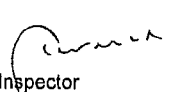
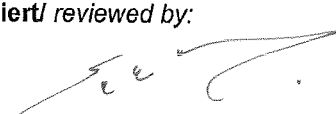


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Auftraggeber: <i>Client:</i>		Kaga Electronics Co.,Ltd 2-2-9,Hongo,Bunkyo-Ku, Tokyo 113-8504 Japan	
Gegenstand der Prüfung: <i>Test item:</i>		Zigbee Module	
Bezeichnung: <i>Identification:</i>	KM-154A	Serien-Nr.: <i>Serial No.:</i>	DEMO001 and DEMO002
Wareneingangs-Nr.: <i>Receipt No.:</i>	213088043-1	Eingangsdatum: <i>Date of receipt:</i>	13-03-2009
Prüfört: <i>Testing location:</i>	4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan		
Prüfgrundlage: 47 CFR Part 15, Subpart C, Section 15.247 (October 1, 2008) <i>Test specification:</i> ANSI C63.4-2003 Measurement of Digital Transmission Systems Operating under Section 15.247 (March 23, 2005) RSS-210 (Issue 7): 2007 RSS-Gen (Issue 2): 2007			
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). The test item passed the test specification(s).		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland Japan Ltd. - Global Technology Assessment Center 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan		
geprüft/ tested by:		kontrolliert/ reviewed by:	
2009-07-13 Terrence Cheung / Inspector 		2009-07-13 Sehb Rachid / Reviewer 	
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
Sonstiges / Other Aspects:			
Abkürzungen: P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet			
Abbreviations: P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested			
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

TEST SUMMARY

3.2.1 VOLTAGE REQUIREMENTS, FCC 15.31(E)

RESULT: PASS

3.2.2 ANTENNA REQUIREMENTS, FCC 15.203, FCC 15.204 AND RSS-GEN 7.1.4

RESULT: PASS

5.1.1 CONDUCTED OUTPUT POWER, FCC 15.247(B)(3) AND RSS-210 A8.4(4)

RESULT: PASS

5.1.2 6dB BANDWIDTH, FCC 15.247(A)(2) AND RSS-210 A8.2(A)

RESULT: PASS

5.1.3 99% BANDWIDTH, RSS-GEN 4.6.1

RESULT: N/A

5.1.4 CONDUCTED SPURIOUS EMISSION, FCC 15.247(D) AND RSS-210 A8.5

RESULT: PASS

5.1.5 PEAK POWER SPECTRAL DENSITY, FCC 15.247(E) AND RSS-210 A8.2(B)

RESULT: PASS

6.1.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER, FCC 15.207 AND RSS-GEN 7.2.2

RESULT: PASS

6.2.1 AC POWER LINE CONDUCTED EMISSION OF RECEIVER, FCC 15.107 AND RSS-GEN 7.2.2

RESULT: PASS

7.1.1 BAND EDGE RADIATED EMISSION, FCC 15.247(D) AND RSS-210 2.2

RESULT: Pass

7.1.2 OUT-OF-BAND AND SPURIOUS EMISSION OF TRANSMITTER, FCC 15.247(D), FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-210 A8.5 AND RSS-GEN 7.2.1

RESULT: PASS

7.2.1 RADIATED SPURIOUS EMISSION OF RECEIVER, FCC 15.109, RSS-210 2.2, RSS-210 2.6, RSS-210 A8.5, RSS-GEN 7.2.3.2

RESULT: PASS

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1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report.

2. Test Sites

2.1 Test Facilities

TÜV Rheinland Japan Ltd. - Global Technology Assessment Center
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The Federal Communications Commission has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance with the requirements of section 2.948 of the FCC rules. The description of the test facility is listed under FCC registration number 299054.

The Industry Canada has reviewed the technical characteristics of the radiated and conducted emission facility, and has found these test facilities to be in compliance. The description of the test facility is listed under OATS filing number 3466B.

The test facility is accredited by VLAC (member of ILAC) under number VLAC-017 according to ISO/IEC 17025:2005. TÜV Rheinland Japan Ltd. is accredited by the Federal Communications Commission as a Conformity Assessment Body under Designation Number JP0017 and Test Firm Registration Number 386498.

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2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
For Antenna Port Conducted Emission					
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2010-01
Spectrum Analyzer	Rohde & Schwarz	FSP 30	10006/030	BT-8017	2009-08
RF Power Meter	Agilent	N1911A	MY451017 37	BT-8226	2009-10
RF Peak Power Sensor	Agilent	N1921A	MY452422 28	BT-8227	2009-10
For AC Power Line Conducted Emission					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2010-02
LISN	Rohde & Schwarz	ENV216	100276	RF-0016	2010-05
LISN	Schwarzbeck Mess-Elektronik	NSLK 8128 (4X32/50A)	8128-239	RF-0017	2010-05
For Radiated Emission					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2010-02
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2010-01
RF Selector (10m)	Toyo Corporation	NS4900	0703-182	RF-0029	2010-05
3dB Attenuator 50Ohm	Tamagawa Electronics Co., Ltd.	CFA-01	-	RF-0265	2010-05
Low Noise Pre-Amplifier	TSJ	MLA-10K01- B01-35	1370750	RF-0253	2010-05
Microwave Pre-Amplifier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	2009-12
Band Reject Filter	Nitsuki	NF-49BT	027	RF-0131	2009-12
Loop Antenna with power supply, 9kHz-30MHz	Rohde & Schwarz	HFH2-Z2	100139	RF-0048	2010-03
Trilog Antenna, 30-1000MHz	Schwarzbeck	VULB9168	0245	RF-0019	2010-05
Horn Antenna, 1-10GHz	Schwarzbeck	BBHA9120B	419	RF-0050	2010-05
Horn Antenna with Pre-Amplifier, 2-18GHz	Toyo Corporation	HAP06-18W	00000025	RF-0065	2010-05
Horn Antenna with Pre-Amplifier, 18-26.5GHz	Toyo Corporation	HAP18-26N	00000010	RF-0070	2010-05
SMA Amplifier	Toyo Corporation	HAP2640-S	-	RF-0258	2010-02
Constant Voltage Constant Frequency Stabilizers					
CVCF (Shielded Room)	NF Corporation	ESU2000S	9075612	RF-0210	N/A
CVCF Booster (Shielded Room)	NF Corporation	ESU2000B	9074403	RF-0211	N/A

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Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
CVCF (10m chamber)	NF Corporation	ESU2000S	9067307	RF-0212	N/A
CVCF Booster (10m chamber)	NF Corporation	ESU2000B	9074408	RF-0213	N/A
CVCF (Pulse Test lab)	NF Corporation	ESU2000U	9067195	RF-0122	N/A
CVCF Booster (Pulse Test lab)	NF Corporation	ESU2000B	9072108	RF-0121	N/A

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
AC Power Line Conducted Emission	150kHz - 30MHz	±2.0dB
Antenna Port Conducted Emission	< 1GHz	±0.39dB
	> 1GHz	±0.68dB
Radiated Emission	30MHz - 1GHz	±3.9dB
	> 1GHz	±5.2dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a Zigbee module. It communicates operating information within 2405-2480MHz.

3.2 System Details

Radio standard:	IEEE 802.15.4
Specified output power:	5.90dBm
Antenna gain:	-2.0dBi and 3dBi
Antenna type:	Chip and Dipole antenna
Antenna mounting type:	Internal and External
Frequency range:	2405-2480MHz
Number of channels:	16
Channel spacing:	5MHz
Modulation type:	QPSK
FCC classification:	DTS
Emission designator:	G1D
Rated voltage:	2.7 - 3.6V
Rated current:	43mA
Protection class:	III
Test voltage:	3.3V

3.2.1 Voltage Requirements, FCC 15.31(e)

RESULT:**PASS**

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the power supply requirements.

3.2.2 Antenna Requirements, FCC 15.203, FCC 15.204 and RSS-Gen 7.1.4

RESULT:**PASS**

The EUT has an internal antenna which is not user accessible. The external antenna is using a custom connector. Hence it complies with the requirements.

3.3 Clock Frequencies

The highest clock frequency generated by the EUT is 16 MHz.

3.4 Independent Operation Modes

The EUT was tested on a stand-alone basis (only attached to the test jig).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4:2003. Testing was performed at the lowest operating frequency (2405MHz), at the operating frequency in the middle of the specified frequency band (2440MHz) and at the highest operating frequency (2480MHz). The product has two configurations available, chip antenna onboard and external antenna. The internal antenna required a matching circuit on the RF path (see schematic). The two configurations have been tested as shown below

The basic operation for internal antenna modes are:

- A.1 EUT transmits at lowest Channel (2405 MHz)
- B.1 EUT transmits at middle Channel (2440 MHz)
- C.1 EUT transmits at highest Channel (2480 MHz)
- D.1 EUT receives packets with 802.15.4 radio

The basic operation for external antenna modes are:

- A.2 EUT transmits at lowest Channel (2405 MHz)
- B.2 EUT transmits at middle Channel (2440 MHz)
- C.2 EUT transmits at highest Channel (2480 MHz)
- D.2 EUT receives packets with 802.15.4 radio

3.5 Noise Suppressing Parts

Refer to schematic and block diagram.

4. Test Set-up and Operation Modes

4.1 Test Methodology

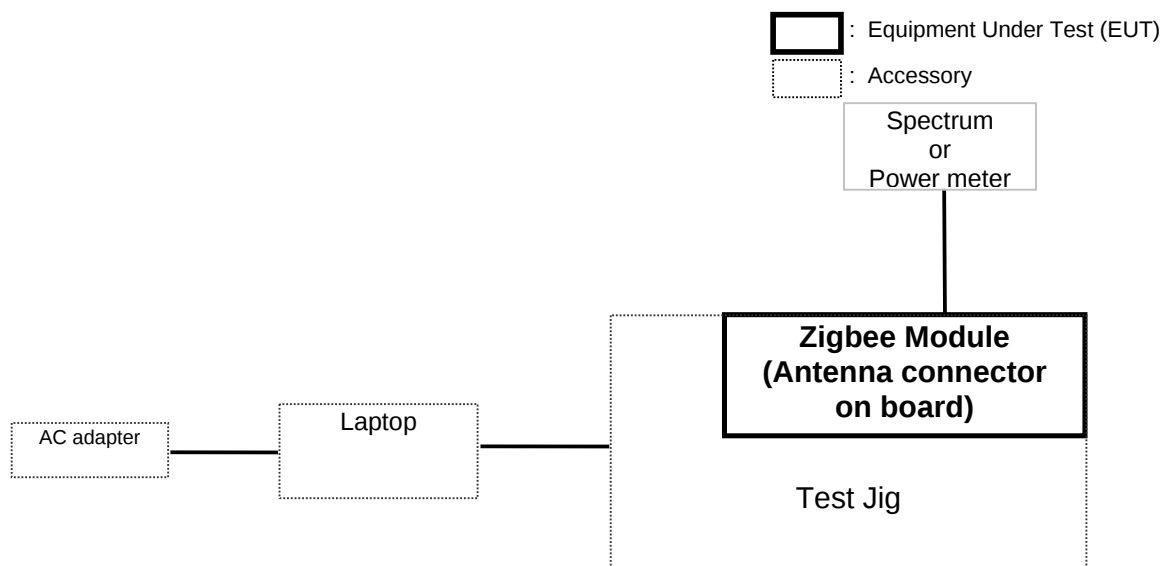
The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.209 and Measurement of Digital Transmission Systems Operating under Section 15.247.

The test methods, which have been used, are based on ANSI C63.4-2003 and RSS-Gen (Issue 2).

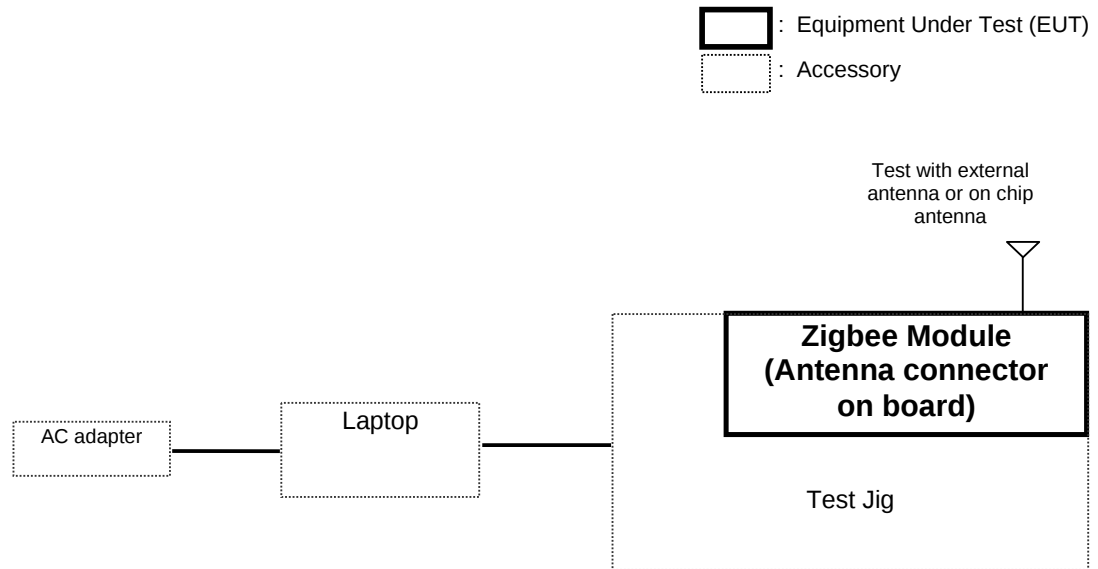
For details, see under each test item.

4.2 Physical Configuration for Testing

Figure 1: Test setup of Conducted radio testing



Remark: All AC input power ports of accessories are not shown.

Figure 2: Test setup of Conducted emission and Radiated Emission testing

Remark: All AC input power ports of accessories are not shown.
For more details, refer to section: Photographs of the Test Set-Up.

4.3 Test Operation and Test Software

A firmware was running on the laptop computer connected to the EUT. It was used to enable the test operation modes listed in section 3.4 as appropriate.

4.4 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Product: Test Jig
Manufacturer: N/A
Model: N/A
Rated Voltage: DC 5V
Serial Number: 0001
2. Product: Laptop Computer
Manufacturer: Hewlett Packard
Model: Compaq nx9040
Rated Voltage: DC 18.5V
Input Current: 3.5A
Serial Number: CNF5031T7C
3. Product: AC adapter for laptop
Manufacturer: Hewlett Packard
Model: 5105138506
Rated Voltage: AC 100-240V
Input Current: 1.6A
Frequency: 50/60Hz
Serial Number: 557640DLLR88TV
4. Product: Ethernet Hub
Manufacturer: Buffalo
Model: LSW3-GT-5N5(D1)
Rated Voltage: AC 100V
Input Power: 5W
Serial Number: 16485784211186
5. Product: AC adapter (for conducted emission)
Manufacturer: ELPA
Model: ACD-030
Rated Voltage: AC 100-240V
Input Current: 0.12A
Frequency: 50/60Hz
Serial Number: 0749
6. Product: Mouse
Manufacturer: Dell
Model: MP58UC
Rated voltage: USB
Input current: -
Serial number: G0601Z20

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4.5 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

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5. Test Results of Conducted Measurements at Antenna Port

For conducted tests, the antenna port was used the external and internal antenna configuration.

5.1.1 Conducted Output Power, FCC 15.247(b)(3) and RSS-210 A8.4(4)

RESULT:
PASS

Date of testing: 2009-06-18

Ambient temperature: 26°C

Relative humidity: 65%

Atmospheric pressure: 1012hPa

Requirements:

For systems using digital modulation in the 2400-2483.5MHz band, the maximum peak output power is 1W (30dBm).

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.8 and Measurement of Digital Transmission Systems Operating under Section 15.247.

The maximum peak output power (conducted) was measured at the antenna connector with a power meter. The final measurement takes into account the loss generated by all the involved cables.

Table 3: Conducted Output Power for internal antenna configuration

Frequency [MHz]	Reading dBm	Cable Loss dB	Output Power dBm	Output Power mW	Limit dBm	Limit mW	Margin dB
Lo (2405MHz)	5.18	0.72	5.90	3.89	30.00	1000	24.10
Mid (2440MHz)	5.00	0.78	5.78	3.78	30.00	1000	24.22
Hi (2480MHz)	-14.92	0.79	-14.13	0.04	30.00	1000	44.13

Notes: Output power = Reading + Correction factor

Correction factor = Total cable loss

mW = $10^{(dBm/10)}$

dBm = $10 \times \log(mW)$

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Table 4: Conducted Output Power for external antenna configuration

Frequency [MHz]	Reading dBm	Cable Loss dB	Output Power dBm	Output Power mW	Limit dBm	Limit mW	Margin dB
Lo (2405MHz)	4.87	0.72	5.59	3.62	30.00	1000	24.41
Mid (2440MHz)	4.91	0.78	5.69	3.71	30.00	1000	24.31
Hi (2480MHz)	-14.35	0.79	-13.56	0.04	30.00	1000	43.56

Notes: Output power = Reading + Correction factor

Correction factor = Total cable loss

mW = $10^{(dBm/10)}$

dBm = $10 \times \log(mW)$

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5.1.2 6dB Bandwidth, FCC 15.247(a)(2) and RSS-210 A8.2(a)**RESULT:****PASS**

Date of testing: 2009-06-18

Ambient temperature: 26°C

Relative humidity: 65%

Atmospheric pressure: 1012hPa

Requirements:

For systems using digital modulation in the 2400-2483.5MHz band, the minimum 6dB bandwidth shall be at least 500kHz.

Test procedure:

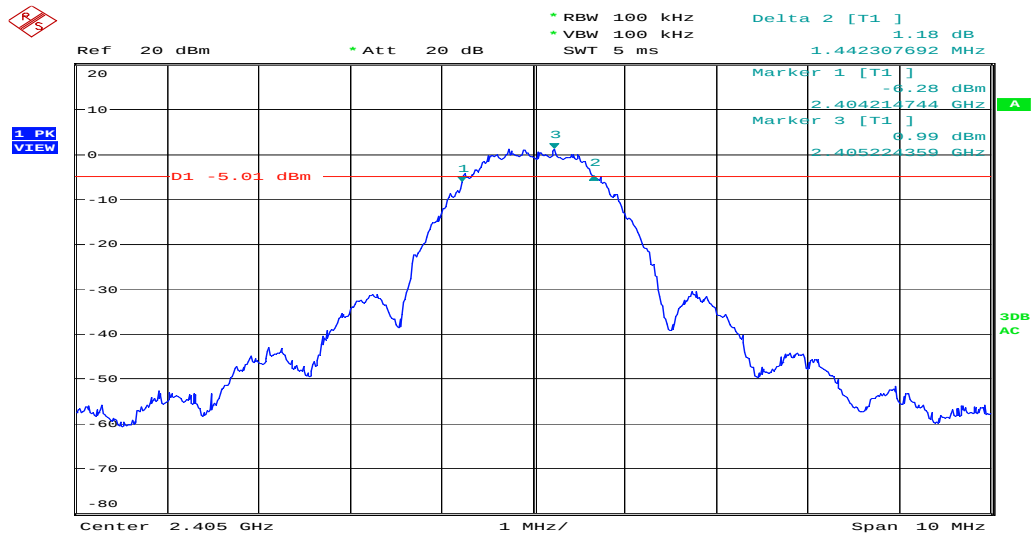
ANSI C63.4-2003, RSS-Gen 4.6.2 and Measurement of Digital Transmission Systems Operating under Section 15.247.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 100kHz and the span to 10MHz.

Table 5: 6dB Bandwidth for internal antenna configuration

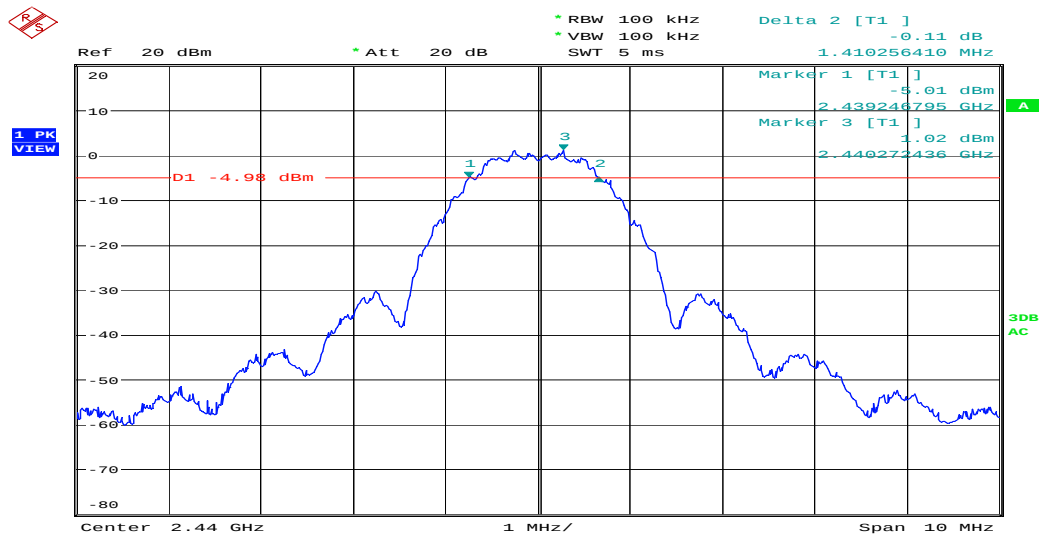
Operating Frequency [MHz]	6dB Bandwidth [MHz]	Minimum Limit [kHz]
2405	1.44	500
2440	1.41	500
2480	1.44	500

Figure 3: 6dB Bandwidth, Mode A1 (2405MHz)



6dB bandwidth, mode A
Date: 18.JUN.2009 14:07:49

Figure 4: 6dB Bandwidth, Mode B1 (2440MHz)



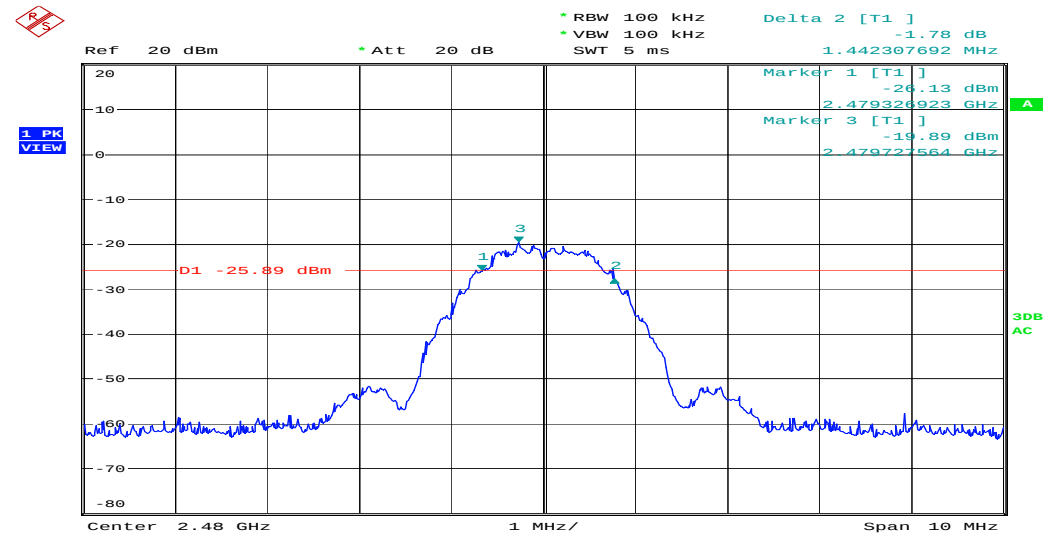
6dB bandwidth, mode B
Date: 18.JUN.2009 14:13:52

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Figure 5: 6dB Bandwidth, Mode C1 (2480MHz)



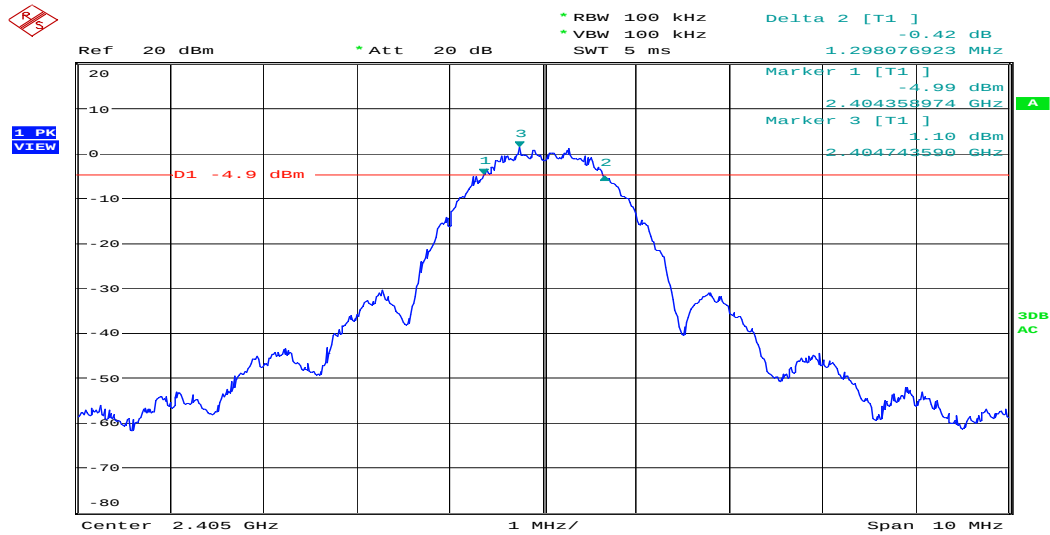
6dB bandwidth, mode C
Date: 18.JUN.2009 14:16:56

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Table 6: 6dB Bandwidth for external antenna configuration

Operating Frequency [MHz]	6dB Bandwidth [MHz]	Minimum Limit [kHz]
2405	1.30	500
2440	1.52	500
2480	1.39	500

Figure 6: 6dB Bandwidth, Mode A2 (2405MHz)

 6dB bandwidth, mode A
 Date: 18.JUN.2009 14:27:33

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Figure 7: 6dB Bandwidth, Mode B2 (2440MHz)

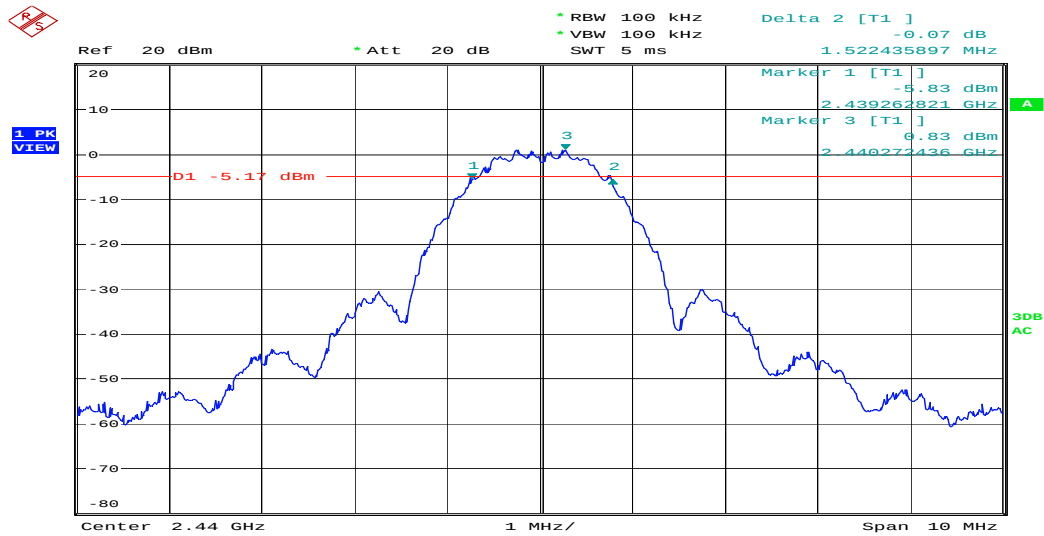
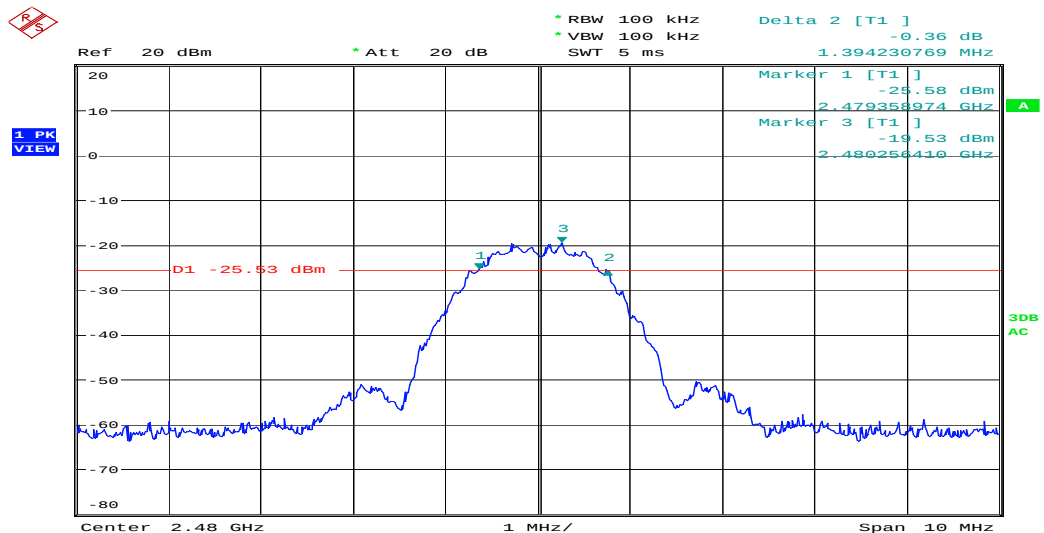
6dB bandwidth, mode B
Date: 18.JUN.2009 14:29:48

Figure 8: 6dB Bandwidth, Mode C2 (2480MHz)

6dB bandwidth, mode C
Date: 18.JUN.2009 14:31:38

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5.1.3 99% Bandwidth, RSS-Gen 4.6.1

RESULT:

N/A

Date of testing: 2009-06-18

Ambient temperature: 26°C

Relative humidity: 65%

Atmospheric pressure: 1012hPa

Requirements:

The 99% bandwidth shall be reported according to RSS-Gen 4.6.1.

Test procedure:

RSS-Gen 4.6.1

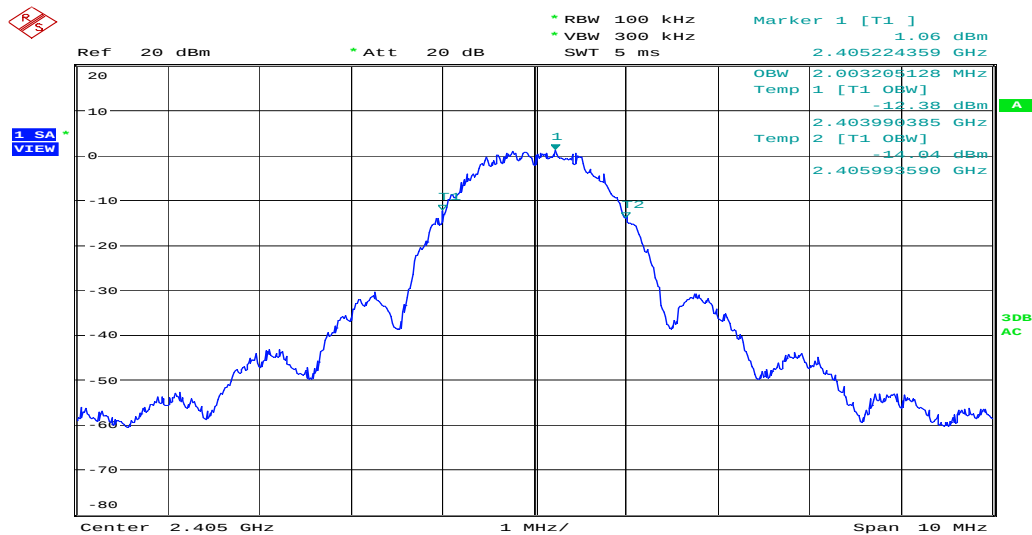
A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 1% of the span (10MHz). The 99% bandwidth was measured by using the OBW function of the analyzer with a 99% coverage setting.

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Table 7: 99% Bandwidth, internal antenna configuration

Operating Frequency [MHz]	99% Bandwidth [MHz]
2405	2.00
2440	2.02
2480	2.02

Figure 9: 99% Bandwidth, Mode A1 (2405MHz)

 99% bandwidth, mode A
 Date: 18.JUN.2009 14:46:10

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Figure 10: 99% Bandwidth, Mode B1 (2440MHz)

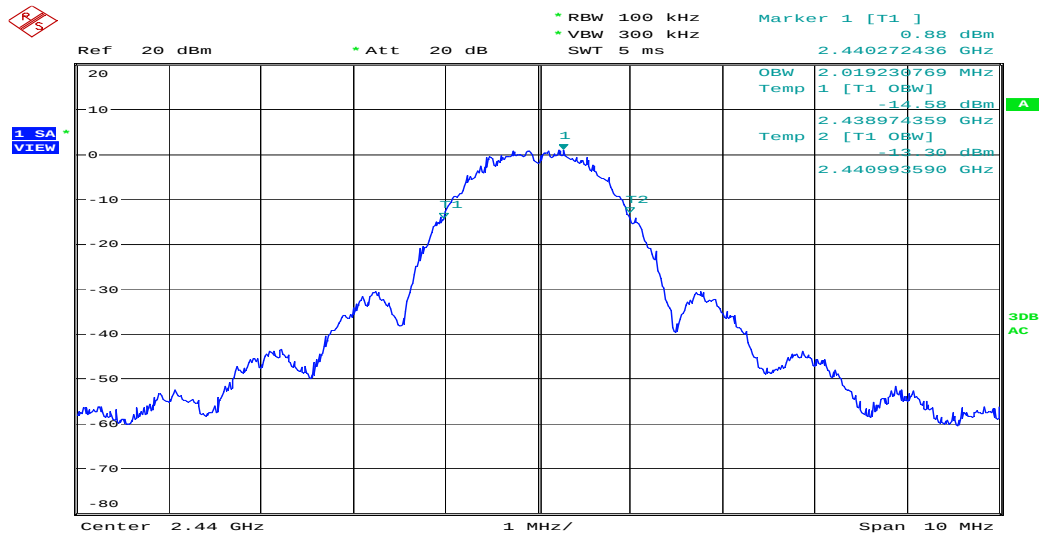
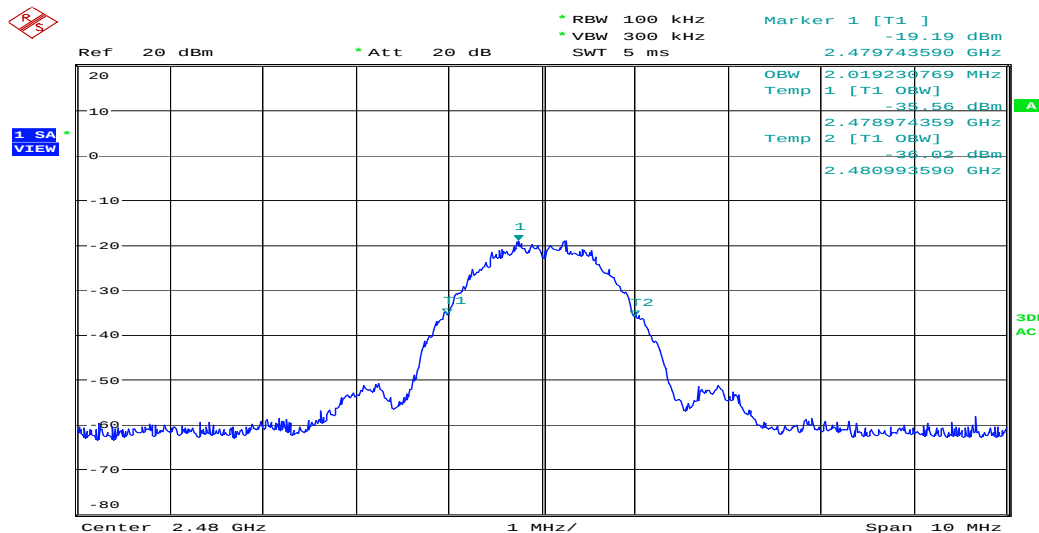
99% bandwidth, mode B
Date: 18.JUN.2009 14:45:08

Figure 11: 99% Bandwidth, Mode C1 (2480MHz)

99% bandwidth, mode C
Date: 18.JUN.2009 14:44:13

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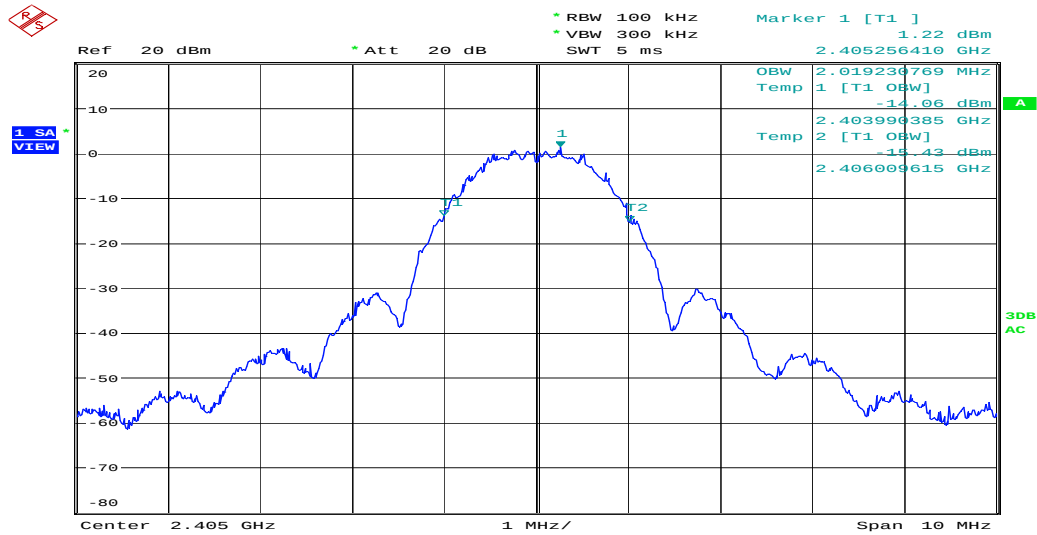
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Table 8: 99% Bandwidth, external antenna configuration

Operating Frequency [MHz]	99% Bandwidth [MHz]
2405	2.02
2440	2.02
2480	2.00

Figure 12: 99% Bandwidth, Mode A2 (2405MHz)



99% bandwidth, mode A
Date: 18.JUN.2009 14:39:01

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Figure 13: 99% Bandwidth, Mode B2 (2440MHz)

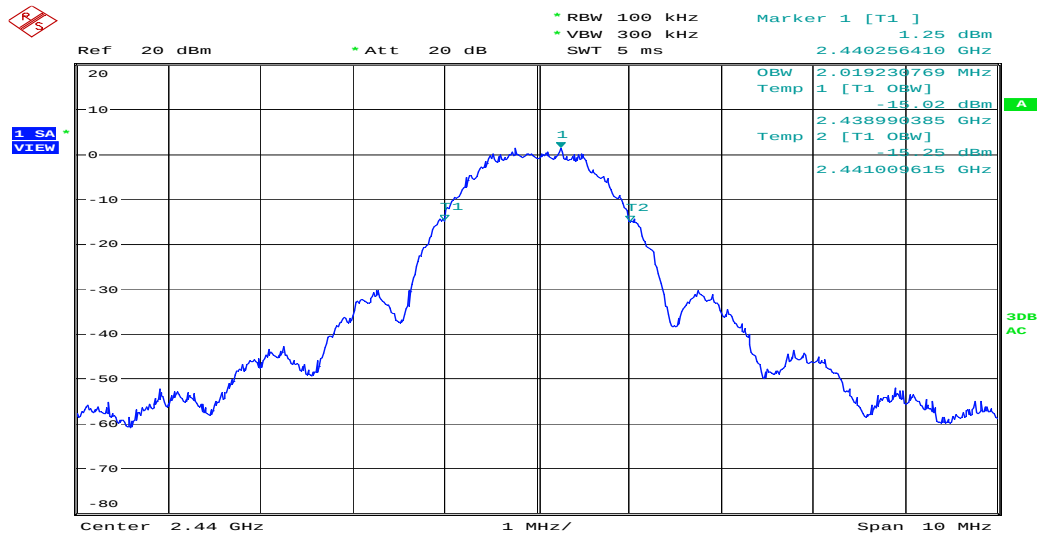
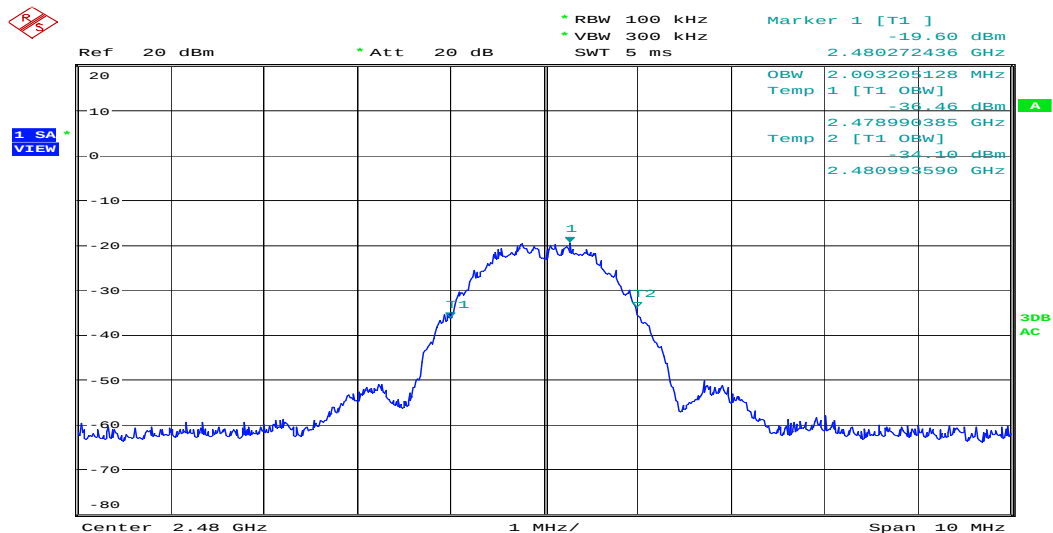
99% bandwidth, mode B
Date: 18.JUN.2009 14:40:27

Figure 14: 99% Bandwidth, Mode C2 (2480MHz)

99% bandwidth, mode C
Date: 18.JUN.2009 14:41:13

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5.1.4 Conducted Spurious Emission, FCC 15.247(d) and RSS-210 A8.5

RESULT:
PASS

Date of testing: 2009-06-18

Ambient temperature: 26°C

Relative humidity: 65%

Atmospheric pressure: 1012hPa

Requirements:

In any 100kHz bandwidth outside the frequency band, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.9 and Measurement of Digital Transmission Systems Operating under Section 15.247.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 100kHz. For each channel investigated, the in-band and out-of-band emission measurements were performed. The out-of-band emissions were measured from 30MHz to 25GHz (10th harmonics).

The final measurement takes into account the loss generated by all the involved cables.

Table 9: Conducted Spurious Emission, Mode A1 (2405MHz)

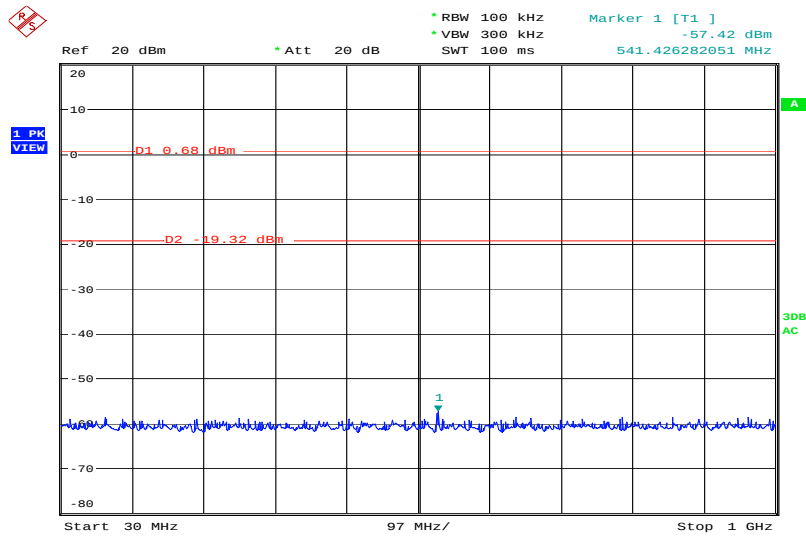
Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
Fundamental	0.68	1.26	1.94	N/A	N/A
541.43	-57.42	0.93	-56.49	-18.06	38.43
2884.62	-46.26	1.35	-44.91	-18.06	26.85
3365.85	-46.67	1.44	-45.23	-18.06	27.17
4814.03	-53.25	1.56	-51.69	-18.06	33.63
9366.99	-57.49	1.93	-55.56	-18.06	37.50
14086.54	-57.94	2.07	-55.87	-18.06	37.81
20600.96	-57.97	2.31	-55.66	-18.06	37.60

Notes: Limit = Reading of fundamental + Correction factor – 20dB

Emission level = Reading + Correction factor

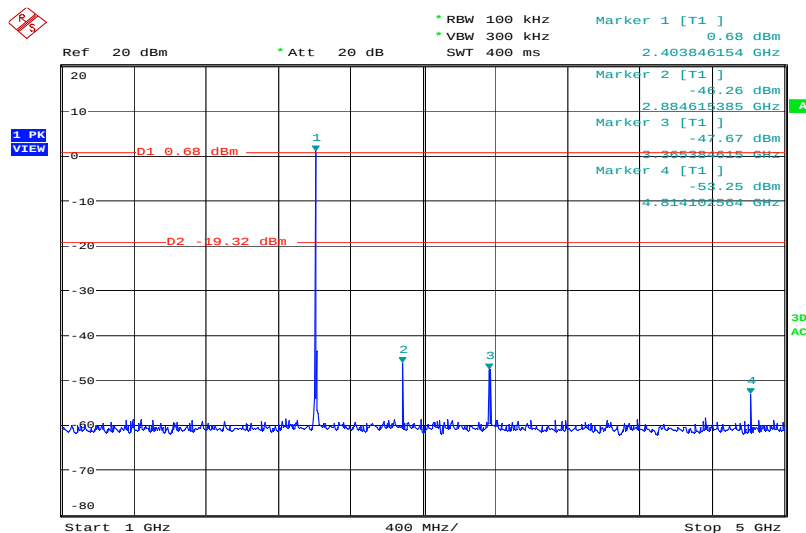
Correction factor = Total cable loss

Figure 15: Spurious Emission from 30MHz to 1GHz, Mode A1 (2405MHz)



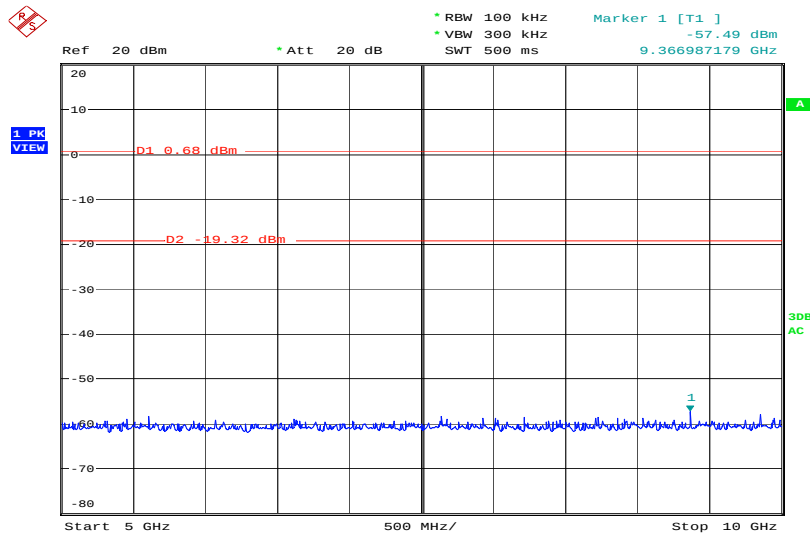
Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 17:06:33

Figure 16: Spurious Emission from 1 to 5GHz, Mode A1 (2405MHz)



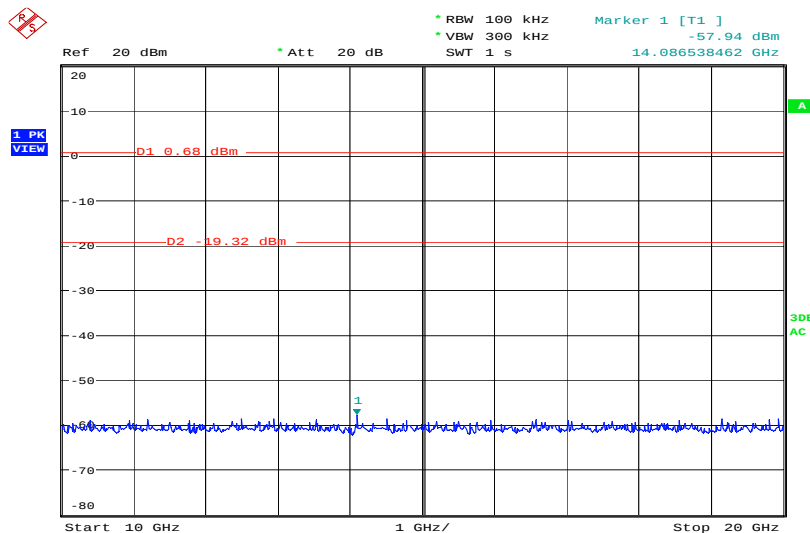
Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 16:58:44

Figure 17: Spurious Emission from 5 to 10GHz, Mode A1 (2405MHz)



Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 17:08:27

Figure 18: Spurious Emission from 10 to 20GHz, Mode A1 (2405MHz)



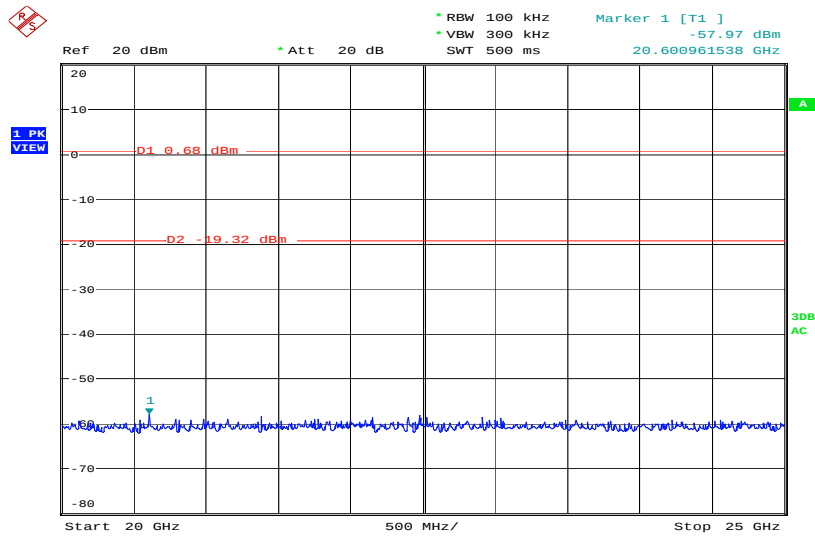
Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 17:08:59

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Figure 19: Spurious Emission from 20 to 25GHz, Mode A1 (2405MHz)



Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 17:10:31

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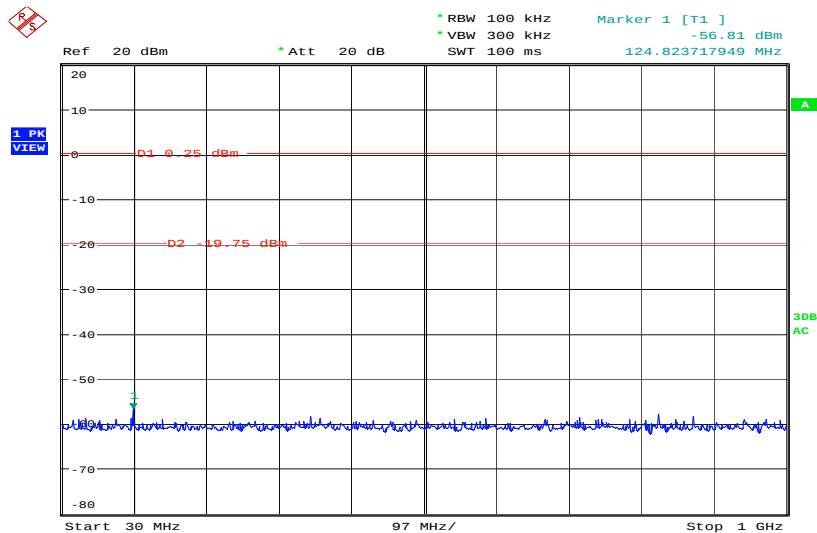
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Table 10: Conducted Spurious Emission, Mode B1 (2440MHz)

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
Fundamental	0.25	1.30	1.55	N/A	N/A
124.82	-56.81	0.83	-55.98	-18.45	37.53
2929.49	-47.03	1.39	-45.64	-18.45	27.20
3416.67	-49.44	1.42	-48.02	-18.45	29.58
4884.62	-54.63	1.49	-53.14	-18.45	34.69
5520.83	-58.34	1.46	-56.88	-18.45	38.43
16858.97	-58.52	2.30	-56.22	-18.45	37.78
22411.86	-58.34	2.41	-55.93	-18.45	37.49

Notes: Limit = Reading of fundamental + Correction factor – 20dB
Emission level = Reading + Correction factor
Correction factor = Total cable loss

Figure 20: Spurious Emission from 30MHz to 1GHz, Mode B1 (2440MHz)



Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 17:13:04

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Figure 21: Spurious Emission from 1 to 5GHz, Mode B1 (2440MHz)

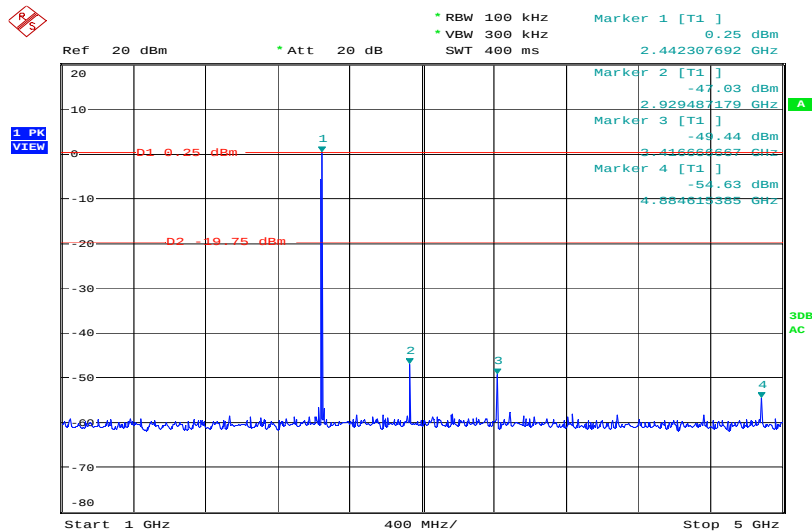
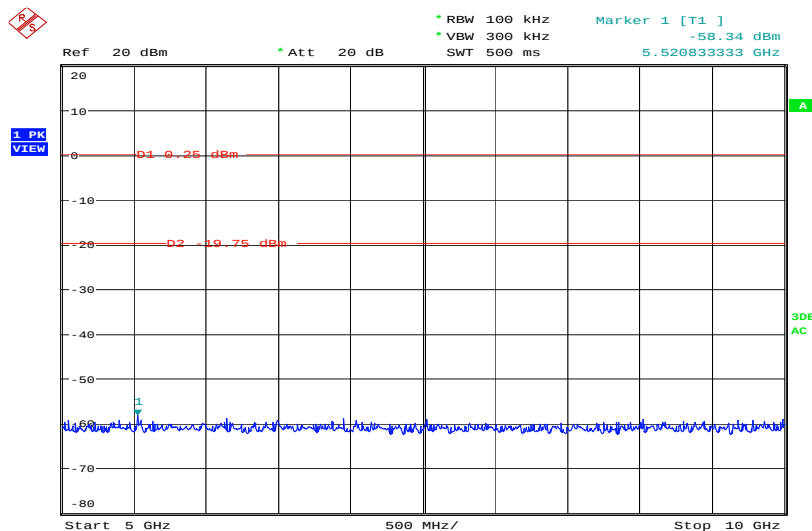
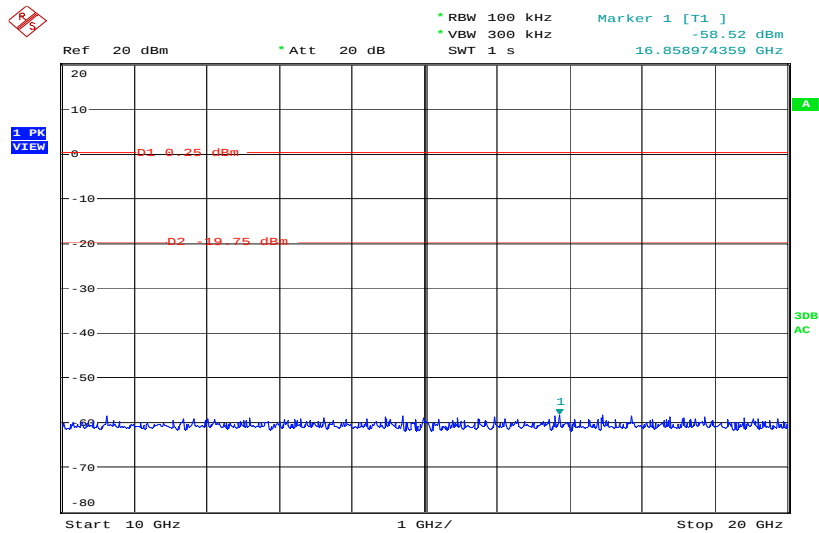
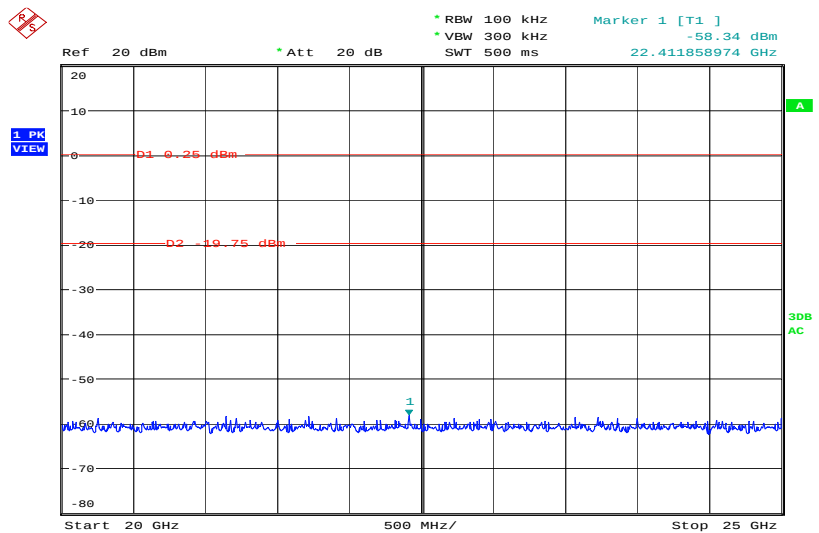
Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 17:12:27

Figure 22: Spurious Emission from 5 to 10GHz, Mode B1 (2440MHz)

Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 17:13:40

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Page 32 of 81**Figure 23: Spurious Emission from 10 to 20GHz, Mode B1 (2440MHz)**Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 17:14:16**Figure 24: Spurious Emission from 20 to 25GHz, Mode B1 (2440MHz)**Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 17:14:53

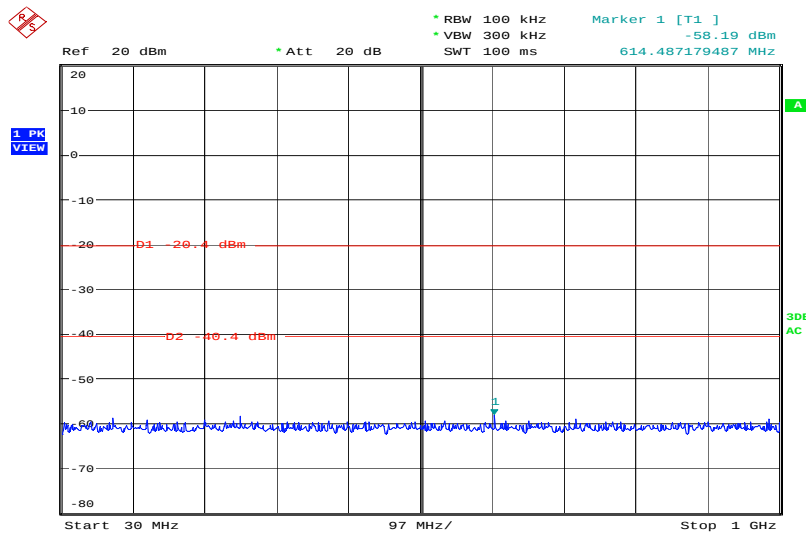
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Table 11: Conducted Spurious Emission, Mode C1 (2480MHz)

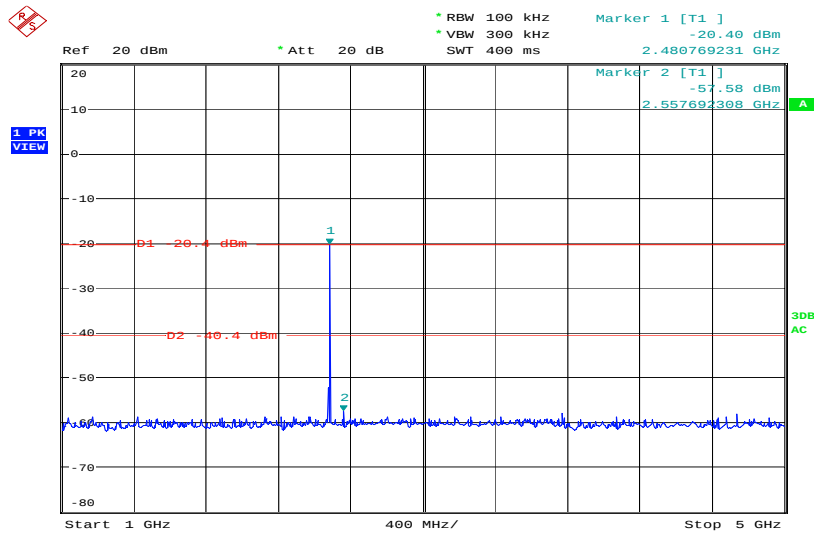
Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
Fundamental	-19.30	1.30	-18.00	N/A	N/A
614.49	-58.19	0.95	-57.24	-38.00	19.24
2557.69	-57.58	1.34	-56.24	-38.00	18.23
8597.76	-58.74	1.88	-56.86	-38.00	18.86
15320.51	-58.19	2.12	-56.07	-38.00	18.06
23381.41	-58.52	2.38	-56.14	-38.00	18.14

Notes: Limit = Reading of fundamental + Correction factor – 20dB
 Emission level = Reading + Correction factor
 Correction factor = Total cable loss

Figure 25: Spurious Emission from 30MHz to 1GHz, Mode C1 (2480MHz)


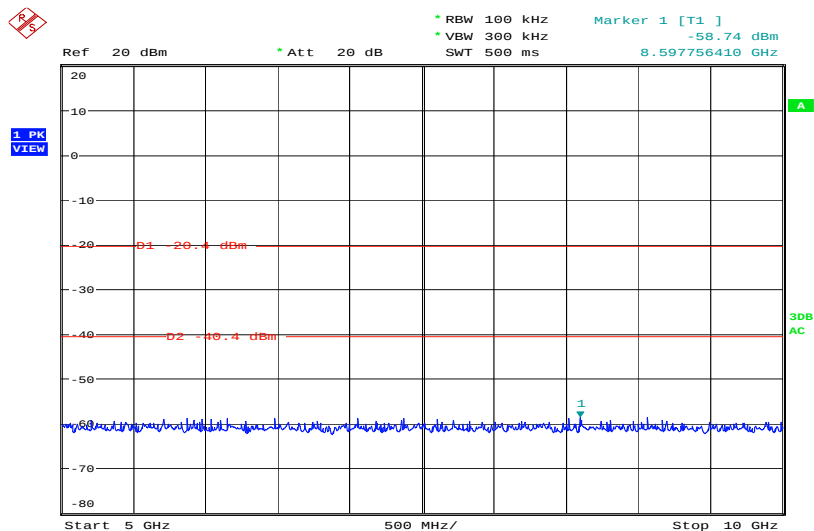
Antenna conducted spurious emission, mode C
 Date: 18.JUN.2009 17:20:19

Figure 26: Spurious Emission from 1 to 5GHz, Mode C1 (2480MHz)



Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 17:16:23

Figure 27: Spurious Emission from 5 to 10GHz, Mode C1 (2480MHz)



Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 17:19:40

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Figure 28: Spurious Emission from 10 to 20GHz, Mode C1 (2480MHz)

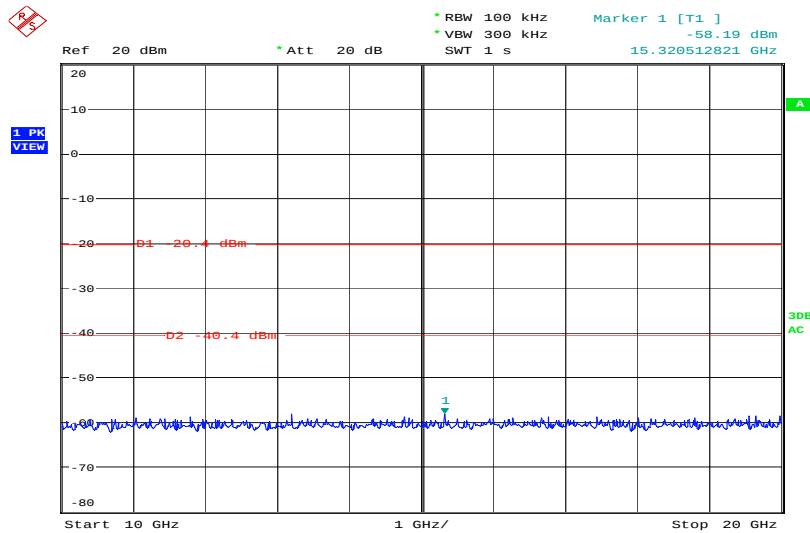
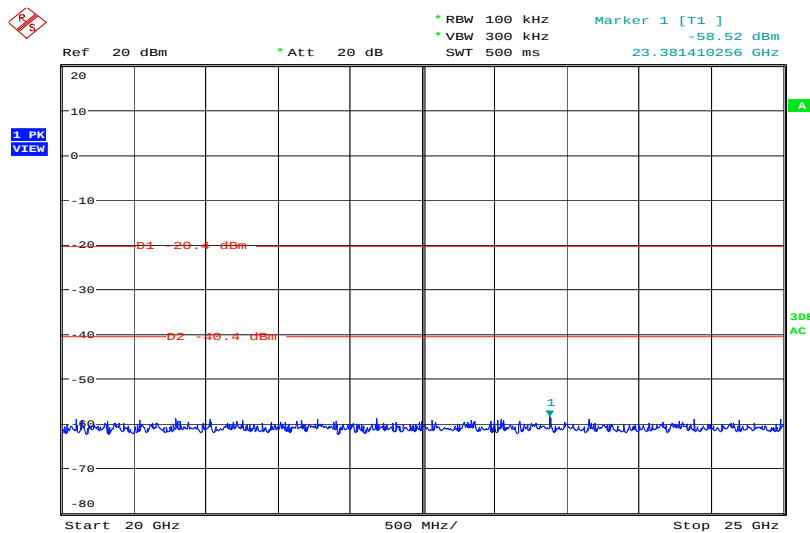
Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 17:18:29

Figure 29: Spurious Emission from 20 to 25GHz, Mode C1 (2480MHz)

Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 17:19:04

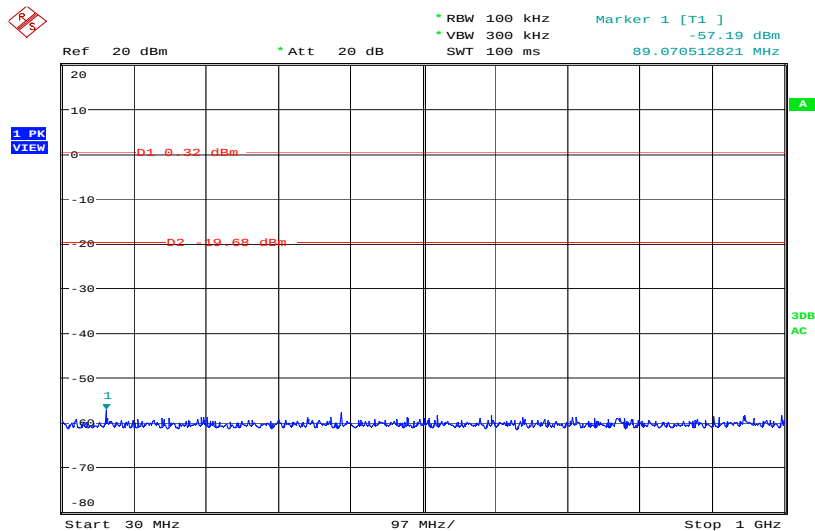
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Table 12: Conducted Spurious Emission, Mode A2 (2405MHz)

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
Fundamental	0.32	1.26	1.58	N/A	N/A
89.07	-57.19	0.83	-56.36	-18.42	37.94
2884.62	-50.29	1.35	-48.94	-18.42	30.52
3365.38	-47.32	1.44	-45.88	-18.42	27.46
4814.10	-54.35	1.56	-52.79	-18.42	34.37
6225.96	-57.87	1.58	-56.29	-18.42	37.87
18445.51	-57.84	2.32	-55.52	-18.42	37.10
24334.94	-58.01	2.52	-55.49	-18.42	37.07

Notes: Limit = Reading of fundamental + Correction factor – 20dB
 Emission level = Reading + Correction factor
 Correction factor = Total cable loss

Figure 30: Spurious Emission from 30MHz to 1GHz, Mode A2 (2405MHz)


Antenna conducted spurious emission, mode A
 Date: 18.JUN.2009 16:30:29

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Figure 31: Spurious Emission from 1 to 5GHz, Mode A2 (2405MHz)

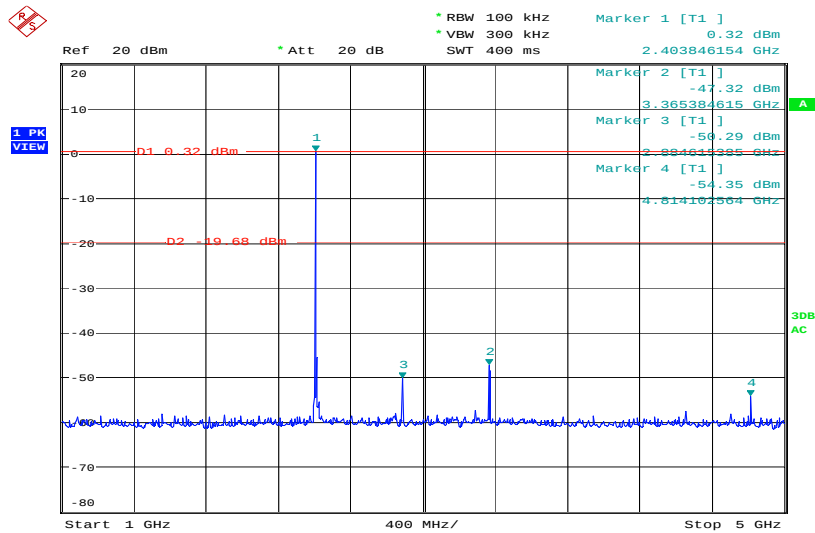
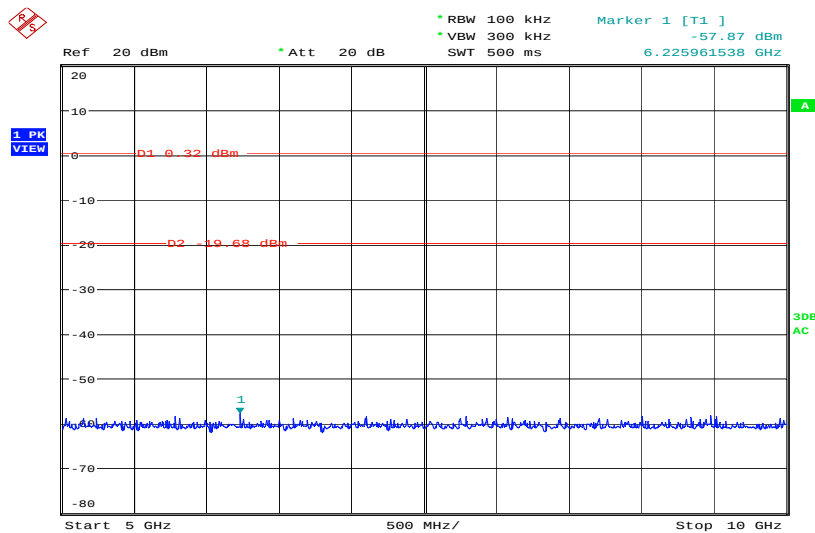
Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 16:29:41

Figure 32: Spurious Emission from 5 to 10GHz, Mode A2 (2405MHz)

Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 16:31:21

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Figure 33: Spurious Emission from 10 to 20GHz, Mode A2 (2405MHz)

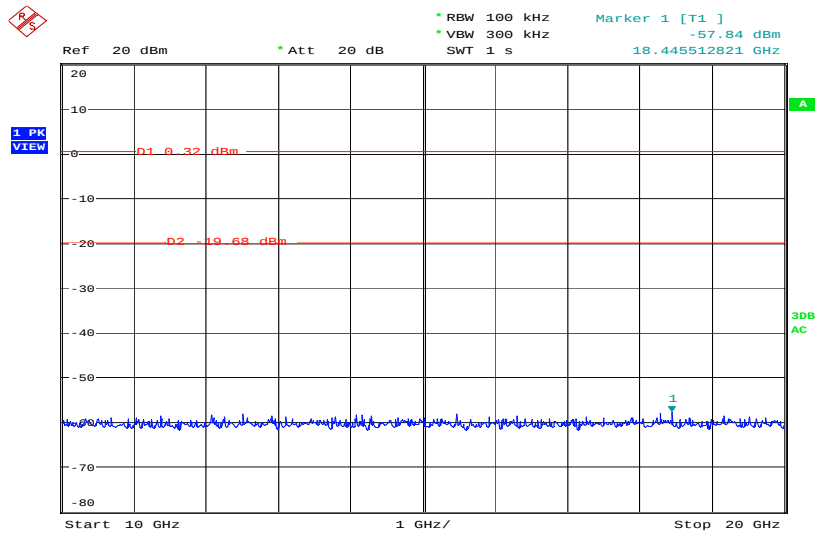
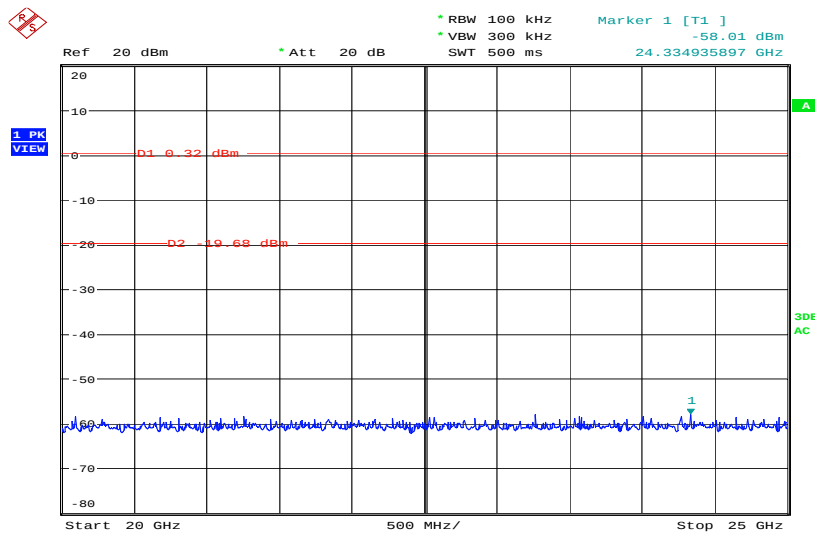
Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 16:32:07

Figure 34: Spurious Emission from 20 to 25GHz, Mode A2 (2405MHz)

Antenna conducted spurious emission, mode A
Date: 18.JUN.2009 16:32:53

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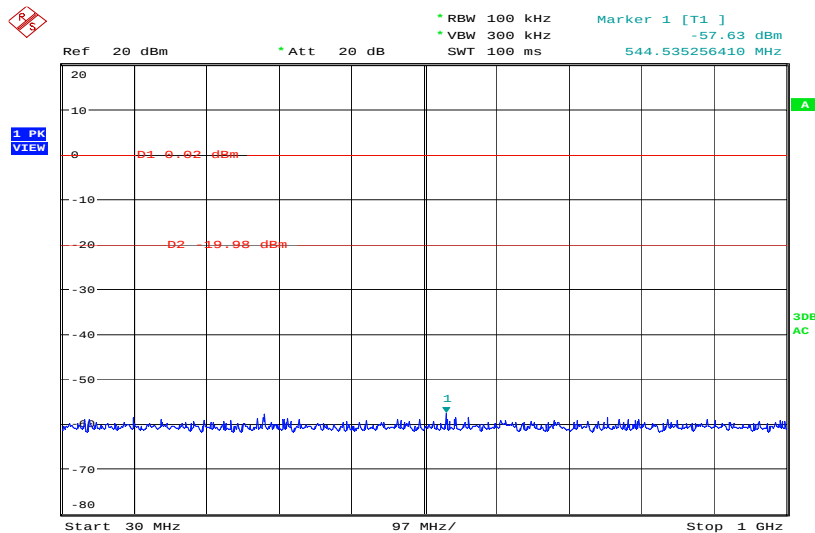
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Table 13: Conducted Spurious Emission, Mode B2 (2440MHz)

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
Fundamental	0.02	1.30	1.32	N/A	N/A
544.54	-57.62	0.92	-56.70	-18.68	37.94
2929.49	-50.91	1.39	-49.52	-18.68	30.52
3416.67	-49.48	1.42	-48.06	-18.68	27.46
4884.62	-54.65	1.49	-53.16	-18.68	34.37
8902.24	-58.02	1.90	-56.12	-18.68	37.87
11266.03	-57.42	1.93	-55.49	-18.68	37.10
23926.28	-57.84	2.46	-55.38	-18.68	37.07

Notes: Limit = Reading of fundamental + Correction factor – 20dB
Emission level = Reading + Correction factor
Correction factor = Total cable loss

Figure 35: Spurious Emission from 30MHz to 1GHz, Mode B2 (2440MHz)



Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 16:35:08

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Figure 36: Spurious Emission from 1 to 5GHz, Mode B2 (2440MHz)

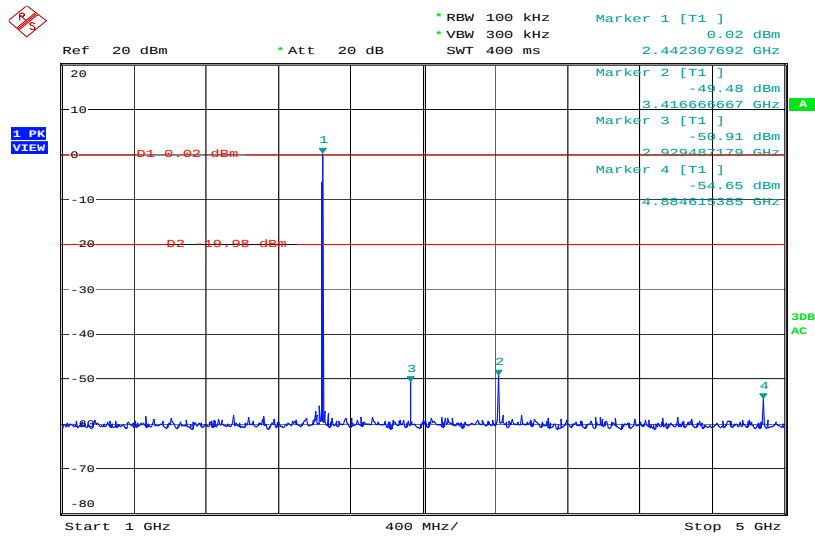
Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 16:34:28

Figure 37: Spurious Emission from 5 to 10GHz, Mode B2 (2440MHz)

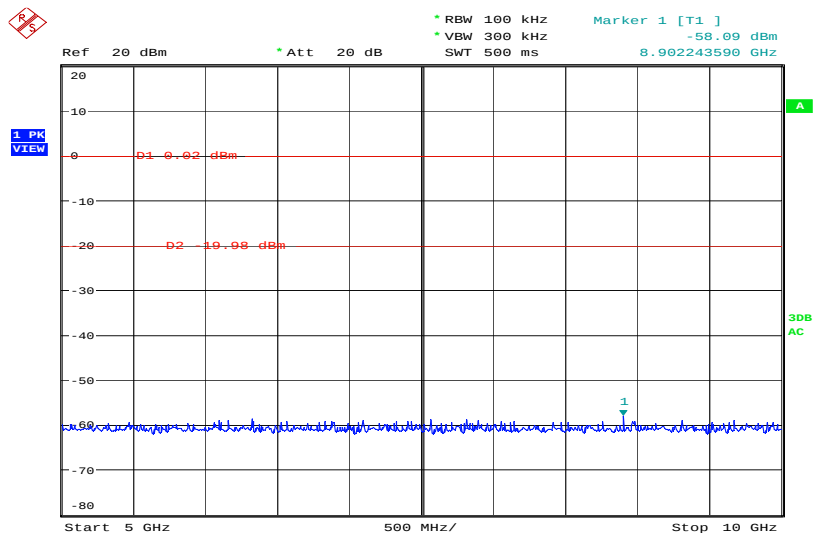
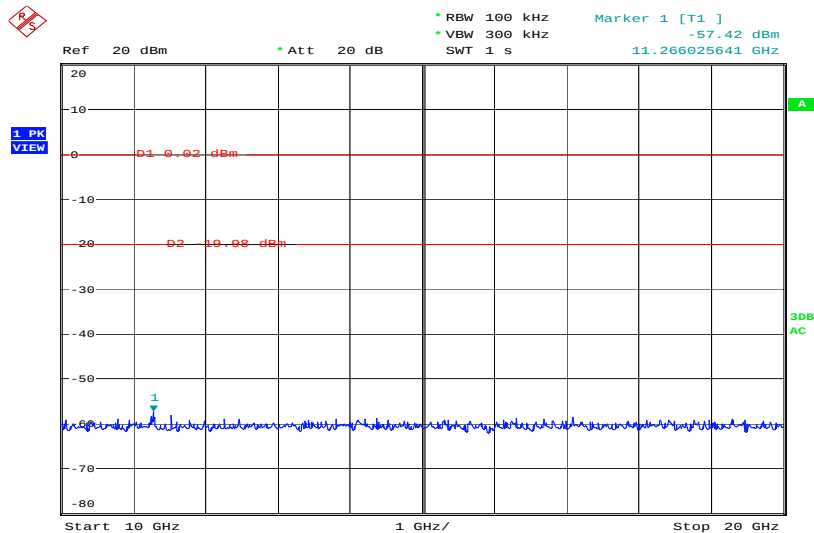
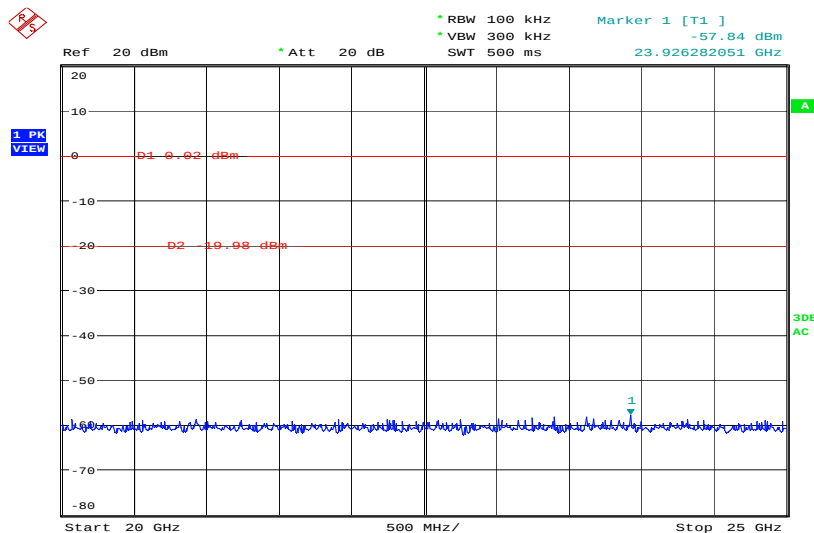
Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 16:35:46

Figure 38: Spurious Emission from 10 to 20GHz, Mode B2 (2440MHz)



Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 16:36:19

Figure 39: Spurious Emission from 20 to 25GHz, Mode B2 (2440MHz)

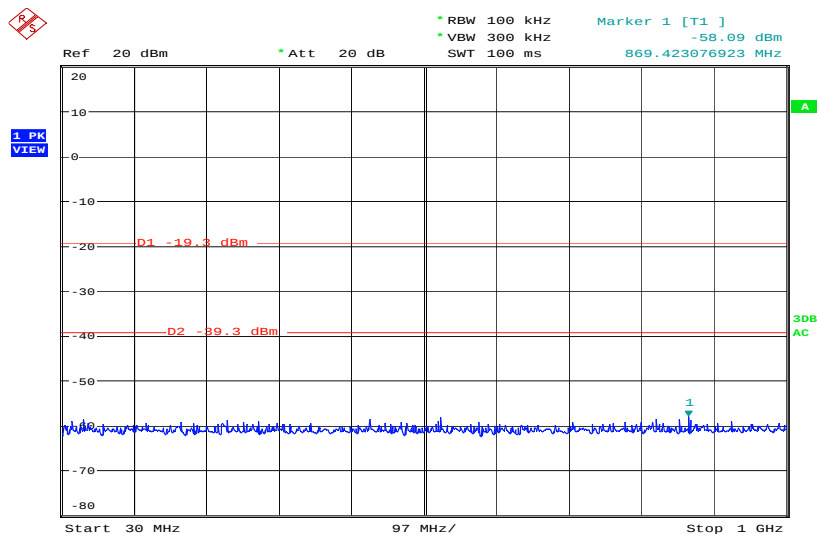


Antenna conducted spurious emission, mode B
Date: 18.JUN.2009 16:37:06

Table 14: Conducted Spurious Emission, Mode C2 (2480MHz)

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
Fundamental	-19.30	1.30	-18.00	N/A	N/A
869.42	-58.09	1.01	-57.08	-38.00	38.03
1980.77	-57.32	1.15	-56.17	-38.00	30.85
3198.72	-57.42	1.39	-56.03	-38.00	29.39
7508.01	-58.04	1.75	-56.29	-38.00	34.48
10112.18	-58.56	1.88	-56.68	-38.00	37.45
22860.58	-57.10	2.36	-54.74	-38.00	36.81

Notes: Limit = Reading of fundamental + Correction factor – 20dB
 Emission level = Reading + Correction factor
 Correction factor = Total cable loss

Figure 40: Spurious Emission from 30MHz to 1GHz, Mode C2 (2480MHz)


Antenna conducted spurious emission, mode C
 Date: 18.JUN.2009 16:39:57

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Figure 41: Spurious Emission from 1 to 5GHz, Mode C2 (2480MHz)

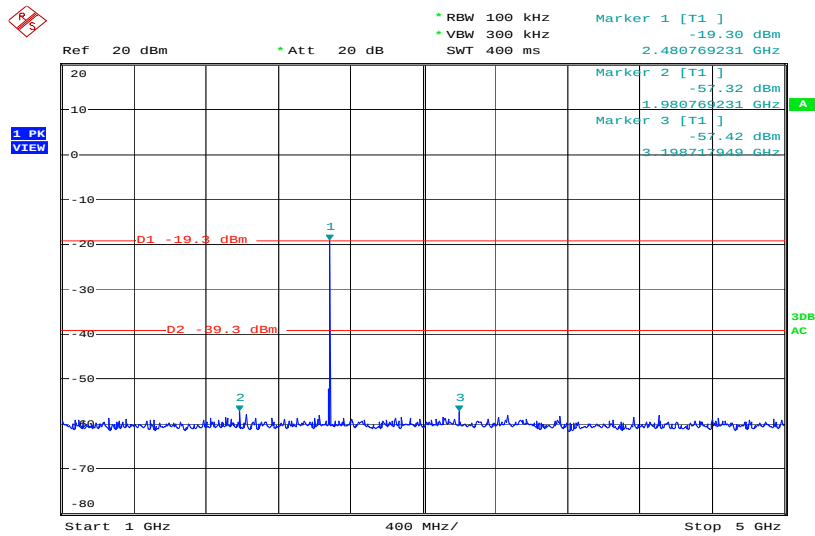
Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 16:39:20

Figure 42: Spurious Emission from 5 to 10GHz, Mode C2 (2480MHz)

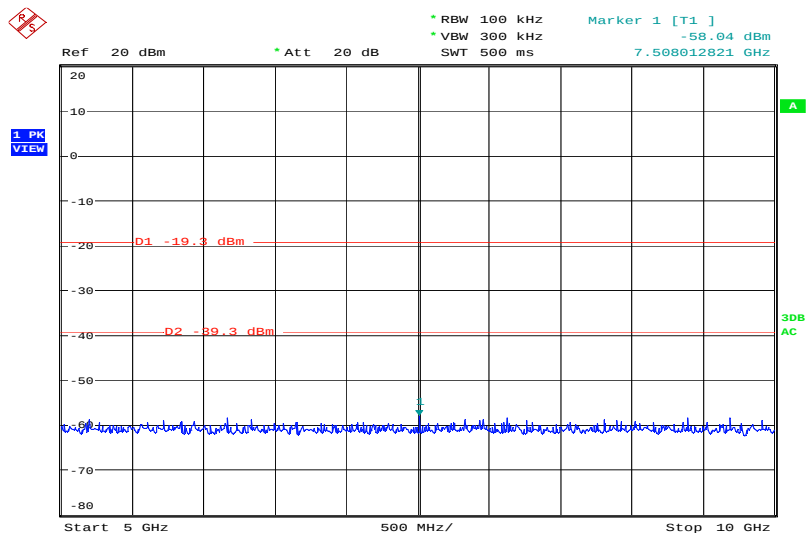
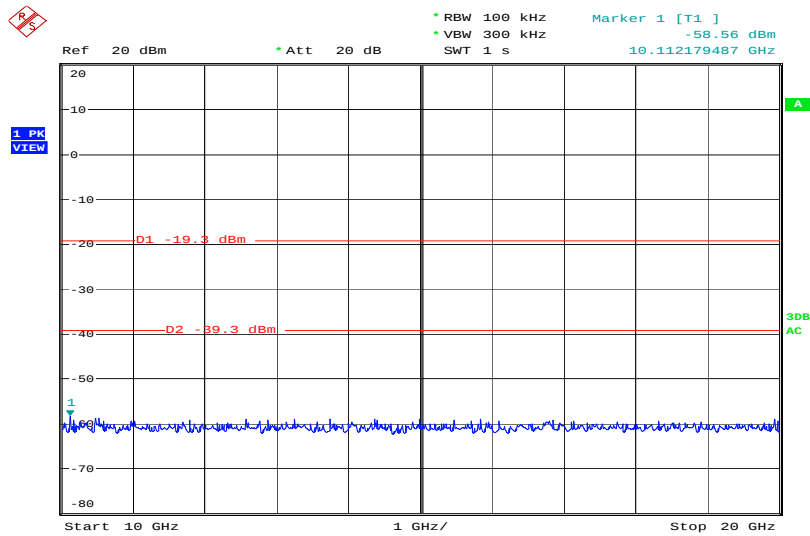
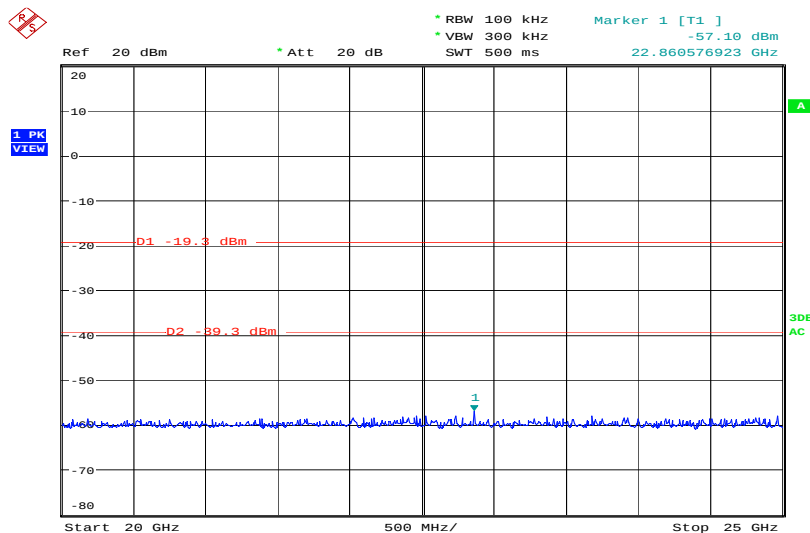
Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 16:40:35

Figure 43: Spurious Emission from 10 to 20GHz, Mode C2 (2480MHz)



Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 16:41:08

Figure 44: Spurious Emission from 20 to 25GHz, Mode C2 (2480MHz)



Antenna conducted spurious emission, mode C
Date: 18.JUN.2009 17:25:27

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5.1.5 Peak Power Spectral Density, FCC 15.247(e) and RSS-210 A8.2(b)

RESULT:
PASS

Date of testing: 2009-06-18

Ambient temperature: 26°C

Relative humidity: 65%

Atmospheric pressure: 1012hPa

Requirements:

For digitally modulated systems, the power spectral density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Test procedure:

ANSI C63.4-2003 and Measurement of Digital Transmission Systems Operating under Section 15.247.

A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 3kHz and the video bandwidth was set to 10kHz. The sweep time was set to 500s.

The final measurement takes into account the loss generated by all the involved cables.

Table 15: Peak Power Spectral Density with internal antenna configuration

Operating Frequency [MHz]	Max PSD Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
2405	2405.01	-6.09	1.26	-4.83	8.00	12.83
2440	2440.06	-6.50	1.30	-5.20	8.00	13.20
2480	2480.06	-27.33	1.30	-26.03	8.00	34.03

Notes: Power density = Reading + Correction factor
 Correction factor = Total cable loss

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Figure 45: Power Spectral Density, Mode A1 (2405MHz)

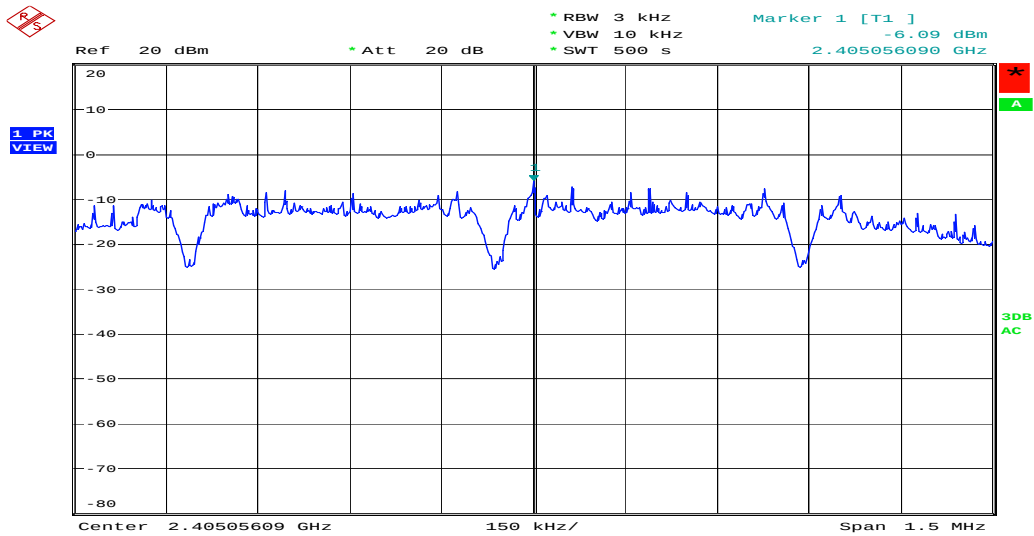
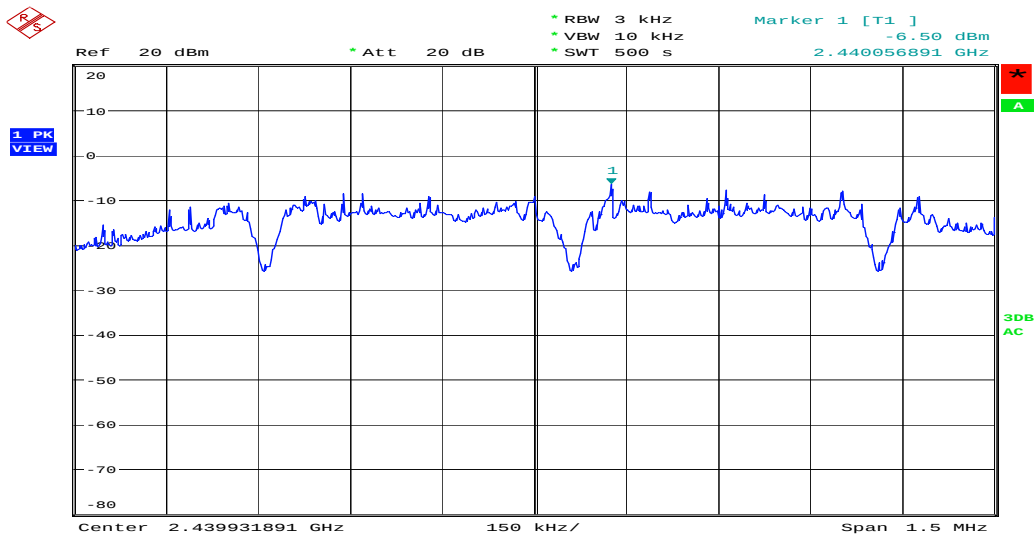
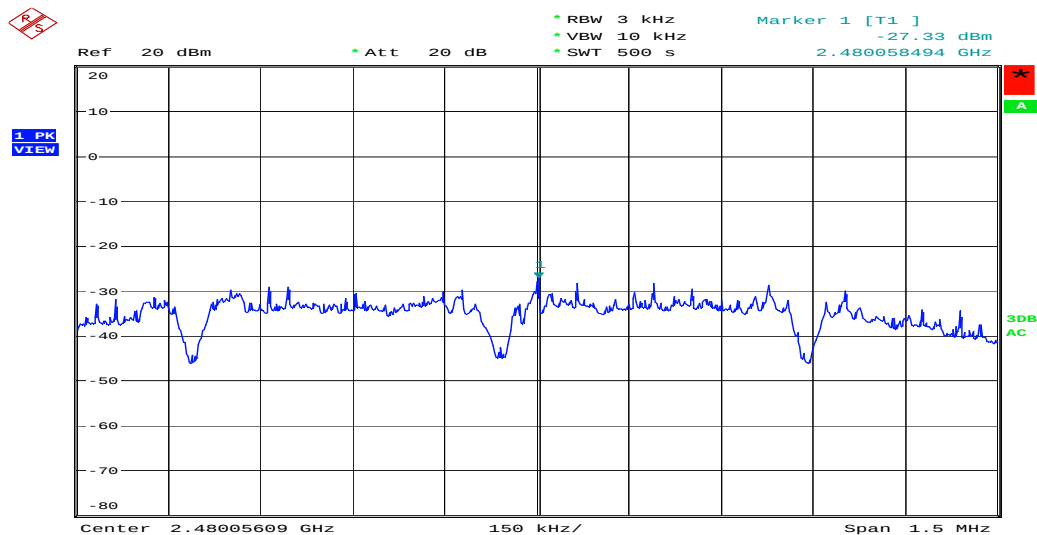
Peak power spectral density, mode A
Date: 18.JUN.2009 14:59:50

Figure 46: Power Spectral Density, Mode B1 (2440MHz)

Peak power spectral density, mode B
Date: 18.JUN.2009 15:10:32

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Figure 47: Power Spectral Density, Mode C1 (2480MHz)

Peak power spectral density, mode C
Date: 18.JUN.2009 15:21:43

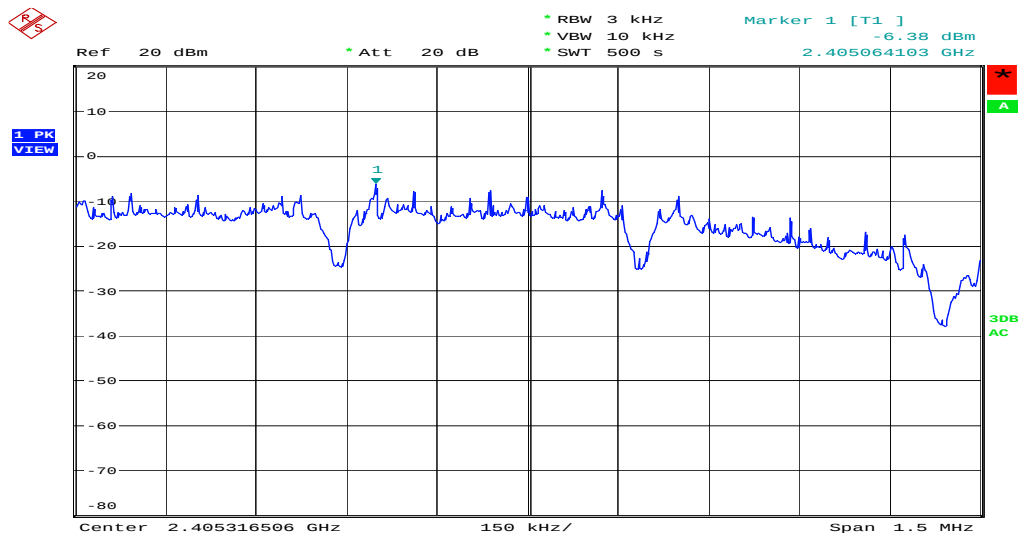
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Table 16: Peak Power Spectral Density with external antenna configuration

Operating Frequency [MHz]	Max PSD Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
2405	2405.05	-6.38	1.26	-5.12	8.00	13.12
2440	2440.06	-6.51	1.30	-5.21	8.00	13.21
2480	2480.07	-27.13	1.30	-25.83	8.00	33.83

 Notes: Power density = Reading + Correction factor
 Correction factor = Total cable loss

Figure 48: Power Spectral Density, Mode A2 (2405MHz)

 Peak power spectral density, mode A
 Date: 18.JUN.2009 15:36:34

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Figure 49: Power Spectral Density, Mode B2 (2440MHz)

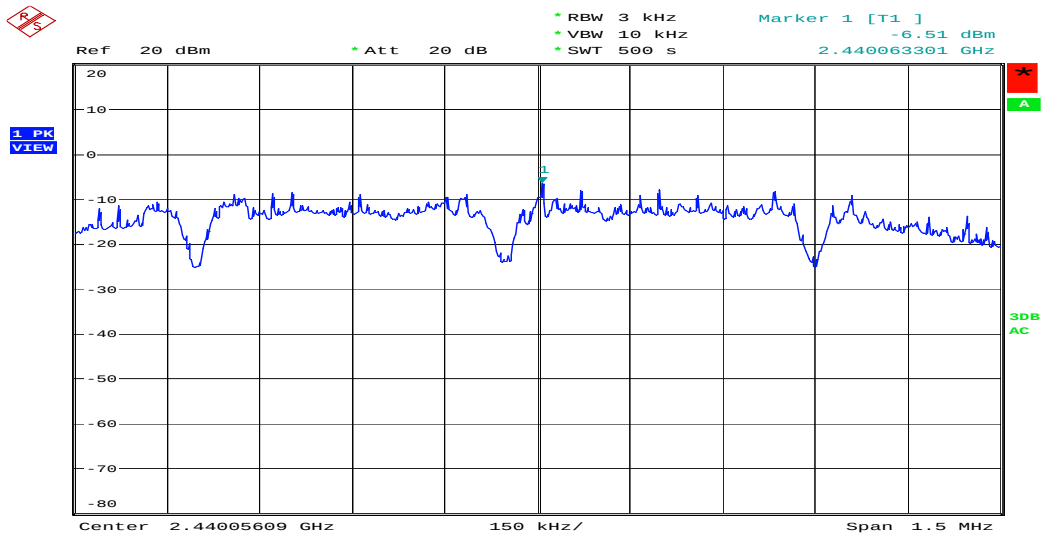
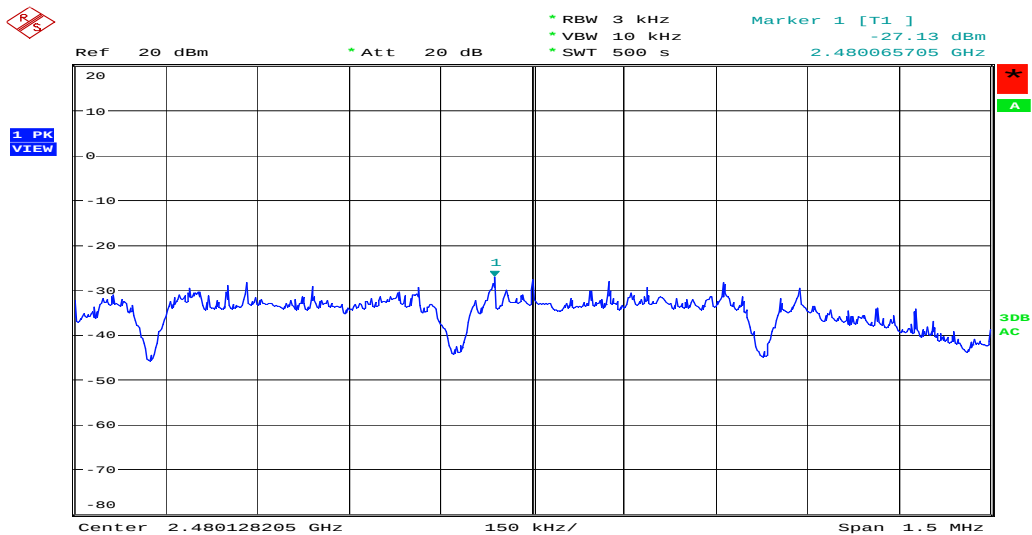
Peak power spectral density, mode B
Date: 18.JUN.2009 15:50:30

Figure 50: Power Spectral Density, Mode C2 (2480MHz)

Peak power spectral density, mode C
Date: 18.JUN.2009 16:00:55

6. Test Results of AC Power Line Conducted Measurements

6.1 AC Power Line Conducted Emission of Transmitter

6.1.1 AC Power Line Conducted Emission of Transmitter, FCC 15.207 and RSS-Gen 7.2.2

RESULT: **PASS**

Date of testing: 2009-04-24

Ambient temperature: 24°C

Relative humidity: 38%

Atmospheric pressure: 1017hPa

Frequency range: 0.15 – 30MHz

Kind of test site: Shielded Room

Requirements:

The AC power line conducted emission on any frequency within the band 150 kHz to 30MHz shall not exceed the limits specified in FCC 15.207 and RSS-Gen 7.2.2.

Test procedure:

ANSI C63.4-2003.

The EUT was placed on a wooden table raised 80cm above the reference ground plane. A vertical conducting plane of the screened room was located 40cm to the rear of the EUT. The AC adapter of the EUT was connected to a Line Impedance Stabilization Network (LISN).

The physical arrangement of the test system and associated cabling was varied to determine the effect on the EUT's emissions in amplitude and frequency in order to ensure that maximum emission amplitudes were attained.

The measurements were performed with the spectrum analyzer operating in the CISPR quasi-peak and average detection modes. The analyzer's 6 dB bandwidth was set to 9kHz. No video filter less than 10 times the resolution bandwidth was used.

Disturbances other than those mentioned are small or not detectable.

Table 17: Conducted Emission, 0.15 – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode A2 (2405MHz)

Freq. [MHz]	Phase	Reading QP [dB(μV)]	Reading AV [dB(μV)]	Factor [dB]	Level QP [dB(μV)]	Level AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
0.35673	L1	38.0	23.0	9.7	47.7	32.7	58.8	48.8	11.1	16.1
0.35683	N	37.2	29.2	9.7	46.9	38.9	58.8	48.8	11.9	9.9
0.43198	N	41.4	33.6	9.7	51.1	43.3	57.2	47.2	6.1	3.9
0.43084	L1	42.6	27.6	9.7	52.3	37.3	57.2	47.2	4.9	9.9
0.72914	N	34.4	24.3	9.7	44.1	34.0	56.0	46.0	11.9	12.0
0.80145	L1	35.2	17.7	9.7	44.9	27.4	56.0	46.0	11.1	18.6
0.89273	N	33.9	21.5	9.7	43.6	31.2	56.0	46.0	12.4	14.8
1.1536	N	35.9	18.8	9.7	45.6	28.5	56.0	46.0	10.4	17.5
1.24892	N	38.3	23.4	9.7	48.0	33.1	56.0	46.0	8.0	12.9
1.24815	L1	38.6	19.4	9.7	48.3	29.1	56.0	46.0	7.7	16.9
1.34284	L1	36.6	18.0	9.7	46.3	27.7	56.0	46.0	9.7	18.3
1.32027	N	37.8	23.6	9.7	47.5	33.3	56.0	46.0	8.5	12.7
1.4136	L1	37.1	18.3	9.7	46.8	28.0	56.0	46.0	9.2	18.0

Notes: Level QP = Reading QP + Factor
 Level AV = Reading AV + Factor

Figure 51: Spectral Diagram, Conducted Emission, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode A2 (2405MHz)

 TÜV Rheinland Japan
 QAC EMC Center

<<Myeahi>>

24 Apr:

 Model : XM-154A
 Serial : D6M0002
 Operator : T. Santez
 AC Power : AC 120V, 60Hz
 Temp, Humidity : 24degC, 38%, 1017hPa

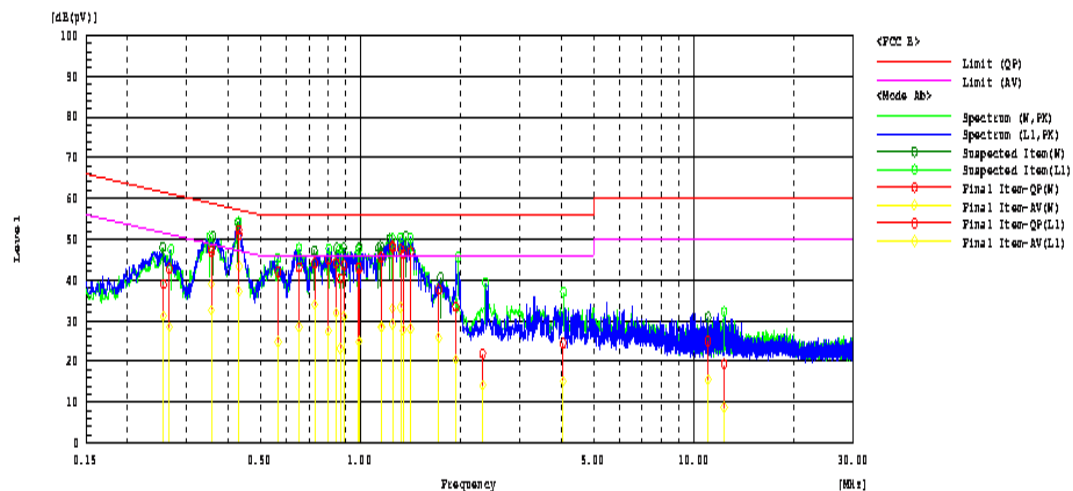
 Standard : ITR; FCC Class B
 Remark1 : Mode Ab
 Remark2 :
 Remark3 :
 Remark4 :


Table 18: Conducted Emission, 0.15 – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode C2 (2480MHz)

Freq. [MHz]	Phase	Reading QP [dB(μV)]	Reading AV [dB(μV)]	Factor [dB]	Level QP [dB(μV)]	Level AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
0.3711	L1	38.1	23.1	9.7	47.8	32.8	58.5	48.5	10.7	15.7
0.43176	L1	42.9	28.1	9.7	52.6	37.8	57.2	47.2	4.6	9.4
0.68341	L1	34.3	17.7	9.7	44.0	27.4	56.0	46.0	12.0	18.6
0.82055	N	32.0	23.0	9.7	41.7	32.7	56.0	46.0	14.3	13.3
0.91927	N	34.4	21.8	9.7	44.1	31.5	56.0	46.0	11.9	14.5
1.295	N	37.9	22.6	9.7	47.6	32.3	56.0	46.0	8.4	13.7
1.29455	L1	38.2	18.7	9.7	47.9	28.4	56.0	46.0	8.1	17.6
1.41311	N	37.7	23.0	9.7	47.4	32.7	56.0	46.0	8.6	13.3

Notes: Level QP = Reading QP + Factor
 Level AV = Reading AV + Factor

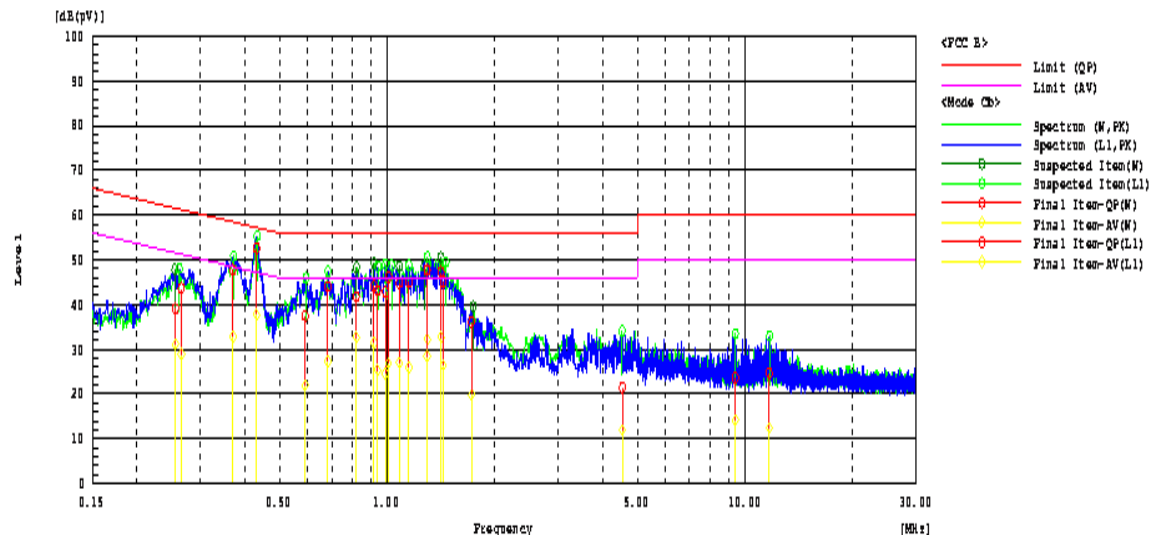
Figure 52: Spectral Diagram, Conducted Emission, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode C2 (2480MHz)

 TÜV Rheinland Japan
 CTAC EMC Center

<Hiyoah!>

24 Apr:

 Model : XM-154A
 Serial : DNM0002
 Operator : T. Saito
 AC Power : AC 120V, 60Hz
 Temp./Humidity : 24degC, 38%, 1017hPa

 Standard : ITR; FCC Class B
 Remark1 : Mode Cb
 Remark2 :
 Remark3 :
 Remark4 :


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6.2 AC Power Line Conducted Emission of Receiver

6.2.1 AC Power Line Conducted Emission of Receiver, FCC 15.107 and RSS-Gen 7.2.2

RESULT:**PASS**

Date of testing: 2009-04-24

Ambient temperature: 24°C

Relative humidity: 38%

Atmospheric pressure: 1017hPa

Frequency range: 0.15 – 30MHz

Kind of test site: Shielded Room

Requirements:

The AC power line on any frequency within the band 150 kHz to 30MHz shall not exceed the limits specified in FCC 15.107(a) and RSS-Gen 7.2.2.

Test procedure:

ANSI C63.4-2003.

The EUT was placed on a wooden table raised 80cm above the reference ground plane. A vertical conducting plane of the screened room was located 40cm to the rear of the EUT. The AC adapter of the EUT was connected to a Line Impedance Stabilization Network (LISN).

The physical arrangement of the test system and associated cabling was varied to determine the effect on the EUT's emissions in amplitude and frequency in order to ensure that maximum emission amplitudes were attained.

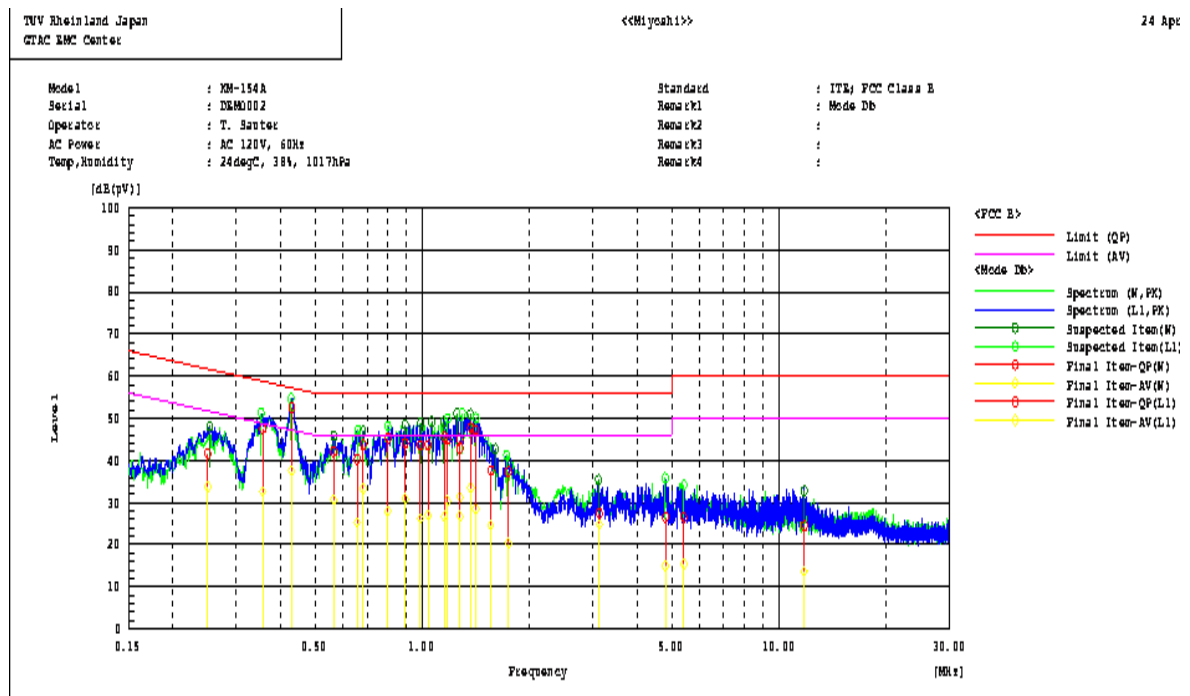
The measurements were performed with the spectrum analyzer operating in the CISPR quasi-peak and average detection modes. The analyzer's 6 dB bandwidth was set to 9kHz. No video filter less than 10 times the resolution bandwidth was used.

Disturbances other than those mentioned are small or not detectable.

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Table 19: Conducted Emission, 0.15 – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode D2)

Freq. [MHz]	Phase	Reading QP [dB(μV)]	Reading AV [dB(μV)]	Factor [dB]	Level QP [dB(μV)]	Level AV [dB(μV)]	Limit QP [dB(μV)]	Limit AV [dB(μV)]	Margin QP [dB]	Margin AV [dB]
0.25054	N	31.9	24.1	9.7	41.6	33.8	61.7	51.7	20.1	17.9
0.35682	L1	37.8	22.8	9.7	47.5	32.5	58.8	48.8	11.3	16.3
0.43039	L1	42.8	27.9	9.7	52.5	37.6	57.2	47.2	4.7	9.6
0.56465	N	32.4	20.9	9.7	42.1	30.6	56.0	46.0	13.9	15.4
0.6834	N	34.1	23.6	9.7	43.8	33.3	56.0	46.0	12.2	12.7
0.89447	N	34.4	21.2	9.7	44.1	30.9	56.0	46.0	11.9	15.1
0.98855	N	33.9	16.5	9.7	43.6	26.2	56.0	46.0	12.4	19.8
1.17441	N	35.3	20.7	9.7	45.0	30.4	56.0	46.0	11.0	15.6
1.27545	N	33.2	21.8	9.7	42.9	31.5	56.0	46.0	13.1	14.5
1.3668	N	38.1	23.8	9.7	47.8	33.5	56.0	46.0	8.2	12.5
1.41122	L1	37.5	18.7	9.7	47.2	28.4	56.0	46.0	8.8	17.6

Notes: Level QP = Reading QP + Factor
Level AV = Reading AV + Factor

Figure 53: Spectral Diagram, Conducted Emission, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode D2


7. Test Results of Radiated Measurements

7.1 Radiated Emission of Transmitter

7.1.1 Band Edge Radiated Emission, FCC 15.247(d) and RSS-210 2.2

RESULT: **Pass**

Date of testing:	2009-03-23	2009-03-24
Ambient temperature:	21°C	21°C
Relative humidity:	32%	30%
Atmospheric pressure:	997hPa	1010hPa
Measurement distance:	3m	
Kind of test site:	Semi Anechoic Chamber	

Requirements:

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-210 2.7 (Table 1), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-210 2.7 (Table 2 and 3).

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.9, 4.10 and Measurement of Digital Transmission Systems Operating under Section 15.247.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Measurements were made at 3m distance. The EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level.

Measurements were taken using both horizontal and vertical antenna polarizations for 3 EUT orientations (X, Y and Z).

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz.

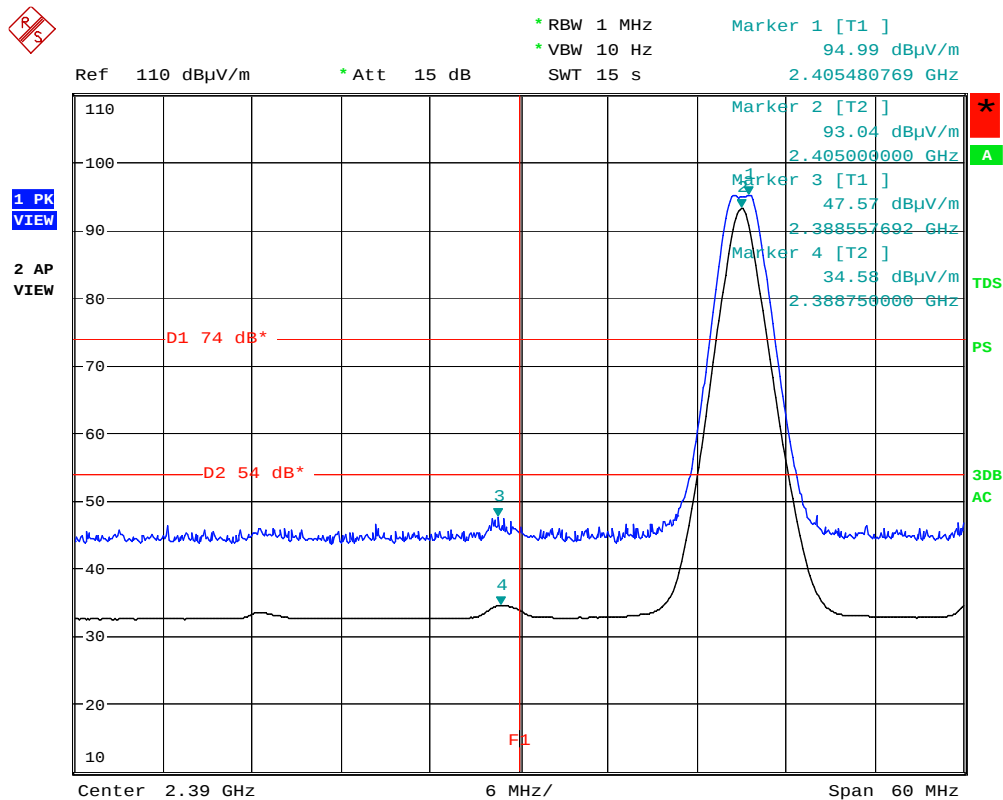
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Note: in order to show compliance to the band edge, plots for channel 15th has been provided to prove that the device remain compliant with the the highest antenna gain.

Table 20: Band Edge Radiated Emission with internal antenna

Operating Frequency [MHz]	EUT Orient. / Antenna Orientation	Average Value [dBµV/m]	Peak Value [dBµV/m]	Average Limit [dBµV/m]	Peak Limit [dBµV/m]	Average Margin [dB]	Peak Margin [dB]
2405	X/V	34.5	47.5	54.0	74.0	19.5	26.5
2480	X/V	33.7	46.6	54.0	74.0	20.3	27.4

Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.
 Average limit in dBµV/m is calculated as follows: Average limit = 20 x log(500uV/m).
 Peak limit in dBµV/m is calculated as follows: Peak limit = Average limit + 20dB.

Figure 54: Band Edge Radiated Emission, Mode A1 (2405MHz), Peak and Average


Spurious Emissions 1-8GHz, Vert, Mode: A, Pos.: X

Date: 24.MAR.2009 15:52:39

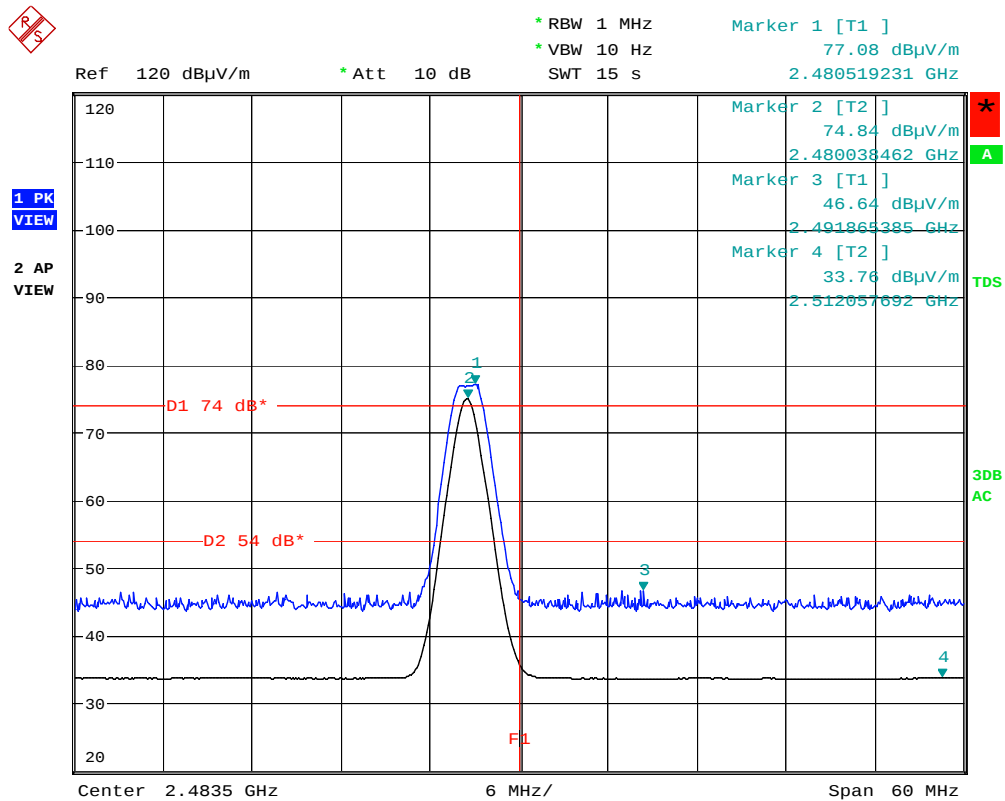
Note: The upper trace shows the peak value and the lower trace shows the average value.

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Figure 55: Band Edge Radiated Emission, Mode C1 (2480MHz), Peak and Average



Spurious Emissions 1-8GHz, Vert, Mode: C, Pos.: X

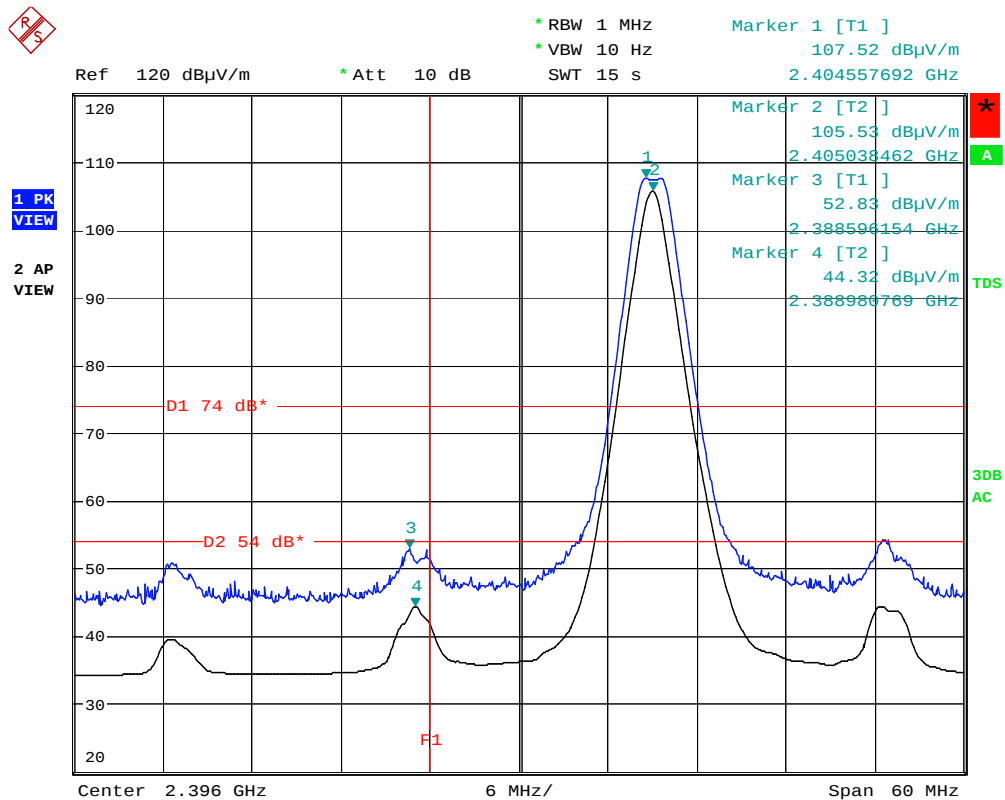
Date: 24.MAR.2009 16:30:26

Note: The upper trace shows the peak value and the lower trace shows the average value.

Table 21: Band Edge Radiated Emission with external antenna

Operating Frequency [MHz]	EUT Orient./ Antenna Orientation	Average Value [dBμV/m]	Peak Value [dBμV/m]	Average Limit [dBμV/m]	Peak Limit [dBμV/m]	Average Margin [dB]	Peak Margin [dB]
2405	Y/H	44.3	52.8	54.0	74.0	9.7	21.2
2480	Y/H	34.4	47.0	54.0	74.0	19.6	20.0

Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.
 Average limit in dBμV/m is calculated as follows: Average limit = 20 x log(500uV/m).
 Peak limit in dBμV/m is calculated as follows: Peak limit = Average limit + 20dB.

Figure 56: Band Edge Radiated Emission, Mode A2 (2405MHz), Peak and Average


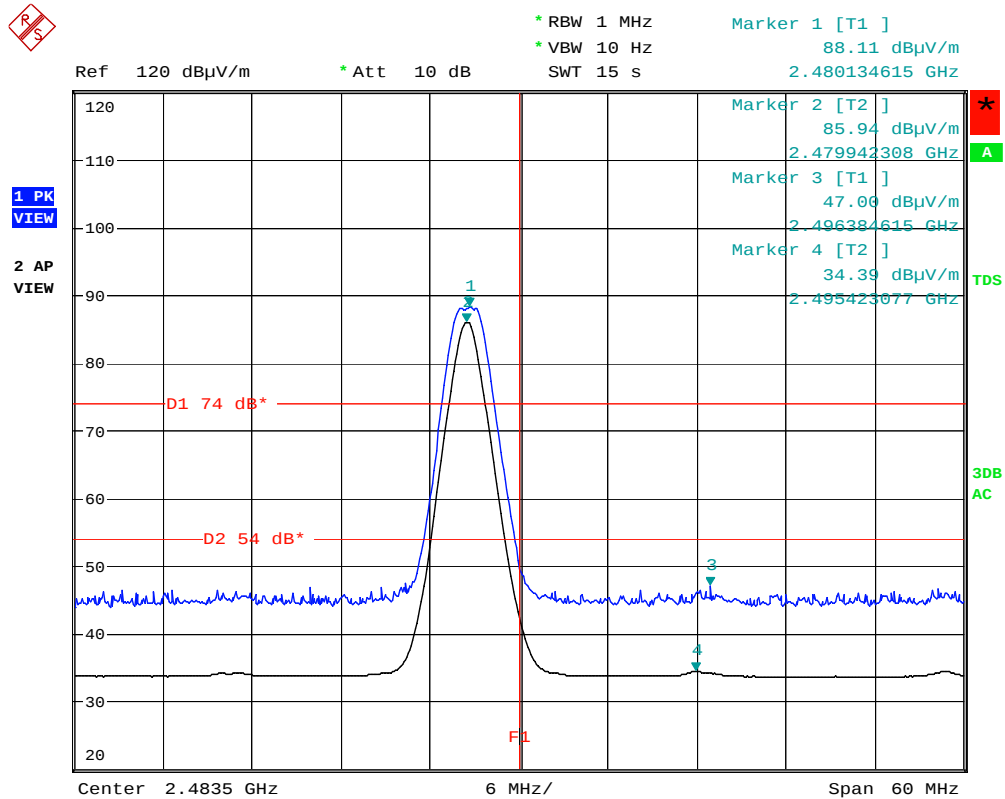
Spurious Emissions 1-8GHz, Hor, Mode: A, Pos.: Y

Date: 23.MAR.2009 17:05:47

Note: The upper trace shows the peak value and the lower trace shows the average value.

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Figure 57: Band Edge Radiated Emission, Mode C2 (2480MHz), Peak and Average

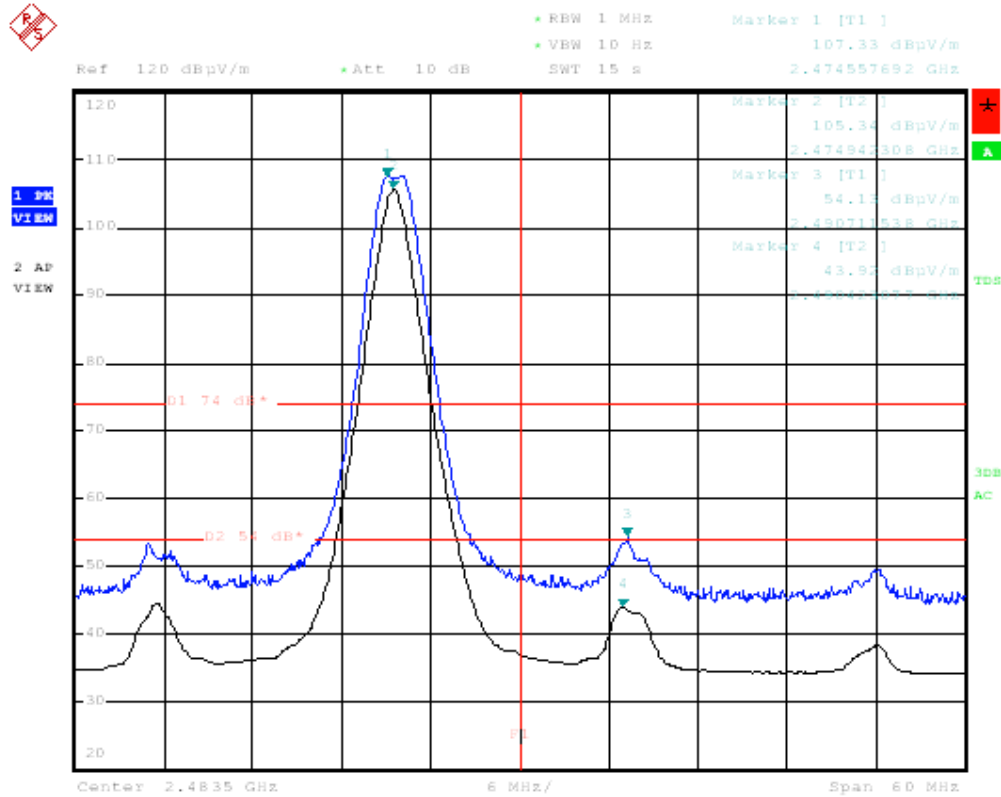


Spurious Emissions 1-8GHz, Hor, Mode: C, Pos.: Y

Date: 23.MAR.2009 17:50:43

Note: The upper trace shows the peak value and the lower trace shows the average value.

Figure 58: Band Edge Radiated Emission, Channel 15 with external antenna , Peak and Average



Spurious Emissions 1-8GHz, Hor, Mode: Pos.: Y

Date: 23.MAR.2009 18:18:23

Note: The upper trace shows the peak value and the lower trace shows the average value.

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7.1.2 Out-of-Band and Spurious Emission of Transmitter, FCC 15.247(d), FCC 15.205, FCC 15.209, RSS-210 2.2, RSS-210 A8.5 and RSS-Gen 7.2.1

RESULT:
PASS

Date of testing:	2009-03-02, 03-03, 03-24, 03-30, 04-6 and 04-07
Ambient temperature:	20, 20, 21, 22, 22 and 22°C
Relative humidity:	31, 30, 30, 31, 31 and 31%
Atmospheric pressure:	1015, 1021, 1010, 1017. 1005 and 1005hPa
Frequency range:	9KHz – 25GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

Requirements:

The emissions from the intentional radiator shall not exceed the field strength specified in FCC 15.209(a) and RSS-210 2.7.

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.9, 4.10 and Measurement of Digital Transmission Systems Operating under Section 15.247.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

Final radiated emission measurements were made at 3m distance. The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz).

At each frequency, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1GHz, measurements were performed using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

Note The band 9KHz to 30MHz has been investigated and no noise was recorded since they were 20 dB below the limit.

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Table 22: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode A1 (2405MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
32.051	X/H	49.3	-24.4	24.9	40.0	15.1	106	359
45.217	X/V	41.9	-23.2	18.7	40.0	21.3	102	138
167.703	X/H	56.2	-22.6	33.6	43.5	9.9	174	242
192.134	X/H	54.1	-25.3	28.8	43.5	14.7	140	249
300.041	X/H	55.6	-21.3	34.3	46.0	11.7	100	263
500.059	X/H	51.3	-15.7	35.6	46.0	10.4	100	1

Note: Level QP = Reading QP + Factor

Table 23: Radiated Emission 1GHz – 25GHz, Horizontal and Vertical Antenna Orientations, Average and Peak Data, Mode A1 (2405MHz)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBµV/m]	Level PK [dBµV/m]	Limit AV [dBµV/m]	Limit PK [dBµV/m]	Margin AV [dB]	Margin PK [dB]
3367.003	Y/V	32.5	43.7	54.0	74.0	21.5	30.3
4809.994	Y/V	44.4	53.0	54.0	74.0	9.6	21.0
7216.213	Y/V	39.1	50.3	54.0	74.0	14.9	23.7
14121.99	Y/H	30.9	45.6	54.0	74.0	23.1	28.4

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

Table 24: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode B1 (2440MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
99.682	Z/H	55.0	-27.4	27.6	43.5	15.9	207	269
99.889	Z/V	54.1	-26.8	27.3	43.5	16.2	132	174
168.231	Z/H	50.9	-22.7	28.2	43.5	15.3	211	277
186.296	Z/H	49.6	-24.7	24.9	43.5	18.6	139	247
300.036	Z/H	57.7	-21.3	36.4	46.0	9.6	108	176
500.069	Z/V	47.7	-15.7	32.0	46.0	14.0	127	194

Note: Level QP = Reading QP + Factor

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Table 25: Radiated Emission 1GHz – 25GHz, Horizontal and Vertical Antenna Orientations, Average and Peak Data, Mode B1 (2440MHz)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBμV/m]	Level PK [dBμV/m]	Limit AV [dBμV/m]	Limit PK [dBμV/m]	Margin AV [dB]	Margin PK [dB]
3415.891	X/V	33.9	44.8	54.0	74.0	20.1	29.2
4879.986	X/V	42.8	52.3	54.0	74.0	11.2	21.7
13066.00	X/V	29.9	43.9	54.0	74.0	24.1	30.1
18088.23	X/V	29.5	43.8	54.0	74.0	24.5	30.2

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

Table 26: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode C1 (2480MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
32.049	Y/H	52.2	-24.4	27.8	40.0	12.2	101	200
51.301	Y/V	39.8	-23.2	16.6	40.0	23.4	260	219
61.762	Y/V	38.9	-24.1	14.8	40.0	25.2	103	286
149.679	Y/V	40.7	-22.6	18.1	43.5	25.4	108	157
168.222	Y/H	55.0	-22.7	32.3	43.5	11.2	186	109
300.041	Y/H	55.9	-21.3	34.6	46.0	11.4	103	263
500.06	Y/H	52.0	-15.7	36.3	46.0	9.7	101	355

Note: Level QP = Reading QP + Factor

Table 27: Radiated Emission 1GHz – 25GHz, Horizontal and Vertical Antenna Orientations, Average and Peak Data, Mode C1 (2480MHz)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBμV/m]	Level PK [dBμV/m]	Limit AV [dBμV/m]	Limit PK [dBμV/m]	Margin AV [dB]	Margin PK [dB]
3500.37	X/V	28.5	40.6	54.0	74.0	25.5	33.4
5661.31	X/V	29.4	43.2	54.0	74.0	24.6	30.8
7032.81	X/V	32.0	45.9	54.0	74.0	22.0	28.1
14122.01	X/V	30.9	44.8	54.0	74.0	23.1	29.2
19468.50	Y/H	23.7	38.2	54.0	74.0	30.3	35.8

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

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Table 28: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode A2 (2405MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
32.072	X/H	48.6	-24.4	24.2	40.0	15.8	106	359
51.253	X/V	39.4	-23.2	16.2	40.0	23.8	143	125
101.388	X/H	49.3	-27.1	22.2	43.5	21.3	252	86
125.08	X/H	49.3	-24.3	25.0	43.5	18.5	242	87
167.952	X/H	53.1	-22.7	30.4	43.5	13.1	151	126
300.035	X/H	57.2	-21.3	35.9	46.0	10.1	100	262
500.049	X/H	50.1	-15.7	34.4	46.0	11.6	100	353

Note: Level QP = Reading QP + Factor

Table 29: Radiated Emission 1GHz – 25GHz, Horizontal and Vertical Antenna Orientations, Average and Peak Data, Mode A2 (2405MHz)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBµV/m]	Level PK [dBµV/m]	Limit AV [dBµV/m]	Limit PK [dBµV/m]	Margin AV [dB]	Margin PK [dB]
2885.73	Y/H	53.0	60.2	54.0	74.0	1.0*	13.8
3366.99	Y/H	52.3	59.2	54.0	74.0	1.7*	14.8
4810.05	Y/H	43.2	52.1	54.0	74.0	10.8	21.9
7213.86	Y/H	38.4	50.3	54.0	74.0	15.6	23.7

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

Table 30: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode B2 (2440MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
45.292	Y/V	47.9	-23.2	24.7	40.0	15.3	106	215
105.38	Y/H	52.2	-26.5	25.7	43.5	17.8	285	214
101.078	Y/V	52.5	-26.7	25.8	43.5	17.7	127	182
185.096	Y/H	45.5	-24.5	21.0	43.5	22.5	121	221
300.041	Y/H	51.9	-21.3	30.6	46.0	15.4	215	184
496.01	Y/V	42.3	-15.9	26.4	46.0	19.6	214	295

Note: Level QP = Reading QP + Factor

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Table 31: Radiated Emission 1GHz – 25GHz, Horizontal and Vertical Antenna Orientations, Average and Peak Data, Mode B2 (2440MHz)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBµV/m]	Level PK [dBµV/m]	Limit AV [dBµV/m]	Limit PK [dBµV/m]	Margin AV [dB]	Margin PK [dB]
2927.69	Y/H	50.8	58.3	54.0	74.0	3.2*	15.7
3415.98	Y/H	44.9	53.4	54.0	74.0	9.1	20.6
4879.99	Y/V	39.2	49.6	54.0	74.0	14.8	24.4
7321.26	Y/V	42.2	53.4	54.0	74.0	11.8	20.6
14129.12	Y/V	30.8	45.4	54.0	74.0	23.2	8.6
20102.55	Y/H	24.7	39.1	54.0	74.0	29.3	14.9

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

Table 32: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode C2 (2480MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
32.057	Z/H	51.4	-24.4	27.0	40.0	13.0	100	200
48.268	Z/V	51.5	-23.2	28.3	40.0	11.7	105	137
128.931	Z/H	50.3	-23.9	26.4	43.5	17.1	232	99
167.769	Z/H	54.4	-22.6	31.8	43.5	11.7	172	247
168.311	Z/V	47.5	-22.6	24.9	43.5	18.6	125	60
300.046	Z/H	56.4	-21.3	35.1	46.0	10.9	102	261
500.068	Z/H	50.7	-15.7	35.0	46.0	11.0	100	352

Note: Level QP = Reading QP + Factor

Table 33: Radiated Emission 1GHz – 25GHz, Horizontal and Vertical Antenna Orientations, Average and Peak Data, Mode C2 (2480MHz)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBµV/m]	Level PK [dBµV/m]	Limit AV [dBµV/m]	Limit PK [dBµV/m]	Margin AV [dB]	Margin PK [dB]
3250.487	X/V	26.6	40.7	54.0	74.0	27.4	33.3
5574.975	X/V	29.4	43.8	54.0	74.0	24.6	30.2
7676.983	X/V	33.0	46.8	54.0	74.0	21.0	27.2

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

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7.2 Radiated Emission of Receiver

7.2.1 Radiated Spurious Emission of Receiver, FCC 15.109, RSS-210 2.2, RSS-210 2.6, RSS-210 A8.5, RSS-Gen 7.2.3.2

RESULT:**PASS**

Date of testing: 2009-03-02, 03-03 and 04-08

Ambient temperature: 20, 21 and 22°C

Relative humidity: 30, 30 and 31%

Atmospheric pressure: 1021, 1010 and 1005hPa

Frequency range: 30MHz – 13GHz

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

Requirements:

The emissions from the unintentional radiator shall not exceed the field strength specified in 15.109(a) and RSS-210 Table 2 (and RSS-Gen Table 1).

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.9, 4.10

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

Final radiated emission measurements were made at 3m distance. The spectrum was examined from 30MHz to the 5th harmonic of the highest fundamental transmitter frequency.

At each frequency, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

For frequencies between 30MHz and 1GHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1GHz, measurements were performed using the following settings: Peak: RBW & VBW = 1MHz, Average: RBW = 1MHz, VBW = 10Hz.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

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Table 34: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode D1 (Receive at 3 meter)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
48.364	Z/V	47.2	-23.2	24.0	40.0	16.0	100	169
94.149	Z/H	58.8	-28.3	30.5	43.5	13.0	207	225
94.99	Z/V	55.6	-27.5	28.1	43.5	15.4	134	175
144.019	Z/V	52.7	-23.0	29.7	43.5	13.8	119	165
168.144	Z/V	52.5	-22.6	29.9	43.5	13.6	100	213
300.041	Z/H	55.2	-21.3	33.9	46.0	12.1	108	250
406.951	Z/H	50.9	-18.3	32.6	46.0	13.4	100	351

Note: Level QP = Reading QP + Factor

Table 35: Radiated Emission 1GHz – 12.4GHz, Horizontal & Vertical Antenna Orientations, Average and Peak Data, Mode D1 (Receive at 3 meter)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBμV/m]	Level PK [dBμV/m]	Limit AV [dBμV/m]	Limit PK [dBμV/m]	Margin AV [dB]	Margin PK [dB]
7310.595	Y/V	33.1	47.0	54.0	74.0	20.9	27.0
7661.634	Y/H	32.8	46.9	54.0	74.0	21.2	27.1

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

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Table 36: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode D2 (Receive at 3 meter)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
48.288	Y/H	47.2	-23.0	24.2	40.0	15.8	388	164
94.424	Y/H	58.7	-28.3	30.4	43.5	13.1	398	228
99.834	Y/V	57.7	-26.9	30.8	43.5	12.7	121	283
143.964	Y/V	55.6	-23.0	32.6	43.5	10.9	105	165
255.558	Y/H	53.8	-23.1	30.7	46.0	15.3	116	189
402.787	Y/H	52.2	-18.3	33.9	46.0	12.1	101	352

Note: Level QP = Reading QP + Factor

Table 37: Radiated Emission 1GHz – 12.4GHz, Horizontal & Vertical Antenna Orientations, Average and Peak Data, Mode D2 (Receive at 3 meter)

Freq. [MHz]	EUT / Antenna Orientation	Level AV [dBµV/m]	Level PK [dBµV/m]	Limit AV [dBµV/m]	Limit PK [dBµV/m]	Margin AV [dB]	Margin PK [dB]
1328.35	Y/H	27.3	42.5	54.0	74.0	26.7	31.5
1393.37	Y/V	24.1	38.2	54.0	74.0	29.9	35.8
7686.49	Y/V	32.8	47.0	54.0	74.0	21.2	27.0

Note: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.

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