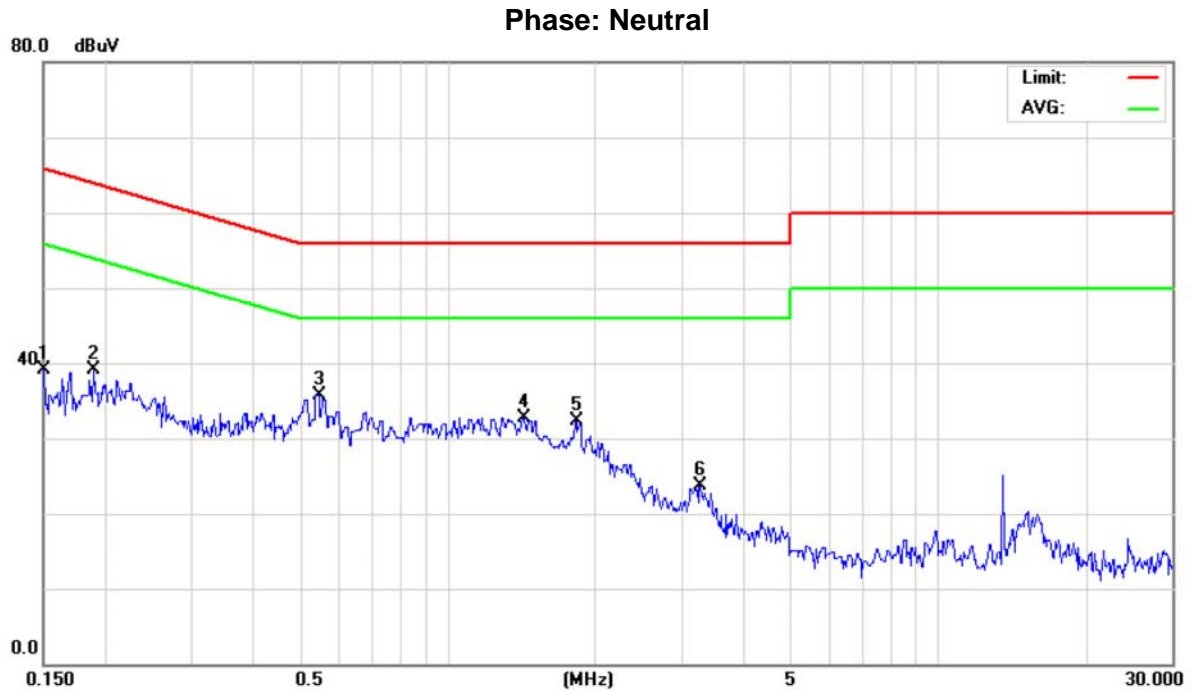


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1548	29.88	8.76	38.64	65.74	-27.10	peak	
2		0.2108	28.66	9.32	37.98	63.17	-25.19	peak	
3		0.5630	25.51	8.67	34.18	56.00	-21.82	peak	
4		0.9950	23.51	9.68	33.19	56.00	-22.81	peak	
5	*	1.3819	25.49	9.55	35.04	56.00	-20.96	peak	
6		1.8409	21.81	9.39	31.20	56.00	-24.80	peak	



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EUT	Mobile Computer	Model Name	8660
Temperature	24°C	Relative Humidity	46%
Test Voltage	AC 120V/60Hz		
Test Mode	Bluetooth/2440 MHz		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1507	30.32	8.71	39.03	65.96	-26.93	peak	
2		0.1898	28.90	10.13	39.03	64.05	-25.02	peak	
3	*	0.5450	27.13	8.63	35.76	56.00	-20.24	peak	
4		1.4268	23.14	9.53	32.67	56.00	-23.33	peak	
5		1.8229	22.82	9.40	32.22	56.00	-23.78	peak	
6		3.2630	14.27	9.40	23.67	56.00	-32.33	peak	



4.2 RADIATED EMISSION MEASUREMENT

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

20dBc 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.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	(dBuV/m) (at 3m)	
	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).

FREQUENCY RANGE OF RADIATED MEASUREMENT (For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower


4.2.2 MEASUREMENT INSTRUMENTS LIST AND SETTING

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014
2	Horn Antenna	Schwarzbeck	BBHA 9120	D-325	Apr. 15, 2014
3	Microwave Pre-amplifier	Agilent	8449B	3008A01714	Apr. 16, 2014
4	Microflex Cable	Harbour industries	27478LL142	1m	May. 13, 2014
5	Microflex Cable	EMC	S104-SMA	8m	May. 13, 2014
6	Microflex Cable	Harbour industries	27478LL142	3m	May. 13, 2014
7	Test Cable	LMR	LMR-400	12m	May. 14, 2014
8	Test Cable	LMR	LMR-400	3m	May. 14, 2014
9	Pre-Amplifier	Anritsu	MH648A	M92649	Jun. 18, 2014
10	Log-Bicon Antenna	Schwarzbeck	VULB9168-352	9168-352	Jun. 11, 2014
11	Preamplifier With Adaptor	EMC	EMC2654045	980030	Feb. 18, 2014
12	Horn Antenna	Schwarzbeck	BBHA 9170	187	Dec. 24, 2013

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of Equipment List is One Year.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average

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

**4.2.3 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 fully-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.

NOTE (Between 30 MHz and 1000 MHz):

- a. Reading in which marked as QP or Peak means measurements by using are Quasi-Peak Mode with Detector BW=120 kHz; SPA setting in RBW=100 kHz, VBW =100 kHz, Swp. Time = 0.3 sec./ MHz.
- b. 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.

NOTE (Above 1000 MHz):

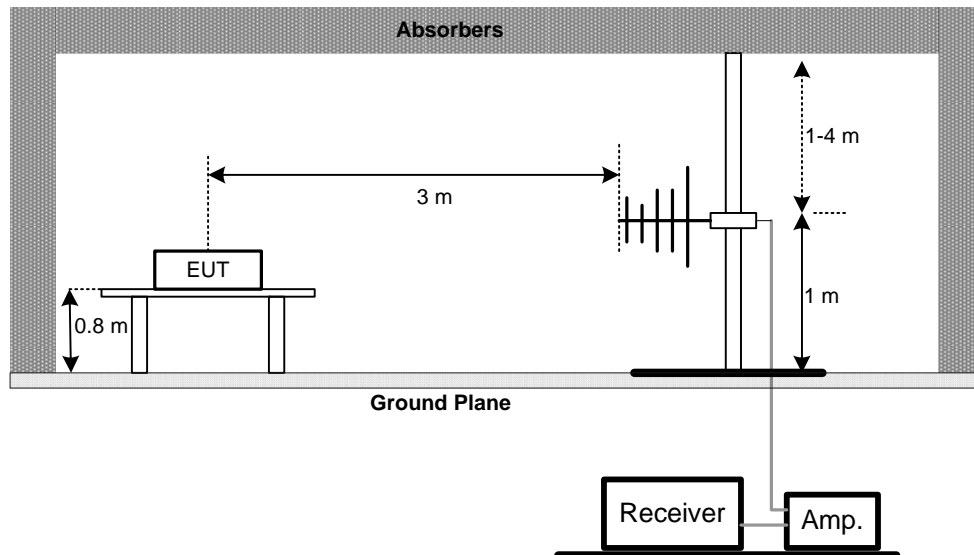
- a. Reading in which marked as Peak means measurements by using are Peak Mode with instrument setting in RBW= 1 MHz, VBW= 1 MHz, Swp. Time = Auto.
Reading in which marked as AV means measurements by using are Average Mode with instrument setting in RBW= 1 MHz, VBW= 10 Hz, Swp. Time = Auto.
- b. All 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.

4.2.4 DEVIATION FROM TEST STANDARD

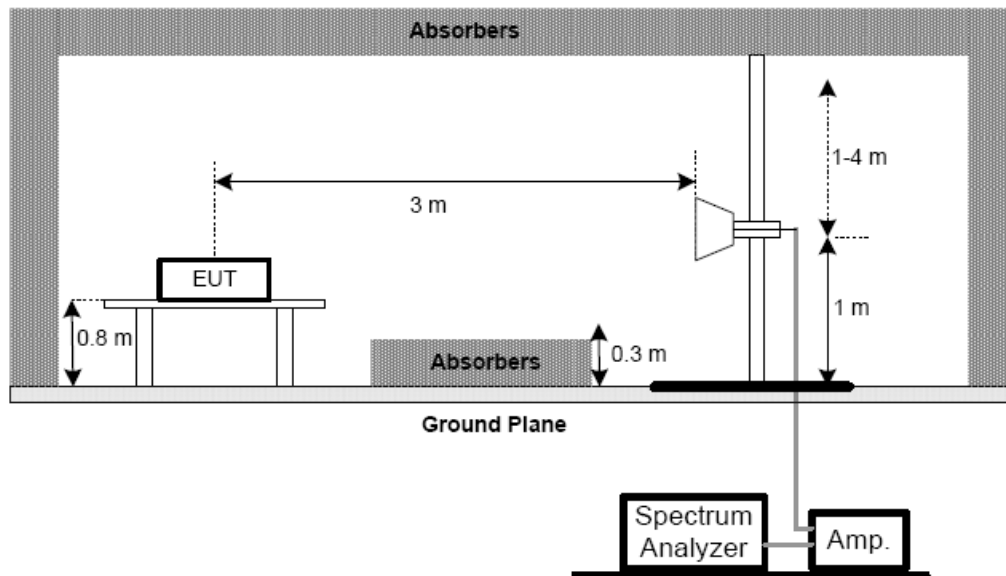
No deviation

4.2.5 TEST SETUP

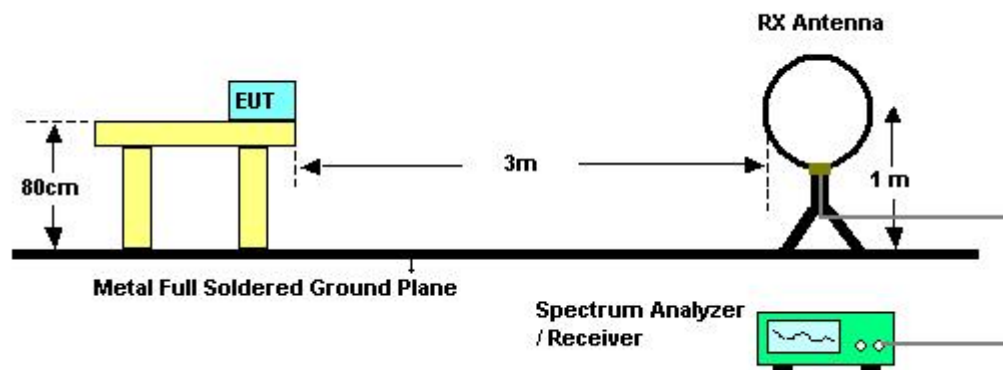
(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



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



(C) For radiated emissions below 30MHz



4.2.6 EUT OPERATING CONDITIONS

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

The EUT was programmed to be in continuously transmitting mode.

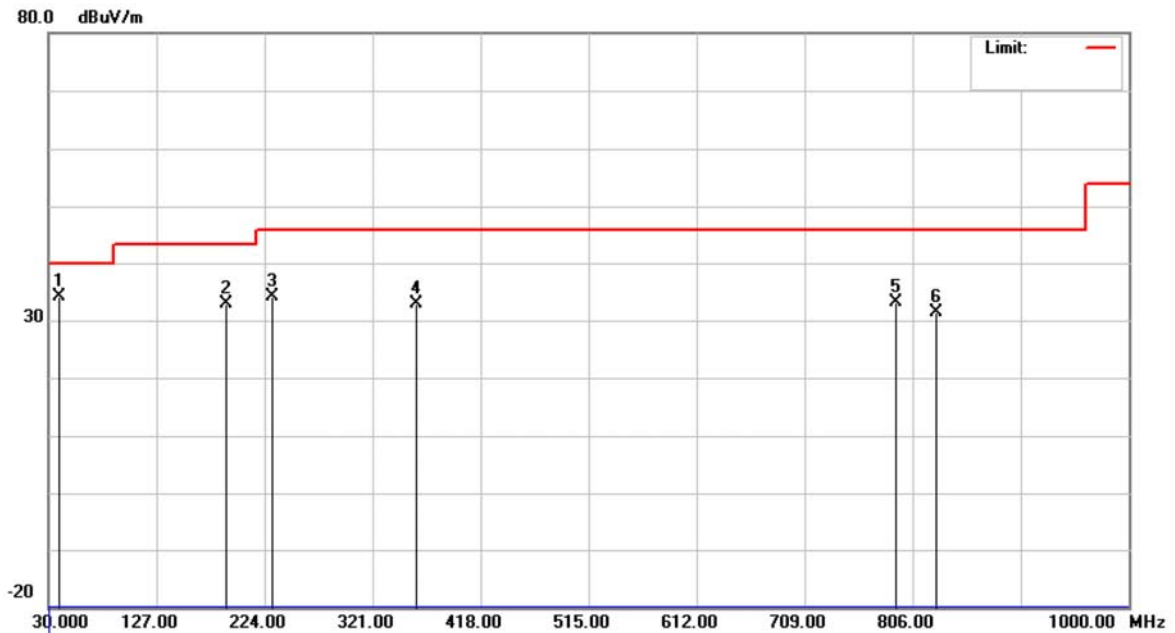


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4.2.8 TEST RESULTS-BETWEEN 30MHZ AND 1000MHZ

EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2440 MHz –CH19-1 Mbps		

Polarization: Vertical

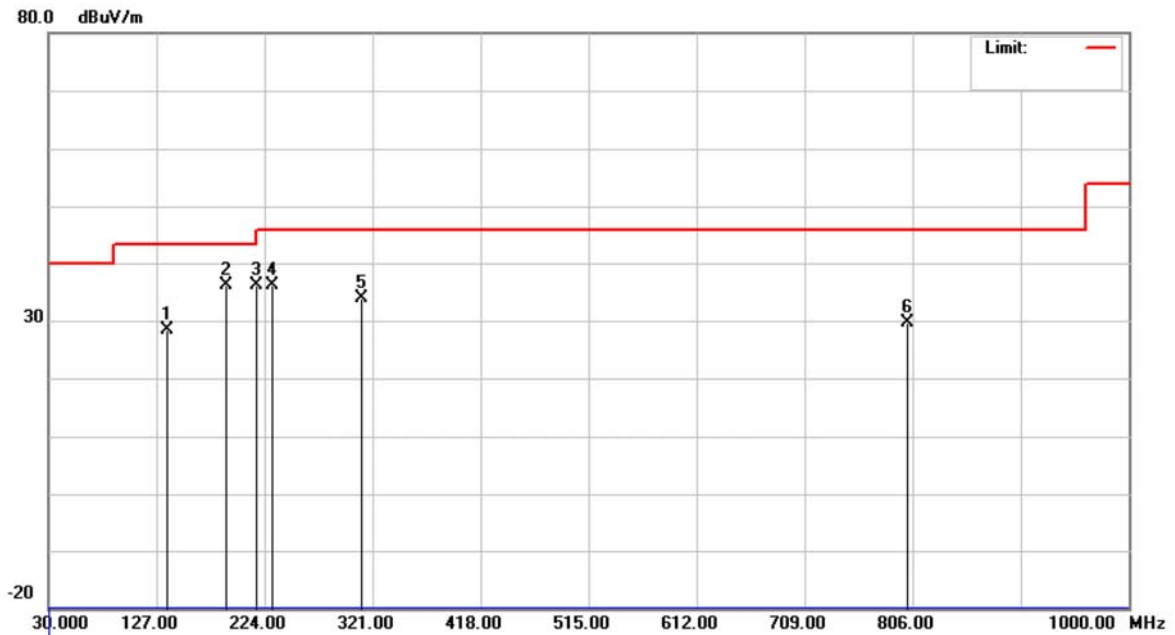


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	39.7000	48.60	-14.45	34.15	40.00	-5.85	peak	
2		190.0500	49.59	-16.75	32.84	43.50	-10.66	peak	
3		231.2749	50.44	-16.19	34.25	46.00	-11.75	peak	
4		359.7998	45.37	-12.37	33.00	46.00	-13.00	peak	
5		791.4500	37.94	-4.93	33.01	46.00	-12.99	peak	
6		827.8250	35.80	-4.39	31.41	46.00	-14.59	peak	



EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2440 MHz –CH19-1 Mbps		

Polarization: Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		136.6999	43.46	-15.05	28.41	43.50	-15.09	peak	
2	*	190.0500	52.83	-16.75	36.08	43.50	-7.42	peak	
3		216.7250	53.13	-16.92	36.21	46.00	-9.79	peak	
4		231.2749	52.43	-16.19	36.24	46.00	-9.76	peak	
5		311.2998	47.42	-13.47	33.95	46.00	-12.05	peak	
6		801.1500	34.50	-4.82	29.68	46.00	-16.32	peak	

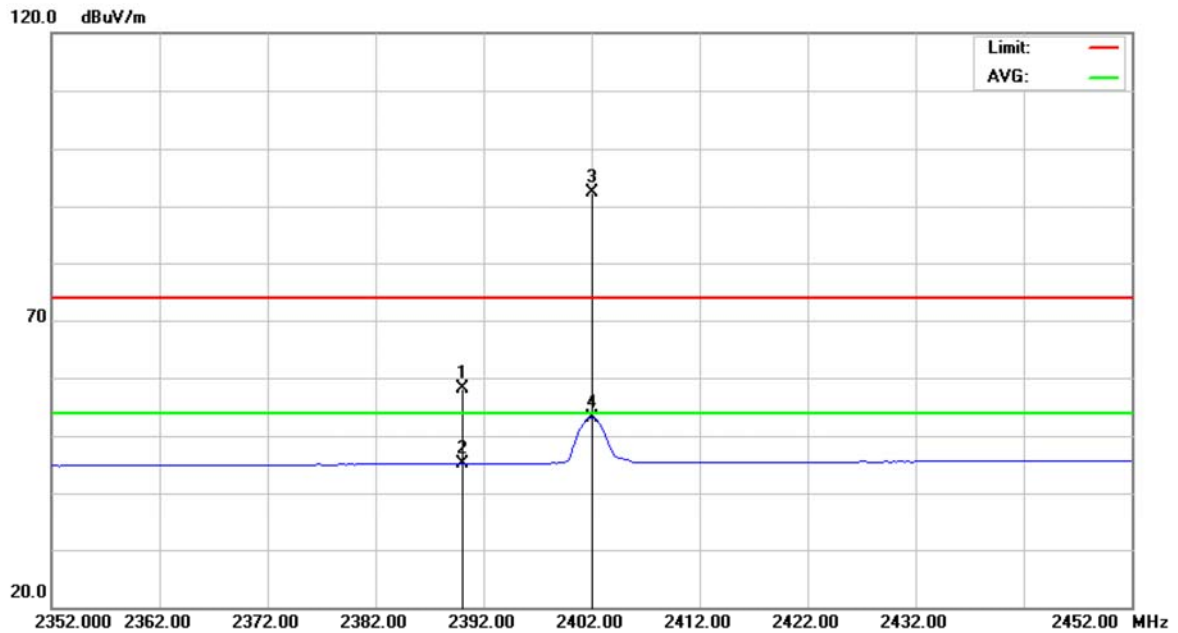


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4.2.7 TEST RESULTS (ABOVE 1000 MHZ)

EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2402 MHz –CH00-1 Mbps		

Polarization: Vertical

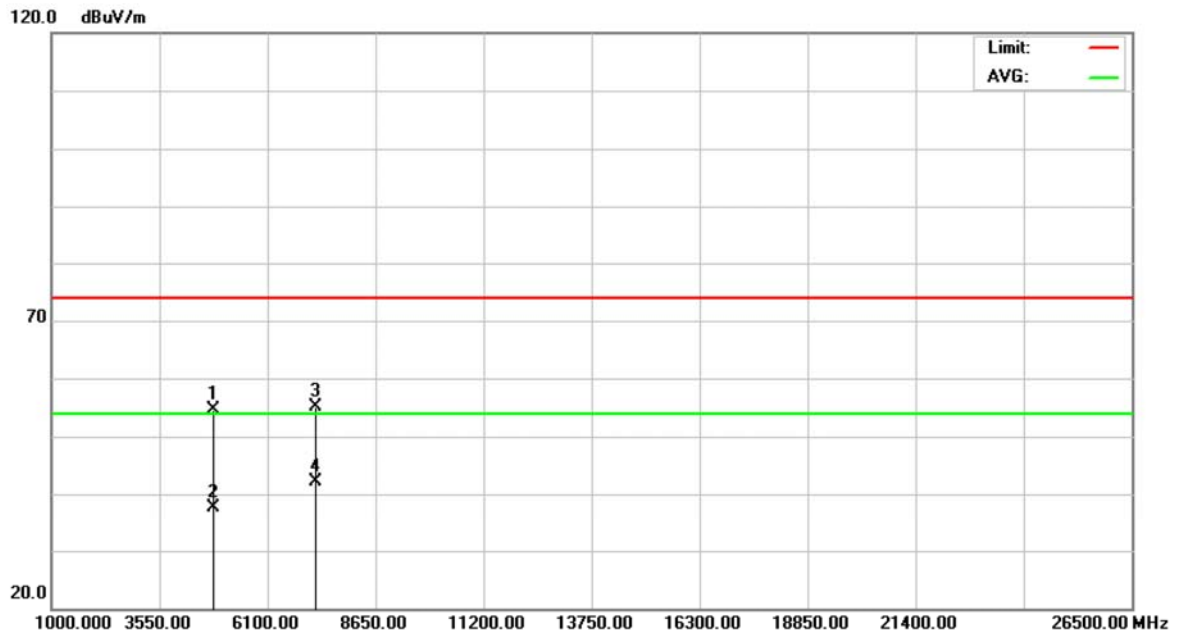


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2390.000	26.39	31.67	58.06	74.00	-15.94	peak	
2		2390.000	13.46	31.67	45.13	54.00	-8.87	AVG	
3	*	2402.000	60.76	31.72	92.48	74.00	18.48	peak	
4		2402.000	21.38	31.72	53.10	54.00	-0.90	AVG	



EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2402 MHz –CH00-1 Mbps		

Polarization: Vertical

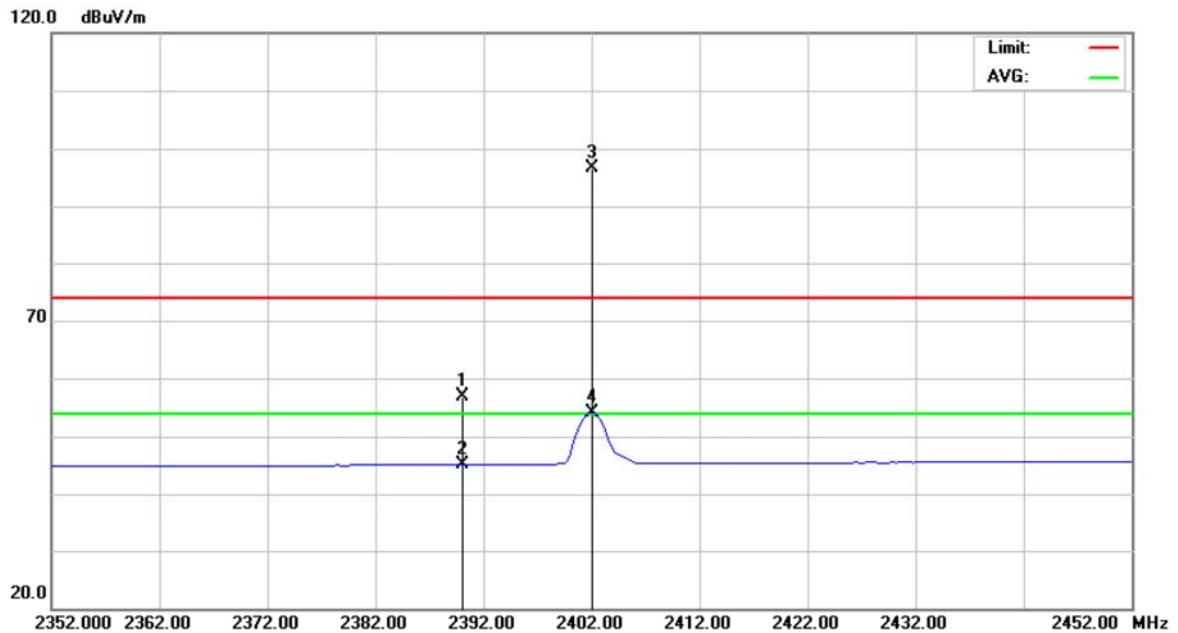


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4803.905	48.89	5.69	54.58	74.00	-19.42	peak	
2		4803.905	31.85	5.69	37.54	54.00	-16.46	AVG	
3		7206.185	42.92	12.18	55.10	74.00	-18.90	peak	
4	*	7206.185	30.05	12.18	42.23	54.00	-11.77	AVG	



EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2402 MHz –CH00-1 Mbps		

Polarization: Horizontal



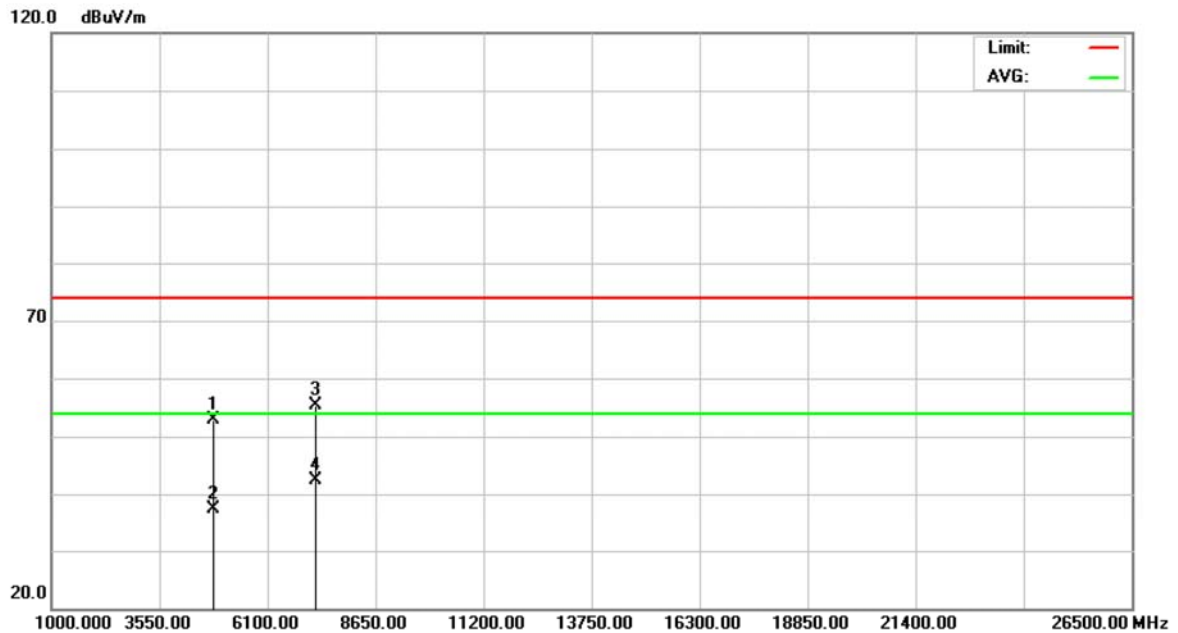
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		2390.000	25.13	31.67	56.80	74.00	-17.20	peak	
2		2390.000	13.45	31.67	45.12	54.00	-8.88	AVG	
3	*	2402.000	65.01	31.72	96.73	74.00	22.73	peak	
4	X	2402.000	22.41	31.72	54.13	54.00	0.13	AVG	



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EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2402 MHz –CH00-1 Mbps		

Polarization: Horizontal



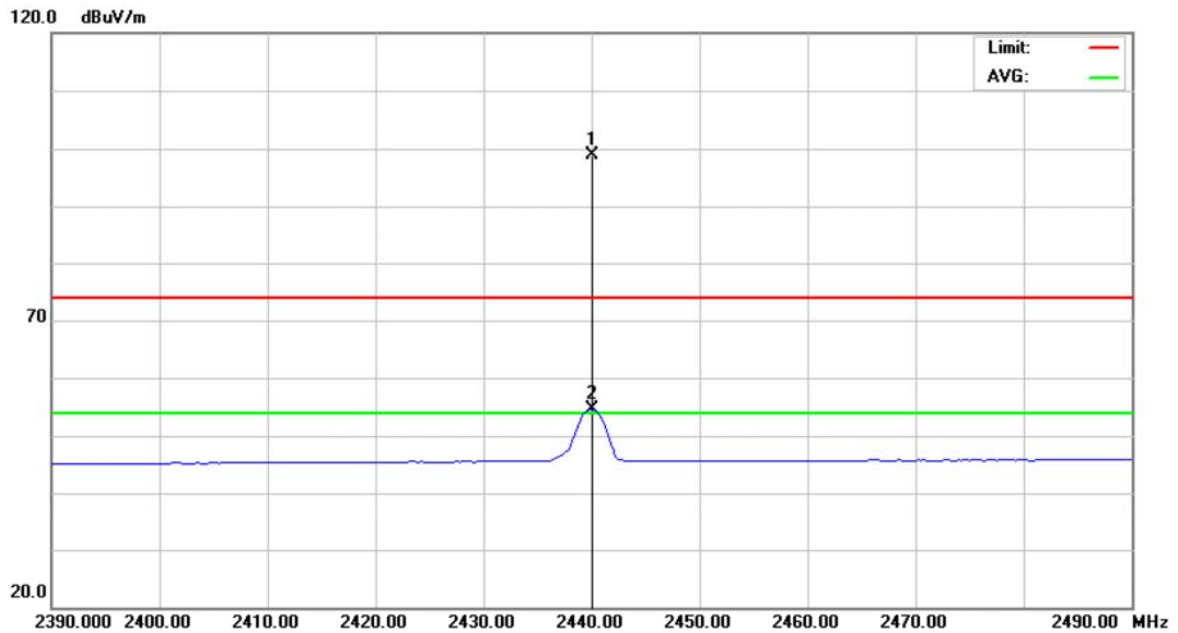
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4803.935	47.16	5.69	52.85	74.00	-21.15	peak	
2		4803.935	31.74	5.69	37.43	54.00	-16.57	AVG	
3		7205.930	43.24	12.18	55.42	74.00	-18.58	peak	
4	*	7205.930	30.09	12.18	42.27	54.00	-11.73	AVG	



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EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2440 MHz –CH19-1 Mbps		

Polarization: Vertical

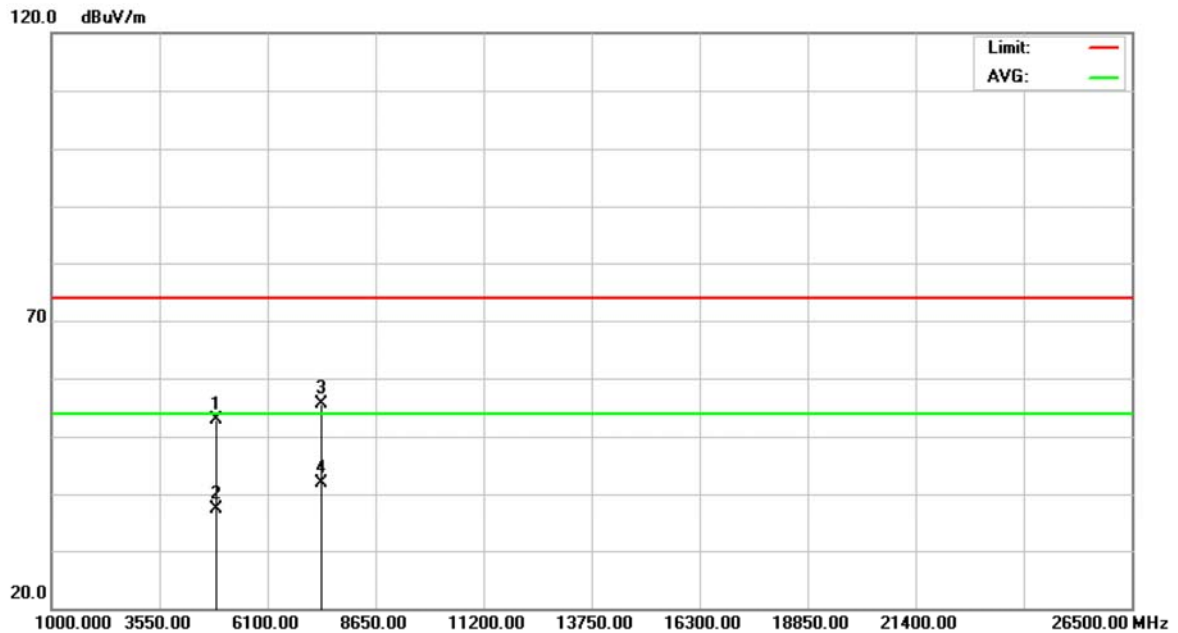


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2440.000	66.89	31.89	98.78	74.00	24.78	peak	
2	X	2440.000	22.76	31.89	54.65	54.00	0.65	AVG	



EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2440 MHz –CH19-1 Mbps		

Polarization: Vertical



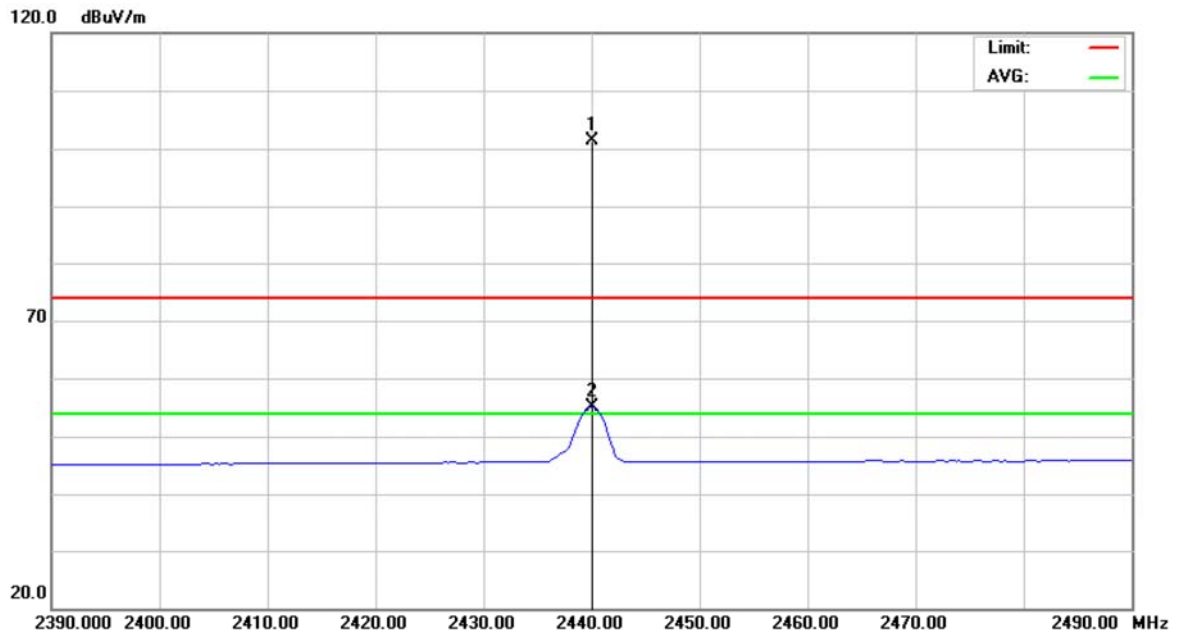
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4879.855	47.06	5.79	52.85	74.00	-21.15	peak	
2		4879.855	31.66	5.79	37.45	54.00	-16.55	AVG	
3		7320.000	43.05	12.60	55.65	74.00	-18.35	peak	
4	*	7320.000	29.37	12.60	41.97	54.00	-12.03	AVG	



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EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2440 MHz –CH19-1 Mbps		

Polarization: Horizontal

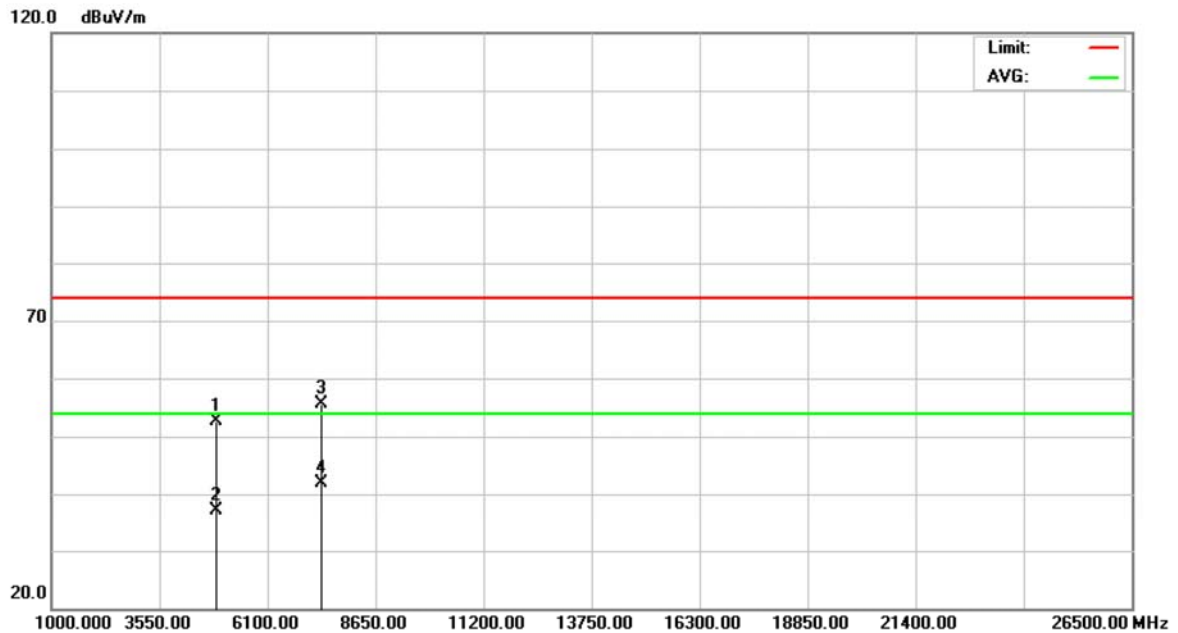


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2440.000	69.40	31.89	101.29	74.00	27.29	peak	
2	X	2440.000	23.31	31.89	55.20	54.00	1.20	AVG	



EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2440 MHz –CH19-1 Mbps		

Polarization: Horizontal



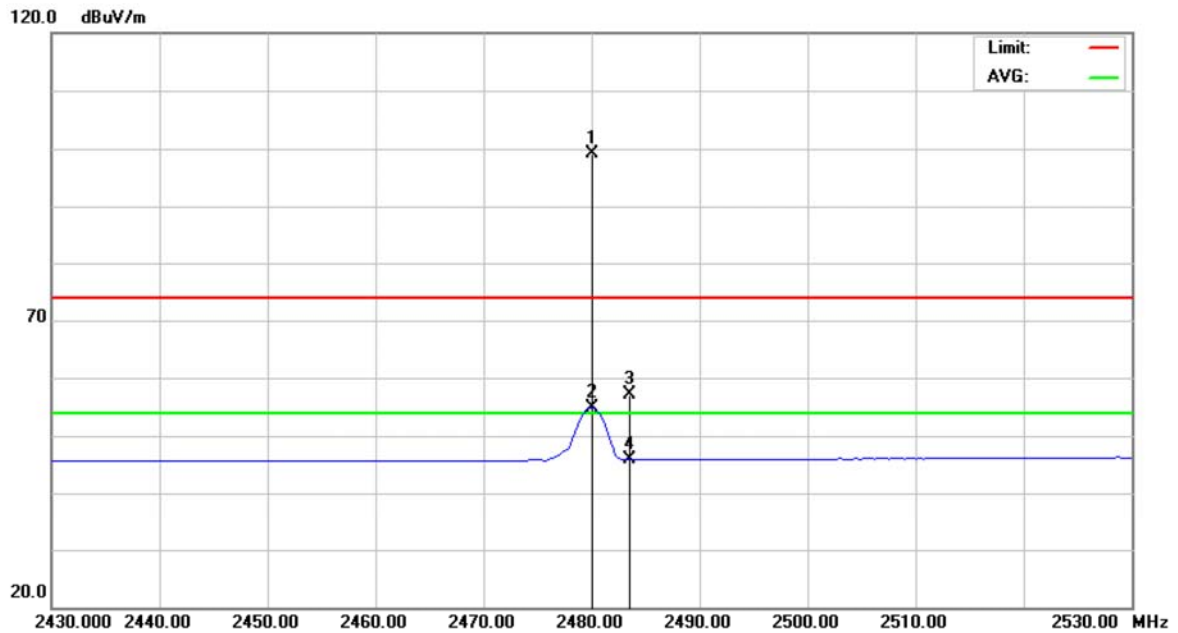
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4880.000	46.92	5.79	52.71	74.00	-21.29	peak	
2		4880.000	31.33	5.79	37.12	54.00	-16.88	AVG	
3		7320.000	42.94	12.60	55.54	74.00	-18.46	peak	
4	*	7320.000	29.37	12.60	41.97	54.00	-12.03	AVG	



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EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2480 MHz –CH39-1 Mbps		

Polarization: Vertical

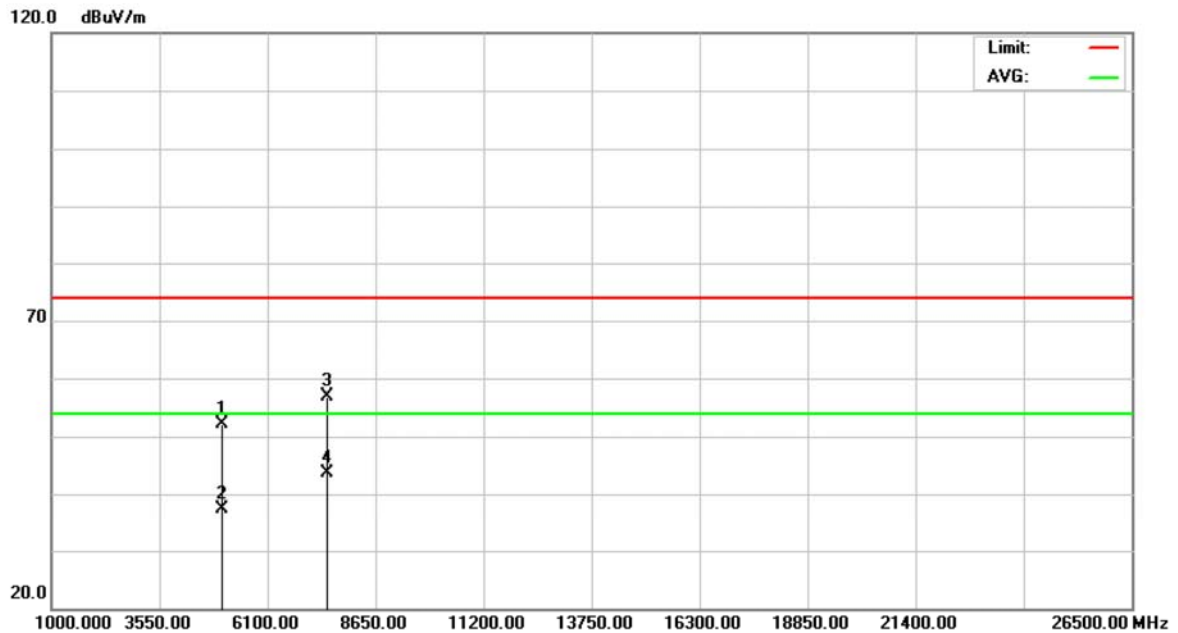


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2480.000	67.12	32.07	99.19	74.00	25.19	peak	
2	X	2480.000	22.80	32.07	54.87	54.00	0.87	AVG	
3		2483.500	25.12	32.09	57.21	74.00	-16.79	peak	
4		2483.500	13.76	32.09	45.85	54.00	-8.15	AVG	



EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2480 MHz –CH39-1 Mbps		

Polarization: Vertical



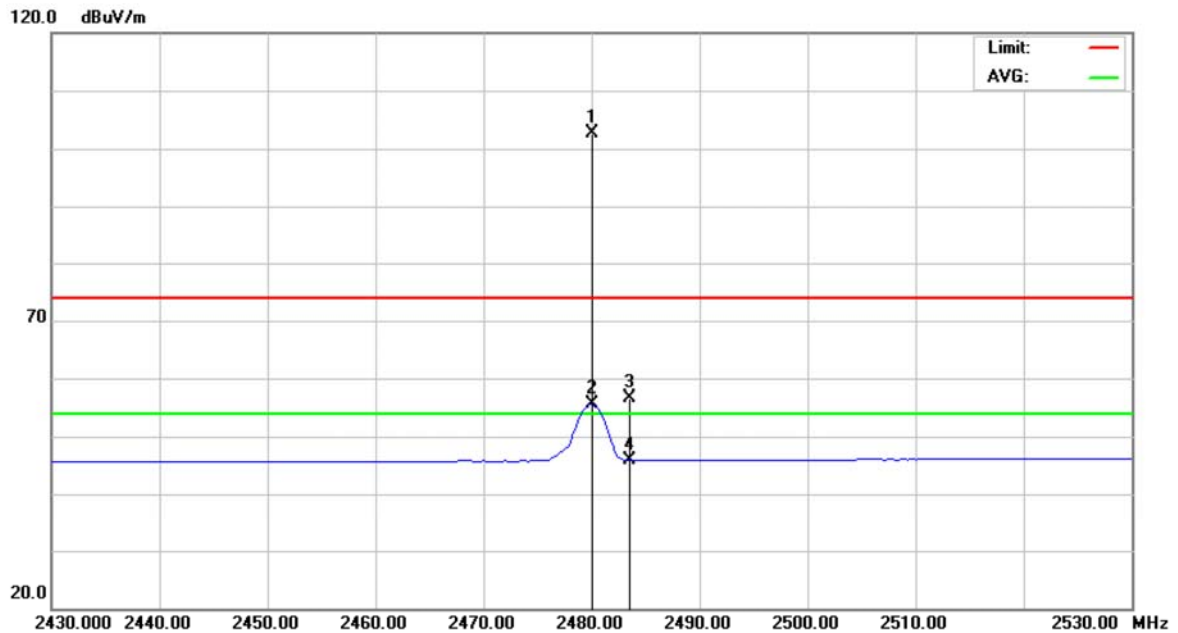
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4959.995	46.26	5.89	52.15	74.00	-21.85	peak	
2		4959.995	31.47	5.89	37.36	54.00	-16.64	AVG	
3		7440.170	43.84	13.05	56.89	74.00	-17.11	peak	
4	*	7440.170	30.49	13.05	43.54	54.00	-10.46	AVG	



Neutron Engineering Inc.

EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2480 MHz –CH39-1 Mbps		

Polarization: Horizontal

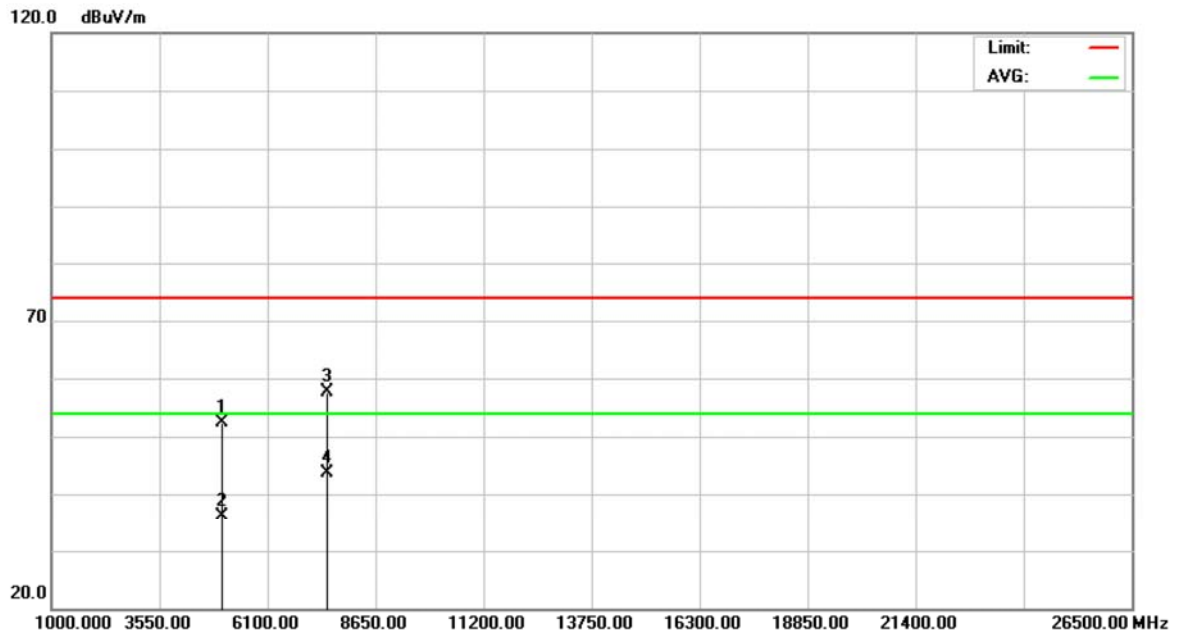


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1	*	2480.000	70.62	32.07	102.69	74.00	28.69	peak	
2	X	2480.000	23.48	32.07	55.55	54.00	1.55	AVG	
3		2483.500	24.66	32.09	56.75	74.00	-17.25	peak	
4		2483.500	13.83	32.09	45.92	54.00	-8.08	AVG	



EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	TX 2480 MHz –CH39-1 Mbps		

Polarization: Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		4959.845	46.42	5.89	52.31	74.00	-21.69	peak	
2		4959.845	30.14	5.89	36.03	54.00	-17.97	AVG	
3		7440.060	44.64	13.05	57.69	74.00	-16.31	peak	
4	*	7440.060	30.48	13.05	43.53	54.00	-10.47	AVG	

**5. BANDWIDTH TEST****5.1 APPLIED PROCESURES / LIMIT**

FCC Part15 (15.247) , Subpart C			
Section	Test Item	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	2400-2483.5	PASS

5.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

Remark: "N/A" denotes no model name, serial no. or calibration specified.

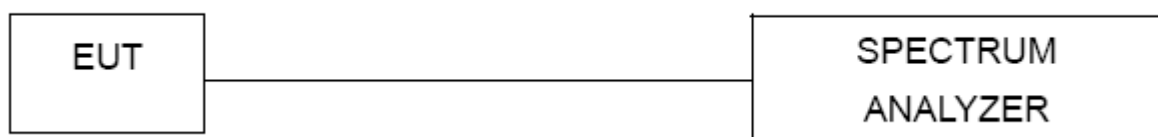
All calibration period of Equipment List is One Year.

5.3 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=300KHz, Sweep time = 2.5 ms.

5.4 DEVIATION FROM STANDARD

No deviation.

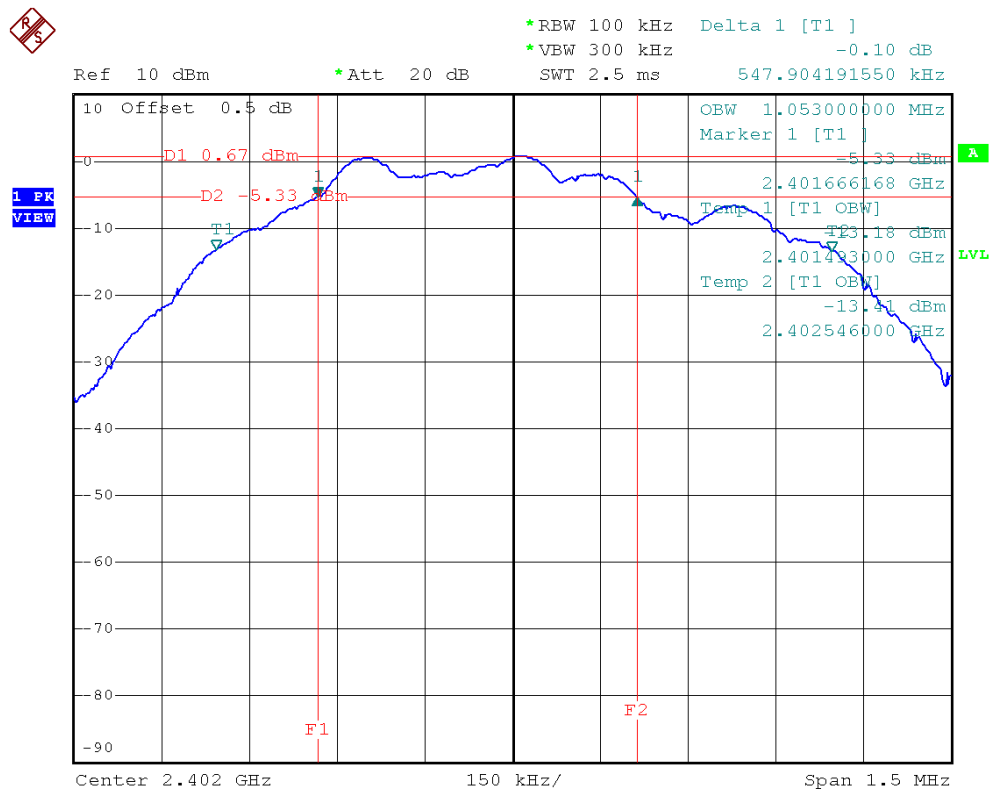
5.5 TEST SETUP**5.6 EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

**5.7 TEST RESULTS**

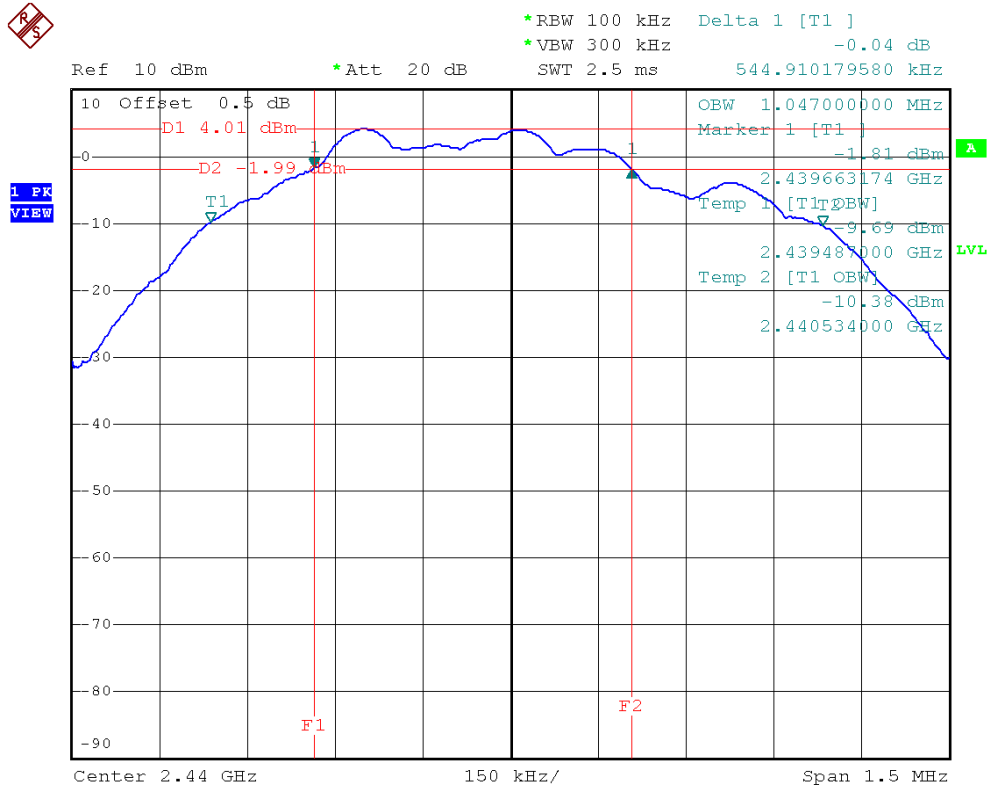
EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	CH00, CH19, CH39 - 1 Mbps		

Test Channel	Frequency (MHz)	Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Test Result
CH00	2402 MHz	0.548	1.053	Pass
CH19	2440 MHz	0.545	1.047	Pass
CH39	2480 MHz	0.554	1.047	Pass

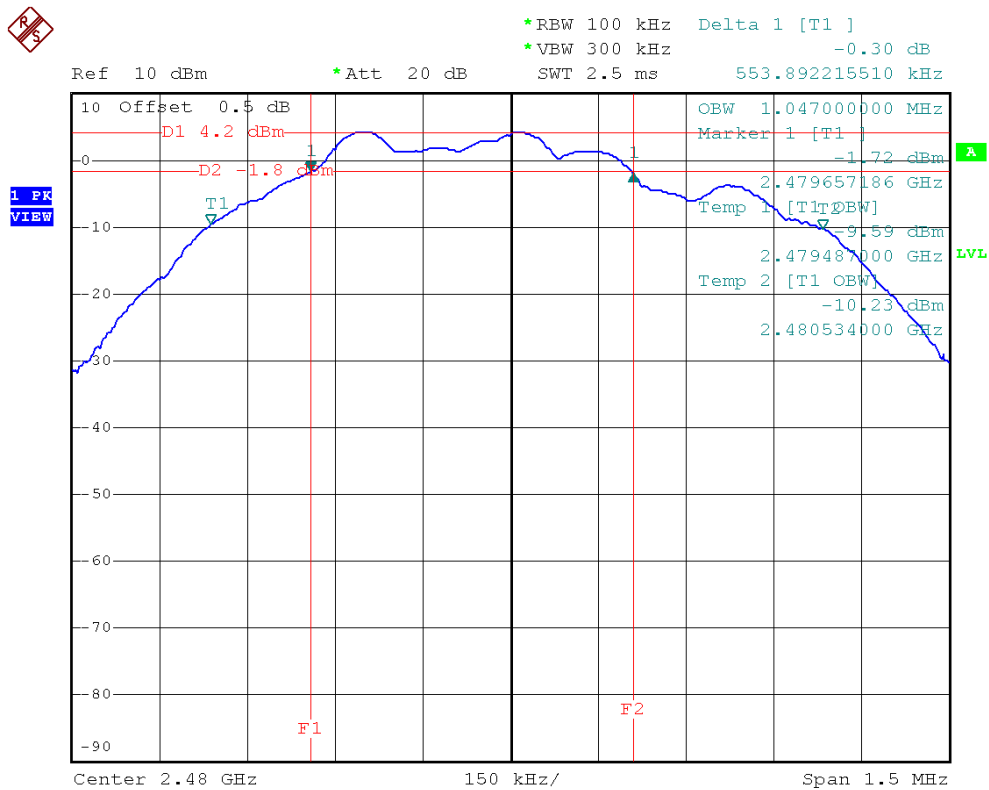
TX CH00



TX CH19



TX CH39



**6. MAXIMUM OUTPUT POWER TEST****6.1 APPLIED PROCEDURES / LIMIT**

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Maximum Output Power	1 watt or 30dBm	2400-2483.5	PASS

6.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of Equipment List is One Year.

6.3 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= 3 MHz, VBW= 3 MHz, Sweep time = Auto.
- The maximum peak conducted output power was performed in accordance with method 9.1.3 of FCC KDB 558074

6.4 DEVIATION FROM STANDARD

No deviation.

6.5 TEST SETUP**6.6 EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

**6.7 TEST RESULTS**

EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	CH00, CH19, CH39 - 1 Mbps		

Test Channel	Frequency (MHz)	Output Power (dBm)	LIMIT (dBm)	LIMIT (W)
CH00	2402 MHz	1.89	30	1
CH19	2440 MHz	5.22	30	1
CH39	2480 MHz	5.35	30	1



7. ANTENNA CONDUCTED SPURIOUS EMISSION

7.1 APPLIED PROCEDURES / LIMIT

30dBc 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.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
960~1000	500	3

7.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

Remark: "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of Equipment List is One Year.

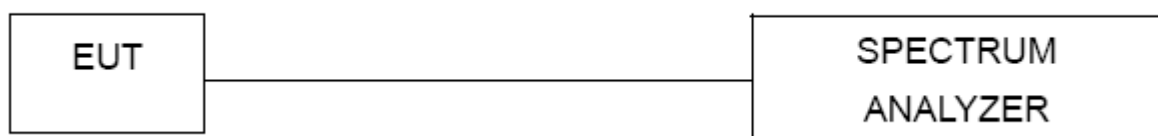
7.3 TEST PROCEDURE

- 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=300KHz, Sweep time = 10 ms.

7.4 DEVIATION FROM STANDARD

No deviation.

7.5 TEST SETUP



7.6 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.

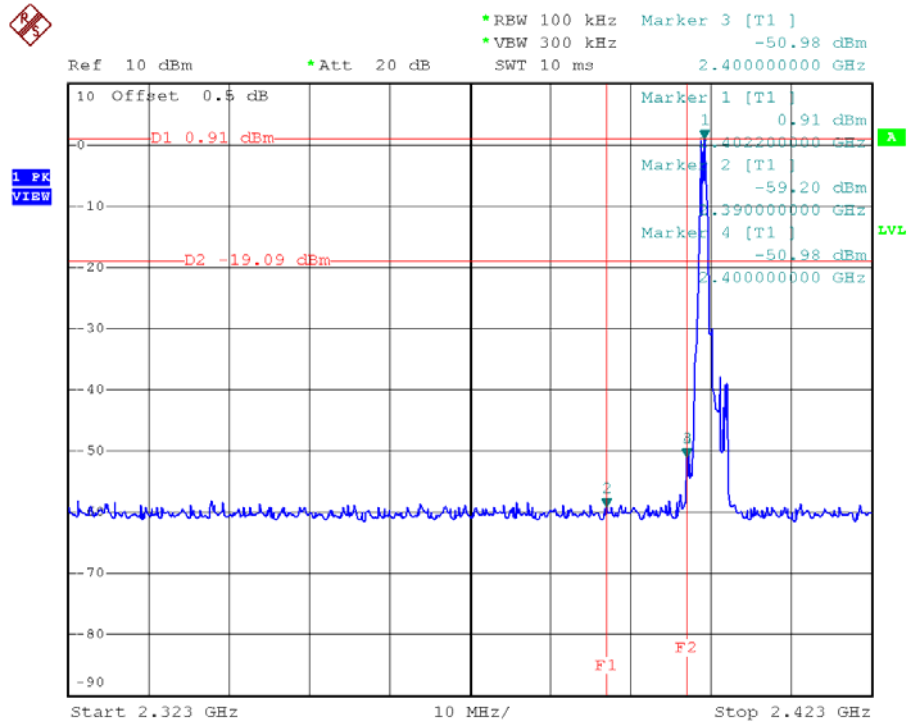
**7.7 TEST RESULTS**

EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	CH00, CH19 , CH39 - 1 Mbps		

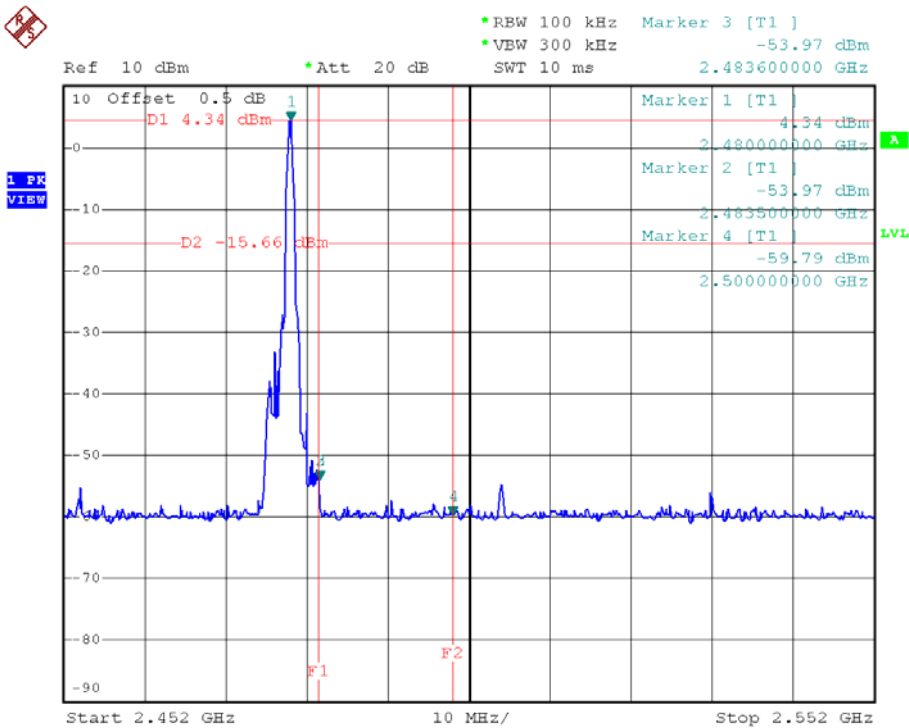
Channel of Worst Data: CH00			
The max. radio frequency power in any 100kHz bandwidth outside the frequency band		The max. radio frequency power in any 100 kHz bandwidth within the frequency band.	
FREQUENCY(MHz)	POWER(dBm)	FREQUENCY(MHz)	POWER(dBm)
2400.00	-50.98	2483.60	-53.97
Result			
In any 100kHz bandwidth outside the frequency band, the radio frequency power is at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.			



CH00 (Lower) - 1 Mbps

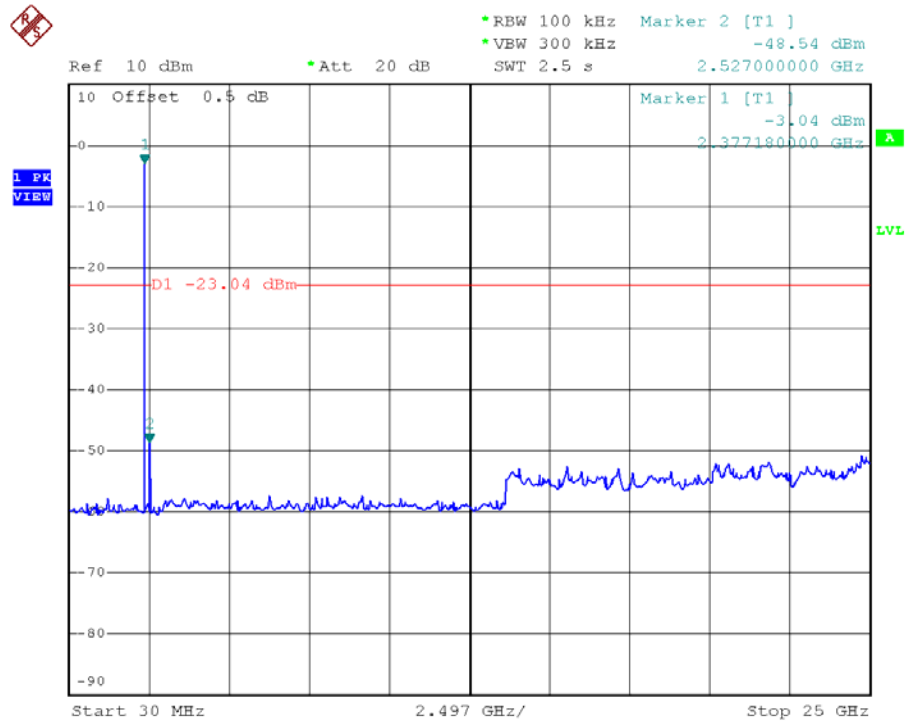


CH39 (upper) - 1 Mbps

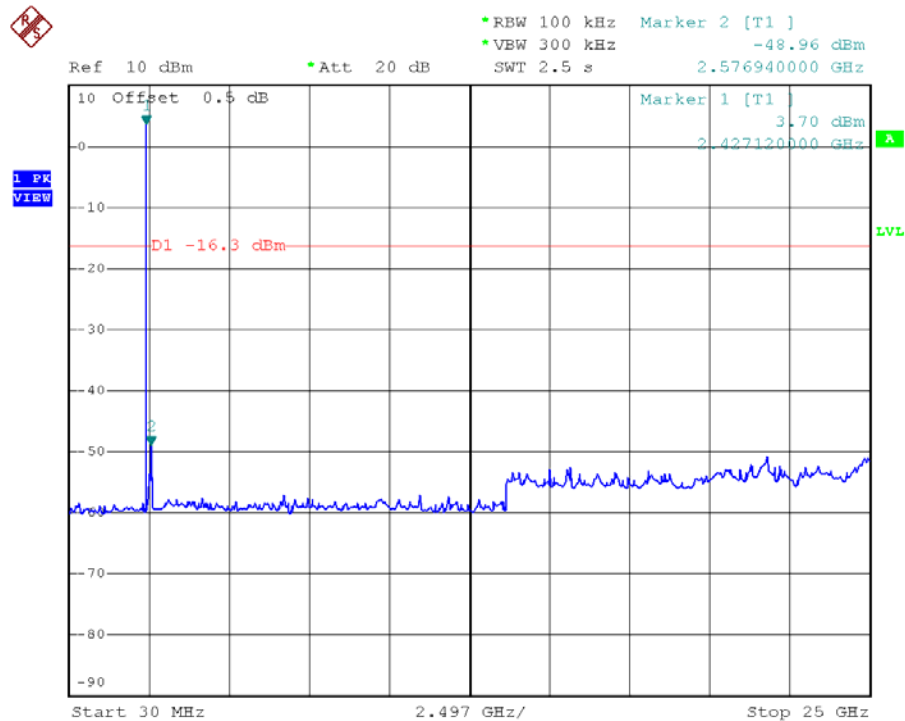


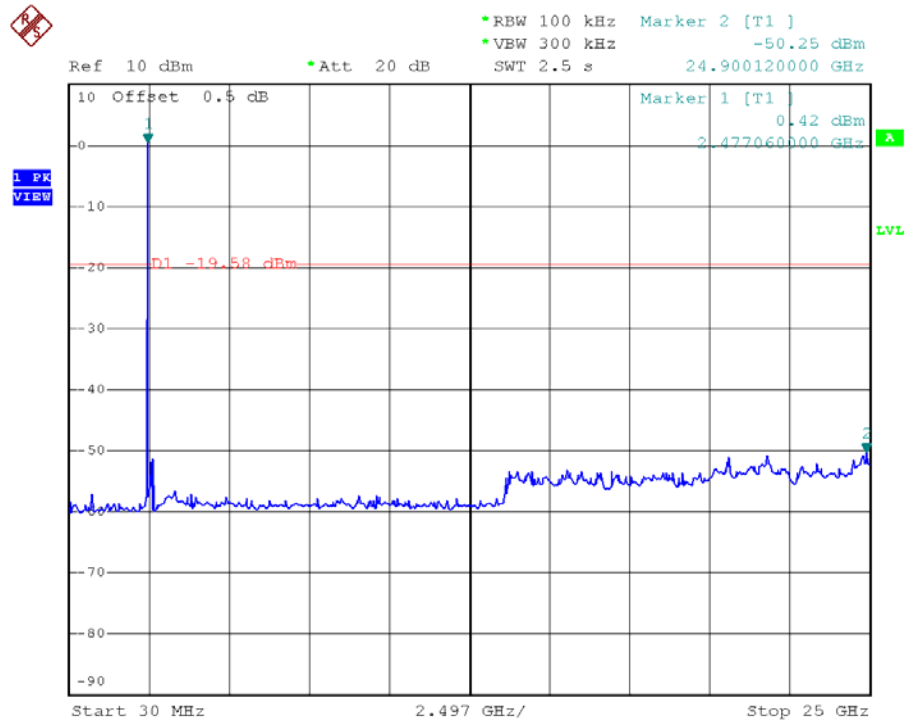


CH00 (10th Harmonic)



CH19 (10th Harmonic)



**Neutron Engineering Inc.****CH39 (10th Harmonic)**

**8. POWER SPECTRAL DENSITY TEST****8.1 APPLIED PROCEDURES / LIMIT**

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(e)	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

8.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Until
1	Spectrum Analyzer	R&S	FSP-30	100854	Sep. 08, 2014

Remark: "N/A" denotes no model name, serial no. or calibration specified.

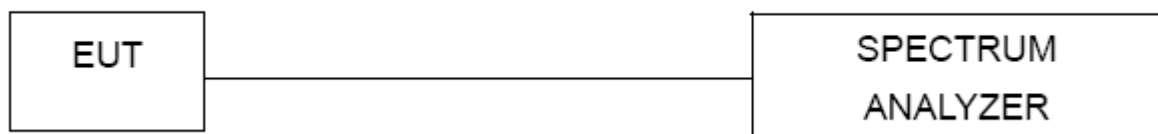
All calibration period of Equipment List is One Year.

8.3 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=3KHz, VBW=10KHz, Sweep time = auto.

8.4 DEVIATION FROM STANDARD

No deviation.

8.5 TEST SETUP**8.6 EUT OPERATION CONDITIONS**

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



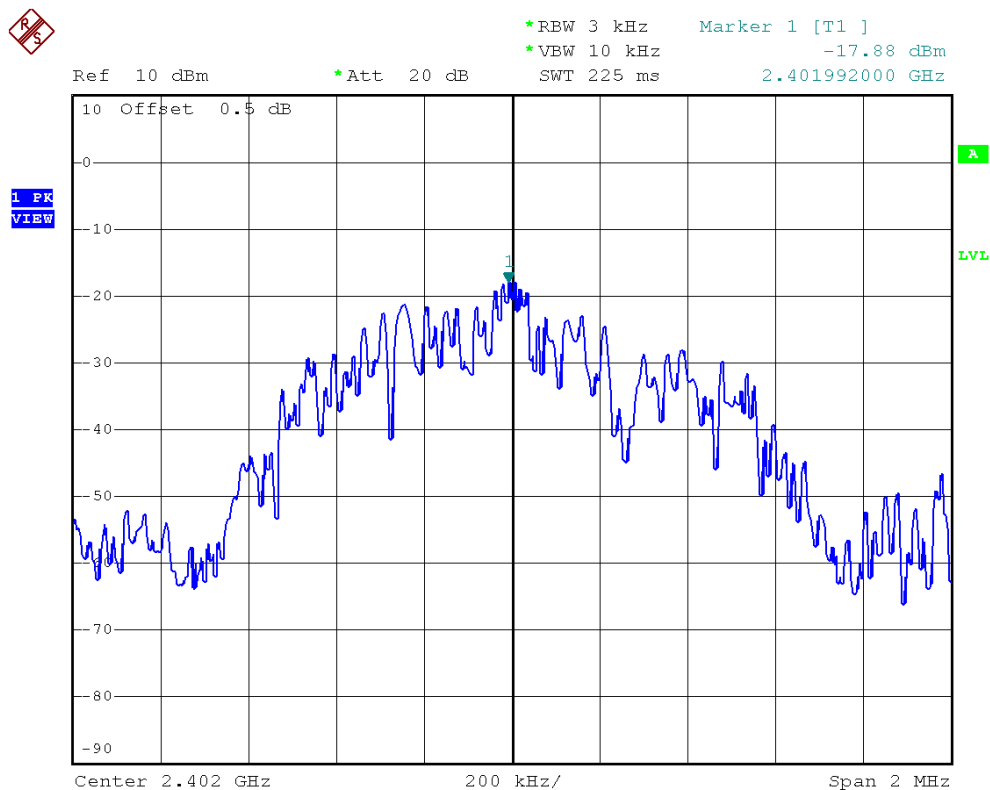
Neutron Engineering Inc.

8.7 TEST RESULTS

EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	CH00, CH19, CH39 -1 Mbps		

Test Channel	Frequency (MHz)	Power Density (dBm)	LIMIT (dBm)
CH00	2402 MHz	-17.88	8
CH19	2440 MHz	-14.70	8
CH39	2480 MHz	-14.35	8

TX CH00

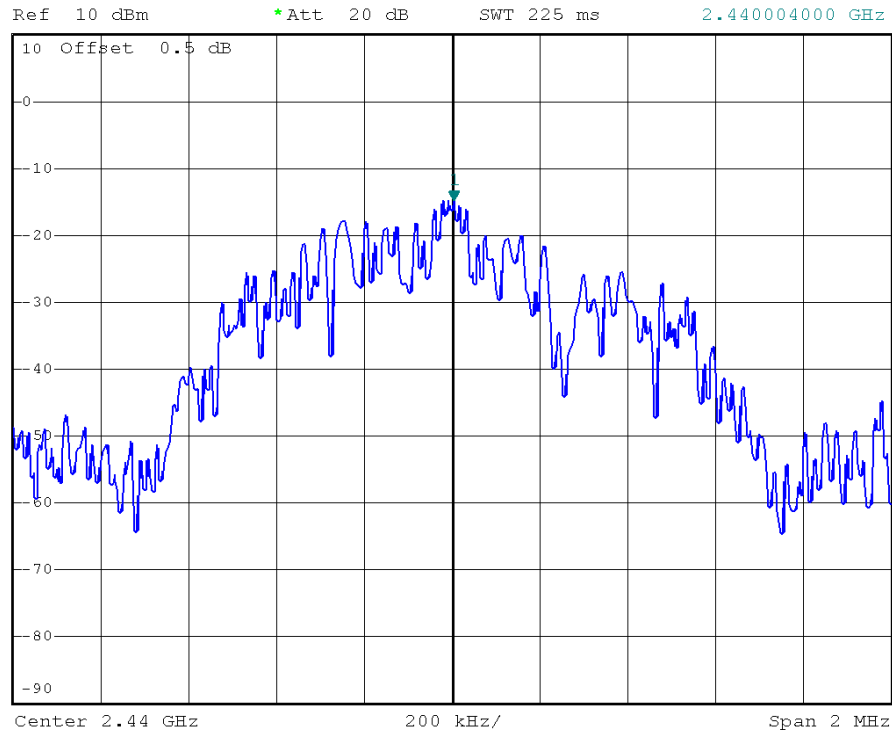




TX CH19



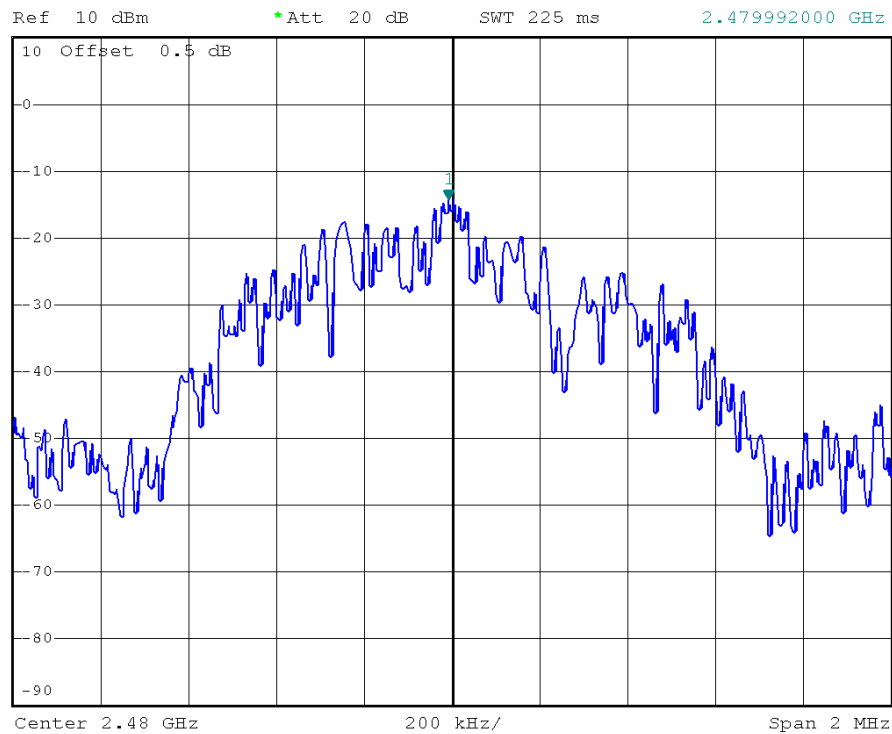
*RBW 3 kHz Marker 1 [T1]
*VBW 10 kHz -14.70 dBm
SWT 225 ms 2.440004000 GHz



TX CH39



*RBW 3 kHz Marker 1 [T1]
*VBW 10 kHz -14.35 dBm
SWT 225 ms 2.479992000 GHz





Neutron Engineering Inc.

9. RF EXPOSURE COMPLIANCE

9.1 LIMIT

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

NOTE: f = frequency in MHz ; *Plane-wave equivalent power density.

9.2 MEASUREMENT INSTRUMENTS LIST

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Power Meter	Anritsu	ML2495A	1128008	Feb,26,2014
2	Power Meter Sensor	Anritsu	MA2411B	1126001	Feb,26,2014

NOTE: **N/A**: denotes No Model Name, No Serial No. or No Calibration specified.

9.3 MPE CALCULATION METHOD

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

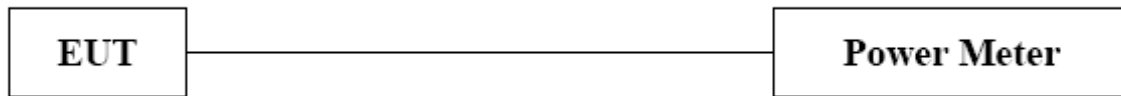
The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained



9.4 TEST SETUP LAYOUT



9.5 DEVIATION FROM TEST STANDARD

No deviation

9.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 4.1.6 Unless otherwise a special operating condition is specified in the follows during the testing.



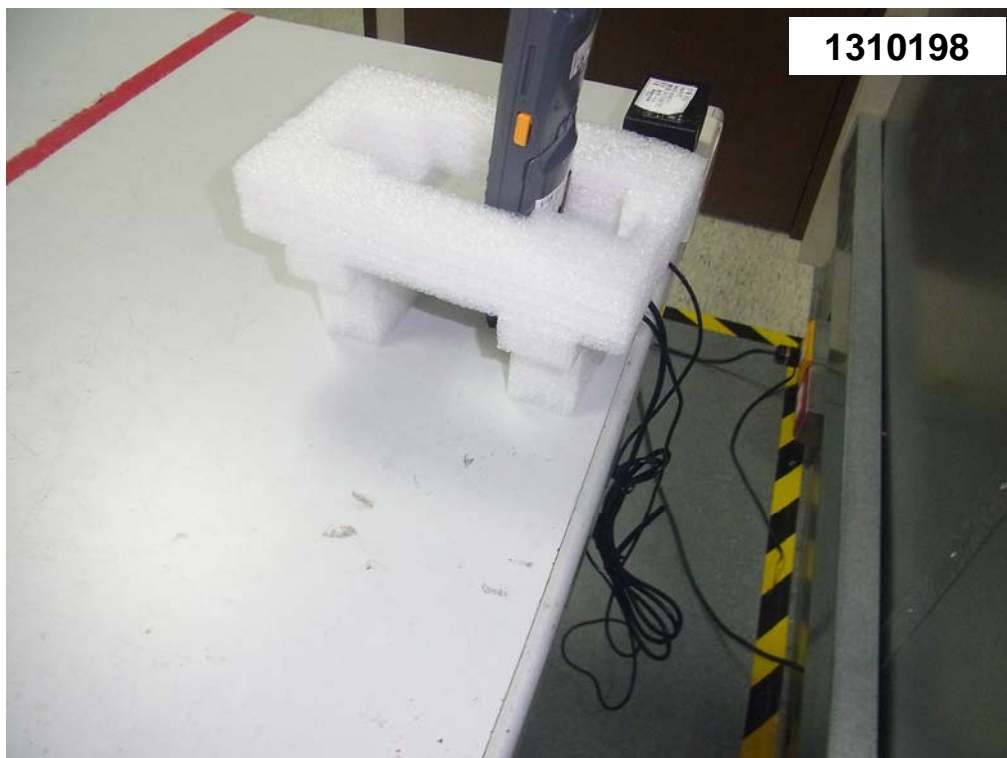
9.7 TEST RESULTS

EUT	Mobile Computer	Model Name	8660
Temperature	26°C	Relative Humidity	60%
Test Voltage	AC 120V/60Hz		
Test Mode	CH00, CH19, CH39 -1 Mbps		

Frequency	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm²)	Limit of Power Density (S) (mW/cm²)	Result
2402 MHz	1.52	1.4191	1.8900	1.5453	0.000436	1	PASS
2440 MHz	1.52	1.4191	5.2200	3.3266	0.000940	1	PASS
2480 MHz	1.52	1.4191	5.3500	3.4277	0.000968	1	PASS

10. EUT TEST PHOTO

Conducted emission test photos



Radiated spurious emission test photos

