



FCC RADIO TEST REPORT

FCC ID : O57FLEX5G14X05
Equipment : Notebook Computer
Brand Name : Lenovo
Model Name : Lenovo Flex 5G 14Q8CX05*****, 82AK*****, Yoga 5G 14Q8CX05*****, 81XE***** (* = 0~9, A~Z, a~z, “_” or blank, for marketing use only, with no impact on RF compliance of the product)
Applicant : Lenovo (Shanghai) Electronics Technology Co., Ltd.
Section 304-305, Building No. 4, # 222, Meiyue Road,
China (Shanghai) Pilot Free Trade Zone, Shanghai
Manufacturer : Lenovo PC HK Limited
23/F, Lincoln House, Taikoo Place, 979 King's Road,
Quarry Bay, Hong Kong
Standard : FCC 47 CFR Part 2, 96

Equipment: Murata LBDD5WV1US-575 and HON LIN T99W175 tested inside of Lenovo Notebook Computer.

The product was received on Sep. 23, 2020 and testing was started from Oct. 05, 2020 and completed on Oct. 06, 2020. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA-603-E and has been in compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan



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History of this test report

Report No.	Version	Description	Issued Date
FG9N2705-01F	01	Initial issue of report	Oct. 14, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	§2.1046	Conducted Output Power	Not Required	-
-	§96.41	Peak-to-Average Ratio	Not Required	-
-	§96.41	Effective Isotropic Radiated Power	Not Required	-
		Power Density	Not Required	-
-	§2.1049 §96.41	Occupied Bandwidth	Not Required	-
-	§2.1051 §96.41	Conducted Band Edge Measurement	Not Required	-
-	§2.1051 §96.41	Conducted Spurious Emission	Not Required	-
-	§2.1055	Frequency Stability for Temperature & Voltage	Not Required	-
3.4	§2.1051 §96.41	Radiated Spurious Emission	Pass	Under limit 10.54 dB at 28406.000 MHz

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report by enable 5G NR FR1 via SW. All the test cases were performed on original report which can be referred to Sporton Report Number FG9N2705F. Based on the original report, the test cases were verified.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang
Report Producer: Vivian Hsu

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Notebook Computer
Brand Name	Lenovo
Model Name	Lenovo Flex 5G 14Q8CX05*****, 82AK*****, Yoga 5G 14Q8CX05*****, 81XE***** (* = 0~9, A~Z, a~z, "-" or blank, for marketing use only, with no impact on RF compliance of the product)
FCC ID	O57FLEX5G14X05
EUT supports Radios application	WCDMA/HSPA/LTE/5G NR/GNSS WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer.
2. Equipment: Murata LBDD5WV1US-575 and HON LIN T99W175 tested inside of Lenovo Notebook Computer.

Antenna Information			
WWAN	3G&LTE (dBi)		
Notebook Mode	Antenna Type	Main: PIFA Antenna	Aux.: PIFA Antenna
	Part number	AUF6Y-100015 (DC33002DB00)	AUF6Y-100017 (DC33002DB30)
	Peak gain (dBi)	Main Antenna : 2.95	Aux. Antenna : 2.85
Tablet Mode	Antenna Type	Main: PIFA Antenna	Aux.: PIFA Antenna
	Part number	AUF6Y-100015 (DC33002DB00)	AUF6Y-100017 (DC33002DB30)
	Peak gain (dBi)	Main Antenna : 2.02	Aux. Antenna : 0.92

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx Frequency	LTE Band 48: 3552.5 MHz ~ 3697.5 MHz
Rx Frequency	LTE Band 48: 3552.5 MHz ~ 3697.5 MHz
Bandwidth	LTE Band 48: 5 MHz / 10 MHz / 15 MHz / 20 MHz
Type of Modulation	QPSK / 16QAM / 64QAM / 256QAM

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan
Test Site No.	Sporton Site No.
	03CH12-HY
Test Engineer	Jack Cheng, Lance Chiang and Chuan Chu
Temperature	22~26°C
Relative Humidity	58~62%

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC Designation No.: TW0007

1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ ANSI C63.26-2015
- ♦ ANSI / TIA-603-E
- ♦ FCC 47 CFR Part 2, 96
- ♦ FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01
- ♦ FCC KDB 940660 D01 Part 96 CBRS Eqpt v01
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

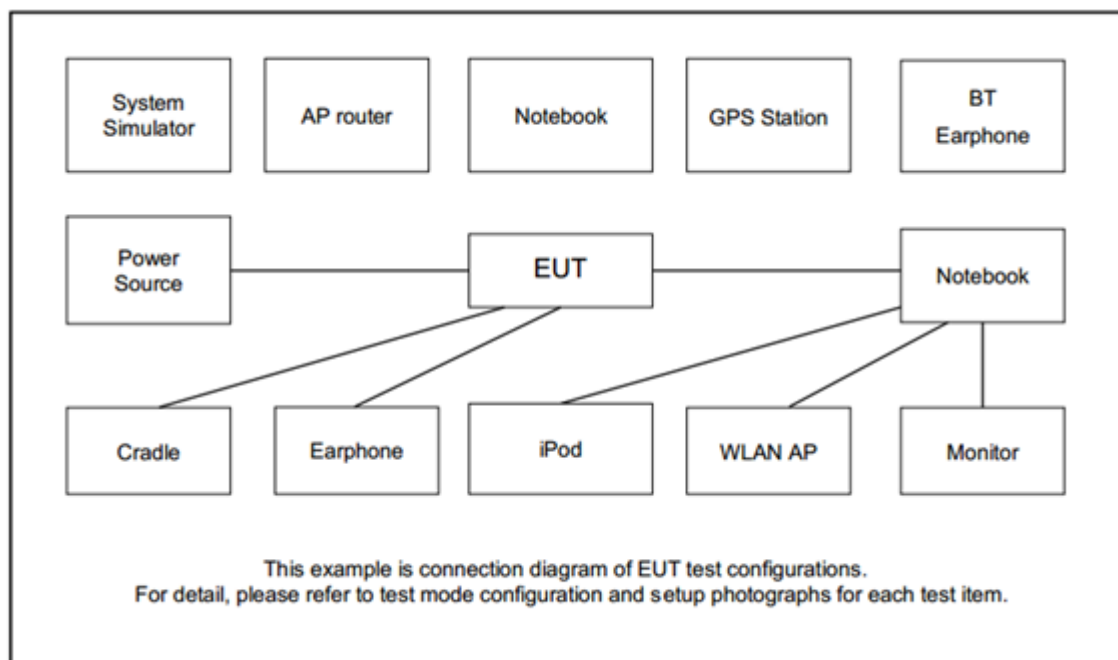
2.1 Test Mode

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y Plane) were recorded in this report.

Test Items	Band	Bandwidth (MHz)						Modulation				RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	64QAM	256QAM	1	Half	Full	L	M	H
Radiated Spurious Emission	48	-	-			v		v				v			v	v	v
Remark	1. The mark "v" means that this configuration is chosen for testing 2. The mark "-" means that this bandwidth is not supported. 3. The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.																

2.2 Connection Diagram of Test System





2.3 Support Unit used in test configuration

Item	Equipment	Brand Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8821C	N/A	N/A	Unshielded, 1.8 m
2.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A

2.4 Frequency List of Low/Middle/High Channels

LTE Band 48 Channel and Frequency List				
BW [MHz]	Channel/Frequency(MHz)	Lowest	Middle	Highest
15	Channel	55315	55990	56665
	Frequency	3557.5	3625.0	3692.5

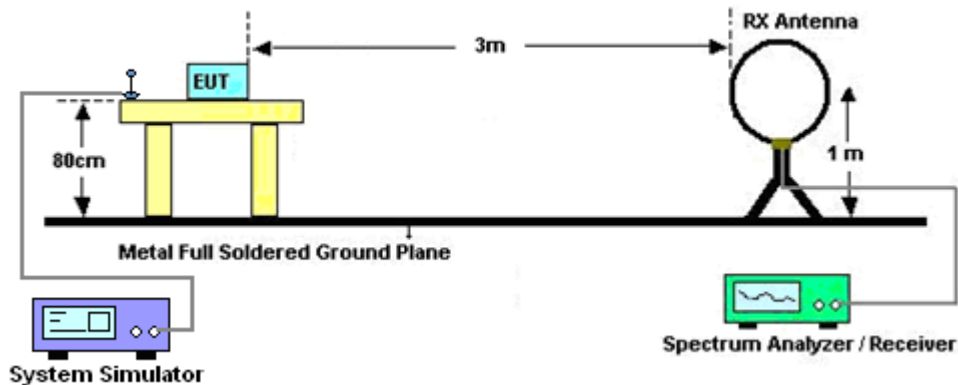
3 Radiated Test Items

3.1 Measuring Instruments

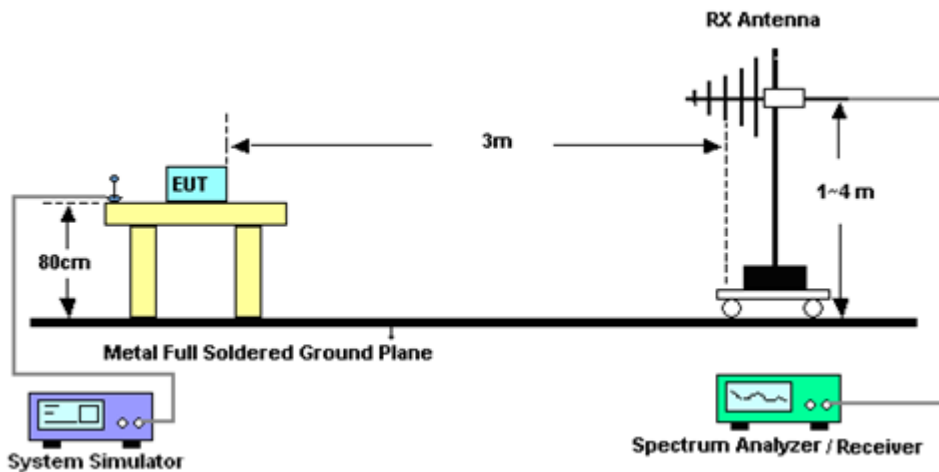
See list of measuring instruments of this test report.

3.2 Test Setup

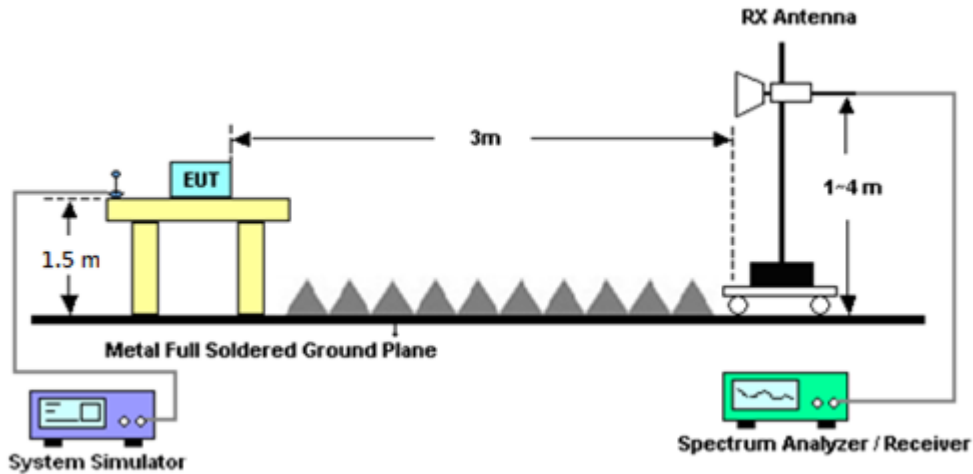
For radiated test below 30MHz



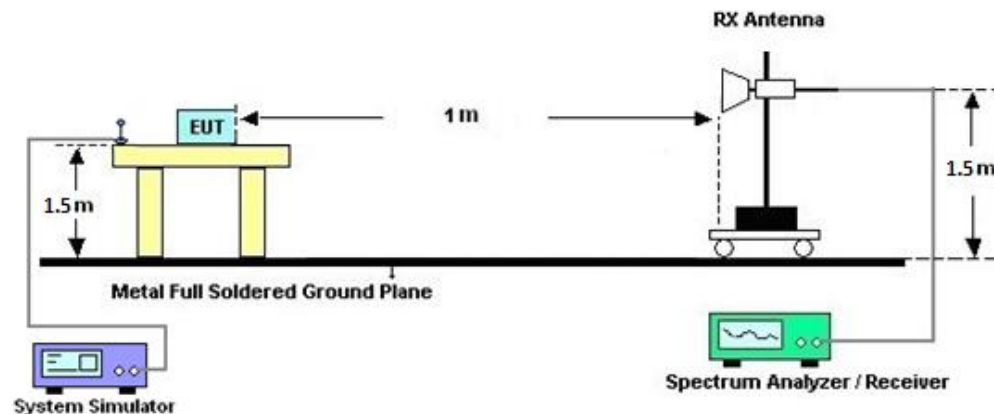
For radiated test from 30MHz to 1GHz



For radiated test 1GHz to 18GHz



For radiated test above 18GHz



3.3 Test Result of Radiated Test

Please refer to Appendix A.

Note:

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.4 Radiated Spurious Emission

3.4.1 Description of Radiated Spurious Emission Measurement

The radiated spurious emission was measured by substitution method according to ANSI / TIA-603-E.

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least -40dBm / MHz.

The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.4.2 Test Procedures

The testing follows FCC KDB 971168 D01 v03r01 Section 7 and ANSI / TIA-603-E Section 2.2.12.

1. The EUT was placed on a turntable with 0.8 meter height for frequency below 1GHz and 1.5 meter height for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the receiving antenna mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between 1m to 4m to search the maximum spurious emission for both horizontal and vertical polarizations.
5. During the measurement, the system simulator parameters were set to force the EUT transmitting at maximum output power.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
$$\text{EIRP (dBm)} = \text{S.G. Power} - \text{Tx Cable Loss} + \text{Tx Antenna Gain}$$
$$\text{ERP (dBm)} = \text{EIRP} - 2.15$$
8. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
The limit line is -40dBm/MHz

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Dec. 26, 2019	Oct. 05, 2020~ Oct. 06, 2020	Dec. 25, 2020	Radiation (03CH12-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D0 1N-06	37059 & 01	30MHz~1GHz	Oct. 12, 2019	Oct. 05, 2020~ Oct. 06, 2020	Oct. 11, 2020	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBEC K	BBHA 9120 D	9120D-132 8	1GHz~18GHz	Nov. 14, 2019	Oct. 05, 2020~ Oct. 06, 2020	Nov. 13, 2020	Radiation (03CH12-HY)
Horn Antenna	SCHWARZBEC K	BBHA 9120D	9120D-121 2	1GHz ~ 18GHz	May 20, 2020	Oct. 05, 2020~ Oct. 06, 2020	May 19, 2021	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBEC K	BBHA 9170	BBHA9170 584	18GHz~40GHz	Dec. 10, 2019	Oct. 05, 2020~ Oct. 06, 2020	Dec. 09, 2020	Radiation (03CH12-HY)
SHF-EHF Horn Antenna	SCHWARZBEC K	BBHA 9170	BBHA9170 980	18GHz ~ 40GHz	Jan. 10, 2019	Oct. 05, 2020~ Oct. 06, 2020	Jan. 09, 2021	Radiation (03CH12-HY)
Preamplifier	COM-POWER	PA-103	161075	10MHz~1GHz	Mar. 25, 2020	Oct. 05, 2020~ Oct. 06, 2020	Mar. 24, 2021	Radiation (03CH12-HY)
Preamplifier	Keysight	83017A	MY572801 20	1GHz~26.5GHz	Jul. 20, 2020	Oct. 05, 2020~ Oct. 06, 2020	Jul. 19, 2021	Radiation (03CH12-HY)
Preamplifier	Jet-Power	JPA0118-55- 303K	17100018 00054002	1GHz~18GHz	Feb. 07, 2020	Oct. 05, 2020~ Oct. 06, 2020	Feb. 06, 2021	Radiation (03CH12-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 13, 2019	Oct. 05, 2020~ Oct. 06, 2020	Dec. 12, 2020	Radiation (03CH12-HY)
Spectrum Analyzer	Agilent	N9010A	MY542004 85	10Hz~44GHz	Feb. 10, 2020	Oct. 05, 2020~ Oct. 06, 2020	Feb. 09, 2021	Radiation (03CH12-HY)
Signal Generator	Anritsu	MG3694C	163401	0.1Hz~40GHz	Feb. 15, 2020	Oct. 05, 2020~ Oct. 06, 2020	Feb. 14, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4 PE	9kHz~30MHz	Mar. 12, 2020	Oct. 05, 2020~ Oct. 06, 2020	Mar. 11, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126E	0058/126E	30MHz~18GHz	Dec. 12, 2019	Oct. 05, 2020~ Oct. 06, 2020	Dec. 11, 2020	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	505134/2	30MHz~40GHz	Feb. 25, 2020	Oct. 05, 2020~ Oct. 06, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	800740/2	30MHz~40GHz	Feb. 25, 2020	Oct. 05, 2020~ Oct. 06, 2020	Feb. 24, 2021	Radiation (03CH12-HY)
Hygrometer	TECPEL	DTM-303B	TP140349	N/A	Oct. 25, 2019	Oct. 05, 2020~ Oct. 06, 2020	Oct. 24, 2020	Radiation (03CH12-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Oct. 05, 2020~ Oct. 06, 2020	N/A	Radiation (03CH12-HY)
Antenna Mast	EMEC	AM-BS-4500 -B	N/A	1m~4m	N/A	Oct. 05, 2020~ Oct. 06, 2020	N/A	Radiation (03CH12-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Oct. 05, 2020~ Oct. 06, 2020	N/A	Radiation (03CH12-HY)
Software	Audix	E3 6.2009-8-24	RK-00098 9	N/A	N/A	Oct. 05, 2020~ Oct. 06, 2020	N/A	Radiation (03CH12-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	3.07
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	3.21
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Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	3.80
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Appendix A. Test Results of Radiated Test

LTE Band 48

LTE Band 48 / 15MHz / QPSK									
Channel	Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)
Lowest	7100	-54.73	-40	-14.73	-56.71	-64.70	1.77	11.74	H
	10653	-57.94	-40	-17.94	-60.21	-66.37	2.47	10.90	H
	14203	-56.44	-40	-16.44	-63.5	-65.28	2.87	11.71	H
	21305	-54.19	-40	-14.19	-76.05	-70.91	1.98	18.70	H
	24855	-53.71	-40	-13.71	-78.37	-69.71	2.07	18.07	H
	28406	-52.60	-40	-12.60	-78.12	-69.84	2.32	19.56	H
	7100	-57.60	-40	-17.60	-59.19	-67.57	1.77	11.74	V
	10653	-58.08	-40	-18.08	-60.1	-66.51	2.47	10.90	V
	14203	-56.48	-40	-16.48	-63.27	-65.32	2.87	11.71	V
	21305	-54.31	-40	-14.31	-76.04	-71.03	1.98	18.70	V
	24855	-52.02	-40	-12.02	-77.89	-68.02	2.07	18.07	V
	28406	-50.54	-40	-10.54	-77.87	-67.78	2.32	19.56	V
Middle	7235	-55.80	-40	-15.80	-58.17	-65.48	1.85	11.52	H
	10855	-58.22	-40	-18.22	-60.55	-66.55	2.57	10.90	H
	14474	-57.19	-40	-17.19	-64.46	-65.40	2.85	11.06	H
	18091	-54.44	-40	-14.44	-72.56	-70.66	1.76	17.98	H
	21710	-55.93	-40	-15.93	-77.46	-72.72	2.00	18.78	H
	25328	-52.84	-40	-12.84	-78.03	-69.46	2.14	18.76	H
	7235	-57.47	-40	-17.47	-59.58	-67.15	1.85	11.52	V
	10855	-58.40	-40	-18.40	-60.53	-66.73	2.57	10.90	V
	14474	-57.97	-40	-17.97	-64.4	-66.18	2.85	11.06	V
	18091	-55.49	-40	-15.49	-72.68	-71.71	1.76	17.98	V
	21710	-55.79	-40	-15.79	-77.31	-72.58	2.00	18.78	V
	25328	-51.51	-40	-11.51	-77.97	-68.13	2.14	18.76	V



Highest	7370	-58.09	-40	-18.09	-60.42	-67.48	1.92	11.31	H
	11057	-58.28	-40	-18.28	-60.78	-66.62	2.63	10.97	H
	14742	-56.28	-40	-16.28	-65.24	-65.14	2.92	11.77	H
	18429	-54.77	-40	-14.77	-73.09	-70.81	1.88	17.91	H
	22115	-54.65	-40	-14.65	-76.94	-71.43	2.07	18.85	H
	25800	-51.79	-40	-11.79	-77.84	-68.84	2.01	19.06	H
	7370	-58.50	-40	-18.50	-60.65	-67.89	1.92	11.31	V
	11057	-57.96	-40	-17.96	-60.29	-66.30	2.63	10.97	V
	14742	-58.36	-40	-18.36	-65.6	-67.22	2.92	11.77	V
	18429	-55.41	-40	-15.41	-72.86	-71.45	1.88	17.91	V
	22115	-54.47	-40	-14.47	-76.77	-71.25	2.07	18.85	V
	25800	-50.83	-40	-10.83	-78.05	-67.88	2.01	19.06	V

Remark: Spurious emissions within 30-1000MHz were found more than 20dB below limit line.