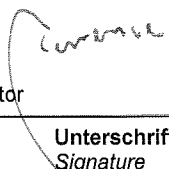


Produkte
Products

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Test Report No.:			
Auftraggeber: Nokia Corporation Client: Elektroniikkatie 10, P.O. Box 50, Oulu, 90571, Finland			
Gegenstand der Prüfung: Nokia Wireless Stereo Headset Test item:			
Bezeichnung: BH-214 Identification:	Serien-Nr.: Serial No.:	Engineering Sample	
Wareneingangs-Nr.: 213084179-1 Receipt No.:	Eingangsdatum: 2009-01-26 Date of receipt:		
Prüfört: 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan Testing location:			
Prüfgrundlage: 47 CFR Part 15.247 (Subpart: C), October, 2008 Test specification: ANSI C63.4-2003 FCC Public Notice DA 00-705, Released March 30, 2000 RSS-210 (Issue 7): 2007 RSS-Gen (Issue 2): 2007			
Prüfergebnis: Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). Test Result: The test item passed the test specification(s).			
Prüflaboratorium: TÜV Rheinland Japan Ltd. - Regional Office West Japan Testing Laboratory: Higashi-Tenma 2-9-1, Kita-ku, Osaka 530-0044, Japan			
geprüft/ tested by:		kontrolliert/ reviewed by:	
			
2008-02-17	T. Cheung / Inspector	2008-02-17	K. Goto / Reviewer
Datum Date	Name/Stellung Name/Position	Datum Date	Name/Stellung Name/Position
	Unterschrift Signature		Unterschrift Signature
Sonstiges / Other Aspects: Details refer to Section 1: "General Remarks"			
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 AT ANTENNA TERMINALS, FCC 15.247(B)(1) AND RSS-210 A8.1(B)

RESULT: PASS

5.1.2 CARRIER FREQUENCY SEPARATION, FCC 15.247(A)(1) AND RSS-210 A8.1(B)

RESULT: PASS

5.1.3 20dB BANDWIDTH, FCC 15.247(A)(1)(II) AND RSS-210 A8.1(A)

RESULT: PASS

5.1.4 HOPPING CHARACTERISTICS NUMBER OF HOPPING FREQUENCIES, FCC 15.247(A)(1)(III) AND RSS-210 A8.1(D)

RESULT: PASS

5.1.5 HOPPING CHARACTERISTICS AVERAGE TIME OF OCCUPANCY, FCC 15.247(A)(1)(III) AND RSS-210 A8.1(D)

RESULT: PASS

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

RESULT: PASS

6.1.1 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE OF TRANSMITTER, FCC 15.207 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 RADIATED EMISSION, OUT-OF-BAND AND SPURIOUS EMISSION, 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 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

There are 4 different types of AC-DC adaptors and 2 different types of DC-DC adaptors for the Wireless Stereo Headset.

Model name of the AC-DC adaptors: AC-3, AC-4, AC-5 and AC-8

Model name of the DC-DC adaptors: DC-4 and DC-9

The AC-DC adaptors: AC-3, AC-4, AC-5 and AC-8, and DC-DC adaptors: DC-4 and DC-9 were pre-tested before the representative adaptors were selected to conduct the full test with the Wireless Stereo Headset. AC-4 was selected as representative adaptor for radio testing and Conducted Emission, and AC-8 was selected as representative adaptor for Radiated Emission.

Test report number	Content
12307528 001	Intentional radiator
12307528 002	Unintentional radiator
12307528 003	Exposure letter

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 Communication 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 O.A.T.S filing number 3466B.

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 8	100025	RF-0020	2009-02
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2010-01
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 Mains Conducted Emission					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2009-02
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2010-01
Two-Line V-Network (LISN)	Rohde & Schwarz	ENV216	100276	RF-0016	2009-05
For Radiated Emission					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2009-02

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Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2010-01
RF Selector (10m)	Toyo Corporation	NS4900	0703-182	RF-0029	2009-05
3dB Attenuator 50Ohm	Tamagawa Electronics Co., Ltd.	CFA-01	-	RF-0265	2009-05
Low Noise Pre-Amplifier	TSJ	MLA-10K01-B01-35	1370750	RF-0253	2009-05
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	2009-04
Biconical Antenna, 30-300MHz	EMCO	3110B	9603-2379	RF-0207	2009-03
Trilog Antenna, 30-1000MHz	Schwarzbeck	VULB9168	0245	RF-0019	2009-05
Horn Antenna, 1-10GHz	Schwarzbeck	BBHA9120B	419	RF-0050	2009-05
Horn Antenna with Pre-Amplifier, 2-18GHz	Toyo Corporation	HAP06-18W	00000025	RF-0065	2009-05
Horn Antenna with Pre-Amplifier, 18-26.5GHz	Toyo Corporation	HAP18-26N	00000010	RF-0070	2009-05
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
CVCF (10m chamber)	NF Corporation	ESU2000S	9067307	RF-0212	N/A
CVCF Booster (10m chamber)	NF Corporation	ESU2000B	9074408	RF-0213	N/A

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Conducted Emission	150kHz - 30MHz	±1.4dB
Antenna Port Conducted Emissions	< 1GHz	±0.39dB
	> 1GHz	±0.68dB
Radiated Emission (Horizontal Orientation)	30MHz - 1GHz	±4.8dB
	> 1GHz	±5.2dB
Radiated Emission (Vertical Orientation)	30MHz - 1GHz	±4.2dB
	> 1GHz	±5.2dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) Nokia Wireless Stereo Headset is intended to operate with electric devices which support Bluetooth wireless technology such as cellular phone as hands free headset.

3.2 System Details

Bluetooth core spec.:	Version 2.1 + EDR
Power output:	6.3dBm
Antenna gain:	-1.0dBi
Antenna type:	Inverted-F antenna
Mounting type:	Printed on PCB
Frequency range:	2402 – 2480 MHz
Number of channel:	79
Channel spacing:	1 MHz
Modulation type:	FHSS
FCC Classification:	DSS
Classification:	F1D
HW version:	0.21R
Mech version:	0.5
SW version:	5007
System Input Voltage:	DC 3.7V, Battery operated AC 110-240V, 50/60Hz, AC-DC adaptor DC 12/24V, DC-DC adaptor
Protection Class:	II & III

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 inverted-F antenna printed on the PCB, details refer to the internal photos.

3.3 Clock Frequencies

The EUT generates internally the following clock frequency:

Frequency	Source
26 MHz	Crystal of BlueTunesROM

3.4 Independent Operation Modes

The system was configured for testing in a typical fashion (as a customer would normally use it).

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 (2402 MHz), the operating frequency in the middle of the specified frequency band (2441 MHz) and the highest operating frequency (2480 MHz).

The basic operation modes are:

- A. EUT transmits at lowest Channel (2402 MHz)
- B. EUT transmits at middle Channel (2441 MHz)
- C. EUT transmits at highest Channel (2480 MHz)
- D. EUT transmits on pseudo -random sequence on the 79 channels
- E. EUT receives packets

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, FCC Public Notice DA 00-705 and Released March 30, 2000

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

For details, see under each test item.

4.2 Physical Configuration for Testing

Figure 1: Test setup of Conducted radio testing

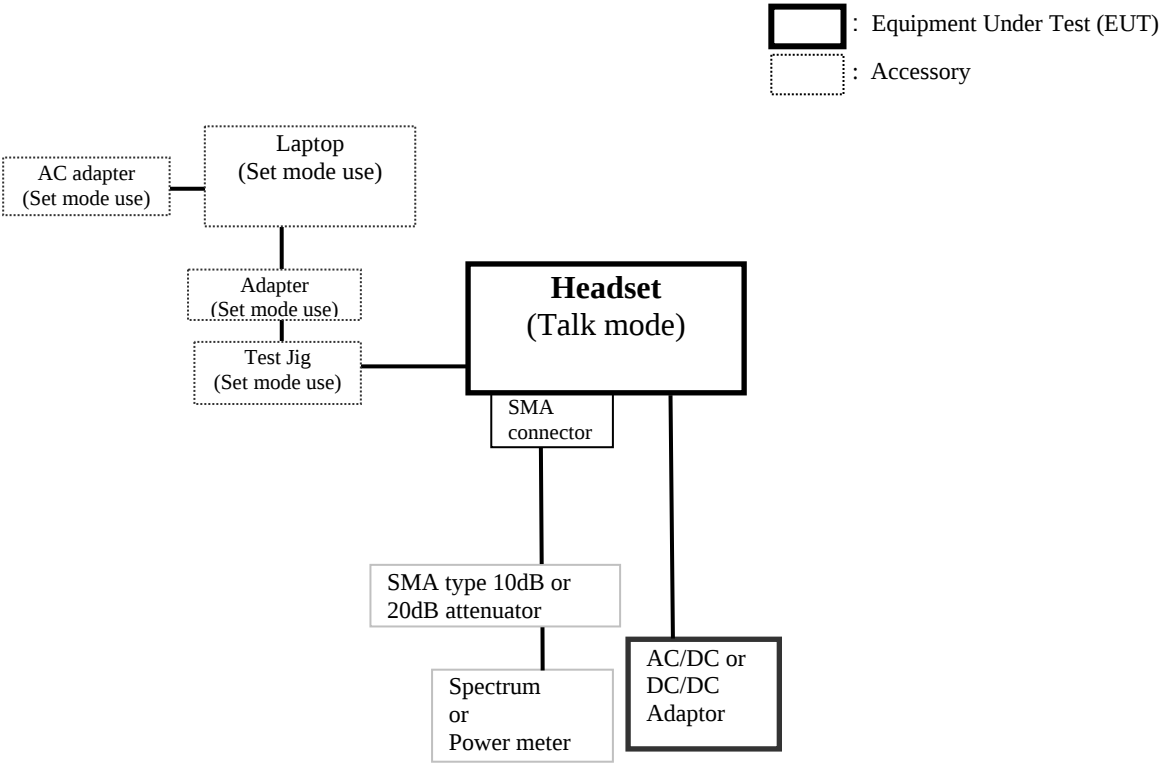
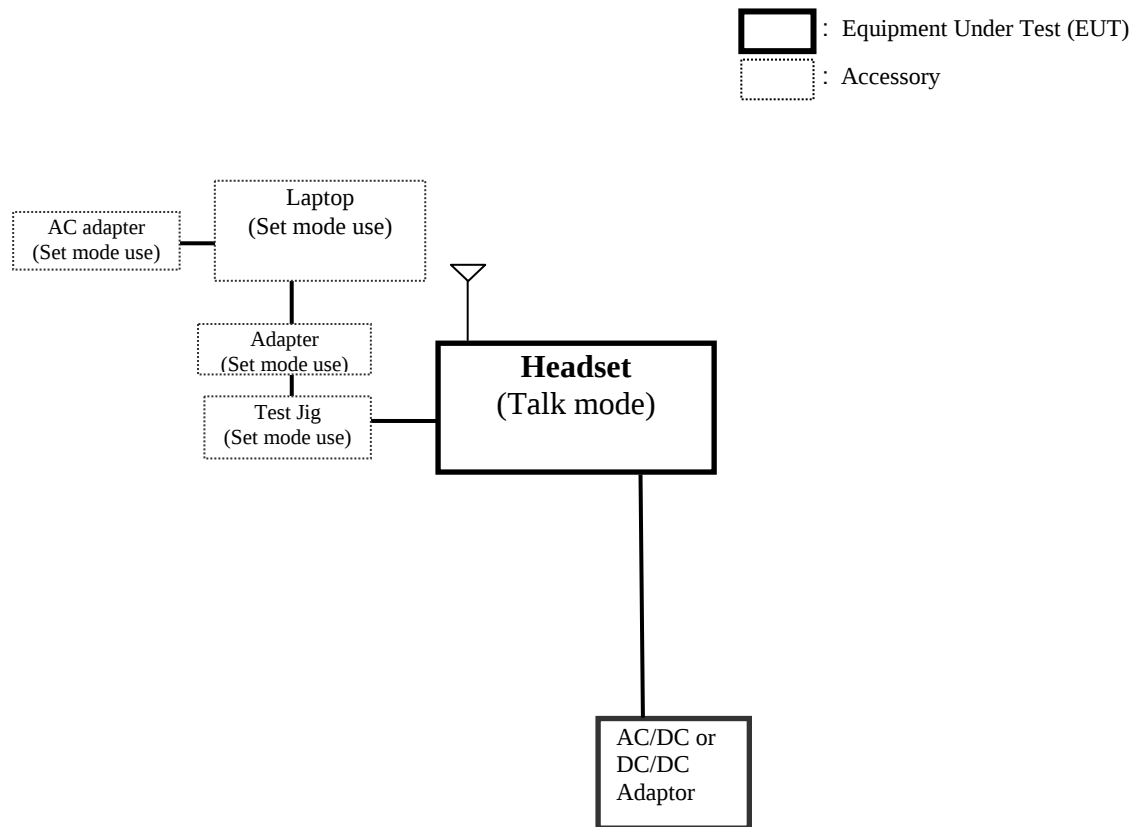


Figure 2: Test setup of Radiated testing



In the sample for conducted tests, the antenna was replaced by a 50Ω antenna connector.

The power line of the adaptor is not mention in the figure.

For more details, refer to section: Photographs of the Test Set-Up.

4.3 Test Operation and Test Software

A software Bluetest3, SW version :5007 was used for testing.

The software was running on the external PC performing continuous radio communication of the EUT with selected operation mode, frequency channel, packet type, packet size. It was used to enable on the EUT the test operation mode specified 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: Earphone
Manufacturer: Hosiden
Model: HS-44
Rated voltage: N/A
Input current: N/A
Frequency: -
Serial number: 0558
2. Product: Interface board
Manufacturer: Hosiden
Model: Interface board
Rated voltage: 5.0V
Input current: 500mA max.
Frequency: -
Serial number: N/A
3. Product: Test jig
Manufacturer: Hosiden
Model: Test jig
Rated voltage: 3.3V max.
Input current: 500mA max.
Frequency: -
Serial number: N/A
5. Product: AC inlet converter
Manufacturer: ELECOM
Model: T-TA
Rated voltage: 600W max.
Input current: -
Frequency: -
Serial number: N/A
6. Product: Cigarette socket
Manufacturer: un-specified
Model: un-specified
Rated voltage: 24V
Input current: -
Frequency: -
Serial number: N/A

4.5 Countermeasures to achieve EMC Compliance

None

5. Test Results Conducted Testing at Antenna Port

For conducted tests, the antenna was replaced by a 50 Ω antenna connector.

5.1.1 Conducted Output Power at Antenna Terminals, FCC 15.247(b)(1) and RSS-210 A8.1(b)

RESULT:

PASS

Date of testing: 2009-02-03

Ambient temperature: 24 °C

Relative humidity: 27 %

Atmospheric pressure: 1004hPa

Requirements:

For systems using frequency hopping systems in the 2400-2483.5MHz band, the maximum peak output power is 0.125W (20.97dBm).

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.8 and FCC Public Notice DA 00-705, Released March 30, 2000.

The maximum peak output power (conducted) was measured directly at the antenna connector with the power meter. The final measurement takes into account the loss generated by the short cable provided by the EUT manufacturer to support the antenna connector.

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

Table 3: Conducted Output Power, Packet type DH1

Power (dBm), DH1, Peak				Limit (dBm)
	1Mbps	2Mbps	3Mbps	
Lo (2402MHz)	6.21	5.94	6.20	20.97
Mid (2441MHz)	5.90	5.63	5.85	20.97
Hi (2480MHz)	5.35	4.94	5.12	20.97

Table 4: Conducted Output Power, Packet type DH5

Power (dBm), DH5, Peak				Limit (dBm)
	1Mbps	2Mbps	3Mbps	
Lo (2402MHz)	6.21	6.06	6.31	20.97
Mid (2441MHz)	6.03	5.73	6.03	20.97
Hi (2480MHz)	5.33	4.93	5.35	20.97

The worst case configuration was found for the power output of the Packet type DH5 at 3Mbps between DH1 and DH5. This was used for the rest of evaluation of the product.

5.1.2 Carrier Frequency Separation, FCC 15.247(a)(1) and RSS-210 A8.1(b)

RESULT:

PASS

Date of testing: 2009-02-05

Ambient temperature: 23 °C

Relative humidity: 22 %

Atmospheric pressure: 1004hPa

Requirements:

For systems using frequency hopping systems in the 2400-2483.5MHz band, the hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of the hopping channel.

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.8 and FCC Public Notice DA 00-705, Released March 30, 2000.

The carrier frequencies separation was measured at the antenna connector with the spectrum analyzer. Allowing the trace to stabilize and using the marker-delta function to determine the separation between the peaks of the adjacent channels.

Table 5: Carrier Frequency Separation, DH5

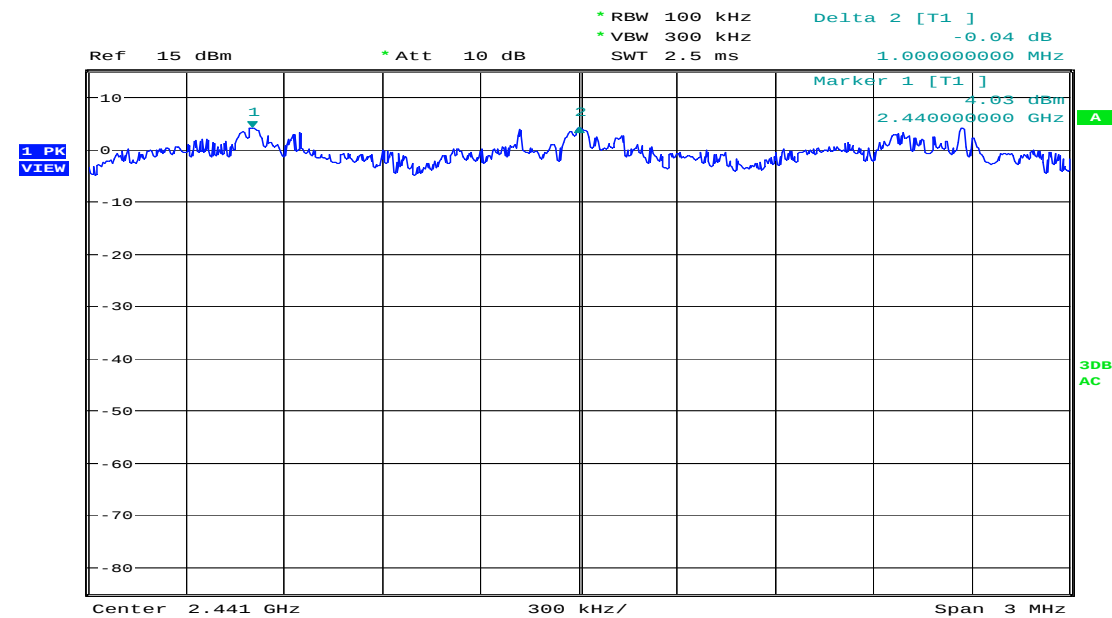
Channel Separation [kHz]	Limit
1000.00	25kHz or the 20dB bandwidth of the hopping channel.

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Figure 3: Carrier Frequency Separation, DH5



Mode D
Date: 5.FEB.2009 20:03:18

5.1.3 20dB Bandwidth, FCC 15.247(a)(1)(ii) and RSS-210 A8.1(a)

RESULT:

PASS

Date of testing: 2009-02-05

Ambient temperature: 23 °C

Relative humidity: 22 %

Atmospheric pressure: 1004hPa

Requirements:

For systems using frequency hopping systems in the 2400-2483.5MHz band, the limit is not specified. The test data was taken as reference.

Test procedure:

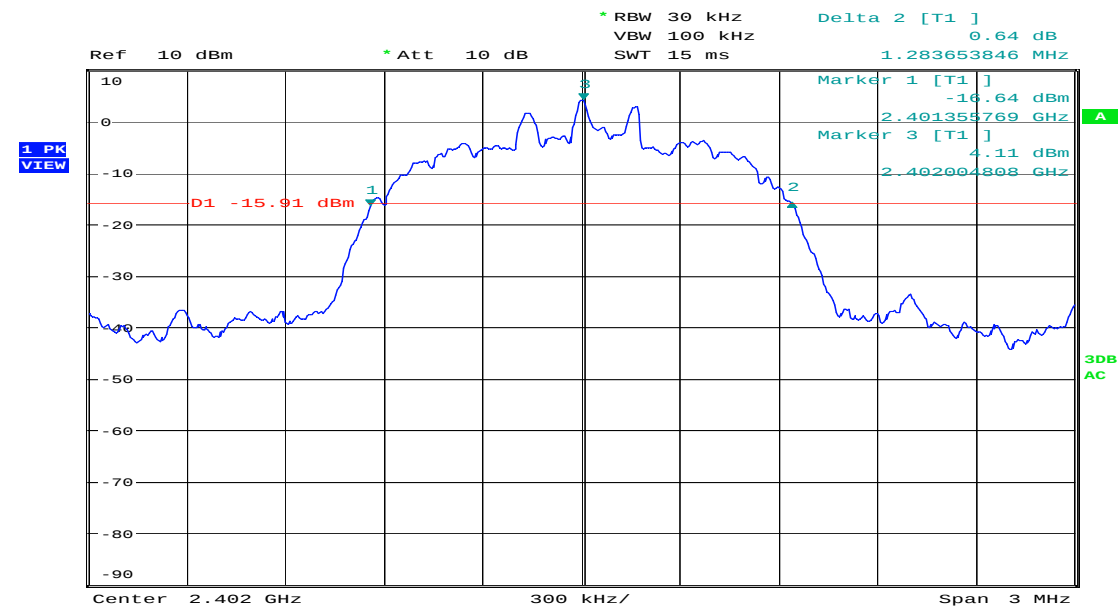
ANSI C63.4-2003, RSS-Gen 4.6.2 and FCC Public Notice DA 00-705, Released March 30, 2000.

The antenna connector was connected to a spectrum analyzer. The spectrum analyzer resolution bandwidth was set to 1% of the SPAN (10MHz). The 20dB Bandwidth was measured by using the DELTA MARKER function of the analyzer.

Table 6: 20dB Bandwidth, DH5

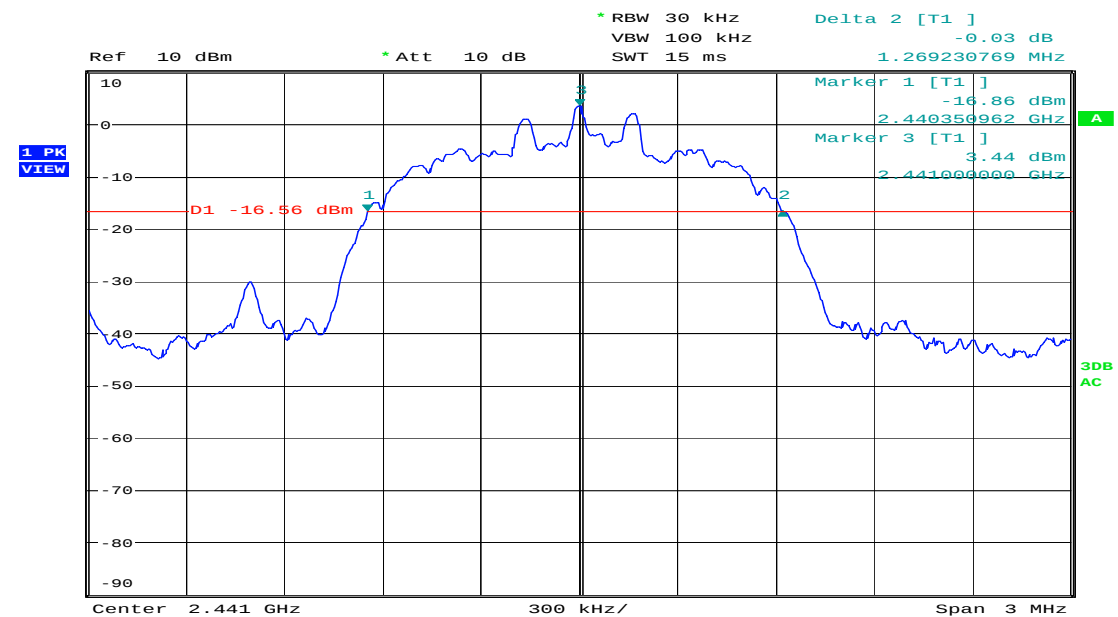
Frequency [MHz]	20dB Bandwidth [MHz]	Minimum Limit [kHz]
2402	1.284	N/A
2441	1.269	N/A
2480	1.269	N/A

Figure 4: 20dB Bandwidth, Mode A (2402MHz)



Mode A
Date: 5.FEB.2009 19:15:14

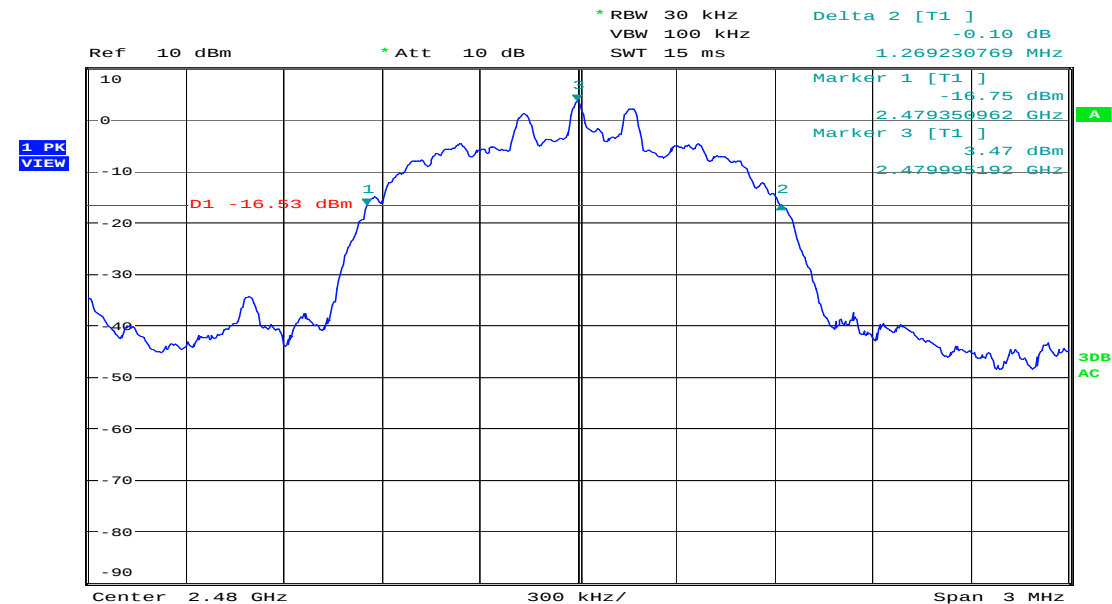
Figure 5: 20dB Bandwidth, Mode B (2441MHz)



Mode B
Date: 5.FEB.2009 19:33:20

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Products

Figure 6: 20dB Bandwidth, Mode C (2480MHz)



Mode C
Date: 5.FEB.2009 19:41:35

5.1.4 Hopping Characteristics Number of Hopping Frequencies, FCC 15.247(a)(1)(iii) and RSS-210 A8.1(d)

RESULT:

PASS

Date of testing: 2009-02-05

Ambient temperature: 23 °C

Relative humidity: 22 %

Atmospheric pressure: 1004hPa

Requirements:

For systems using frequency hopping systems in the 2400-2483.5MHz band, the number of hopping frequency is at least 15 channels.

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.8 and FCC Public Notice DA 00-705, Released March 30, 2000.

The antenna connector was connected to a spectrum analyzer. Allowing the trace to stabilize and breaking into 2 plots which clearly show all the hopping frequencies.

Table 7: Carrier Frequency Separation, DH5

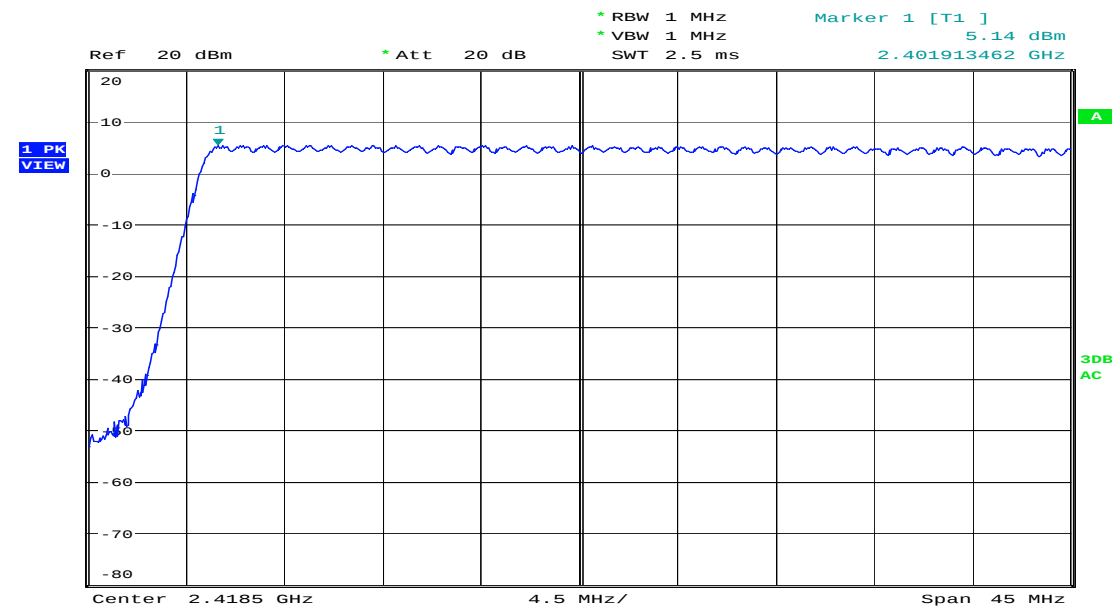
Hopping Channel	Limit
79	15

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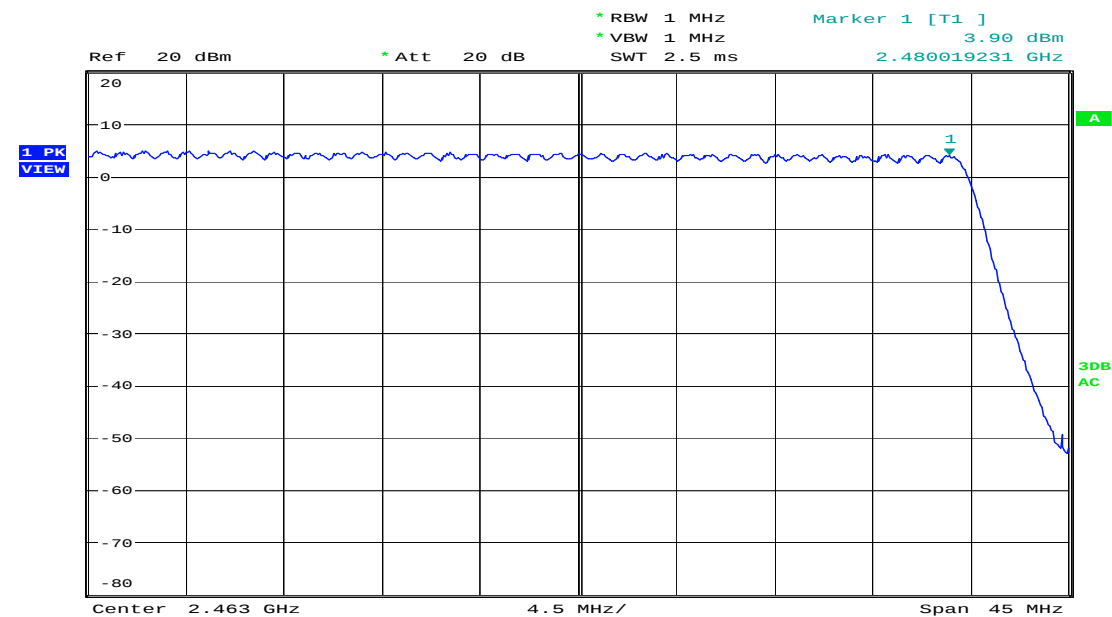
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Figure 7: Number of hopping frequencies, Mode D



Mode D
Date: 5.FEB.2009 20:12:57

Figure 8: 20dB Bandwidth, Mode D



Mode D
Date: 5.FEB.2009 20:17:41

**5.1.5 Hopping Characteristics Average time of Occupancy, FCC
15.247(a)(1)(iii) and RSS-210 A8.1(d)**

RESULT:

PASS

Date of testing: 2009-02-05

Ambient temperature: 23 °C

Relative humidity: 22 %

Atmospheric pressure: 1004hPa

Requirements:

For systems using frequency hopping systems in the 2400-2483.5MHz band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test procedure:

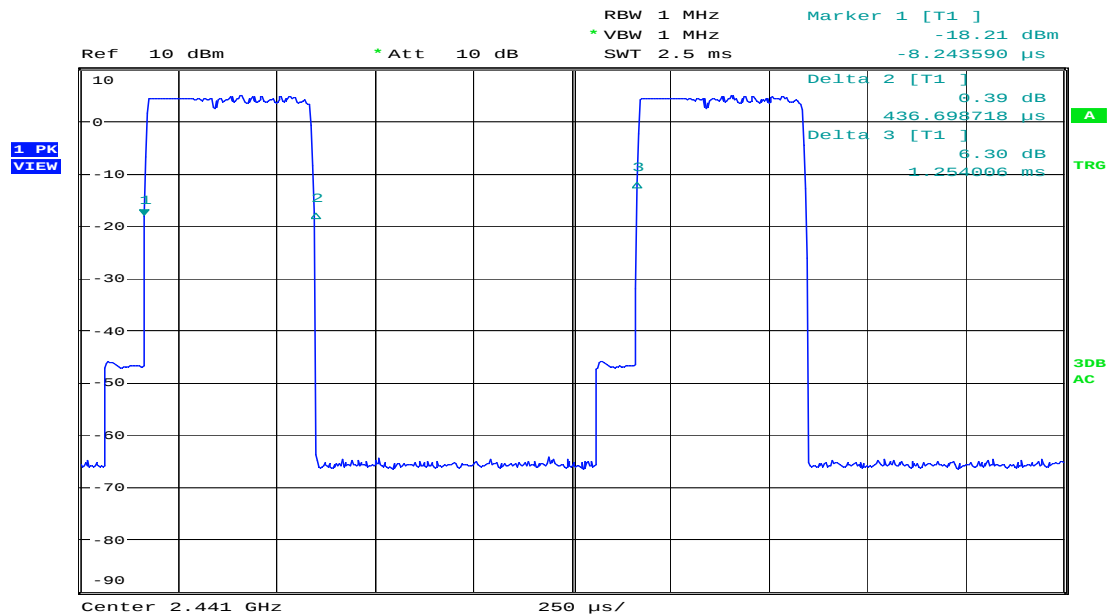
ANSI C63.4-2003, RSS-Gen 4.8 and FCC Public Notice DA 00-705, Released March 30, 2000.

The antenna connector was connected to a spectrum analyzer.. The dwell time was measured by using the DELTA MARKER function of the analyzer.

Table 8: Average time of Occupancy

Packet type	Dwell time [ms]	Limit
DH1	137.7	400ms per 31.6 second
DH5	315.5	

Figure 9: Average time of occupancy, Mode D, DH1



DH1
Date: 5.FEB.2009 21:48:34

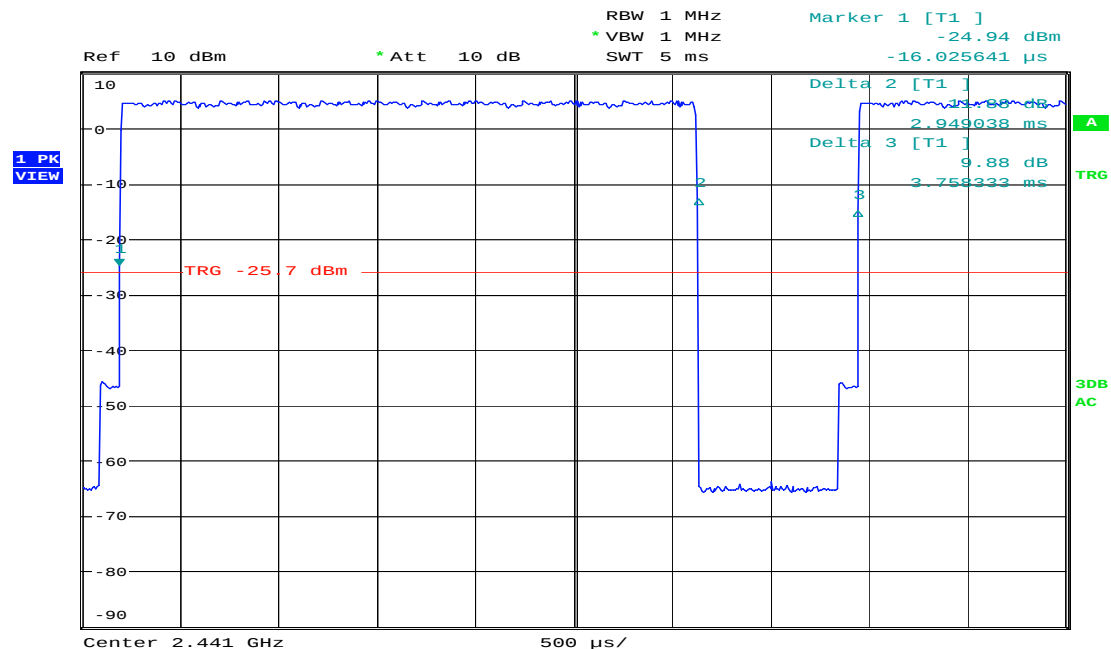
DH1 packet:

Each tx-time per appearance is 0.437ms

Dwell time= 315* 0.437= 137.7ms

Remark: 315 peaks was counted within 31.6s

Figure 10: Average time of occupancy, Mode D, DH5



Date: 5.FEB.2009 20:52:21

DH5 packet:

Each tx-time per appearance is 2.949ms

Dwell time= 107* 2.949= 315.5ms

Remark: 107 peaks was counted within 31.6s

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

RESULT:

PASS

Date of testing: 2009-02-04

Ambient temperature: 23 °C

Relative humidity: 27 %

Atmospheric pressure: 1016hPa

Requirements:

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

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.9 and FCC Public Notice DA 00-705, Released March 30, 2000.

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

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

Table 9: Conducted Spurious Emission, Mode A (2402MHz), DH5

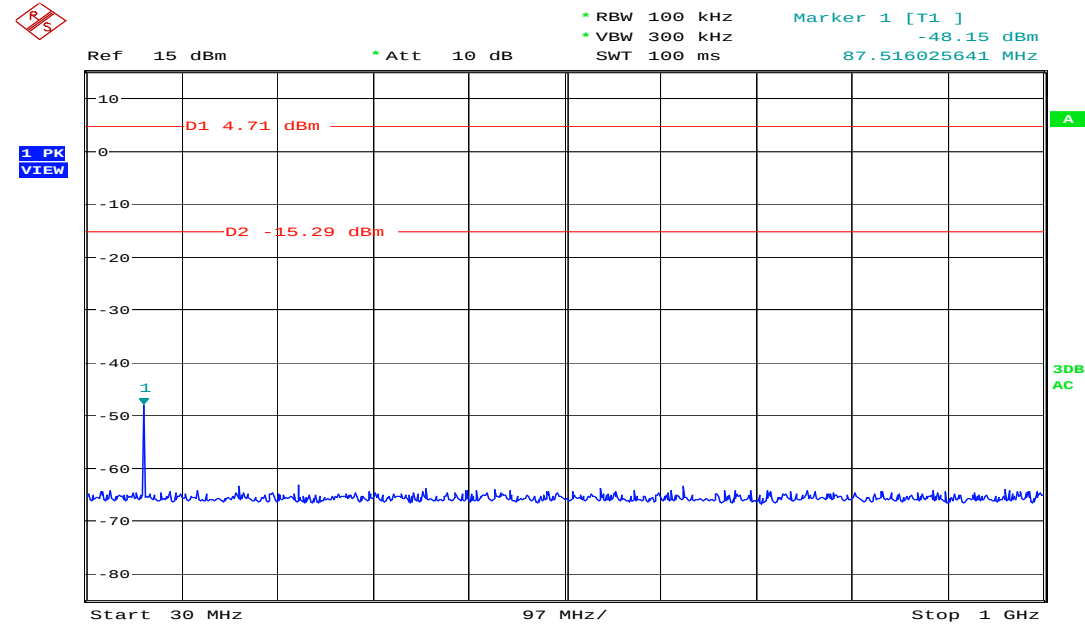
Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
87.51	-48.15	0.05	-48.10	-14.91	33.19
2404	4.71	0.38	5.09	N/A	N/A
2353	-61.41	0.38	-61.03	-14.91	46.12
2455	-62.58	0.34	-62.24	-14.91	47.33
6410	-58.84	0.57	-58.27	-14.91	43.37
13558	-63.37	0.69	-62.68	-14.91	47.77
22308	-63.04	0.82	-62.22	-14.91	47.31

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

Emission level = Reading + Correction factor

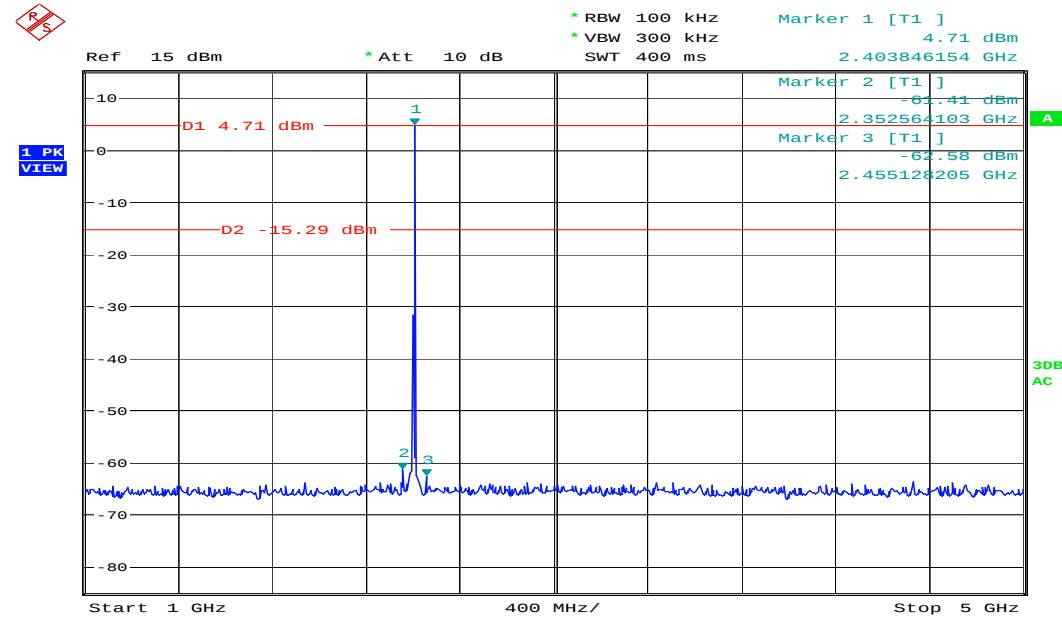
Correction factor = Total cable loss

Figure 11: Spurious Emission from 30MHz to 1GHz, Mode A (2402MHz), DH5



Mode A
Date: 4.FEB.2009 23:50:23

Figure 12: Spurious Emission from 1 to 5GHz, Mode A (2402MHz), DH5



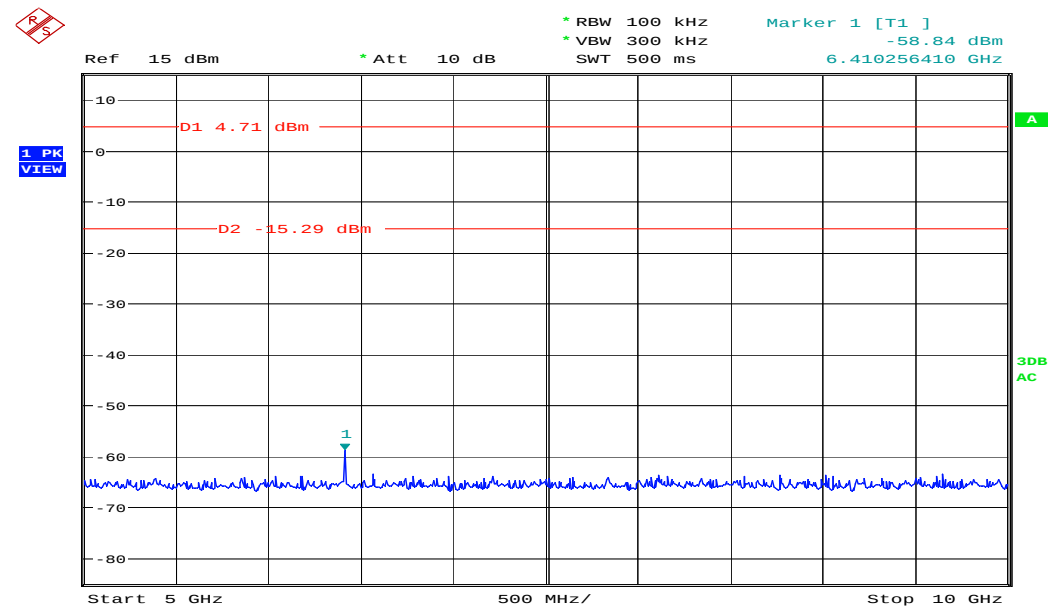
Mode A
Date: 4.FEB.2009 23:49:15

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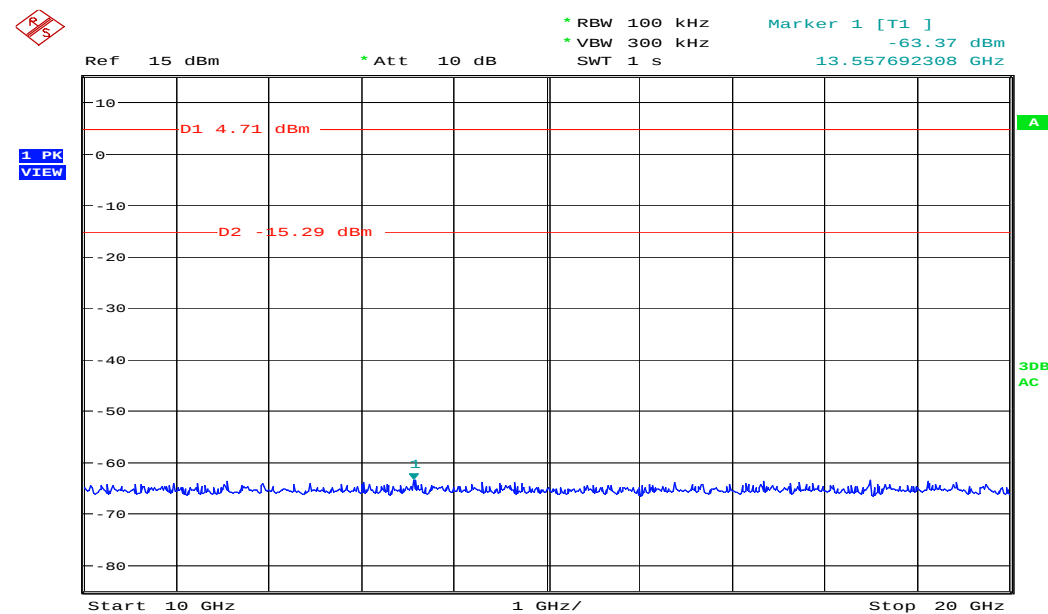
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Figure 13: Spurious Emission from 5 to 10GHz, Mode A (2402MHz), DH5



Mode A
Date: 4.FEB.2009 23:51:13

Figure 14: Spurious Emission from 10 to 20GHz, Mode A (2402MHz), DH5



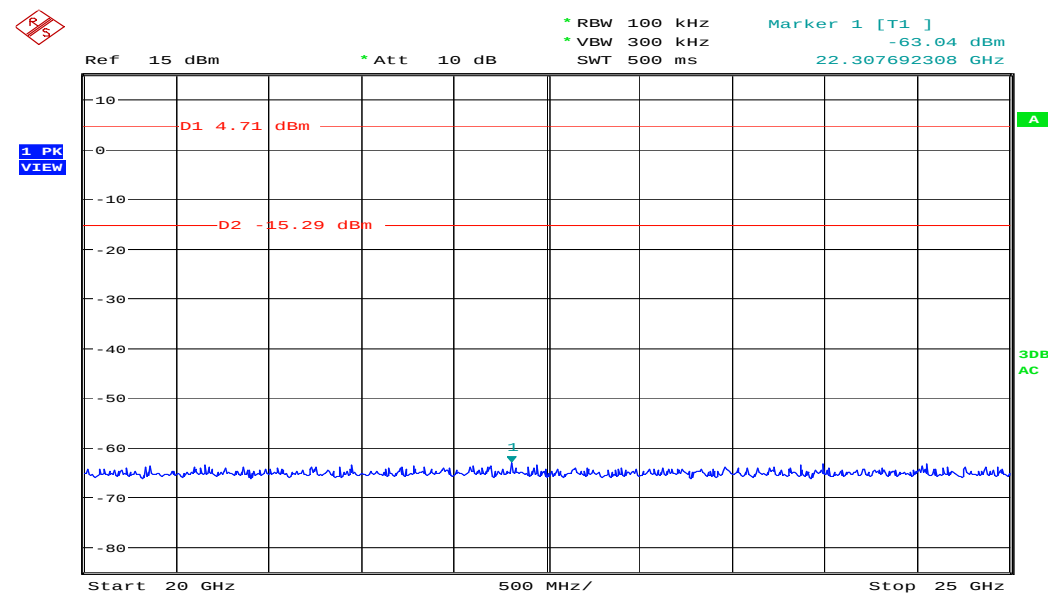
Mode A
Date: 4.FEB.2009 23:52:09

Produkte
Products

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Figure 15: Spurious Emission from 20 to 25GHz, Mode A (2402MHz), DH5



Mode A
Date: 4.FEB.2009 23:53:20

Produkte
Products

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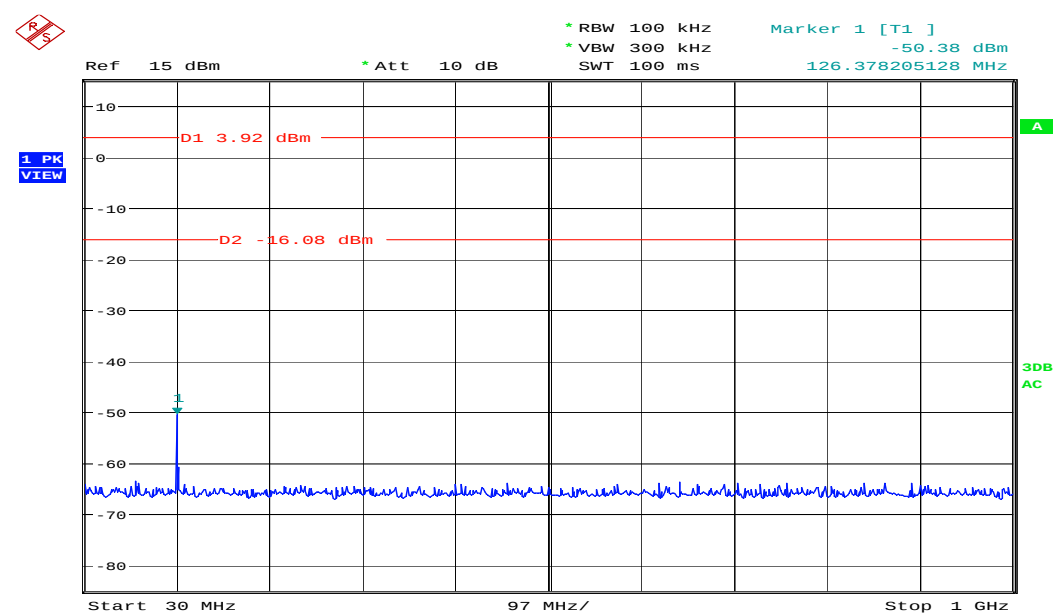
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Table 10: Conducted Spurious Emissions, Mode B (2441MHz), DH5

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
126.38	-50.38	0.07	-50.31	-15.75	34.55
2442	3.92	0.33	4.25	N/A	N/A
2391	-61.84	0.39	-61.45	-15.75	45.70
2494	-61.62	0.37	-61.25	-15.75	45.50
6506	-60.49	0.61	-59.88	-15.75	44.12
16362	-62.72	0.98	-61.74	-15.75	45.99
22660	-63.37	1.19	-62.18	-15.75	46.42

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

Figure 16: Spurious Emission from 30MHz to 1GHz, Mode B (2441MHz), DH5



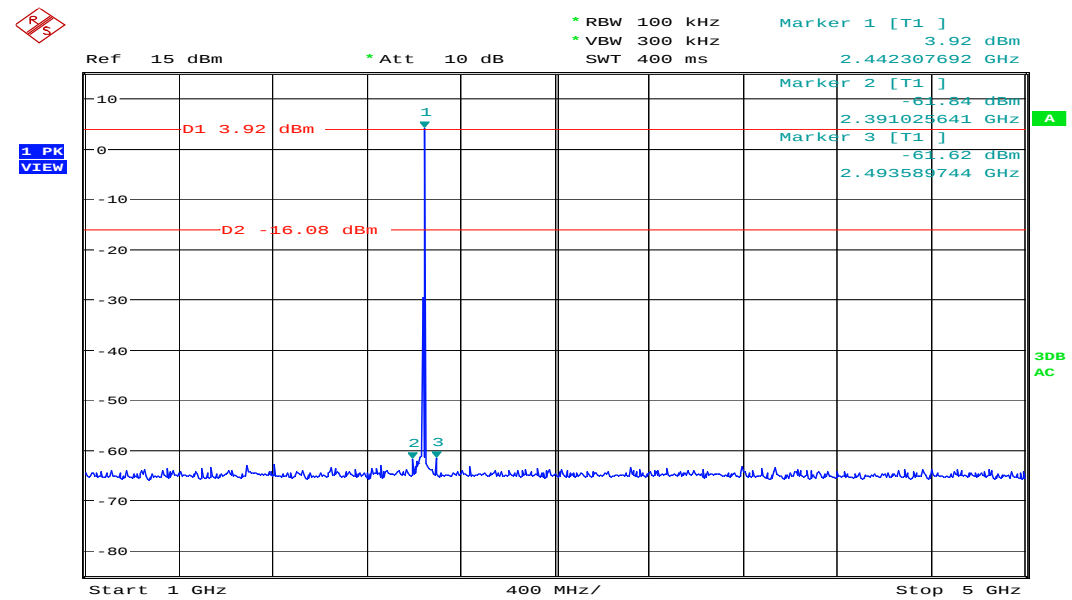
Mode B
Date: 5.FEB.2009 00:08:11

Produkte
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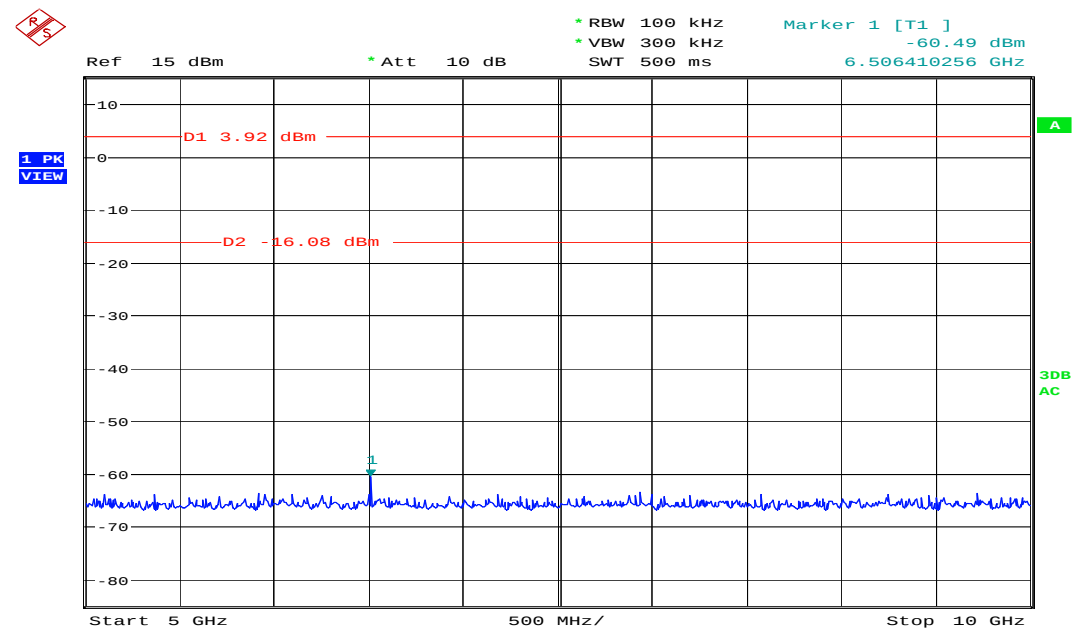
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Figure 17: Spurious Emission from 1 to 5GHz, Mode B (2441MHz), DH5



Mode B
Date: 5.FEB.2009 00:07:32

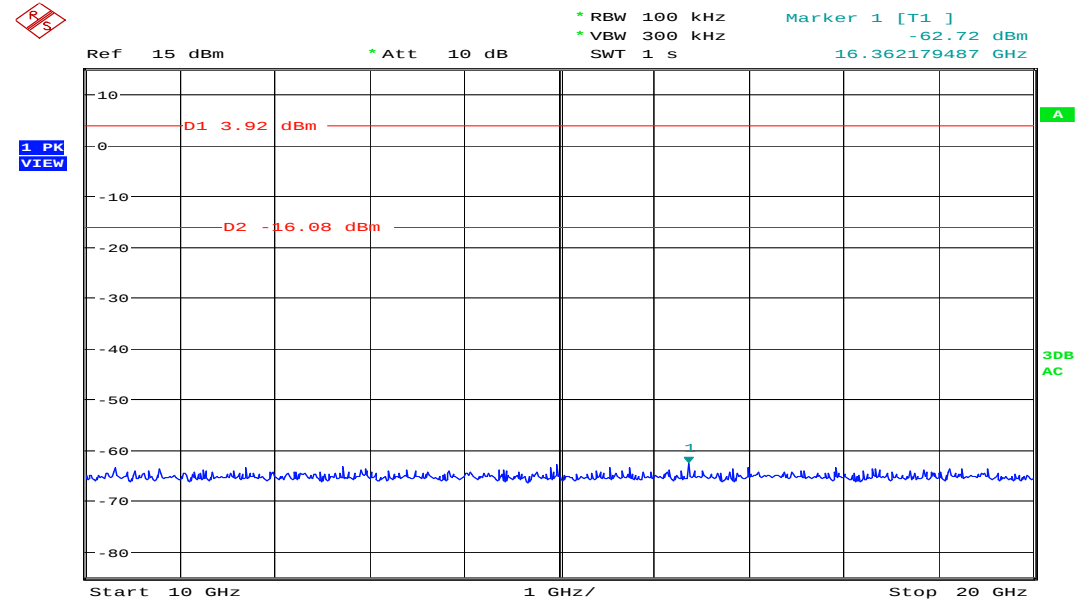
Figure 18: Spurious Emission from 5 to 10GHz, Mode B (2441MHz), DH5



Mode B
Date: 5.FEB.2009 00:08:51

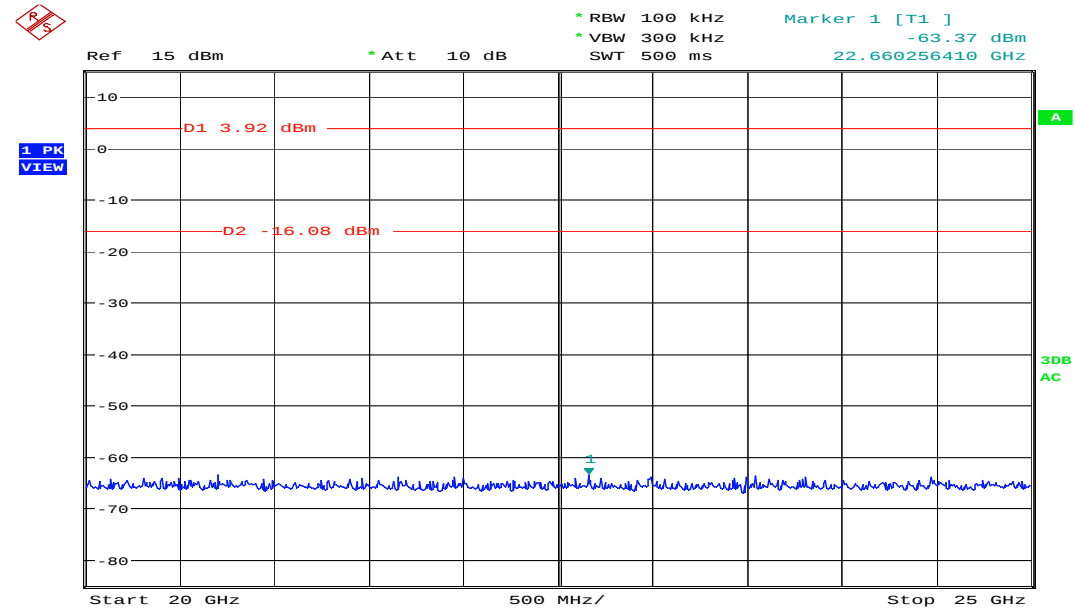
Produkte
Products

Figure 19: Spurious Emission from 10 to 20GHz, Mode B (2441MHz), DH5



Mode B
Date: 5.FEB.2009 00:09:46

Figure 20: Spurious Emission from 20 to 25GHz, Mode B (2441MHz), DH5



Mode B
Date: 5.FEB.2009 00:10:20

Produkte
Products

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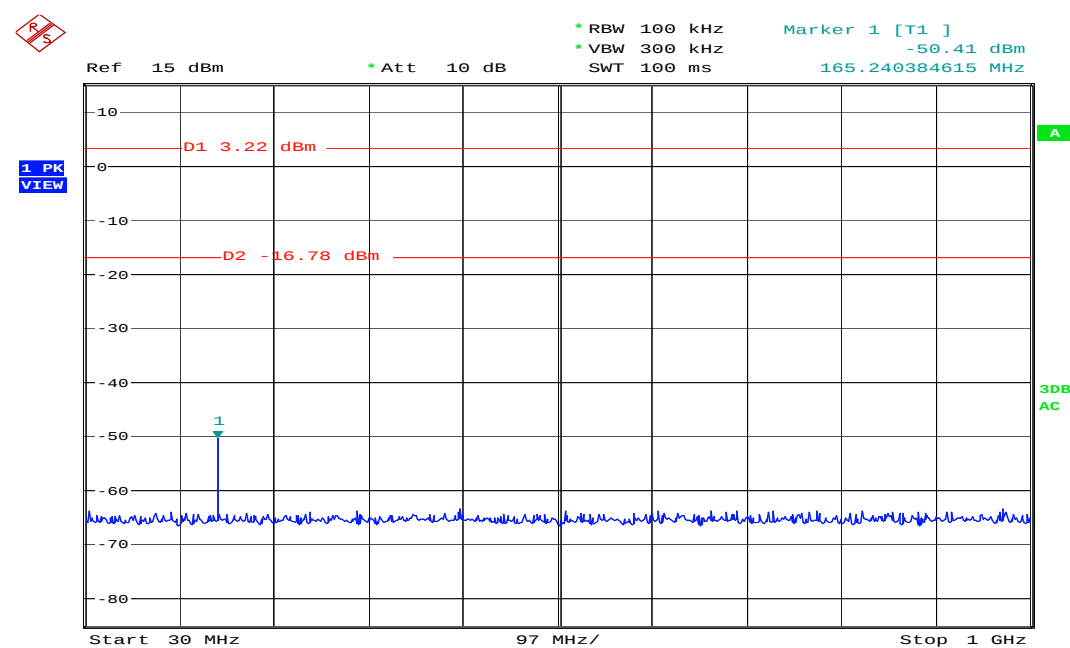
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Table 11: Conducted Spurious Emissions, Mode C (2480MHz), DH5

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
165.24	-50.41	0.10	-50.31	-16.41	33.91
2481	3.22	0.37	3.59	N/A	N/A
2430	-61.54	0.34	-61.20	-16.41	44.79
2532	-61.72	0.38	-61.34	-16.41	44.93
6611	-60.46	0.61	-59.85	-16.41	43.44
11186	-63.22	0.76	-62.46	-16.41	46.05
23285	-63.26	1.30	-61.96	-16.41	45.55

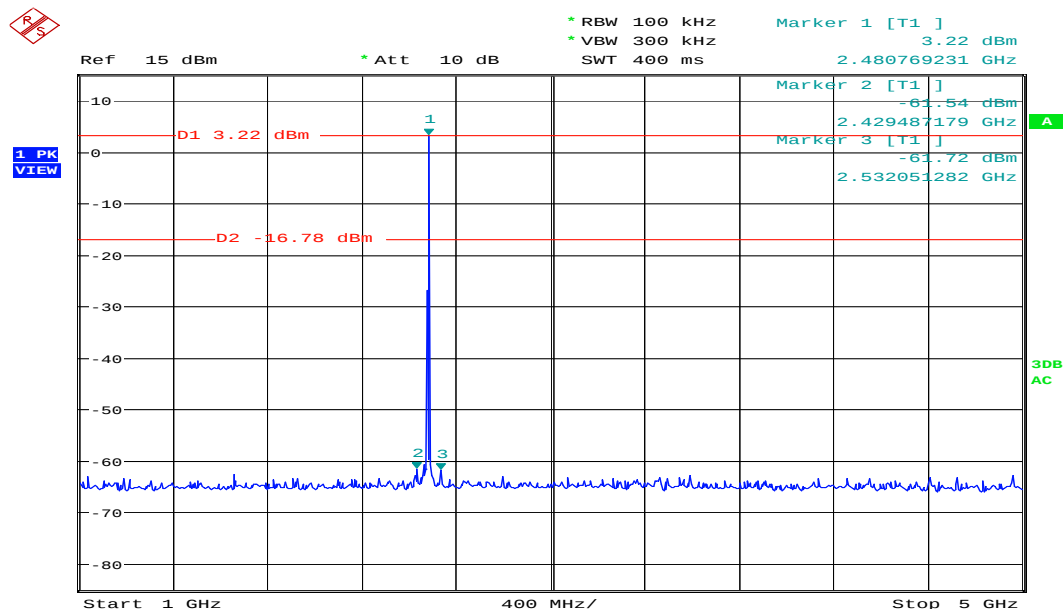
Notes: Limit = Reading of fundamental + Correction factor – 20dB
Emission level = Reading + Correction factor
Correction factor = Total cable loss

Figure 21: Spurious Emission from 30MHz to 1GHz, Mode C (2480MHz), DH5



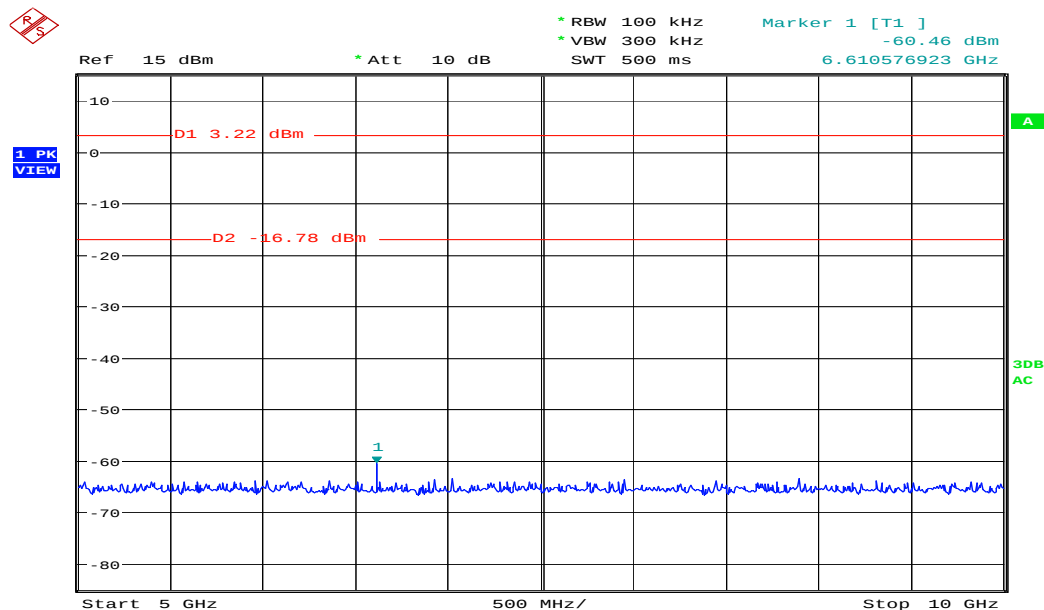
Mode C
Date: 5.FEB.2009 00:16:11

Figure 22: Spurious Emission from 1 to 5GHz, Mode C (2480MHz), DH5



Mode C
Date: 5.FEB.2009 00:15:23

Figure 23: Spurious Emission from 5 to 10GHz, Mode C (2480MHz), DH5



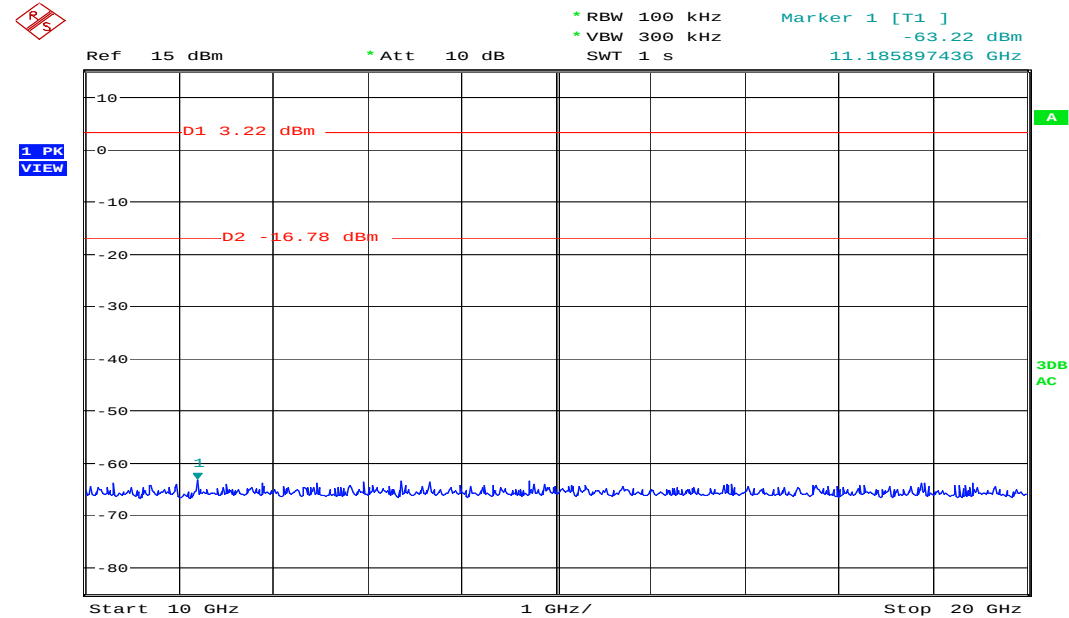
Mode C
Date: 5.FEB.2009 00:16:48

Produkte
Products

Prüfbericht - Nr.: 12307528 001
Test Report No.:

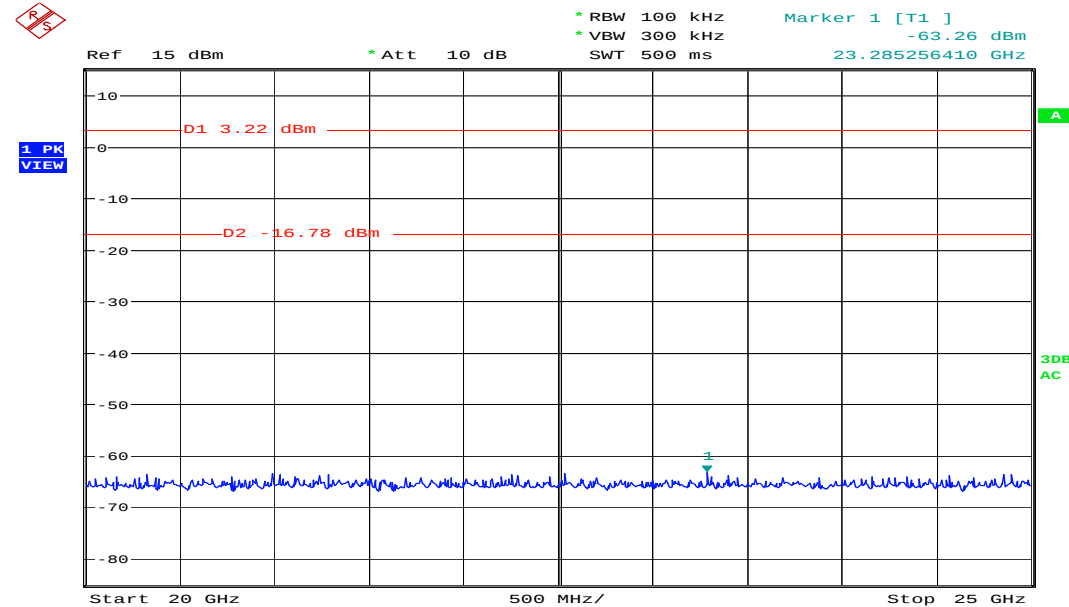
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Figure 24: Spurious Emission from 10 to 20GHz, Mode C (2480MHz), DH5



Mode C
Date: 5.FEB.2009 00:17:19

Figure 25: Spurious Emission from 20 to 25GHz, Mode C (2480MHz), DH5



Mode C
Date: 5.FEB.2009 00:17:48

6. Test Results AC Mains Conducted Emission

6.1 AC Mains Conducted Emission of Transmitter

6.1.1 Mains Terminal Continuous Disturbance Voltage of Transmitter, FCC 15.207 and RSS-Gen 7.2.2

RESULT: **PASS**

Date of testing: 2009-02-06

Ambient temperature: 25°C

Relative humidity: 18%

Atmospheric pressure: 1015hPa

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 15.207 and RSS-Gen 7.2.2.

Test procedure:

ANSI C63.4-2003, RSS-Gen 7.2.2.and FCC Public Notice DA 00-705, Released March 30, 2000.

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 laptop computer was connected to a Line Impedance Stabilization Network (LISN) / Artificial Mains Network (AMN).

The physical arrangement of the test system and associated cabling was varied in order 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 using a CISPR quasi-peak detector and average detector.

Disturbances other than those mentioned are small or not detectable.

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Table 12: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode A, DH5

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]
0.188	L1	21.8	9.2	9.6	31.4	18.8	64.1	54.1	32.7	35.3
0.213	N	28.3	12.7	9.6	37.9	22.3	63.1	53.1	25.2	30.8
0.420	N	23.5	9.1	9.7	33.2	18.8	57.5	47.5	24.3	28.7
0.644	N	19.8	7.2	9.7	29.5	16.9	56.0	46.0	26.5	29.1
0.875	N	17.8	6.0	9.7	27.5	15.7	56.0	46.0	28.5	30.3
1.745	N	15.9	4.1	9.7	25.6	13.8	56.0	46.0	30.4	32.2
3.127	N	11.7	1.3	9.8	21.5	11.1	56.0	46.0	34.5	34.9
3.872	L1	6.8	-0.5	9.8	16.6	9.3	56.0	46.0	39.4	36.7

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

Table 13: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode C, DH5

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]
0.208	L1	23.9	10.7	9.6	33.5	20.3	63.3	53.3	29.8	33.0
0.218	N	26.1	11.5	9.6	35.7	21.1	62.9	52.9	27.2	31.8
0.420	N	24.0	9.3	9.7	33.7	19.0	57.4	47.4	23.7	28.4
0.424	L1	19.2	8.1	9.7	28.9	17.8	57.4	47.4	28.5	29.6
0.634	N	19.5	7.3	9.7	29.2	17.0	56.0	46.0	26.8	29.0
0.849	N	19.8	7.0	9.7	29.5	16.7	56.0	46.0	26.5	29.3
1.275	N	18.5	5.9	9.7	28.2	15.6	56.0	46.0	27.8	30.4
1.901	N	16.5	4.4	9.7	26.2	14.1	56.0	46.0	29.8	31.9
16.082	N	4.5	-3.6	10.3	14.8	6.7	60.0	50.0	45.2	43.3

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

Table 14: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode E, DH5

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]
0.194	N	21.0	9.3	9.6	30.6	18.9	63.9	53.9	33.3	35.0
0.211	L1	27.5	12.4	9.6	37.1	22.0	63.2	53.2	26.1	31.2
0.429	N	18.0	7.8	9.7	27.7	17.5	57.3	47.3	29.6	29.8
0.436	L1	19.3	7.4	9.7	29.0	17.1	57.1	47.1	28.1	30.0
0.616	L1	17.2	6.4	9.7	26.9	16.1	56.0	46.0	29.1	29.9
0.849	L1	19.6	7.0	9.7	29.3	16.7	56.0	46.0	26.7	29.3
2.208	L1	13.7	2.6	9.8	23.5	12.4	56.0	46.0	32.5	33.6
16.481	L1	4.1	-3.7	10.2	14.3	6.5	60.0	50.0	45.7	43.5

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

7. Test Results Radiated Emission

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: 2009-02-04

Ambient temperature: 23°C

Relative humidity: 27%

Atmospheric pressure: 1016hPa

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 FCC Public Notice DA 00-705, Released March 30, 2000

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

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

Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental.

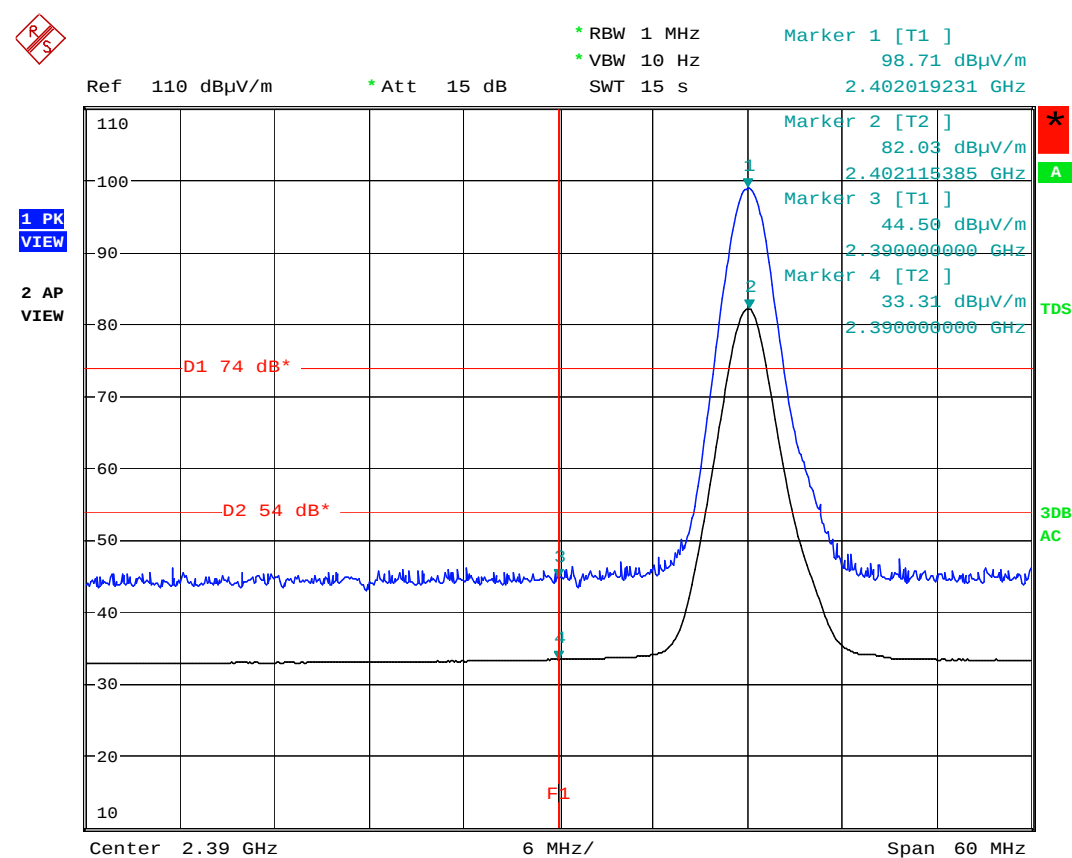
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 15: Band Edge Radiated Emission

Operating Frequency [MHz]	EUT / Antenna Orient.	Peak Value [dBuV/m]	Average Value [dBuV/m]	Peak Limit [dBuV/m]	Average Limit [dBuV/m]	Peak Margin [dB]	Average Margin [dB]
2402	Z / V	44.50	33.31	74.00	54.00	29.50	20.69
2480	Z / H	56.63	47.14	74.00	54.00	17.37	6.86

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

Figure 26: Band Edge Radiated Emission, Mode A (2402MHz), Peak and Average



Spurious Emissions 1-8GHz, Vert, Mode: A, Pos.: Z
Date: 4.FEB.2009 15:42:33

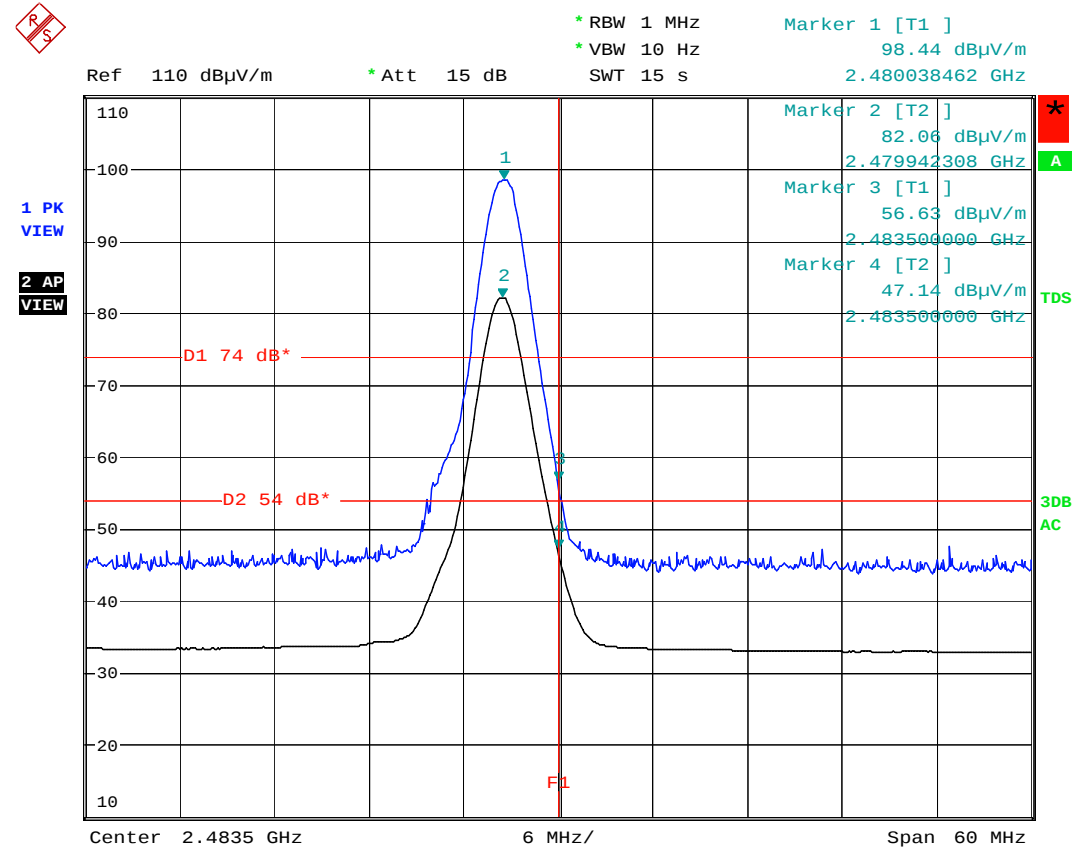
Note: The upper trace shows the peak value and the lower trace shows the average value.

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Figure 27: Band Edge Radiated Emission, Mode C (2480MHz), Peak and Average



Spurious Emissions 1-8GHz, Hor, Mode: A, Pos.: Z
Date: 4.FEB.2009 15:06:26

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

7.1.2 Radiated Emission, Out-of-Band and Spurious Emission, 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: 2009-02-03 2009-02-05

Ambient temperature: 21°C 21°C

Relative humidity: 24% 28%

Atmospheric pressure: 1004hPa 1013hPa

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 FCC Public Notice DA 00-705, Released March 30, 2000

Before final measurements of radiated emissions were made in Semi Anechoic Chamber, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the orientation (X, Y, Z) of the EUT were varied in order to ensure that maximum emission amplitudes were attained.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Final radiated emission measurements were made at 3m. The spectrum was examined from 30 MHz to the 10th harmonic of the highest fundamental transmitter frequency (25 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters 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, emissions were measured using following settings: Peak: RBW=1MHz, 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 16: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode A

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dB(μV)]	Factor [dB(1/m)]	Level QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
39.91	Z / V	50.4	-23.6	26.8	40.0	13.2	113	141
39.95	Z / V	50.7	-23.6	27.1	40.0	12.9	109	146
39.99	Z / V	47.2	-23.6	23.6	40.0	16.4	345	160
40.09	Z / V	51.4	-23.6	27.8	40.0	12.2	100	153
86.96	Z / V	38.7	-27.8	10.9	40.0	29.1	105	112
257.40	Z / H	42.1	-23.0	19.1	46.0	26.9	115	112
600.65	Z / H	43.7	-13.6	30.1	46.0	15.9	149	163
927.02	Z / H	30.4	-9.9	20.5	46.0	25.5	277	351

Note: Level QP = Reading QP + Factor

Table 17: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode B

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dB(μV)]	Factor [dB(1/m)]	Level QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
39.87	Z / V	51.9	-23.6	28.3	40.0	11.7	101	160
40.07	Z / V	51.7	-23.6	28.1	40.0	11.9	101	169
90.24	Z / V	41.0	-27.9	13.1	43.5	30.4	155	252
109.99	Z / H	40.7	-25.9	14.8	43.5	28.7	166	66
228.40	Z / V	49.3	-23.9	25.4	46.0	20.6	101	202
273.14	Z / H	41.5	-22.3	19.2	46.0	26.8	105	120
606.16	Z / H	42.8	-13.6	29.2	46.0	16.8	146	160
919.23	Z / H	30.8	-10.0	20.8	46.0	25.2	230	107

Note: Level QP = Reading QP + Factor

Table 18: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode C

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dB(μV)]	Factor [dB(1/m)]	Level QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
33.96	Y / V	52.3	-24.3	28.0	40.0	12.0	199	186
34.01	Y / V	52.1	-24.3	27.8	40.0	12.2	212	122
34.06	Y / V	51.3	-24.3	27.0	40.0	13.0	265	110
39.02	Y / V	46.9	-23.7	23.2	40.0	16.8	101	147
128.40	Y / V	37.5	-24.3	13.2	43.5	30.3	109	180
213.30	Y / V	35.0	-24.3	10.7	43.5	32.8	200	50
594.30	Y / V	41.2	-13.7	27.5	46.0	18.5	100	177
603.59	Y / H	41.7	-13.6	28.1	46.0	17.9	166	163

Note: Level QP = Reading QP + Factor

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Table 19: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode A

Freq. [MHz]	EUT / Antenna P	Reading AV [dB(μV)]	Reading PK [dB(μV)]	Factor [dB(1/m)]	Level AV [dB(μV/m)]	Level PK [dB(μV/m)]	Limit AV / PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [°]
1602.00	Z / H	49.3	55.4	-14.7	34.6	40.7	54.0 / 74.0	19.4	33.3	111	241
3203.98	Z / V	50.2	57.8	-11.7	38.5	46.1	54.0 / 74.0	15.5	27.9	100	149
4803.97	Z / H	49.8	66.4	-9.3	40.5	57.1	54.0 / 74.0	13.5	16.9	102	178
4804.05	Z / V	45.5	62.0	-9.3	36.2	52.7	54.0 / 74.0	17.8	21.3	149	49
14144.23	Z / H	38.0	52.3	-7.1	30.9	45.2	54.0 / 74.0	23.1	28.8	107	219

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

Table 20: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode B

Freq. [MHz]	EUT / Antenna P	Reading AV [dB(μV)]	Reading PK [dB(μV)]	Factor [dB(1/m)]	Level AV [dB(μV/m)]	Level PK [dB(μV/m)]	Limit AV / PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [°]
3253.32	Y / H	55.5	62.4	-11.6	43.9	50.8	54.0 / 74.0	10.1	23.2	123	170
4881.99	Y / V	42.8	62.7	-9.2	33.6	53.5	54.0 / 74.0	20.4	20.5	156	150
16378.09	Z / V	36.9	51.3	-6.7	30.2	44.6	54.0 / 74.0	23.8	29.4	156	7
23635.03	X / H	39.2	53.2	-13.5	25.7	39.7	54.0 / 74.0	28.3	34.3	127	101

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

Table 21: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode C

Freq. [MHz]	EUT / Antenna P	Reading AV [dB(μV)]	Reading PK [dB(μV)]	Factor [dB(1/m)]	Level AV [dB(μV/m)]	Level PK [dB(μV/m)]	Limit AV / PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [°]
3305.32	Z / H	53.7	61.0	-11.5	42.2	49.5	54.0 / 74.0	11.8	24.5	100	205
4957.92	Z / V	40.8	57.7	-9.2	31.6	48.6	54.0 / 74.0	22.4	25.4	122	290
14157.37	Y / H	38.2	52.8	-7.2	31.0	45.6	54.0 / 74.0	23.0	28.4	123	350

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

7.2 Radiated Emission of Receiver

7.2.1 Radiated 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:	2009-02-03	2009-02-05
Ambient temperature:	21°C	21°C
Relative humidity:	24%	28%
Atmospheric pressure:	1004hPa	1013hPa
Frequency range:	30MHz – 25GHz	
Equipment classification:	Class B	
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 and FCC Public Notice DA 00-705, Released March 30, 2000.

Before final measurements of radiated emissions were made in Semi Anechoic Chamber, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the orientation (X, Y,Z) of the EUT were varied in order to ensure that maximum emission amplitudes were attained.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. Final radiated emission measurements were made at 3m. The spectrum was examined from 30 MHz to the 10th harmonic of the highest fundamental transmitter frequency (25 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters 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, emissions were measured using following settings: Peak: RBW=1MHz, 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 22: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode E

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dB(μV)]	Factor [dB(1/m)]	Level QP [dB(μV/m)]	Limit [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
34.02	Y / V	45.2	-24.3	20.9	40.0	19.1	249	126
34.18	Y / V	44.7	-24.3	20.4	40.0	19.6	248	229
34.81	Y / V	48.1	-24.2	23.9	40.0	16.1	249	154
39.72	Y / V	40.2	-23.6	16.6	40.0	23.4	290	155
44.87	Y / V	36.2	-23.2	13.0	40.0	27.0	258	102
78.18	Y / V	37.9	-26.6	11.3	40.0	28.7	108	187
170.01	Y / V	40.7	-22.8	17.9	43.5	25.6	110	296
596.86	Y / H	43.2	-13.7	29.5	46.0	16.5	147	256

Note: Level QP = Reading QP + Factor

Table 23: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode E

Freq. [MHz]	EUT / Antenna P	Reading AV [dB(μV)]	Reading PK [dB(μV)]	Factor [dB(1/m)]	Level AV [dB(μV/m)]	Level PK [dB(μV/m)]	Limit AV / PK [dB(μV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [°]
1628.35	Y / V	47.0	54.4	-14.6	32.4	39.8	54.0 / 74.0	21.6	24.2	103	7
14120.94	Y / V	38.0	52.1	-7.0	31.0	45.0	54.0 / 74.0	23.0	29.0	148	75

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

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