FCC ID: RXEWT30

TTI - P-G 089 / 94-11
DAT - P-011 / 91-02

EMI -- T E S T R E P O R T

Test Report No. :	**T25323-00-01AA**	14. January 2005 Date of issue

Type / Model Name : WT30-M01-FLK

Product Description : Wireless SS Terminal

Applicant : TÜV Product Service Japan

Address : Ltd. Kansai Office (OSK)

Manufacturer : OMRON OKAYAMA Co., Ltd.

Address : 2075 MIYOSHI OKAYAMA-CITY
OKAYAMA 703-8502, Japan

Licence holder : OMRON OKAYAMA Co., Ltd.

Address : 2075 MIYOSHI OKAYAMA-CITY
OKAYAMA 703-8502, Japan

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

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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Contents

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart C - Intentional Radiators (October 01, 2003)

Part 15, Subpart C, Section 15.35(c)	Correction for Pulse Operation (Duty Cycle)
Part 15, Subpart C, Section 15.209(a)	Radiated emissions, general requirements
Part 15, Subpart C, Section 15.247(c)	Radiated emissions, outside the used frequency band
Part 15, Subpart C, Section 15.247(2)	Minimum 6dB bandwidth requirement
Part 15, Subpart C, Section 15.247(b) (3)	Maximum Peak output Power of intentional radiator
Part 15, Subpart C, Section 15.247(d)	Peak power spectral density

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October 01, 2003)

Part 15, Subpart B, Section 15.107(a)	AC Line conducted emissions
Part 15, Subpart B, Section 15.109(a)	Radiated emissions, general requirements

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2 SUMMARY

GENERAL REMARKS:

The following samples with a combination of different antennas have been tested to find out the worst case:

EuT: WT30-M01-FLK (master)
WT30-SID16 (slave)
WT30-SMD16 (slave)
WT30-SMD16-1 (slave)

Antenna: Whip
Magnetic
Magnetic with extension
Flat
Flat with extension

The EuT is working on 67 channels with a channel spacing of 1.2 MHz.
Channel 1 is the lowest used channel the frequency of 2401.0 MHz.
Channel 17 is located in the middle of the used frequency band at 2439.4 MHz.
Channel 34 is the highest used channel at 2480.2 MHz.

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 of MBPS

Testing commenced on : 02. November 2004

Testing concluded on : 22. November 2004

Checked by:

Thomas Weise
Ich bestätige die Richtigkeit und Integrität dieses Dokuments
2005.01.14 10:30:43 +01'00'

Thomas Weise
Dipl. Ing.(FH)

Tested by:

Anton Altmann
Ich bin der Verfasser dieses Dokuments
2005.01.14 10:27:34 +01'00'

Anton Altmann
Dipl. Ing.(FH)

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT


ANT1
ANT2
PWR
COMM
MS
WS
MCA
RSSI
UNIT No.
W NODE
W CH
MODE
RUN
TEST
SET
ENTER
ON
OFF
x10
x1
RS-232C
MODE
FUNCTION
DC24V 0V
OMRON
WT30-M01-FLK

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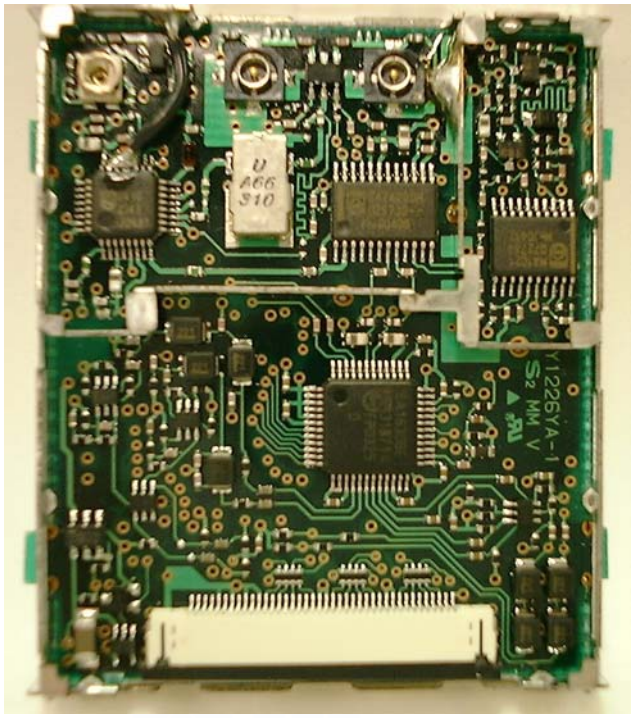
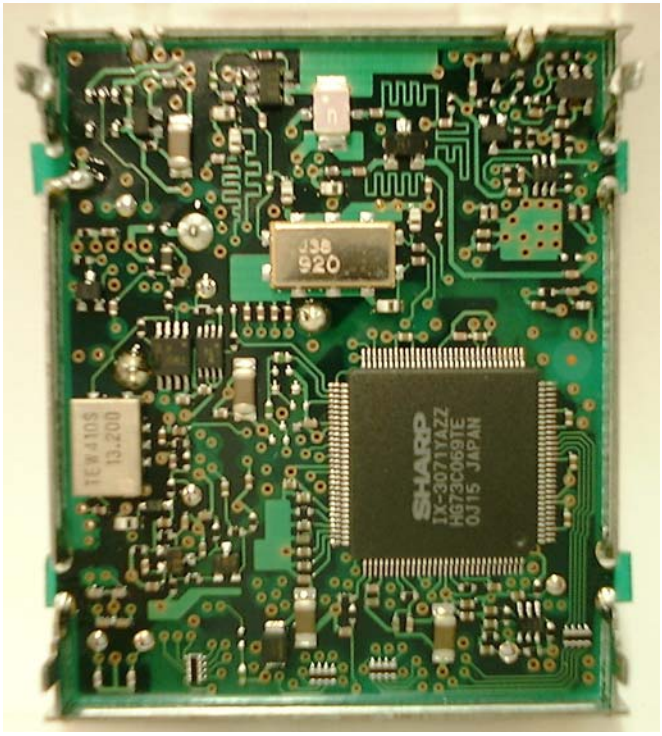
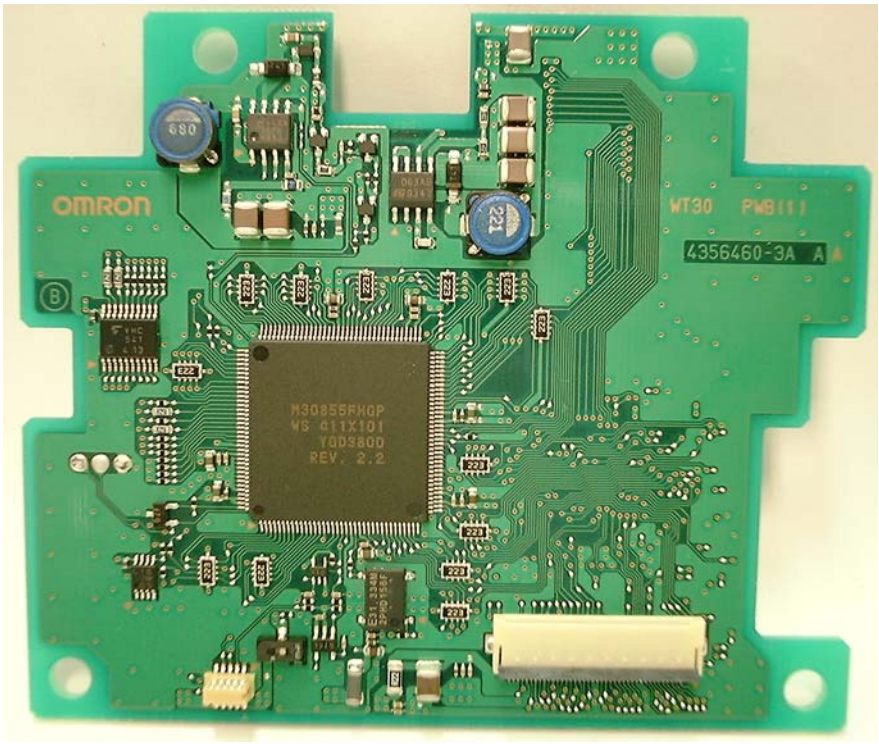
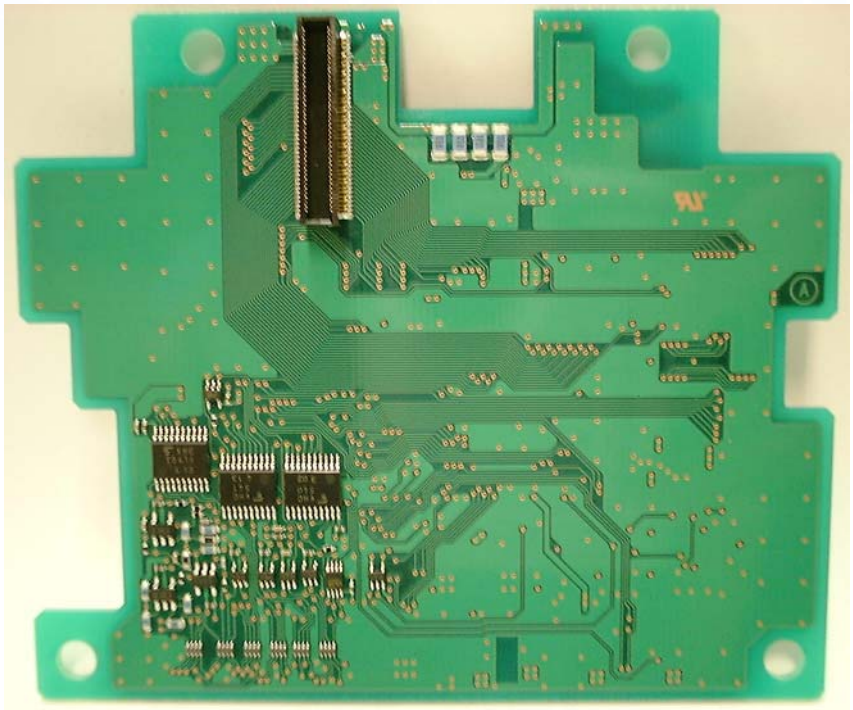
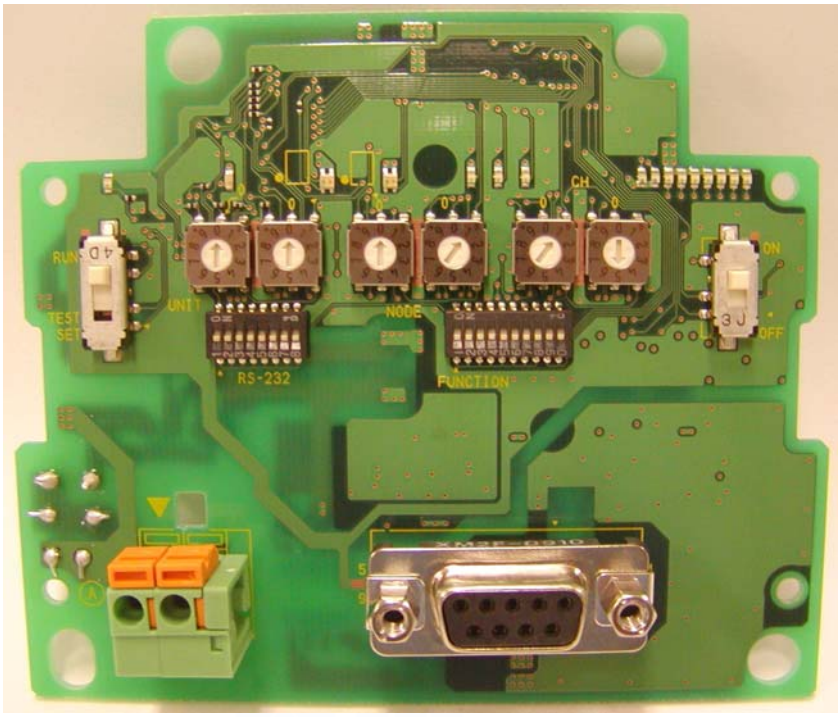
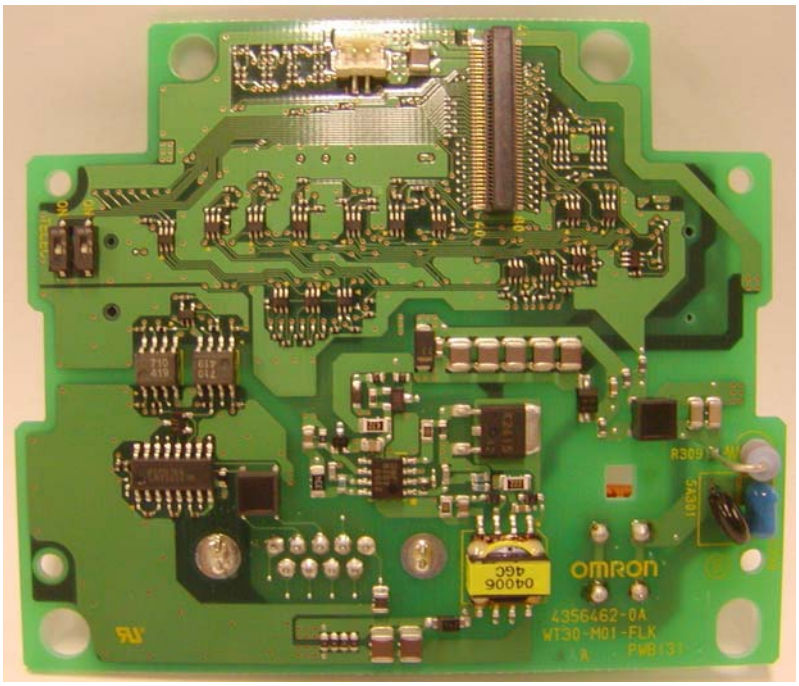

U
A66
310
Y1226YA-1
S2
MM V


J38
920
SHARP
IX-3071YAZZ
HG73C069IE
0J15 JAPAN


OMRON
WT30 PWB(1)
4356460-3A A
M30855FHGP
REV. 2.2




RUN
TEST
SET
UNIT
NODE
CH
ON
OFF
RS-232
FUNCTION


OMRON
4356462-0A
WT30-M01-FLK

3.2 Power supply system utilised

Power supply voltage : 24 V / DC

3.3 Short description of the Equipment under Test (EuT)

The EuT WT30 comprises a serial master and a single I/O slave or more. Serial master is connected with a personal computer or PLC via RS-232C and collects ON/OFF data from I/O slaves by using the radio.

Number of tested samples: 4 (1 master and 3 slaves)
Serial number: Prototype

EuT operation mode:

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

- Test mode CW

- Test mode digital modulated (PN9)

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:

-	RS-232C communication cable	Model :	standard
-	I/O data cable	Model :	universal
-	Antenna cable	Model :	coaxial
-		Model :	
-		Model :	
-		Model :	

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

MIKES BABT Product Service GmbH
Ohmstrasse 2-4
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. 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 MIKES BABT Product Service GmbH 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 has the sole responsibility of continued compliance of the device.

4.4 Measurement Protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22 (1997), European Standard EN 55022 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). 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.

4.4.1.2 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 MIKES BABT Product Service GmbH 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.

4.4.1.3 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 it’s characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

4.4.2.1 General Standard Information

The test methods used comply with CISPR Publication 22 (1997), EN 55022 (2001) 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."

4.4.2.2 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 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 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.

4.4.2.3 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.

4.5 Discovery of worst case measurement conditions

To find out the worst case, 1 master and 3 different slaves have been tested with different antenna configurations.
The tests pointed out that the master with the magnetic antenna has maximal radiated emissions.
Therefore the complete compliance test has been performed with the WT30-M01-FLK and the magnetic antenna.

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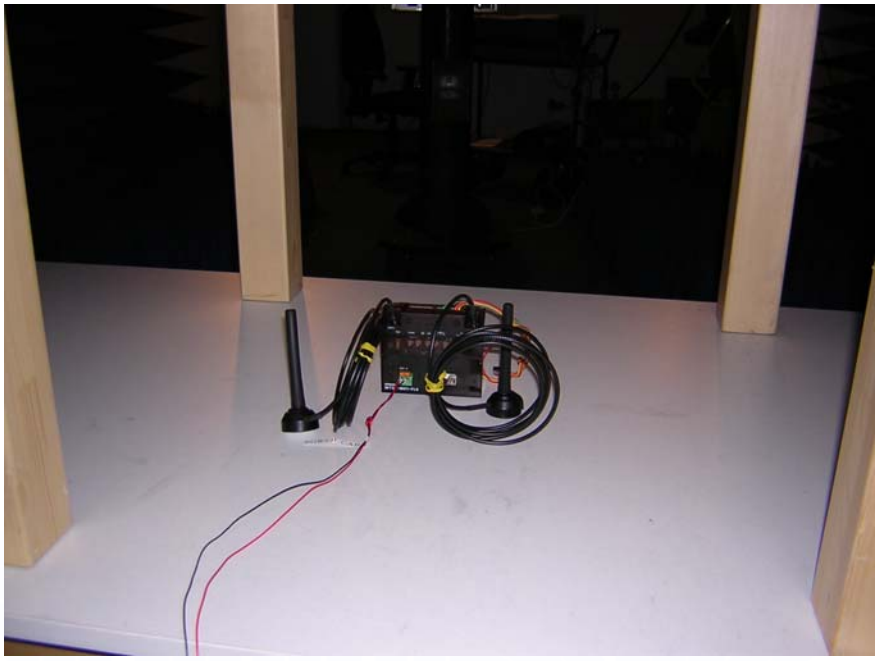
4.6 Radiated power of fundamental wave

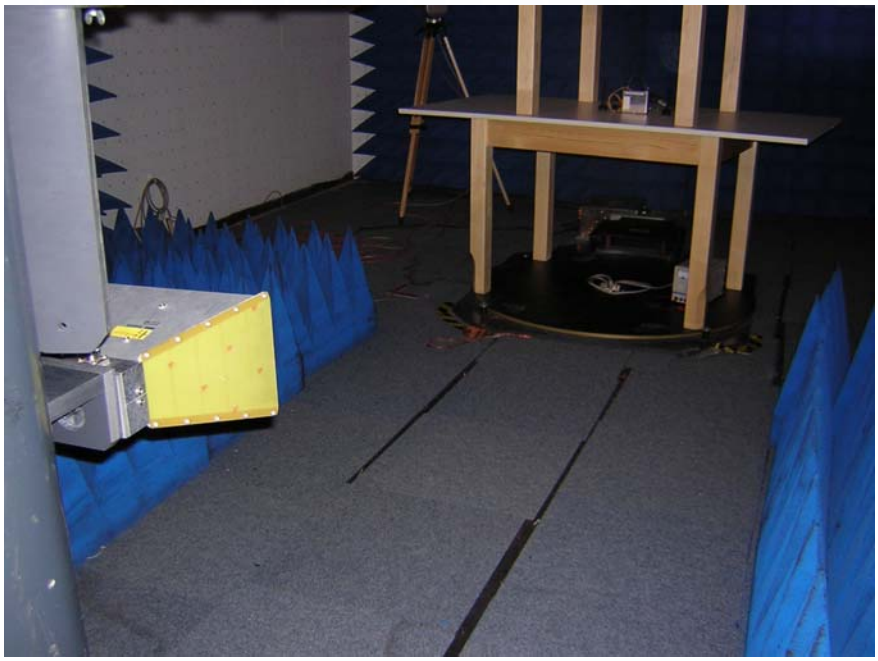
For test instruments and accessories used see section 6 Part **CPR 3**.

4.6.1 Description of the test location

Test location: Anechoic Chamber A2

4.6.2 Photo documentation of the test set-up





4.6.3 Test result

Channel	Frequency [MHz]	Peak Power Output (dBm)	Correct. [dB]	Corr. Peak Power Output (dBm)	Peak Power Limit (dBm)	Delta [dB]
1	2401.0	3.5	5.6	9.1	30	-20.9
17	2439.4	1.2	5.9	7.1	30	-22.9
34	2480.2	0.3	6.2	6.5	30	-23.5

Peak Power Limit according to FCC Subpart 15.247(b) (3)

Frequency (MHz)	Peak Power Limit	
	(dBm)	(Watt)
902-928	30	1,0
2400-2483.5	**30**	**1,0**
5725-5850	30	1,0

The requirements are **FULFILLED.**

Remarks: _____

4.7 Radiated emissions (electric field) 30 MHz – 40 GHz

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

4.7.1 Description of the test location

Test location: OATS1

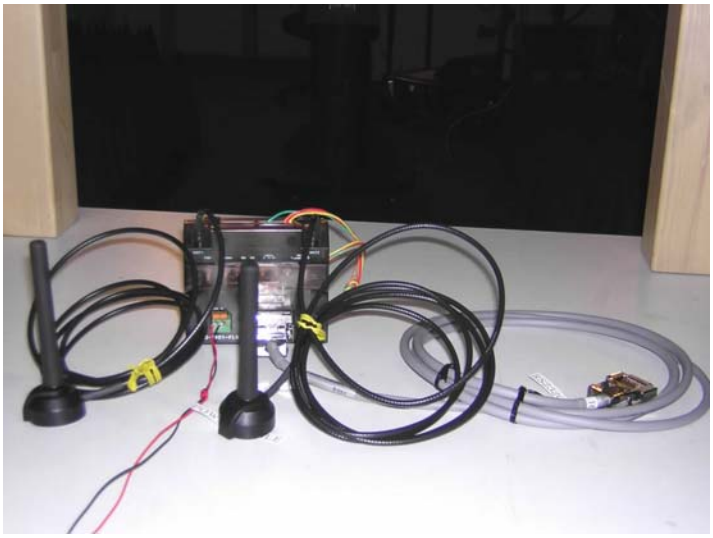
Test location: Anechoic Chamber A2

Test distance: 3 metres

4.7.2 Photo documentation of the test set-up

OATS 1: SER2

Anechoic Chamber A2: SER 3



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4.7.3 Test result

Testresult in detail:(<1GHz)

Channel	Frequency [MHz]	L: QP [dBµV]	Bandwidth [kHz]	Correct. [dB]	L: QP [dBµV/m]	Limit [dBµV/m]	Delta [dB]
1	30 - 1000		120		< 10		
17	30 - 1000		120		< 10		
34	30 - 1000		120		< 10		

Testresult in detail:(>1GHz)

Channel 1: 2401.0 MHz

Field strength of fundamental wave as reference for radiated emissions: 99.3 dBµV/m

Frequency [MHz]	L: PK [dBµV]	Corr. Duty Cycle [dB]	L: AV [dBµV] *)	Band-width [kHz]	Correct. [dB]	L: PK [dBµV/m]	L: AV [dBµV/m]	Limit AV [dBµV/m]	Delta [dB]
3714	44.5	-	-	100	-5.5	39.0	-	54	-15.0
4804	54.9	-	-	100	-3.8	51.5	-	54	-2.5
7436	43.2	-	-	100	-0.9	42.3	-	54	-11.7

Channel 17: 2439.4 MHz

Field strength of fundamental wave as reference for radiated emissions: 98.4 dBµV/m

Frequency [MHz]	L: PK [dBµV]	Corr. Duty Cycle [dB]	L: AV [dBµV] *)	Band-width [kHz]	Correct. [dB]	L: PK [dBµV/m]	L: AV [dBµV/m]	Limit AV [dBµV/m]	Delta [dB]
3716	45.1	-	-	100	-5.5	39.6	-	54	-14.4
4881	52.6	-	-	100	-3.2	49.4	-	54	-4.6
7434	43.9	-	-	100	-0.9	43.0	-	54	-11.0

Channel 34: 2480.2 MHz

Field strength of fundamental wave as reference for radiated emissions: 98.6 dBµV/m

Frequency [MHz]	L: PK [dBµV]	Corr. Duty Cycle [dB]	L: AV [dBµV] *)	Band-width [kHz]	Correct. [dB]	L: PK [dBµV/m]	L: AV [dBµV/m]	Limit AV [dBµV/m]	Delta [dB]
3715	45.1	-	-	100	-5.5	39.6	-	54	-14.4
4960	53.2	-	-	100	-2.8	50.4	-	54	-3.6
7443	44.0	-	-	100	-0.9	43.1	-	54	-10.9

Peak-Limit according to FCC Subpart 15.247(c)

In any 100 kHz bandwidth outside the frequency band 2400 – 2483.50 MHz, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required.

Limit according to FCC Subpart 15.209

Frequency [MHz]	Limits acc. 15.209 [dBµV/m]	Limits acc. 15.247(c) [dBµV/m]			Final Radiated Limits [dBµV/m]		
		Ch 1	Ch 17	Ch 34	Ch 1	Ch 17	Ch 34
30-88	40	79.3	78.4	78.6	40	40	40
88-216	43,5	79.3	78.4	78.6	43.5	43.5	43.5
216-960	46	79.3	78.4	78.6	46	46	46
Above 960	54	79.3	78.4	78.6	54	54	54

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209

MHz	MHz	GHz
25.5 – 25.67	960 – 1240	4.5 – 5.15
37.5 – 38.25	1300 – 1427	5.35 – 5.46
73 – 74.6	1435 – 1626.5	7.25 – 7.75
74.8 – 75.2	1645.5 – 1646.5	8.025 – 8.5
108 – 121.94	1660 – 1710	9.0 – 9.2
123 – 138	1718.8 – 1722.2	9.3 – 9.5
149.9 – 150.05	2200 – 2300	10.6 – 12.7
156.52475 – 156.52525	2310 – 2390	13.25 – 13.4
156.7 – 156.9	2483.5 – 2500	14.47 – 14.5
162.0125 – 167.17	2655 – 2900	15.35 – 16.2
167.72 – 173.2	3260 – 3267	17.7 – 21.4
240 – 285	3332 – 3339	22.01 – 23.12
322 – 335.4	3345.8 – 3358	23.6 – 24.0
399.9 – 410	3600 – 4400	31.2 – 31.8
608 – 614		36.43 – 36.5

The requirements are **FULFILLED.**

Remarks: During the test, the Eut was set into normal modulation mode as intended for use.

The measurement was performed up to the 10th harmonic (25000MHz).

4.8 Correction for Pulse Operation (Duty Cycle)

For test instruments and accessories used see section 6 Part **DC**.

4.8.1 Description of the test location

Test location: AREA4

4.8.2 Description of Measurement

The Duty cycle factor, expressed in dB, is arrived by taking the following formula:

$$K_E = 20 \log [(t_{iB} * p)/T_w]$$

K_E: pulse operation correction factor [dB]
t_{iw} pulse duration for one complete pulse track [msec]
t_{iB} pulse duration for one pulse [msec]
T_w a period of the pulse track [msec]
p number of pulses in one train

4.8.3 Test result

t_{iw} [msec]	T_w [msec]	t_{iB} [msec]	p	K_E [dB / %]
12.0	12.0	2.4	1	-14 / 20

Remarks: There is no need of correction for pulse operation due to the peak-values are below the average-limit.

4.9 6dB Bandwidth Measurement

For test instruments and accessories used see section 6 Part **MB**.

4.9.1 Description of the test location

Test location: AREA4

4.9.2 Test result

Channel	Fundamental Frequency [MHz]	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)
1	2401.0	1.022	0.500
17	2439.4	0.993	0.500
34	2480.2	1.038	0.500

Limit according to FCC Subpart 15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz

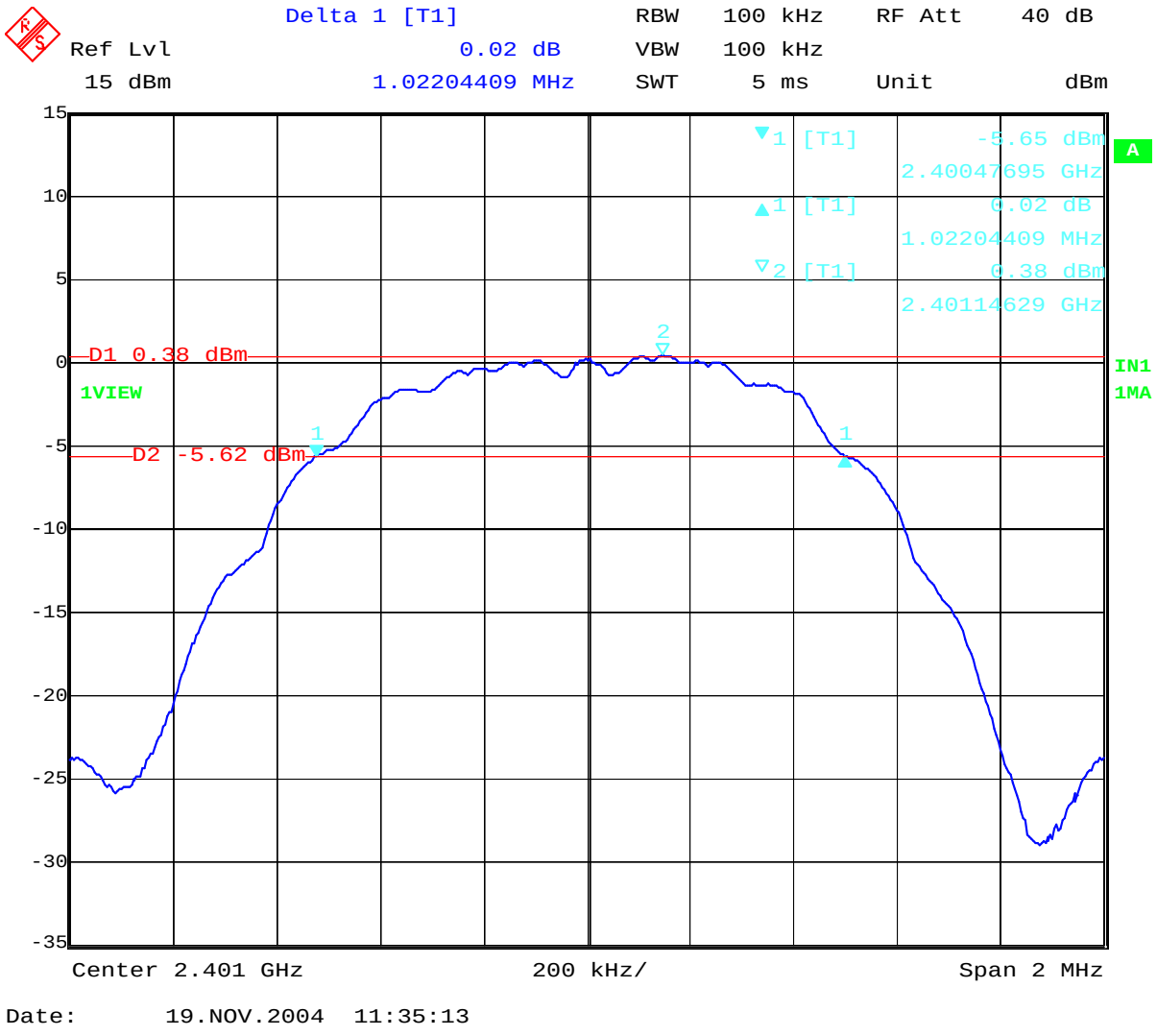
The requirements are **FULFILLED.**

Remarks: For detailed results, see the following page(s).

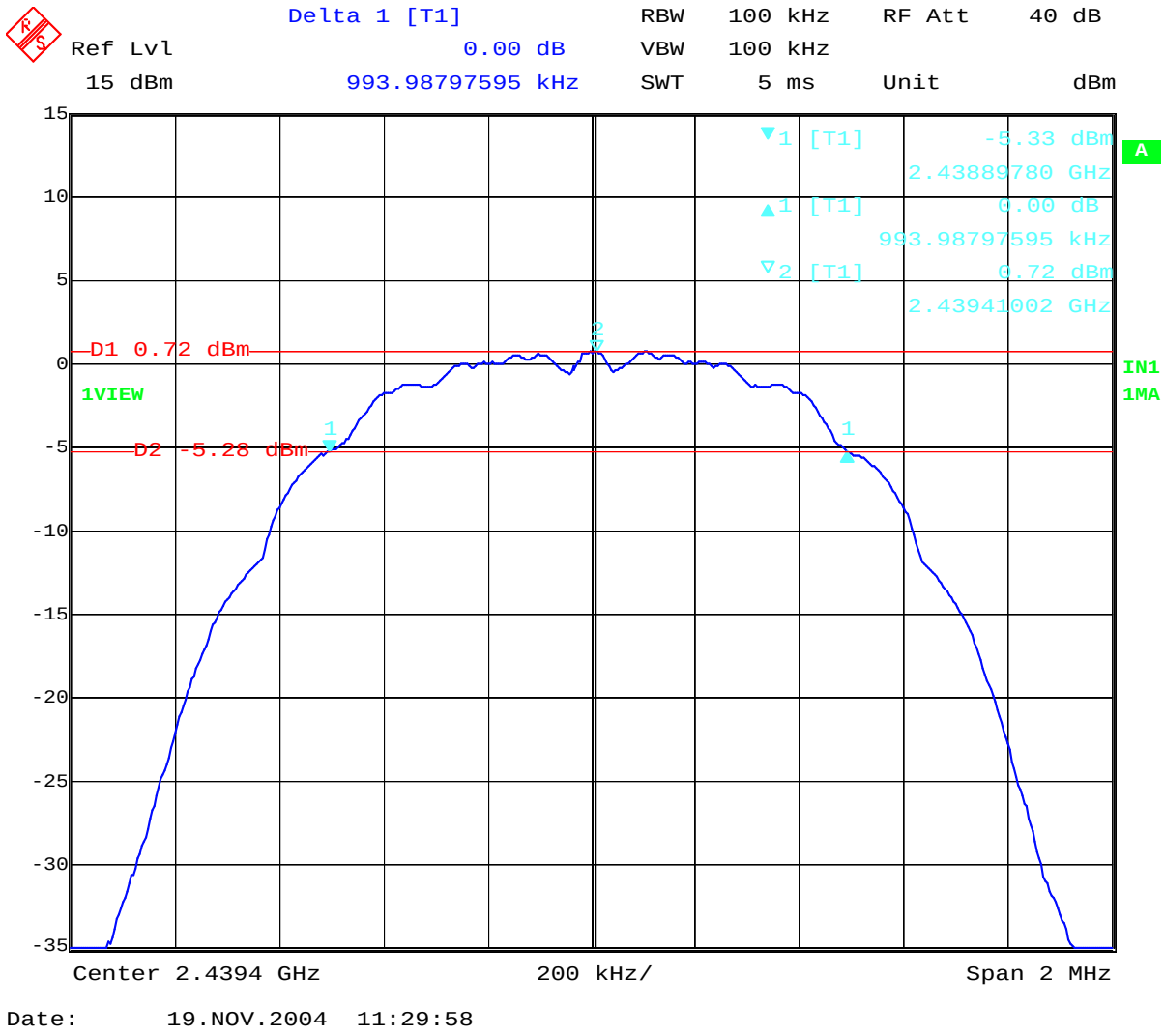
4.9.3 Test protocol

6dB Bandwidth Measurement
FCC Part 15 Subpart 15.247(a) (2)

Channel 1:



Channel 17:



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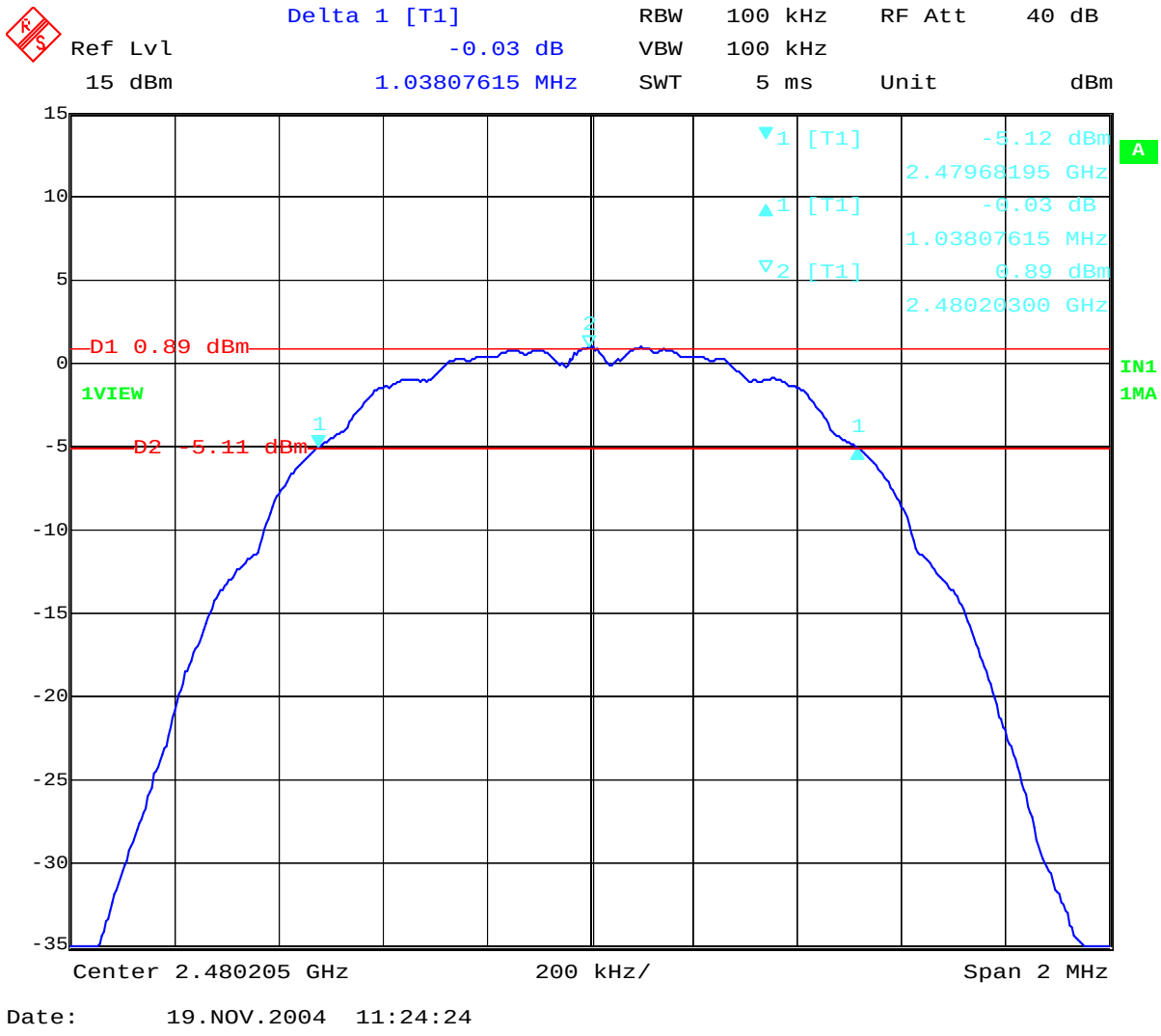
Channel 34:


Delta 1 [T1]
RBW 100 kHz
RF Att 40 dB
Ref Lvl
-0.03 dB
VBW 100 kHz
15 dBm
1.03807615 MHz
SWT 5 ms
Unit dBm
1 [T1] -5.12 dBm
2.47968195 GHz
1 [T1] -0.03 dB
1.03807615 MHz
2 [T1] 0.89 dBm
2.48020300 GHz
D1 0.89 dBm
D2 -5.11 dBm
1VIEW
A
IN1
1MA
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
Center 2.480205 GHz
200 kHz/
Span 2 MHz
Date: 19.NOV.2004 11:24:24

4.10 Peak Power Density

For test instruments and accessories used see section 6 Part **PPD**.

4.10.1 Description of the test location

Test location: AREA4

4.10.2 Test result

Channel	Fundamental Frequency [MHz]	BANDWIDTH (kHz)	Peak Power density (dBm)
1	2401.0	3	-16.5
17	2439.4	3	-16.6
34	2480.2	3	-16.6

Limit according to FCC Subpart 15.247 (d)

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band.

The requirements are **FULFILLED.**

Remarks: _____

_____

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4.11 Receiver conducted disturbances 0.15 - 30 MHz

For test instruments and accessories used see section 6 Part **A 4**.

4.11.1 Description of the test location

Test location:

4.11.2 Photo documentation of the test set-up

4.11.3 Test result

Frequency range:

Min. limit margin

The requirements are

Remarks: The measurement is not applicable.

4.12 Receiver radiated emissions (electric field) 30 MHz - 40 GHz

For test instruments and accessories used see section 6 Part **SER2** and **SER3**.

4.12.1 Description of the test location

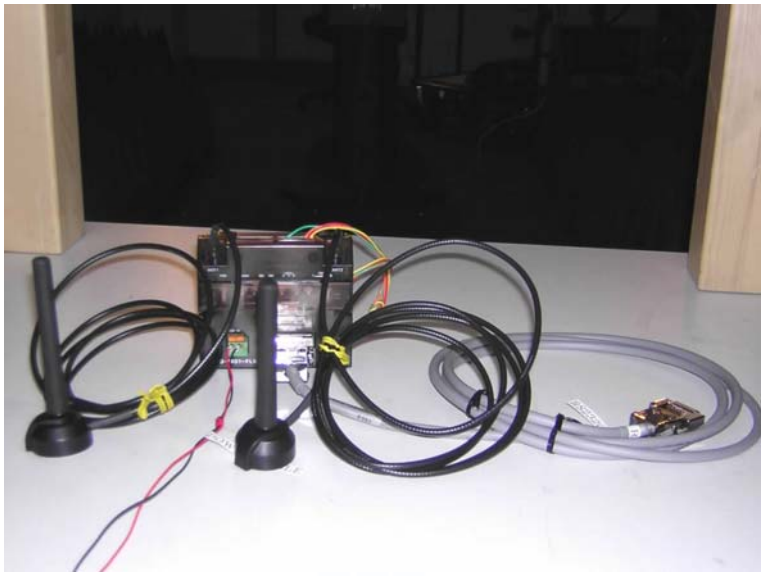
Test location: OATS1
Test location: Anechoic Chamber A2

Test distance: 3 metres

4.12.2 Photo documentation of the test set-up

OATS1: SER2

Anechoic chamber A2: SER3



4.12.3 Test result <1GHz

Channel	Frequency [MHz]	L: QP [dBµV]	Bandwidth [kHz]	Correct. [dB]	L: QP [dBµV/m]	Limit [dBµV/m]	Delta [dB]
1	30 - 1000		120		< 10		
17	30 - 1000		120		< 10		
34	30 - 1000		120		< 10		

4.12.4 Test result >1GHz

Channel 1, 17, 34

Frequency [MHz]	L: PK [dBµV]	L: AV [dBµV]	Bandwidth [kHz]	Correct. [dB]	L: PK [dBµV/m]	L: AV [dBµV/m]	Limit [dBµV/m]	Delta [dB]
1080	62.4	-	100	-15.1	47.3	-	54	-6.7
1438	48.6	-	100	-13.9	34.7	-	54	-19.3
2158	42.6	-	100	-11.4	31.2	-	54	-22.8
4327	57.4	-	100	-5.1	52.3	-	54	-1.7
8645	41.6	-	100	3.5	45.1	-	54	-8.9

Limit according to FCC Subpart 15.109(a)

Frequency of emission [MHz]	Field strength Limits [µV/m]	Field strength Limits [dBµV/m]
30-88	100	40
88-216	150	44
216-960	200	46
Above 960	500	54

The requirements are **FULFILLED.**

Remarks: The measurement was performed up to the 5th harmonic (12000 MHz).

The emissions are independent of selected channel.

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5 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model / Type	Kind of Equipment	Manufacturer	Equipment No.
CPR3	Peaktech 6015 A	DC Power Supply	BÜRKLIN	04-07/49-03-003
	SM 01	Switchmatrix 1-18 GHz	MBPS GmbH	04-07/60-04-215
	BBHA-9120 E	Horn Antenna 0,5-6 GHz	Schwarzbeck Mess-Elektronik	04-07/62-03-007
	ESIB 40	Test Receiver	Rohde & Schwarz München	04-07/63-03-002
DC	Peaktech 6015 A	DC Power Supply	BÜRKLIN	04-07/49-03-003
	ESIB 40	Test Receiver	Rohde & Schwarz München	04-07/63-03-002
MB	Peaktech 6015 A	DC Power Supply	BÜRKLIN	04-07/49-03-003
	ESIB 40	Test Receiver	Rohde & Schwarz München	04-07/63-03-002
PPD	NRVD	Dual Channel Power Mete	Rohde & Schwarz München	04-07/32-04-001
	Tektronix THS 730A	Handheld Scope	Tektronix GmbH	04-07/38-02-001
	Peaktech 6015 A	DC Power Supply	BÜRKLIN	04-07/49-03-003
	ESIB 40	Test Receiver	Rohde & Schwarz München	04-07/63-03-002
	SMT 03	Signal Generator	Rohde & Schwarz München	04-07/64-01-005
SER2	Peaktech 6015 A	DC Power Supply	BÜRKLIN	04-07/49-03-003
	HCC	Controller Ant.-Mast	Rohde & Schwarz München	04-07/59-97-002
	Sucofeed 7/8	RF Cable	Huber+Suhner	04-07/60-04-089
	NW-2000-NB	RF Cable	MBPS GmbH	04-07/60-04-205
	EF393-21N-15m	RF Cable	Huber+Suhner	04-07/60-04-258
	VULB 9165	Super Broadband Antenn	Schwarzbeck Mess-Elektronik	04-07/62-00-001
	ESVS 30	Test Receiver	Rohde & Schwarz München	04-07/63-04-001
	Antenna Mast	Antenna Mast	Rohde & Schwarz München	04-07/92-97-002
SER3	Peaktech 6015 A	DC Power Supply	BÜRKLIN	04-07/49-03-003
	SM 01	Switchmatrix 1-18 GHz	MBPS GmbH	04-07/60-04-215
	WBH2-18HN	Horn Antenna 2-18 GHz	EMCO Elektronik GmbH	04-07/62-03-004
	BBHA-9120 E	Horn Antenna 0,5-6 GHz	Schwarzbeck Mess-Elektronik	04-07/62-03-007
	ESIB 40	Test Receiver	Rohde & Schwarz München	04-07/63-03-002

ATTACHMENT A1

Alternative antenna configurations:

Flat antenna

Whip antenna

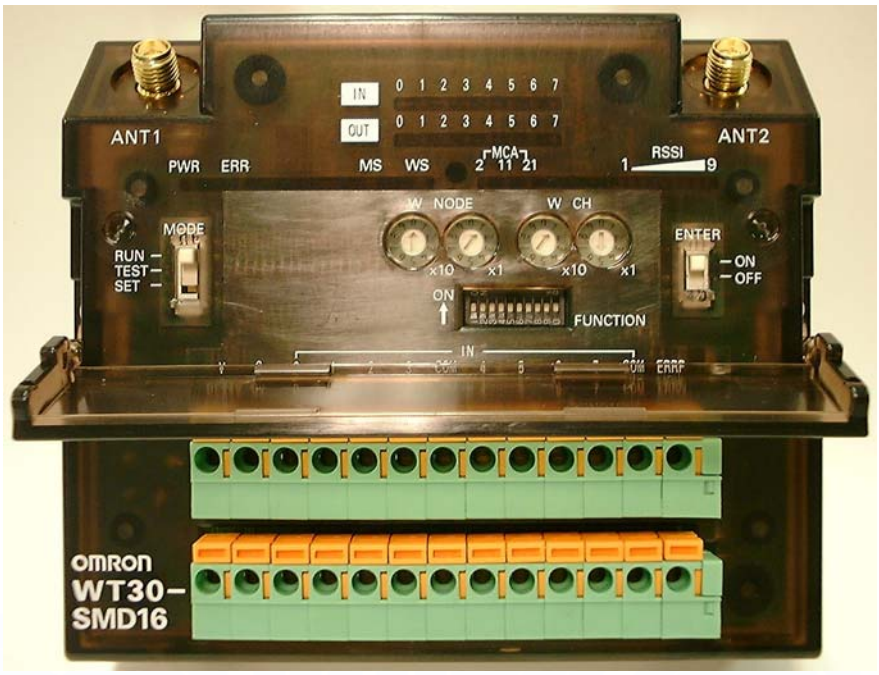
ATTACHMENT A2

Identical equipment defined as slaves:

WT30-SID16

ATTACHMENT A3

WT30-SMD16



ATTACHMENT A4

WT30-SMD16-1