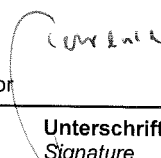


Produkte
Products

Prüfbericht - Nr.: 12307454 002		Seite 1 von 54 <i>Page 1 of 54</i>	
<i>Test Report No.:</i>			
Auftraggeber: <i>Client:</i>		INTELLIGENT SYSTEMS Co., Ltd. 60 Kamitakamatsu-cho, Fukuine, Higashiyama-ku, Kyoto City, Kyoto Pre. 605-0983 Japan	
Gegenstand der Prüfung: <i>Test item:</i>		DEBUGGER and CAPTURE	
Bezeichnung: <i>Identification:</i>		Serien-Nr.: <i>Serial No.:</i>	Engineering Sample
ISXD and ISXC			
Wareneingangs-Nr.: <i>Receipt No.:</i>		Eingangsdatum: <i>Date of receipt:</i>	2008-10-17
213083532-1			
Prüfart: <i>Testing location:</i>		4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan	
Prüfgrundlage: 47 CFR Part 15.247 (Subpart: C), October , 2008 <i>Test specification:</i> ANSI C63.4-2003 Measurement of Digital Transmission Systems Operating under Section 15.247 RSS-210 (Issue 7): 2007 RSS-Gen (Issue 2): 2007			
Prüfresultat: Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>Test Result:</i> The test item passed the test specification(s).			
Prüflaboratorium: TÜV Rheinland Japan Ltd. - Regional Office West Japan <i>Testing Laboratory:</i> Higashi-Tenma 2-9-1, Kita-ku, Osaka 530-0044, Japan			
geprüft/ tested by:		kontrolliert/ reviewed by:	
 2009-03-27 T. Cheung / Inspector		 2009-03-27 R. Sehb / Reviewer	
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
Sonstiges / Other Aspects:			
This test report deals with the intentional radiator 802.11 of the tested product, 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)(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 CONDUCTED SPURIOUS EMISSION, FCC 15.247(D) AND RSS-210 A8.5

RESULT: PASS

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

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

Contents

1.	GENERAL REMARKS	5
1.1	COMPLEMENTARY MATERIALS	5
2.	TEST SITES	5
2.1	TEST FACILITIES	5
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS	6
2.3	MEASUREMENT UNCERTAINTY	7
3.	GENERAL PRODUCT INFORMATION	8
3.1	PRODUCT FUNCTION AND INTENDED USE	8
3.2	SYSTEM DETAILS	8
3.2.1	<i>Voltage Requirements, FCC 15.31(e)</i>	<i>9</i>
3.2.2	<i>Antenna Requirements, FCC 15.203, FCC 15.204 and RSS-Gen 7.1.4</i>	<i>9</i>
3.3	CLOCK FREQUENCIES	10
3.4	INDEPENDENT OPERATION MODES	10
3.5	NOISE SUPPRESSING PARTS	11
4.	TEST SET-UP AND OPERATION MODES	11
4.1	TEST METHODOLOGY	11
4.2	PHYSICAL CONFIGURATION FOR TESTING	12
4.3	TEST OPERATION AND TEST SOFTWARE	13
4.4	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	13
4.5	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE	17
5.	TEST RESULTS CONDUCTED TESTING AT ANTENNA PORT	18
5.1.1	<i>Conducted Output Power at Antenna Terminals, FCC 15.247(b)(3) and RSS-210 A8.4(4)</i>	<i>18</i>
5.1.2	<i>6dB Bandwidth, FCC 15.247(a)(2) and RSS-210 A8.2(a)</i>	<i>20</i>
5.1.3	<i>Conducted Spurious Emission, FCC 15.247(d) and RSS-210 A8.5</i>	<i>23</i>
5.1.4	<i>Peak Power Spectral Density, FCC 15.247(e) and RSS-210 A8.2(b)</i>	<i>33</i>
6.	TEST RESULTS AC MAINS CONDUCTED EMISSION	36
6.1	AC MAINS CONDUCTED EMISSION OF TRANSMITTER	36
6.1.1	<i>Mains Terminal Continuous Disturbance Voltage of Transmitter, FCC 15.207 and RSS-Gen</i>	
7.2.2	<i>36</i>	
7.	TEST RESULTS RADIATED EMISSION	38
7.1	RADIATED EMISSION OF TRANSMITTER	38
7.1.1	<i>Band Edge Radiated Emission, FCC 15.247(d) and RSS- 210 2.2</i>	<i>38</i>
7.1.2	<i>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</i>	<i>41</i>

Produkte
Products

Prüfbericht - Nr.:	12307454 002	Seite 4 von 54
<i>Test Report No.:</i>		<i>Page 4 of 54</i>
7.2	RADIATED EMISSION OF RECEIVER	45
7.2.1	<i>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</i>	<i>45</i>
8.	PHOTOGRAPHS OF TEST SETUP	47
9.	LIST OF TABLES.....	53
10.	LIST OF FIGURES	53
11.	LIST OF PHOTOGRAPHS	54

1. General Remarks

The EUTs are Debugger, ISXD and Capture, ISXC. The Debugger and Capture are tested due to different Digital interface construction. This test report covers intentional radiator aspects in 802.11, other aspects are covered by other test report as shown follows.

Test report number	Content
12307454 001	Intentional radiator: 802.11.b/g
12307454 002	Intentional radiator: 802.11
12308454 003	Unintentional radiator
12308454 004	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 Conducted Emission					
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2009-02
Peak Power Meter	Agilent	N1911A	MY45101339	-	2008-12
Wideband Power Sensor (50MHz-18GHz)	Agilent	N1921A	MY45241019	-	2008-12
For AC Mains Conducted Emission (CE)					
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2009-02
Two-Line V-Network (LISN)	Rohde & Schwarz	ENV216	100276	RF-0016	2009-05
For Radiated Emission (RE)					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2009-02
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2009-02
RF Selector (10m)	Toyo Corporation	NS4900	0703-182	RF-0029	2009-05
Low Noise Pre-Amplifier	TSJ	MLA-10K01-B01-35	1370750	RF-0253	2009-05
3dB Attenuator 50Ohm	Tamagawa Electronics Co., Ltd.	CFA-01	-	RF-0265	2009-05
Band Reject Filter	Nitsuki	NF-49BT	027	RF-0131	2008-12
Microwave Preamplifier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	2008-12
Trilog Antenna	Schwarzbeck	VULB9168	0245	RF-0019	2009-05
Biconical Antenna	EMCO	3110B	9603-2379	RF-0207	2009-03
Broad Band Horn Antenna (1-10GHz)	Schwarzbeck	BBHA9120B	419	RF-0050	2009-05
Double Ridged Broadband Horn Antenna (2-18GHz)	Toyo Corporation	HAP06-18W	00000025	RF-0065	2009-05
Broad Band Horn Antenna (18-26.5GHz)	Toyo Corporation	HAP18-26N	00000010	RF-0070	2009-05
Constant Voltage Constant Frequency Stabilizers					
CVCF (3m chamber)	NF Corporation	ESU2000S	9067195	RF-0208	N/A
CVCF Booster (3m chamber)	NF Corporation	ESU2000B	9072132	RF-0209	N/A
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

Prüfbericht - Nr.: 12307454 002
Test Report No.:

Seite 7 von 54
Page 7 of 54

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
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
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)s are DEBUGGER or CAPTURE which is the tool that can take screenshots and AVI movies of game play. The radio module includes 802.11 b/g and 802.11 using the same antenna which can transmit either one at the same time. 802.11 can be connected with Wii or Nintendo DS.

3.2 System Details

Radio standard:	IEEE 802.11.b/g
Specified power output:	2.0dBm
Antenna gain:	2.0dBi
Antenna type:	Dipole antenna
Mounting type:	External
Frequency range:	2412 – 2462 MHz
Number of channel:	11
Channel spacing:	5 MHz
Modulation type:	BPSK, QPSK, CCK, BPSK, QPSK, 16 QAM, 64 QAM
FCC Classification:	DTS
Classification:	G1D
System Input Voltage:	AC 110-240V, 50/60Hz via AC adaptor
Protection Class:	I

Radio standard:	IEEE 802.11
Specified power output:	0dBm (max. peak power: 1mW)
Antenna gain:	2.0 dBi
Antenna type:	Dipole antenna
Mounting type:	External
Frequency range:	2412 – 2472 MHz
Number of channel:	13
Channel spacing:	5 MHz
Modulation type:	DBPSK, DQPSK
FCC Classification:	DTS
Classification:	G1D
System Input Voltage:	AC 110-240V, 50/60Hz via AC adaptor
Protection Class:	I

Prüfbericht - Nr.: 12307454 002
Test Report No.:

Seite 9 von 54
Page 9 of 54

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 external antenna with SMA connector, details refer to the professional installation letter for the installation guidance.

3.3 Clock Frequencies

The EUT generates internally the following clock frequencies:

Frequency	Source
32.768 kHz	RTC
4 MHz	CPLD
16.756991 MHz	TWL CPU(TARGET CPU)
24 MHz	USB controller
48 MHz	V850 (HOST CPU)

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 (2412 MHz), the operating frequency in the middle of the specified frequency band (2437 MHz) and the highest operating frequency (2472 MHz).

The basic operation modes are:

- A. EUT transmits at lowest Channel (2412 MHz), 802.11 b/g radio
- B. EUT transmits at middle Channel (2437 MHz), 802.11 b/g radio
- C. EUT transmits at highest Channel (2462 MHz), 802.11 b/g radio
- D. EUT transmits with 802.11 b radio
- E. EUT transmits with 802.11 g radio
- F. EUT receives packets with 802.11 b radio
- G. EUT receives packets with 802.11 g radio
- I. EUT transmits at lowest Channel (2412 MHz), 802.11 radio
- J. EUT transmits at middle Channel (2437 MHz), 802.11 radio
- K. EUT transmits at highest Channel (2472 MHz), 802.11 radio
- L. EUT receives packets with 802.11 radio
- H. Normal Operation mode – to simulate the data processing on EUT in below sequences
 - Data transfer (Tx/Rx) through signal cable (EUT <-> Controller (Dummy Game Machine)) and make verification,
 - Communication (Tx/Rx) through USB cable (EUT <-> Host PC) and make verification
 - Picture display through video signal cables (EUT -> Monitor x2)

3.5 Noise Suppressing Parts

Refer to the schematic

4. Test Set-up and Operation Modes

4.1 Test Methodology

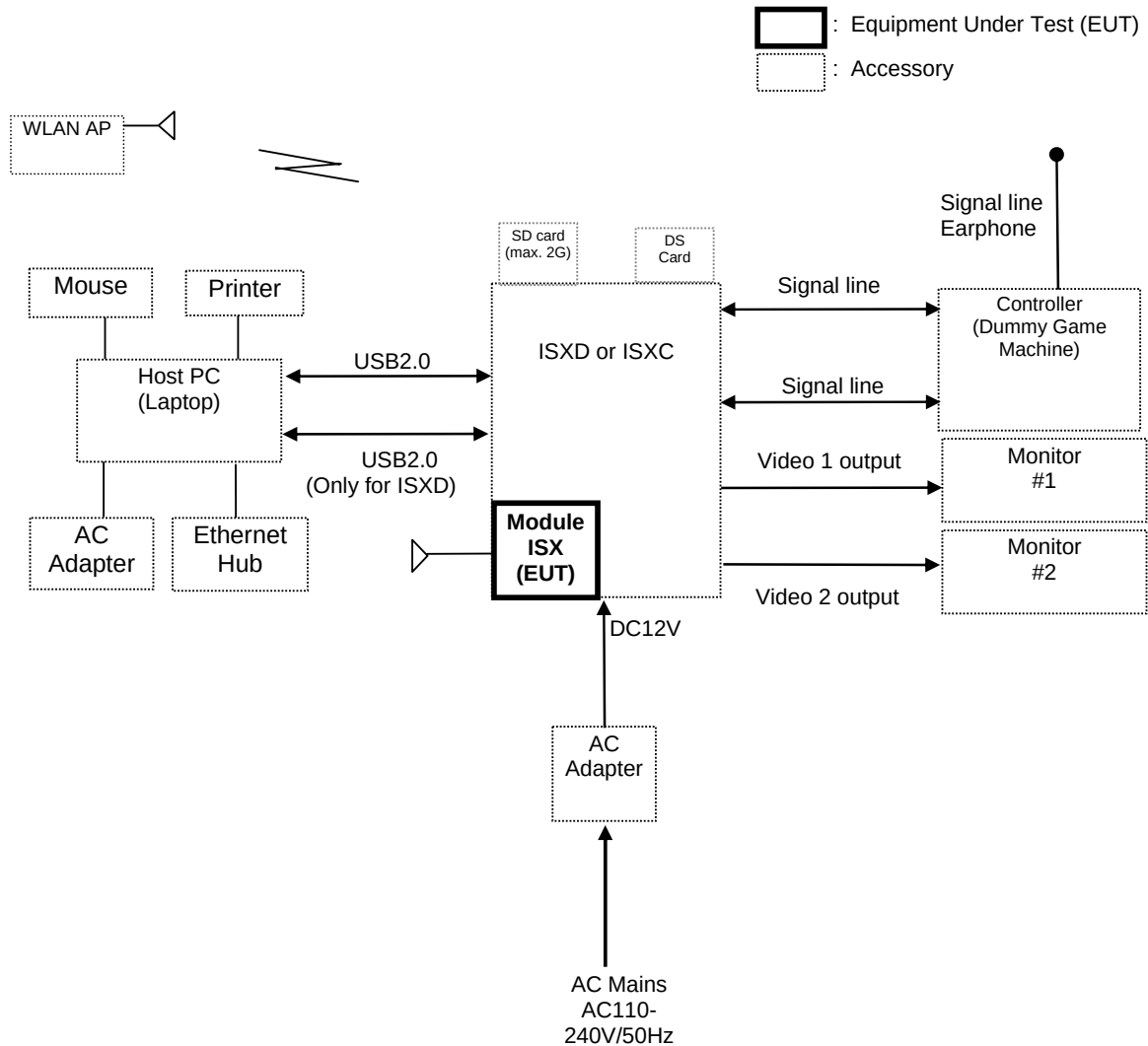
The test methodology used is based on the requirements of 47 CFR Part 15, sections 15.31, 15.33, 15.35, 15.205, 15.209 and Measurement of Digital Transmission Systems Operating under Section 15.247.

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

For details, see under each test item.

4.2 Physical Configuration for Testing

Figure 1: Test setup



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

The printer was only used for the measurement of the AC mains conducted and radiated emissions of the receiver.

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

4.3 Test Operation and Test Software

Following software were used for testing provided by INTELLIGENT SYSTEMS Co., Ltd.

- a. RF Module
Wireless communication program
 - EMC-1(WIFI) / WR-HP-G54 (Access Point)
 - SPI-USB
 - ARTPC SOFT
 - WIFI-ISXD
 - WIFI-ISXCProgram on DS Card
 - WMTEST
- b. Debugger and Capture
Full operation test program
 - EMC-1PC SOFT
 - ISXC
 - ISXDLimited function test program.
 - EMC-1(MIN)Program on DS Card
 - WMTEST

Above software were running on the external PC performing continuous radio communication of the EUT with the WLAN Access Point, and data process (Digital Interface) was disable. 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: ISXD
Manufacturer: Intelligent Systems
Model: IS-TWL-Debugger
Rated voltage: DC 12V
Input current: 3.7A
Frequency: -
Serial number: 1100427-2

Produkte
Products

Prüfbericht - Nr.: 12307454 002

Test Report No.:

Seite 14 von 54

Page 14 of 54

2. Product: Nintendo DS i
Manufacturer: Intelligent Systems
Model: IS-TWL-CTRL
Rated voltage: DC 1.65V
Frequency: -
Serial number: 1100427-2
3. Product: AC Adapter (for ISXD)
Manufacturer: Nintendo
Model: RVL-002 (USA)
Rated voltage: 120V
Input power: 53W
Frequency: 60Hz
Serial number: A8VT210
4. Product: 4 Port USB Hub
Manufacturer: Green House
Model: GH-UHC204BW
Rated voltage: USB
Input current: -
Frequency: -
Protection class:-
Serial number: R010/1518
5. Product: Laptop Computer
Manufacturer: NEC
Model: LaVie LJ700/7
Rated voltage: 19 V
Input current: 2.64 A
Frequency: -
Protection class:-
Serial number: D03-0041 JPB
6. Product: AC Adapter for NEC Laptop Computer
Manufacturer: NEC
Model: ADP63
Rated voltage: AC 100-240V
Input current: 101-141 VA
Frequency: 50-60Hz
Serial number: 3800492DC

Produkte
Products

Prüfbericht - Nr.: 12307454 002

Test Report No.:

Seite 15 von 54

Page 15 of 54

7. Product: Laptop Computer
Manufacturer: Dell
Model: PP18L
Rated voltage: 19.5V
Input current: 4.62A
Frequency: -
Serial number: 18188759085
8. Product: AC Adapter for Dell Laptop Computer
Manufacturer: Dell
Model: HA65NS0-00
Rated voltage: 100-240V
Input current: 1.5A
Frequency: 50-60Hz
Serial number: CN-0DF261-47890-73K-A0GL
9. Product: WLAN Access Point
Manufacturer: PCI
Model: GW-US54GXS
Rated voltage: USB
Input current: -
Frequency: -
Serial number: 61HH06344AR
10. Product: Nintendo DS Headphone
Manufacturer: Un-specified
Model: Un-specified
Rated voltage: -
Input current: -
Frequency: -
Serial number: Un-specified
11. Product: Monitor
Manufacturer: Sony
Model: KVL-14SP2
Rated voltage: DC 16.5C
Input current: 60W
Frequency: -
Serial number: 2008220
12. Product: AC Adapter for Monitor
Manufacturer: Sony
Model: AC-FD006
Rated voltage: 100-240V
Input current: 125-165VA
Frequency: 50-60 Hz
Serial number: 045005895

Produkte
Products

Prüfbericht - Nr.: 12307454 002

Test Report No.:

Seite 16 von 54

Page 16 of 54

13. Product: Monitor
Manufacturer: Sony
Model: KVL-14SP2
Rated voltage: DC 16.5C
Input current: 60W
Frequency: -
Serial number: 2015371
14. Product: AC Adapter for Monitor
Manufacturer: Sony
Model: AC-FD006
Rated voltage: 100-240V
Input current: 125-165VA
Frequency: 50-60 Hz
Serial number: 044003931
15. Product: Mouse
Manufacturer: Dell
Model: MP58UC
Rated voltage: USB
Input current: -
Frequency: -
Serial number: G0601Z20
16. Product: Ethernet Hub
Manufacturer: Buffalo
Model: Giga Switching Hub, LSW3-GT-5NS(D1)
Rated voltage: AC100V
Input power: 5W
Frequency: 50/60Hz
Serial number: 16485784211186
17. Product: Printer
Manufacturer: HP
Model: HP Officejet Pro K550
Rated voltage: 100-240V
Input current: 0.7A
Frequency: 50-60Hz
Serial number: MY6C77101X
18. Product: Printer
Manufacturer: Dell
Model: 725
Rated voltage: 100-240V
Input current: 1A
Frequency: 50-60Hz
Serial number: CN-OFF790-48734-5BS-3HAV

4.5 Countermeasures to achieve EMC Compliance

1. USB port
L shape aluminum tape was added to USB connector.
2. Shielding for controller (dummy game unit) ferrite sheet and copper sheet was added between housing and connecting cable for main unit Cable connector's GND for controller (dummy game unit) was improved.
3. Ferrite ring
 - a. Seiwa (small): E04SR211132
 - i. For USB cables (ISXD and ISXC), 25cm from main unit, 1 loop
 - ii. For controller (dummy game unit)
Both Nintendo DS cables and Nintendo DS side, 0 loop
 - b. TDK (large): ZCAT3035-1330
 - i. For Controller (dummy game unit) cable x 2
Both Nintendo DS cables and main unit side, 0 loop

All the countermeasures are considered due to the digital interface's noise.

5. Test Results Conducted Testing at Antenna Port

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

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

RESULT: **PASS**

Date of testing:	2008-11-05	2008-11-17	2009-02-13
Ambient temperature:	25 °C	25°C	21°C
Relative humidity:	35 %	44%	35 %
Atmospheric pressure:	1016hPa	1005hPa	1012hPa

Requirements:

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

Test procedure:

RSS-Gen 4.8 and Measurement of Digital Transmission Systems Operating under Section 15.247.

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, 802.11

Power (dBm), 802.11, Peak			Limit (dBm)
	1Mbps	2Mbps	
Lo (2412MHz)	0.9	1.2	30
Mid (2437MHz)	0.7	0.2	30
Hi (2472MHz)	0.4	-0.8	30

Notes: $\text{mW} = 10^{(\text{dBm}/10)}$
 $\text{dBm} = 10 \times \log(\text{mW})$

The worst case configuration was found for the power output of the 802.11 at 2Mbps. This test mode will be used for the rest of evaluation of the RF Module.

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

RESULT:

PASS

Date of testing: 2008-11-23 2009-02-13

Ambient temperature: 24°C 21°C

Relative humidity: 42% 35 %

Atmospheric pressure: 1019hPa 1012hPa

Requirements:

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

Test procedure:

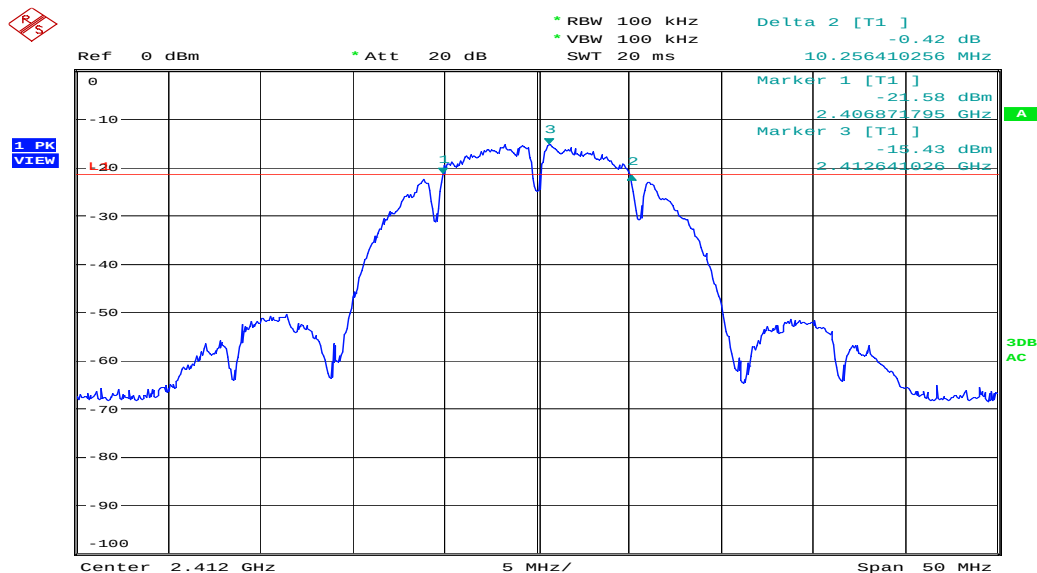
RSS-Gen 4.6.2 and Measurement of Digital Transmission Systems Operating under Section 15.247.

The antenna connector was connected to a spectrum analyzer. The spectrum analyzer resolution bandwidth was set to 1% of the SPAN (10MHz). The 6dB Bandwidth was measured by using the DELTA MARKER function of the analyzer.

Table 4: 6dB Bandwidth, 802.11

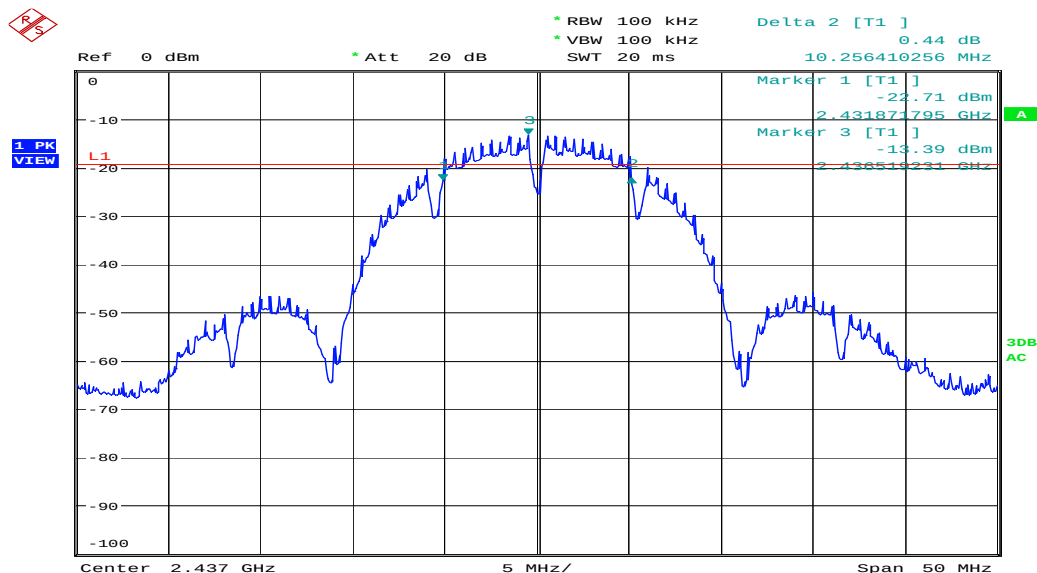
Frequency [MHz]	6dB Bandwidth [MHz]	Minimum Limit [kHz]
2412	10.26	500
2437	10.26	500
2472	10.17	500

Figure 2: 6dB Bandwidth, Mode I (2412MHz)



6dB bandwidth, 802.11, lower channel
Date: 23.NOV.2008 17:04:00

Figure 3: 6dB Bandwidth, Mode J (2437MHz)



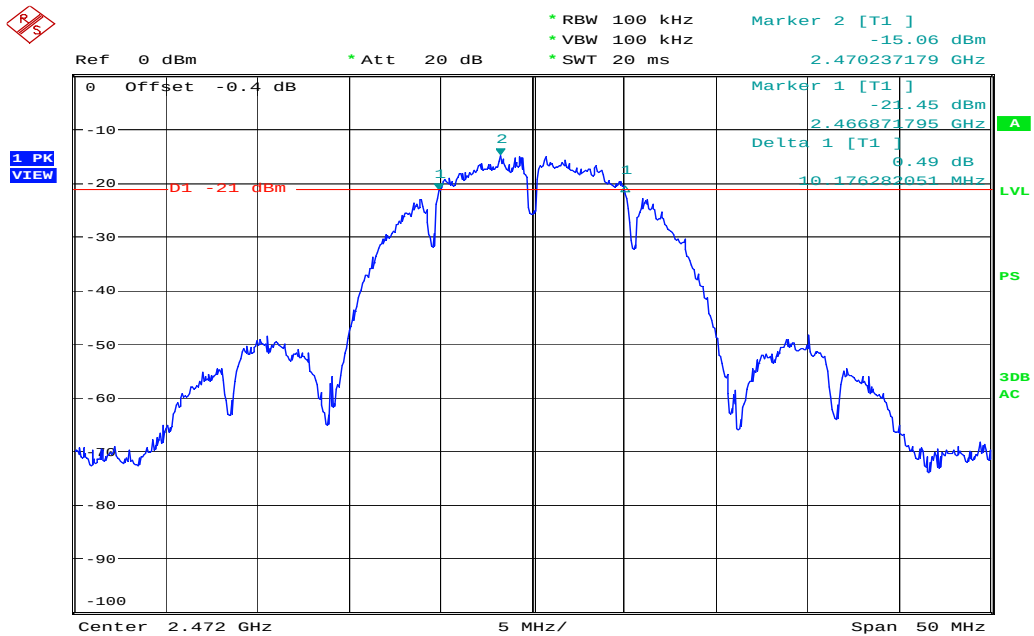
6dB bandwidth, 802.11, middle channel
Date: 23.NOV.2008 17:09:57

Produkte
Products

Prüfbericht - Nr.: 12307454 002
Test Report No.:

Seite 22 von 54
Page 22 of 54

Figure 4: 6dB Bandwidth, Mode K (2472MHz)



channel13 6db

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

RESULT: **PASS**

Date of testing: 2008-11-23 2009-02-13

Ambient temperature: 24°C 21°C

Relative humidity: 42% 35 %

Atmospheric pressure: 1019hPa 1012hPa

Requirements:

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

Test procedure:

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 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).

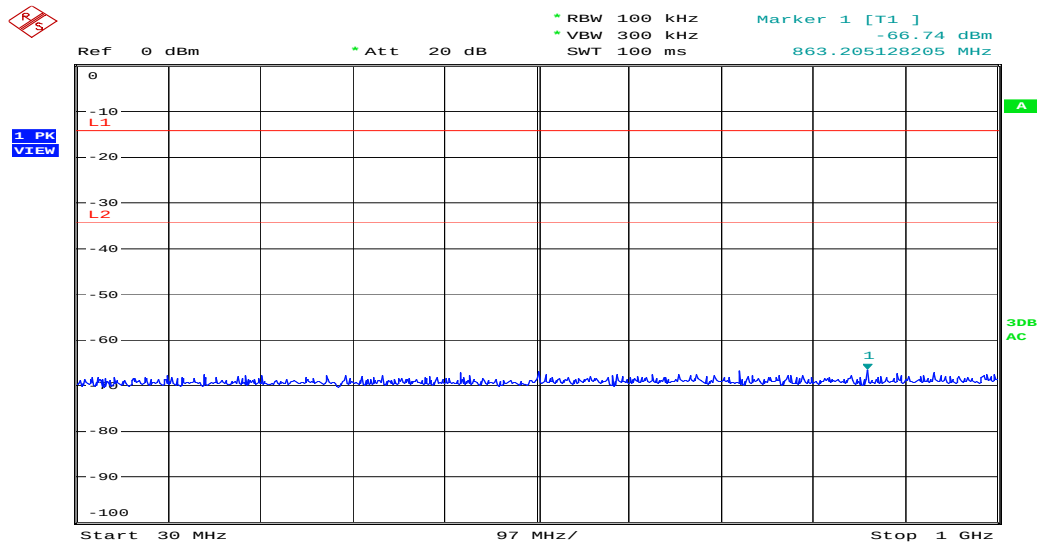
The final measurement takes into account the loss generated by all the involved cables.

Table 5: Conducted Spurious Emissions, Mode I (2412MHz), 802.11

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
863.21	-66.74	0.70	-66.04	-33.10	32.94
2410	-14.27	1.17	-13.10	N/A	N/A
3218	-58.52	1.50	-57.02	-33.10	23.92
7740	-66.83	2.25	-64.58	-33.10	31.48
13686	-66.56	2.75	-63.81	-33.10	30.71
22893	-65.79	4.27	-61.52	-33.10	28.42

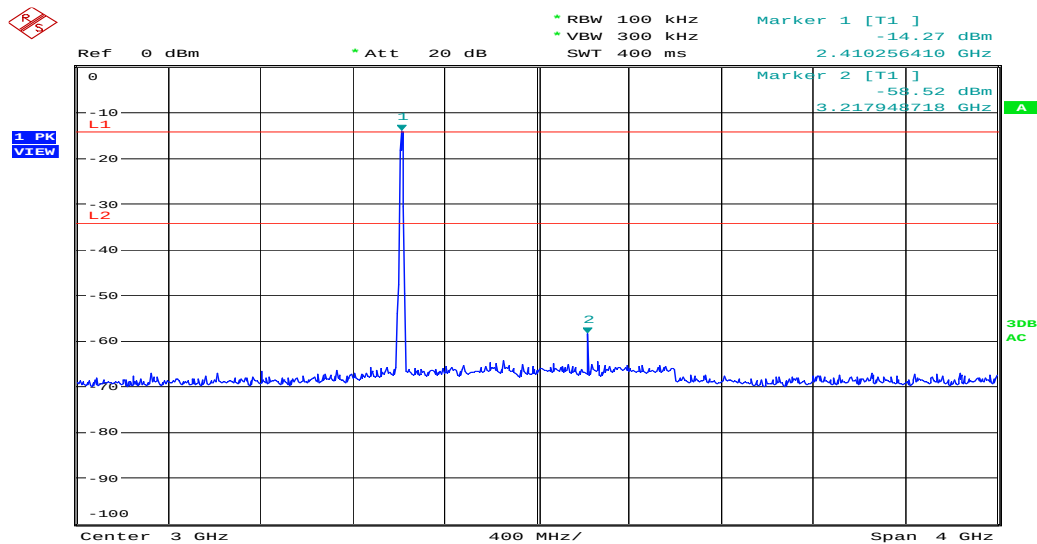
Notes: Limit = Reading of fundamental + Correction factor – 20dB
Emission level = Reading + Correction factor
Correction factor = Total cable loss

Figure 5: Spurious Emission from 30MHz to 1GHz, Mode I (2412MHz)



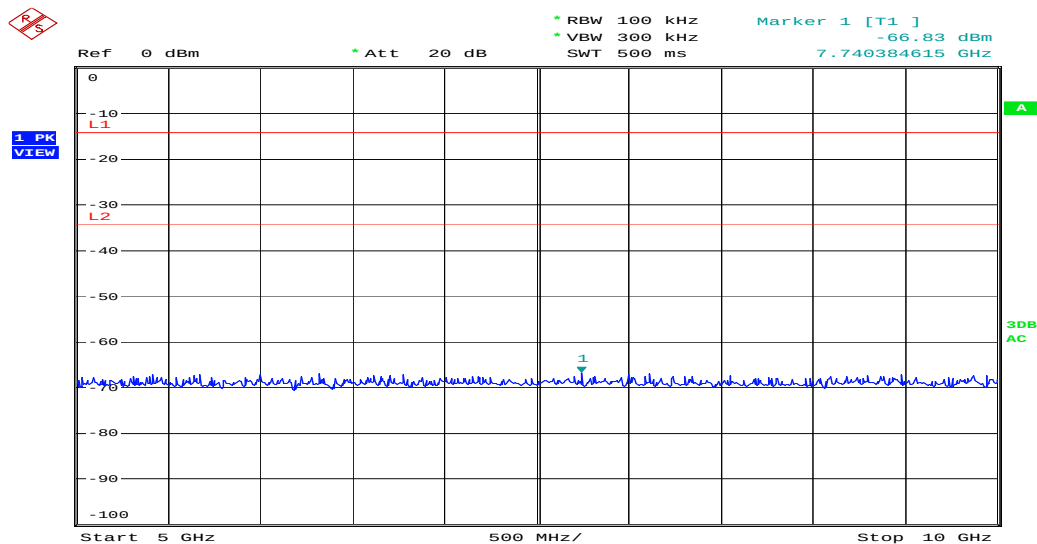
Spurious, 802.11, lower channel
L1=-14.27dBm, L2=-34.27dBm
Date: 23.NOV.2008 21:18:51

Figure 6: Spurious Emission from 1 to 5GHz, Mode I (2412MHz)



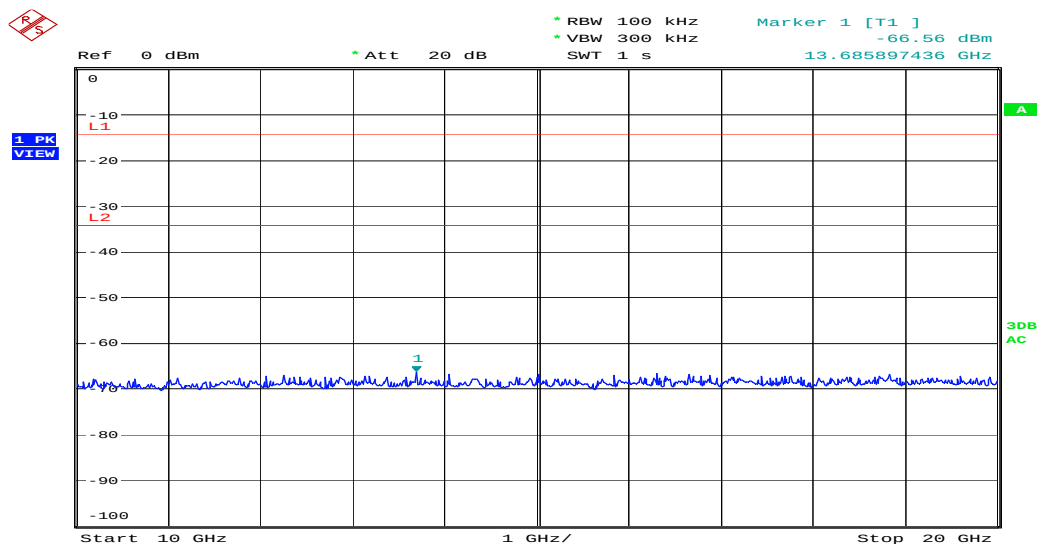
Spurious, 802.11, lower channel
L1=-14.27dBm, L2=-34.27dBm
Date: 23.NOV.2008 21:15:40

Figure 7: Spurious Emission from 5 to 10GHz, Mode I (2412MHz)



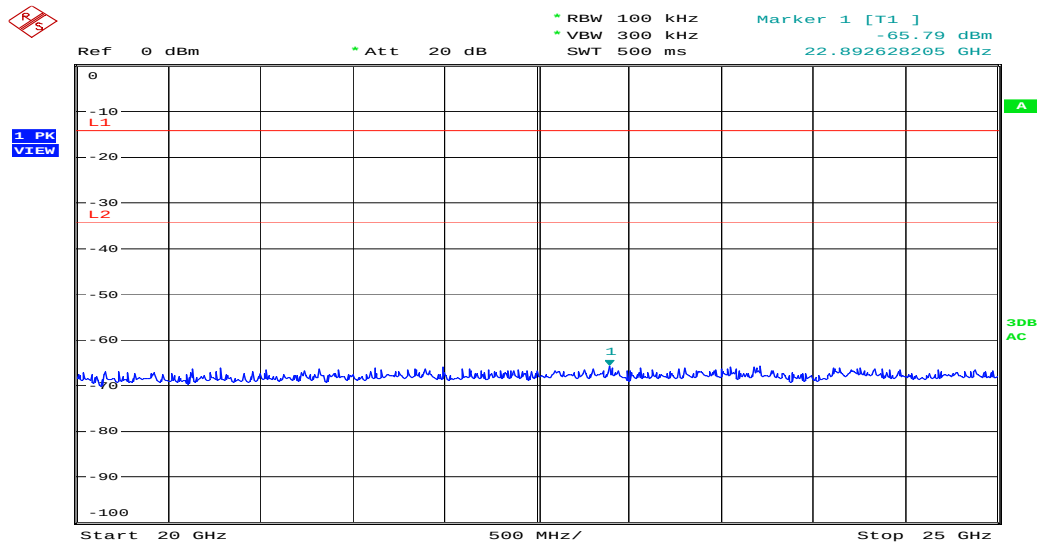
Spurious, 802.11, lower channel
L1=-14.27dBm, L2=-34.27dBm
Date: 23.NOV.2008 21:21:16

Figure 8: Spurious Emission from 10 to 20GHz, Mode I (2412MHz)



Spurious, 802.11, lower channel
L1=-14.27dBm, L2=-34.27dBm
Date: 23.NOV.2008 21:22:23

Figure 9: Spurious Emission from 20 to 25GHz, Mode I (2412MHz)



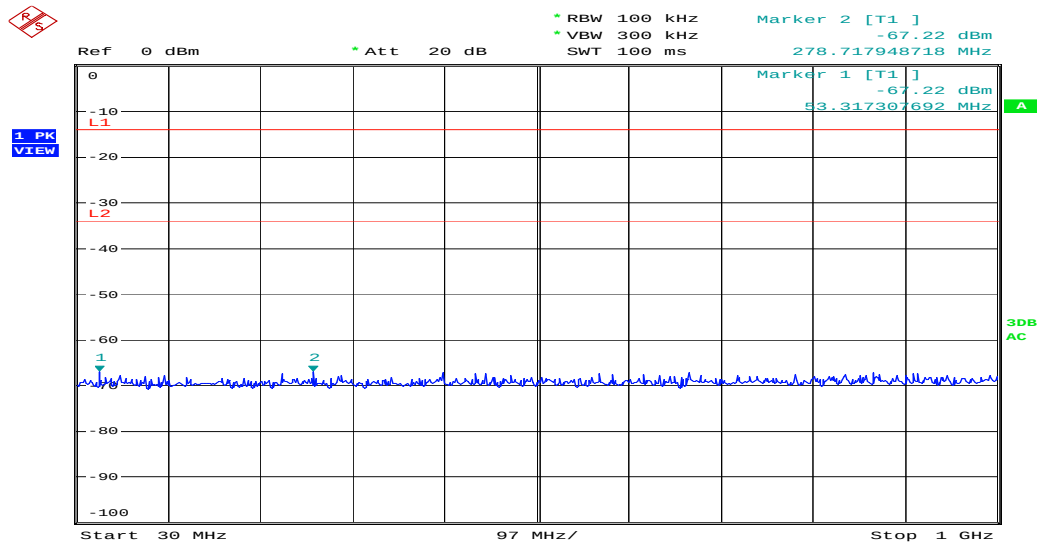
Spurious, 802.11, lower channel
L1=-14.27dBm, L2=-34.27dBm
Date: 23.NOV.2008 21:23:27

Table 6: Conducted Spurious Emissions, Mode J (2437MHz), 802.11

Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
53.32	-67.22	0.18	-67.04	-32.80	34.24
278.72	-67.22	0.40	-66.82	-32.80	34.02
2436	-13.97	1.17	-12.80	N/A	N/A
3250	-58.17	1.50	-56.67	-32.80	23.87
4295	-66.39	1.60	-64.79	-32.80	31.99
4878	-65.19	1.70	-63.49	-32.80	30.69
5096	-66.92	1.77	-65.15	-32.80	32.35
13910	-66.23	2.79	-63.44	-32.80	30.64
22332	-64.74	4.01	-60.73	-32.80	27.93

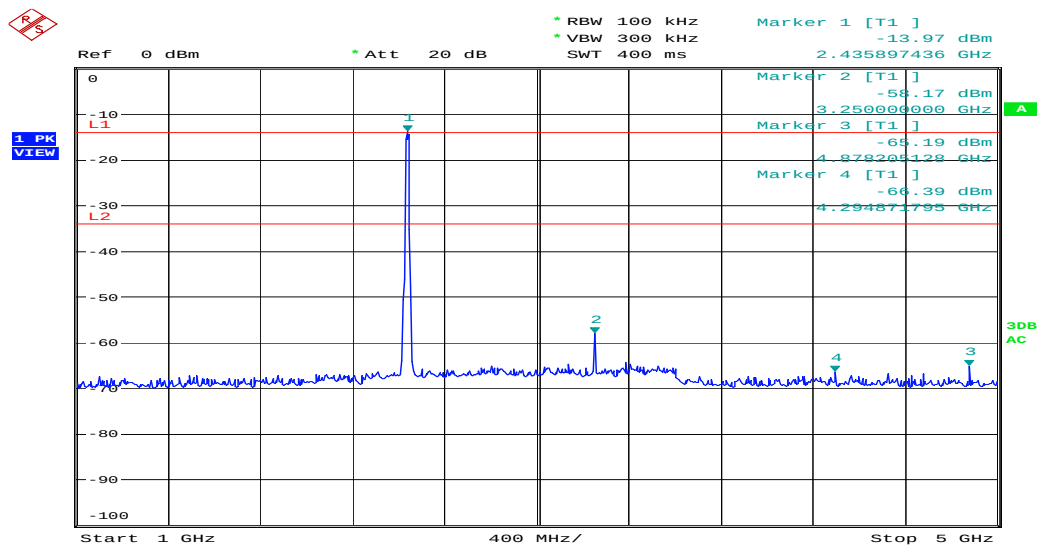
Notes: Limit = Reading of fundamental + Correction factor – 20dB
Emission level = Reading + Correction factor
Correction factor = Total cable loss

Figure 10: Spurious Emission from 30MHz to 1GHz, Mode J (2437MHz)



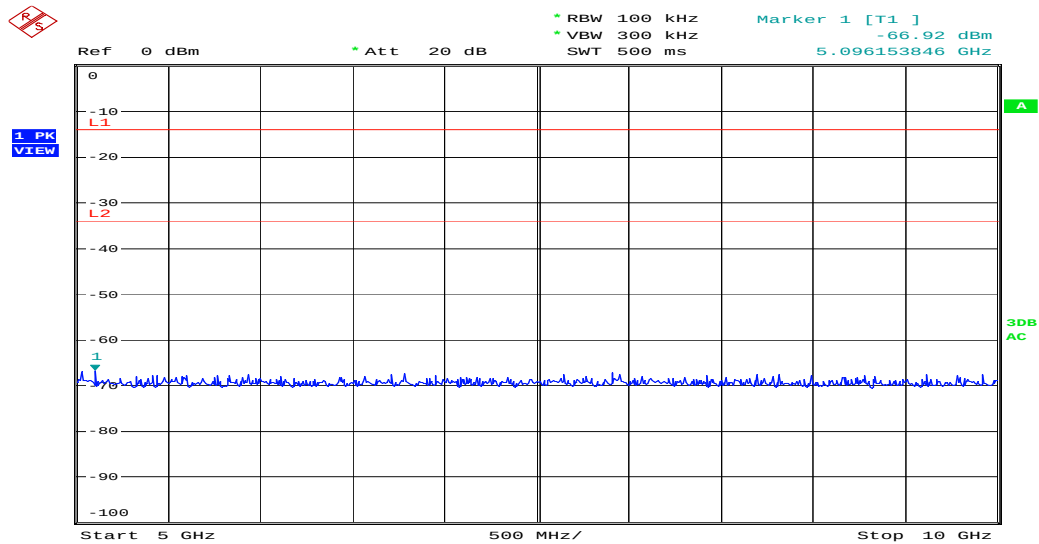
Spurious, 802.11, middle channel
L1=-13.97dBm, L2=-33.97dBm
Date: 23.NOV.2008 21:39:23

Figure 11: Spurious Emission from 1 to 5GHz, Mode J (2437MHz)



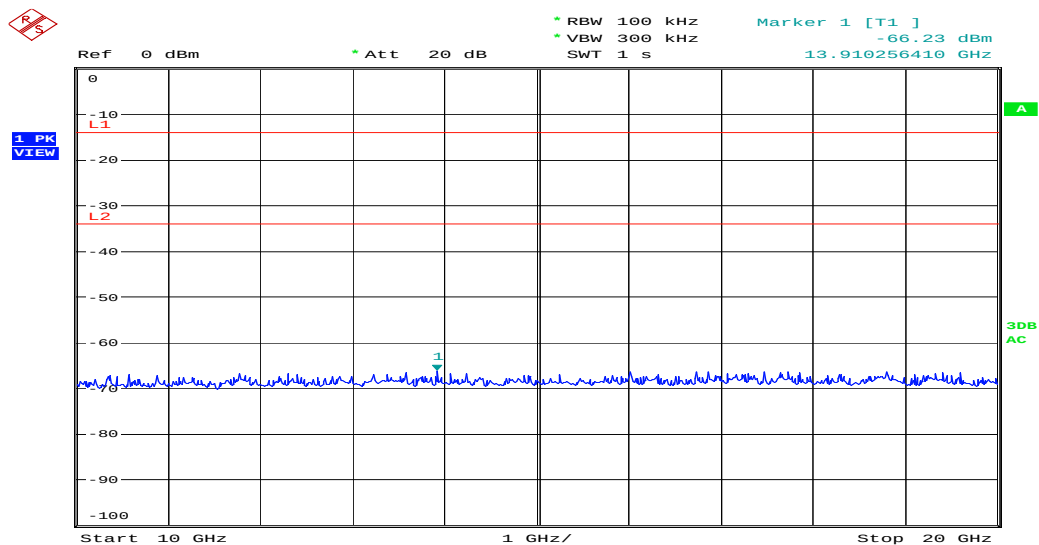
Spurious, 802.11, middle channel
L1=-13.97dBm, L2=-33.97dBm
Date: 23.NOV.2008 21:38:07

Figure 12: Spurious Emission from 5 to 10GHz, Mode J (2437MHz)



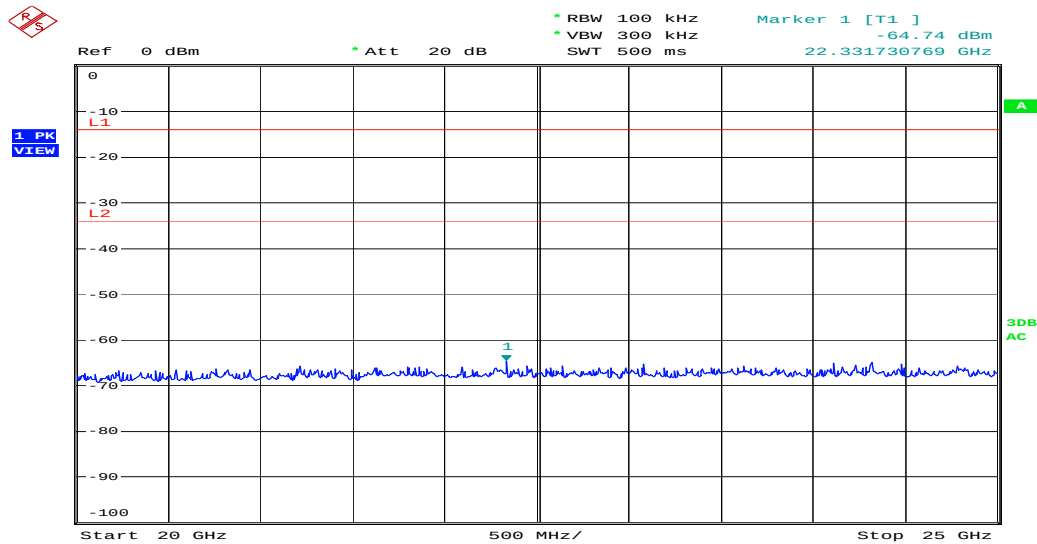
Spurious, 802.11, middle channel
L1=-13.97dBm, L2=-33.97dBm
Date: 23.NOV.2008 21:40:17

Figure 13: Spurious Emission from 10 to 20GHz, Mode J (2437MHz)



Spurious, 802.11, middle channel
L1=-13.97dBm, L2=-33.97dBm
Date: 23.NOV.2008 21:40:54

Figure 14: Spurious Emission from 20 to 25GHz, Mode J (2437MHz)



Spurious, 802.11, middle channel
L1=-13.97dBm, L2=-33.97dBm
Date: 23.NOV.2008 21:41:32

Table 7: Conducted Spurious Emissions, Mode K (2472MHz), 802.11

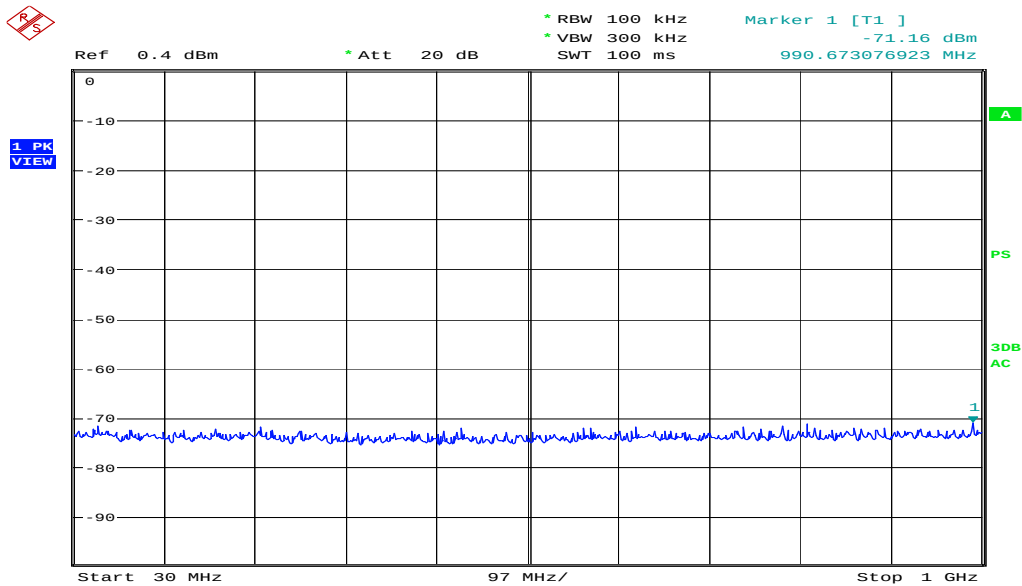
Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Emission Level [dBm]	Limit [dBm]	Margin [dB]
-71.16	0.32	-70.84	-35.06	35.78	-71.16
-15.46	0.40	-15.06	N/A	N/A	-15.46
-68.71	0.34	-68.37	-35.06	33.30	-68.71
-60.34	0.47	-59.87	-35.06	24.80	-60.34
-66.16	0.51	-65.65	-35.06	30.59	-66.16
-66.11	0.98	-65.13	-35.06	30.07	-66.11
-65.08	1.12	-63.96	-35.06	28.89	-65.08
-71.16	0.32	-70.84	-35.06	35.78	-71.16

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

Prüfbericht - Nr.: 12307454 002
Test Report No.:

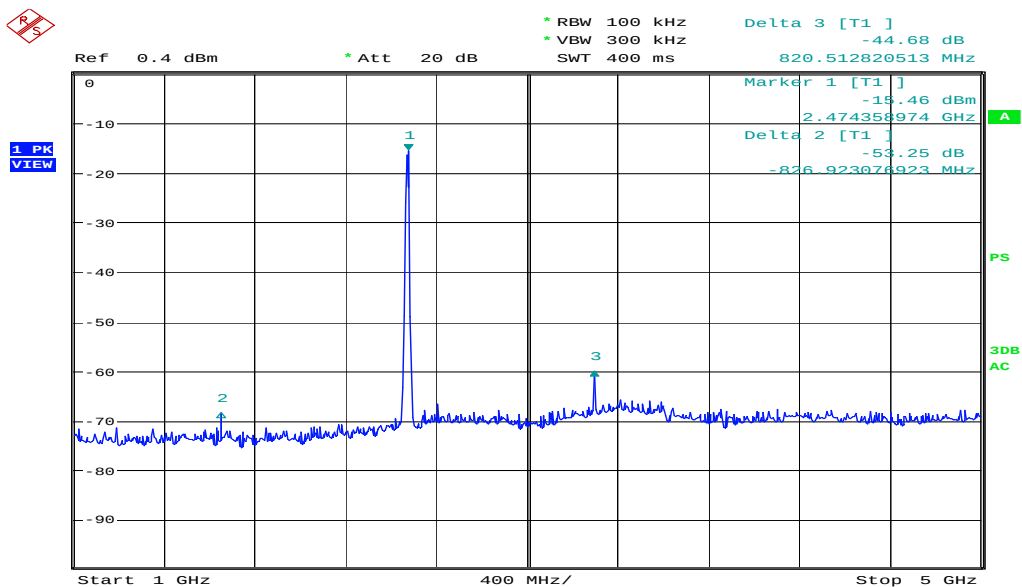
Seite 30 von 54
Page 30 of 54

Figure 15: Spurious Emission from 30MHz to 1GHz, Mode K (2472MHz)



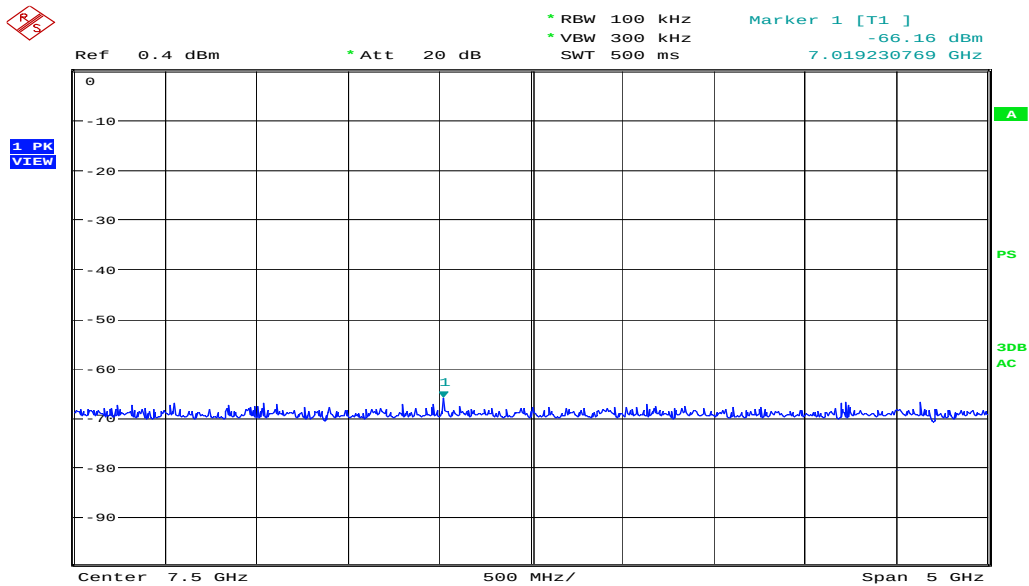
30 MHz-1 GHz 802.11 channel 13
Date: 13.FEB.2009 16:55:22

Figure 16: Spurious Emission from 1 to 5GHz, Mode K (2472MHz)



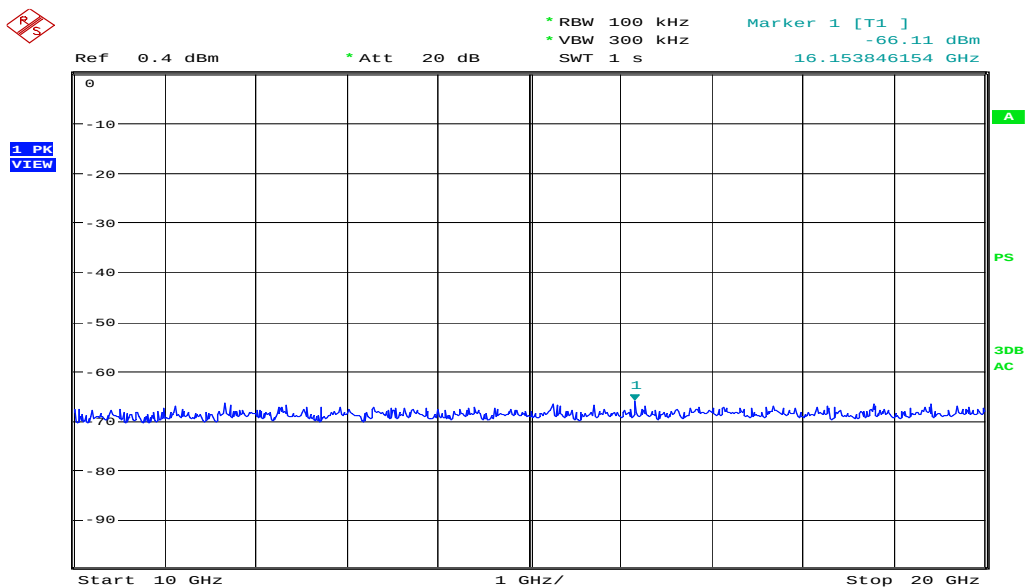
1 GHz-5 GHz 802.11 channel 13
Date: 13.FEB.2009 16:56:51

Figure 17: Spurious Emission from 5 to 10GHz, Mode K (2472MHz)



5 GHz-10 GHz 802.11 channel 13
Date: 13.FEB.2009 16:57:54

Figure 18: Spurious Emission from 10 to 20GHz, Mode K (2472MHz)



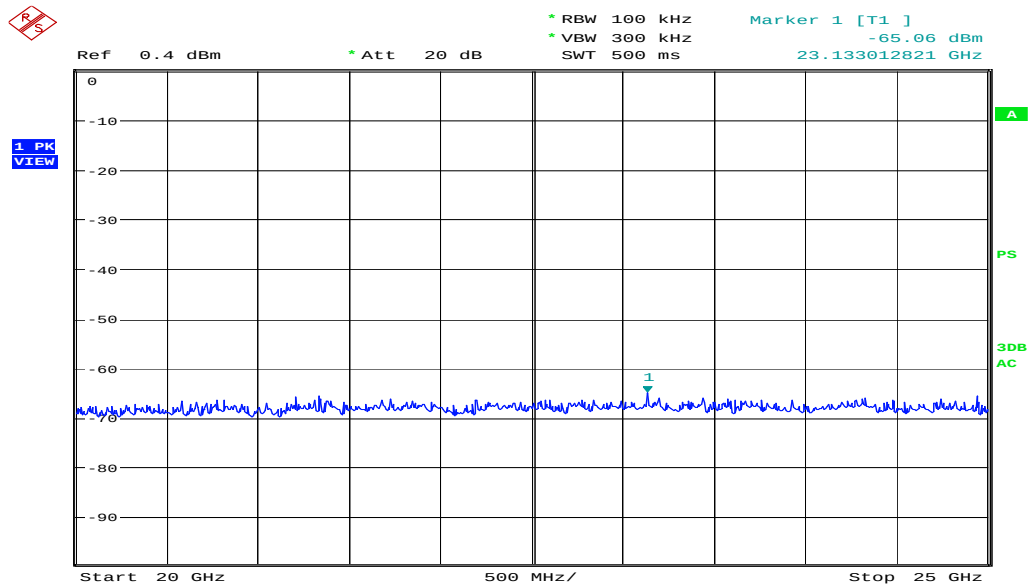
10 GHz-20 GHz 802.11 channel 13
Date: 13.FEB.2009 16:58:54

Produkte
Products

Prüfbericht - Nr.: 12307454 002
Test Report No.:

Seite 32 von 54
Page 32 of 54

Figure 19: Spurious Emission from 20 to 25GHz, Mode K (2472MHz)



20 GHz-25 GHz 802.11 channel 13
Date: 13.FEB.2009 16:59:45

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

RESULT:

PASS

Date of testing: 2008-11-23 2009-02-13

Ambient temperature: 24°C 21°C

Relative humidity: 42% 35 %

Atmospheric pressure: 1019hPa 1012hPa

Requirements:

For digitally modulated systems, the power spectral density 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:

RSS-Gen 4.8 and Measurement of Digital Transmission Systems Operating under Section 15.247.

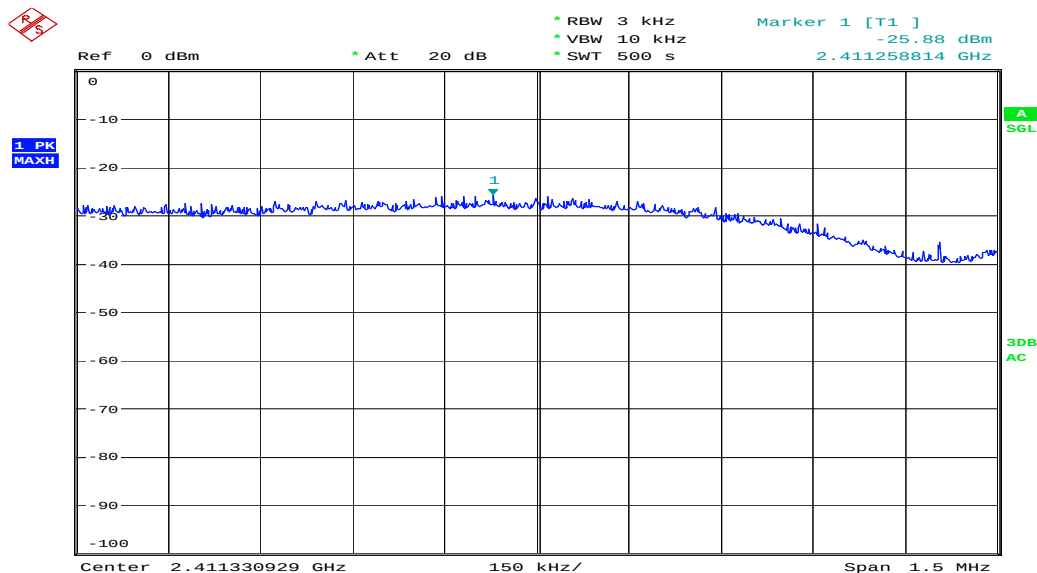
A spectrum analyzer was connected to the antenna port of the transmitter. Analyzer Resolution Bandwidth was set to 3kHz. The Video Bandwidth was set to 10kHz, and the sweep time was set to 500sec.

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

Table 8: Peak Power Spectral Density, 802.11

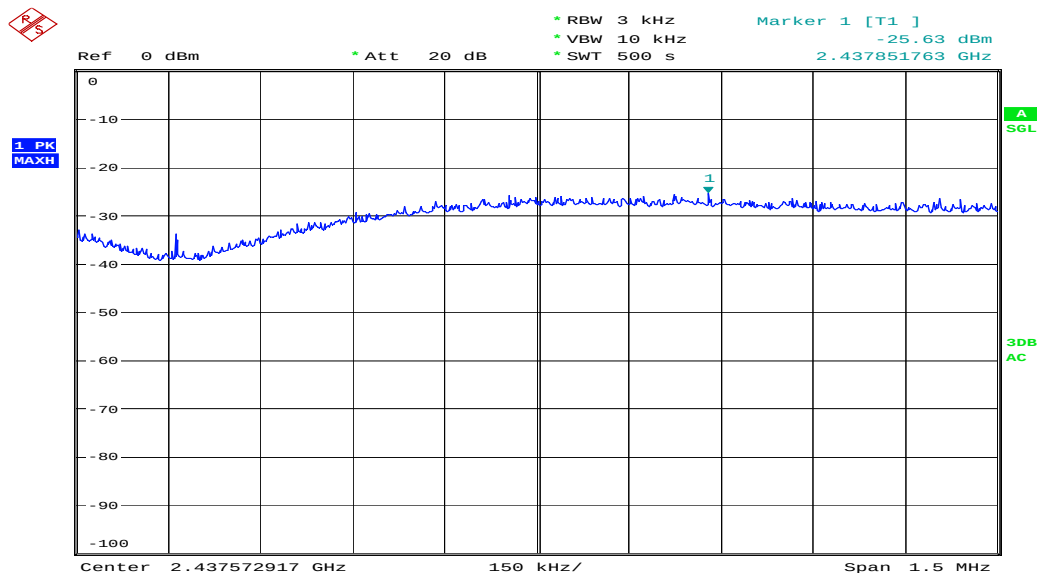
Frequency [MHz]	Reading [dBm]	Correction Factor [dB]	Power Density [dBm]	Limit [dBm]	Margin [dB]
2411.26	-25.88	1.17	-24.71	8	32.71
2437.85	-25.63	1.17	-24.46	8	32.46
2472.27	-27.98	1.18	-26.40	8	34.40

Figure 20: Power Spectral Density, Mode I (2412MHz), 802.11



Power spectral density, 802.11, lower channel
Date: 23.NOV.2008 20:15:42

Figure 21: Power Spectral Density, Mode J (2437MHz), 802.11



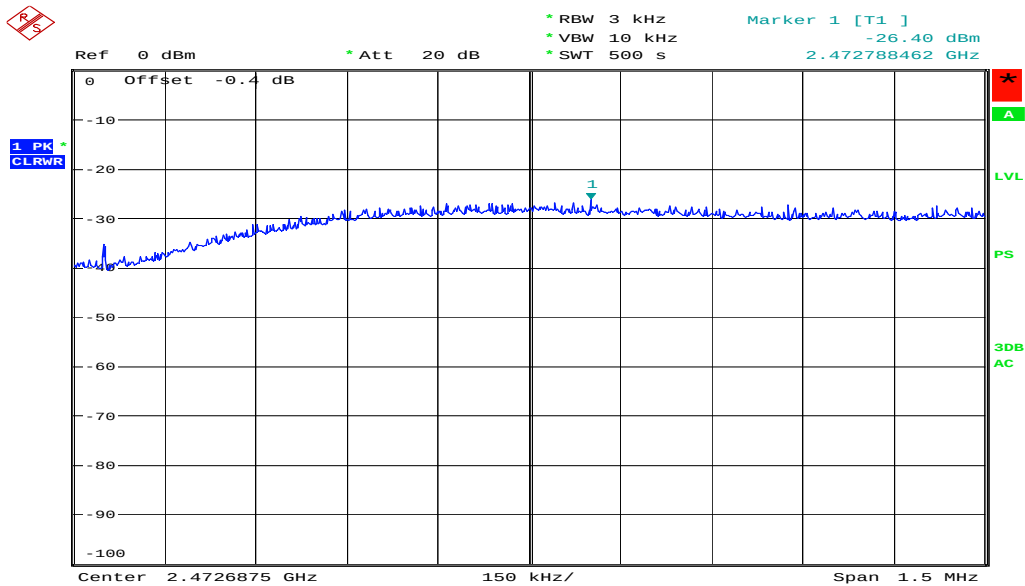
Power spectral density, 802.11, middle channel
Date: 23.NOV.2008 20:43:29

Produkte
Products

Prüfbericht - Nr.: 12307454 002
Test Report No.:

Seite 35 von 54
Page 35 of 54

Figure 22: Power Spectral Density, Mode K (2472MHz), 802.11



channel13 psd 80211
Date: 13.FEB.2009 16:45:12

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: 2008-11-27

Ambient temperature: 25°C

Relative humidity: 45%

Atmospheric pressure: 1019hPa

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

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. The 50 ohm output of the EUT LISN was connected to the spectrum analyzer input. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or average mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements were performed in a linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by decreasing the sweep time in order to obtain a calibrated measurement.

Disturbances other than those mentioned are small or not detectable.

Table 9: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode I, 802.11

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]
0.169	L1	42.3	40.6	9.6	51.9	50.2	65.0	55.0	13.1	4.8
0.172	N	45.5	43.8	9.6	55.1	53.4	64.9	54.9	9.8	1.5*
0.173	N	45.8	44.0	9.6	55.4	53.6	64.8	54.8	9.4	1.2*
0.228	L1	38.2	37.5	9.6	47.8	47.1	62.5	52.5	14.7	5.4
0.288	L1	36.9	36.6	9.7	46.6	46.3	60.6	50.6	14.0	4.3
0.576	L1	29.9	29.3	9.7	39.6	39.0	56.0	46.0	16.4	7.0
0.634	L1	35.4	34.9	9.7	45.1	44.6	56.0	46.0	10.9	1.4*
4.666	L1	30.1	29.6	9.8	39.9	39.4	56.0	46.0	16.1	6.6
5.127	L1	31.5	31.0	9.8	41.3	40.8	60.0	50.0	18.7	9.2
6.106	L1	33.0	31.3	9.9	42.9	41.2	60.0	50.0	17.1	8.8

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

Table 10: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode K, 802.11

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]
0.150	N	38.1	13.4	9.6	47.7	23.0	66.0	56.0	18.3	33.0
0.168	L1	40.0	38.0	9.6	49.6	47.6	65.1	55.1	15.5	7.5
0.170	N	44.4	42.6	9.6	54.0	52.2	65.0	55.0	11.0	2.8
0.228	L1	39.0	38.3	9.6	48.6	47.9	62.5	52.5	13.9	4.6
0.286	N	36.8	36.5	9.7	46.5	46.2	60.6	50.6	14.1	4.4
0.572	N	28.6	27.9	9.7	38.3	37.6	56.0	46.0	17.7	8.4
0.632	N	36.1	35.7	9.7	45.8	45.4	56.0	46.0	10.2	0.6*
5.003	L1	30.6	30.1	9.8	40.4	39.9	60.0	50.0	19.6	10.1

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

Uncertainty

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

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: 2008-11-19 2009-02-12

Ambient temperature: 24°C 20°C

Relative humidity: 62% 25%

Atmospheric pressure: 1009hPa` 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

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 EUT orientations (X, Y and Z).

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.

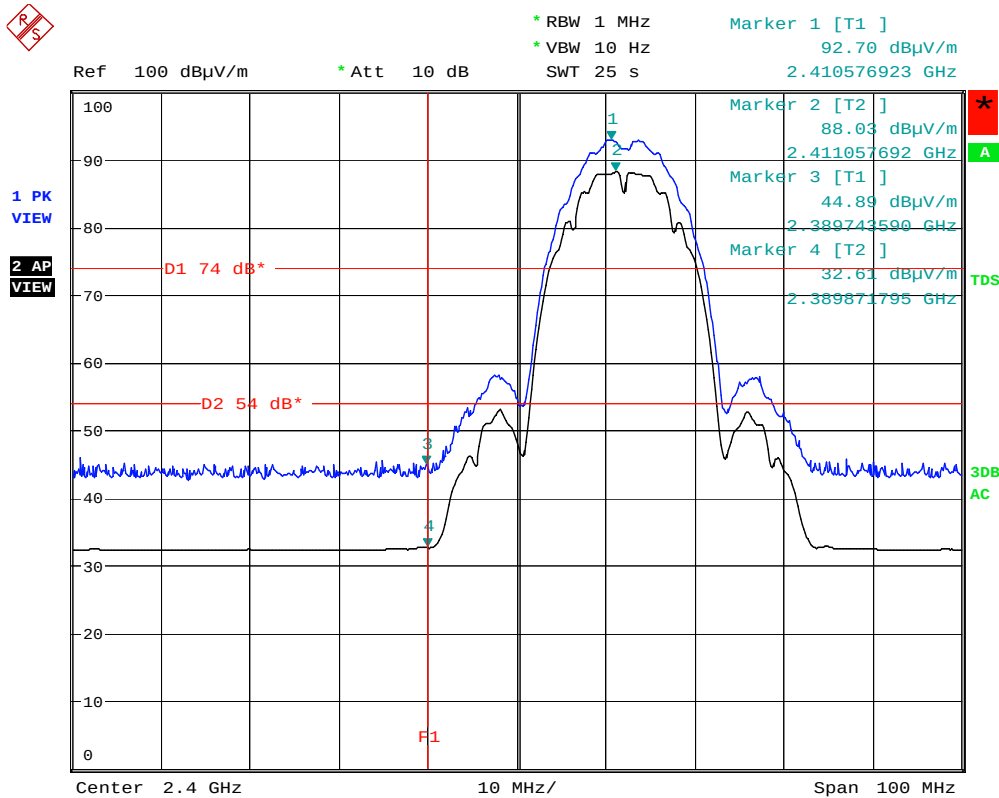
The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 11: Band Edge Radiated Emission, 802.11

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]
2412	Y / H	44.89	32.61	74	54	29.11	21.39
2472	Y / V	57.79	53.63	74	54	16.21	0.37

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 23: Band Edge Radiated Emission, Mode I (2412MHz), Peak and Average



Band edge, mode I, antenna H, EUT orientation Y
Date: 19.NOV.2008 01:59:43

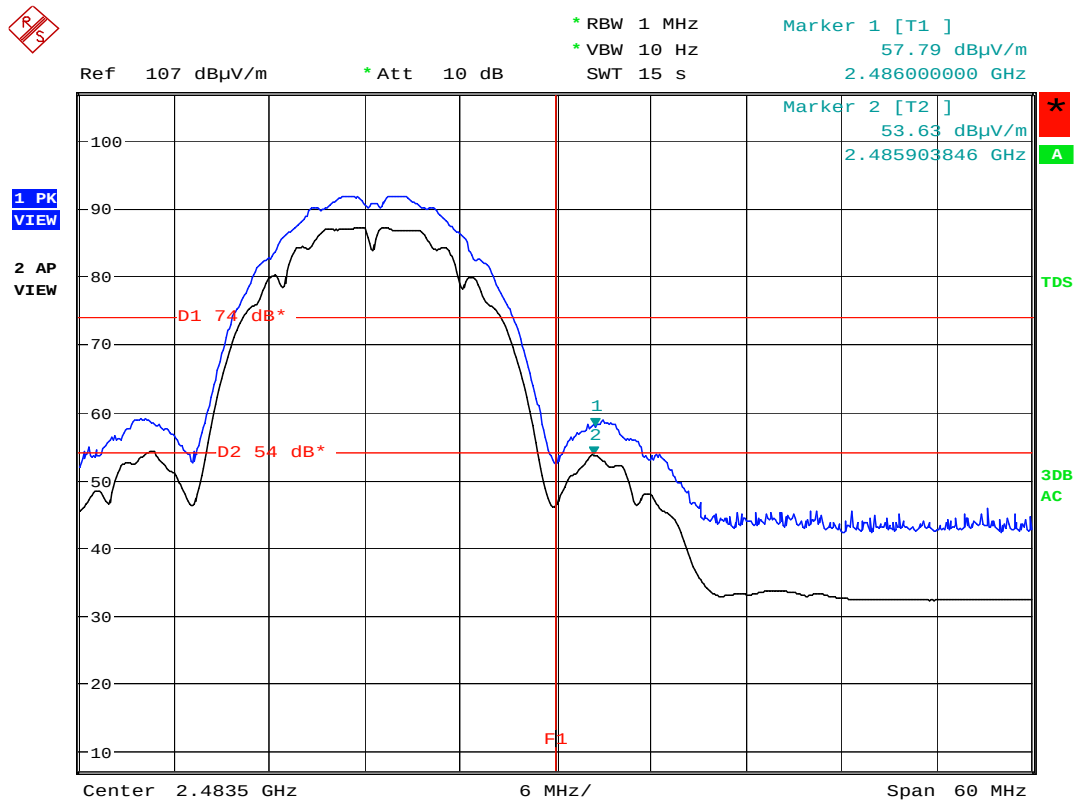
Note: The upper trace shows the peak value and the lower trace shows the average value.

Produkte
Products

Prüfbericht - Nr.: 12307454 002
Test Report No.:

Seite 40 von 54
Page 40 of 54

Figure 24: Band Edge Radiated Emission, Mode K (2472MHz), Peak and Average



Spurious Emissions 1-8GHz, Hor, Mode: C, Pos.: Y
Date: 12.FEB.2009 15:21:24

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

Prüfbericht - Nr.: 12307454 002

Test Report No.:

Seite 41 von 54

Page 41 of 54

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: 2008-11-17 2008-11-18 2008-11-20
2008-11-28 2008-11-29 2009-02-12

Ambient temperature: 22°C 23°C 24°C

23°C 23°C 20°C

Relative humidity: 33% 44% 23%

41% 41% 21%

Atmospheric pressure: 1016hPa 1005hPa 1009hPa

1002hPa 1002hPa 1010hPa

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

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 antenna 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.

Table 12: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode I, 802.11

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 [°]
41.89	Z / V	60.5	-23.4	37.1	40.0	2.9	101	98
81.04	Z / V	57.3	-27.1	30.2	40.0	9.8	101	126
347.91	Z / H	61.7	-19.9	41.8	46.0	4.2	100	20
377.60	Z / V	60.3	-18.9	41.4	46.0	4.6	108	181
493.84	Z / V	55.4	-15.9	39.5	46.0	6.5	100	170
522.78	Z / V	54.6	-15.2	39.4	46.0	6.6	102	170
551.91	Z / H	59.5	-14.5	45.0	46.0	1.0*	100	143
579.86	Z / H	58.9	-13.9	45.0	46.0	1.0*	166	134
695.80	Z / H	54.6	-12.7	41.9	46.0	4.1*	100	217
816.01	Z / V	47.6	-11.3	36.3	46.0	9.7	139	359

Note: Level QP = Reading QP + Factor

Uncertainty

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

Table 13: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode J, 802.11

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 [°]
41.90	Z / V	60.6	-23.4	37.2	40.0	2.8*	101	102
75.40	Z / V	60.6	-26.2	34.4	40.0	5.6	105	281
347.90	Z / H	60.2	-19.9	40.3	46.0	5.7	101	22
377.62	Z / V	61.0	-18.9	42.1	46.0	3.9*	106	187
493.77	Z / V	55.2	-15.9	39.3	46.0	6.7	101	168
522.80	Z / V	55.2	-15.2	40.0	46.0	6.0	100	167
551.90	Z / H	59.7	-14.5	45.2	46.0	0.8*	100	143
579.86	Z / H	58.7	-13.9	44.8	46.0	1.2*	162	137
695.80	Z / H	53.0	-12.7	40.3	46.0	5.7	100	216
815.97	Z / V	46.5	-11.3	35.2	46.0	10.8	140	355

Note: Level QP = Reading QP + Factor

Uncertainty

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

Table 14: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode K, 802.11

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 [°]
58.64	Y / V	57.7	-23.7	34.0	40	6.0	100	269
242.979	Z / H	62.5	-23.7	38.8	46	7.2	128	112
259.736	X / H	61.3	-22.9	38.4	46	7.6	100	135
276.492	Z / H	59.2	-22.2	37.0	46	9.0	100	136
293.248	Z / H	57.3	-21.4	35.9	46	10.1	100	131
336.01	Z / H	63.1	-20.3	42.8	46	3.2*	100	77
623.991	Y / H	52.0	-13.4	38.6	46	7.4	107	316
768.034	X / H	51.4	-11.9	39.5	46	6.5	101	199
864.042	Z / H	54.9	-10.8	44.1	46	1.9*	100	51
904.872	Y / H	49.5	-10.3	39.2	46	6.8	100	34

Note: Level QP = Reading QP + Factor Uncertainty

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

Table 15: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode I, 802.11

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 [°]
1093.46	Z / V	58.8	64.9	-16.6	42.2	48.3	54.0 / 74.0	11.8	25.7	100	210
1159.66	Z / H	59.2	64.6	-16.3	42.9	48.3	54.0 / 74.0	11.1	25.7	100	204
1219.95	Z / H	62.6	66.7	-16.1	46.5	50.6	54.0 / 74.0	7.5	23.4	100	214
1452.72	Z / H	46.4	56.9	-15.2	31.2	41.7	54.0 / 74.0	22.8	32.3	143	189
14121.15	X / V	37.6	51.4	-7.0	30.6	44.4	54.0 / 74.0	23.4	29.6	199	131

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

Table 16: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode J, 802.11

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 [°]
1093.46	Y / V	58.4	64.3	-16.6	41.8	47.7	54.0 / 74.0	12.2	26.3	101	206
1159.67	Y / H	58.9	64.3	-16.3	42.6	48.0	54.0 / 74.0	11.4	26.0	101	203
1219.95	Y / H	60.8	64.8	-16.1	44.7	48.7	54.0 / 74.0	9.3	25.3	139	190
14160.84	Z / V	37.9	51.9	-7.2	30.7	44.7	54.0 / 74.0	23.3	29.3	173	219

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

Produkte
Products

Prüfbericht - Nr.: 12307454 002

Test Report No.:

Seite 44 von 54

Page 44 of 54

Table 17: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode K, 802.11

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 [°]
1093.47	Z / V	57.8	63.6	-16.6	41.2	47.0	54.0 / 74.0	12.8	27.0	101	204
1161.86	Z / H	59.3	65.8	-16.3	43.0	49.5	54.0 / 74.0	11.0	24.5	101	206
1219.96	Z / H	61.1	65.6	-16.1	45.0	49.5	54.0 / 74.0	9.0	24.5	106	216
8633.19	Y / H	37.5	52.0	-10.5	27.0	41.5	54.0 / 74.0	27.0	12.5	199	313
14188.81	Y / H	38.0	51.7	-7.3	30.7	44.3	54.0 / 74.0	23.3	29.7	156	30

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:	2008-11-18
Ambient temperature:	23°C
Relative humidity:	44%
Atmospheric pressure:	1005 hPa
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

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 antenna 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.

Table 18: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode L, 802.11.

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 [°]
42.25	X / V	58.3	-23.3	35.0	40.0	5.0	100	75
81.21	X / V	58.2	-27.1	31.1	40.0	8.9	129	128
326.77	X / H	60.9	-20.5	40.4	46.0	5.6	100	136
347.91	X / V	60.5	-19.7	40.8	46.0	5.2	181	303
377.62	X / V	62.3	-18.9	43.4	46.0	2.6*	111	108
493.80	X / V	56.0	-15.9	40.1	46.0	5.9	100	85
522.83	X / V	56.6	-15.2	41.4	46.0	4.6	100	79
551.90	X / H	58.2	-14.5	43.7	46.0	2.3*	114	64
579.85	X / H	57.0	-13.9	43.1	46.0	2.9*	112	50
623.99	X / V	55.9	-13.4	42.5	46.0	3.5*	100	149
733.25	X / H	55.5	-12.4	43.1	46.0	2.9*	135	184
816.03	X / V	48.2	-11.3	36.9	46.0	9.1	113	120

Note: Level QP = Reading QP + Factor

Uncertainty

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

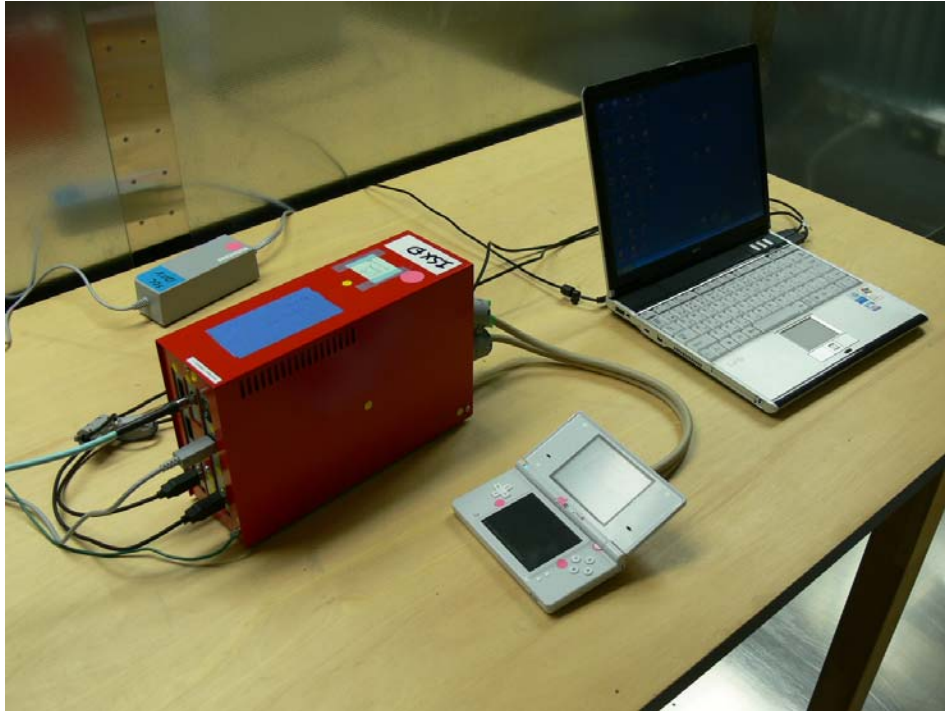
Table 19: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode L, 802.11

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 [°]
1050.106	Z/H	58.3	67.2	-16.8	41.5	50.4	54/74	12.5	3.6	100	201
1399.974	X/V	55.8	60.3	-15.4	40.4	44.9	54/74	13.6	9.1	110	223
2349.953	X/H	51.8	61.3	-13.5	38.3	47.8	54/74	15.7	6.2	114	320
2950.14	Z/H	49.6	58.7	-12.4	37.2	46.3	54/74	16.8	7.7	102	13
4943.954	X/H	43.7	53.3	-9.2	34.5	44.1	54/74	19.5	9.9	100	160
7398.625	Z/H	37.8	51.6	-4.6	33.2	47	54/74	20.8	7	196	139

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

8. Photographs of test setup

Photograph 1: Set-up for Conducted Emissions at Antenna Port



Photograph 2: Set-up for Radiated Emission, EUT Configuration X-Axis



Photograph 3: Set-up for Radiated Emission, EUT Configuration Y-Axis



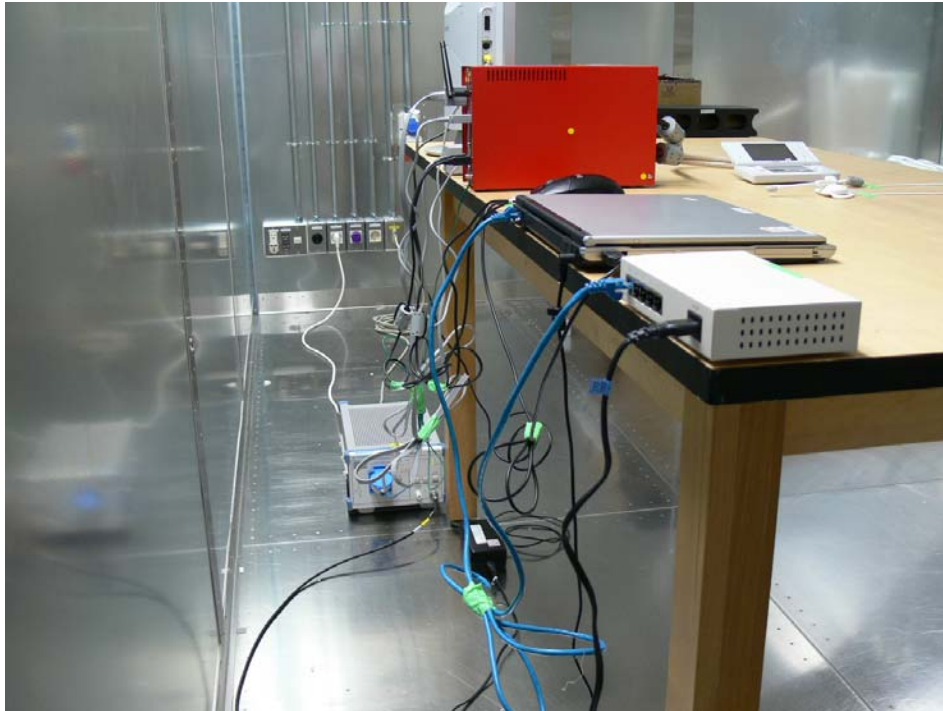
Photograph 4: Set-up for Radiated Emission, EUT Configuration Z-Axis



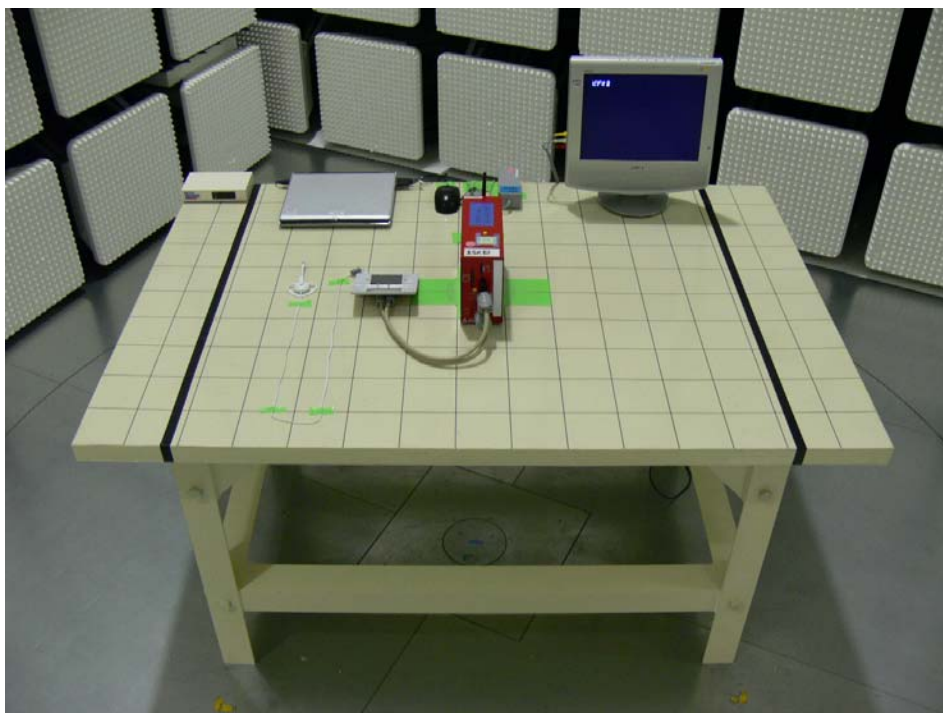
Photograph 5: Set-up for AC Mains Conducted Emission of Transmitter, Front View



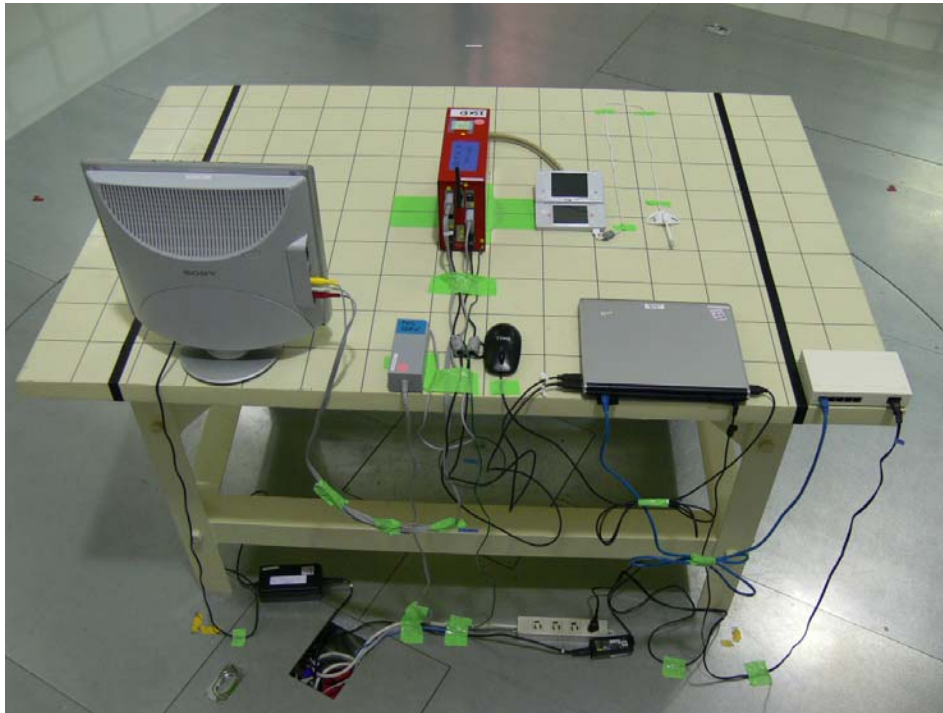
Photograph 6: Set-up for AC Mains Conducted Emission of Transmitter, Rear View



Photograph 7: Set-up for Radiated Emission of Transmitter, Front View



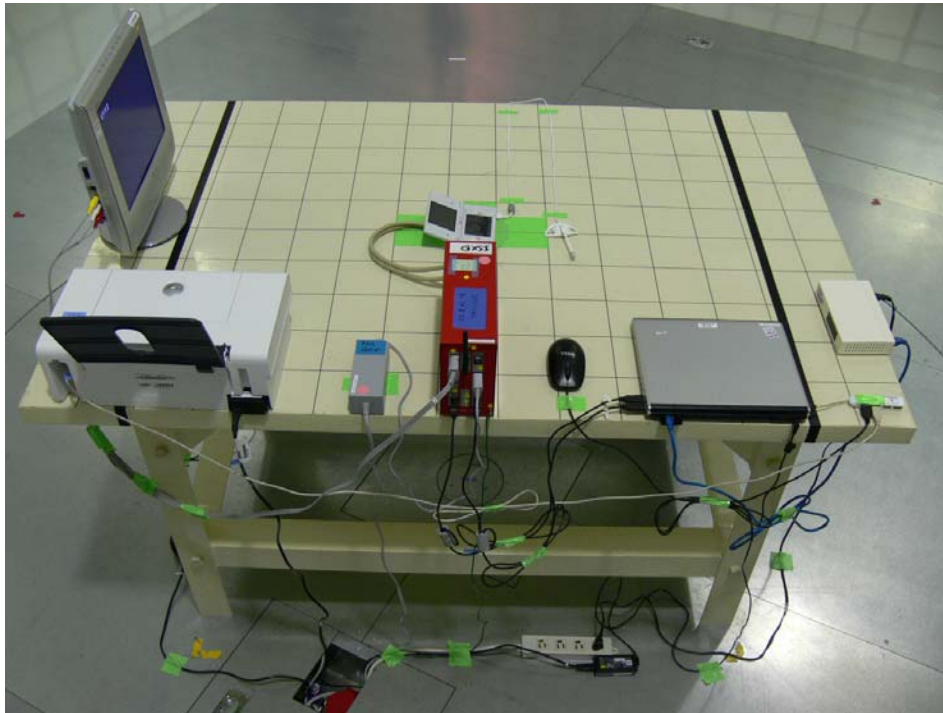
Photograph 8: Set-up for Radiated Emission of Transmitter, Rear View



Photograph 9: Set-up for Radiated Emission of Receiver, Front View



Photograph 10: Set-up for Radiated Emission of Receiver, Rear View



9. List of Tables

Table 1: List of Test and Measurement Equipment.....	6
Table 2: Emission Measurement Uncertainty.....	7
Table 3: Conducted Output Power, 802.11	19
Table 4: 6dB Bandwidth, 802.11	20
Table 5: Conducted Spurious Emissions, Mode I (2412MHz), 802.11	23
Table 6: Conducted Spurious Emissions, Mode J (2437MHz), 802.11	26
Table 7: Conducted Spurious Emissions, Mode K (2472MHz), 802.11	29
Table 8: Peak Power Spectral Density, 802.11	33
Table 9: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode I, 802.11	37
Table 10: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode K, 802.11	37
Table 11: Band Edge Radiated Emission, 802.11	39
Table 12: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode I, 802.11	42
Table 13: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode J, 802.11	42
Table 14: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode K, 802.11	43
Table 15: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode I, 802.11	43
Table 16: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode J, 802.11	43
Table 17: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode K, 802.11	44
Table 18: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data, Mode L, 802.11	46
Table 19: Radiated Emission 1GHz – 25GHz, Horizontal & Vertical Antenna Orientations, Peak and Average Data, Mode L, 802.11	46

10. List of Figures

Figure 1: Test setup.....	12
Figure 2: 6dB Bandwidth, Mode I (2412MHz)	21
Figure 3: 6dB Bandwidth, Mode J (2437MHz)	21
Figure 4: 6dB Bandwidth, Mode K (2472MHz).....	22
Figure 5: Spurious Emission from 30MHz to 1GHz, Mode I (2412MHz)	24
Figure 6: Spurious Emission from 1 to 5GHz, Mode I (2412MHz).....	24
Figure 7: Spurious Emission from 5 to 10GHz, Mode I (2412MHz).....	25
Figure 8: Spurious Emission from 10 to 20GHz, Mode I (2412MHz).....	25
Figure 9: Spurious Emission from 20 to 25GHz, Mode I (2412MHz).....	26
Figure 10: Spurious Emission from 30MHz to 1GHz, Mode J (2437MHz).....	27
Figure 11: Spurious Emission from 1 to 5GHz, Mode J (2437MHz).....	27
Figure 12: Spurious Emission from 5 to 10GHz, Mode J (2437MHz).....	28
Figure 13: Spurious Emission from 10 to 20GHz, Mode J (2437MHz).....	28
Figure 14: Spurious Emission from 20 to 25GHz, Mode J (2437MHz).....	29
Figure 15: Spurious Emission from 30MHz to 1GHz, Mode K (2472MHz)	30
Figure 16: Spurious Emission from 1 to 5GHz, Mode K (2472MHz)	30
Figure 17: Spurious Emission from 5 to 10GHz, Mode K (2472MHz)	31
Figure 18: Spurious Emission from 10 to 20GHz, Mode K (2472MHz)	31

Figure 19: Spurious Emission from 20 to 25GHz, Mode K (2472MHz)	32
Figure 20: Power Spectral Density, Mode I (2412MHz), 802.11	34
Figure 21: Power Spectral Density, Mode J (2437MHz), 802.11	34
Figure 22: Power Spectral Density, Mode K (2472MHz), 802.11	35
Figure 23: Band Edge Radiated Emission, Mode I (2412MHz), Peak and Average	39
Figure 24: Band Edge Radiated Emission, Mode K (2472MHz), Peak and Average	40

11. List of Photographs

Photograph 1: Set-up for Conducted Emissions at Antenna Port.....	47
Photograph 2: Set-up for Radiated Emission, EUT Configuration X-Axis.....	48
Photograph 3: Set-up for Radiated Emission, EUT Configuration Y-Axis.....	48
Photograph 4: Set-up for Radiated Emission, EUT Configuration Z-Axis.....	49
Photograph 5: Set-up for AC Mains Conducted Emission of Transmitter, Front View	49
Photograph 6: Set-up for AC Mains Conducted Emission of Transmitter, Rear View	50
Photograph 7: Set-up for Radiated Emission of Transmitter, Front View	50
Photograph 8: Set-up for Radiated Emission of Transmitter, Rear View.....	51
Photograph 9: Set-up for Radiated Emission of Receiver, Front View	51
Photograph 10: Set-up for Radiated Emission of Receiver, Rear View.....	52