



Accredited testing-laboratory

DAR registration number: DAT-P-176/94-D1

**Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97**

Recognized by the Federal Communications Commission

Anechoic chamber registration no.: 90462 (FCC)

Anechoic chamber registration no.: 3463A-1 (IC)

Certification ID: DE 0001

Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

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Test report no. : 1-0762-01-05/08-A
Type identification : SKM100, SKM300, SKM500, EM300, EM500
Applicant : Sennheiser electronic GmbH & Co. KG
FCC ID : DMOG3SKMEM
IC Certification No : 2099A-G3SKMEM
Test standards : 47 CFR Part 74
RSS - 123 Issue 1
47 CFR Part 15
ICES-003 Issue 4

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test laboratory manager:

2008-10-13

Jakob Reschke



Date

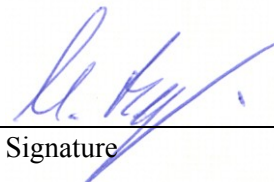
Name

Signature

Technical responsibility for area of testing:

2008-10-13

Michael Berg



Date

Name

Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Phone: + 49 681 5 98 - 0

Fax: + 49 681 5 98 - 9075

e-mail: info@ICT.cetecom.de

Internet: http://www.cetecom-ict.de

State of accreditation: The test laboratory (area of testing) is accredited according to
DIN EN ISO/IEC 17025
DAR registration number: DAT-P-176/94-D1

Accredited by: Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97

Testing location, if different from CETECOM ICT Services GmbH:

Name :
Street :
Town :
Country :
Phone :
Fax :

1.3 Details of applicant

Name:	Sennheiser electronic GmbH & Co. KG
Street:	Am Labor 1
Town:	30900 Wedemark
Country:	Germany
Telephone:	+49 (0) 5130 6 00 -0
Fax:	+49 (0) 5130 600 330
Contact:	Herrn Volker Bartsch
E-mail:	bartschv@sennheiser.com
Telephone:	+49 (0) 5130 600 465

1.4 Application details

Date of receipt of order:	2008-09-30
Date of receipt of test item:	2008-09-29
Date of start test:	2008-09-29
Date of end test:	2008-10-13
Persons(s) who have been present during the test:	-/-

2 Test standard/s:

47 CFR Part 74	2006-10	Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission Experimental radio, auxiliary, special broadcast and other program distribution services
RSS - 123 Issue 1	1999-11	Spectrum Management and Telecommunications Policy - Radio Standards Specification Low Power Licensed Radiocommunication Devices
47 CFR Part 15	2008-07	Title 47 of the Code of Federal Regulations; Chapter I- Federal Communications Commission subchapter A - general, Part 15-Radio frequency devices
ICES-003 Issue 4	2004-04	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard

3 Technical tests

3.1 Details of manufacturer

Name:	Sennheiser electronic GmbH & Co. KG
Street:	Am Labor 1
Town:	30900 Wedemark
Country:	Germany

3.1.1 Test item and Additional EUT information For IC Canada (appendix 2)

Kind of test item:	Evolution Wireless Microphone System
Type identification:	SKM100, SKM300, SKM500, EM300, EM500
Open Area Test Site Industry Canada Number:	IC 3463A-1
S/N serial number:	See Photos
HW hardware status:	-/-
SW software status:	0.3.11 for Transmitter and 0.3.10 for Receiver
Frequency Band [MHz]:	470 MHz – 608 MHz & 614 MHz – 698 MHz (USA) 470 MHz – 608 MHz & 614 MHz – 806 MHz (Canada) Frequency band used by the equipment Some frequency bands are limited for some countries 516 MHz – 558 MHz 518 MHz – 554 MHz 566 MHz – 608 MHz 626 MHz – 668 MHz 626 MHz – 662 MHz 734 MHz – 776 MHz 780 MHz – 822 MHz
Number of Channels:	1680
Measured Channels	
Channel 1- Power [mW]	516.000 MHz – 44.97 mW
Channel 2- Power [mW]	608.000 MHz – 31.62 mW
Channel 3- Power [mW]	626.000 MHz – 41.69 mW
Channel 4- Power [mW]	697.950 MHz – 34.55 mW
Channel 5- Power [mW]	755.000 MHz – 34.67 mW
Channel 6- Power [mW]	806.000 MHz – 33.11 mW
Type of Modulation:	FM

Emission Designator:	<p><u>516 MHz</u> 124KF3E (2x max. Audio Frequency + 2x max. FM Deviation) 93K2F3E (measured Bandwidth)</p> <p><u>608 MHz</u> 124KF3E (2x max. Audio Frequency + 2x max. FM Deviation) 91K2F3E (measured Bandwidth)</p> <p><u>626 MHz</u> 124KF3E (2x max. Audio Frequency + 2x max. FM Deviation) 94K2F3E (measured Bandwidth)</p> <p><u>697.950 MHz</u> 124KF3E (2x max. Audio Frequency + 2x max. FM Deviation) 86K2F3E (measured Bandwidth)</p> <p><u>755 MHz</u> 124KF3E (2x max. Audio Frequency + 2x max. FM Deviation) 93K2F3E (measured Bandwidth)</p> <p><u>806 MHz</u> 124KF3E (2x max. Audio Frequency + 2x max. FM Deviation) 86K2F3E (measured Bandwidth)</p>
Antenna Type:	External antenna
Power Supply:	2.40 V DC by Battery and Power Supply
Temperature Range:	-10 °C to 55 °C
Occupied Bandwidth (99% BW) [kHz]:	94.18 (max. 200)
Transmitter Spurious (worst case) [dBm]:	-40 (noise floor)
Receiver Spurious (worst case) [μ V/m @ 3m]:	141 (noise floor)
IC Registration Number:	2099A-G3SKMEM
FCC ID:	DMOG3SKMEM
IC Standards:	RSS-123 Issue 1, Rev. 2 November 6, 1999

ATTESTATION: I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned departmental standard(s), and that the radio equipment identified in this application has been subject to all applicable test conditions specified in the departmental standards and all of the requirements of the standards have been met.

Signature:



Test engineer: Jakob Reschke

Date: 2008-10-13

3.1.2 RF Technical Brief Cover Sheet acc. To RSS-102

All Fields must be completed with the requested information or the following codes: N/A for Not Applicable, N/P for Not Performed or N/V for Not Available. Where applicable, check appropriate box.

1. COMPANY NUMBER: **2099A**
2. MODEL NUMBER: **SKM100, SKM300, SKM500, EM300, EM500**
3. MANUFACTURER: **Sennheiser electronic GmbH & Co. KG**
4. TYPE OF EVALUATION: **(c) RF Evaluation**

- Evaluated against exposure limits: General Public Use Controlled Use
- Duty cycle used in evaluation: 100 %
- Standard used for evaluation: RSS-102 Issue 2 (2005-11)
- Measurement distance: 5 m
- RF value: 0.089 V/m A/m W/m²
- Measured Computed Calculated

Declaration of RF Exposure Compliance

ATTESTATION: I attest that the information provided in this testreport is correct; that a Technical Brief was prepared and the information it contains is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed and that the device meets the SAR and/or RF exposure limits of RSS-102.



Name: Jakob Reschke

Title: Engineer

Company: Cetecom ICT Services GmbH

3.1.3 Description of the test

In this report we tested only the radiated emissions of the sample.

All tests were done in accordance with the EIA/TIA 603.

The substitution method (TIA/EIA 603) was used.

This products fulfils also the requirements for CANADA RSS-123

3.1.4 EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
Op. 0	Normal mode	Normal temperature and power source conditions
Op. 1		low temperature, low power source conditions
Op. 2		low temperature, high power source conditions
Op. 3		high temperature, low power source conditions
Op. 4		high temperature, high power source conditions

*) EUT operating mode no. is used to simplify the test plan

3.1.5 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature	T _{nom}	°C	22
Nominal Humidity	H _{nom}	%	55
Nominal Power Source	V _{nom}	V	2.40

Type of power source: **DC by Battery and Power Supply**

Deviations from these values are reported in chapter 2

4 Summary of Measurement Results and list of all performed test cases

- No deviations from the technical specifications were ascertained**
- There were deviations from the technical specifications ascertained

Section in this Report	Test Name	Verdict
5.1	RF Power Output	Pass
5.2	Frequency Stability	Pass
5.3	Frequency Error	Pass
5.4	Characteristics of the Audio Modulation	Pass
5.5	Occupied Bandwidth	Pass
5.6	Emission Mask	Pass
5.7	Radiated Emissions	Pass
5.8	FCC Subpart B	Pass
5.9	Spurious Radiation Radiated	Pass
5.10	Spurious Radiation Conducted	Pass

5 Measurements and results

5.1 Output Power (radiated) FCC Rule Part 74.861 (e)(1)(ii)

Method of measurement:

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

- (a) The measurements was performed with full rf output power and modulation.
- (b) Test was performed at listed 3m test site (listed with FCC, IC).
- (c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
- (d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
- (e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$
- (f) Set the EMI Receiver and #2 as follows:
 - Centre Frequency: test frequency
 - Resolution BW: 100 kHz
 - Video BW: same
 - Detector Mode: positive
 - Average: off
 - Span: 3 x the signal bandwidth
- (g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
- (h) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
- (i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
- (j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
- (k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
- (l) Repeat for all different test signal frequencies

Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

- (a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:
 - Centre Frequency : equal to the signal source
 - Resolution BW : 10 kHz
 - Video BW : same
 - Detector Mode : positive
 - Average : off
 - Span : 3 x the signal bandwidth
- (b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level
Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
 $E \text{ (dBuV/m)} = \text{Reading (dBuV)} + \text{Total Correction Factor (dB/m)}$
- (c) Select the frequency and E-field levels for ERP/EIRP measurements.
- (d) Substitute the EUT by a signal generator and one of the following transmitting antennas (substitution antenna):
.DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz}.

- (e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
- (f) Use one of the following antenna as a receiving antenna: .DIPOLE antenna for frequency from 30-1000 MHz or .HORN antenna for frequency above 1 GHz }.
- (g) If the DIPOLE antenna is used, tune its elements to the frequency as specified in the calibration manual.
- (h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
- (i) Tune the EMI Receivers to the test frequency.
- (j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- (k) The transmitter was rotated through 360 o about a vertical axis until a higher maximum signal was received.
- (l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
- (m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
- (n) Record the power level read from the Average Power Meter and calculates the ERP/EIRP as follows:

$$P = P1 - L1 = (P2 + L2) - L1 = P3 + A + L2 - L1$$

$$EIRP = P + G1 = P3 + L2 - L1 + A + G1$$

$$ERP = EIRP - 2.15 \text{ dB}$$

Total Correction factor in EMI Receiver # 2 = L2 - L1 + G1

Where: P: Actual RF Power fed into the substitution antenna port after corrected.

P1: Power output from the signal generator

P2: Power measured at attenuator A input

P3: Power reading on the Average Power Meter

EIRP: EIRP after correction

ERP: ERP after correction

- (o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
- (p) Repeat step (d) to (o) for different test frequency
- (q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
- (r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Results:

TEST CONDITIONS		TRANSMITTER ERP (mW)					
Frequency (MHz)		516.000 MHz	608.000 MHz	626.000 MHz	697.950 MHz	755.000 MHz	806.000 MHz
T _{nom} °C	V _{nom} V	44.67	31.62	41.69	34.55	34.67	33.11
antenna gain		Not applicable					
Maximum deviation from output power under extreme test conditions (dBc)		±0.12 dB					
Measurement uncertainty		±3.0dB					

Sample calculation:

Freg	SA Reading	SG Setting	Ant. gain	Dipol gain	Cable loss	ERP Result	ERP Result	
MHz	dBµV	dBm	dBi	dBd	dB	dBm	mW	
758.0	108.5	13.9	-	0.0	2.9	11.0	12.6	

ERP = SG (dBm) - Cable Loss (dB) + Ant. gain (dBd)

LIMIT

FCC Rule Part 74.861

Frequency range MHz	Power level mW
54-72, 76-88, 174-216	50
470-608, 614-806	250

5.2 AFC Frequency Error vs. Voltage FCC Rule Part 74.861

Method of measurement:

The EUT was fixed in test fixture to a resistive coaxial attenuator of normal load impedance, and the un-modulated carrier was measured by means of a spectrum analyzer.

The input voltage was varied in an range from 2.2V to 3.1V and the maximum change in frequency was noted within one minute.

The temperature tests were performed for each frequency range on one channel

516.000 MHz

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
2.00	2100	0.00040	4.06
2.20	2000	0.00038	3.87
2.40	2000	0.00038	3.87
2.60	2200	0.00042	4.26
2.80	2200	0.00042	4.26
3.10	2200	0.00042	4.26

608.000 MHz

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
2.00	1100	0.00018	1.80
2.20	1100	0.00018	1.80
2.40	1000	0.00016	1.64
2.60	1000	0.00016	1.64
2.80	1100	0.00018	1.80
3.10	1100	0.00018	1.80

626.000 MHz

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
2.00	1300	0.00020	2.07
2.20	1300	0.00020	2.07
2.40	1200	0.00019	1.91
2.60	1200	0.00019	1.91
2.80	1200	0.00019	1.91
3.10	1300	0.00020	2.07

697.950 MHz

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
2.00	1800	0.00026	2.69
2.20	1800	0.00026	2.69
2.40	1800	0.00026	2.69
2.60	1700	0.00025	2.54
2.80	1600	0.00023	2.39
3.10	1600	0.00023	2.39

755.000 MHz

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
2.00	-800	0.00010	1.05
2.20	-800	0.00010	1.05
2.40	-800	0.00010	1.05
2.60	-900	0.00011	1.19
2.80	-800	0.00010	1.05
3.10	-900	0.00010	1.05

806.000 MHz

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
2.00	-1000	0.00012	1.24
2.20	-1000	0.00012	1.24
2.40	-900	0.00011	1.11
2.60	-900	0.00011	1.11
2.80	-800	0.00009	0.99
3.10	-900	0.00011	1.11

LIMIT

FCC Rule Part 74.861(4)

The frequency tolerance of the transmitter shall be 0.005 percent

5.3 AFC Frequency Error vs. Temperature FCC Rule Part 74.861

Method of measurement:

The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the un-modulated carrier was measured by means of a spectrum analyzer. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency error was noted within one minute. The temperature tests were performed for each frequency range on one channel

516.000 MHz

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	2400	0.00046	4.65
-20	2400	0.00046	4.65
-10	2200	0.00042	4.26
±0.0	2200	0.00042	4.26
+10	2300	0.00044	4.45
+20	2300	0.00044	4.45
+30	2300	0.00044	4.45
+40	2300	0.00044	4.45
+50	2300	0.00044	4.45

608.000 MHz

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	1000	0.00016	1.64
-20	800	0.00013	1.31
-10	700	0.00011	1.15
±0,0	700	0.00011	1.15
+10	600	0.00009	0.98
+20	800	0.00013	1.31
+30	900	0.00014	1.48
+40	900	0.00014	1.48
+50	900	0.00014	1.48

626.000 MHz

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	1700	0.00027	2.71
-20	1600	0.00025	2.55
-10	1600	0.00025	2.55
±0,0	1500	0.00023	2.39
+10	1500	0.00023	2.39
+20	1500	0.00023	2.39
+30	1500	0.00023	2.39
+40	1600	0.00025	2.55
+50	1500	0.00023	2.39

697.950 MHz

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	2500	0.00037	3.74
-20	2300	0.00034	3.44
-10	2300	0.00034	3.44
±0.0	2200	0.00032	3.29
+10	2200	0.00032	3.29
+20	2200	0.00032	3.29
+30	2200	0.00032	3.29
+40	2200	0.00032	3.29
+50	2300	0.00034	3.44

755.000 MHz

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-1900	-0.00025	-2.51
-20	-1800	-0.00023	-2.38
-10	-1800	-0.00023	-2.38
±0.0	-1800	-0.00023	-2.38
+10	-1700	-0.00022	-2.25
+20	-1700	-0.00022	-2.25
+30	-1800	-0.00023	-2.38
+40	-1900	-0.00025	-2.51
+50	-2000	-0.00026	-2.64

806.000 MHz

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	-1000	-0.00011	-1.15
-20	-1000	-0.00011	-1.15
-10	-900	-0.00010	-1.03
±0.0	-800	-0.00009	-0.92
+10	-800	-0.00009	-0.92
+20	-700	-0.00008	-0.80
+30	-800	-0.00009	-0.92
+40	-1000	-0.00011	-1.15
+50	-1200	-0.00014	-1.48

LIMIT

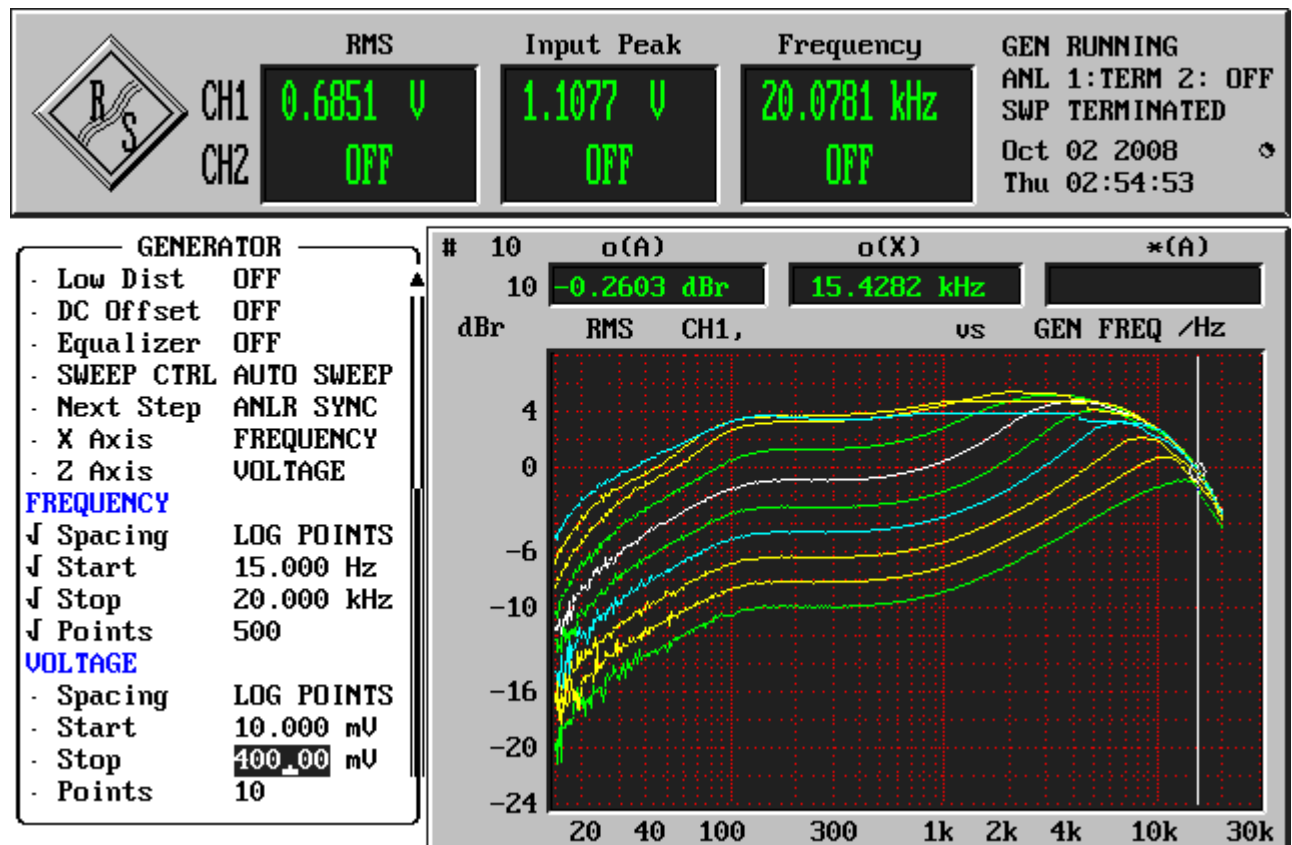
FCC Rule Part 74.861

The frequency tolerance of the transmitter shall be 0.005 percent

5.4 Characteristics of the Audio Modulation Circuitry FCC Rule Part 74 .861(e3)

Method of measurement:

The audio frequency responds was measured in accordance with EIA/TIA 603. The plots shows 10 curves with different modulation levels, starting from 10.0mV to 400 mV (30%+20 dB Modulation), the frequency is varied from 15 Hz to 20 kHz.



Max. measured frequency deviation : 47 kHz

This measurement is valid for all channels

Limit: max Deviation ±75kHz

5.5 Occupied Bandwidth FCC Rule Part 74.861(e)(3), (5)/ Sec. 2.1049

Test method:

The audio frequency responds was measured in accordance with EIA/TIA 603.

Data in the plots show that all sidebands between 50 & 100% for the authorized bandwidth are attenuated by at least 25dB. From 100 to 250% of the authorized bandwidth they are attenuated by at least 35dB and beyond 250% 43 log(Po) dB. The plot shows the transmitter modulated with 15000 Hz (the highest modulation frequency), adjusted for 50% modulation plus 16 dB. The spectrum analyzer was set with the un-modulated carrier at the top of the screen. The test procedure diagram and occupied bandwidth plots follow.

TEST CONDITIONS Frequency (MHz)		OCCUPIED BANDWIDTH (kHz)					
		516.000 MHz	608.000 MHz	626.000 MHz	697.950 MHz	755.000 MHz	806.000 MHz
$T_{nom} \text{ } ^\circ\text{C}$	$V_{nom} \text{ V}$	93.18	91.18	94.18	86.17	93.18	86.17
max. Deviation (FM)		47 kHz					
Measurement uncertainty		±0.5%					

Limits

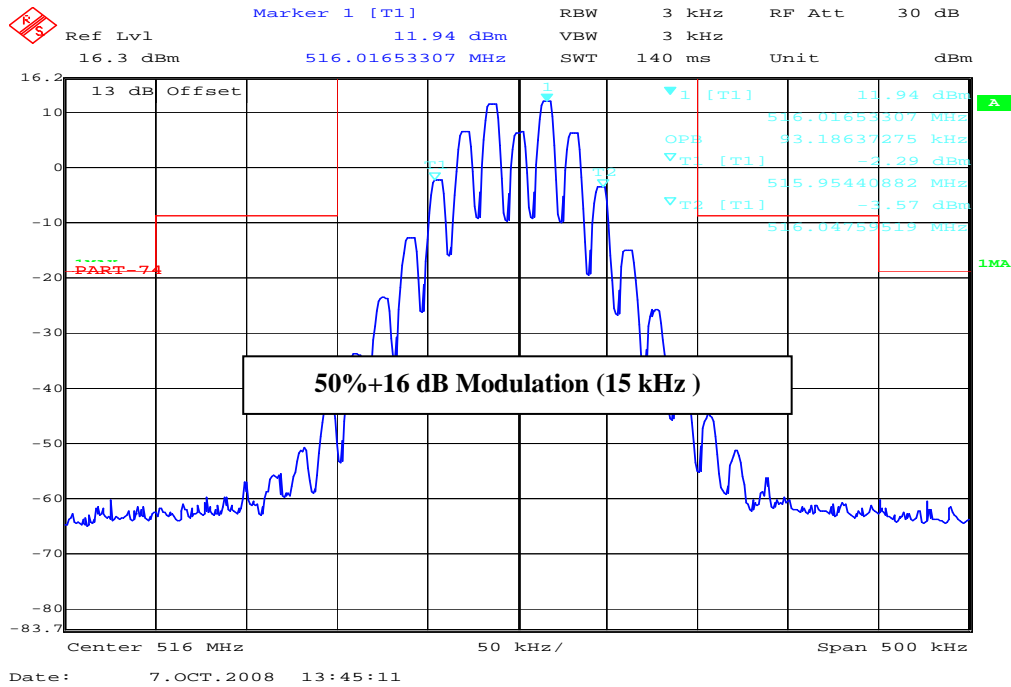
FCC Rule Part 74.861(e)(5)

The operating bandwidth shall not exceed 200 kHz

OCCUPIED BANDWIDTH

FCC Rule Part 74.861(e)(3), (5)/ Sec. 2.989

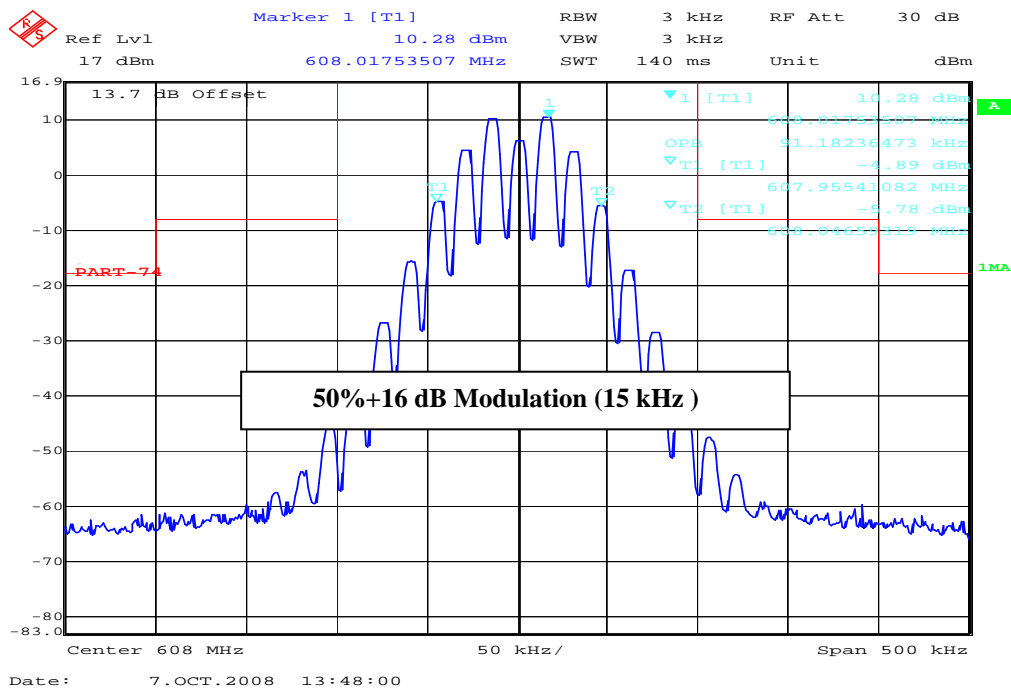
Frequency: 516.000 MHz / max. deviation: ± 47 kHz (Limit ± 75 kHz)



OCCUPIED BANDWIDTH

FCC Rule Part 74.861(e)(3), (5)/ Sec. 2.1049

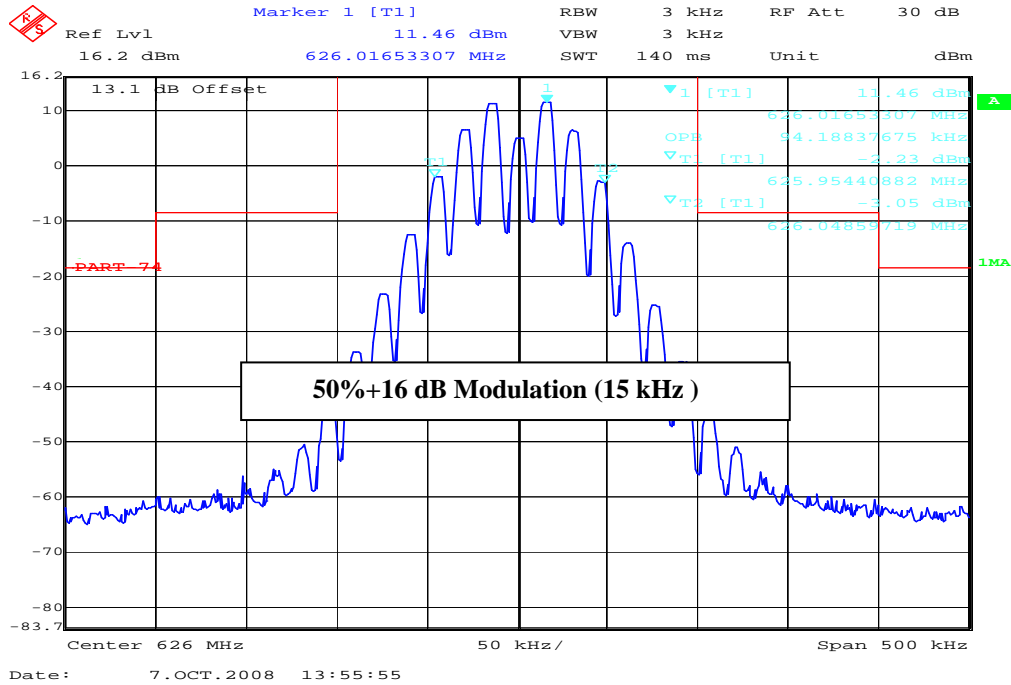
Frequency: 608.000 MHz / max. deviation : ± 47 kHz (Limit ± 75 kHz)



OCCUPIED BANDWIDTH

FCC Rule Part 74.861(e)(3), (5)/ Sec. 2.1049

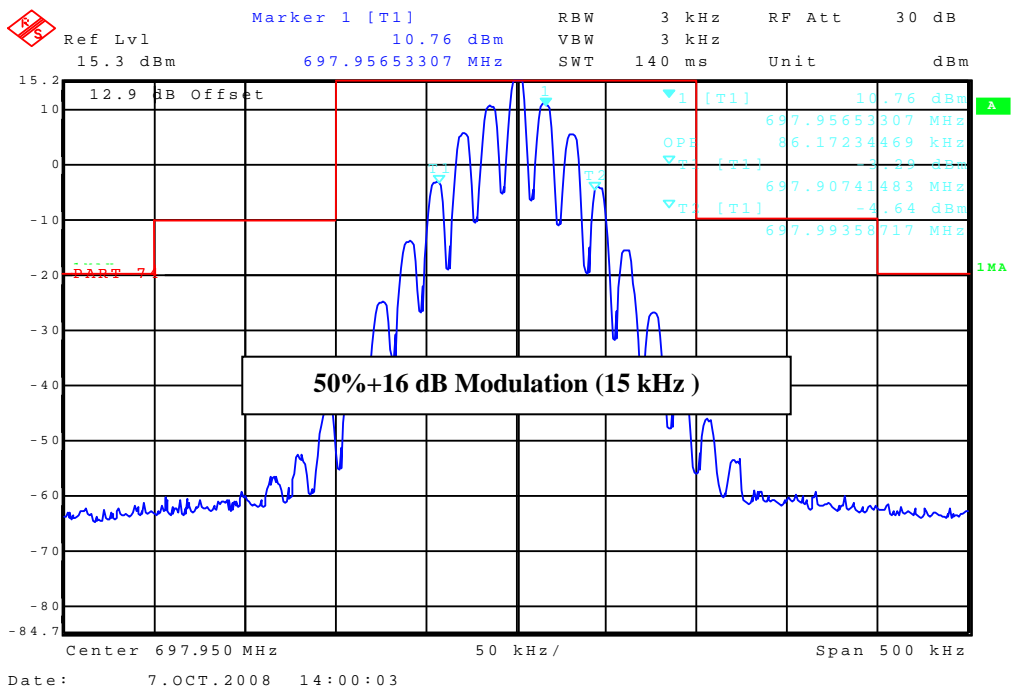
Frequency: 626.000 MHz / max. deviation : ± 47 kHz (Limit ± 75 kHz)



OCCUPIED BANDWIDTH

FCC Rule Part 74.861(e)(3), (5)/ Sec. 2.989

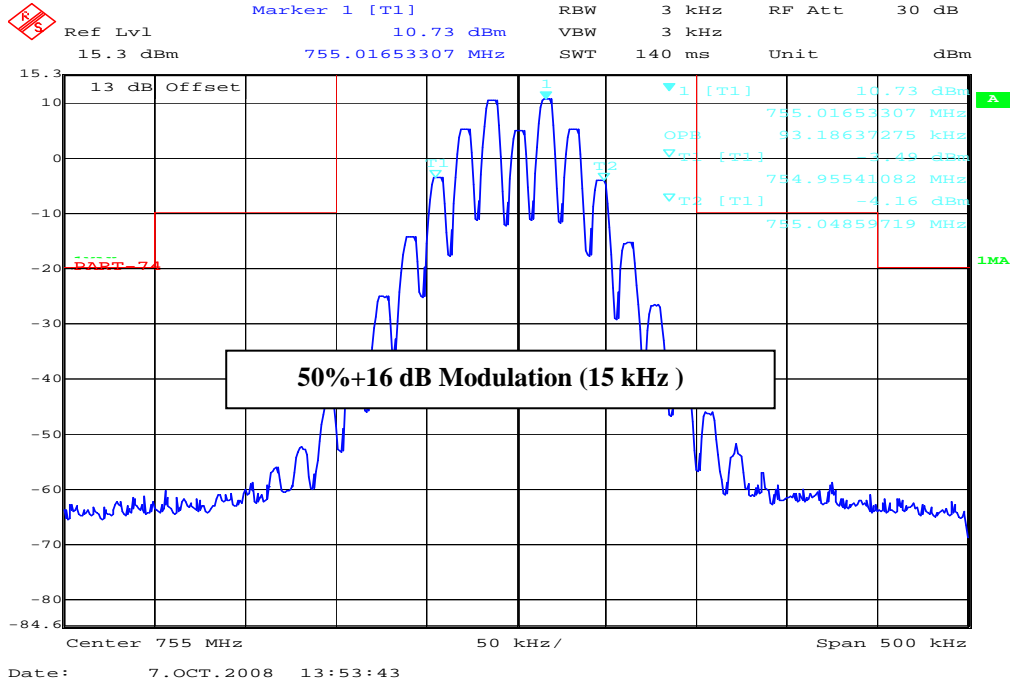
Frequency: 697.950 MHz / max. deviation : ± 47 kHz (Limit ± 75 kHz)



OCCUPIED BANDWIDTH

FCC Rule Part 74.861(e)(3), (5)/ Sec. 2.1049

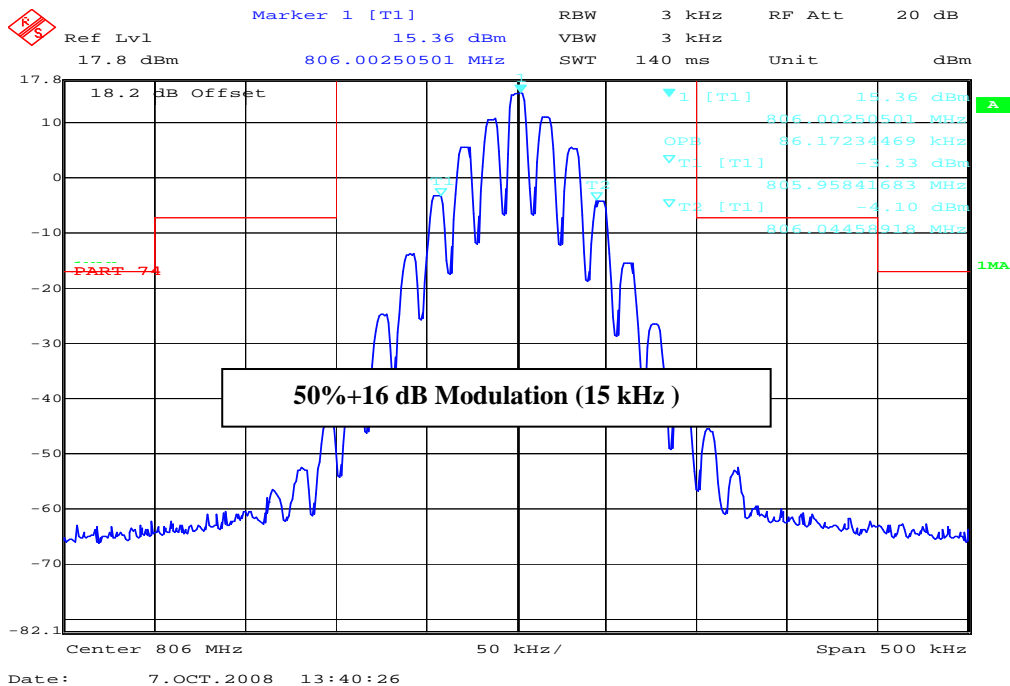
Frequency: 755.000 MHz / max. deviation : ± 47 kHz (Limit ± 75 kHz)



OCCUPIED BANDWIDTH

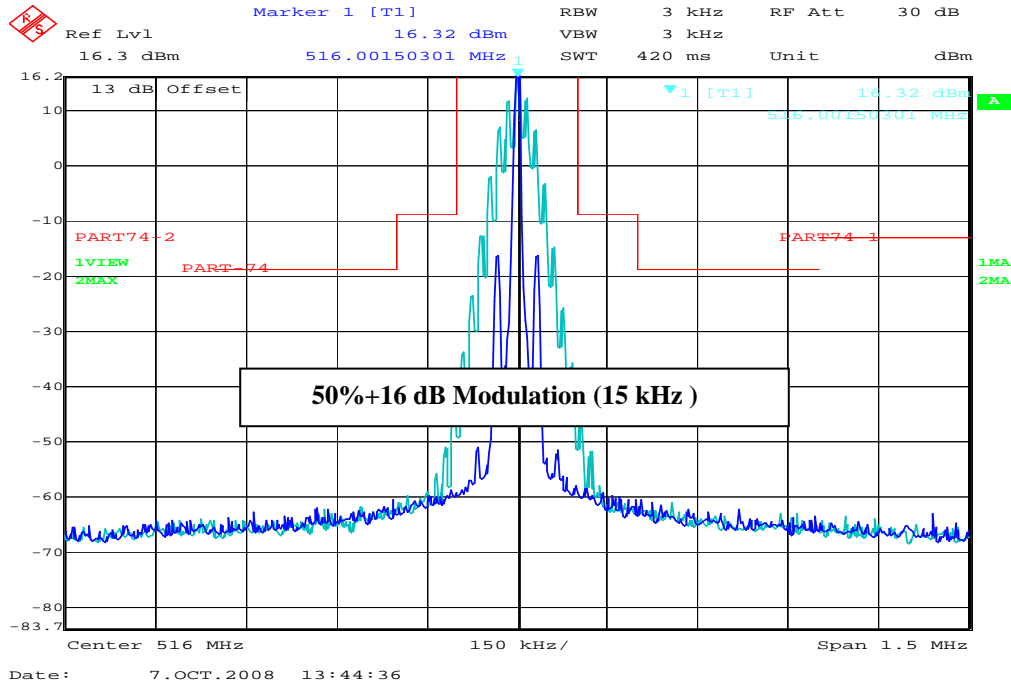
FCC Rule Part 74.861(e)(3), (5)/ Sec. 2.1049

Frequency: 806.000 MHz / max. deviation : ± 47 kHz (Limit ± 75 kHz)

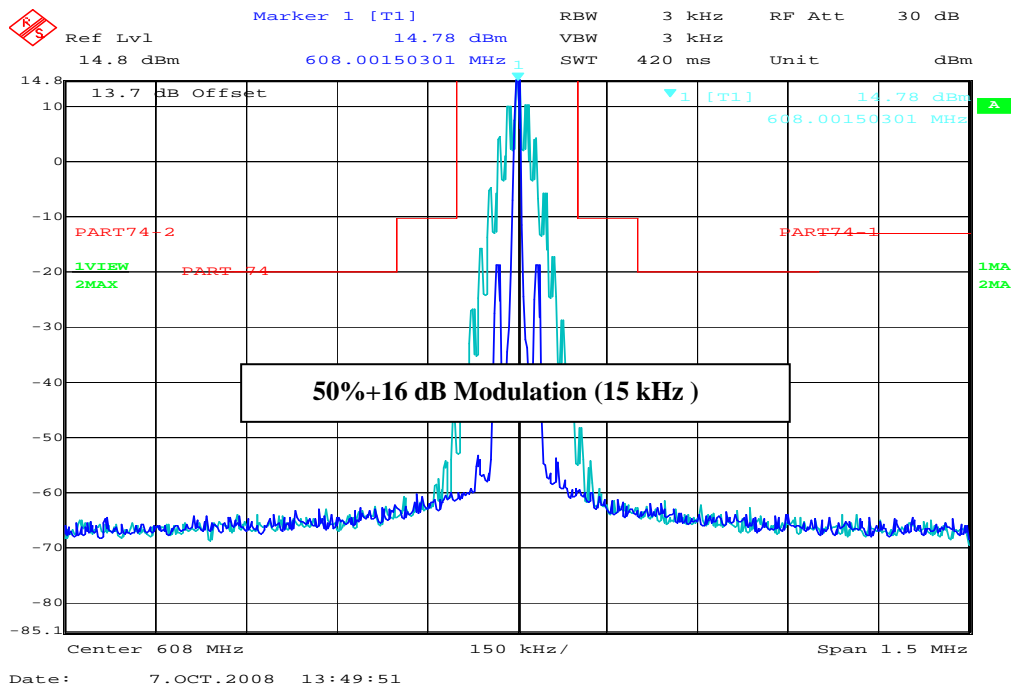


5.6 Emission mask FCC 74 861(e)(6)

Frequency: 516.000 MHz

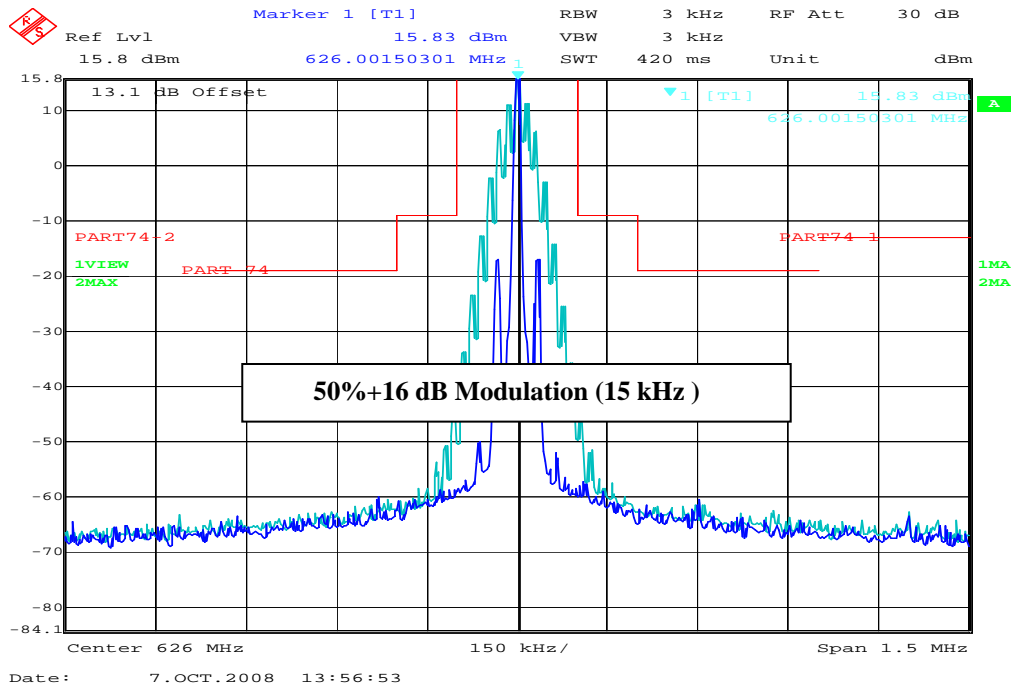


Frequency: 608.000 MHz

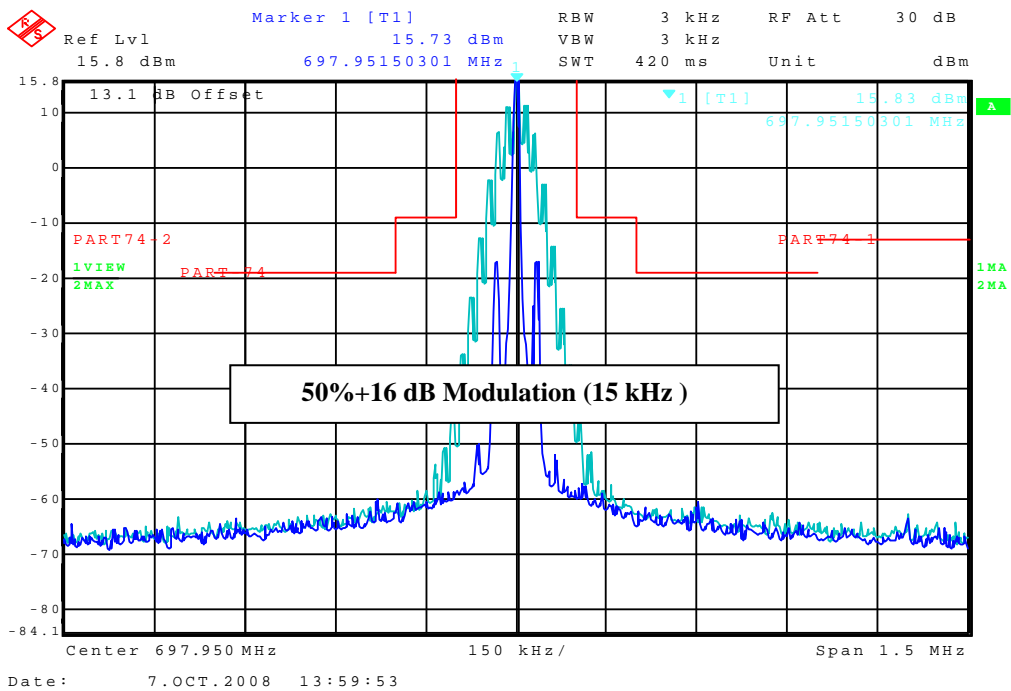


FCC 74 861(e)(6)

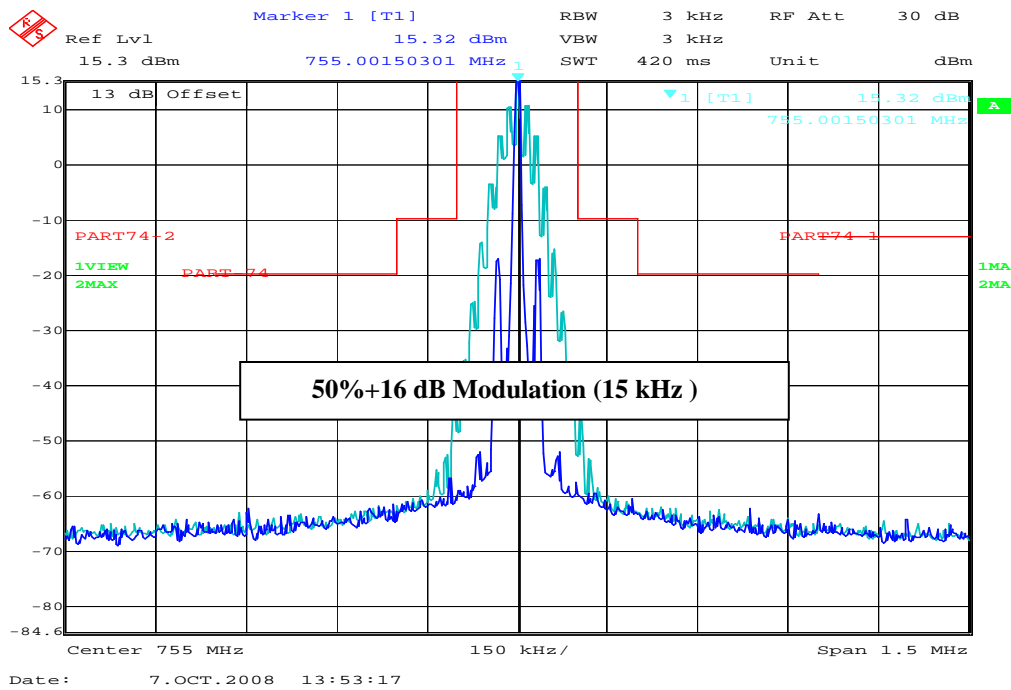
Frequency: 626.000 MHz



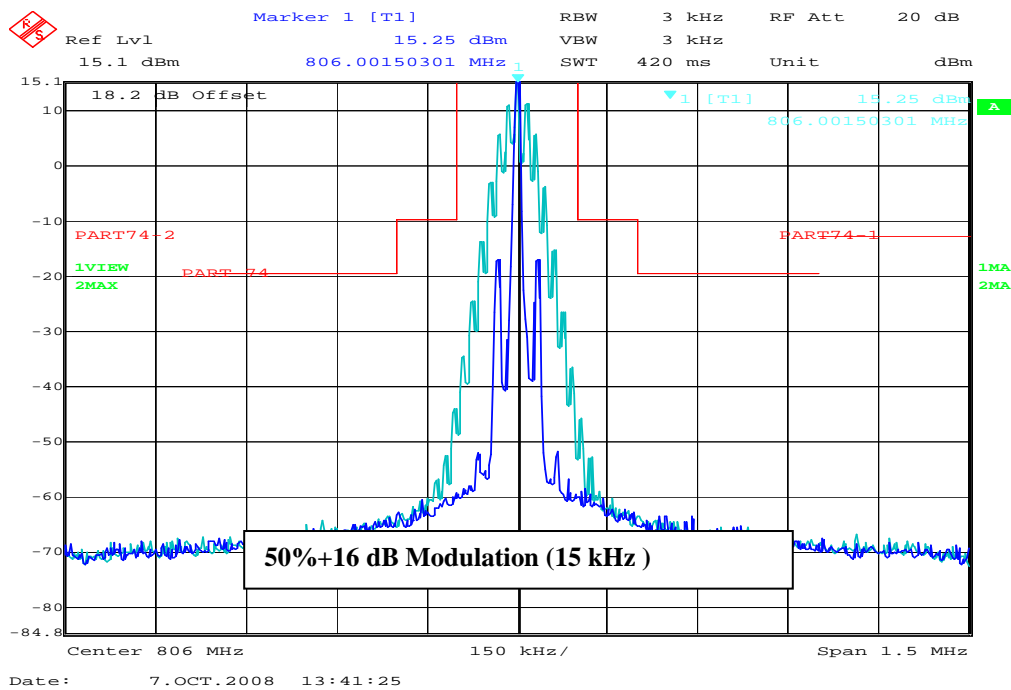
Frequency: 697.950 MHz



Frequency: 755.000 MHz



Frequency: 806.000 MHz



Limits

FCC Rule Part 74.861(e)(6)

$f \pm 100 \text{ kHz}$ to $f \pm 200 \text{ kHz}$	$f \pm 200 \text{ kHz}$ to $f \pm 500 \text{ kHz}$	$f \pm 500 \text{ kHz}$
25 dBc	35 dBc	-43 + $10 \log_{10}$ (mean output power in watts) dB below the mean output power

5.7 Radiated Emissions FCC Rule Part 74 subpart H

Test procedure

- 1). on a test site, the EUT shall be placed on a turntable and in the position closest to the normal use as declared by the user.
- 2). the test antenna shall be oriented initially for vertical polarization located 3m from the EUT to correspond to the frequency of the transmitter.
- 3). the output of the test antenna shall be connected to the measuring receiver and either a peak or quasi-peak detector was used for the measurement as indicated on the report. The detector selection is based on how close the emission level was approaching the limit.
- 4). the transmitter shall be switched on, if possible, without the modulation and the measurement receiver shall be tuned to the frequency of the transmitter under test.
- 5). the test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
- 6). the transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
- 7). the test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
- 8). the maximum signal level detected by the measuring receiver shall be noted.
- 9). the transmitter shall be replaced by a substitution antenna (tuned dipole for f less than 1GHz and horn for frequency higher than 1GHz).
- 10). the substitution antenna shall be oriented for vertical polarization and the length (if a dipole antenna is used) of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
- 11). the substitution antenna shall be connected to a calibrated signal generator.
- 12). If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
- 13). the test antenna shall be raised and lowered through the specified range of the height to ensure that the maximum signal is received.
- 14). the input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuation setting of the measuring receiver.
- 15). the input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
- 16). the measurement shall be repeated with the test antenna and the substitution antenna oriented for horizontal polarization.
- 17). the measure of the effective radiated power is the larger of the two levels recorded, at the input to the substitution antenna, corrected for the gain of the substitution antenna if necessary.
- 18). Repeat above substitution measurement procedure for fundamental and all harmonica emissions.

5.7.1 Results of the measurements

Freq	SA Reading	SG Setting	Ant. gain	Dipole gain	Cable loss	ERP Result	Limit	Margin	Pol
MHz	dBμV	dBm	dBi	dBd	dB	dBm	dBm	dBm	H/V
No critical peaks found									

All results worst case

Limits

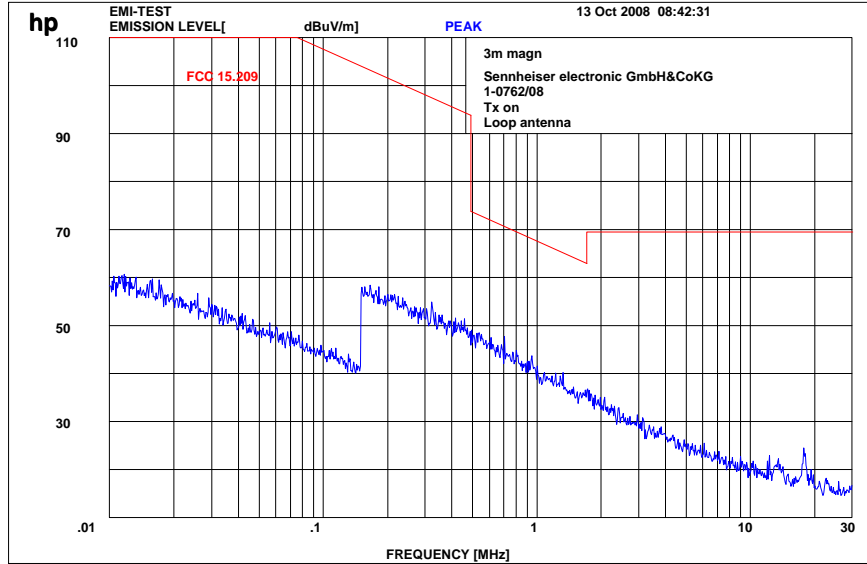
FCC Rule Part 74.861(e)(6)

f ± 100 kHz to f ± 200 kHz	f ± 200 kHz to f ± 500 kHz	f ± 500 kHz
25 dBc	35 dBc	-43 +10 log ₁₀ (mean output power in watts) dB below the mean output power

5.7.2 Plots of the measurements

RADIATED EMISSIONS
(This plot is valid for all channels)
Part 15.209 Magnetics

FCC Rule Part 74 subpart H

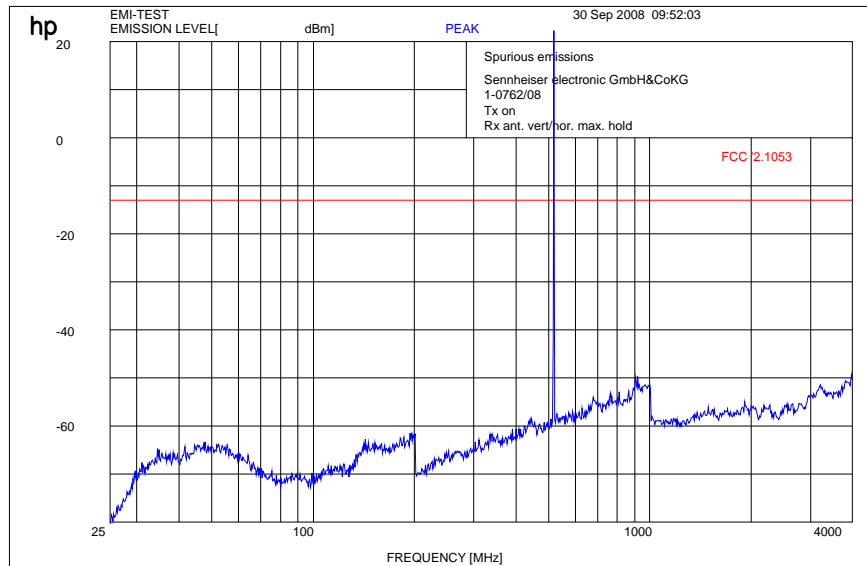


RADIATED EMISSIONS (25 MHz to 10 GHz)

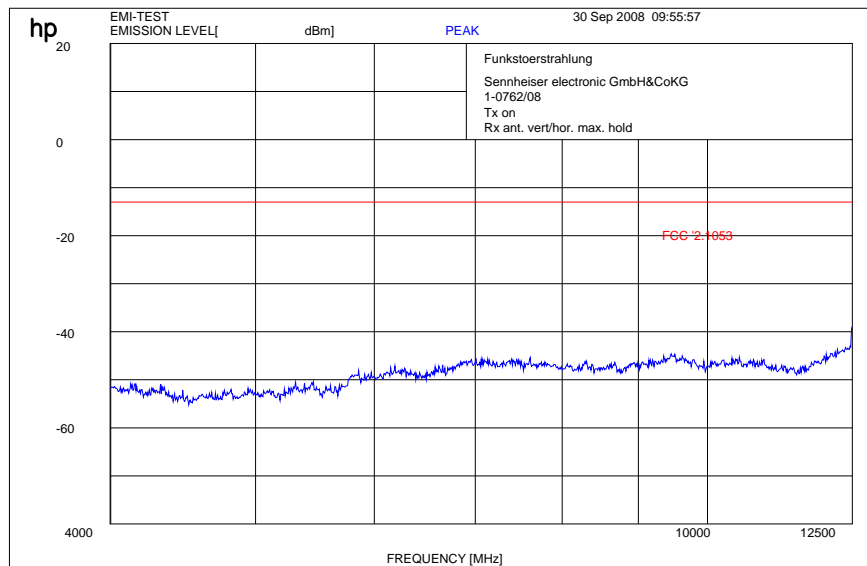
FCC Rule Part 74 subpart H

516.000 MHz

Plot 1:

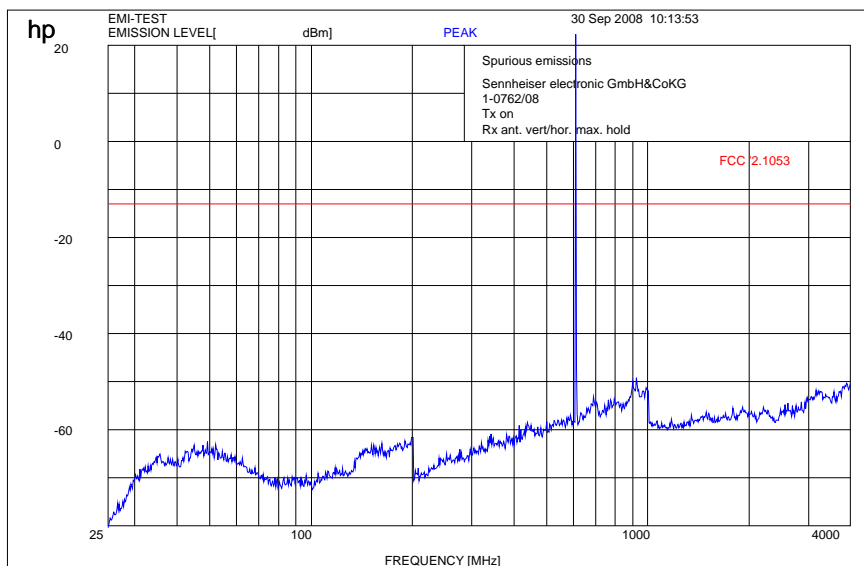


Plot 2:

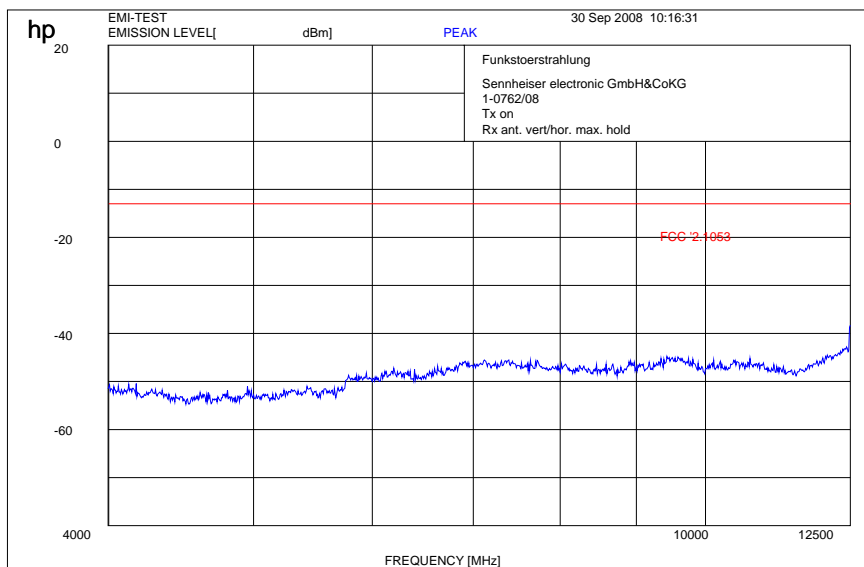


608.000 MHz

Plot 1:

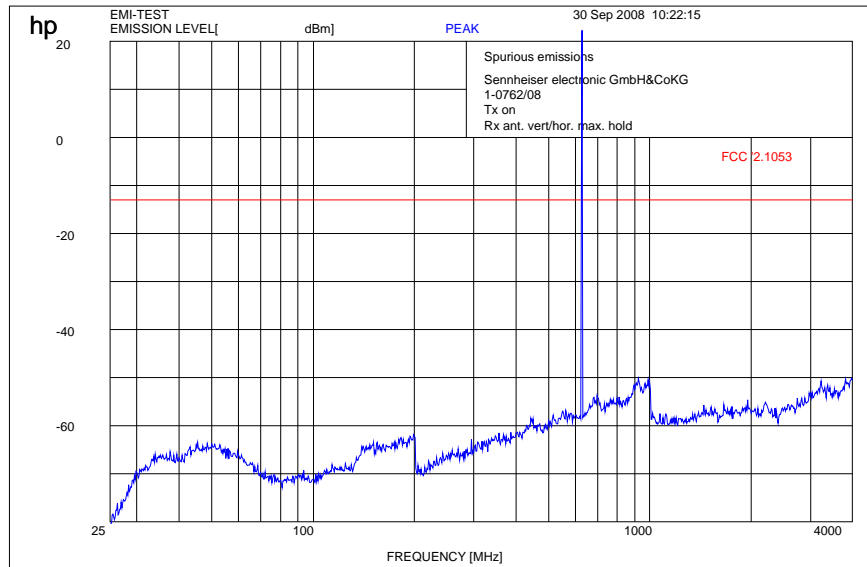


Plot 2:

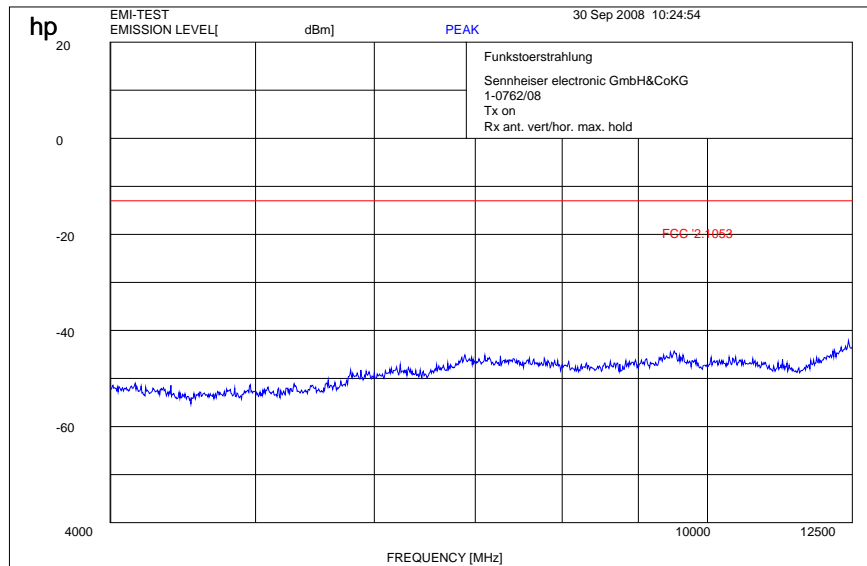


626.000 MHz

Plot 1:

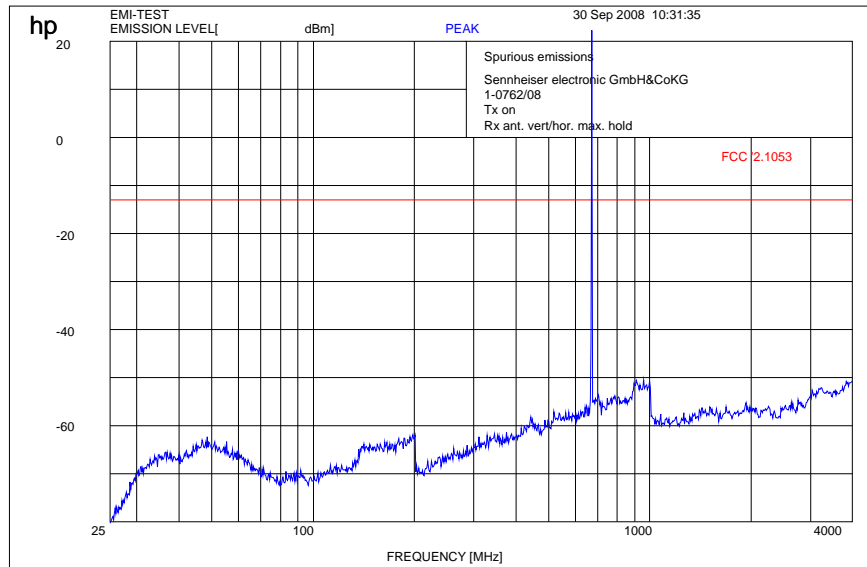


Plot 2:

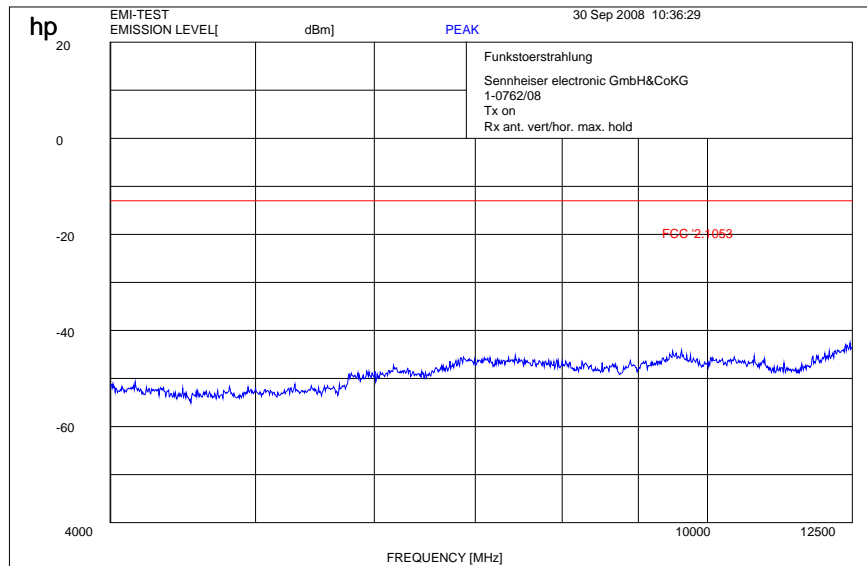


697.950 MHz

Plot 1:

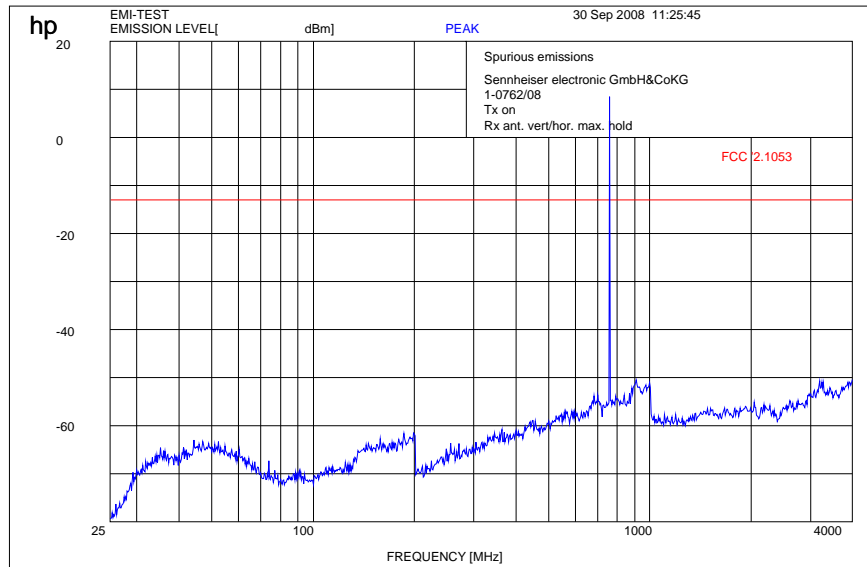


Plot 2:

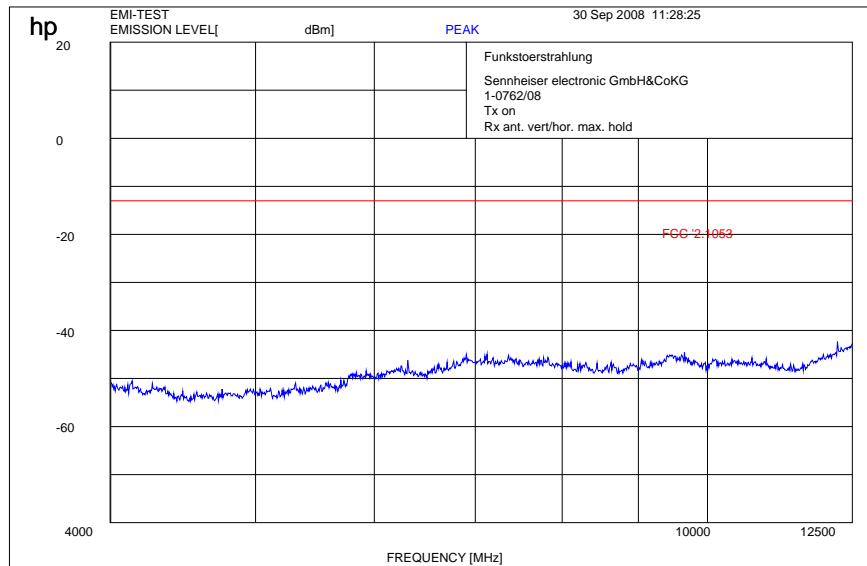


755.000 MHz

Plot 1:

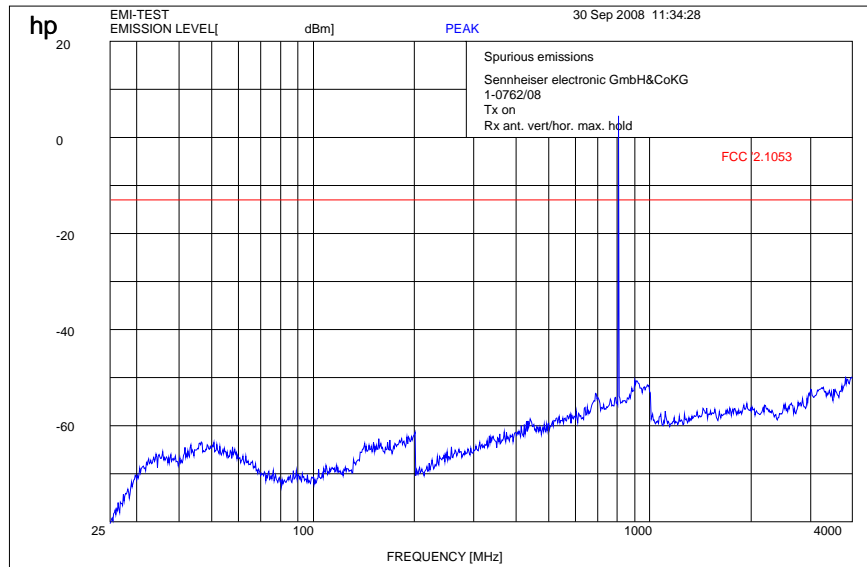


Plot 2:

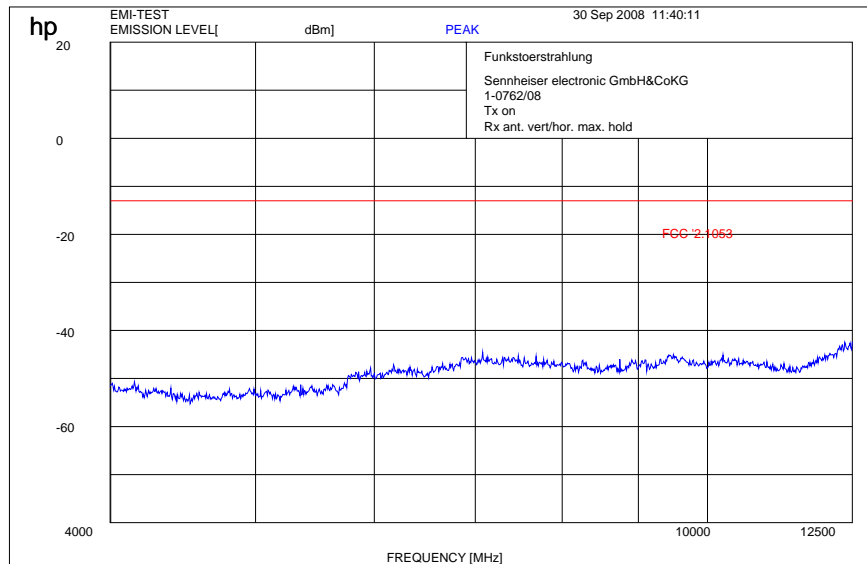


806.000 MHz

Plot 1:



Plot 2:



5.8 FCC Part 15 Subpart B

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber.

The receiving antennas are conforming to specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2001 clause 4.1.5. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test set-ups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received.

The wanted and unwanted emissions are received by spectrum analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.4-2001 clause 4.2.

Antennas are conforming to ANSI C63.2-1996 item 15.

150 kHz - 30 MHz: Quasi Peak measurement, 9 kHz Bandwidth, passive loop antenna.

30 MHz - 200 MHz: Quasi Peak measurement, 120 KHz Bandwidth, biconical antenna

200MHz - 1GHz: Quasi Peak measurement, 120 KHz Bandwidth, log periodic antenna

>1GHz: Average, RBW 1MHz, VBW 10 Hz, wave guide horn

All measurement settings are according to FCC 15.35, 15.209.

The product fulfils also the requirements for CANADA RSS-210

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

FINAL VERDICT : PASS

5.9 Spurious Radiation Radiated § 15.109

5.9.1 Results of the measurements

SPURIOUS EMISSIONS LEVEL ($\mu\text{V/m}$)								
Receiver			-/-			-/-		
f (MHz)	Detector	Level (dB $\mu\text{V/m}$)	f (MHz)	Detector	Level (dB $\mu\text{V/m}$)	f (MHz)	Detector	Level (dB $\mu\text{V/m}$)
No critical peaks found								
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

H = Horizontal; V= Vertical

Measurement distance see table

Limits: § 15.109

Frequency (MHz)	Field strength (dB $\mu\text{V/m}$)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

Plot 1:

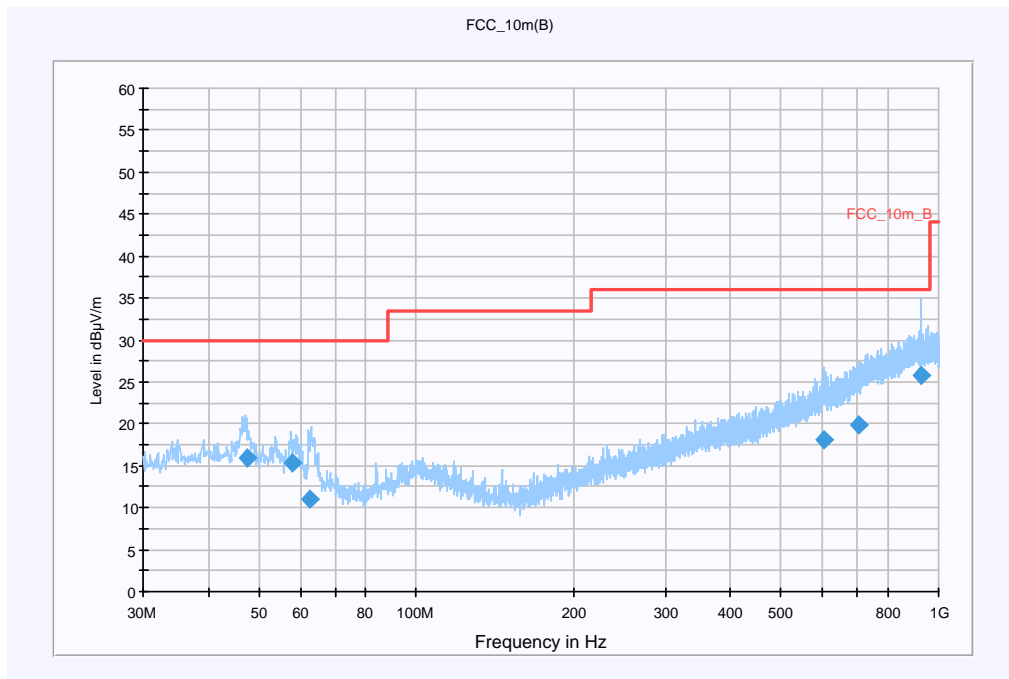
Common Information

EUT:	ew500G3 + FW7661/12
Serial Number:	2358100082 + 3108
Test Description:	FCC @ 10 m
Operating Conditions:	Rx
Operator Name:	Folz
Comment:	Powered with AC 115V/ 60 Hz

Scan Setup: FCC_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



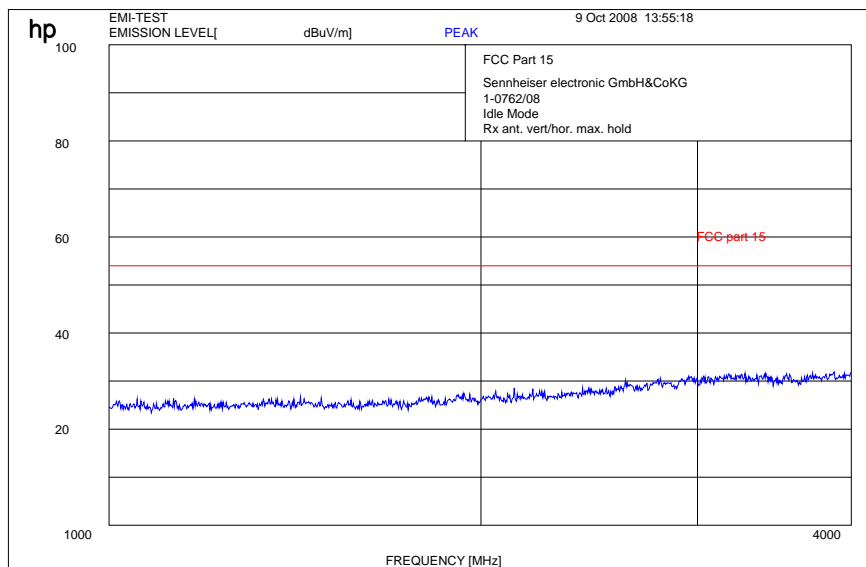
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
47.315800	16.0	15000.000	120.000	114.0	V	87.0	13.5	14.0	30.0	
57.931950	15.3	15000.000	120.000	151.0	H	-1.0	12.3	14.7	30.0	
62.418350	11.0	15000.000	120.000	361.0	V	220.0	11.2	19.0	30.0	
605.004000	18.1	15000.000	120.000	132.0	V	56.0	20.9	17.9	36.0	
700.802350	19.8	15000.000	120.000	223.0	H	94.0	22.6	16.2	36.0	
928.697650	25.8	15000.000	120.000	145.0	V	62.0	25.9	10.2	36.0	

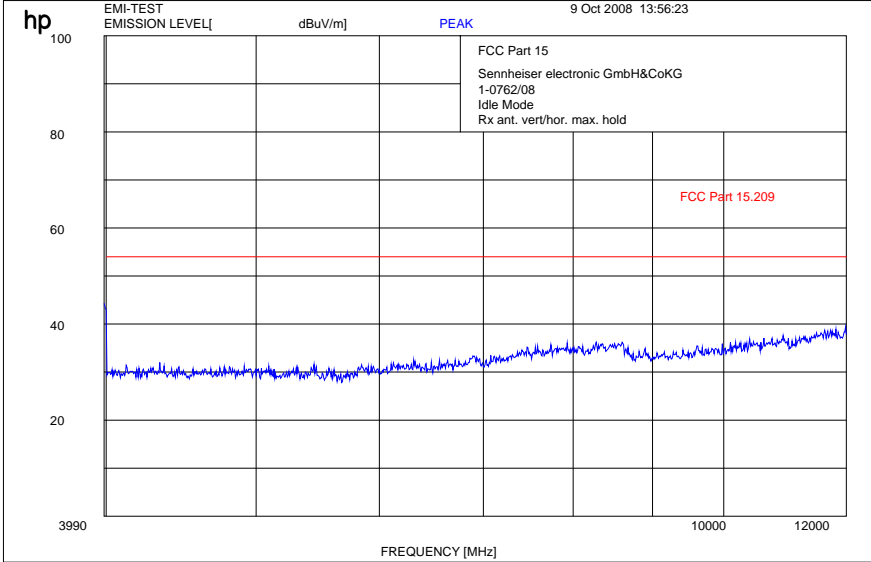
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW ---, CAL 08.04.2010 Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cabel with switch (0908)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

Plot 2:



Plot 3:



5.10 Spurious Radiation Conducted

§ 15.111

5.10.1 Results of the measurements

SPURIOUS EMISSIONS LEVEL (nW)								
Receiver			-/-			-/-		
f (MHz)	Detector	Level (nW)	f (MHz)	Detector	Level (nW)	f (MHz)	Detector	Level (nW)
See Plot below								
Measurement uncertainty			±3 dB					

RBW/VBW: 100 kHz

Measurement distance see table

Limits

SUBCLAUSE § 15.111

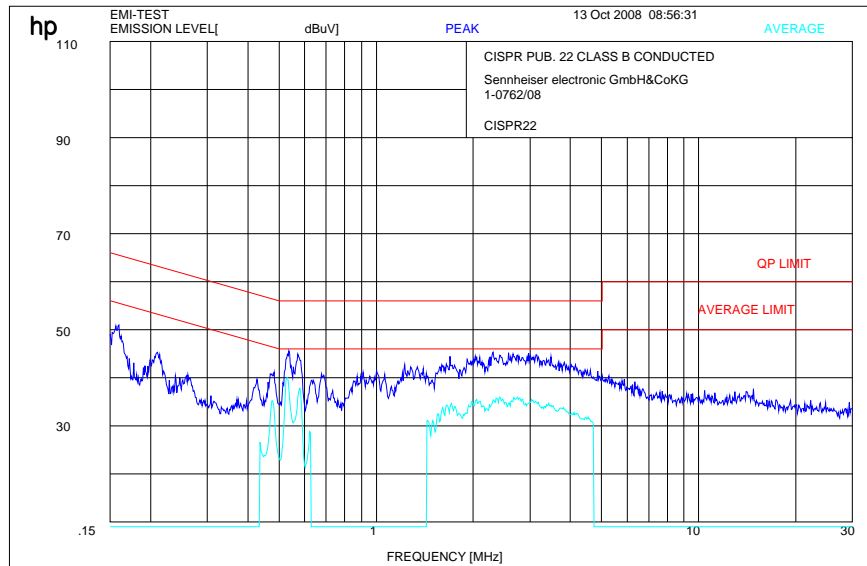
Frequency (MHz)	Power
0.009 – 5000	2 nW

5.10.2 Plots of the measurements

Conducted Receiver Spurious emission (9 kHz to 10 GHz)

Valid for all channels

Plot 1:



Limits

SUBCLAUSE § 15.111

Frequency (MHz)	Power
0.009 – 5000	2 nW

6 Test equipment and ancillaries used for tests

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

All reported calibration intervals are calibrations according to the EN/ISO/IEC 17025 standard. These calibrations were performed from an accredited external calibration laboratory.

Additional to these calibrations the laboratory performed comparison measurements with other calibrated systems and performed a weekly chamber inspection.

All used devices are connected with a 10 MHz external reference.

According to the manufacturers' instruction is it possible to establish a calibration interval for the FSP unit of 24 month, if the device has an external 10 MHz reference.

Anechoic chamber C:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Anechoic chamber	MWB	87400/02	300000996	Monthly verification		
2	System-Rack 85900	HP I.V.	*	300000222	n.a.		
3	Measurement System 1						
4	Spektrum Analyzer 8566B	HP	3138A07614	300001207	13.12.2007	24	13.12.2009
5	Spektrum Analyzer Display 85662A	HP	3144A28627	300001208	13.12.2007	24	13.12.2009
6	Quasi-Peak-Adapter 85650A	HP	2811A01204	300002308	13.12.2007	24	13.12.2009
7	RF-Preselector 85685A	HP	2837A00778	300002448	13.12.2007	24	13.12.2009
8	PC Vectra VL	HP		300001688	n.a.		
9	Software EMI	HP		300000983	n.a.		
10	Measurement System 2						
11	FSP 30	R&S	100886	300003575	25.08.2008	24	25.08.2010
12	PC	F+W			n.a.		
13	TILE	TILE			n.a.		
14	Biconical antenna	EMCO	S/N: 860 942/003		Monthly verification (System cal.)		
15	Log. Period. Antenna 3146	EMCO	2130	300001603	Monthly verification (System cal.)		
16	Double Ridged Antenna HP 3115P	EMCO	3088	300001032	Monthly verification (System cal.)		
17	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
18	Power Supply 6032A	HP	2818A03450	300001040	12.05.2007	36	12.05.2010
19	Busisolator	Kontron		300001056	n.a.		
20	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
21	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
22	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
23	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		

Climatic Box:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Climatic box VT 4002	Heraeus Vötsch	58566046820010	300003019	11.05.2007	24	11.05.2009
2	Climatic box CTS T-40/50	CTS	064023	300003540	03.01.2007	24	03.01.2009

SRD Laboratory Room 002:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	System Controller PSM 12	R&S	835259/007	3000002681-00xx	n.a.		
2	Memory Extension PSM-K10	R&S	To 1	3000002681	n.a.		
3	Operating Software PSM-B2	R&S	To 1	3000002681	n.a.		
4	19" Monitor		22759020-ED	3000002681	n.a.		
5	Mouse		LZE 0095/6639	3000002681	n.a.		
6	Keyboard		G00013834L461	3000002681	n.a.		
7	Spectrum Analyser FSIQ 26	R&S	835540/018	3000002681-0005	10.01.2008	24	10.01.2010
8	Tracking Generator FSIQ-B10	R&S	835107/015	3000002681	s.No.7		
10	RF-Generator SMIQ03 (B1 Signal)	R&S	835541/056	3000002681-0002	26.08.2008	36	26.08.2011
11	Modulation Coder SMIQ-B20	R&S	To 10	3000002681	s.No.10		
12	Data Generator SMIQ-B11	R&S	To 10	3000002681	s.No.10		
13	RF Rear Connection SMIQ-B19	R&S	To 10	3000002681	s.No.10		
14	Fast CPU SM-B50	R&S	To 10	3000002681	s.No.10		
15	FM Modulator SM-B5	R&S	835676/033	3000002681	s.No.10		
16	RF-Generator SMIQ03 (B2 Signal)	R&S	835541/055	3000002681-0001	25.08.2008	36	25.08.2011
17	Modulation Coder SMIQ-B20	R&S	To 16	3000002681	s.No.16		
18	Data Generator SMIQ-B11	R&S	To 16	3000002681	s.No.16		
19	RF Rear Connection SMIQ-B19	R&S	To 16	3000002681	s.No.16		
20	Fast CPU SM-B50	R&S	To 16	3000002681	s.No.16		
21	FM Modulator SM-B5	R&S	836061/022	3000002681	s.No.16		
22	RF-Generator SMP03 (B3 Signal)	R&S	835133/011	3000002681-0003	26.08.2008	36	26.08.2011
23	Attenuator SMP-B15	R&S	835136/014	3000002681	S.No.22		
24	RF Rear Connection SMP-B19	R&S	834745/007	3000002681	S.No.22		
25	Power Meter NRVD	R&S	835430/044	3000002681-0004	26.08.2008	24	26.08.2010
26	Power Sensor NRVD-Z1	R&S	833894/012	3000002681-0013	26.08.2008	24	26.08.2010
27	Power Sensor NRVD-Z1	R&S	833894/011	3000002681-0010	26.08.2008	24	26.08.2010
28	Rubidium Standard RUB	R&S		3000002681-0009	27.08.2008	24	27.08.2010
29	Switching and Signal Conditioning Unit SSCU	R&S	338864/003	3000002681-0006	01.08.2006	24	01.08.2008
30	Laser Printer HP Deskjet 2100	HP	N/A	3000002681-0011	n.a.		
31	19" Rack	R&S	11138363000004	3000002681	n.a.		
32	RF-cable set	R&S	N/A	3000002681	n.a.		
33	IEEE-cables	R&S	N/A	3000002681	n.a.		
34	Sampling System FSIQ-B70	R&S	835355/009	3000002681	s.No.7		
35	RSP programmable attenuator	R&S	834500/010	3000002681-0007	26.08.2008	24	26.08.2010
36	Signalling Unit	R&S	838312/011	3000002681	n.a.		
37	NGPE programmable Power Supply for EUT	R&S	192.033.41	3000002681			
39	Power Splitter 6005-3	Inmet Corp.	none	300002841	23.12.2006	24	23.12.2008
40	SMA Cables SPS-1151-985-SPS	Insulated Wire	different	different	n.a.		
41	CBT32 with EDR Signaling Unit	R&S					
42	Coupling unit	Narda	N/A	--	n.a.		
43	2xSwitch Matrix PSU	R&S	872584/021	300001329	n.a.		
44	RF-cable set	R&S	N/A	different	n.a.		
45	IEEE-cables	R&S	N/A	--	n.a.		

Note: 3000002681-00xx inventoried as a system

Anechoic chamber F:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Control Computer	F+W	FW0502032	300003303	-/-	-/-	-/-
2	Trilog Antenna	9163-295	-/-	-/-	30.04.2008	24	30.04.2010
3	Amplifier - 0518C-138	Veritech Micro- wave Inc.	-/-	-/-	-/-	-/-	-/-
4	Switch - 3488A	HP		300000368	-/-	-/-	-/-
5	EMI Test receiver - ESCI	R&S	100083	300003312	31.01.2007	24	31.01.2009
6	Turntable Controller - 1061 3M	EMCO	1218	300000661	-/-	-/-	-/-
7	Tower Controller 1051 Controller	EMCO	1262	300000625	-/-	-/-	-/-
8	Tower - 1051	EMCO	1262	300000625	-/-	-/-	-/-
10	Ultra Notch-Filter Rejected band Ch. 62	WRCD	9	-/-	-/-	-/-	-/-

7 Photographs of the Test Set-up

Photo documentation

Photo 1:



Photo 2:

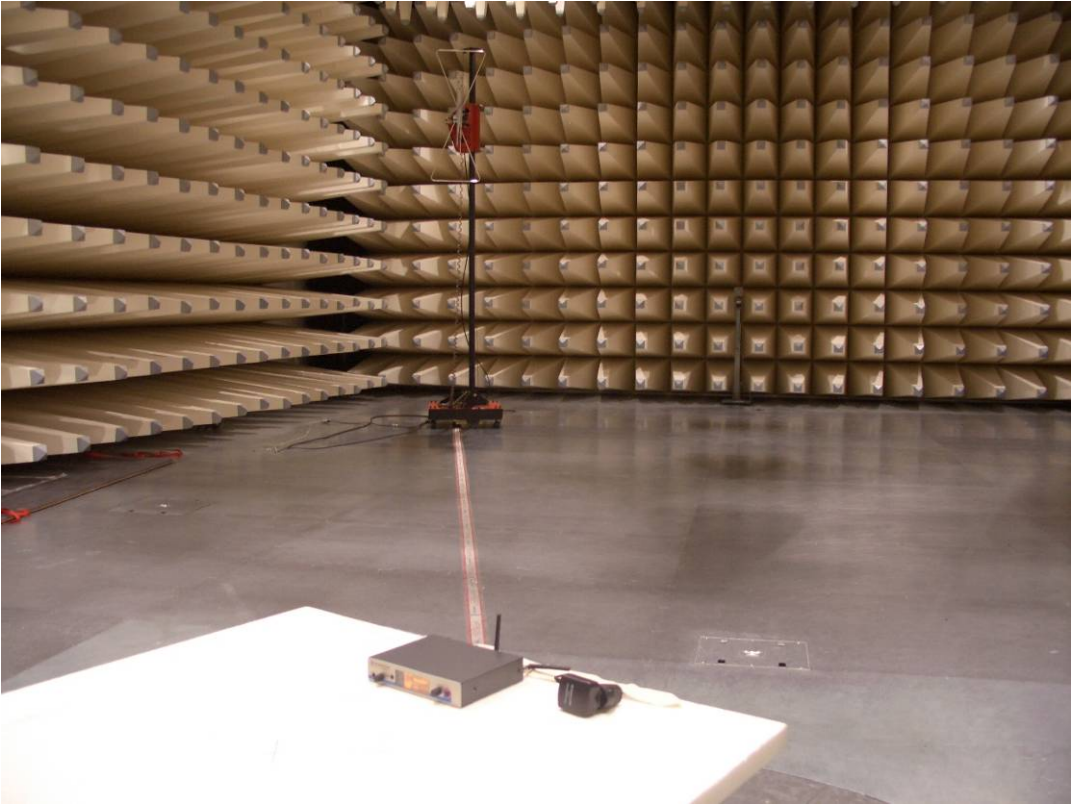


Photo 3:



8 Photographs of the EUT

Photo documentation

Photo 4:



Photo 5:



Photo 6:



Photo 7:



Photo 8:

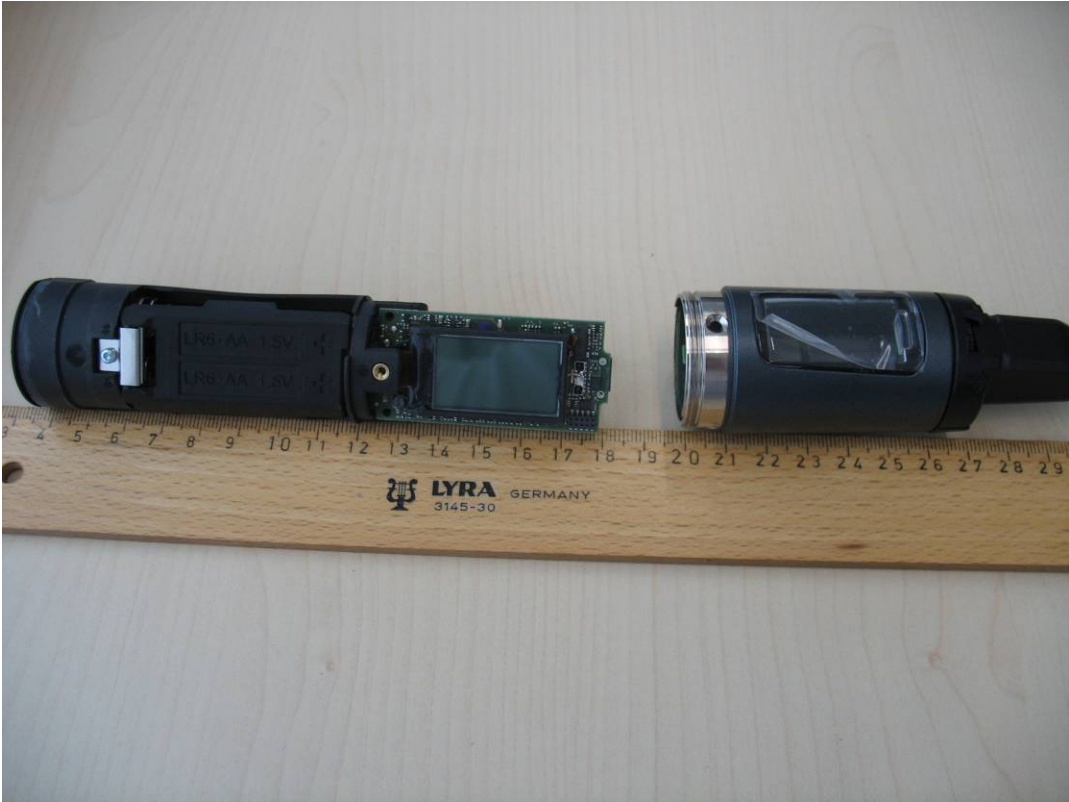


Photo 9:



Photo 10:



Photo 11:



Photo 12:



Photo 13:

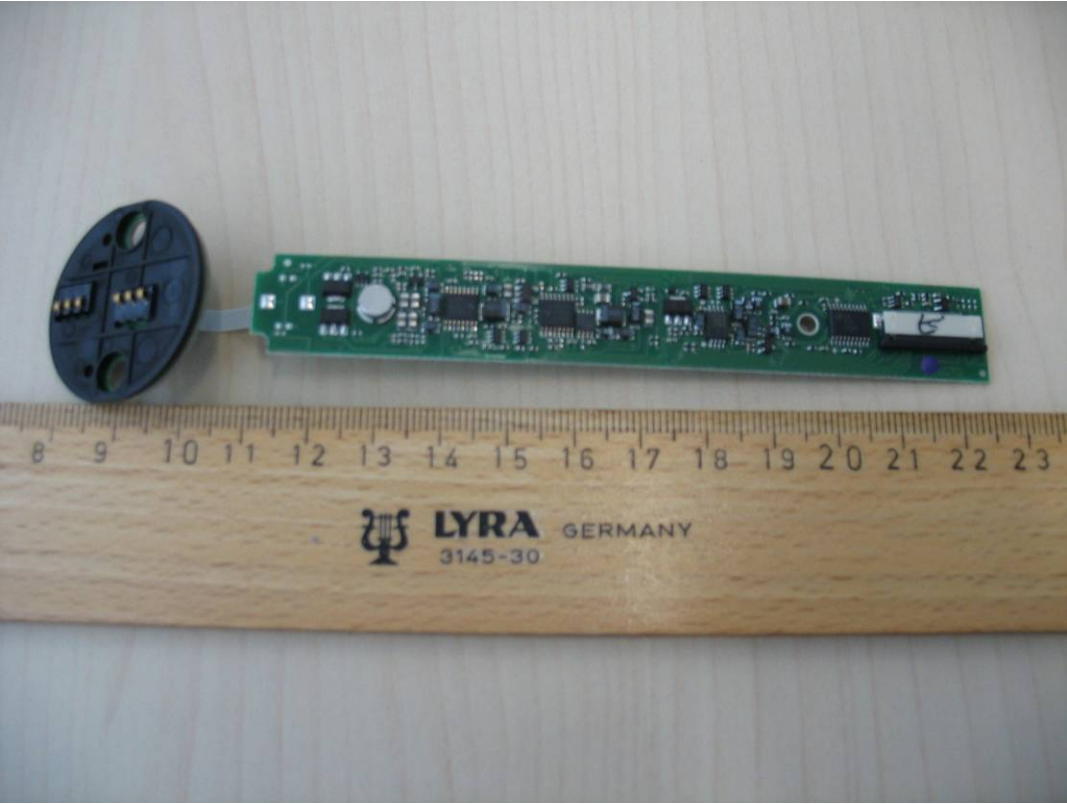


Photo 14:



Photo 15:



Photo 16:



Photo 17:



Photo 18:



Photo 19:



Photo 20:



Photo 21:



Photo 22:



Photo 23:



Photo 24:



Photo 25:

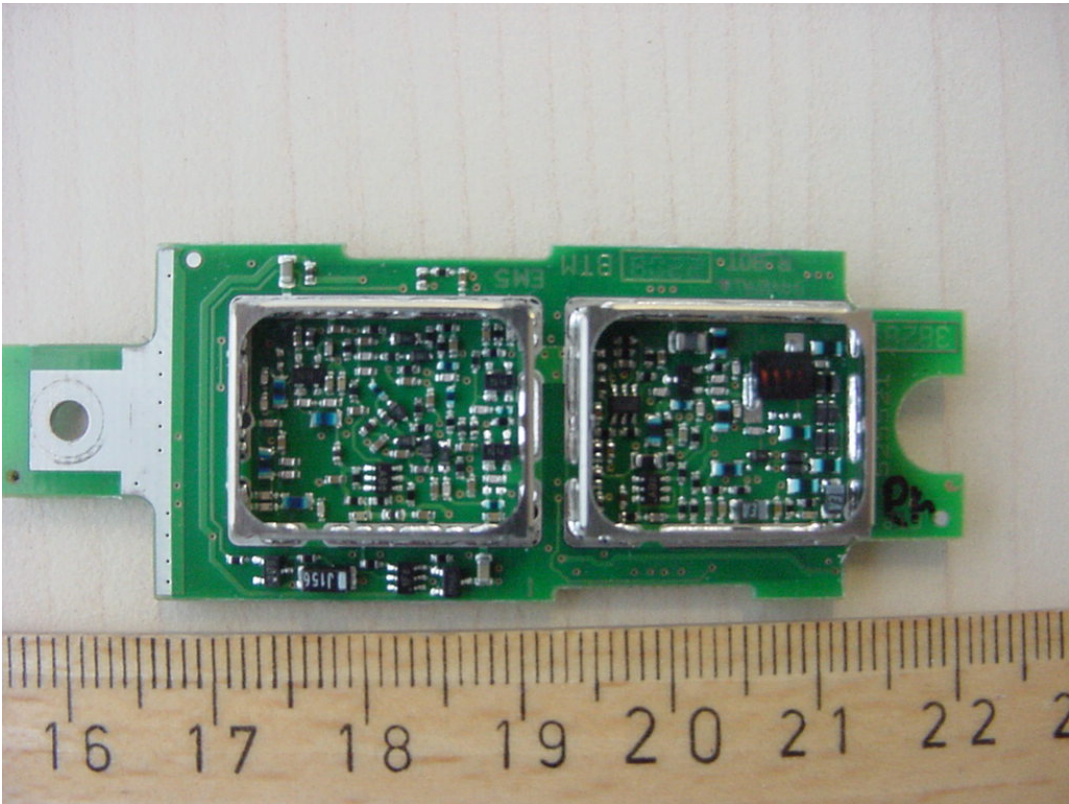


Photo 26:

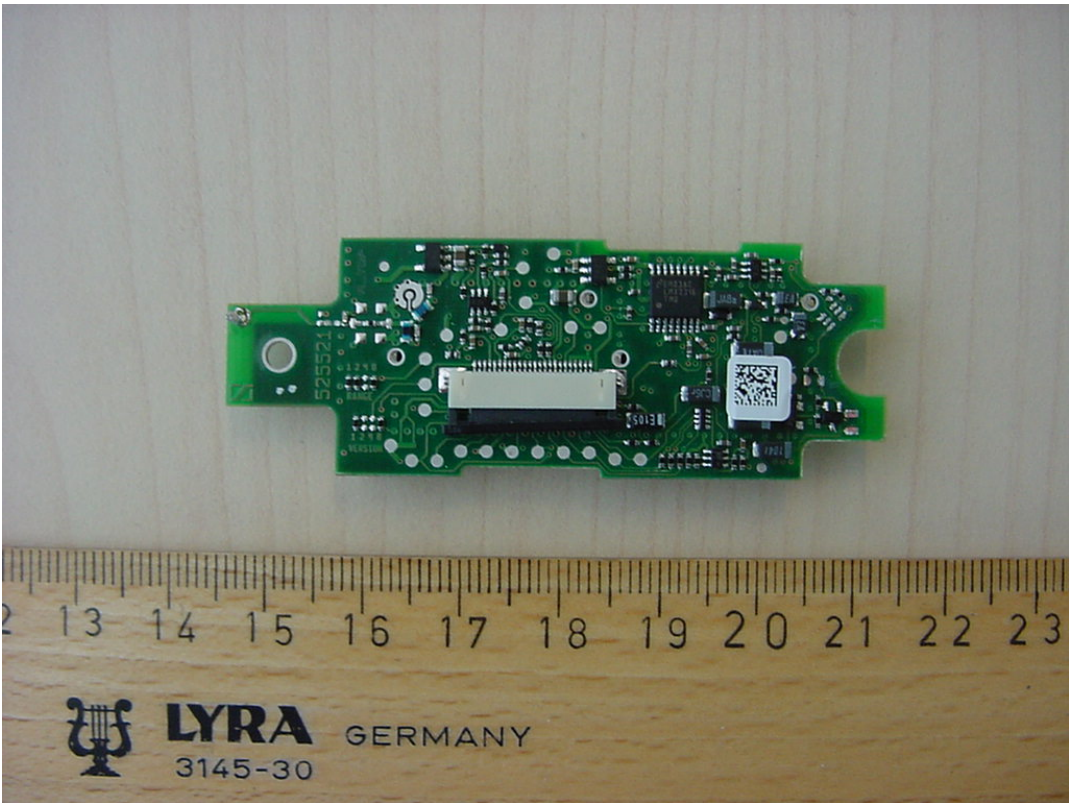


Photo 27:

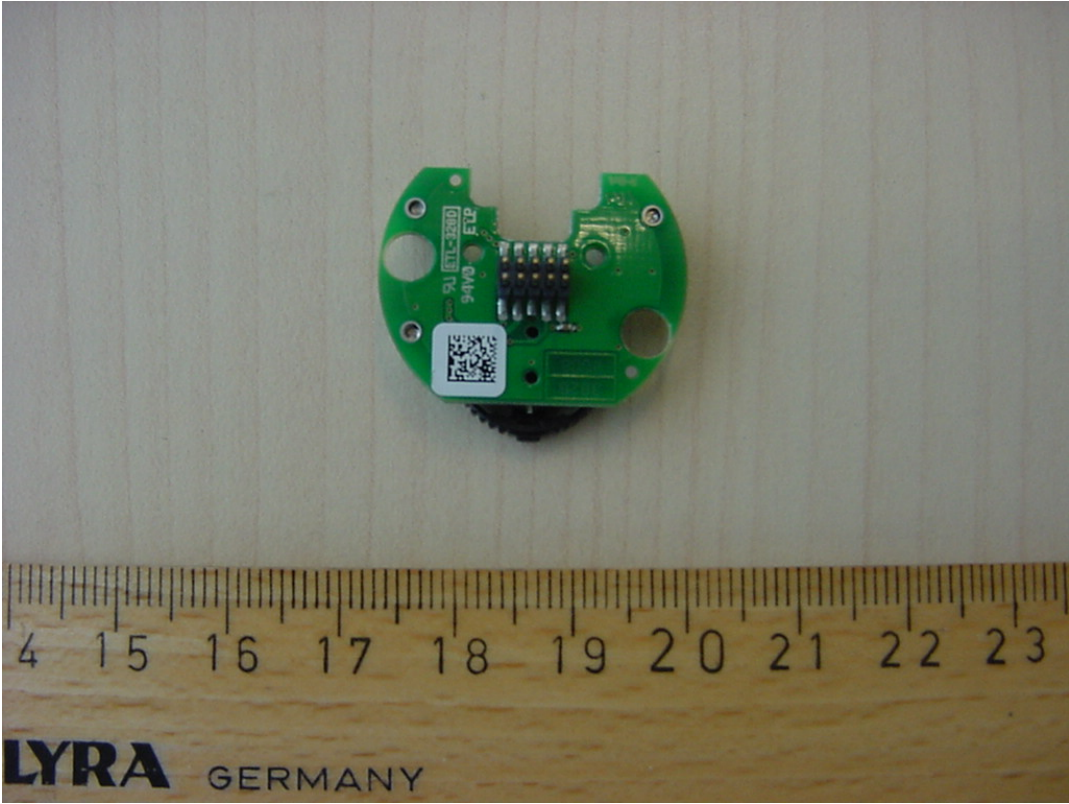


Photo 28:



Photo 29:

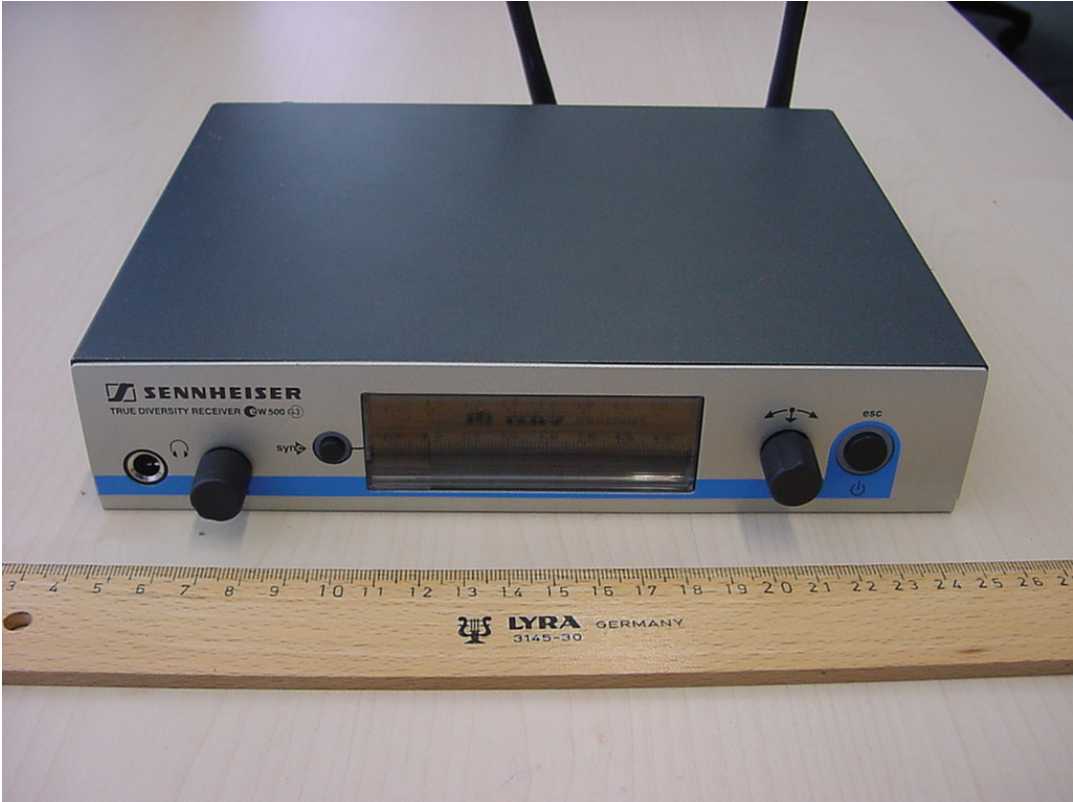


Photo 30:



Photo 31:



Photo 32:



Photo 33:



Photo 34:



Photo 35:

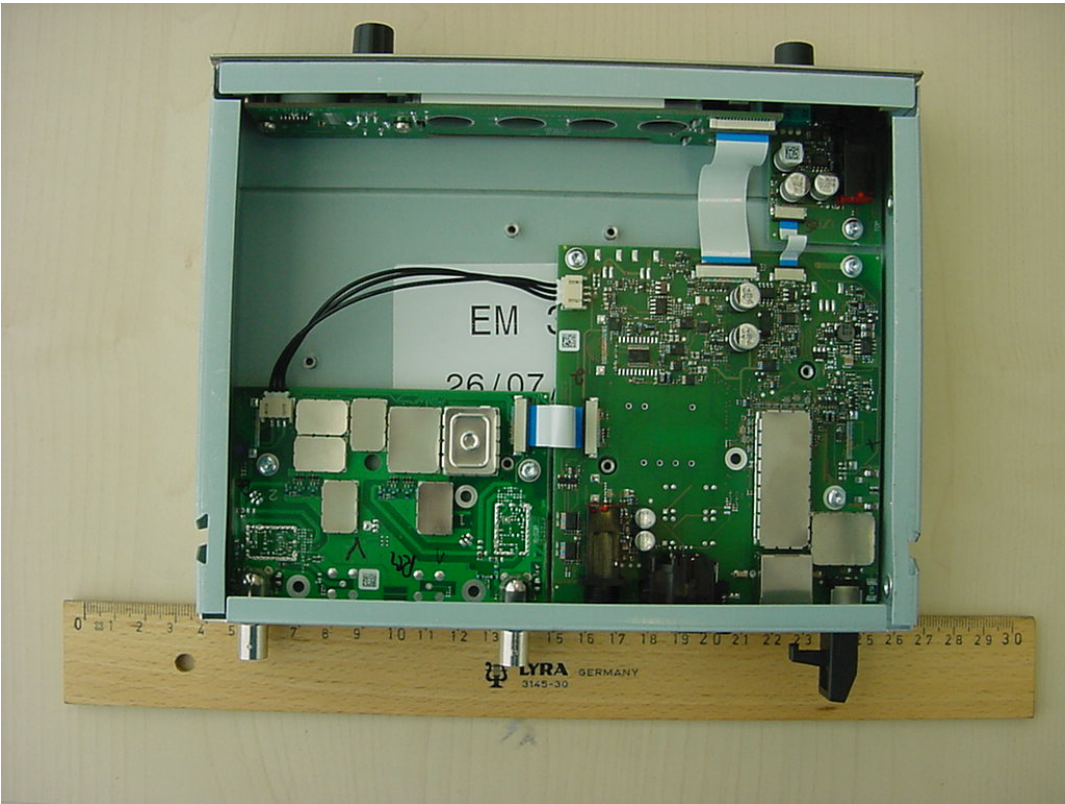


Photo 36:

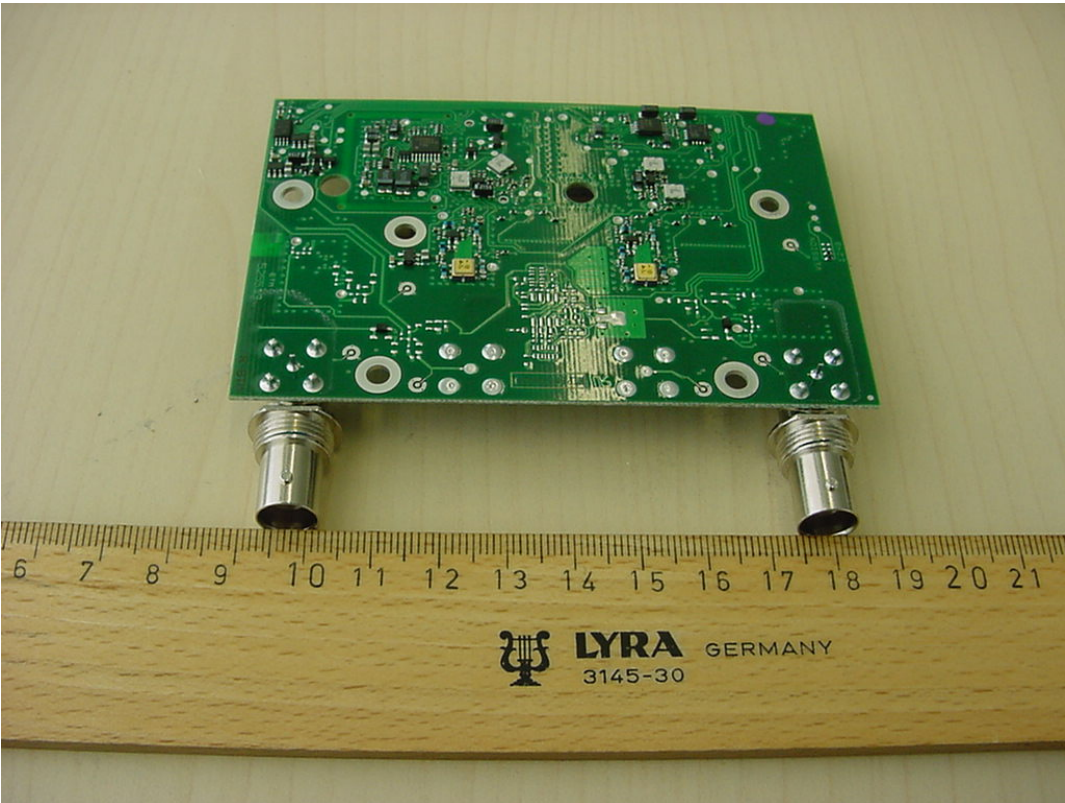


Photo 37:

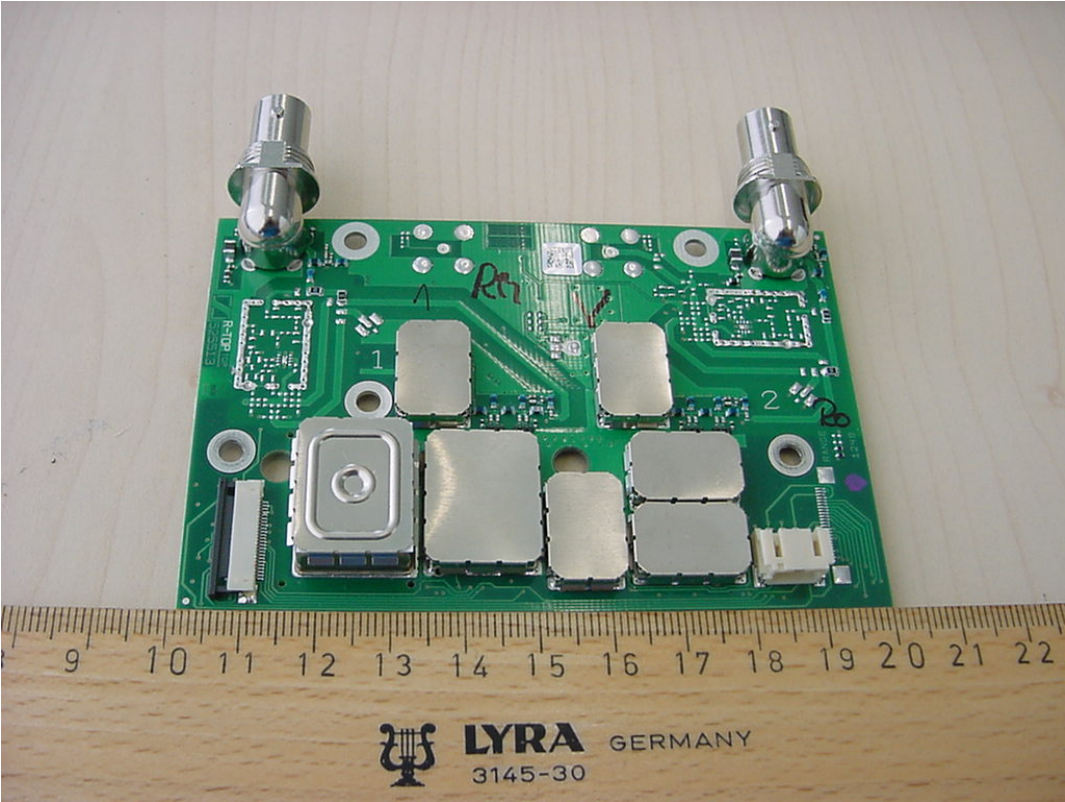


Photo 38:

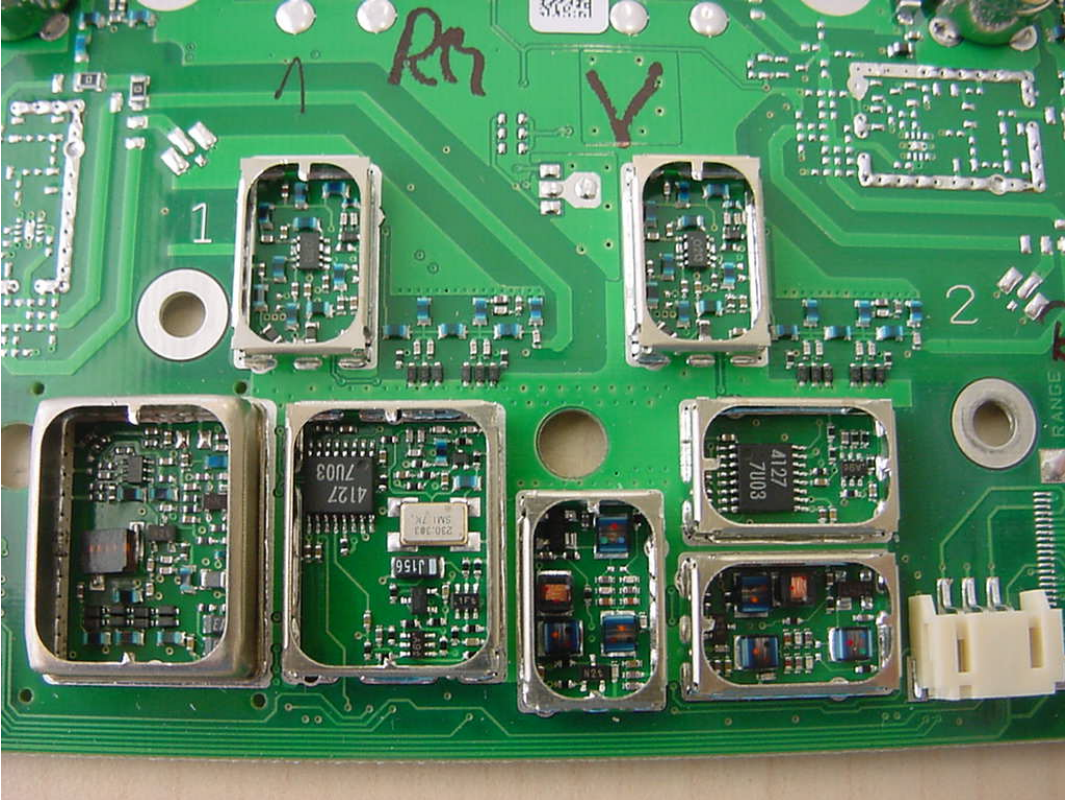


Photo 39:

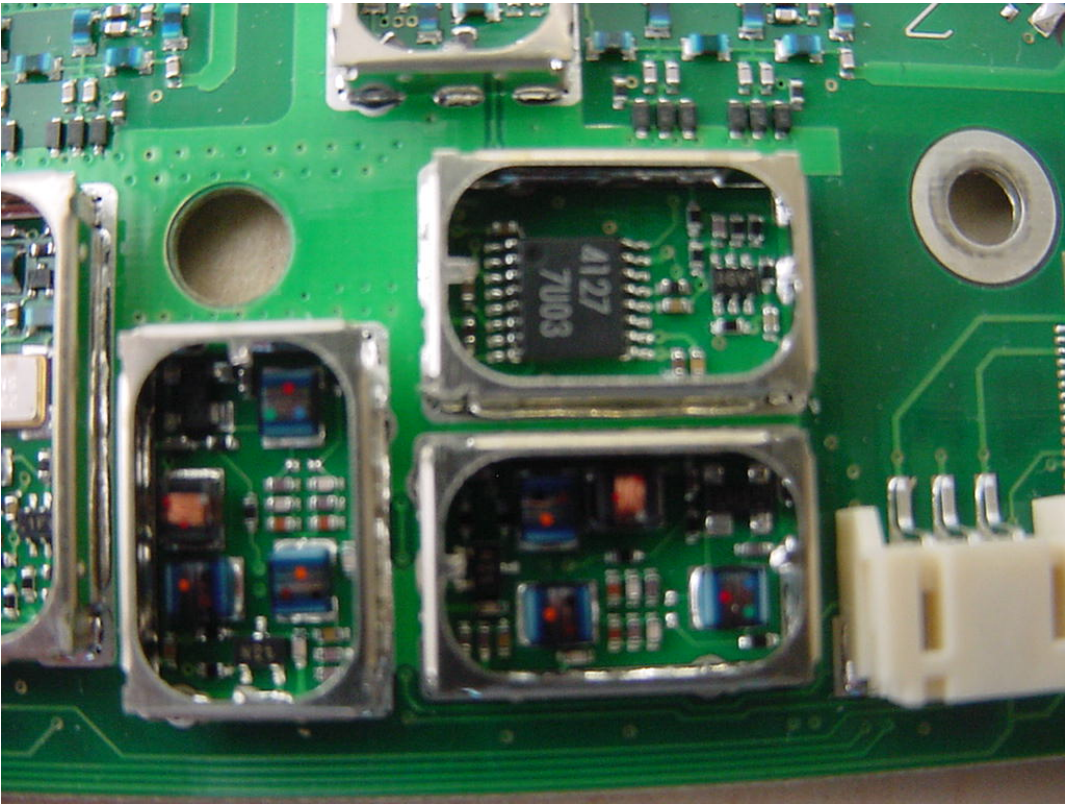


Photo 40:

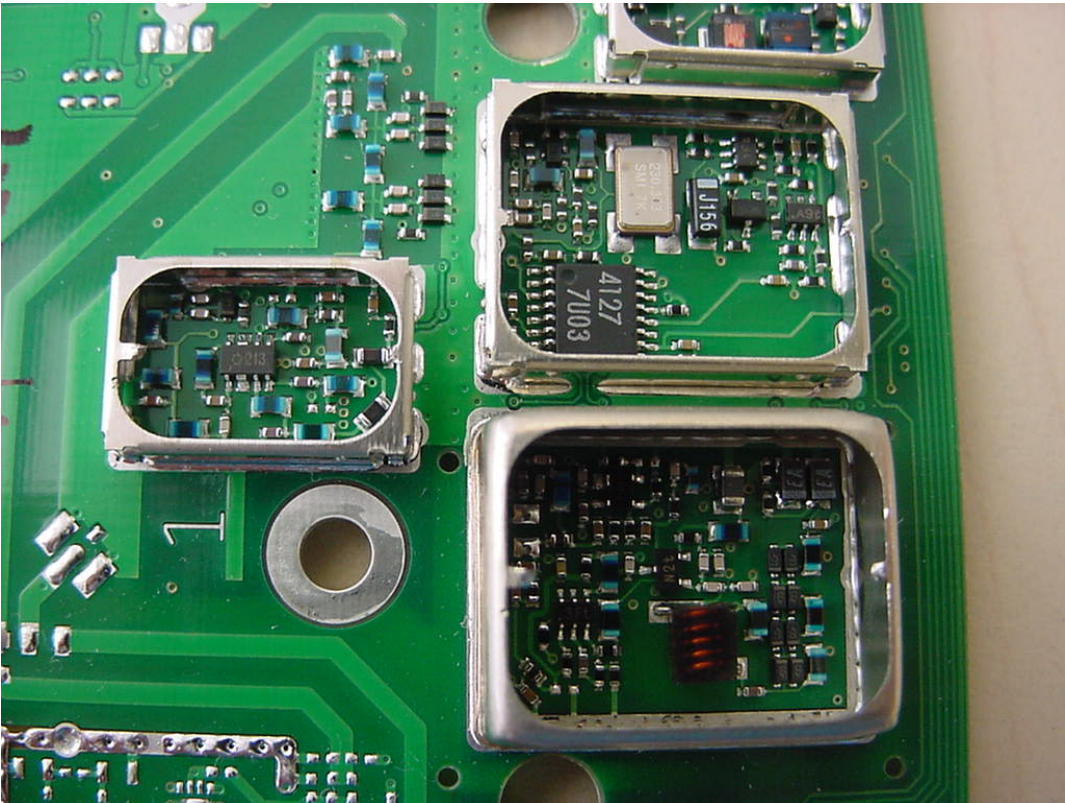


Photo 41:

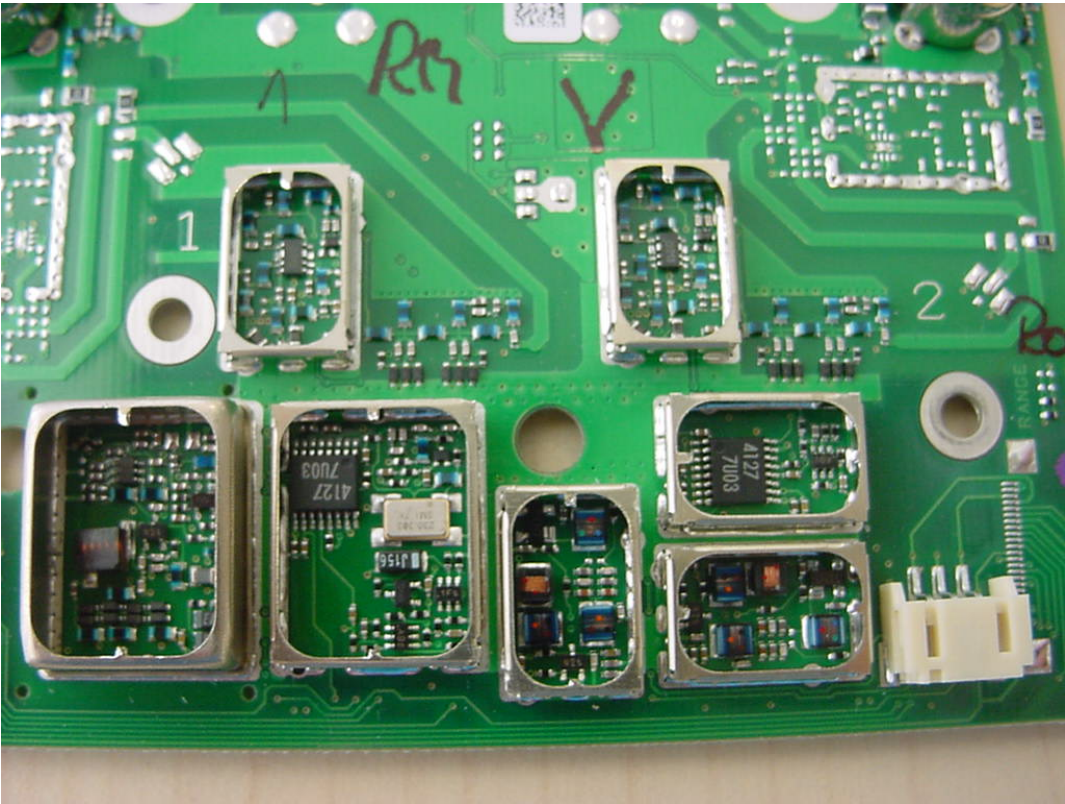


Photo 42:

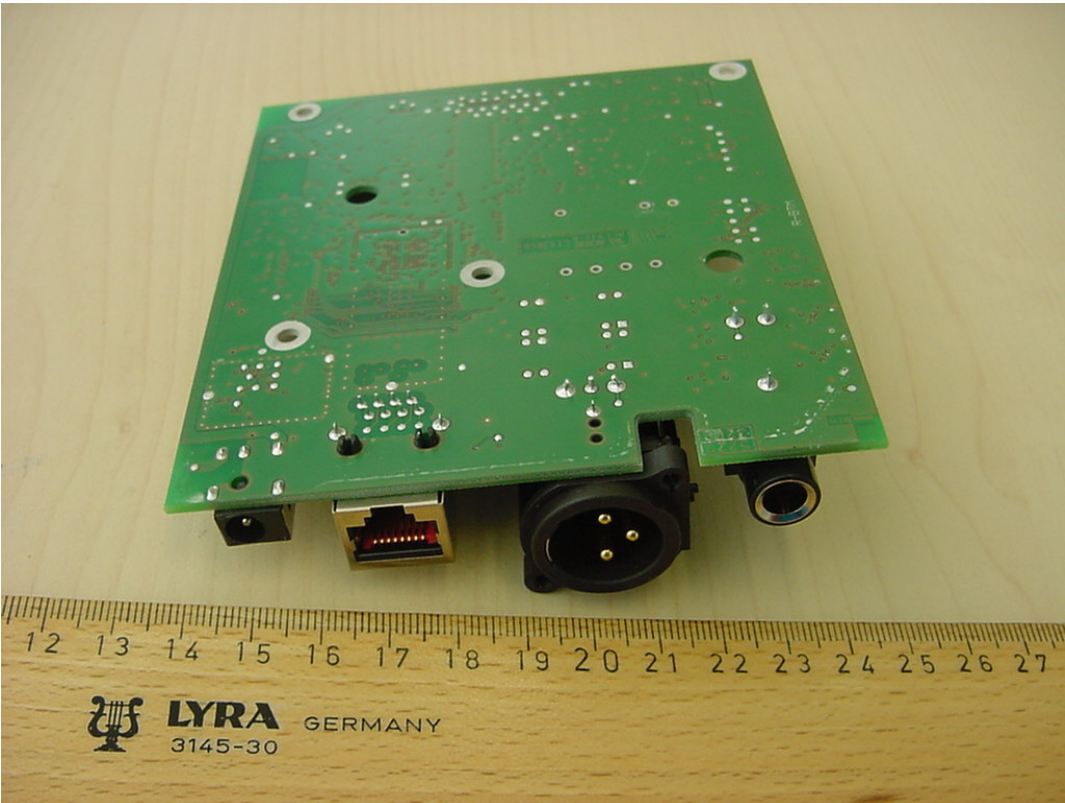


Photo 43:

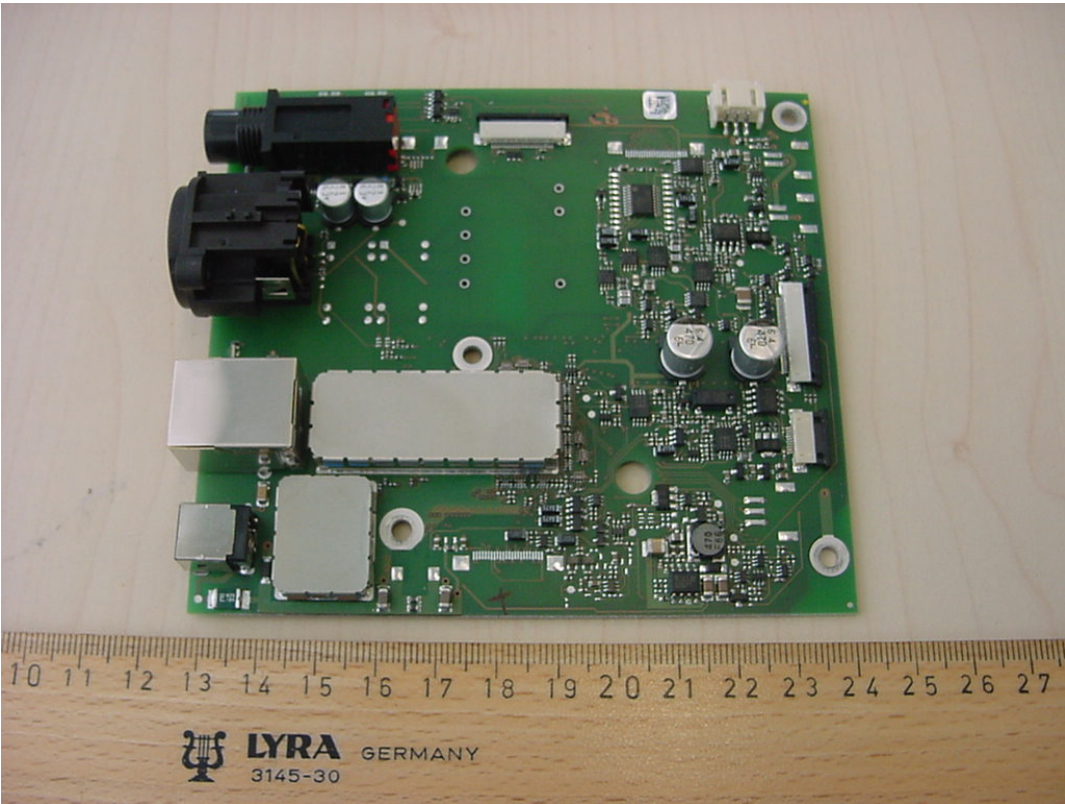


Photo 44:

