

Variant FCC RF Test Report

APPLICANT : Symbol Technologies Inc.
EQUIPMENT : Enterprise Digital Assistant (EDA)
BRAND NAME : Motorola
MODEL NAME : MC55A0
FCC ID : H9PMC55A0
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : Digital Transmission System (DTS)

This is a variant report which is only valid together with the original test report. The product was received on Jan. 24, 2011 and completely tested on Jan. 26, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

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

Reviewed by:



Anderson Chiu / Deputy Manager



SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR000411-01	Rev. 01	This is a variant report by adding test data of WLAN Channel 12 and 13. All the test cases were performed on original report which can be referred to Sporton Report Number FR000411B.	Jan. 26, 2011



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(d)	A8.5	Radiated Band Edges	15.209(a) & 15.205(a)	Pass	-



1 General Description

1.1 Applicant

Symbol Technologies Inc.
One Motorola Plaza, Holtsville, NY 11742-1300 USA

1.2 Manufacturer

Symbol Technologies Inc.
One Motorola Plaza, Holtsville, NY 11742-1300 USA

1.3 Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Enterprise Digital Assistant (EDA)
Brand Name	Motorola
Model Name	MC55A0
FCC ID	H9PMC55A0
Tx/Rx Frequency Range	802.11b/g : 2400 MHz ~ 2483.5 MHz 802.11a : 5725 MHz ~ 5850 MHz
Channel Spacing	802.11b/g : 5 MHz 802.11a : 20 MHz
Antenna Type	802.11b/g : PIFA Antenna with gain 2.55 dBi 802.11a : PIFA Antenna with gain 2.94 dBi
HW Version	DV
SW Version	BSP34
Type of Modulation	802.11b : DSSS (BPSK / QPSK / CCK) 802.11g/a : OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Identical Prototype

Remark:

1. This test report recorded only product characteristics and test results of Digital Transmission System (DTS).
2. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Testing Site

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	03CH07HY	722060/4086B-1

1.5 Applied Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 (Measurement Guidelines of DTS)
- ♦ ANSI C63.4-2003
- ♦ IC RSS-210 Issue 8 Annex 8

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.

1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
2.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m

2 Test Configuration of Equipment Under Test

2.1 RF Power

Preliminary tests were performed in different data rate and recorded the RF Output Power in the following table:

Channel	Frequency	2.4GHz 802.11b RF Power (dBm)			
		DSSS Data Rate			
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps
CH 12	2467 MHz	1.04	0.98	0.91	0.92
CH 13	2472 MHz	0.98	0.92	0.94	0.95

Channel	Frequency	2.4GHz 802.11g RF Power (dBm)							
		OFDM Data Rate							
		6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
CH 12	2467 MHz	7.63	7.21	7.46	7.33	7.26	7.30	7.26	7.43
CH 13	2472 MHz	7.68	7.26	7.42	7.31	7.24	7.25	7.21	7.43

Remark:

1. The data rates of WLAN 802.11b/g were set in 1Mbps for 802.11b and 6Mbps for 802.11g for all the test cases due to the highest RF output power.
2. The EUT is programmed to transmit signal continuously for all testing.

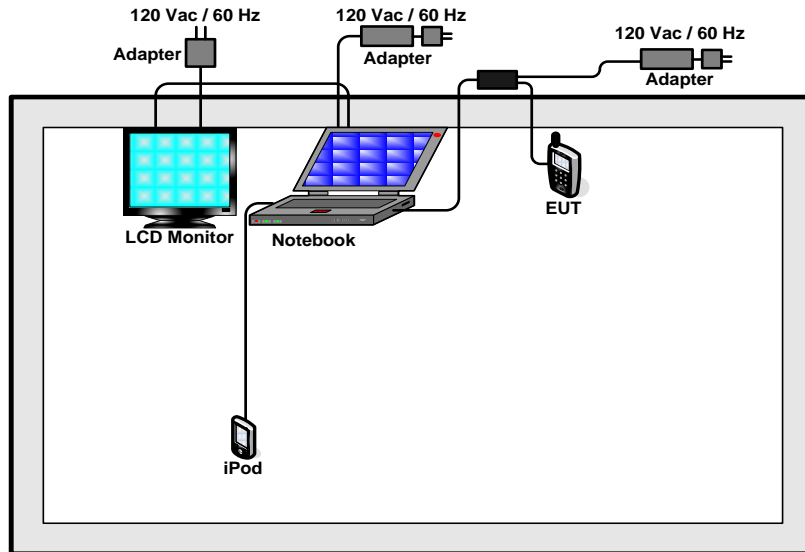
2.2 Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following tables are showing the test modes as the worst cases and recorded in this report.

Test Cases		
Test Item	802.11b (Modulation : DSSS)	802.11g (Modulation : OFDM)
Radiated	Mode 1: 802.11b_CH12_2467 MHz	Mode 3: 802.11g_CH12_2467 MHz
Band Edges	Mode 2: 802.11b_CH13_2472 MHz	Mode 4: 802.11g_CH13_2472 MHz
Remark: The test was performed together with USB charging cable with AC power, Qwerty Keypad, Battery (3600mAh) and 2D Scanner.		

2.3 Connection Diagram of Test System



2.4 RF Utility

The programmed RF utility “CEcTxRx” is installed in EUT to provide channel selection, power level, data rate and the application type. RF utility can send transmitting signal for all testing. 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.

3 Test Result

3.1 Radiated Band Edges Measurement

3.1.1 Limit of Radiated Band Edges

Radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below :

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
Above 960	500	3

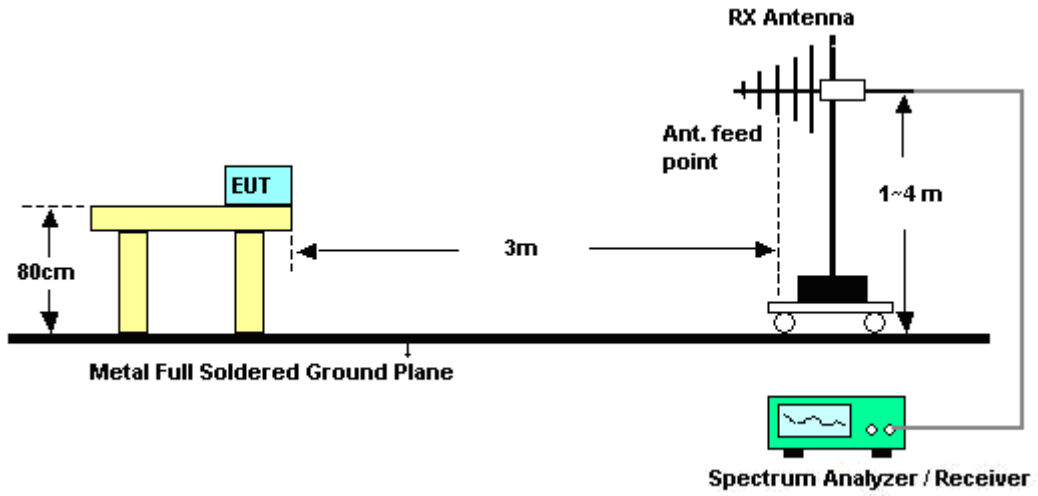
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows the guidelines in ANSI C63.4-2003 and FCC KDB Publication No. 558074 (Measurement Guidelines of DTS).
2. Radiated emission test: Apply to band edge emissions that fall in the restricted bands listed in FCC Section 15.205. The maximum permitted average field strength is listed in FCC Section 15.209. A pre-amp is necessary for this measurement. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep=Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation as in FCC Section 15.35(b) and (c).

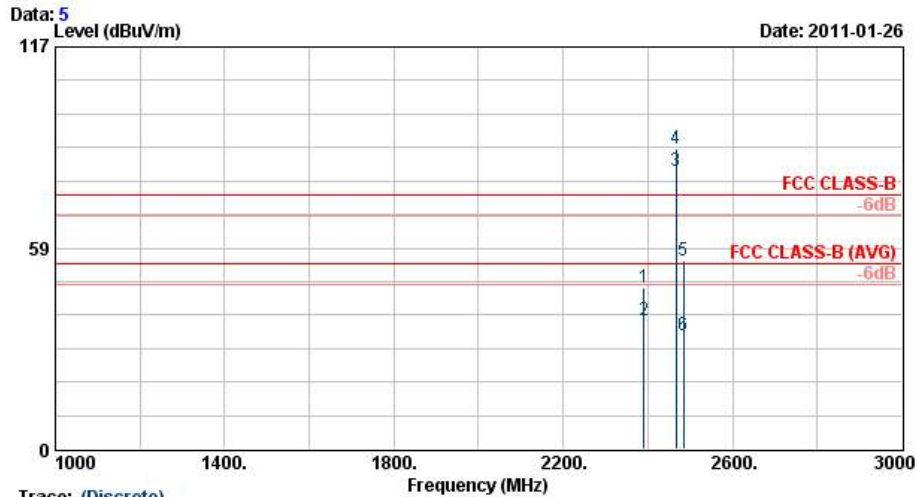
3.1.4 Test Setup





3.1.5 Test Result of Radiated Band Edges

Test Mode :	Mode 1	Temperature :	23~24°C
Test Channel :	12	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Horizontal
Remark :	2467 MHz is Fundamental Signals which can be ignored.		

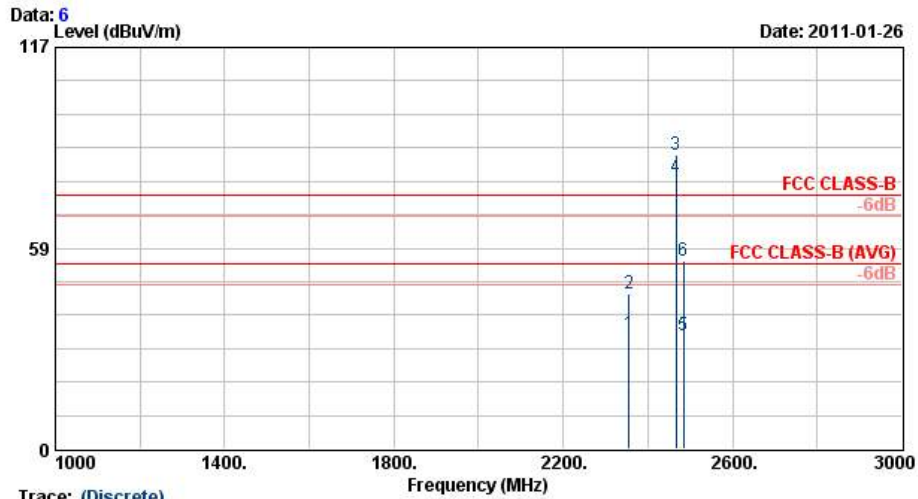


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_100824 HORIZONTAL
 Project : TR 000411-01

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	2390.00	46.94	-27.06	74.00	42.59	32.18	6.03	33.85	103	330 Peak
2	2390.00	37.49	-16.51	54.00	33.14	32.18	6.03	33.85	103	330 Average
3 @	2467.00	81.02			76.51	32.26	6.14	33.89	103	330 Average
4 X	2467.00	87.37			82.85	32.26	6.14	33.89	103	330 Peak
5	2484.61	54.87	-19.13	74.00	50.31	32.28	6.18	33.90	103	330 Peak
6	2484.61	32.92	-21.08	54.00	28.36	32.28	6.18	33.90	103	330 Average



Test Mode :	Mode 1	Temperature :	23~24°C
Test Channel :	12	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Vertical
Remark :	2467 MHz is Fundamental Signals which can be ignored.		

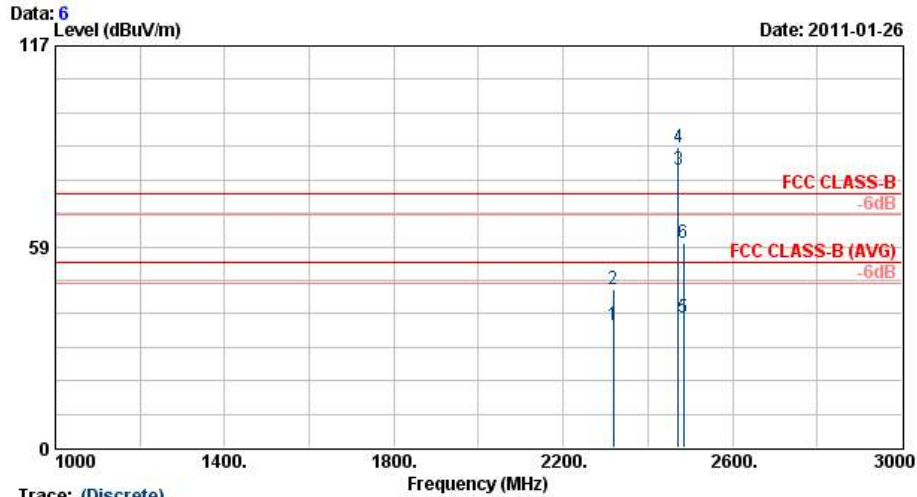


Trace: (Discrete)
 Site : D3CH07-HY
 Condition : FCC CLASS-B HF_ANT_100824 VERTICAL
 Project : TR 000411-01

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Remark
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2356.00	33.69	-20.31	54.00	29.43	32.13	5.96	33.83	154	143	Average
2	2356.00	45.04	-28.96	74.00	40.78	32.13	5.96	33.83	154	143	Peak
3 X	2467.00	85.76			81.25	32.26	6.14	33.89	154	143	Peak
4 @	2467.00	79.35			74.84	32.26	6.14	33.89	154	143	Average
5	2483.50	32.87	-21.13	54.00	28.31	32.28	6.18	33.90	154	143	Average
6	2483.50	54.86	-19.14	74.00	50.30	32.28	6.18	33.90	154	143	Peak



Test Mode :	Mode 2	Temperature :	23~24°C
Test Channel :	13	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Horizontal
Remark :	2472 MHz is Fundamental Signals which can be ignored.		

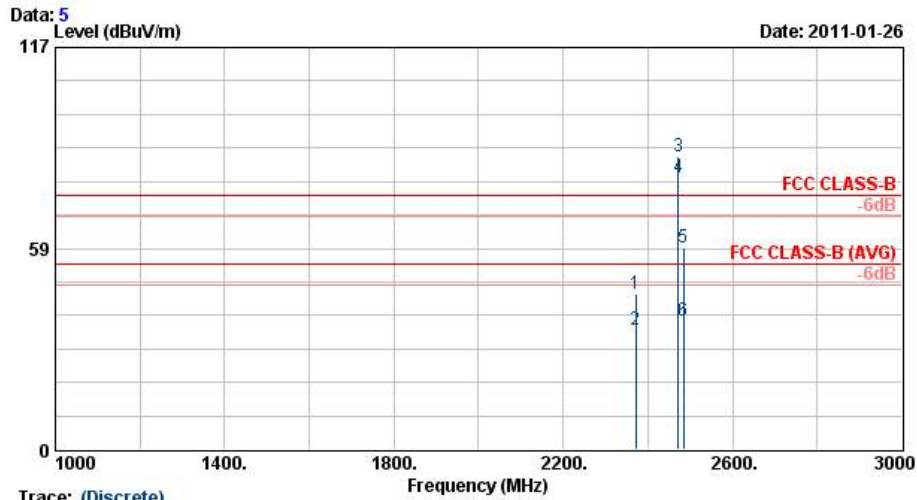


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_100824 HORIZONTAL
 Project : TR 000411-01

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2318.00	35.47	-18.53	54.00	31.28	32.09	5.92	33.82	100	326	Average
2	2318.00	46.19	-27.81	74.00	42.00	32.09	5.92	33.82	100	326	Peak
3 @	2472.00	80.99			76.46	32.28	6.14	33.89	100	326	Average
4 X	2472.00	87.56			83.03	32.28	6.14	33.89	100	326	Peak
5	2483.50	37.84	-16.16	54.00	33.28	32.28	6.18	33.90	100	326	Average
6	2483.50	59.54	-14.46	74.00	54.98	32.28	6.18	33.90	100	326	Peak



Test Mode :	Mode 2	Temperature :	23~24°C
Test Channel :	13	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Vertical
Remark :	2472 MHz is Fundamental Signals which can be ignored.		

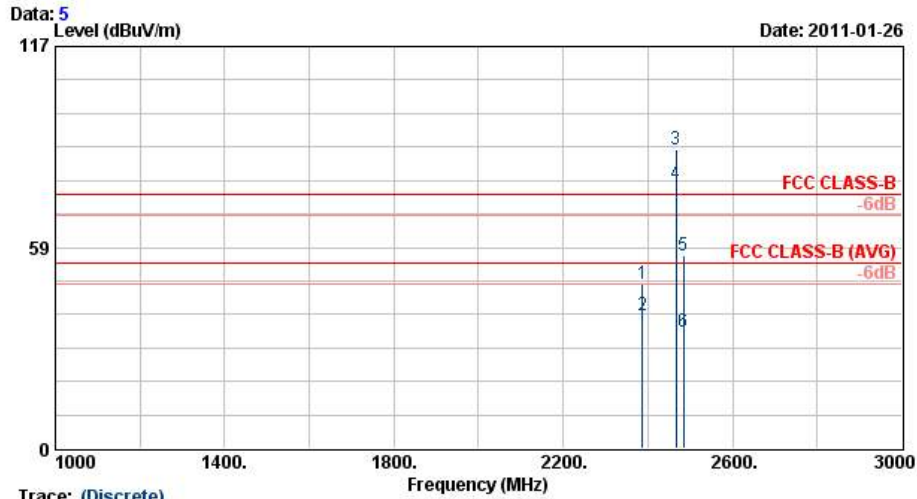


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_100624 VERTICAL
 Project : TR 000411-01

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2372.00	45.20	-28.80	74.00	40.89	32.16	5.99	33.84	161	145	Peak
2	2372.00	34.93	-19.07	54.00	30.62	32.16	5.99	33.84	161	145	Average
3 X	2472.00	85.20			80.66	32.28	6.14	33.89	161	145	Peak
4 X	2472.00	79.24			74.71	32.28	6.14	33.89	161	145	Average
5	2483.50	58.83	-15.17	74.00	54.27	32.28	6.18	33.90	161	145	Peak
6	2483.50	37.30	-16.70	54.00	32.74	32.28	6.18	33.90	161	145	Average



Test Mode :	Mode 3	Temperature :	23~24°C
Test Channel :	12	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Horizontal
Remark :	2467 MHz is Fundamental Signals which can be ignored.		

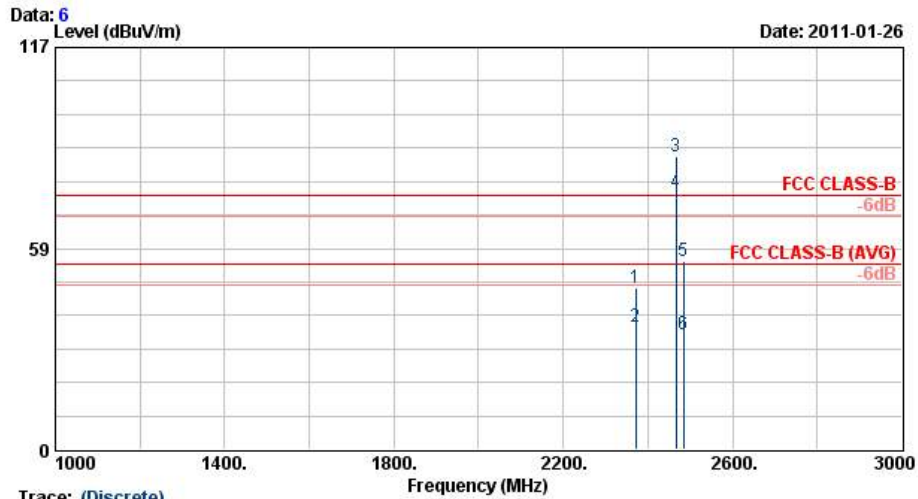


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_I00824 HORIZONTAL
 Project : TR 000411-01

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2388.00	47.72	-26.28	74.00	43.37	32.18	6.03	33.85	102	32	Peak
2	2388.00	38.73	-15.27	54.00	34.38	32.18	6.03	33.85	102	32	Average
3 X	2467.00	87.10			82.59	32.26	6.14	33.89	102	32	Peak
4 @	2467.00	77.01			72.50	32.26	6.14	33.89	102	32	Average
5	2483.85	55.99	-18.01	74.00	51.43	32.28	6.18	33.90	102	32	Peak
6	2483.85	33.97	-20.03	54.00	29.41	32.28	6.18	33.90	102	32	Average



Test Mode :	Mode 3	Temperature :	23~24°C
Test Channel :	12	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Vertical
Remark :	2467 MHz is Fundamental Signals which can be ignored.		

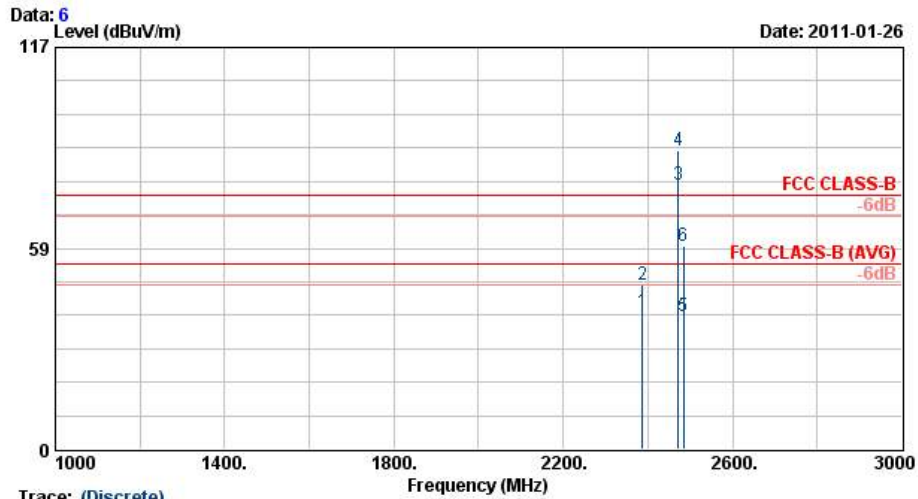


Trace: (Discrete)
 Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_I00824 VERTICAL
 Project : TR 000411-01

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2372.00	47.14	-26.86	74.00	42.83	32.16	5.99	33.84	119	69	Peak
2	2372.00	35.70	-18.30	54.00	31.39	32.16	5.99	33.84	119	69	Average
3 X	2467.00	85.06			80.55	32.26	6.14	33.89	119	69	Peak
4 X	2467.00	75.01			70.50	32.26	6.14	33.89	119	69	Average
5	2483.85	54.68	-19.32	74.00	50.12	32.28	6.18	33.90	119	69	Peak
6	2483.85	33.64	-20.36	54.00	29.08	32.28	6.18	33.90	119	69	Average



Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	13	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Horizontal
Remark :	2472 MHz is Fundamental Signals which can be ignored.		

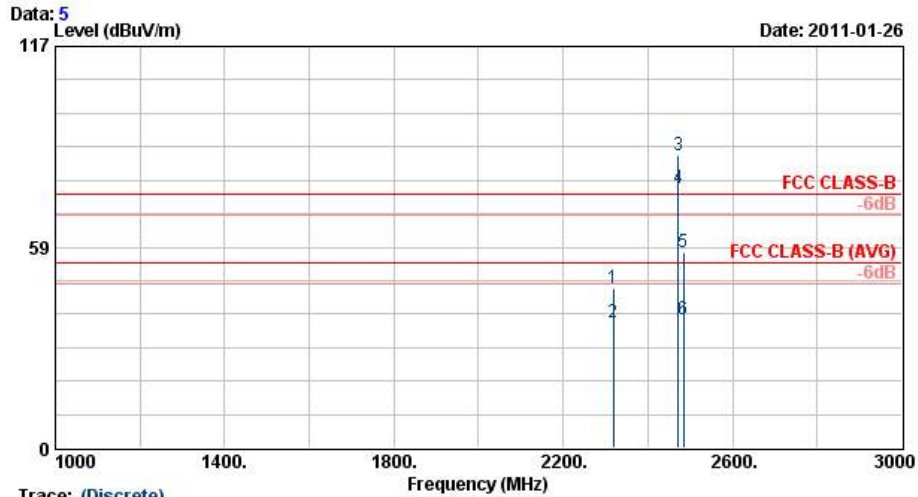


Site : 03CH07-HY
 Condition : FCC CLASS-B HF_ANT_100624 HORIZONTAL
 Project : TR 000411-01

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	2388.00	40.01	-13.99	54.00	35.66	32.18	6.03	33.85	100	327	Average
2	2388.00	48.04	-25.96	74.00	43.69	32.18	6.03	33.85	100	327	Peak
3 @	2472.00	77.10			72.57	32.28	6.14	33.89	100	327	Average
4 X	2472.00	86.91			82.38	32.28	6.14	33.89	100	327	Peak
5	2483.50	38.55	-15.45	54.00	33.99	32.28	6.18	33.90	100	327	Average
6	2483.50	59.13	-14.87	74.00	54.57	32.28	6.18	33.90	100	327	Peak



Test Mode :	Mode 4	Temperature :	23~24°C
Test Channel :	13	Relative Humidity :	50~54%
Test Engineer :	Cona Huang	Polarization :	Vertical
Remark :	2472 MHz is Fundamental Signals which can be ignored.		



Trace: (Discrete)
 Site : D3CH07-HY
 Condition : FCC CLASS-B HF_ANT_100824 VERTICAL
 Project : TR 000411-01

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Pos	Pos	Remark
			dB	dBuV/m	dBuV	dB	dB	cm	deg	
1	2318.00	46.55	-27.45	74.00	42.36	32.09	5.92	33.82	131	170 Peak
2	2318.00	36.56	-17.44	54.00	32.37	32.09	5.92	33.82	131	170 Average
3 X	2472.00	85.24			80.70	32.28	6.14	33.89	131	170 Peak
4 X	2472.00	75.57			71.04	32.28	6.14	33.89	131	170 Average
5	2483.50	57.02	-16.98	74.00	52.46	32.28	6.18	33.90	131	170 Peak
6	2483.50	37.25	-16.75	54.00	32.69	32.28	6.18	33.90	131	170 Average



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 31, 2010	Oct. 30, 2011	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP	101067	9KHz ~ 30GHz	Dec. 03, 2010	Dec. 02, 2011	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 19, 2010	Aug. 18, 2011	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Dec. 06, 2010	Dec. 05, 2011	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32 dB.GAIN	Mar. 27, 2010	Mar. 26, 2011	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Jul. 28, 2011	Radiation (03CH07-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (1GHz ~ 40GHz)

Contribution	Uncertainty of X_i		$u(X_i)$	C_i	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	±0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	±1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	±0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site Imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty $U_c(y)$	2.36				
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	4.72				