

Radio Satellite Communication

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RSC14 issue test report consist of 39 Pages

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Recognized by the
Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3463 (IC)
TCB ID: DE 0001



Accredited by the
German Accreditation Council

DAR-Registration Number

TTI-P-G 081/94-D0

Deutscher
Akkreditierungs
Rat

Independent ETSI compliance test house



Accredited Bluetooth<sup>TM</sup> Test Facility (BQTF)

Test Report No.: 4\_1273-01-02/04 FCC Part 15.247 / CANADA RSS-210 MCW770/37 FCC ID: BOUMCW770 IC: 135M-MCW770

> CETECOM – ICT Services GmbH Untertürkheimerstr. 6-10 66117 Saarbrücken, Germany

Telephone: + 49 (0) 681 / 598-0 Fax: + 49 (0) 681 / 589-9075



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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 1.5. 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:**

2004-06-16 RSC8414 Ames H. Signature

Date Section Name Signature

**Technical Responsibility for Area of Testing:** 

2004-06-16 RSC8412 Hausknecht D. / Caus human Signature



## 1.2 Testing Laboratory

**CETECOM ICT Services GmbH** 

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Telephone : + 49 681 598 - 0
Telefax : + 49 681 598 - 9075
E-mail : info@ict.cetecom.de
Internet : www.cetecom-ict.de

**Accredited testing laboratory** 

The Test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025.

DAR-registration number : TTI-P-G 081/94-D0 Accredited Bluetooth<sup>TM</sup> Test Facility (BQTF)

BLUETOOTH is a trademark owned by Bluetooth SIG, Inc. and licensed to CETECOM

## 1.3 Details of Applicant

Name : Philips Austria GmbH, Audio Video Innovation Centre

Street : Gutheil-Schoder-Gasse 8

City: A-1102 Vienna

Country : Austria

Telephone: +43 1 60101 4333 Telefax: +43 1 60101 4981 Contact: Mr. Karl Roschanek Telephone: +49 (0) 2191 698 0

E-mail : Karl.roschanek@philips.com

### 1.4 Application Details

Date of receipt of application : 2004-03-08 Date of receipt of test item : 2004-03-08

Date of test : 2004-03-10 to 2003-03-15



#### 1.5 Test Item

Type of equipment : Home Audio System with WLAN

Type designation : MCW770/37 Manufacturer : See applicant

Street

City

Country :

 Serial number
 : KT 000403000002

 FCC - ID
 : BOUMCW770

 IC
 : 135M-MCW770

Hardware : . - . Software : . - .

Additional information

Frequency : 2412 – 2462 MHz Type of modulation : 15M1P7D (DSSS)

Number of channels : 11

Antenna : Build-in antenna

Power supply : AC 115 V

Output power : EIRP: 34.6 mW (worst case);

Field strength : max. 112.9 dBµV/m in 3m with a correction factor of 10 dB

Occupied bandwidth : n.a.

Transmitter spurious :  $66.7 \mu V/m \text{ in } 3m$ Receiver spurious :  $51.3 \mu V/m \text{ in } 3m$ 

Temperature range :  $-30^{\circ}\text{C} - +70^{\circ}\text{C}$ 

**DECLARATION OF COMPLIANCE:** I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Signature:

Date: 2004-03-15 Michael Berg; Test management

NAME AND TITLE (Please print or type):

### **1.6** Test Specifications:

FCC Part 15 §15.247 (March 13. 2003) CANADA RSS-210 (Issue 5)



#### 2 Technical Test

### 2.1 Summary of Test Results

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 GHz in semi-anechoic chambers. The EUT is positioned on a nonconductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are conform with specifications ANSI C63.2-1987 clause 15 and ANSI C63.4-1992 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 setups 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 analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-1992 clause 4.2.

Antennas are conform with ANSI C63.2-1996 item 15.

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

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

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

1GHz: Average, RBW 1MHz, VBW 10 MHz, waveguide horn

All measurements are done in accordance with the Filing and Measurement Guidelines for DSSS-Systems

The product fullfils also the requirements for CANADA RSS-210

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

#### **Remarks:**

The WLAN module inside the radio is a Zyxel PCMCIA card.

This card is formerly tested for EU and FCC.

So we made radiated and AC-conducted tests only.

# **Final verdict : PASS**



2.2 Test Report

**TEST REPORT** 

Test Report No.: 4\_1273-01-02/04



### TEST REPORT REFERENCE

### LIST OF MEASUREMENTS

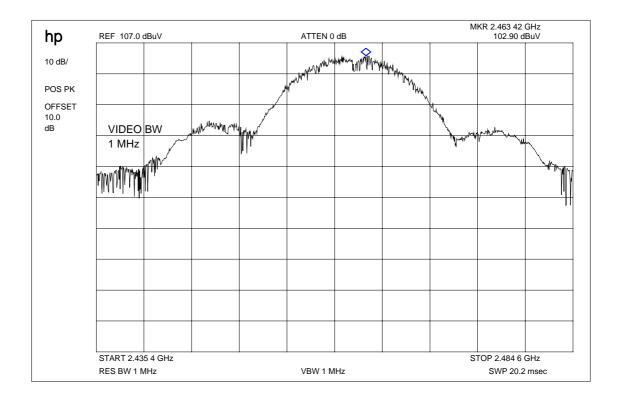
PARAMETER TO BE MEASURED	PAGE
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### BAND EDGE COMPLIANCE RADIATED

Max field strength in 3m distance peak (single frequency)

## correction factor included in plot



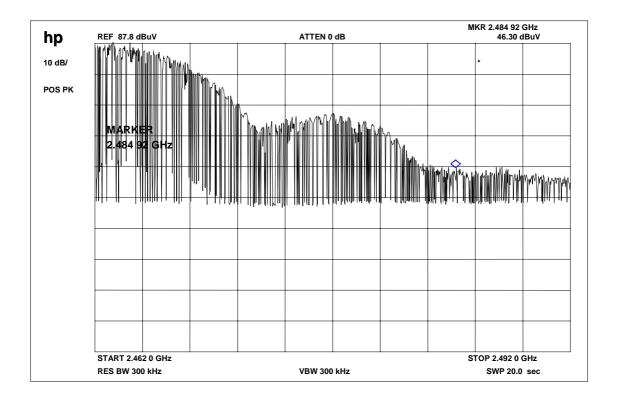
Frequency	Meter reading	Cable loss	Antenna factor	Results
2480 MHz	107.9	1.3	-6.3	102.9 dBμV/m
		correction factor in		

Correction factor = 10 \* log(6 dB BW/ used BW), here 10.0 dB

=> max field strength = 112.9 dB $\mu$ V/m at 3m or 15.4 dBm



# Band-edge compliance radiated Marker-Delta Method



Marker-Delta-Value: 41.5 dB

This measurement was made to show that the behavior of the system is conform to

FCC 15.205 (restricted bands)



**Band-edge compliance of radiated emissions** 

§15.205

## Radiated field strength

The field strength was measured with an EMI measuring receiver and 1 MHz RBW / VBW for peak at a distance of 3m and the average value was calculated by a duty cycle of 10%.

high channel	setup	measured value (3m)	correction factor (3m)	calculated value (3m)
Max. peak value	1 MHz RBW 1 MHz VBW	107.9 dBμV/m Peak	-5.0	102.9 dBμV/m
Max. average value	Calculated factor for 10% duty cycle	102.9 dBμV/m	-10 dB	92.9 dBμV/m
Delta value	Peak min. 30 kHz RBW/VBW	41.5 dB	-	-
Value at band edge	limit 54 dBµV/m			51.4 dΒμV/m
Statement:				Complies

## The product complies with the limit of the restricted bands.

Delta marker plots see above pages



#### SPURIOUS RADIATED EMISSION

§ 15.247 (c) (1)

	SPURIOUS EMISSIONS LEVEL (μV/m)							
	2412 MHz			2437 MHz		2462 MHz		
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)
		No	signal for	und < 10 dl	B below lir	<u>nit</u>		
Measur	Measurement uncertainty ±3 dB							

f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1GHz: RBW/VBW: 1 \text{ MHz}$ 

## **LIMITS**

## **SUBCLAUSE § 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Limits

**SUBCLAUSE § 15.209** 

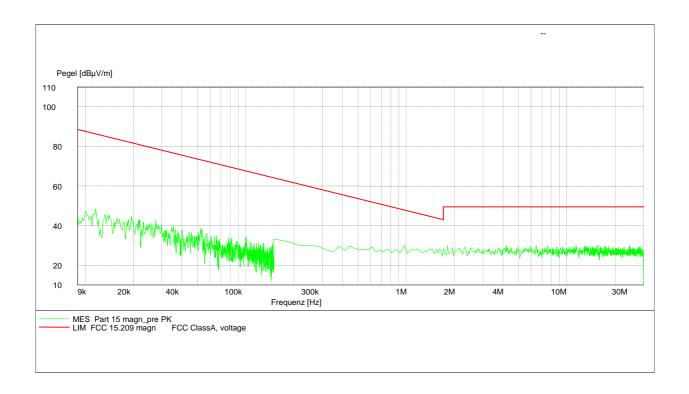
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100 (40 dBμV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBμV/m)	3
above 960	500 (54 dBμV/m)	3



# **EMISSION LIMITATIONS** (valid for all channels)

**SUBCLAUSE § 15.247 (c) (1)** 

9 kHz -30 MHz



For peak measurement we use 100 kHz RBW/VBW For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz 9 kHz for 150 kHz to 30 MHz

Limits

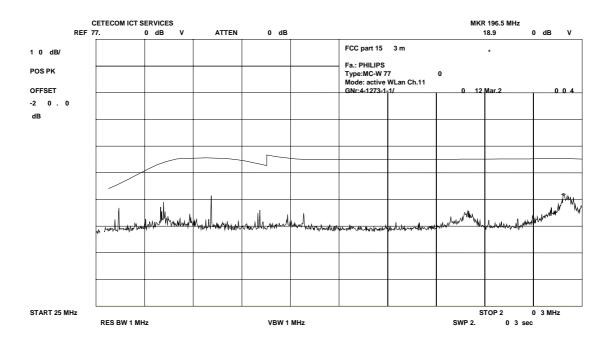
**SUBCLAUSE § 15.109** 

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30 / 29.5 dBμV/m	30

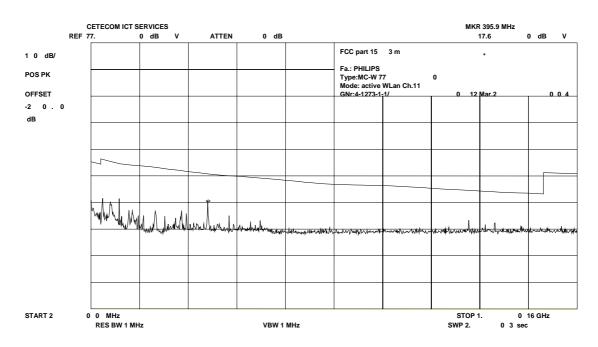


## EMISSION LIMITATIONS 2462 MHz (30 MHz – 200 MHz)

### **SUBCLAUSE § 15.247 (c) (1)**

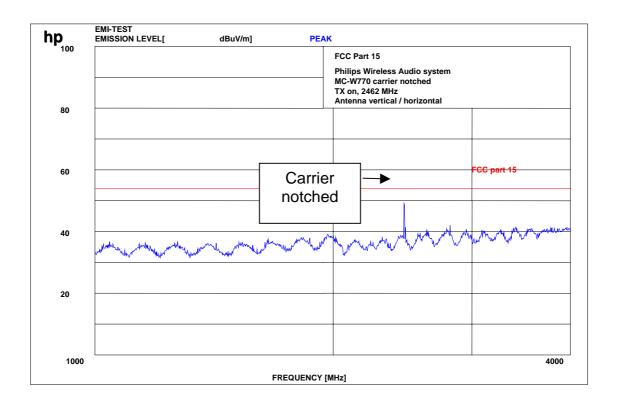


#### 200 MHz to 1000 MHz





EMISSION LIMITATIONS 2462 MHz (1 GHz - 4 GHz) **SUBCLAUSE § 15.247 (c) (1)** 



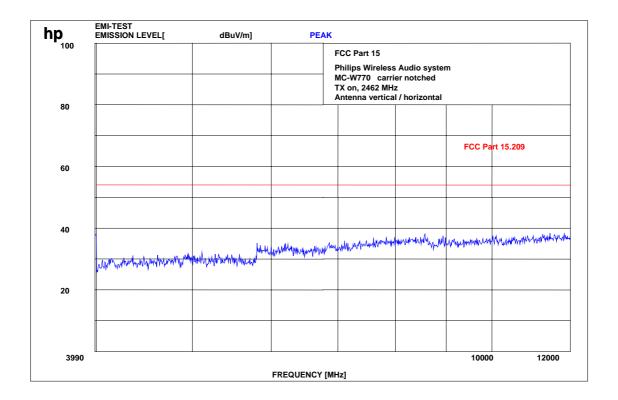
f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

#### **LIMITS**

### **SUBCLAUSE § 15.247 (c)**



EMISSION LIMITATIONS 2462 MHz (4 GHz - 12 GHz) **SUBCLAUSE § 15.247 (c) (1)** 



f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

#### **LIMITS**

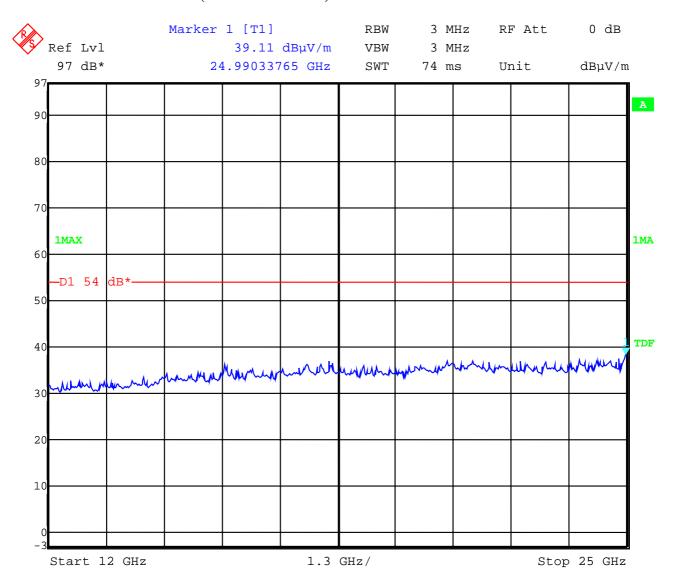
**SUBCLAUSE § 15.247 (c)** 



#### **EMISSION LIMITATIONS**

### **SUBCLAUSE § 15.247 (c) (1)**

valid for all three channels (12 GHz – 25 GHz)



f < 1 GHz : RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz} : RBW/VBW: 1 \text{ MHz}$ 

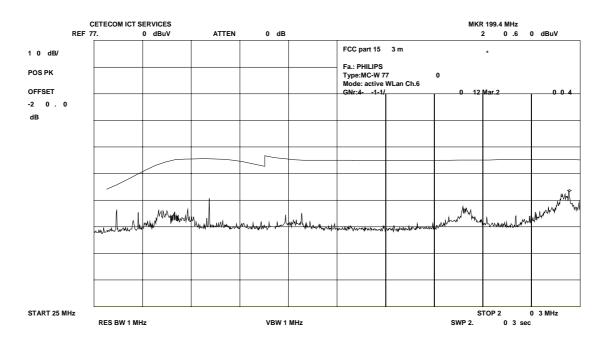
#### LIMITS

### **SUBCLAUSE § 15.247 (c)**

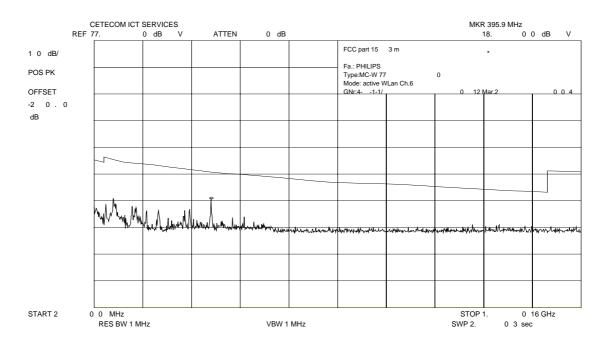


## EMISSION LIMITATIONS 2437 MHz (30 MHz - 200 MHz)

### **SUBCLAUSE § 15.247 (c) (1)**

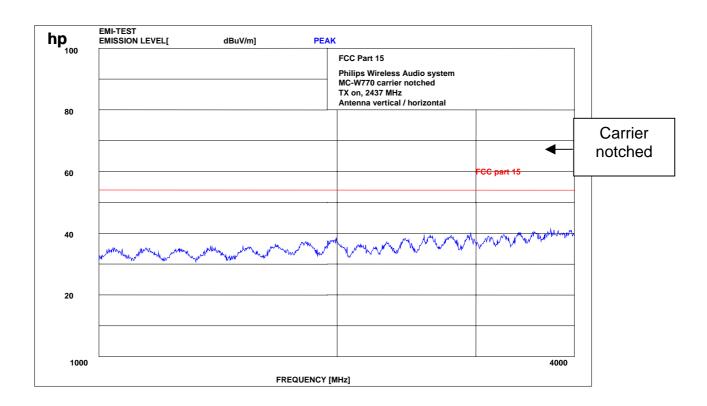


### 200 MHz to 1000 MHz





EMISSION LIMITATIONS 2437 MHz (1 GHz – 4 GHz) **SUBCLAUSE § 15.247 (c) (1)** 



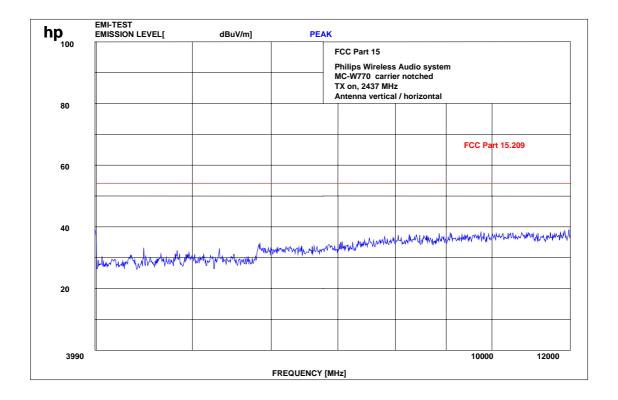
f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

#### **LIMITS**

**SUBCLAUSE § 15.247 (c)** 



EMISSION LIMITATIONS 2437 MHz (4 GHz – 12 GHz) **SUBCLAUSE § 15.247 (c) (1)** 



f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

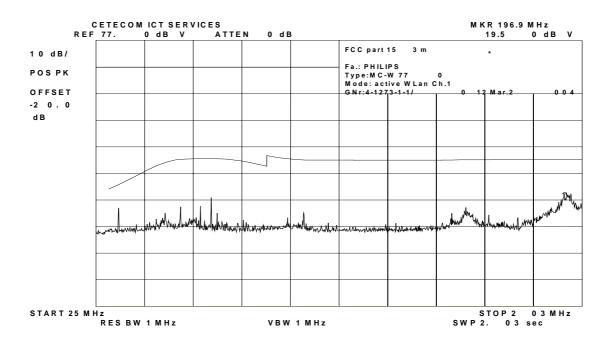
### **LIMITS**

**SUBCLAUSE § 15.247 (c)** 

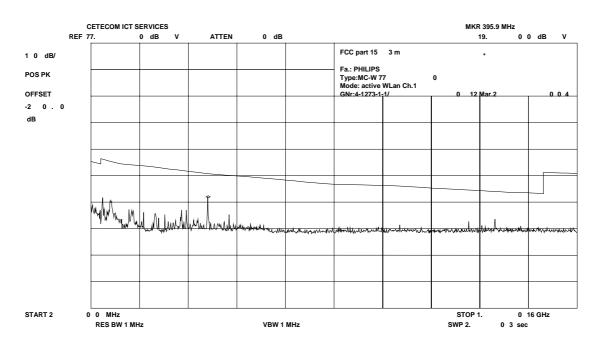


## EMISSION LIMITATIONS 2412 MHz (30 MHz - 200 MHz)

### **SUBCLAUSE § 15.247 (c) (1)**

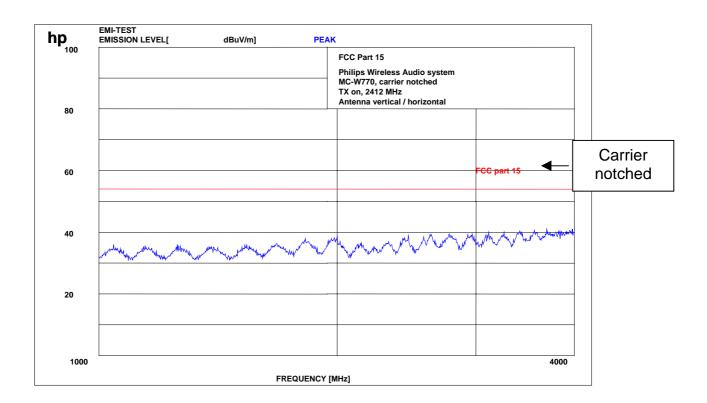


#### 200 MHz to 1000 MHz





EMISSION LIMITATIONS 2412 MHz (1 GHz – 4 GHz) **SUBCLAUSE § 15.247 (c) (1)** 



f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

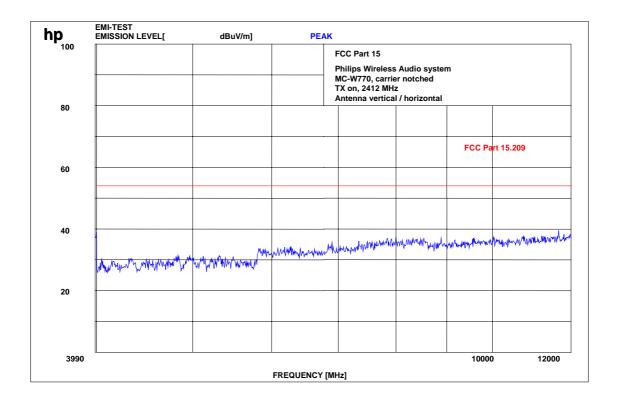
#### **LIMITS**

**SUBCLAUSE § 15.247 (c)** 



EMISSION LIMITATIONS 2412 MHz (4 GHz – 12 GHz)

### **SUBCLAUSE § 15.247 (c) (1)**



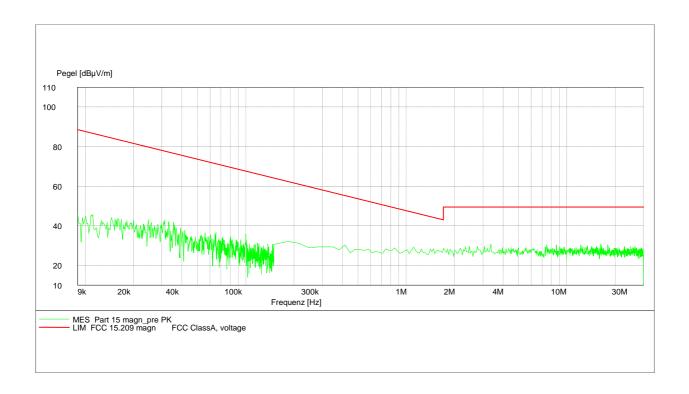
f < 1 GHz : RBW/VBW: 100 kHz  $f \ge 1GHz : RBW/VBW: 1 \text{ MHz}$ 

## **LIMITS**

## **SUBCLAUSE § 15.247 (c)**



EMISSION LIMITATIONS ( Receiver) SUBCLAUSE § 15.109 (9 kHz –30 MHz)

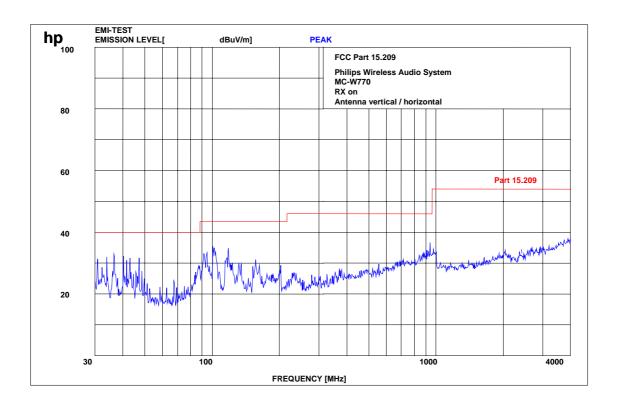


For peak measurement we use 100 kHz RBW/VBW
For CISPR QP measurement we use 200 Hz from 9 kHz to 150kHz
9 kHz for 150 kHz to 30 MHz

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30



# EMISSION LIMITATIONS ( Receiver) SUBCLAUSE § 15.109 (30 MHz – 4 GHz)

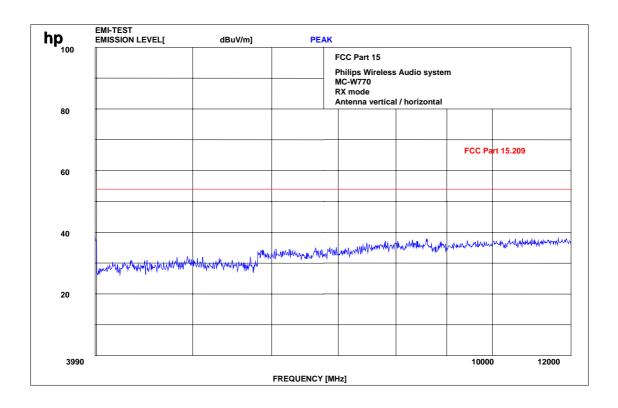


f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100 (40 dBμV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBμV/m)	3
above 960	500 (54 dBμV/m)	3



EMISSION LIMITATIONS (Receiver) SUBCLAUSE § 15.109 (4 GHz – 12 GHz)

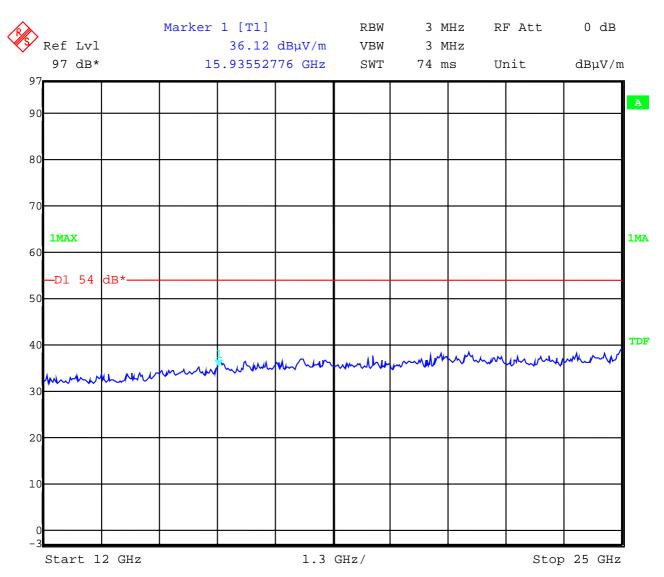


f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100 (40 dBμV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBμV/m)	3
above 960	500 (54 dBμV/m)	3



# EMISSION LIMITATIONS (Receiver) SUBCLAUSE § 15.109 (12 GHz – 25 GHz)



f < 1 GHz: RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz}: RBW/VBW: 1 \text{ MHz}$ 

Frequency (MHz)	Field strength (μV/m)	Measurement distance (m)
30 - 88	100 (40 dBμV/m)	3
88 - 216	150 (43.5 dBμV/m)	3
216 - 960	200 (46 dBμV/m)	3
above 960	500 (54 dBμV/m)	3



# RECEIVER SPURIOUS RADIATION Radiated

§ 15.109

**SUBCLAUSE § 15.109** 

	SPURIOUS EMISSIONS LEVEL (μV/m)							
	CH 1/2/3							
f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (µV/m)	f (MHz)	Detector	Level (μV/m)
All peaks	> 10 dB	below limit						
Measur	Measurement uncertainty ±3 dB							

f < 1 GHz : RBW/VBW: 100 kHz  $f \ge 1 \text{ GHz} : RBW/VBW: 1 \text{ MHz}$ 

W/ VDW: 100 KHZ 1 2 1GHZ

see above plots

Limits

## Measurement distance see table

Measurement distance see table

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100 (40 dBμV/m)	3
88 - 216	150 (43.5 dBμV/m)	3
216 - 960	200 (46 dBµV/m)	3
above 960	500 (54 dBμV/m)	3



## **CONDUCTED EMISSIONS**

§ 15.107/207

EN 55022 / CISPR 22

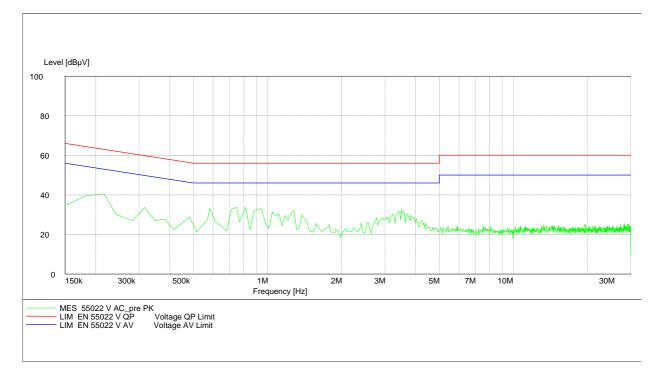
SCAN TABLE: "EN 55022 V"

Short Description: Voltage Mains 1.60

Start Stop Step Detector Meas. IF Transducer

Frequency Frequency Width Time Bandw.

150.0 kHz 30.0 MHz 7.5 kHz MaxPeak 100.0 ms 10 kHz ESH3-Z5 L1 1458



#### Limit § 15.207

Frequency of Emission (MHz)	Conducted Limit (dBuV)			
	Quasi-peak	Average		
0.15-0.5	66 to 56 *	56 to 46 *		
0.5-5	56	46		
5-30	60	50		

<sup>\*</sup>Decreases with the logarithm of the frequency.



## 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.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Calibr ated
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257	Yes
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860	Yes
03	Oscilloscope	7633	Tektronix	230054	Yes
04	Radio Communication	CMTA 54	Rohde & Schwarz	894 043/010	Yes
04	Analyzer	CMINST	Ronde & Senwarz	074 045/010	Tes
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027	Yes
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867	Yes
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012	Yes
08	<b>Function Generator</b>	AFGU	Rohde & Schwarz	862 480/032	Yes
09	Regulating	MPL	Erfi	91350	n.a.
	Transformer				
10	LISN	NNLA 8120	Schwarzbeck	8120331	Yes
11	Relay-Matrix	PSU	Rohde & Schwarz	893 285/020	Yes
12	Power-Meter	436 A	Hewlett-Packard	2101A12378	Yes
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156	Yes
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616	Yes
15	<b>Modulation Meter</b>	9008	Racal-Dana	2647	Yes
16	Frequency Counter	5340 A	Hewlett-Packard	1532A03899	Yes
17	Anechoic Chamber		MWB	87400/002	Yes
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306	Yes
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541	Yes
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131	Yes
21	RF-Preselector	85685 A	Hewlett-Packard	2833A00768	Yes
22	Biconical Antenna	3104	Emco	3758	Yes
23	Log. Per. Antenna	3146	Emco	2130	Yes
24	Double Ridged Horn	3115	Emco	3088	Yes
25	EMI-Testreceiver	ESAI	Rohde & Schwarz	863 180/013	Yes
26	EMI-Analyzer-Display	ESAI-D	Rohde & Schwarz	862 771/008	Yes
27	Biconical Antenna	HK 116	Rohde & Schwarz	888 945/013	Yes
28	Log. Per. Antenna	HL 223	Rohde & Schwarz	825 584/002	Yes
29	Relay-Switch-Unit	RSU	Rohde & Schwarz	375 339/002	Yes
30	Highpass	HM985955	FSY Microwave	001	n.a.
31	Amplifier	P42-GA29	Tron-Tech	B 23602	Yes
32	Anechoic Chamber		Frankonia		Yes
33	Control Computer	PSM 7	Rohde & Schwarz	834 621/004	Yes
34	EMI Test Receiver	ESMI	Rohde & Schwarz	827 063/010	Yes
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010	Yes



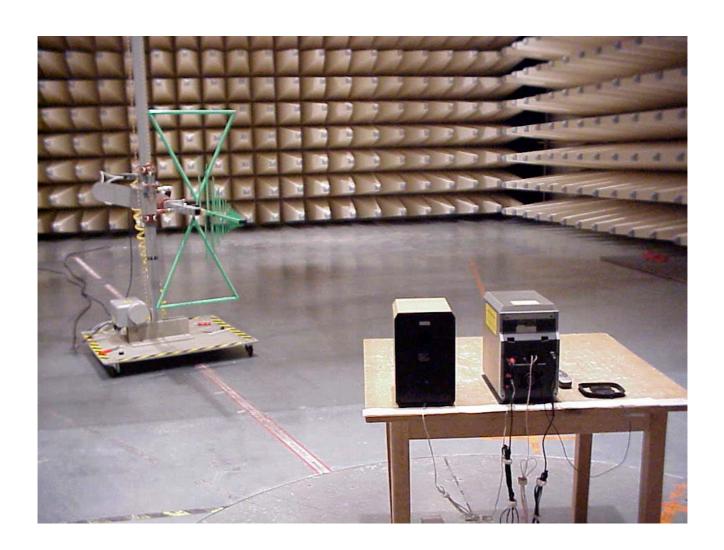
No	Instrument/Ancillary	Type	Manufacturer	Serial No.	Calibr
					ated
36	<b>Control Computer</b>	HD 100	Deisel	100/322/93	n.a.
37	Relay Matrix	PSN	Rohde & Schwarz	829 065/003	Yes
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008	Yes
39	Relay Switch Unit	RSU	Rohde & Schwarz	316 790/001	Yes
40	Power Supply	6032A	Hewlett Packard	2846A04063	Yes
41	Spectrum Monitor	EZM	Rohde & Schwarz	883 720/006	n.a.
42	Measuring Receiver	ESH 3	Rohde & Schwarz	890 174/002	Yes
43	Measuring Receiver	ESVP	Rohde & Schwarz	891 752/005	Yes
44	Bicon Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011	Yes
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010	Yes
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461	Yes
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002	Yes
48	Polarisation Network	HL 024 Z1	Rohde & Schwarz	341 570/002	Yes
49	Double Ridged Horn	3115	EMCO	9107-3696	Yes
	Antenna 1-26.5 GHz				
50	Microw. Sys. Amplifier	8317A	Hewlett Packard	3123A00105	Yes
	0.5- 26.5 GHz				
51	Audio Analyzer	UPD	Rohde & Schwarz	1030.7500.04	Yes
52	Controler	PSM 7	Rohde & Schwarz	883 086/026	Yes
53	DC V-Network	ESH3-Z6	Rohde & Schwarz	861 406/005	Yes
54	DC V-Network	ESH3-Z6	Rohde & Schwarz	893 689/012	Yes
55	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	861 189/014	Yes
56	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	894 981/019	Yes
57	AC-3 Phase V-Network	ESH2-Z5	Rohde & Schwarz	882 394/007	Yes
58	Power Supply	6032A	Rohde & Schwarz	2933A05441	Yes
59	RF-Test Receiver	ESVP.52	Rohde & Schwarz	881 487/021	Yes
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026	n.a.
61	RF-Test Receiver	ESH3	Rohde & Schwarz	881 515/002	Yes
62	Relay Matrix	PSU	Rohde & Schwarz	882 943/029	Yes
63	Relay Matrix	PSU	Rohde & Schwarz	828 628/007	Yes
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27	Yes
65	Spectrum Analyzer	HP 8565E	Hewlett Packard	3473A00773	Yes
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## **TEST SITE**













# PHOTOS OF THE EUT





