TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**12604582 004**	**Seite 1 von 33** *Page 1 of 33*

Auftraggeber: *Client:*	**OLYMPUS CORPORATION** 2951 Ishikawa-cho, Hachioji-shi, Tokyo 192-8507, Japan
Gegenstand der Prüfung: *Test item:*	**RFID Module for Full Color Inkjet Web Printer**
Bezeichnung: *Identification:*	**444-59005**
Serien-Nr.: *Serial No.:*	**2088RB-0001**
Wareneingangs-Nr.: *Receipt No.:*	**213082133**
Eingangsdatum: *Date of receipt:*	**2008-09-22**
Prüfort: *Testing location:*	4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan
Prüfgrundlage: *Test specification:*	**47 CFR Part 15.225 (Subpart: C), October 10, 2007** **ANSI C63.4-2003** **Measurement of Low Power Communication Device Transmitter Operating under Section 15.225** **RSS-210 (Issue 7): 2007** **RSS-Gen (Issue 2): 2007**
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Japan Ltd. - Global Technology Assessment Center** 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

geprüft/ *tested by:*

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
2008-10-28	T. Sauter / Inspector	

kontrolliert/ *reviewed by:*

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
2008-10-28	M. Zietz / Reviewer	

Sonstiges / *Other Aspects:*

This test report deals with the intentional radiator portion of the tested product. Unintentional radiator aspects are covered by test reports 12604582 002 and 003.

This test report supersedes test report 12604582 001 issued by TÜV Rheinland Japan, Ltd.

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

TEST SUMMARY

3.2.1 ANTENNA REQUIREMENTS, FCC 15.203, FCC 15.204 AND RSS-GEN 7.1.4
RESULT: PASS

5.1.1 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE, FCC 15.207 AND RSS-GEN 7.2.2
RESULT: PASS

5.2.1 RADIATED EMISSION, 9KHZ – 30MHZ, FCC 15.225(A)(B)(C)(D) AND RSS-210 A2.6(A)(B)(C)(D)
RESULT: PASS

5.2.2 RADIATED EMISSION, 30MHZ – 1000MHZ, FCC 15.225(D), FCC15.209 AND RSS-210 2.2
RESULT: PASS

5.2.3 FREQUENCY STABILITY, FCC 15.225(E), RSS-GEN 7.2.4 AND RSS-210 A2.6
RESULT: PASS

5.2.4 20DB BANDWIDTH, FCC PART 15.215(C)
RESULT: PASS

5.2.5 99% BANDWIDTH, RSS-GEN 4.6.1
RESULT: PASS

Contents

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report.

2. Test Sites

2.1 Test Facilities

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

This test site 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 Conducted Emission					
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					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	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
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100139	RF-0048	2009-04
Trilog Antenna	Schwarzbeck	VULB9168	0245	RF-0019	2009-05
Biconical Antenna	EMCO	3110B	9603-2379	RF-0207	2009-03
For Frequency Stability					
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2009-02
Transformer (Slider)	Yamabishi Electric	S-260-10	-	Y3-0310	N/A
Multimeter	Fluke	87V	93760364	TL-9108	2009-09
Temperature Chamber	Voetsch	VT 4018	585660250 90010	BT-8012	2009-07
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
Radiated Emission (Loop Antenna)	9kHz – 30MHz	±4.8dB
Radiated Emission (Horizontal Orientation)	30MHz - 1GHz	±4.8dB
Radiated Emission (Vertical Orientation)	30MHz - 1GHz	±4.2dB

3. General Product Information

3.1 Product Function and Intended Use

444-59005 is a RFID module operating at the frequency 13.56MHz with ISO 15693 modulation type. It incorporates four identical antennae and is designed to be installed inside an industrial printer. The RFID module checks information contained in tags located inside the ink cartridges.

3.2 Ratings and System Details

Radio Standard:	ISO 15693
Antenna gain:	-61.76 dBi
Antenna type:	Inductive loop antenna (O-shape antenna)
Mounting type:	To be installed inside an industrial printer (only professional installation), not user accessible
Antenna orientation:	Vertical only
Operation frequency:	13.56 MHz
Modulation type:	ASK
FCC Classification:	DXX
System Input Voltage:	DC 5.0V ± 10% (through power supply)
Protection Class:	III
Test voltage:	DC 5V (AC 120V, 60Hz for power supply)

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

RESULT: **PASS**

The EUT incorporates four antennae and is intended to be installed inside a printer. The antennae are therefore not user accessible. Hence the EUT complies with the requirements.

3.3 Clock Frequencies

The EUT generates internally the following clock frequency:

13.56 MHz

3.4 Independent Operation Modes

The basic operation mode is:

A. The four antennae transmit alternatively, with 100ms intervals, a modulated signal and read the value of passive RFID tags.

3.5 Noise Suppressing Parts

Nothing mentioned explicitly.

3.6 Submitted Documents

None.

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

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 Low Power Communication Device Transmitter operating under Section 15.225.

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

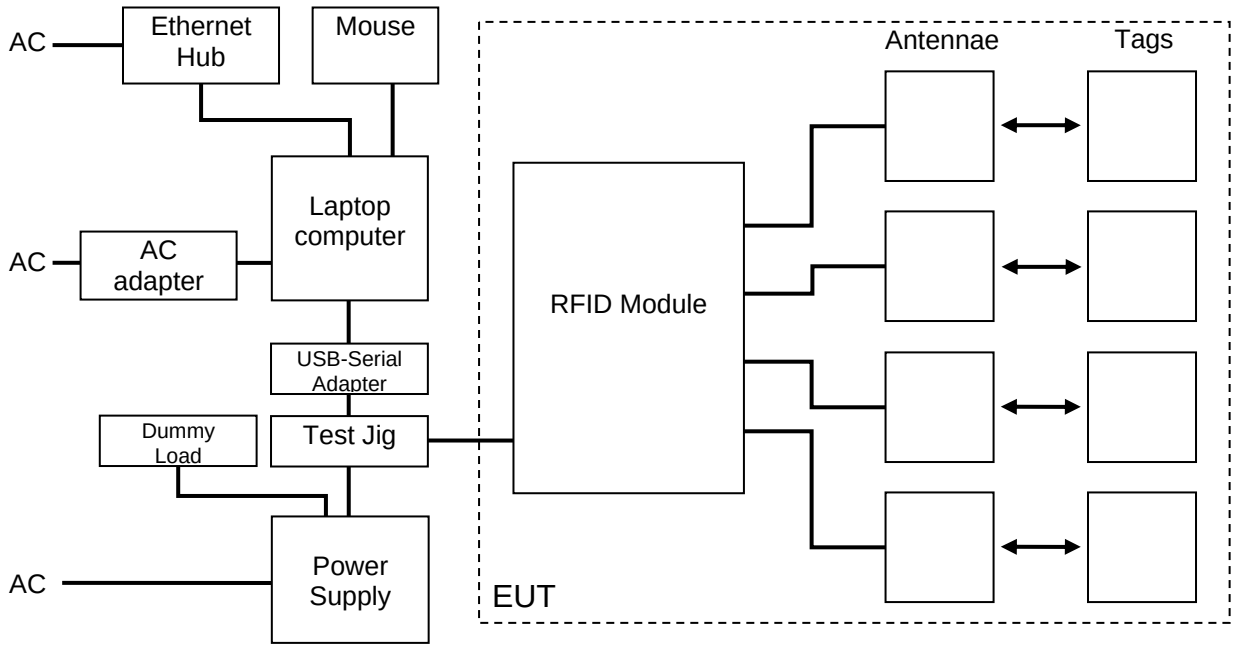
For details, see under each test item.

4.2 Physical Configuration for Testing

The EUT consists of an RFID module with four circular antennae. The antennae are intended to be installed vertically inside the final product; therefore, they were attached to a vertical non-conducting support, on which they could be rotated around their central axis, for testing purpose.

Identification number of the antennae used for testing: 0871511, 0871538, 0871539, 0871545.

Figure 1: Test setup



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

4.3 Test Operation and Test Software

The software UID READ PGM, provided by the manufacturer, was used to control the EUT during testing.

4.4 Special Accessories and Auxiliary Equipment

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

1. Product: Power Supply (for EUT)
   Manufacturer: Hitachi Media Electronics Co., Ltd.
   Model: FW6865
   Rated Voltage: AC 100-240V
   Frequency: 50/60Hz
   Serial Number: 05113

2. Product: Laptop Computer
   Manufacturer: Panasonic
   Model: CF-T2DC1AXS
   Rated Voltage: DC 16V
   Input Current: 2.5A
   Serial Number: 4HKSA76227

3. Product: AC Adapter for Panasonic Laptop Computer
   Manufacturer: Panasonic
   Model: CF-AA1625A M1
   Rated Voltage: AC 100 - 240V
   Input Current: 0.9-0.4A
   Frequency: 50/60Hz
   Serial Number: 03529704A

4. Product: Mouse
   Manufacturer: Dell
   Model: MO58UC
   Serial Number: G0601Z20

5. Product: Laptop Computer
   Manufacturer: IBM
   Model: 2629-Y1J
   Rated Voltage: DC 16V
   Input Current: 3.6A
   Serial Number: 97-413BZ 05/01

6. Product: AC Adapter for IBM Laptop Computer
   Manufacturer: IBM
   Model: 02K6665
   Rated Voltage: AC 100 - 240V
   Input Power: 140-170VA
   Frequency: 50/60Hz
   Serial Number: 11S02K6665Z1Z2U8185T30

7. Product: Mouse
   Manufacturer: HP
   Model: M-S69
   Serial Number: F6AB70S5BPQ11IL

8. 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

9. Product: USB-Serial Adapter
   Manufacturer: Arvel
   Model: SRC06-USM
   Serial Number: 19613

10. Product: Test Jig (see note below)

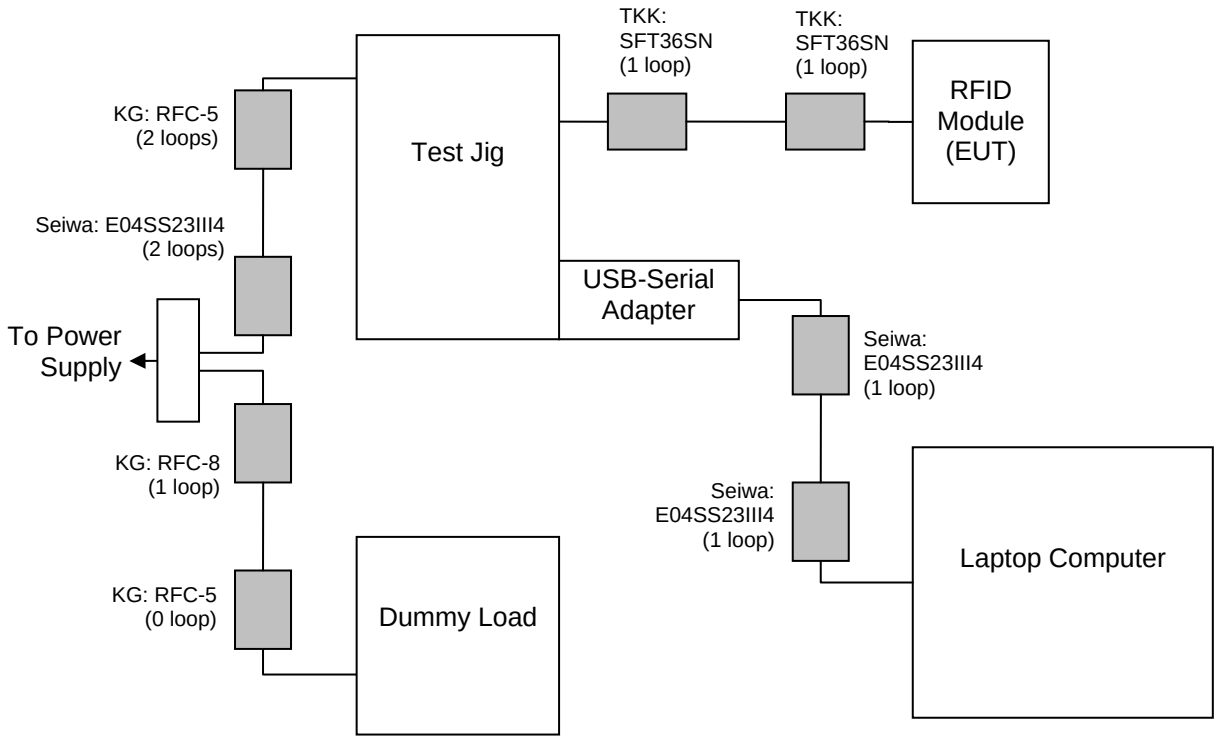
11. Product: Dummy Load

Notes:

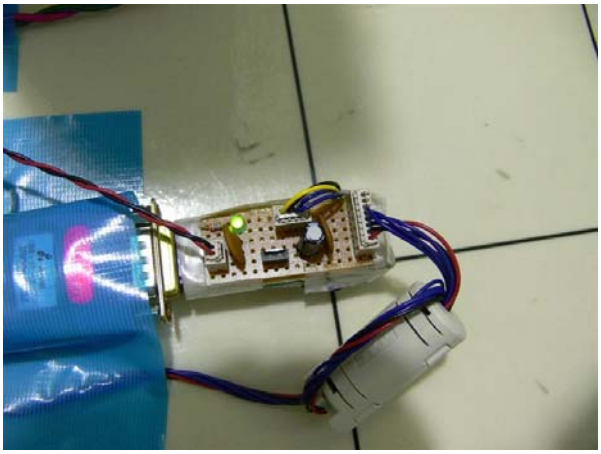
The test jig provides an interface between the EUT, the associated power supply and the controller unit (laptop computer and USB-serial adaper) for testing purpose. Refer to the pictures here below for more details.

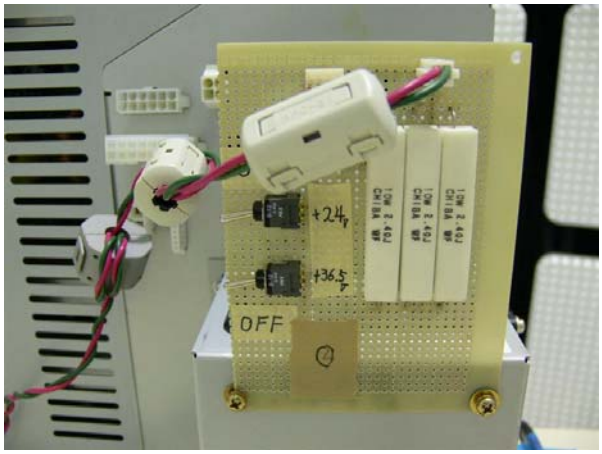
Accessories No. 2, 3 and 4 were only used for the AC mains conducted emission test and for the radiated emission measurement according to FCC 15.225(a)(b)(c)(d) and RSS-210 A2.6(a)(b)(c)(d) in the range 9kHz – 30MHz. Accessories No. 5, 6 and 7 were used for all the other radiated emission tests. Other accessories were used for all the tests.

Figure 2: Test Jig Connection Diagram with Ferrite Cores



Photograph 1: Test Jig (Left) and Dummy Load (Right)





4.5 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

5. Test Results EMISSION

5.1 AC Mains Conducted Emission

5.1.1 Mains Terminal Continuous Disturbance Voltage, FCC 15.207 and RSS-Gen 7.2.2

RESULT: **PASS**

Date of testing:	2008-09-22
Ambient temperature:	24°C
Relative humidity:	63%
Atmospheric pressure:	1004hPa
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 and RSS-Gen 7.2.2

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 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 power supply feeding the EUT was connected to a Line Impedance Stabilization Network (LISN) / Artificial Mains Network (AMN).

The measurements were performed using a CISPR quasi-peak detector and average detector.

Disturbances other than those mentioned are small or not detectable.

Table 3: Conducted Emission, 150kHz – 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L)

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]
0.3779	L1	10.2	4.5	9.7	19.9	14.2	58.3	48.3	38.4	34.1
4.96509	L1	17.5	12.6	9.8	27.3	22.4	56	46	28.7	23.6
11.84654	L1	28	25	10.1	38.1	35.1	60	50	21.9	14.9
21.65626	L1	29	24	10.2	39.2	34.2	60	50	20.8	15.8
0.26963	N	11	5.5	9.7	20.7	15.2	61.1	51.1	40.4	35.9
1.34054	N	6.6	1.1	9.7	16.3	10.8	56	46	39.7	35.2
4.89955	N	16.5	11.5	9.8	26.3	21.3	56	46	29.7	24.7
12.07007	N	26.6	13.5	10.1	36.7	23.6	60	50	23.3	26.4
21.27027	N	27.3	20.9	10.3	37.6	31.2	60	50	22.4	18.8
23.99309	N	23.7	16.8	10.4	34.1	27.2	60	50	25.9	22.8

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

5.2 Radiated Emission

5.2.1 Radiated Emission, 9kHz – 30MHz, FCC 15.225(a)(b)(c)(d) and RSS-210 A2.6(a)(b)(c)(d)

RESULT: **PASS**

Date of testing:	2008-10-28
Ambient temperature:	24°C
Relative humidity:	38%
Atmospheric pressure:	1005hPa
Frequency range:	9kHz – 30MHz
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 15.225(a)(b)(c)(d) and RSS-210 A2.6(a)(b)(c)(d).

Test procedure:
ANSI C63.4-2003 and RSS-Gen 4.9

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

The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. Final radiated emissions measurements were made at 3m with a loop antenna placed 1m above the ground plane. The values were recalculated for a 30m distance using a factor of 40dB/decade according to FCC 15.31(f) and RSS-Gen 7.2.5(b). The spectrum was examined from 9 kHz to 30MHz.

At each frequency, the EUT was rotated 360° in order to determine the emission's maximum level. For frequencies between 150kHz and 30MHz, the spectrum analyzer's 6 dB bandwidth was set to 9kHz, and the analyzer was operated in the CISPR quasi-peak detection mode or average detection mode, depending on the investigated frequeny range.

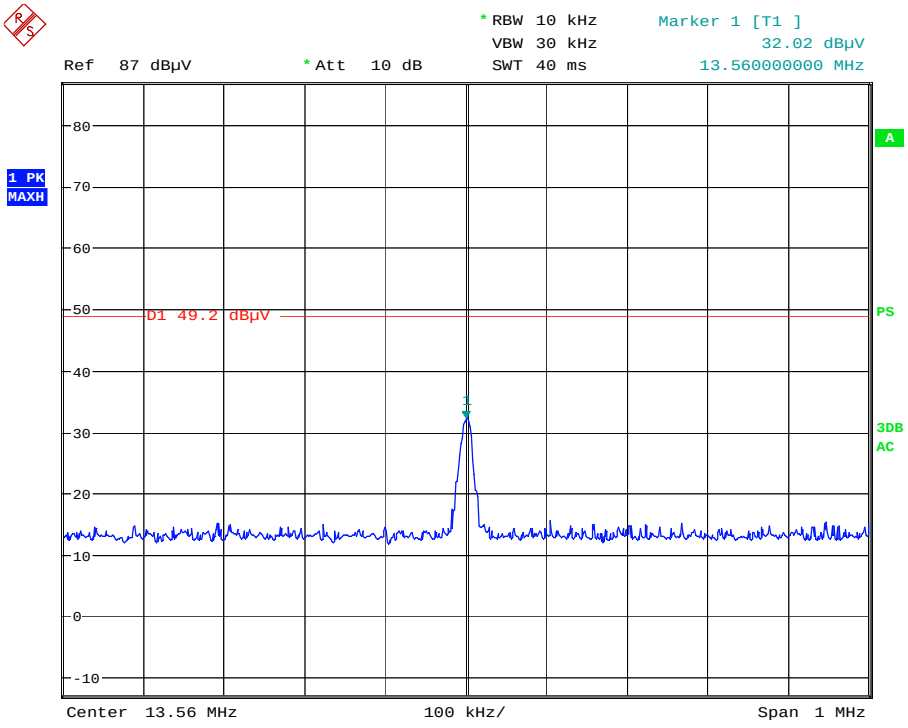
The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

Table 4: Radiated Emission 9kHz – 30MHz, Quasi Peak Data

Frequency [MHz]	Reading QP at 3m [dB(uV)]	Factor [dB(1/m)]	Level QP at 3m [dB(uV/m)]	Level QP at 30m [dB(uV/m)]	Limit at 30m [uV/m]	Limit at 30m [dB(uV/m)]	Margin QP [dB]
13.11	6.4	20.2	26.6	-13.4	30	29.5	42.9
13.41	6.5	20.3	26.8	-13.2	106	40.5	53.7
13.553	8.9	20.3	29.2	-10.8	334	50.5	61.3
13.561	26.7	20.3	47.0	7.0	15848	84.0	77.0
13.567	16.9	20.3	37.2	-2.8	334	50.5	53.3
13.71	6.5	20.3	26.8	-13.2	106	40.5	53.7
14.01	6.5	20.4	26.9	-13.1	30	29.5	42.6

Notes: Level QP at 3m = Reading QP at 3m + Factor
Level QP at 30m = Level QP at 3m - distance extrapolation factor for one decade
Distance extrapolation factor = 40dB/decade (FCC 15.31(f) and RSS-Gen 7.2.5(b))
dB(uV/m) = 20 x log(uV/m)
Final measurement was performed for the EUT orientation Y and antenna angle 0° (worst case).

Figure 3: Spectrum in the Range 13.06 – 14.06MHz



Frequency range 13.06 - 14.06 MHz, FCC 15.225(a)(b)(c)
Date: 28.OCT.2008 19:50:13

Notes: This spectrum is given for illustration purpose only.
Only the lowest limit specified in FCC 15.225(a)(b)(c)(d) and RSS-210 A2.6(a)(b)(c)(d) is shown in this spectrum. Since correction factors are not included in this spectrum, the limit level was adapted accordingly. (Displayed limit level = Limit at 3m – Factor.)

5.2.2 Radiated Emission, 30MHz – 1000MHz, FCC 15.225(d), FCC15.209 and RSS-210 2.2

RESULT: **PASS**

Date of testing:	2008-09-24, 2008-10-02
Ambient temperature:	24, 24°C
Relative humidity:	45, 42%
Atmospheric pressure:	1008, 1014hPa
Frequency range:	30MHz – 1GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

Requirements:
The emission from the intentional radiator shall not exceed the field strength specified in 15.225(d), 15.209(a) and RSS-210 2.2.

Test procedure:
ANSI C63.4-2003 and RSS-Gen 4.9.

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

The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. Final radiated emissions measurements were made at 3m.

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 30 and 1000MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode.

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 5: Radiated Emission 30MHz – 1GHz, Horizontal & Vertical Antenna Orientations, Quasi Peak Data

Freq. [MHz]	Antenna Orient.	Reading QP [dB(µV)]	Factor [dB(1/m)]	Level QP [dB(µV/m)]	Limit [µV/m]	Limit [dB(µV/m)]	Margin QP [dB]	Height [cm]	Angle [°]
47.978	V	62.1	-26.8	35.3	100	40	4.7	101	239
98.4	V	62.7	-26.2	36.5	150	43.5	7	100	281
99.01	V	58.9	-26.2	32.7	150	43.5	10.8	102	1
99.311	V	66.4	-26.2	40.2	150	43.5	3.3	101	168
100.051	V	64	-26.1	37.9	150	43.5	5.6	100	277
101.916	V	63.8	-26	37.8	150	43.5	5.7	101	265
110.8	V	58.8	-25.1	33.7	150	43.5	9.8	105	287
189.855	H	60.4	-25.1	35.3	150	43.5	8.2	170	52
284.8	H	60	-21.8	38.2	200	46	7.8	101	307
324.059	H	59.1	-20.6	38.5	200	46	7.5	199	207
449.384	H	53.1	-17.1	36	200	46	10	225	246
486.037	H	55.3	-16.1	39.2	200	46	6.8	101	102
563.971	V	55.9	-14.2	41.7	200	46	4.3	168	204
698.568	V	49	-12.6	36.4	200	46	9.6	100	327
893.443	H	50.4	-10.4	40	200	46	6	101	274

Notes: Level QP = Reading QP + Factor
dB(uV/m) = 20 x log(uV/m)
Final measurement was performed for the EUT orientation Y and antenna angle 0° (worst case).

5.2.3 Frequency Stability, FCC 15.225(e), RSS-Gen 7.2.4 and RSS-210 A2.6

RESULT: **PASS**

Date of testing: 2008-09-26

Ambient temperature: 26°C
Relative humidity: 42%
Atmospheric pressure: 995hPa

Temperature Variation: -20°C – 50°C
Voltage Variation 120V ± 15%

Requirements:
The frequency tolerance of the carrier signal shall be maintained within ± 0.01% of the operating frequency over the temperature and voltage variations specified in FCC 15.225(e), RSS-Gen 7.2.4 and RSS-210 A2.6.

Test procedure:
ANSI C63.4-2003 and RSS-Gen 4.7.

The EUT was placed inside a temperature chamber and the frequency of the carrier signal was measured with a loop antenna placed near the EUT outside the temperature chamber.

Measurements were performed for every 10°C inside the specified temperature interval. Measurements started after the temperature was sufficiently stabilized and were performed at start-up of the EUT, and then after 2, 5 and 10 minutes.

This test was then repeated at a temperature of 20°C for a variation of ± 15% of the input voltage. Since the EUT does not incorporate a voltage regulator, voltage variation measurements were performed on the EUT power supply.

Table 6: Frequency Stability at 50°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561105	0.0081	0.01	Pass
2	13.56	13.561099	0.0081	0.01	Pass
5	13.56	13.561092	0.0081	0.01	Pass
10	13.56	13.561105	0.0081	0.01	Pass

Table 7: Frequency Stability at 40°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561115	0.0082	0.01	Pass
2	13.56	13.561128	0.0083	0.01	Pass
5	13.56	13.561112	0.0082	0.01	Pass
10	13.56	13.561128	0.0083	0.01	Pass

Table 8: Frequency Stability at 30°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561147	0.0085	0.01	Pass
2	13.56	13.561147	0.0085	0.01	Pass
5	13.56	13.561144	0.0084	0.01	Pass
10	13.56	13.561144	0.0084	0.01	Pass

Table 9: Frequency Stability at 20°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561173	0.0087	0.01	Pass
2	13.56	13.561173	0.0087	0.01	Pass
5	13.56	13.561173	0.0087	0.01	Pass
10	13.56	13.561176	0.0087	0.01	Pass

Table 10: Frequency Stability at 10°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561193	0.0088	0.01	Pass
2	13.56	13.561193	0.0088	0.01	Pass
5	13.56	13.561191	0.0088	0.01	Pass
10	13.56	13.561193	0.0088	0.01	Pass

Table 11: Frequency Stability at 0°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561205	0.0089	0.01	Pass
2	13.56	13.561206	0.0089	0.01	Pass
5	13.56	13.561207	0.0089	0.01	Pass
10	13.56	13.561212	0.0089	0.01	Pass

Table 12: Frequency Stability at -10°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561193	0.0088	0.01	Pass
2	13.56	13.561197	0.0088	0.01	Pass
5	13.56	13.561196	0.0088	0.01	Pass
10	13.56	13.561199	0.0088	0.01	Pass

Table 13: Frequency Stability at -20°C

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561048	0.0077	0.01	Pass
2	13.56	13.561053	0.0078	0.01	Pass
5	13.56	13.561036	0.0076	0.01	Pass
10	13.56	13.561036	0.0076	0.01	Pass

Table 14: Frequency Stability at 20 °C, AC 102V

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561173	0.0087	0.01	Pass
2	13.56	13.561176	0.0087	0.01	Pass
5	13.56	13.561171	0.0086	0.01	Pass
10	13.56	13.561174	0.0087	0.01	Pass

Table 15: Frequency Stability at 20 °C, AC 120V

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561173	0.0087	0.01	Pass
2	13.56	13.561173	0.0087	0.01	Pass
5	13.56	13.561173	0.0087	0.01	Pass
10	13.56	13.561176	0.0087	0.01	Pass

Table 16: Frequency Stability at 20 °C, AC 138V

Elapsed Time [min]	Nominal Frequency [MHz]	Measured Frequency [MHz]	Deviation [%]	Limit [%]	Result
Start-up	13.56	13.561174	0.0087	0.01	Pass
2	13.56	13.561174	0.0087	0.01	Pass
5	13.56	13.561174	0.0087	0.01	Pass
10	13.56	13.561173	0.0087	0.01	Pass

5.2.4 20dB Bandwidth, FCC Part 15.215(c)

RESULT: **PASS**

Date of testing: 2008-09-24

Ambient temperature: 24 °C
Relative humidity: 45 %
Atmospheric pressure: 1008hPa

Requirements:
The 20dB bandwidth of the emission shall be contained within its designated frequency band.

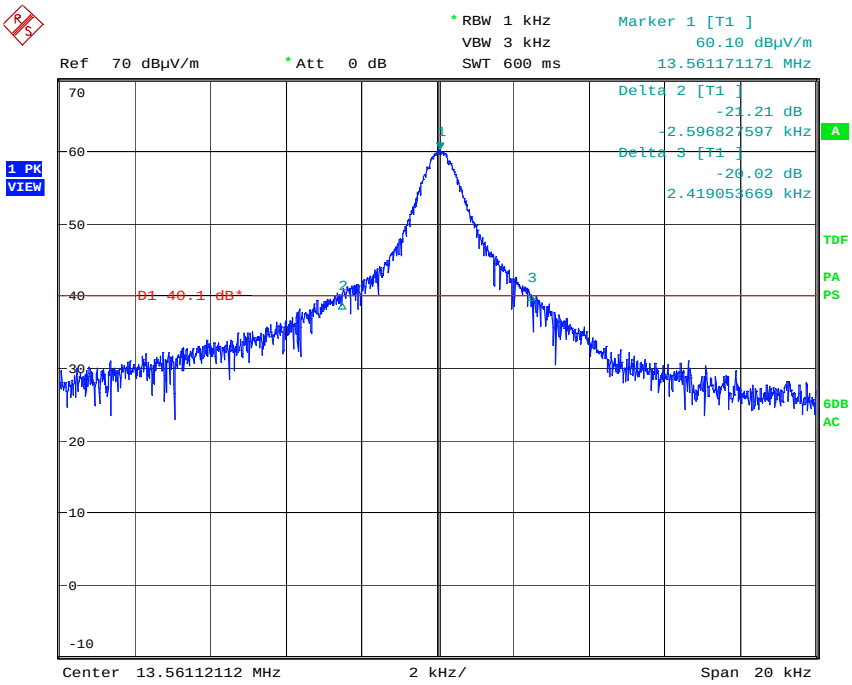
Test procedure:
ANSI C63.4-2003

The 20dB bandwidth was measured using a loop antenna connected to a spectrum analyzer with a coaxial cable. The spectrum analyzer resolution bandwidth was set to 1kHz and the video bandwidth to 3kHz.

Table 17: 20dB Bandwidth

Frequency [MHz]	20dB Bandwidth [kHz]
13.56	5.0154

Figure 4: 20dB Bandwidth



20dB bandwidth
Date: 24.SEP.2008 15:48:25

5.2.5 99% Bandwidth, RSS-Gen 4.6.1

RESULT: **PASS**

Date of testing: 2008-09-24

Ambient temperature: 24 °C
Relative humidity: 45 %
Atmospheric pressure: 1008hPa

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

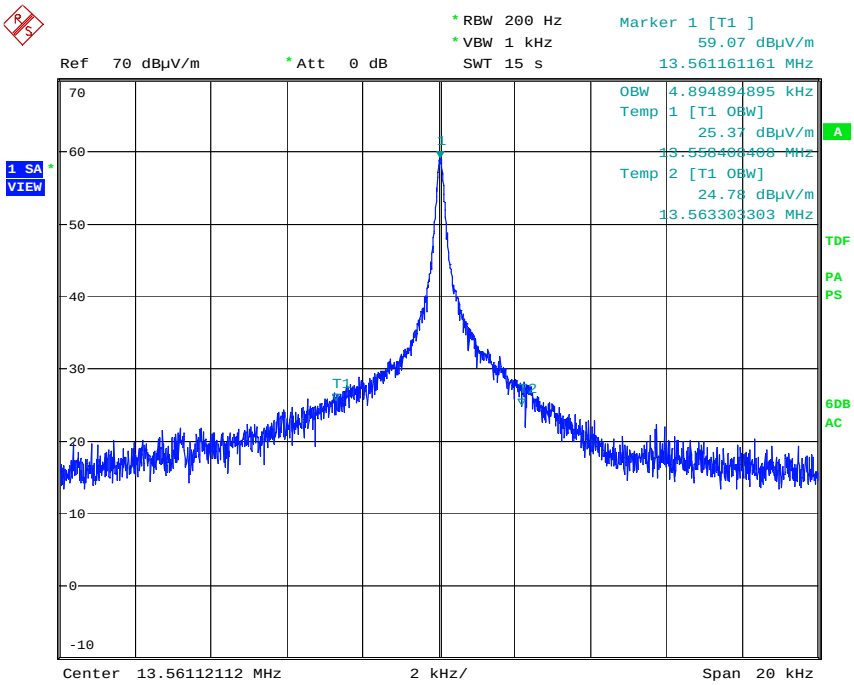
Test procedure:
RSS-Gen 4.6.1

The 99% bandwidth was measured using a loop antenna. The spectrum analyzer resolution bandwidth was set to 1% of the SPAN (10MHz). The 99% Bandwidth was measured by using the OBW function of the analyzer with a 99% coverage setting.

Table 18: 99% Bandwidth

Frequency [MHz]	99% Bandwidth [kHz]
13.56	4.8949

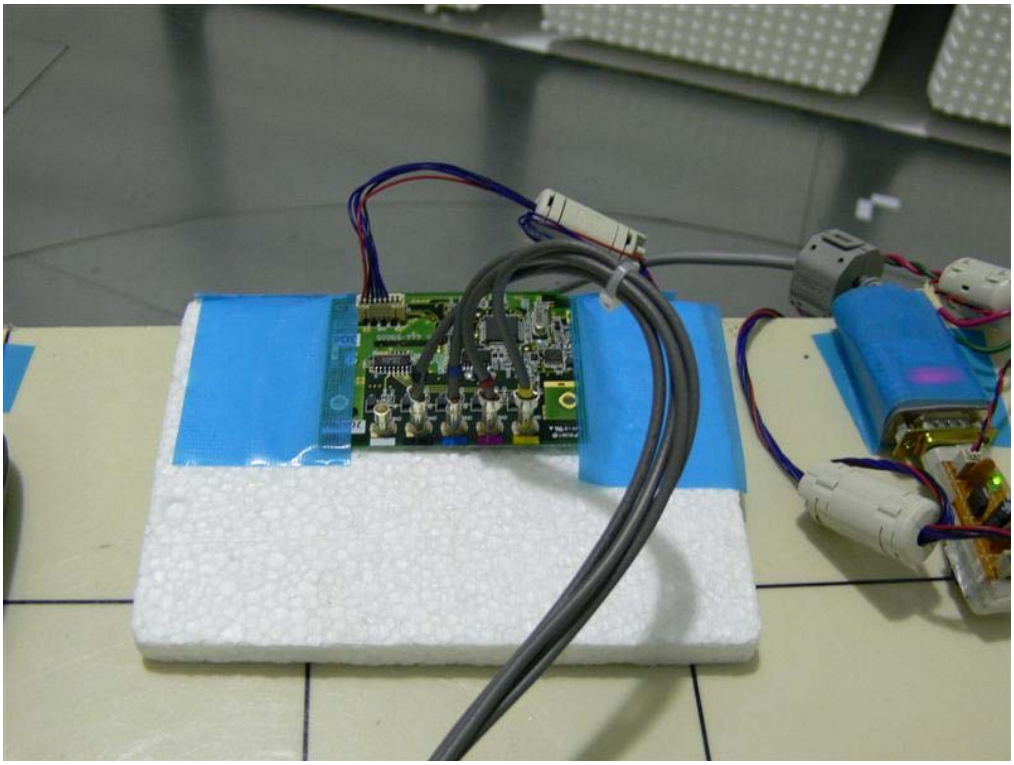
Figure 5: 99% Bandwidth



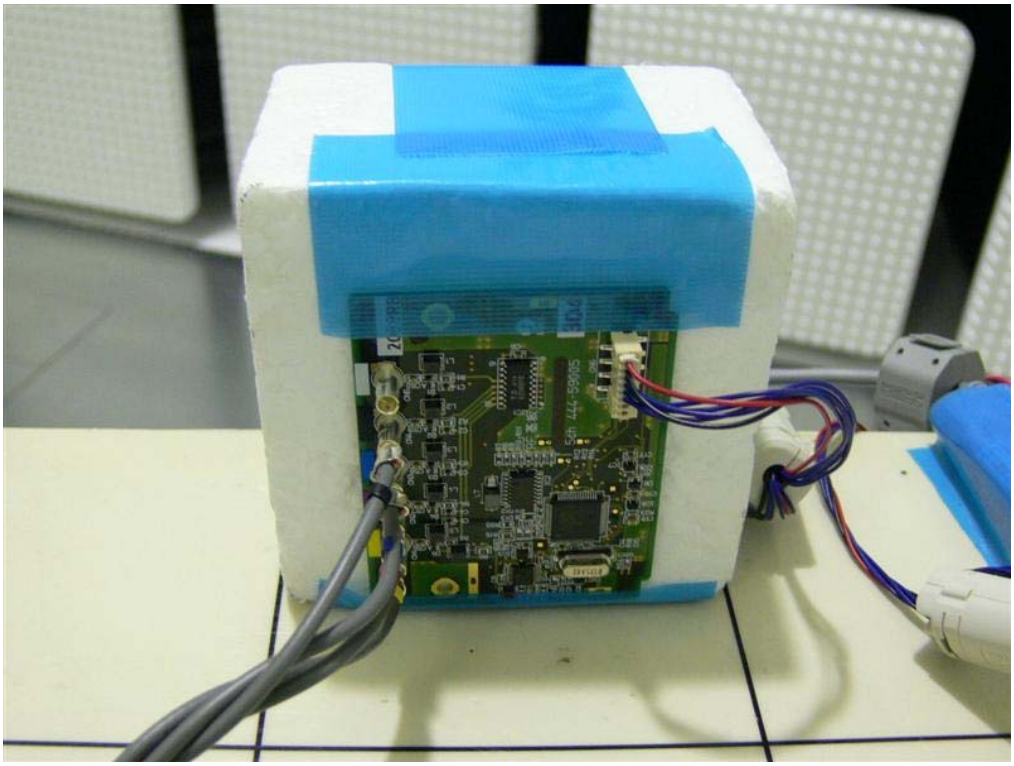
99% bandwidth
Date: 24.SEP.2008 15:38:35

6. Photographs of the Test Set-Up

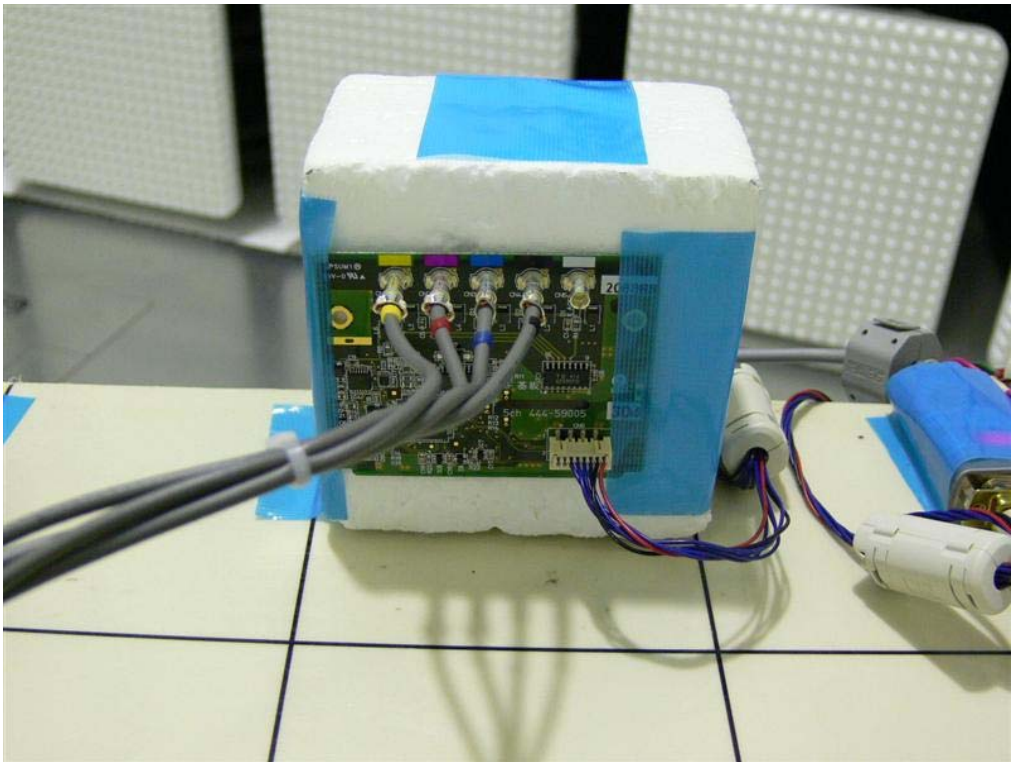
Photograph 2: Set-up for Radiated Emission, EUT Configuration X-Axis



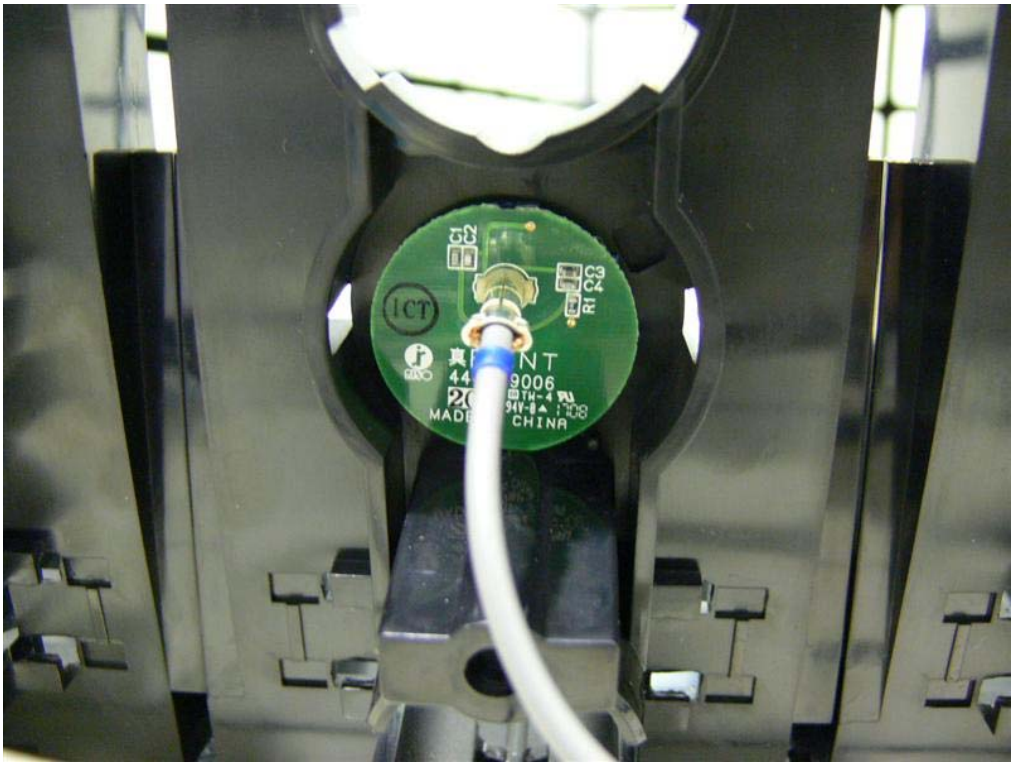
Photograph 3: Set-up for Radiated Emission, EUT Configuration Y-Axis



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



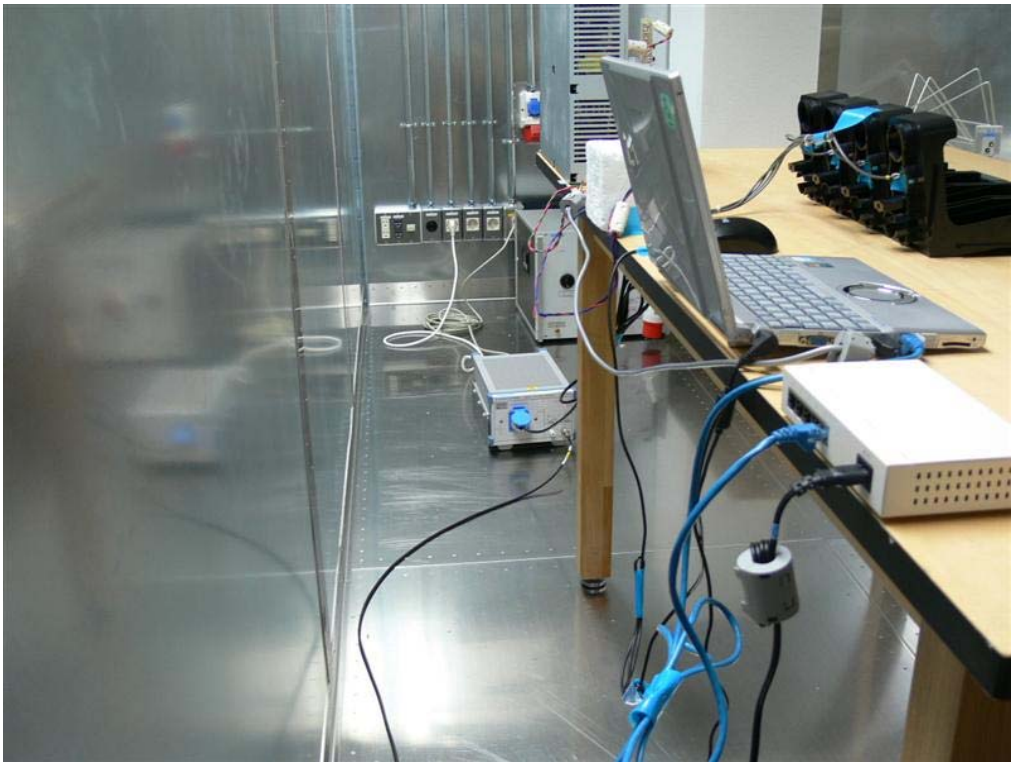
Photograph 5: Set-up for Radiated Emission, Antenna Rotation Angle 0°



Photograph 6: Set-up for Radiated Emission, Antenna Rotation Angle 90°

Photograph 7: Set-up for Conducted Emission, on AC Mains, Front View

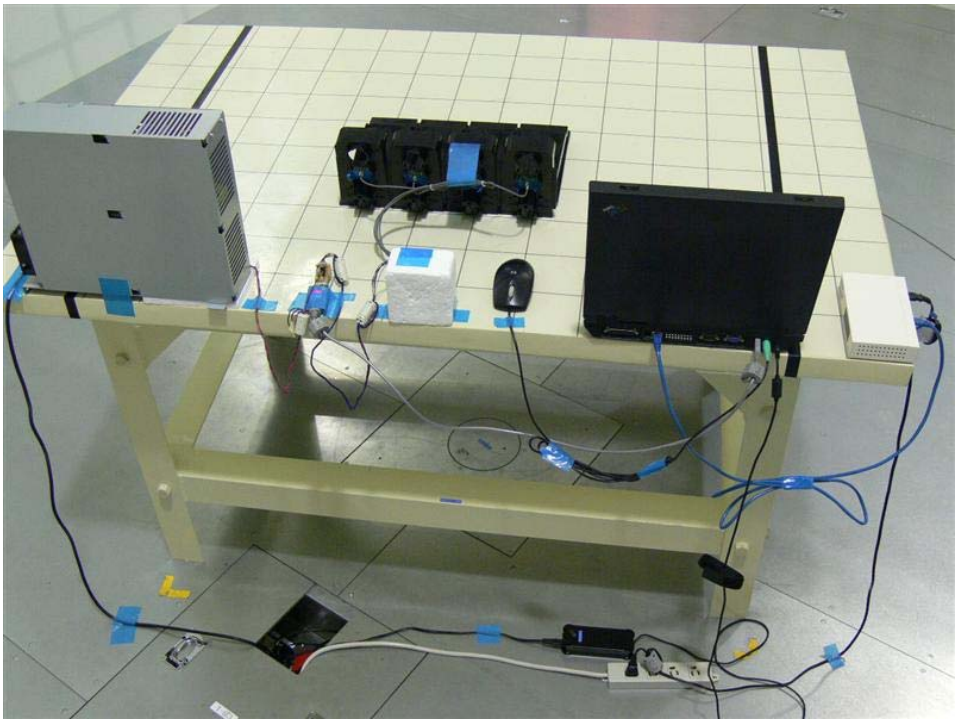
Photograph 8: Set-up for Conducted Emission, on AC Mains, Rear View



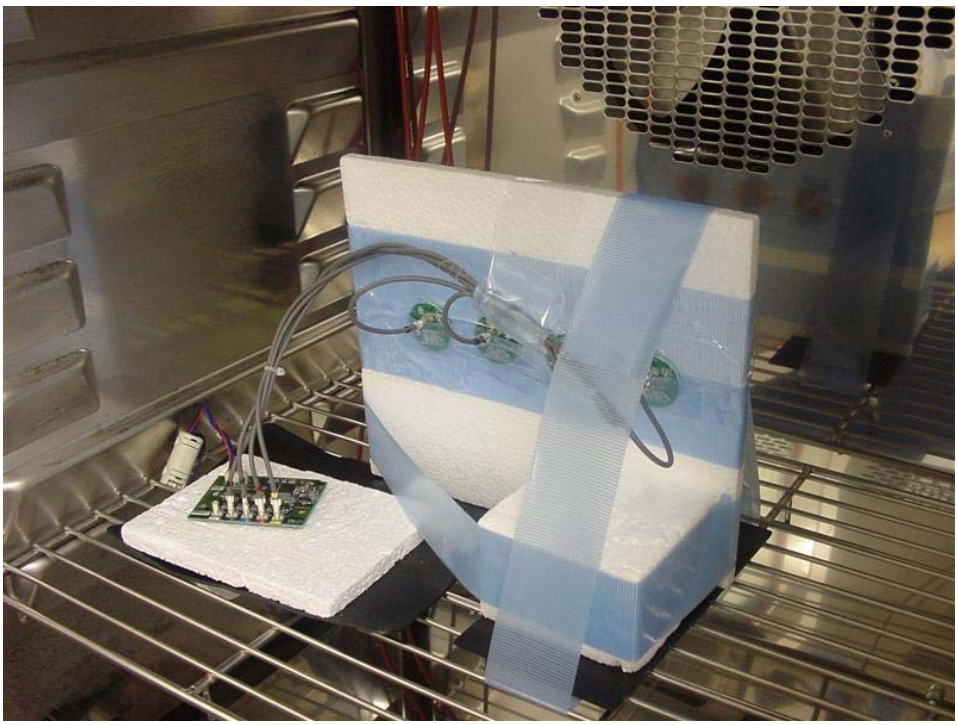
Photograph 9: Set-up for Radiated Emission, including Loop Antenna

Photograph 10: Set-up for Radiated Emission, Close View

Photograph 11: Set-up for Radiated Emission, Rear View



Photograph 12: Set-up for Frequency Stability, Inside Temperature Chamber



7. List of Tables

8. List of Figures

9. List of Photographs