4.7. Band Edge Emissions Measurement

4.7.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.25 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.470-5.725 GHz band: all emissions outside of the 5.470-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz (78.3dBuV/m at 3m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). In addition, 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
Above 960	500	3

4.7.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1 MHz /1 MHz for Peak

4.7.3. Test Procedures

1. The test procedure is the same as section 4.6.3, only the frequency range investigated is limited to 100MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

4.7.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.6.4.

4.7.5. Test Deviation

There is no deviation with the original standard.

4.7.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.7.7. Test Result of Band Edge and Fundamental Emissions

Temperature	26℃	Humidity	56%
Test Engineer	Roy Huang	Configurations	Draft n MCS16 20MHz Ch 36, 40, 48 / Ant. B

Channel 36

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 @	5148.000	74.22	-0.08	74.30	36.73	33.04	0.00	4.44	PEAK	138	106	VERTICAL
2 @	5150.000	58.86	-1.14	60.00	21.38	33.04	0.00	4.44	AVERAGE	138	106	VERTICAL
3 @	5180.800	119.96			82.43	33.09	0.00	4.43	PEAK	138	106	VERTICAL
4 @	5182.600	106.85			69.32	33.09	0.00	4.43	AVERAGE	138	106	VERTICAL

Item 3, 4 are the fundamental frequency at 5180 MHz.

Channel 40

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 !	5150.000	59.69	-0.31	60.00	22.21	33.04	0.00	4.44	AVERAGE	264	112	VERTICAL
2 !	5150.000	72.51	-1.79	74.30	35.03	33.04	0.00	4.44	PEAK	264	112	VERTICAL
3 over	5196.800	114.27			76.72	33.12	0.00	4.43	AVERAGE	264	112	VERTICAL
4 over	5198.600	126.21			88.66	33.12	0.00	4.43	PEAK	264	112	VERTICAL

Item 3, 4 are the fundamental frequency at 5200 MHz.

Channel 48

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 over	5238.800	126.35			88.76	33.17	0.00	4.42	PEAK	269	110	VERTICAL
2 over	5241.600	114.52			76.90	33.20	0.00	4.42	AVERAGE	269	110	VERTICAL

Item 1, 2 are the fundamental frequency at 5240 MHz.

Temperature	26℃	Humidity	56%
Test Engineer	Roy Huang	Configurations	Draft n MCS16 20MHz Ch 36, 40, 48 / Ant. D

Channel 36

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 @	5150.000	58.33	-1.67	60.00	20.85	33.04	0.00	4.44	AVERAGE	338	100	VERTICAL
2 @	5150.000	75.72	-4.28	80.00	38.24	33.04	0.00	4.44	PEAK	338	100	VERTICAL
3 @	5180.600	123.44			85.91	33.09	0.00	4.43	PEAK	338	100	VERTICAL
4 @	5181.400	112.05			74.52	33.09	0.00	4.43	AVERAGE	338	100	VERTICAL

Item 3, 4 are the fundamental frequency at 5180 MHz.

Channel 40

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 @	5150.000	59.64	-0.36	60.00	22.16	33.04	0.00	4.44	AVERAGE	202	100	VERTICAL
2 @	5150.000	75.66	-4.34	80.00	38.18	33.04	0.00	4.44	PEAK	202	100	VERTICAL
3 @	5194.600	129.17			91.61	33.12	0.00	4.43	PEAK	202	100	VERTICAL
4 @	5199.200	116.86			79.32	33.12	0.00	4.43	AVERAGE	202	100	VERTICAL

Item 3, 4 are the fundamental frequency at 5200 MHz.

Channel 48

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg	
1 @	5235.200	121.36			80.96	33.82	6.58	0.00	PEAK	112	289	VERTICAL
2 over	5241.200	108.60			68.20	33.82	6.58	0.00	AVERAGE	112	289	VERTICAL

Item 1, 2 are the fundamental frequency at 5240 MHz.

Temperature	26℃	Humidity	56%
Test Engineer	Roy Huang	Configurations	Draft n MCS16 40MHz Ch 38, 46 / Ant. B

Channel 38

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 @	5150.000	58.90	-1.10	60.00	21.42	33.04	0.00	4.44	AVERAGE	140	100	VERTICAL
2 @	5150.000	73.12	-1.18	74.30	35.64	33.04	0.00	4.44	PEAK	140	100	VERTICAL
3 @	5180.800	100.78			63.25	33.09	0.00	4.43	AVERAGE	140	100	VERTICAL
4 @	5184.400	113.36			75.83	33.09	0.00	4.43	PEAK	140	100	VERTICAL

Item 3, 4 are the fundamental frequency at 5190 MHz.

Channel 46

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 !	5147.600	72.90	-1.40	74.30	35.42	33.04	0.00	4.44	PEAK	258	109	VERTICAL
2 !	5150.000	59.36	-0.64	60.00	21.88	33.04	0.00	4.44	AVERAGE	258	109	VERTICAL
3 over	5220.400	121.15			83.58	33.15	0.00	4.42	PEAK	258	109	VERTICAL
4 @	5221.600	108.62			71.05	33.15	0.00	4.42	AVERAGE	258	109	VERTICAL

Item 3, 4 are the fundamental frequency at 5230 MHz.

Temperature	26℃	Humidity	56%
Test Engineer	Roy Huang	Configurations	Draft n MCS16 40MHz Ch 38, 46 / Ant. D

Channel 38

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 @	5150.000	59.88	-0.12	60.00	22.39	33.04	0.00	4.44	AVERAGE	329	100	VERTICAL
2 @	5150.000	71.32	-8.68	80.00	33.84	33.04	0.00	4.44	PEAK	329	100	VERTICAL
3 @	5184.800	116.30			78.77	33.09	0.00	4.43	PEAK	329	100	VERTICAL
4 @	5198.400	104.58			67.03	33.12	0.00	4.43	AVERAGE	329	100	VERTICAL

Item 3, 4 are the fundamental frequency at 5190 MHz.

Channel 46

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Remark	Table Pos	Ant Pos	Pol/Phase
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		deg	cm	
1 @	5143.600	74.73	-5.27	80.00	37.24	33.04	0.00	4.45	PEAK	353	100	VERTICAL
2 @	5150.000	59.24	-0.76	60.00	21.75	33.04	0.00	4.44	AVERAGE	353	100	VERTICAL
3 @	5215.600	111.10			73.52	33.15	0.00	4.43	AVERAGE	353	100	VERTICAL
4 @	5226.400	122.92			85.32	33.17	0.00	4.42	PEAK	353	100	VERTICAL

Item 3, 4 are the fundamental frequency at 5230 MHz.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

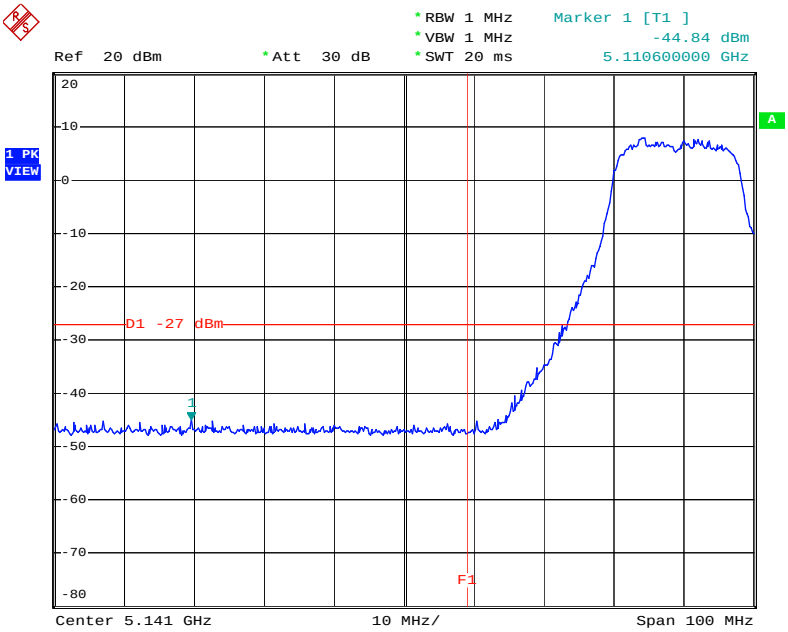
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

The limits above 5GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

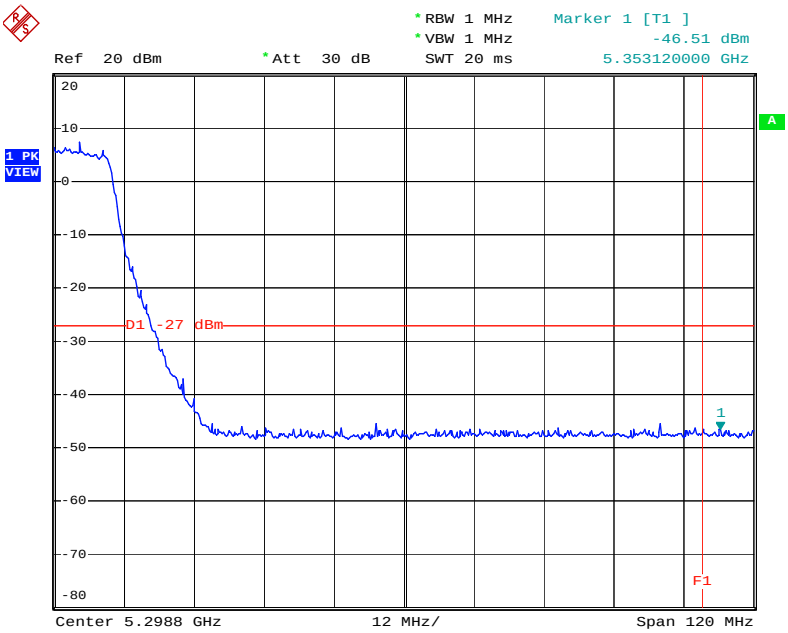
Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

EIRP Emission in Band on Configuration Draft n MCS16 20MHz Ant. A-1+Ant. A-2+Ant. A-3 / 5180 MHz



Date: 15.FEB.2008 12:59:25

EIRP Emission in Band on Configuration Draft n MCS16 20MHz Ant. A-1+Ant. A-2+Ant. A-3 / 5240 MHz



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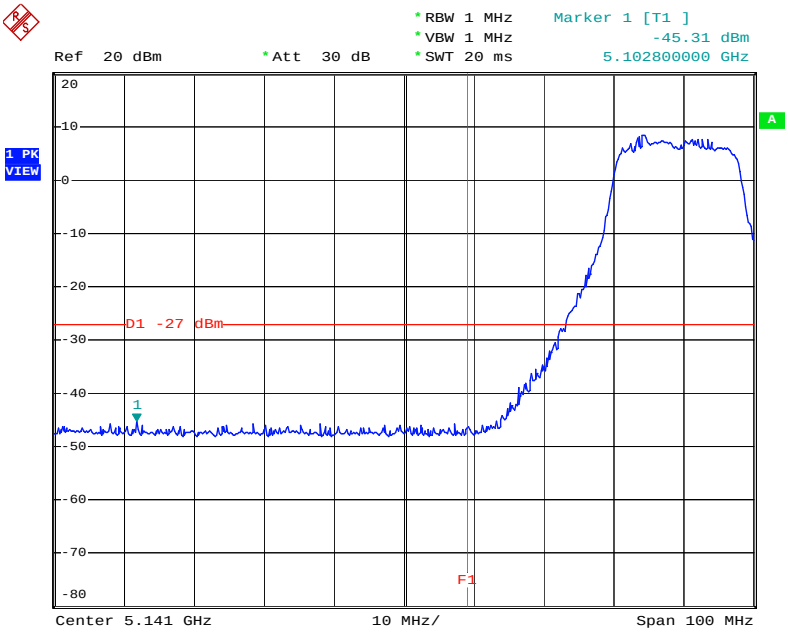
EIRP Emission in Band on Configuration Draft n MCS16 20MHz Ant. D-1+Ant. D-2+Ant. D-3 / 5180 MHz



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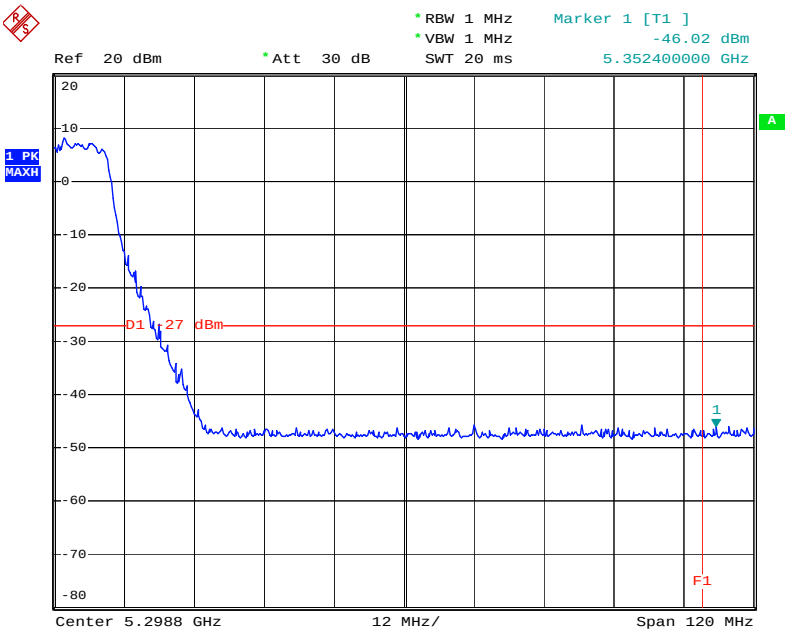
EIRP Emission in Band on Configuration Draft n MCS16 20MHz Ant. D-1+Ant. D-2+Ant. D-3 / 5240 MHz



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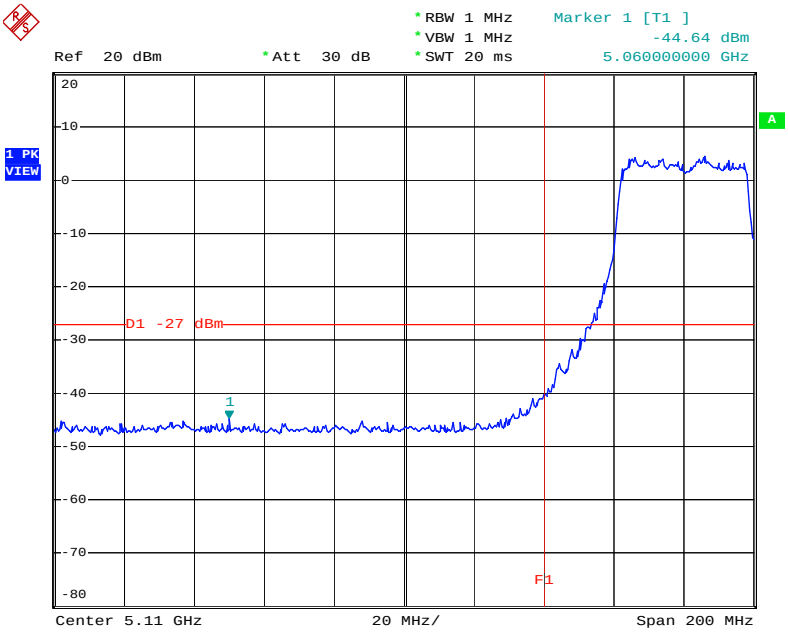
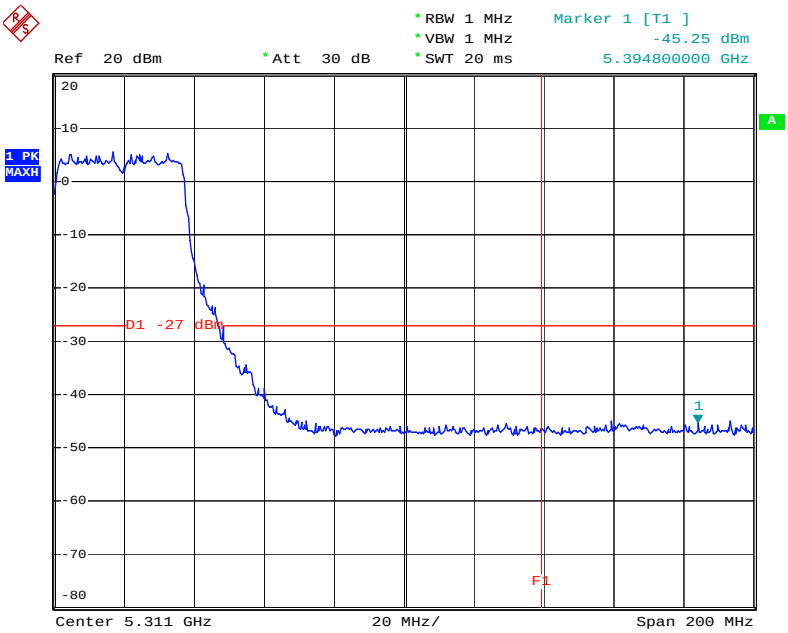
EIRP Emission in Band on Configuration Draft n MCS16 40MHz Ant. A-1+Ant. A-2+Ant. A-3 / 5190 MHz



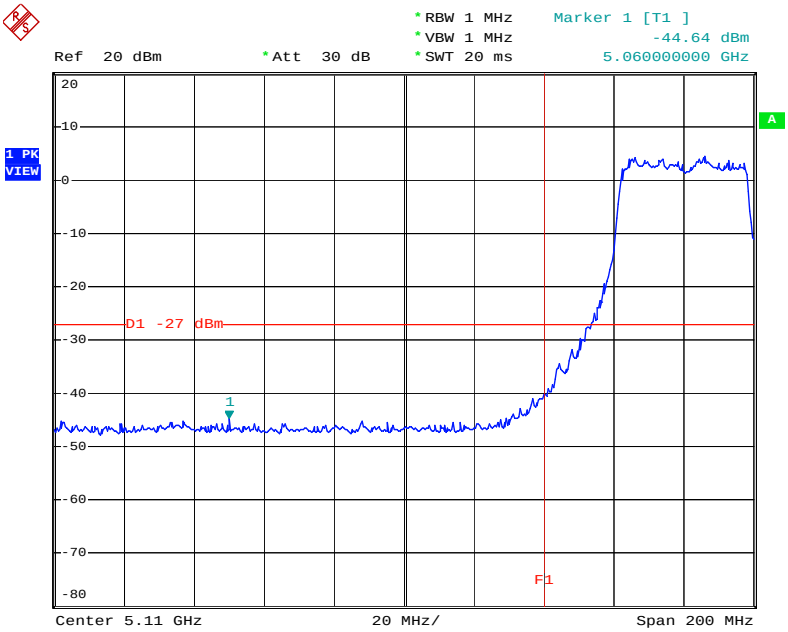
Date: 15.FEB.2008 11:59:30

EIRP Emission in Band on Configuration Draft n MCS16 40MHz Ant. A-1+Ant. A-2+Ant. A-3 / 5230 MHz



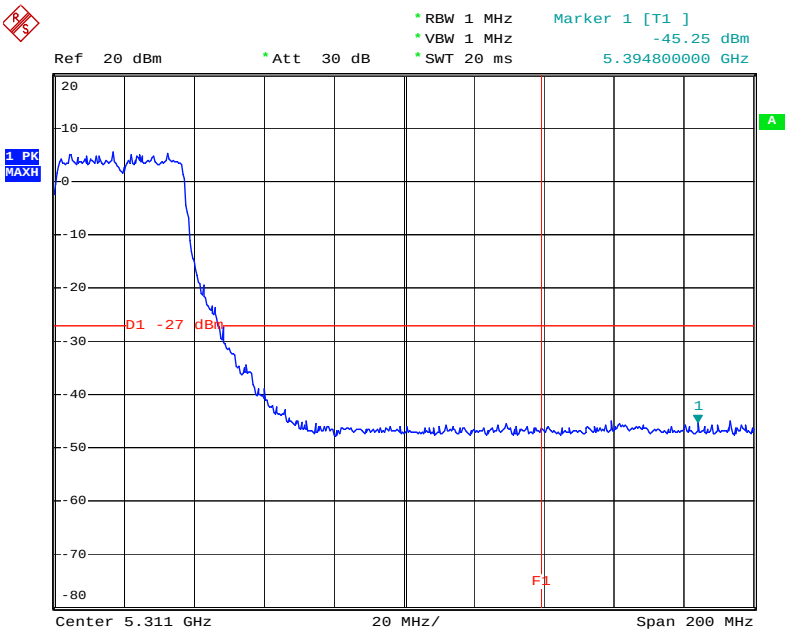
Date: 29.FEB.2008 09:22:06

EIRP Emission in Band on Configuration Draft n MCS16 40MHz Ant. D-1+Ant. D-2+Ant. D-3 / 5190 MHz



Date: 15.FEB.2008 11:59:30

EIRP Emission in Band on Configuration Draft n MCS16 40MHz Ant. D-1+Ant. D-2+Ant. D-3 / 5230 MHz



Date: 29.FEB.2008 09:22:06

4.8. Frequency Stability Measurement

4.8.1. Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emissions is maintained within the band of operation under all conditions of normal operation as specified in the user's manual or ±20ppm (Draft n specification).

4.8.2. Measuring Instruments and Setting

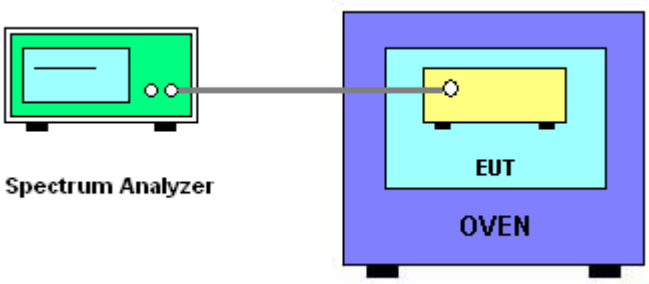
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RB	10 kHz
VB	10 kHz
Sweep Time	Auto

4.8.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyser.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (Draft n specification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is -30°C~50°C.
8. Measuring multiple antennas, the connector is required to link with spectrum analyser through a combiner.

4.8.4. Test Setup Layout



4.8.5. Test Deviation

There is no deviation with the original standard.

4.8.6. EUT Operation during Test

The EUT was programmed to be in continuously un-modulation transmitting mode.

4.8.7. Test Result of Frequency Stability

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	**5200**
126.50	5200.015600
110.00	5200.021300
93.50	5200.025500
Max. Deviation (MHz)	**0.025500**
Max. Deviation (ppm)	**4.90**

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(℃)	**5200**
-30	5200.063200
-20	5200.035600
-10	5200.019800
0	5200.010600
10	5200.008500
20	5199.995500
30	5199.982300
40	5199.967400
50	5199.935800
Max. Deviation (MHz)	**0.064200**
Max. Deviation (ppm)	**12.35**

4.9. Antenna Requirements

4.9.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.9.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Mar. 03, 2007	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99079	9kHz – 30MHz	Mar. 31, 2007	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Mar. 22, 2007	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2007	Conduction (CO04-HY)
ISN	SCHAFFNER	ISN T400	21653	9kHz –30MHz	Mar. 27, 2007	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 14, 2007	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	COA9231A	18667	9 kHz - 2 GHz	Jan. 14, 2008	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	Jun. 07, 2007	Radiation (03CH03-HY)
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5 GHz - 40 GHz	Jan. 22, 2007*	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100305	9 kHz - 40 GHz	Sep. 27, 2007	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	May 23, 2006*	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz – 1 GHz	Jul. 21, 2007	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	May 04, 2007	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	Jan. 18, 2008	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Dec. 03, 2007	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec. 03, 2007	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 – 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP30	100023	9kHz ~ 30GHz	Jan. 10, 2008	Conducted (TH01-HY)
Power Meter	R&S	NRVS	100444	DC ~ 40GHz	Jun. 27, 2007	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z51	100458	DC ~ 30GHz	Jun. 27, 2007	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Jun. 27, 2007	Conducted (TH01-HY)
AC Power Source	HPC	HPB-500W	HPB-9100024	AC 0 ~ 300V	May 04, 2007*	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Mar. 03, 2007	Conducted (TH01-HY)
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Jan. 14, 2008	Conducted (TH01-HY)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Jan. 04, 2008	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Jan. 04, 2008	Conducted (TH01-HY)
Vector Signal Generator	R&S	SMU200A	102098	100kHz ~ 6GHz	Nov. 14, 2007	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Mar. 07, 2007	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year.

* Calibration Interval of instruments listed above is two year.

NCR means Non-Calibration required.

6. TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	:	886-2-2696-2468
	FAX	:	886-2-2696-2255
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	:	886-3-327-3456
	FAX	:	886-3-318-0055
LINKOU	ADD	:	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	:	886-2-2601-1640
	FAX	:	886-2-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	886-2-2631-4739
	FAX	:	886-2-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	:	886-2-2794-8886
	FAX	:	886-2-2794-9777
JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
	TEL	:	886-3-656-9065
	FAX	:	886-3-656-9085

7. TAF CERTIFICATE OF ACCREDITATION

Certificate No. : L1190-070110

財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	:	ISO/IEC 17025:2005
Accreditation Number	:	1190
Originally Accredited	:	December 15, 2003
Effective Period	:	January 10, 2007 to January 09, 2010
Accredited Scope	:	Testing Field, see described in the Appendix
Specific Accreditation Program	:	Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory

Jay-San Chen
President, Taiwan Accreditation Foundation
Date : January 10, 2007

P1, total 9 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when used without the Appendix.