FCC ID: QOQWT41

EMI – TEST REPORT

- FCC Part 15.209 -

Test Report No. :	T38793-00-00JP	14. October 2014 Date of issue

Type / Model Name : WT41

Product Description : Bluetooth module

Applicant : MSC Technologies Systems GmbH

DC Augsburg

Address : August-Wessels-Str. 17

86156 Augsburg

GERMANY

Manufacturer : BlueGiga Technologies Inc.

Address : Sinikalliontie 5A

FI-02630 Espoo

Finland

Test Result according to the standards listed in clause 1 test standards:	**POSITIVE**

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12030-01-00

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.

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2013)

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2013)

Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

GENERAL REMARKS:

The testing is conducted on the combination of WT41 module and antenna WE-MCA to show compliance with the radiated emission limits according to FCC Part 15.209 regarding the listing of the antenna in the module filling.

The frequency range from 30 MHz to 25GHz was scanned. The peripheral PCB motherboard is used to operate the WT41 module as well as it is used as carrier board for the antenna WE-MCA.

FINAL ASSESSMENT:

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

Testing commenced on : 30 September 2014

Testing concluded on : 01 October 2014

Checked by:

Klaus Gegenfurtner
I confirm the correctness and
Integrity of this documents
2014.10.14 10:30:21 +02'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

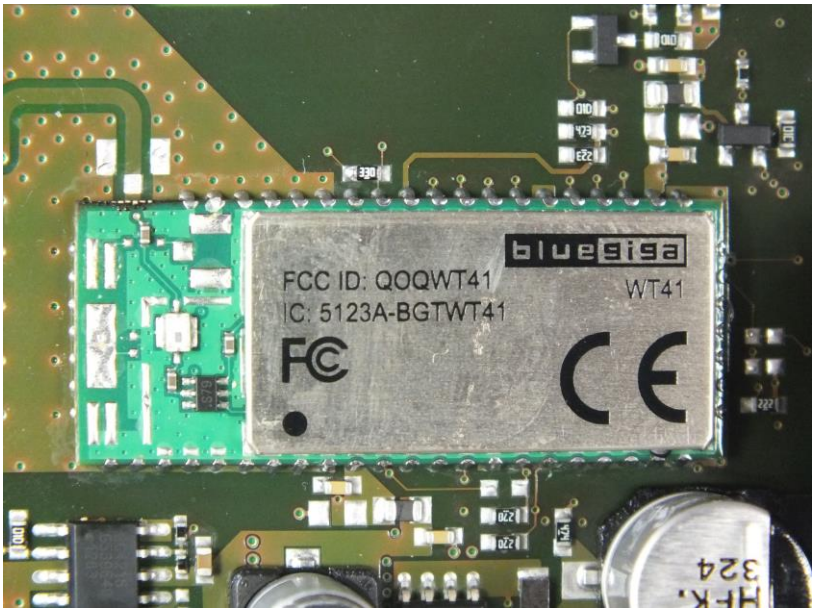
Jürgen Pessinger
2014.10.14
10:24:28 +02'00'

Jürgen Pessinger

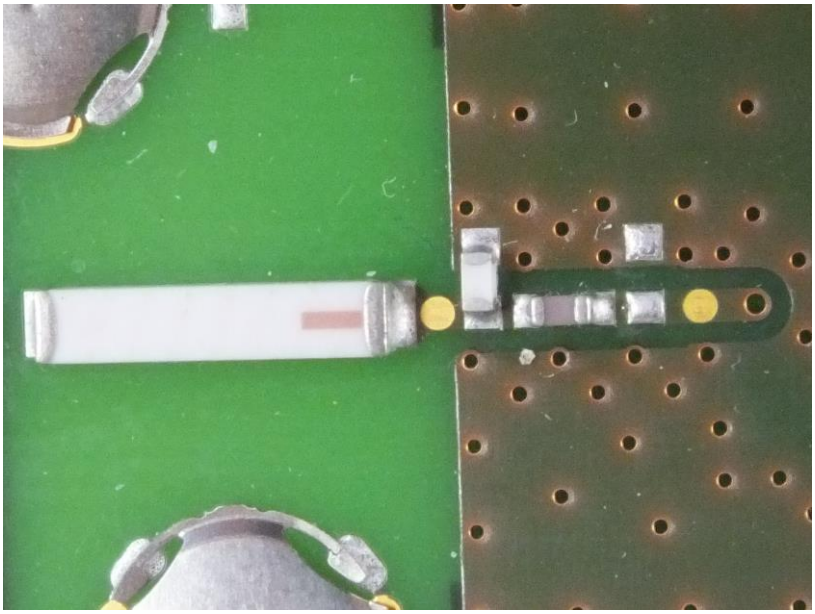
3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT

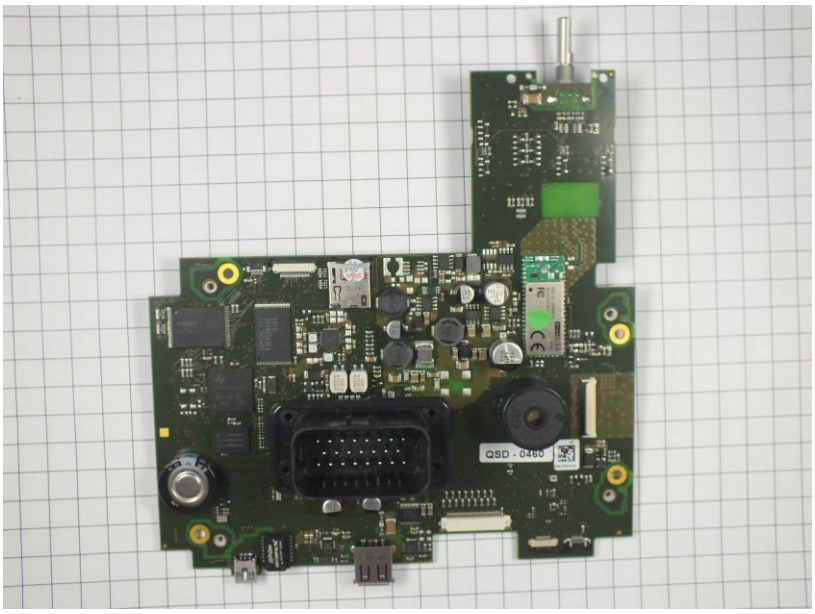
WT41 module

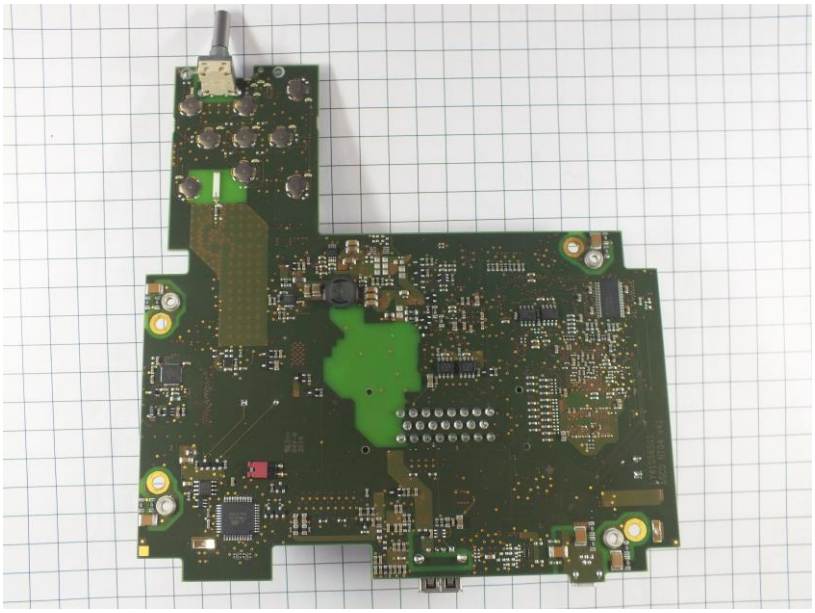


Antenna WE-MCA



Periphery





3.2 Power supply system utilised

Power supply voltage: : 3.0 – 3.6 VDC (supplied via NT05 motherboard)

3.3 Short description of the equipment under test (EUT)

The EuT is a Bluetooth module for integration in several electronic products to add Bluetooth functionality to the products.

Number of tested samples: 1
Serial number: none

EUT operation mode:

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

- TX mode CH low (2402MHz)

- TX mode CH mid (2441MHz)

- TX mode CH high (2480MHz)

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

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

- Motherboard Model : NT05 V41, MSC Technologies Systems GmbH
- Antenna Model : WE-MCA, Würth Elektronik eiSos GmbH
- Laptop Model : Tecra A2, Toshiba, CSA ID 01-01/01-05-005

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 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

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % 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. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.4 Measurement protocol for FCC

4.4.1 GENERAL INFORMATION

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

4.4.1.2 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 using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

General Standard information

The test methods used comply with CISPR Publication 22, EN 55022 - " Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.3 Conducted emission

The final level, expressed in dBμV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.
To convert between dBμV and μV, the following conversions apply:

dBμV = 20*log(μV);
μV = 10^(dBμV/20);

Conducted emissions 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 50Ω/50 μH (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 limit margin of a peak mode measurement appears to be less than 20 dB, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.4.4 Radiated emission (electrical field 30 MHz - 1 GHz)

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4.The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that 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 screened room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters and the EUT is rotated 360 degrees.
The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency	Level	+	Factor	=	Level	-	CISPR Limit	=	Delta
(MHz)	(dBµV)		(dB)		(dBµV/m)		(dBµV/m)		(dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

4.4.5 Radiated emission (electrical field 1 GHz - 40 GHz)

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The 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 screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

5 TEST CONDITIONS AND RESULTS

5.1 Spurious emissions

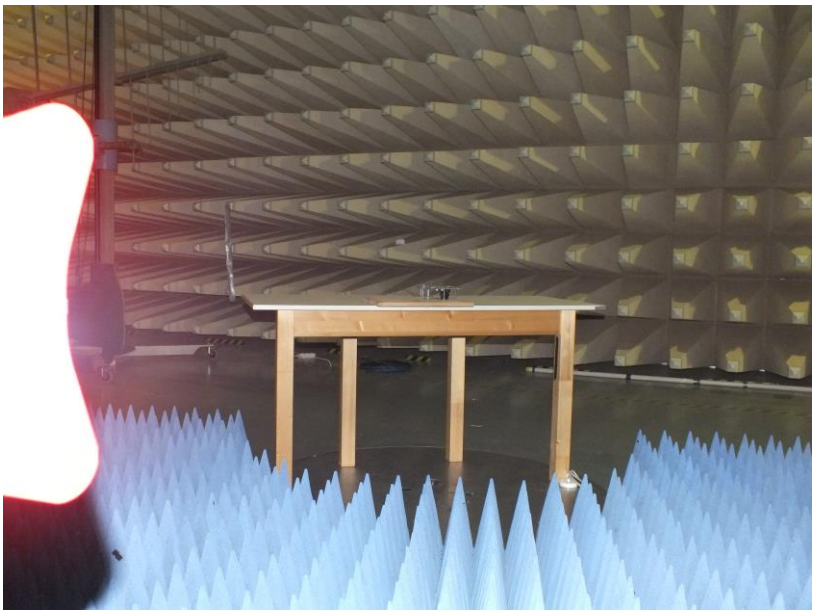
For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

5.1.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1

Test distance: 3 m

5.1.2 Photo documentation of the test set-up



5.1.1 Applicable standard

According to FCC Part 15C, Section 15.209:
The emissions from intentional radiators shall not exceed the effective field strength limits.

5.1.2 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. In the frequency range above 1GHz a peak detector measurtement is made if the peak result complies with the average limit then no average measurement is performed.
The resolution bandwidth during the measurement is as follows:
30 MHz – 1000 MHz: RBW: 120 kHz
1000 MHz – 25 GHz RBW: 1 MHz

5.1.3 Test result <1GHz

GFSK

CH mid (2441MHz)

Frequency (MHz)	Reading level QP (dBµV)	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Limit QP dB(µV/m)	Delta (dB)
50.00	11.1	15.1	26.2	40.0	-13.8
80.15	13.5	10.3	23.8	40.0	-16.2
200.00	5.6	10.9	16.5	43.5	-27.0
349.99	6.2	17.2	23.4	46.0	-22.6
450.00	3.7	20.4	24.1	46.0	-21.9
550.00	3.6	23.0	26.6	46.0	-19.4

DQPSK

CH mid (2441MHz)

Frequency (MHz)	Reading level QP (dBµV)	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Limit QP dB(µV/m)	Delta (dB)
50.00	11.4	15.1	26.5	40.0	-13.5
80.15	13.3	10.3	23.6	40.0	-16.4
200.00	5.3	10.6	15.9	43.5	-27.6
349.99	6.8	17.2	24.0	46.0	-22.0
450.00	3.9	20.4	24.3	46.0	-21.7
550.00	3.4	23.0	26.4	46.0	-19.6

8DPSK

CH mid (2441MHz)

Frequency (MHz)	Reading level QP (dBµV)	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Limit QP dB(µV/m)	Delta (dB)
50.00	10.7	15.1	25.8	40.0	-14.2
80.15	13.2	10.3	23.5	40.0	-16.5
200.00	4.7	10.9	15.6	43.5	-27.9
349.99	6.7	17.2	23.9	46.0	-22.1
450.00	4.2	20.4	24.6	46.0	-21.4
550.00	3.5	23.0	26.5	46.0	-19.5

5.1.4 Test result >1GHz

GFSK

CH low (2402MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1330.00	59,6	46.7	-19.1	40.5	27.6	74.0	54.0	-25.2
4804.00	67.2	51.2	2.3	69.5	53.5	74.0	54.0	-0.5
7206.00	63.4	45.9	6.9	70.3	52.8	74.0	54.0	-1.2
9608.00	47.1	34.0	7.8	54.9	41.8	74.0	54.0	-12.2
12010.00	49.2	39.6	1.0	50.2	40.6	74.0	54.0	-13.4
14412.00	51.3	41.3	2.7	54.0	44.0	74.0	54.0	-10.0
16814.00	49.9	41.4	6.1	56.0	47.5	74.0	54.0	-6.5

CH mid (2441MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1330.00	58.4	46.8	-19.1	39.0	27.7	74.0	54.0	-26.3
4882.00	65.8	47.1	2.4	68.2	49.4	74.0	54.0	-4.6
7323.00	60.1	44.7	6.9	66.9	51.5	74.0	54.0	-2.5
9764.00	47.2	33.4	8.6	55.8	42.0	74.0	54.0	-12.0
12205.00	55.0	45.4	1.5	56.5	46.9	74.0	54.0	-7.1
14646.00	54.5	43.8	4.5	59.0	48.3	74.0	54.0	-5.7
17087.00	46.0	35.0	6.6	52.6	41.6	74.0	54.0	-12.4

CH high (2480MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1330.00	57.8	50.0	-19.1	38.7	30.8	74.0	54.0	-23.2
4960.00	58.8	47.9	2.7	61.5	50.6	74.0	54.0	-3.4
7440.00	56.8	43.0	6.9	63.7	49.9	74.0	54.0	-4.1
9920.00	40.9	29.2	8.4	49.3	37.6	74.0	54.0	-16.4
12400.00	51.6	41.2	1.7	53.3	42.9	74.0	54.0	-11.1
14880.00	55.5	45.2	3.4	58.9	48.6	74.0	54.0	-5.4
17360.00	46.5	36.2	6.0	52.5	42.2	74.0	54.0	-11.8

DQPSK

CH low (2402MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1444.00	60.8	49.8	-20.5	40.3	29.2	74.0	54.0	-24.8
4804.00	71.0	50.3	2.3	73.3	52.6	74.0	54.0	-0.7
7206.00	63.9	37.0	6.9	70.7	43.8	74.0	54.0	-3.3
9608.00	51.0	30.5	7.3	58.3	37.8	74.0	54.0	-15.7
12010.00	51.5	39.9	1.0	52.5	40.9	74.0	54.0	-13.1
14412.00	51.4	42.6	2.7	54.1	45.4	74.0	54.0	-8.6
16814.00	52.3	41.3	6.1	58.3	47.4	74.0	54.0	-6.6

CH mid (2441MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1330.00	60.4	50.5	-19.5	41.0	31.1	74.0	54.0	-22.9
4882.00	60.9	49.8	2.4	63.3	52.2	74.0	54.0	-1.8
7323.00	56.8	41.7	6.9	63.7	48.6	74.0	54.0	-5.4
9764.00	47.0	34.0	7.8	54.8	41.7	74.0	54.0	-12.3
12205.00	53.4	44.8	1.5	54.9	46.3	74.0	54.0	-7.7
14646.00	54.9	44.5	4.5	59.4	49.0	74.0	54.0	-5.0
17087.00	45.4	34.5	6.6	52.0	41.1	74.0	54.0	-12.9

CH high (2480MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
2104.00	60.5	51.8	-15.9	44.6	35.9	74.0	54.0	-18.1
4960.00	62.5	50.4	2.7	65.2	53.1	74.0	54.0	-0.9
7440.00	56.5	42.9	6.9	63.4	49.8	74.0	54.0	-4.2
9920.00	40.7	29.7	8.4	49.0	38.1	74.0	54.0	-15.9
12400.00	51.0	40.4	1.7	52.7	42.2	74.0	54.0	-11.8
14880.00	55.2	44.7	3.4	58.6	48.1	74.0	54.0	-5.9
17360.00	46.6	36.3	6.0	52.6	42.3	74.0	54.0	-11.7

8DPSK

CH low (2402MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1444.00	61.1	49.2	-20.5	40.5	28.6	74.0	54.0	-25.4
4804.00	70.6	50.3	2.3	72.9	52.6	74.0	54.0	-1.1
7206.00	61.7	42.2	6.9	68.6	49.1	74.0	54.0	-4.9
9608.00	46.3	30.5	7.3	53.6	37.8	74.0	54.0	-16.2
12010.00	51.7	41.5	1.0	52.7	42.5	74.0	54.0	-11.5
14412.00	51.1	39.4	2.7	53.8	42.1	74.0	54.0	-11.9
16814.00	53.0	38.6	6.1	59.1	44.7	74.0	54.0	-9.3

CH mid (2441MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1444.00	57.1	48.0	-20.0	37.1	27.9	74.0	54.0	-26.1
4882.00	66.0	51.0	2.4	68.4	53.4	74.0	54.0	-0.6
7323.00	59.1	42.7	6.9	66.0	49.6	74.0	54.0	-4.4
9764.00	52.4	33.5	7.8	60.2	41.3	74.0	54.0	-12.7
12205.00	54.6	43.2	1.5	56.1	44.7	74.0	54.0	-9.3
14646.00	52.9	43.3	4.5	57.4	47.8	74.0	54.0	-6.2
17087.00	45.1	34.8	6.6	51.7	41.4	74.0	54.0	-12.6

CH high (2480MHz)

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1444.00	57.6	46.6	-20.0	37.6	26.5	74.0	54.0	-27.5
4960.00	58.9	48.9	2.7	61.6	51.6	74.0	54.0	-2.4
7440.00	54.3	42.7	6.9	61.3	49.6	74.0	54.0	-4.4
9920.00	40.3	28.5	8.4	48.7	36.9	74.0	54.0	-17.1
12400.00	50.0	40.0	1.7	51.7	41.8	74.0	54.0	-12.2
14880.00	52.2	43.2	3.4	55.6	46.6	74.0	54.0	-7.4
17360.00	46.3	36.2	6.0	52.3	42.2	74.0	54.0	-11.8

Limit according to FCC Part 15 Subpart 15.209(a):

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

The requirements are **FULFILLED.**

Remarks: The measurement in the frequency range 30 MHz to 1000MHz was made on the middle channel. Prescans showed that the emission level in this frequency range depends NOT on the set transmission channel.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
SER 2	ESVS 30	02-02/03-05-006	03/07/2015	03/07/2014		
	VULB 9168	02-02/24-05-005	08/04/2015	08/04/2014	04/03/2015	04/09/2014
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	FSP 30	02-02/11-05-001	24/10/2014	24/10/2013		
	JS4-18004000-30-5A	02-02/17-05-017				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	3117	02-02/24-05-009	07/05/2015	07/05/2014		
	BBHA 9170	02-02/24-05-014				
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	KMS102-0.2 m	02-02/50-11-020				
	SF104/11N/11N/1500MM	02-02/50-13-015				