

Test Report

T-0249-3677-03 JP

Type / Model Name: AW-GH321 & B2029

FCC ID: YM6-AWGH321 & YM6-B2029

Product Description: WLAN module & BT Module

Applicant: MSC Freiburg GmbH

EMC -- TEST REPORT

Test Report No. :	T-0249-3677-03 JP	2011-07-14 Date of issue
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Type / Model Name : AW-GH321 & B2029

FCC ID: YM6-AWGH321 & YM6-B2029

Product Description : WLAN module & BT Module

Applicant : MSC Freiburg GmbH

Address : August-Wessels-Str. 17
86156 Augsburg
Germany

Manufacturer : MSC Freiburg GmbH

Address : Munzinger Str. 3
79111 Freiburg
Germany

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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DAT-P-121/02-01
KBA-P 00057-01

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed partly according to following standards:

FCC Part 15 Subpart A : 2009	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)
FCC Part 15 Subpart C : 2009	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC) Applied Paragraphs: §15.209
ANSI C63.4-2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz – 40 GHz

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2 OVERVIEW TEST RESULT

Performed test(s)	Result		
	Passed	Failed	Not performed
Radiated disturbance in the frequency range 1GHz – 25GHz	X		

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3 SUMMARY

GENERAL REMARKS:

The EUTs has a TX mode and a RX mode but RX is without TX beacons not possible therefore the measurements were performed in TX mode only.

Radiated emission testing according to §15.209 was performed in the frequency range 1GHz to 25GHz to show the compliance according to radiated emission limit in simultaneous operation mode.

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMC requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 2011-01-20

Testing concluded on : 2011-01-20

Checked by:

Tested by:

Frank Scharnowski
Quality Manager

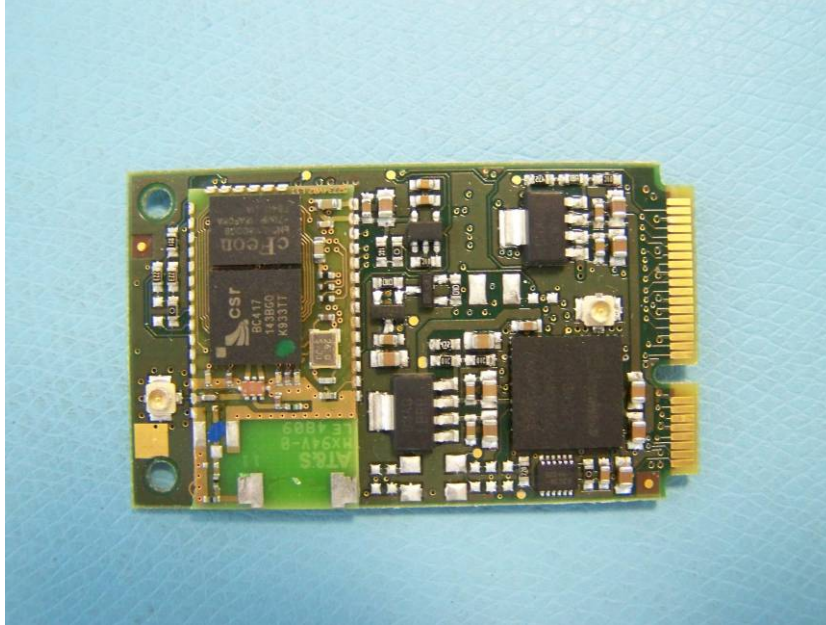
Jürgen Pessinger

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4 EQUIPMENT UNDER TEST

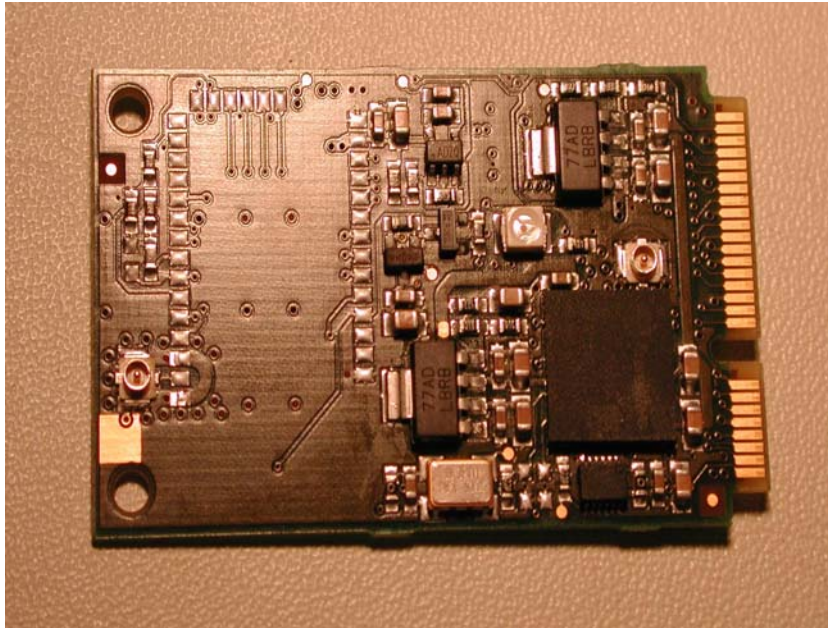
4.1 Photo documentation of the EuT

combined modules, YM6-AWGH321 & YM6-B2029



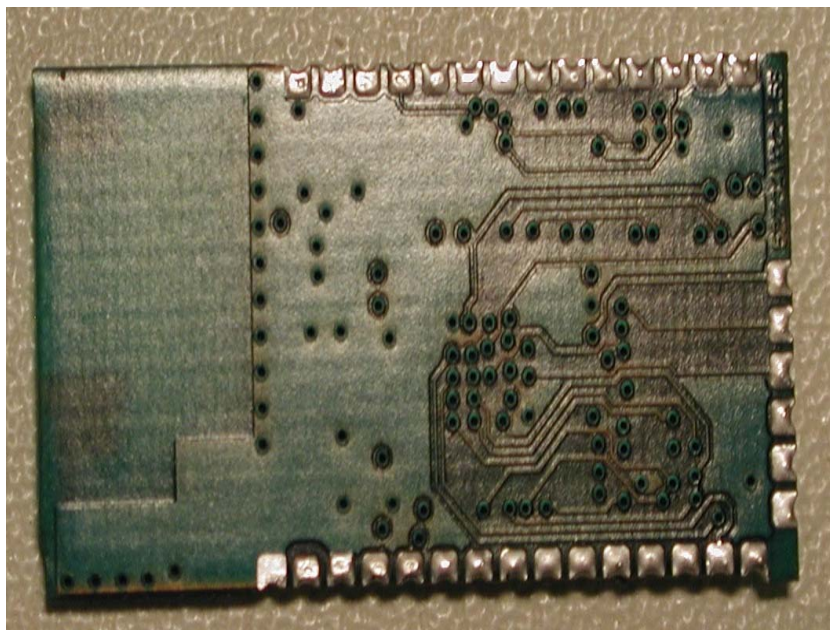
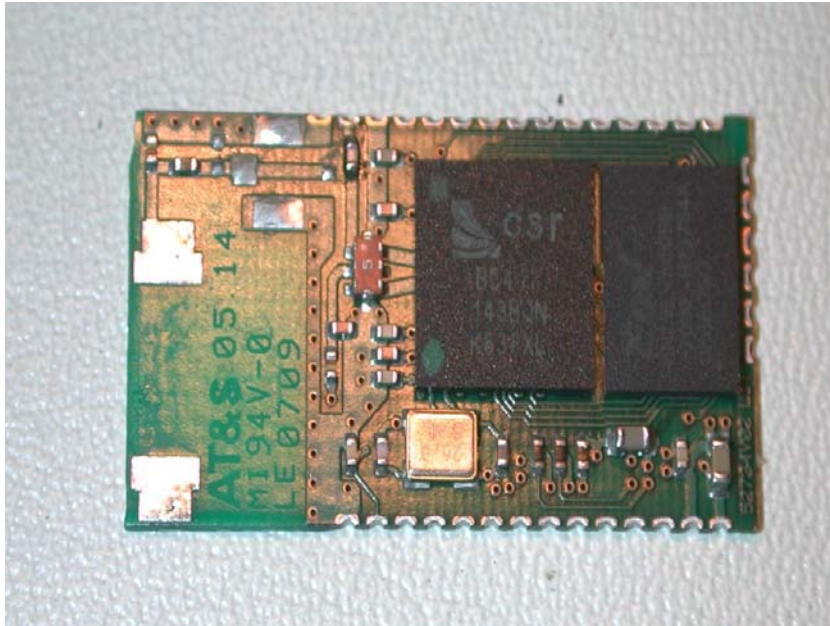
File No. **T-0249-3677-03 JP**

WLAN module, YM6-AWGH321



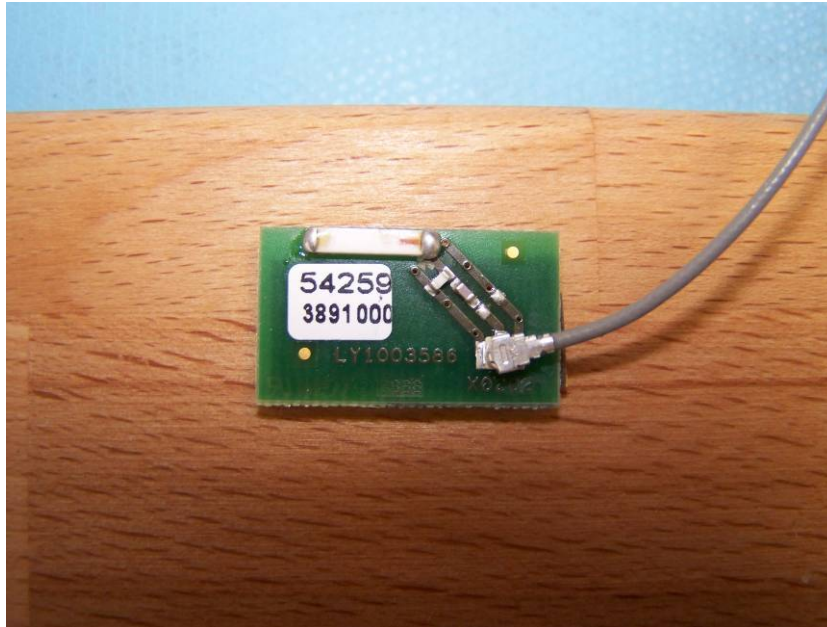
File No. **T-0249-3677-03 JP**

BT module, YM6-B2029

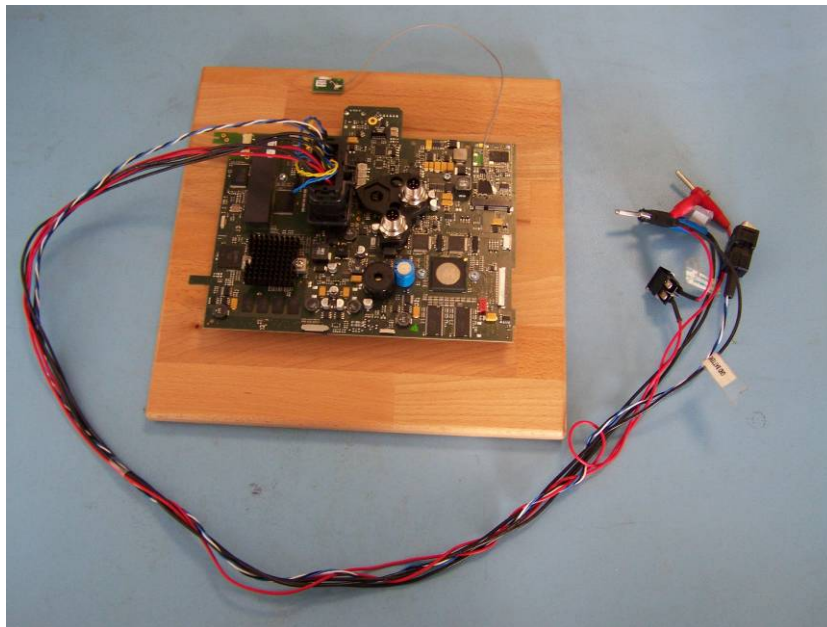


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Antenna:



Periphery:



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4.2 Power supply system

Power supply voltage: 3,3V DC

4.3 Short description of the Equipment under Test (EuT)

Number of tested samples: 1
Serial number: none

Dimensions AWGH321:	L: 53mm	W: 30mm	H: 4mm
Dimensions B2029:	L: 28mm	W: 14mm	H: 2mm

Radio equipment characteristics

AWGH321

Frequency band(s):	2400 – 2483,5 MHz
Operating frequency:	2412 – 2462 MHz
Channel spacing:	5MHz
Number of RF-channels:	11
Comments:	None

B2029

Frequency band(s):	2400 – 2483,5 MHz
Operating frequency:	2402 – 2480 MHz
Channel spacing:	1MHz
Number of RF-channels:	79
Comments:	None

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EuT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- simultan transmission of BT and WLAN, maximum RF power adjusted

EuT configuration:

The following interface cables and peripheral devices were connected during the measurements:

Interface cables:

Interface cable	Length [m]	Type	Line		Line termination
			shielded	unshielded	
Antenna cable WLAN	0,3	1-wires	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Antenna
Antenna cable BT	0,3	1-wires	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Antenna

Peripheral devices:

Kind of equipment		Model and/or Manufacturer
Antenna WLAN		WE-MCA, Würth Elektronik
Antenna BT		WE-MCA, Würth Elektronik
Motherboard		LY4003582_AGC_DV4-Main, MSC Freiburg

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5 TEST ENVIRONMENT

5.1 Address of the test laboratory

**emitel AG
Ohmstrasse 1
94342 STRASSKIRCHEN
DEUTSCHLAND**

Laboratory registration numbers:

DAR Registration number:	DAT-P-121/02-01
DAR Registration number:	KBA-P 00057-01
SNCH Registration number:	SNCH 001/2005 ext 01
FCC Registration number:	765810
IC Registration number:	IC 5066A-1
VCCI Registration number:	T-215; C-3049; R-2765

5.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

All atmospheric pressure values refer to our Laboratory altitude of 324m.

5.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 /11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer does have the sole responsibility for the continued compliance of the device.

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5.4 Measurement Protocol for FCC, VCCI and AUSTEL

5.4.1 GENERAL INFORMATION

5.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22 (1997+A1:2000+A2:2002), European Standard EN 55022 (1998+A1:2000+A2:2003) and Australian Standard AS 3548 (which are based on CISPR 22).

The Japanese standard, "Voluntary Control Council for Interference (VCCI) by Data Processing Equipment and Electronic Office Machines, Technical Requirements" is technically equivalent to CISPR 22 (1997+A1:2000+A2:2002). For official compliance, a conformance report must be sent to and accepted by the VCCI.

In compliance with FCC Docket 92-152, "Harmonization of Rules for Digital Devices Incorporate International Standards", testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using the CISPR 22 Limits.

5.4.1.2 Measurement Error

The data and results referenced in this document are true and accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. The measurement uncertainty was calculated for all measurements listed in this test report according to NIS 81/5.1994 "The treatment of uncertainty in EMC measurements" and is documented in the emitel AG quality system according to DIN EN ISO/IEC 17025. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the device.

5.4.1.3 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum disturbances from the unit.

5.4.2 CONDUCTED DISTURBANCE

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the CISPR limit, which is equivalent to the Australian AS 3548 limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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5.4.3 RADIATED DISTURBANCE

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the EMI receiver (Level dB μ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factor are stored. This result then has the CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in section 5.2. The CISPR 22 limit is equivalent to the Australian AS 3548 limit.

Example:	CISPR B	Delta						
Frequency	Level	+	Factor	=	Final	-	Limit	=
(MHz)	(dB μ V)		(dB)		(dB μ V/m)		(dB μ V/m)	
								CISPR B
								(dB)
37.19	10.2	+	12.0	=	22.2	-	40.0	=
								-17.8

5.4.4 DETAILS OF TEST PROCEDURES

5.4.4.1 General Standard Information

The test methods used comply with CISPR Publication 22 (1997+A1:2000+A2:2002), EN 55022 (1998+A1:2000+A2:2003) and AS 3548 (1992) - "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment" and with ANSI C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

5.4.4.2 Conducted disturbance

Conducted disturbance on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi peak and average detection and recorded on the data sheets.

5.4.4.3 Radiated disturbance

Radiated disturbance from the EUT are measured in the frequency range of 30 to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and average detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

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6 TEST CONDITIONS AND RESULTS

6.1 Radiated disturbance in the frequency range 1GHz – 25GHz

For test instruments and accessories used see section 7 Part SER 3.

6.1.1 Description of the test location

Test location: Anechoic Chamber A4

Test distance: 3 metres

6.1.2 Photo documentation of the test set-up



6.1.3 Test specification

Environmental conditions: Temperature: 25 ° C Humidity: 48 % Atmospheric pressure: 97 kPa

Frequency range: 1000 MHz - 25000 MHz

The test was carried out in the following operation mode(s):

- simultan transmission of BT and WLAN, maximum RF power adjusted

6.1.4 Test result

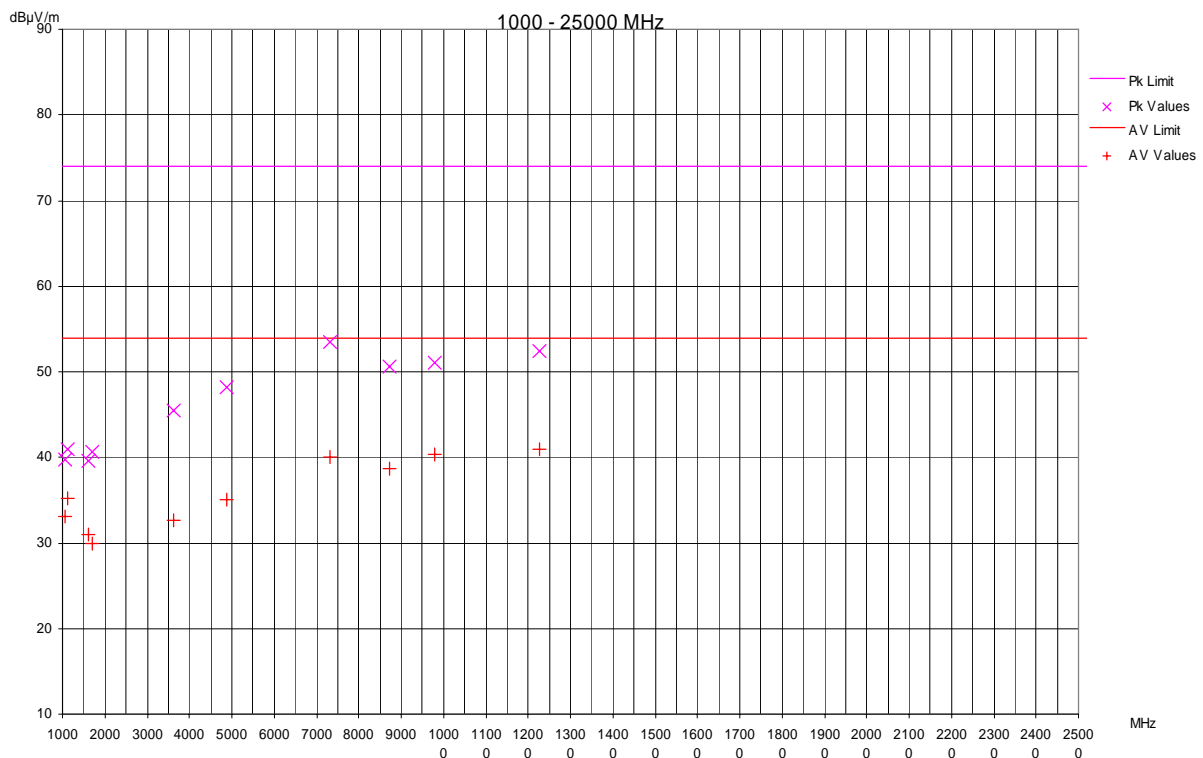
The requirements are **FULFILLED**.

Remarks: none

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6.1.5 Test protocol

Date of test:	2011-01-20
Operator:	Jürgen Pessinger
Mode:	WLAN: TX mode, 802.11b CH6/2437MHz (11Mbps) BT: TX mode, hopping through Channels 1-79
Standard:	FCC 15.209
Test:	Radiated Emission Test (Distance 3m)
Detector:	Pk / AV
Result:	Limit kept
Applied to:	Horizontal
Remark:	none

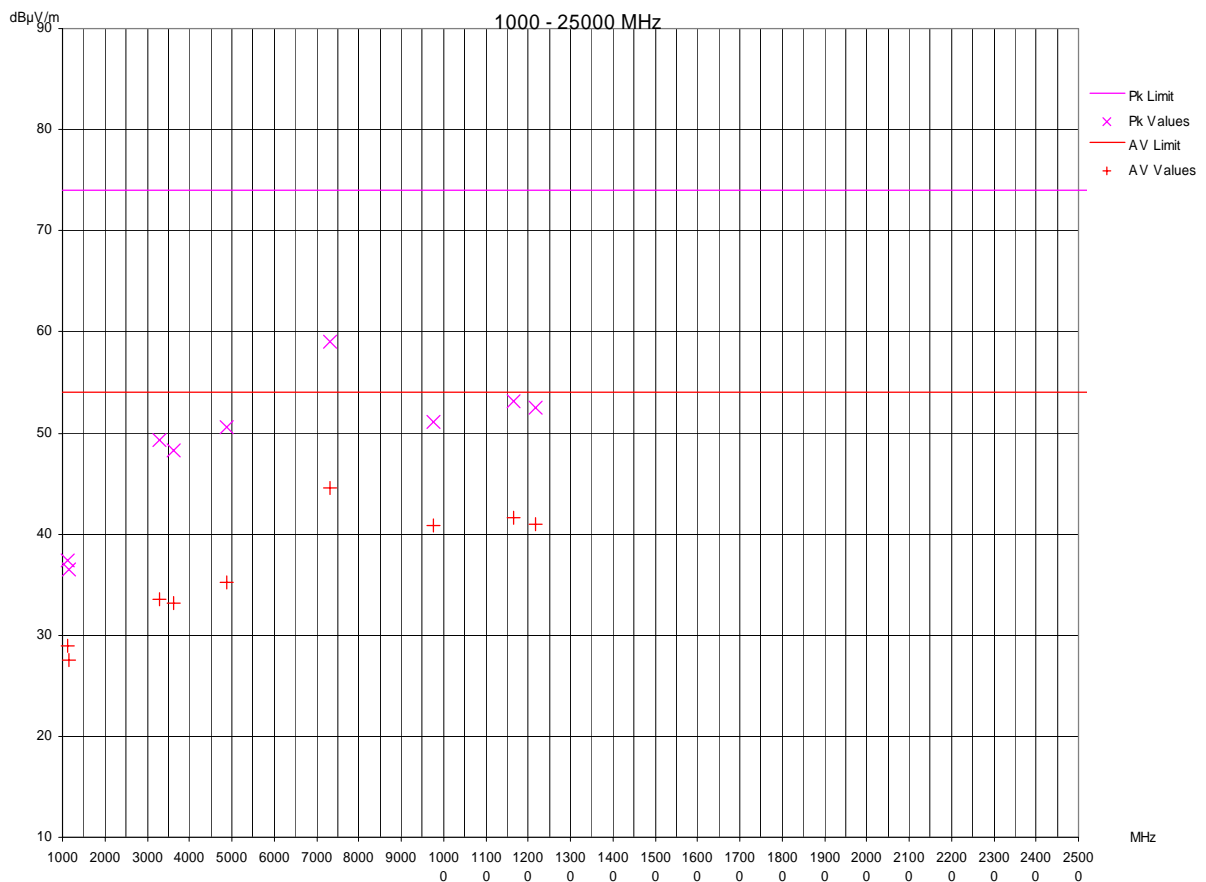


Minimum margin to limit: -13,0 dB

Frequency [MHz]	Reading [dBµV] Pk	Reading [dBµV] AV	Correction [dB]	Values [dBµV/m] Pk	Values [dBµV/m] AV	Limit [dBµV/m] Pk	Limit [dBµV/m] AV	Margin [dB] Pk	Margin [dB] AV
1052,000	51,6	44,9	-11,8	39,8	33,0	74,0	54,0	-34,2	-20,9
1120,000	52,3	46,5	-11,3	41,0	35,2	74,0	54,0	-33,0	-18,8
1608,000	49,1	40,5	-9,5	39,6	31,0	74,0	54,0	-34,4	-23,0
1692,000	49,2	38,5	-8,5	40,7	30,0	74,0	54,0	-33,3	-24,0
3630,000	47,8	35,1	-2,4	45,4	32,7	74,0	54,0	-28,6	-21,3
4868,000	48,4	35,2	-0,1	48,3	35,1	74,0	54,0	-25,7	-18,9
7320,000	48,9	35,4	4,6	53,5	40,0	74,0	54,0	-20,5	-14,0
8730,000	44,9	32,9	5,8	50,7	38,7	74,0	54,0	-23,3	-15,3
9780,000	44,6	33,9	6,4	51,0	40,3	74,0	54,0	-23,0	-13,7
12270,000	44,5	33,0	8,0	52,5	41,0	74,0	54,0	-21,5	-13,0

File No. T-0249-3677-03 JP

Date of test:	2011-01-20
Operator:	Jürgen Pessinger
Mode:	WLAN: TX mode, 802.11b CH6/2437MHz (11Mbps) BT: TX mode, hopping through Channels 1-79
Standard:	FCC 15.209
Test:	Radiated Emission Test (Distance 3m)
Detector:	Pk / AV
Result:	Limit kept
Applied to:	Vertical
Remark:	none

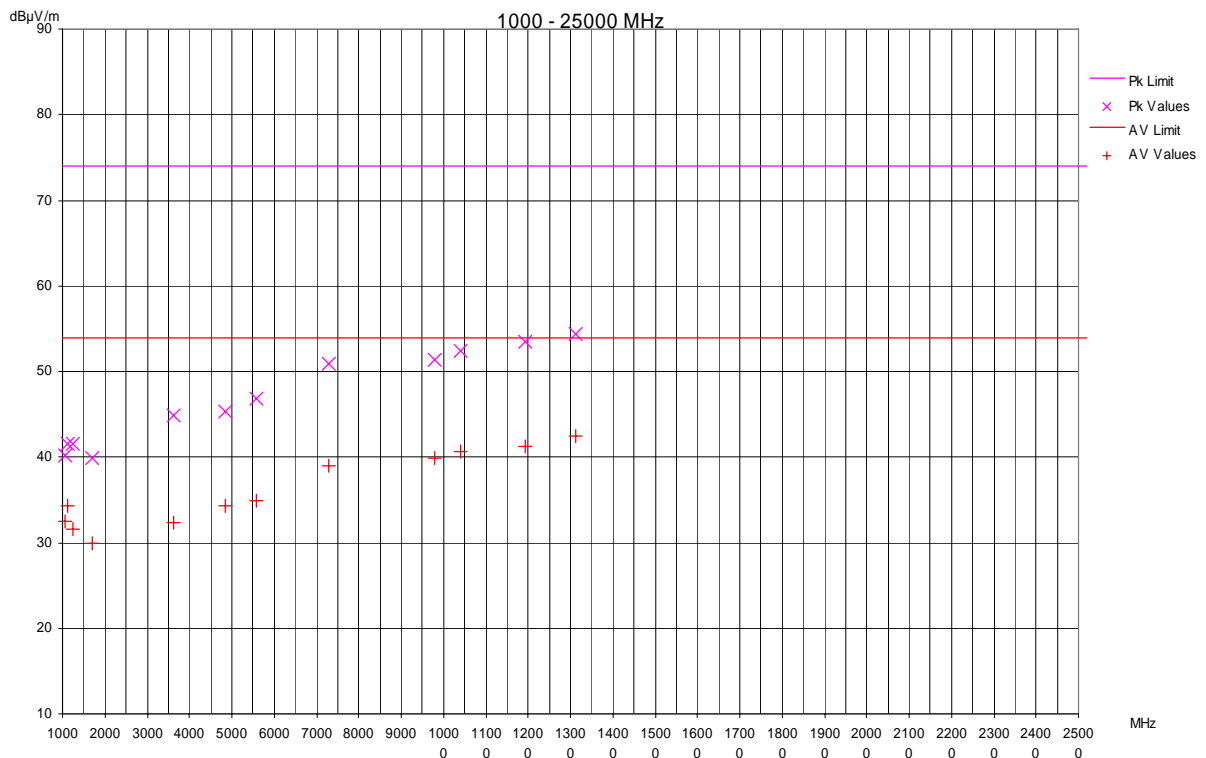


Minimum margin to limit: **-9,4 dB**

Frequency [MHz]	Reading [dBµV]		Correction [dB]	Values [dBµV/m]		Limit [dBµV/m]		Margin [dB]	
	Pk	AV		Pk	AV	Pk	AV	Pk	AV
1112,000	48,7	40,3	-11,3	37,4	29,0	74,0	54,0	-36,6	-25,0
1152,000	47,7	38,7	-11,2	36,5	27,5	74,0	54,0	-37,5	-26,5
3300,000	52,4	36,7	-3,1	49,3	33,6	74,0	54,0	-24,7	-20,4
3630,000	50,7	35,6	-2,4	48,3	33,2	74,0	54,0	-25,7	-20,8
4866,000	50,7	35,3	-0,1	50,6	35,2	74,0	54,0	-23,4	-18,8
7320,000	54,4	40,0	4,6	59,0	44,6	74,0	54,0	-15,0	-9,4
9750,000	44,7	34,5	6,4	51,1	40,9	74,0	54,0	-22,9	-13,1
11670,000	44,3	32,7	8,9	53,2	41,6	74,0	54,0	-20,8	-12,4
12180,000	44,4	33,0	8,0	52,4	41,0	74,0	54,0	-21,5	-12,9

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Date of test:	2011-01-20
Operator:	Jürgen Pessinger
Mode:	WLAN: TX mode, 802.11g CH6/2437MHz (54Mbps) BT: TX mode, hopping through Channels 1-79
Standard:	FCC 15.209
Test:	Radiated Emission Test (Distance 3m)
Detector:	Pk / AV
Result:	Limit kept
Applied to:	Horizontal
Remark:	none

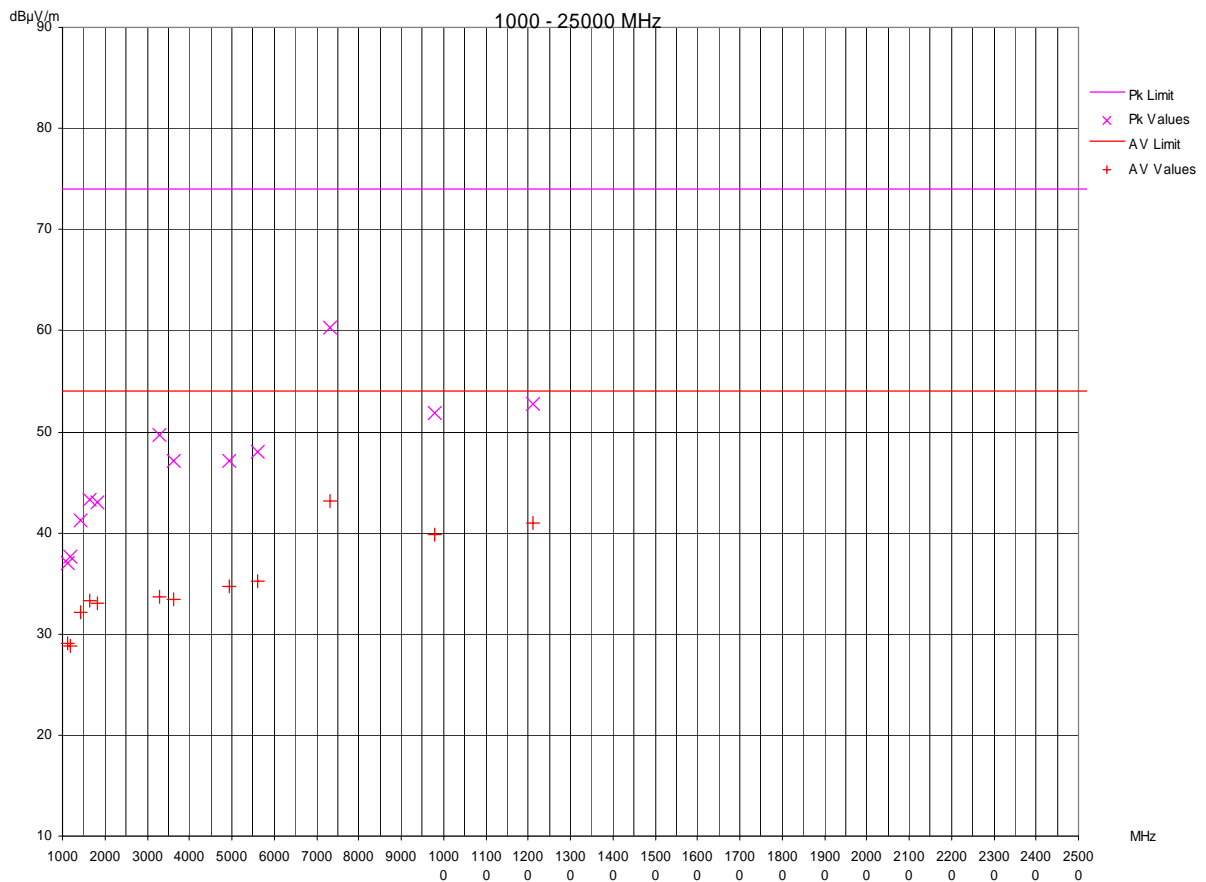


Minimum margin to limit: **-11,6 dB**

Frequency [MHz]	Reading [dBµV] Pk	AV	Correction [dB]	Values [dBµV/m] Pk	AV	Limit [dBµV/m] Pk	AV	Margin [dB] Pk	AV
1052,000	52,0	44,3	-11,8	40,2	32,5	74,0	54,0	-33,8	-21,5
1116,000	52,8	45,6	-11,3	41,5	34,3	74,0	54,0	-32,5	-19,7
1248,000	52,3	42,3	-10,8	41,5	31,5	74,0	54,0	-32,4	-22,4
1692,000	48,4	38,4	-8,5	39,9	29,9	74,0	54,0	-34,1	-24,1
3630,000	47,2	34,8	-2,4	44,8	32,4	74,0	54,0	-29,2	-21,6
4860,000	45,4	34,4	-0,1	45,3	34,3	74,0	54,0	-28,7	-19,7
5580,000	45,6	33,7	1,3	46,9	35,0	74,0	54,0	-27,1	-19,0
7290,000	46,4	34,5	4,5	50,9	39,0	74,0	54,0	-23,1	-15,0
9809,000	44,9	33,4	6,4	51,3	39,8	74,0	54,0	-22,6	-14,1
10410,000	44,8	33,0	7,6	52,4	40,6	74,0	54,0	-21,5	-13,3
11940,000	44,8	32,6	8,6	53,4	41,2	74,0	54,0	-20,5	-12,7
13110,000	45,7	33,7	8,7	54,4	42,4	74,0	54,0	-19,6	-11,6

File No. **T-0249-3677-03 JP**

Date of test:	2011-01-20
Operator:	Jürgen Pessinger
Mode:	WLAN: TX mode, 802.11g CH6/2437MHz (54Mbps) BT: TX mode, hopping through Channels 1-79
Standard:	FCC 15.209
Test:	Radiated Emission Test (Distance 3m)
Detector:	Pk / AV
Result:	Limit kept
Applied to:	Vertical
Remark:	none



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Minimum margin to limit: -10,8 dB

Frequency [MHz]	Reading [dB μ V]		Correction [dB]	Values [dB μ V/m]		Limit [dB μ V/m]		Margin [dB]	
	Pk	AV		Pk	AV	Pk	AV	Pk	AV
1108,000	48,4	40,4	-11,3	37,1	29,1	74,0	54,0	-36,9	-24,9
1196,000	48,6	39,7	-10,9	37,7	28,8	74,0	54,0	-36,3	-25,2
1440,000	51,4	42,3	-10,2	41,2	32,1	74,0	54,0	-32,8	-21,9
1644,000	52,5	42,5	-9,3	43,2	33,2	74,0	54,0	-30,7	-20,7
1816,000	50,9	40,9	-7,8	43,1	33,1	74,0	54,0	-30,9	-20,9
3300,000	52,8	36,8	-3,1	49,7	33,7	74,0	54,0	-24,3	-20,3
3630,000	49,5	35,8	-2,4	47,1	33,4	74,0	54,0	-26,9	-20,6
4950,000	47,0	34,6	0,1	47,1	34,7	74,0	54,0	-26,9	-19,3
5610,000	46,7	34,0	1,3	48,0	35,3	74,0	54,0	-26,0	-18,7
7320,000	55,8	38,6	4,6	60,4	43,2	74,0	54,0	-13,6	-10,8
9800,000	45,4	33,4	6,4	51,8	39,8	74,0	54,0	-22,2	-14,2
12100,000	44,6	32,9	8,1	52,7	41,0	74,0	54,0	-21,3	-13,0

File No. **T-0249-3677-03 JP**

7 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
SER 3	AMF-40-005-180-24-10P	01-02/17-02-009			02/12/2011	02/12/2010
	HCC	01-02/50-01-021				
	FA210A0020000000	01-02/50-06-065				
	FA210A0050000000	01-02/50-10-005				
	Tile Version 3.4K20	01-02/68-09-001				
	emitel ESW V31	01-02/68-09-002				
	RST 070	01-05/60-02-003				
	FSP 30	02-02/11-05-001	04/05/2011	04/05/2010		
	3117	02-02/24-05-009	10/02/2011	10/02/2010		
	R1 _ 18 - 30 GHz	02-02/30-09-002			17/02/2011	17/02/2010

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