



FCC ID: DO4WRTZ1000

Registration No. DAT-P-207/05

EMI -- TEST REPORT

- FCC Part 15.247 FHSS-

Test Report No. : T34121-01-00HU	03. May 2010
	Date of issue

Type / Model Name : WRTZ - 1000

Product Description : RFID UHF Reader

Applicant : Checkpoint Systems, Inc.

Address : 101 Wolf Drive, Thorofare
New Jersey, USA 08086

Manufacturer : Checkpoint Systems, Inc.

Address : 101 Wolf Drive, Thorofare
New Jersey, USA 08086

Licence holder : Checkpoint Systems, Inc.

Address : 101 Wolf Drive, Thorofare
New Jersey, USA 08086

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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DAT-P-207/05-00

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.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2009)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart B - Unintentional Radiators (October, 2009)

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

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2009)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

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.
ANSI C95.1:1992	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 frequency range was scanned from 9 kHz to 10 GHz.

All emissions not reported in this test report were more than 10 dB below the specified limit.

The EuT is a frequency hopping system using 50 channels in the frequency band from 902 to 928 MHz.

The antenna UHF RFID Antenna (8.2 dBic) are provided with the EuT:

- UHF RFID antenna: Type 520 10073 (8.2 dBic)

Measurements have been made with power settings of 30.0 dBm.

The EuT is declared as Class A digital device. The EuT fulfills the requirements of a class B device.

It is not possible to set the EuT only in receiving mode.

FINAL ASSESSMENT:

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

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

Testing commenced on : 17. March 2010

Testing concluded on : 25. March 2010

Checked by:

Tested by:

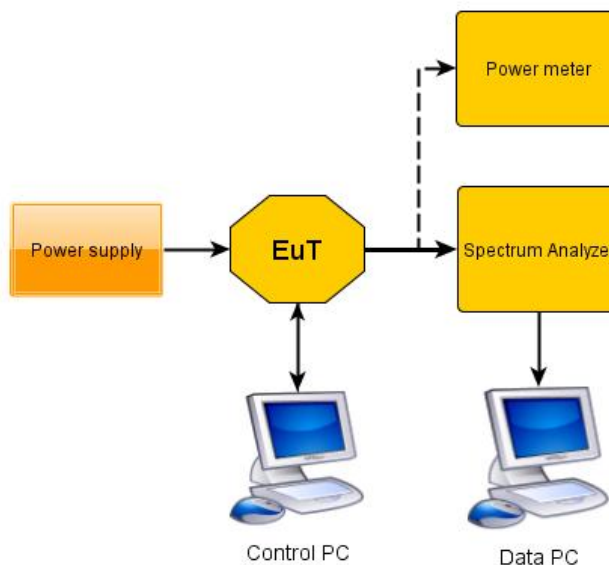
Thomas Weise
Dipl.-Ing.(FH)
Laboratory Manager

Markus Huber

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see Attachment A

3.2 Test setup



3.3 Power supply system utilised

Power supply voltage: : 100-240 V / 50-60 Hz / 1 ϕ , 12 V DC

3.4 Short description of the EUT

The EuT WRTZ - 1000 is a UHF RFID reader. It can read active and passive Tags in the frequency range from 902 to 928 MHz. 8 antenna connectors are available.

Number of tested samples: 1
Serial number: Prototype

EUT operation mode:

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

- TAG reading mode supplying 30.0 dBm

- Standby mode

-

EUT configuration:

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

- | | |
|----------------------------------|--|
| - <u>Test software</u> | Model : <u>Supplied by manufacturer Checkpoint</u> |
| - <u>Lap Top</u> | Model : <u>Supplied by manufacturer Checkpoint</u> |
| - <u>Antenna</u> | Model : <u>Kathrein Type No. 520 10073</u> |
| - <u>PSU (Power Supply Unit)</u> | Model : <u>XP Power Supply – AEB70US12</u> |
| - <u>PSU (Power Supply Unit)</u> | Model : <u>EOS – Red Rocket – LFZVC60NP12E4</u> |
| - _____ | Model : _____ |
- customer specific cables

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners 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 may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners 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 diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

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 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.

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.

4.4.1.2 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.

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5 TEST CONDITIONS AND RESULTS

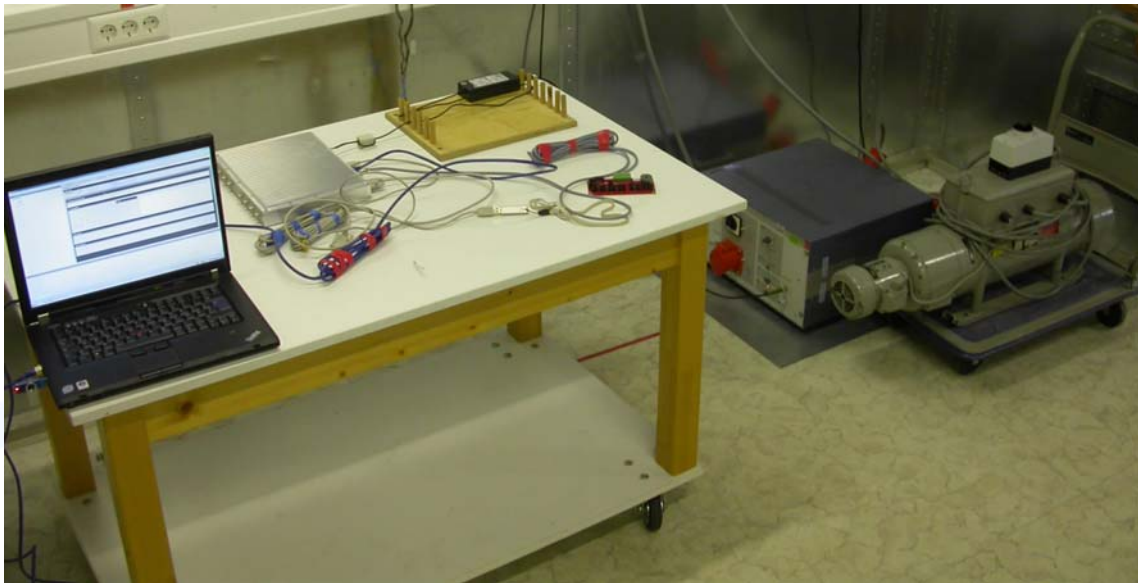
5.1 Conducted emissions

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

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15C, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

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

* Decreases with the logarithm of the frequency

5.1.4 Description of Measurement

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 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 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.

To convert between dBµV and µV, the following conversions apply:

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

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 3.5 dB at 455.0 kHz
(Test point N, Standby mode, EOS – Red Rocket – LFZVC60NP12E4)

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols.

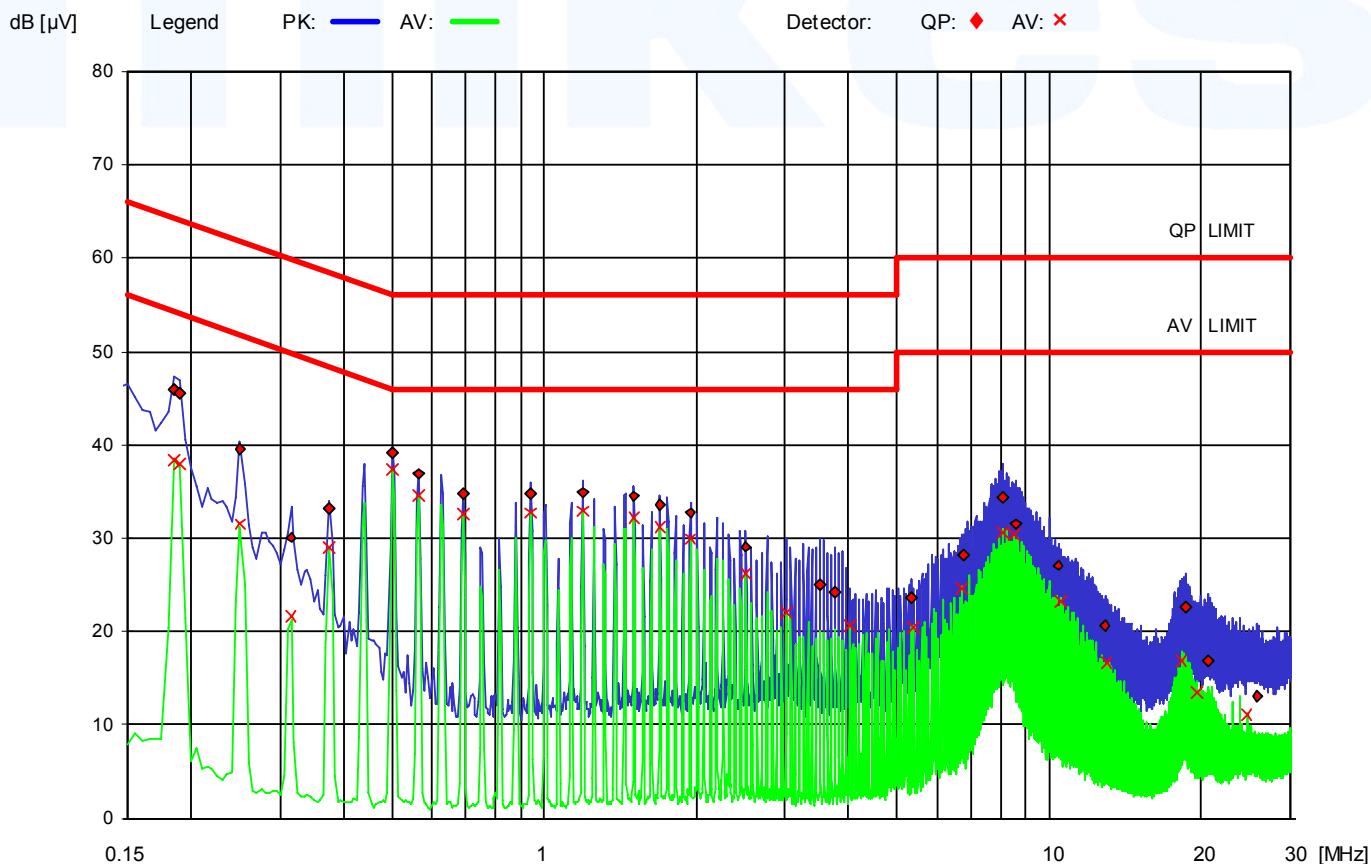
5.1.6 Test protocol

Test point L1
 Operation mode: Tag reading mode supplying 30.0 dBm
 Remarks: XP Power Supply – AEB70US12

Result: Passed

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
185	45,9	18,4	185	38,4	15,9
190	45,5	18,5	190	37,9	16,1
250	39,5	22,3	250	31,5	20,3
315	30,1	29,7	315	21,6	28,2
375	33,2	25,2	375	29	19,4
500	39,2	16,8	500	37,4	8,6
565	36,9	19,1	565	34,6	11,4
690	34,7	21,3	690	32,6	13,4
940	34,8	21,2	940	32,7	13,3
1190	34,9	21,1	1190	32,9	13,1
1505	34,5	21,5	1505	32,2	13,8
1695	33,6	22,4	1695	31,2	14,8
1945	32,7	23,3	1945	29,9	16,1
2510	29,1	26,9	2510	26,2	19,8
3510	25	31,0	3010	22	24,0

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
3765	24,2	31,8	4015	20,6	25,4
5335	23,6	36,4	5395	20,5	29,5
6775	28,2	31,8	6715	24,6	25,4
8095	34,4	25,6	8095	30,6	19,4
8590	31,5	28,5	8535	30,4	19,6
10415	27,1	32,9	10540	23,2	26,8
12865	20,7	39,3	12990	16,6	33,4
18630	22,6	37,4	18260	16,8	33,2
20590	16,8	43,2	19640	13,5	36,5
25840	13,1	46,9	24555	11,1	38,9

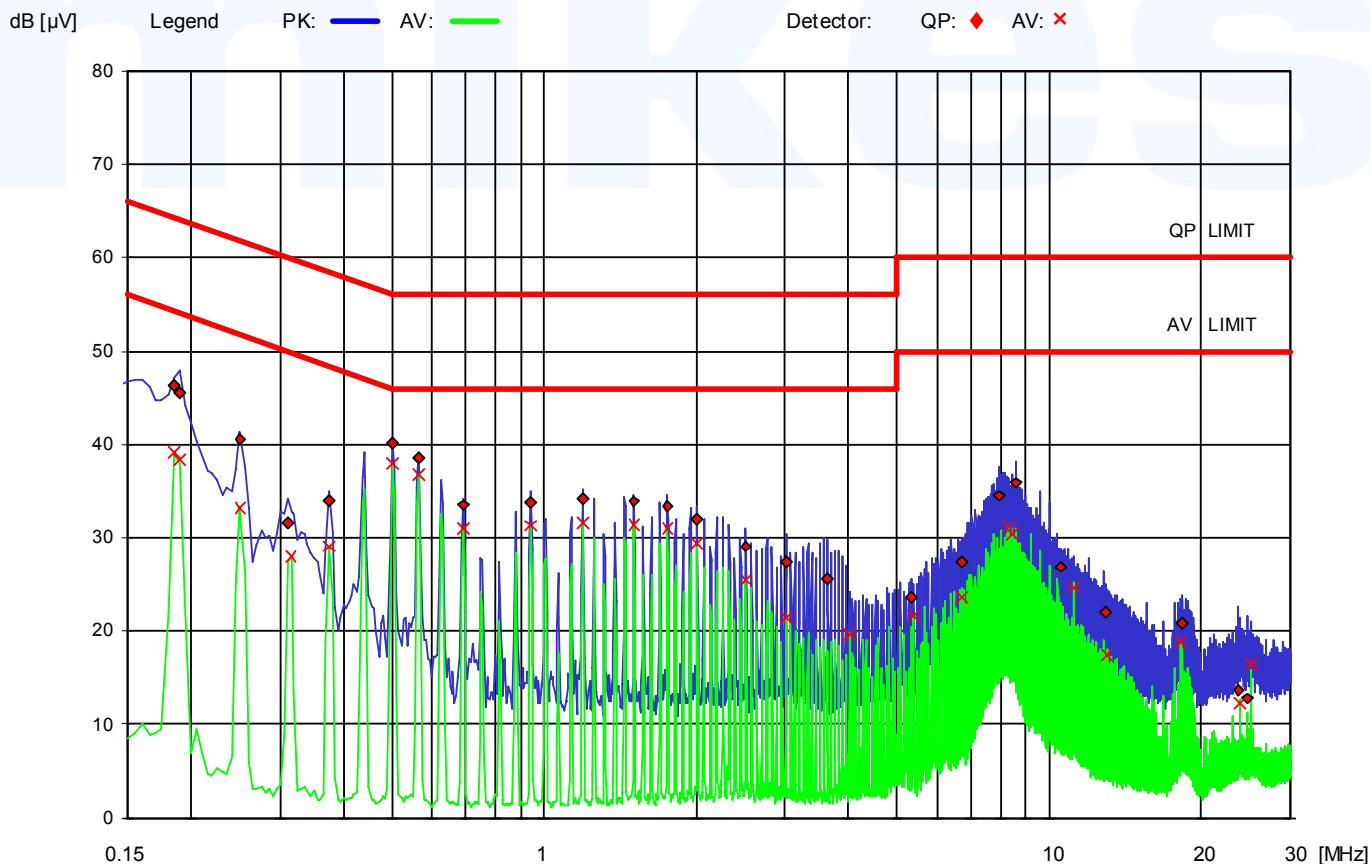


Test point: N
 Operation mode: Tag reading mode supplying 30.0 dBm
 Remarks: XP Power Supply – AEB70US12

Result: Passed

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
185	46,3	18,0	185	39,1	15,2
190	45,6	18,4	190	38,4	15,6
250	40,6	21,2	250	33,2	18,6
310	31,6	28,4	315	28	21,8
375	34	24,4	375	29,1	19,3
500	40,1	15,9	500	37,9	8,1
565	38,6	17,4	565	36,8	9,2
690	33,5	22,5	690	31	15,0
940	33,8	22,2	940	31,3	14,7
1190	34,1	21,9	1190	31,6	14,4
1505	33,9	22,1	1505	31,4	14,6
1755	33,4	22,6	1755	31	15,0
2005	32	24,0	2005	29,4	16,6
2510	29,1	26,9	2510	25,5	20,5
3010	27,4	28,6	3010	21,4	24,6

Freq kHz	QP- L dB[μV]	D -Limit QP [dB]	Freq kHz	AV-L dB[μV]	D -Limit AV [dB]
3635	25,6	30,4	4015	19,7	26,3
5330	23,6	36,4	5395	21,6	28,4
6715	27,4	32,6	6715	23,6	26,4
7970	34,5	25,5	8280	31,2	18,8
8590	35,9	24,1	8440	30,4	19,6
10535	26,9	33,1	11190	24,7	25,3
12920	22,1	37,9	12985	17,4	32,6
18305	20,8	39,2	18240	18,9	31,1
23715	13,7	46,3	23780	12,2	37,8
24660	12,8	47,2	25000	16,5	33,5



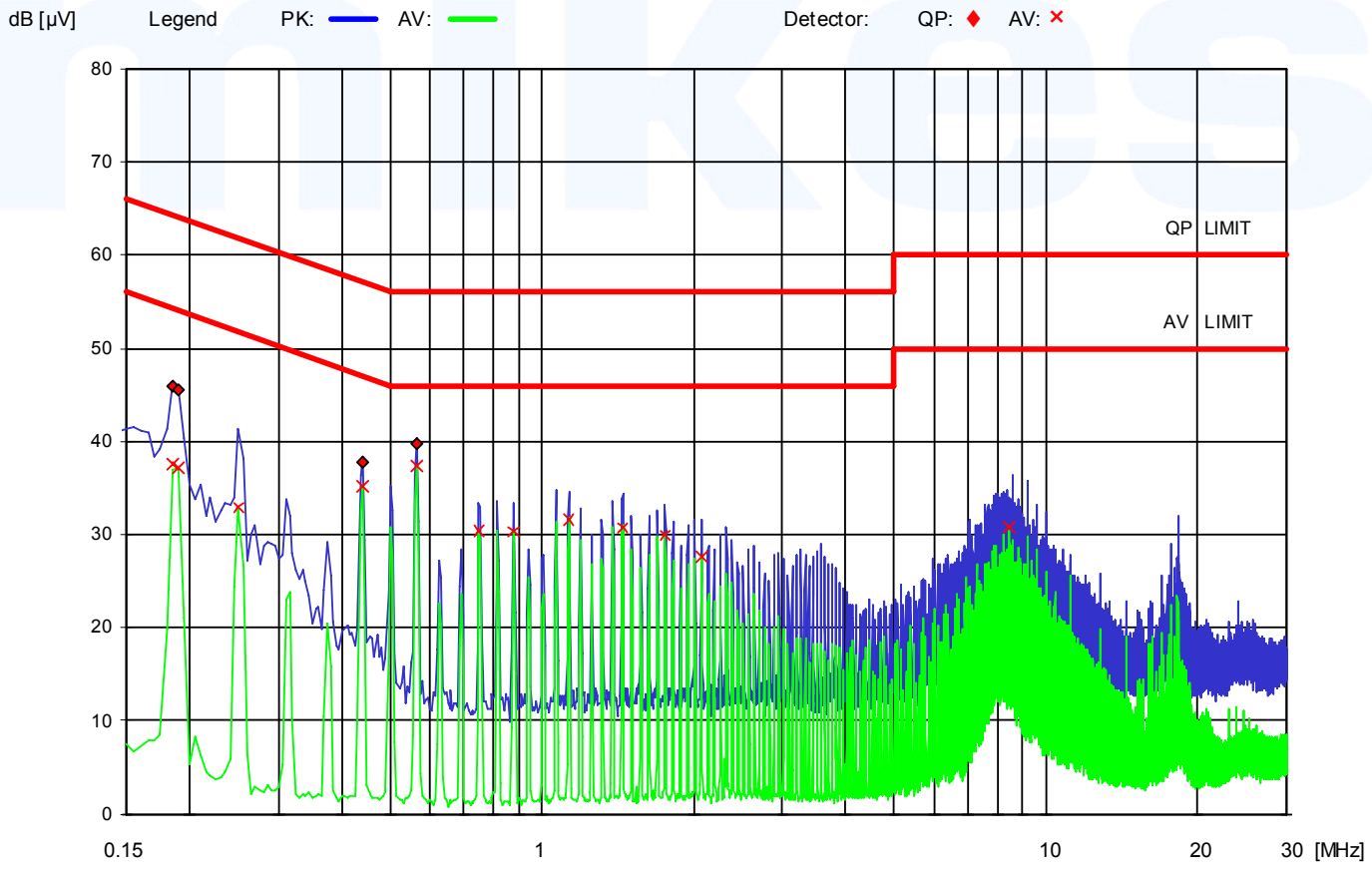
FCC ID: DO4WRTZ1000

Test point: L1
 Operation mode: Standby mode
 Remarks: XP Power Supply – AEB70US12

Result: Passed

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]
185	45,9	18,4	185	37,6	16,7
190	45,5	18,5	190	37,1	16,9
440	37,8	19,3	250	32,9	18,9
565	39,8	16,2	440	35,2	11,9
			565	37,4	8,6
			750	30,4	15,6
			880	30,3	15,7
			1130	31,6	14,4
			1445	30,7	15,3
			1755	29,9	16,1
			2070	27,6	18,4
			8450	30,8	19,2

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]



FCC ID: DO4WRTZ1000

Test point: N
Operation mode: Standby mode
Remarks: XP Power Supply – AEB70US12

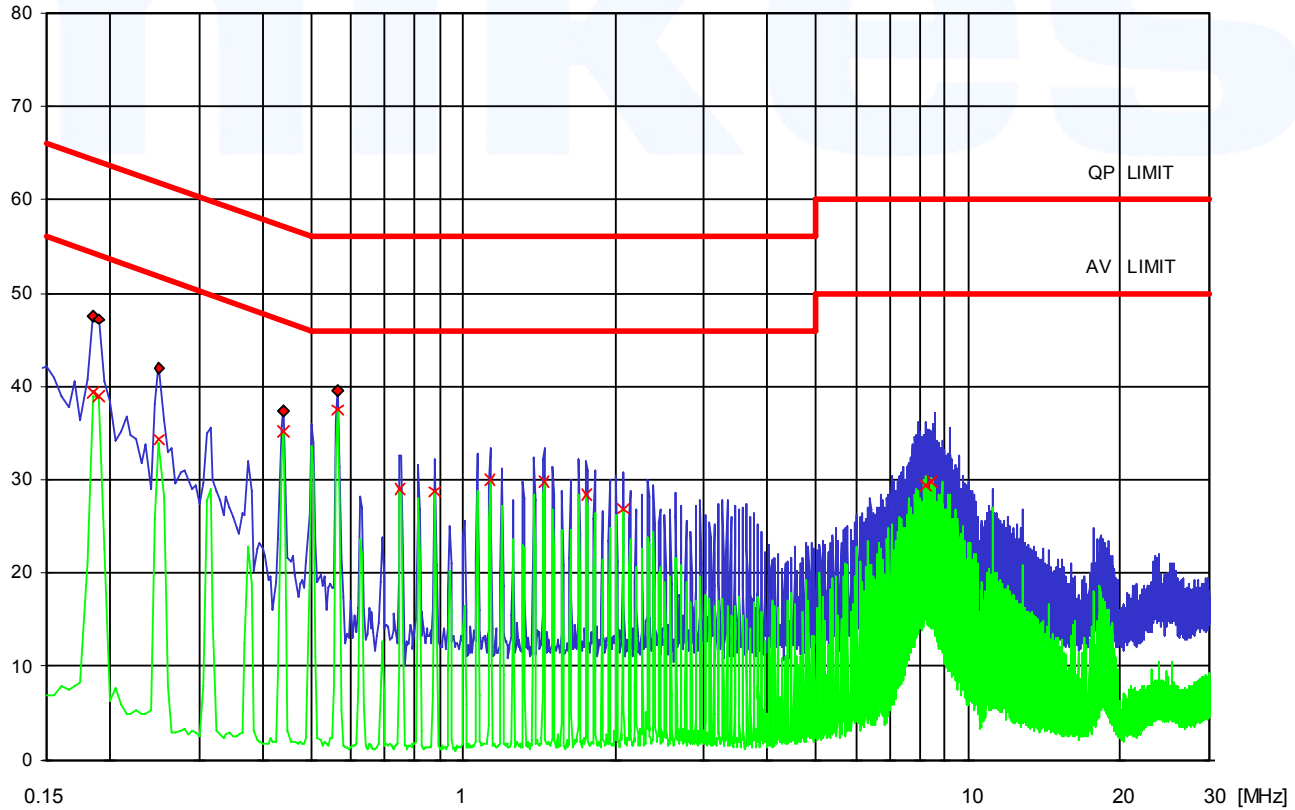
Result: Passed

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]
185	47,5	16,8	185	39,3	15,0
190	47,2	16,8	190	38,9	15,1
250	42	19,8	250	34,3	17,5
440	37,3	19,8	440	35,1	12,0
565	39,6	16,4	565	37,5	8,5
			750	29	17,0
			880	28,7	17,3
			1130	30	16,0
			1445	29,8	16,2
			1755	28,4	17,6
			2070	26,9	19,1
			8225	29,4	20,6
			8475	29,8	20,2

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]

Legend PK: AV: — —

Detector: QP: ◆ AV: ×



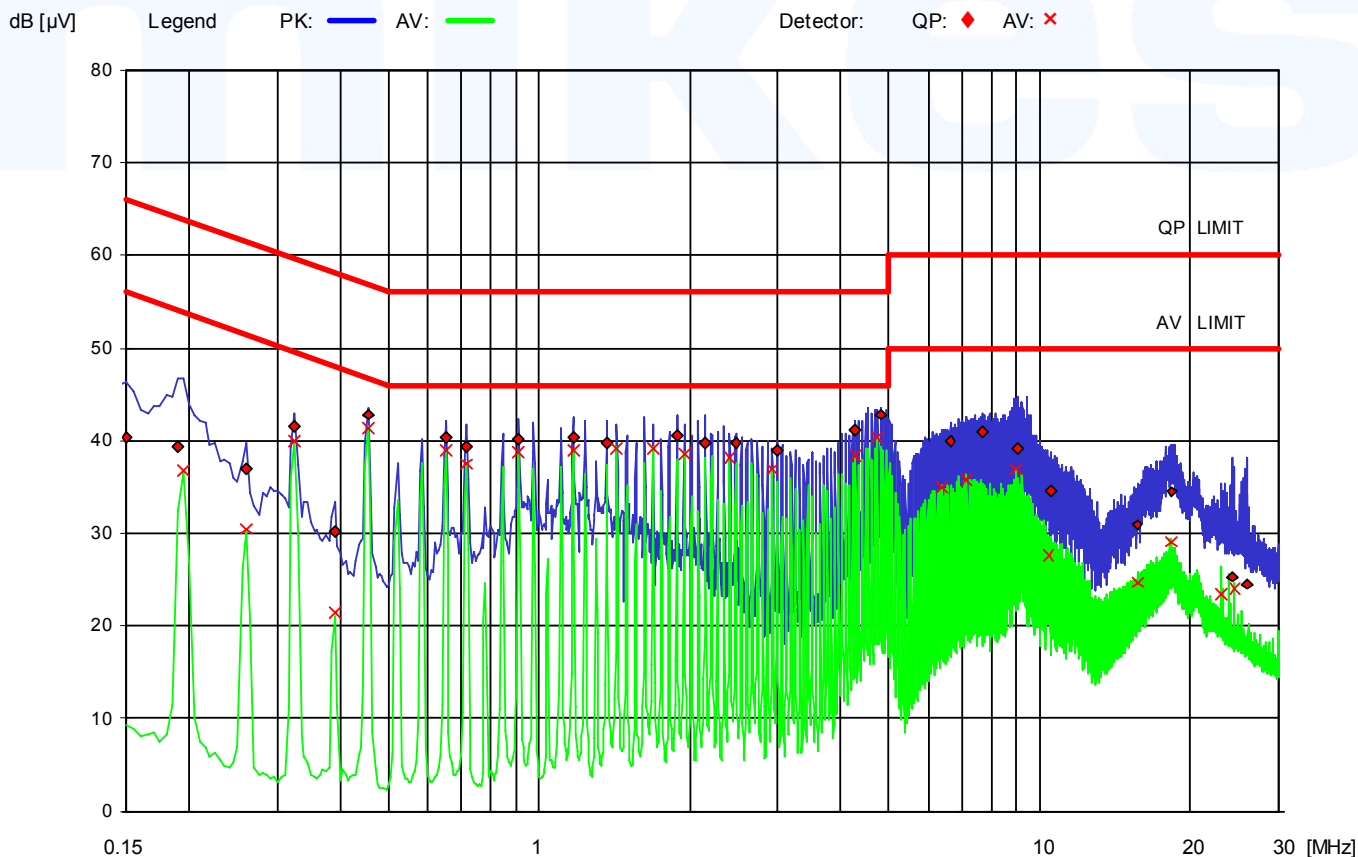
FCC ID: DO4WRTZ1000

Test point L1
 Operation mode: Tag reading mode supplying 30.0 dBm
 Remarks: EOS – Red Rocket – LFZVC60NP12E4

Result: Passed

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[μV]	QP [dB]	kHz	dB[μV]	AV [dB]
150	40,3	25,7	195	36,7	17,1
190	39,4	24,6	260	30,5	20,9
260	37	24,4	325	39,9	9,7
325	41,5	18,1	390	21,4	26,7
390	30,2	27,9	455	41,4	5,4
455	42,8	14,0	650	39	7,0
650	40,4	15,6	715	37,5	8,5
715	39,3	16,7	910	38,8	7,2
910	40,2	15,8	1170	39	7,0
1170	40,3	15,7	1430	39,2	6,8
1365	39,8	16,2	1690	39,1	6,9
1885	40,5	15,5	1950	38,6	7,4
2145	39,8	16,2	2405	38,2	7,8
2470	39,8	16,2	2925	36,9	9,1
2990	38,9	17,1	4290	38,4	7,6

Freq	QP- L	D -Limit	Freq	AV-L	D -Limit
kHz	dB[μV]	QP [dB]	kHz	dB[μV]	AV [dB]
4285	41,2	14,8	4745	40,3	5,7
4810	42,8	13,2	6370	35	15,0
6625	40	20,0	7150	35,7	14,3
7665	40,9	19,1	8970	36,9	13,1
9045	39,1	20,9	10405	27,6	22,4
10520	34,6	25,4	15735	24,7	25,3
15660	30,9	29,1	18305	29,1	20,9
18375	34,5	25,5	22995	23,4	26,6
24270	25,3	34,7	24525	24	26,0
25895	24,5	35,5			

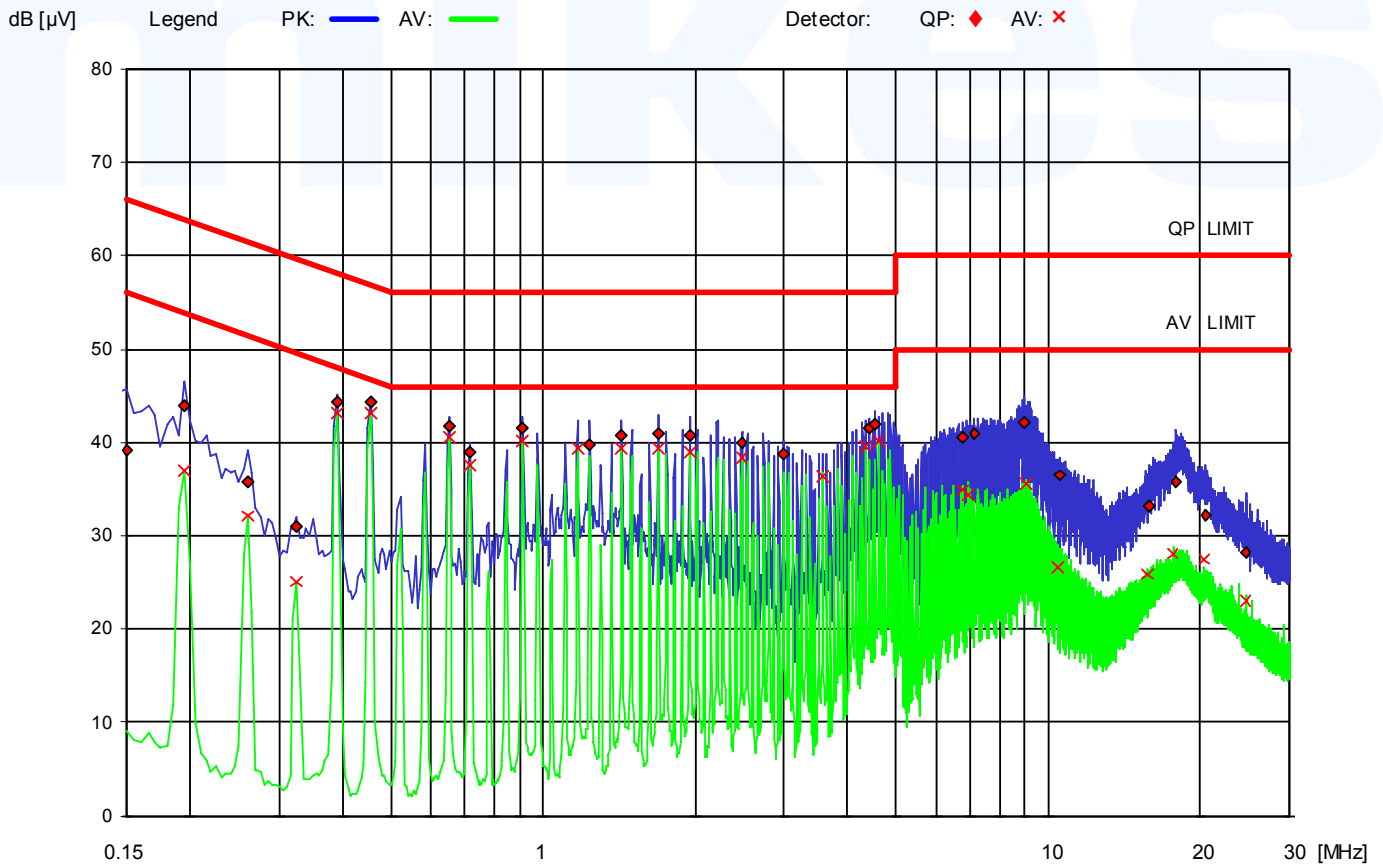


Test point: N
 Operation mode: Tag reading mode supplying 30.0 dBm
 Remarks: EOS – Red Rocket – LFZVC60NP12E4

Result: Passed

Freq kHz	QP-L dB[μ V]	D-Limit QP [dB]	Freq kHz	AV-L dB[μ V]	D-Limit AV [dB]
150	39,1	26,9	195	37	16,8
195	44	19,8	260	32,1	19,3
260	35,7	25,7	325	25,1	24,5
325	31	28,6	390	43,1	5,0
390	44,3	13,8	455	43,1	3,7
455	44,3	12,5	650	40,5	5,5
650	41,7	14,3	715	37,6	8,4
715	38,9	17,1	910	40,2	5,8
910	41,5	14,5	1170	39,3	6,7
1235	39,8	16,2	1430	39,3	6,7
1430	40,7	15,3	1690	39,3	6,7
1690	40,9	15,1	1950	39	7,0
1950	40,7	15,3	2470	38,4	7,6
2470	40	16,0	3575	36,4	9,6
2990	38,8	17,2	4355	39,6	6,4

Freq kHz	QP-L dB[μ V]	D-Limit QP [dB]	Freq kHz	AV-L dB[μ V]	D-Limit AV [dB]
4420	41,6	14,4	4615	40,1	5,9
4545	42	14,0	6755	34,9	15,1
6750	40,6	19,4	6950	34,4	15,6
7145	41	19,0	9035	35,6	14,4
8965	42,2	17,8	10455	26,6	23,4
10520	36,5	23,5	15720	25,9	24,1
15840	33,2	26,8	17640	28,1	21,9
17925	35,8	24,2	20370	27,5	22,5
20515	32,2	27,8	24550	23,1	26,9
24590	28,2	31,8			



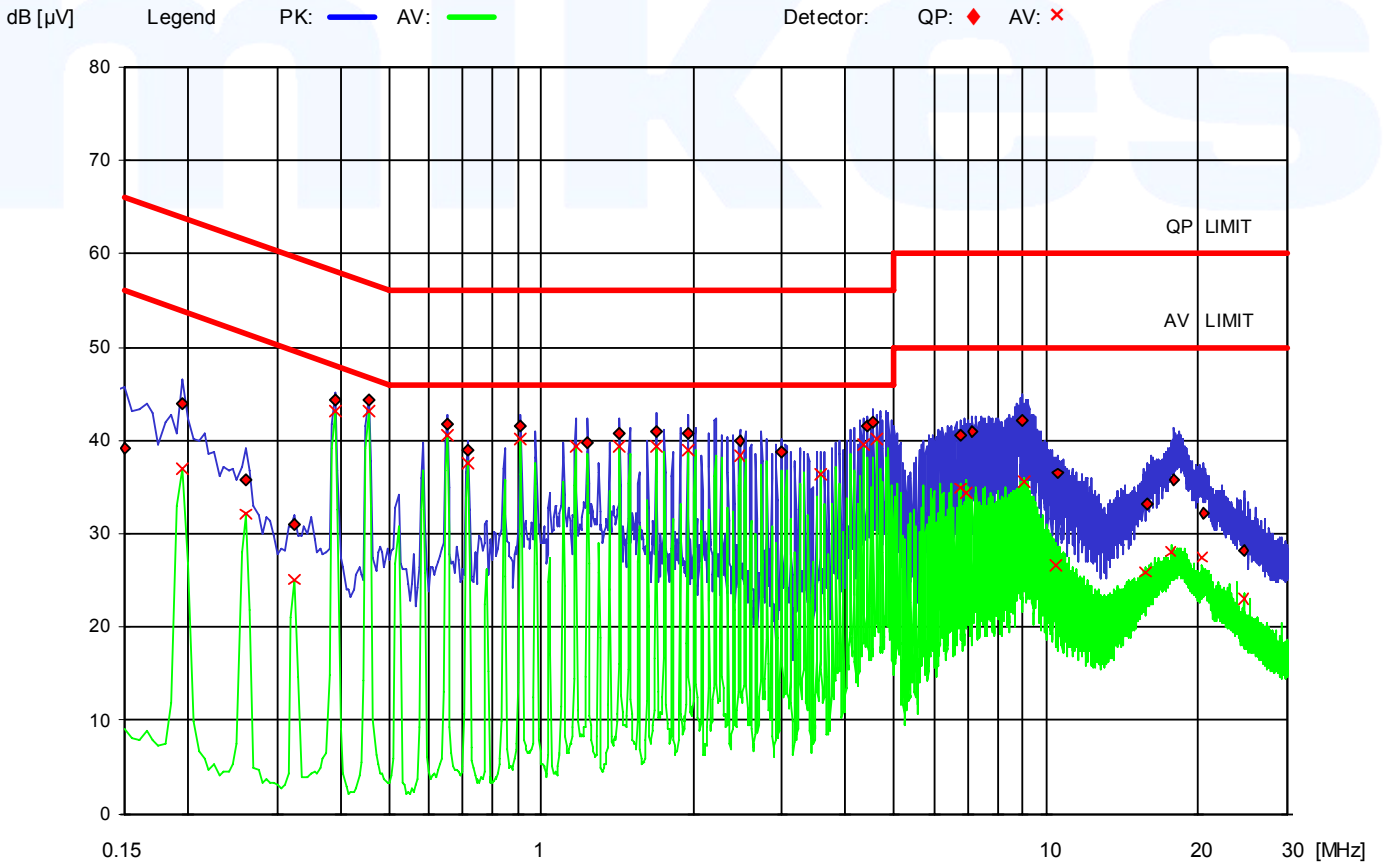
FCC ID: DO4WRTZ1000

Test point L1
 Operation mode: Standby mode
 Remarks: EOS – Red Rocket – LFZVC60NP12E4

Result: Passed

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]
150	39,1	26,9	195	37	16,8
195	44	19,8	260	32,1	19,3
260	35,7	25,7	325	25,1	24,5
325	31	28,6	390	43,1	5,0
390	44,3	13,8	455	43,1	3,7
455	44,3	12,5	650	40,5	5,5
650	41,7	14,3	715	37,6	8,4
715	38,9	17,1	910	40,2	5,8
910	41,5	14,5	1170	39,3	6,7
1235	39,8	16,2	1430	39,3	6,7
1430	40,7	15,3	1690	39,3	6,7
1690	40,9	15,1	1950	39	7,0
1950	40,7	15,3	2470	38,4	7,6
2470	40	16,0	3575	36,4	9,6
2990	38,8	17,2	4355	39,6	6,4

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]
4420	41,6	14,4	4615	40,1	5,9
4545	42	14,0	6755	34,9	15,1
6750	40,6	19,4	6950	34,4	15,6
7145	41	19,0	9035	35,6	14,4
8965	42,2	17,8	10455	26,6	23,4
10520	36,5	23,5	15720	25,9	24,1
15840	33,2	26,8	17640	28,1	21,9
17925	35,8	24,2	20370	27,5	22,5
20515	32,2	27,8	24550	23,1	26,9
24590	28,2	31,8			



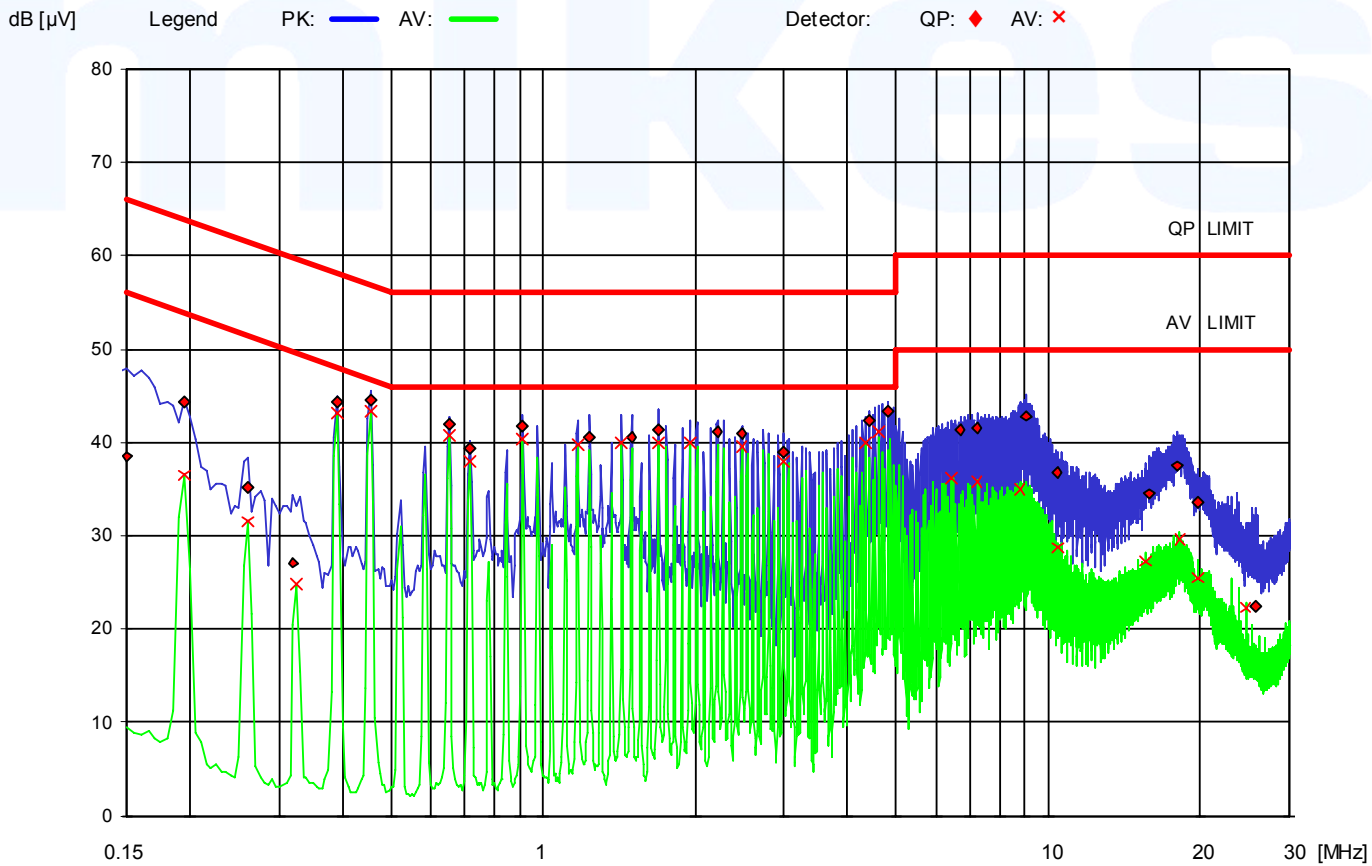
FCC ID: DO4WRTZ1000

Test point: N
 Operation mode: Standby mode
 Remarks: EOS – Red Rocket – LFZVC60NP12E4

Result: Passed

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]
150	38,5	27,5	195	36,5	17,3
195	44,3	19,5	260	31,5	19,9
260	35,1	26,3	325	24,8	24,8
320	27,1	32,6	390	43,1	5,0
390	44,3	13,8	455	43,3	3,5
455	44,6	12,2	650	40,7	5,3
650	41,9	14,1	715	38	8,0
715	39,3	16,7	910	40,4	5,6
910	41,7	14,3	1170	39,8	6,2
1235	40,5	15,5	1430	40	6,0
1495	40,5	15,5	1690	40	6,0
1690	41,3	14,7	1950	39,9	6,1
2210	41,2	14,8	2470	39,6	6,4
2470	40,9	15,1	2990	38	8,0
2985	39	17,0	4355	40	6,0

Freq kHz	QP-L dB[μV]	D-Limit QP [dB]	Freq kHz	AV-L dB[μV]	D-Limit AV [dB]
4415	42,4	13,6	4615	41,1	4,9
4805	43,3	12,7	6435	36,1	13,9
6690	41,3	18,7	7215	35,8	14,2
7215	41,5	18,5	8780	35	15,0
9035	42,8	17,2	10470	28,7	21,3
10405	36,8	23,2	15615	27,3	22,7
15805	34,5	25,5	18215	29,6	20,4
17955	37,5	22,5	19710	25,5	24,5
19705	33,6	26,4	24550	22,3	27,7
25775	22,5	37,5			



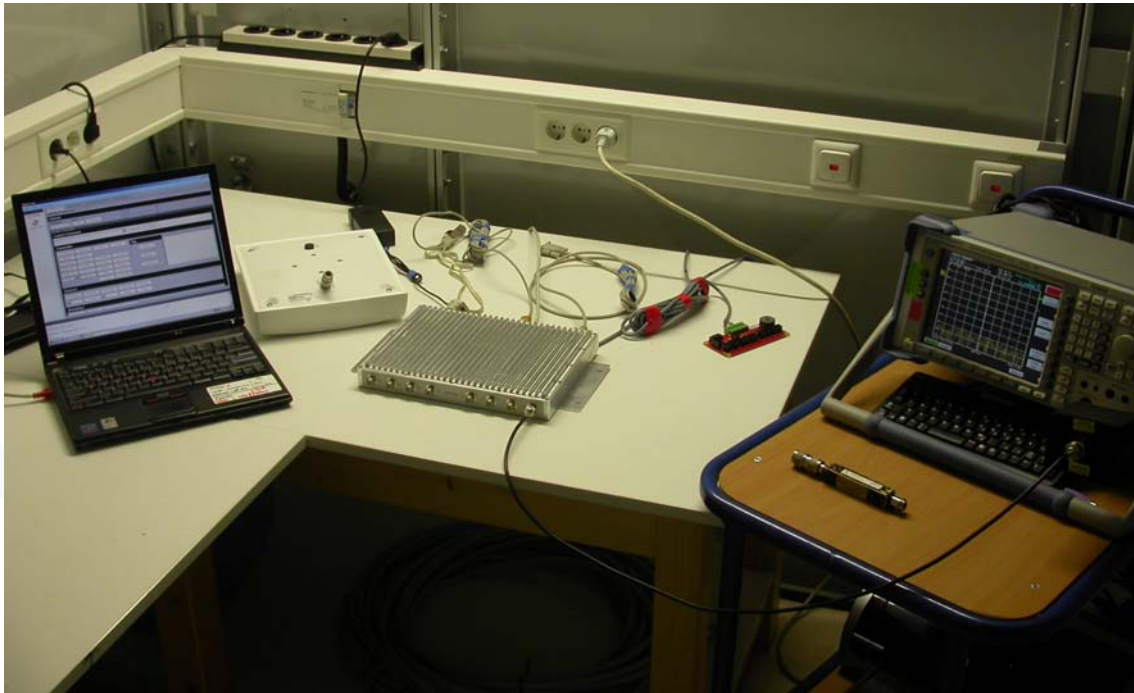
5.2 20 dB bandwidth

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

5.2.1 Description of the test location

Test location: AREA4

5.2.2 Photo documentation of the test set-up



5.2.1 Applicable standard

According to FCC Part 15C, Section 15.247(a):

Frequency hopping systems shall have hopping carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.2.2 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or the first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

5.2.3 Test result

Power setting 30.0 dBm:

Channel No.	-20 dB Bandwidth below peak (kHz)
CH 1 (902.75 MHz)	85.76
CH 25 (914.75 MHz)	86.40
CH 50 (927.25 MHz)	86.08

Bandwidth limit according to FCC Part15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	Limit -20 db bandwidth (kHz)
902-928	≥ 50	< 250

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.

5.2.4 Test protocol

Channel 1
902.75 MHz

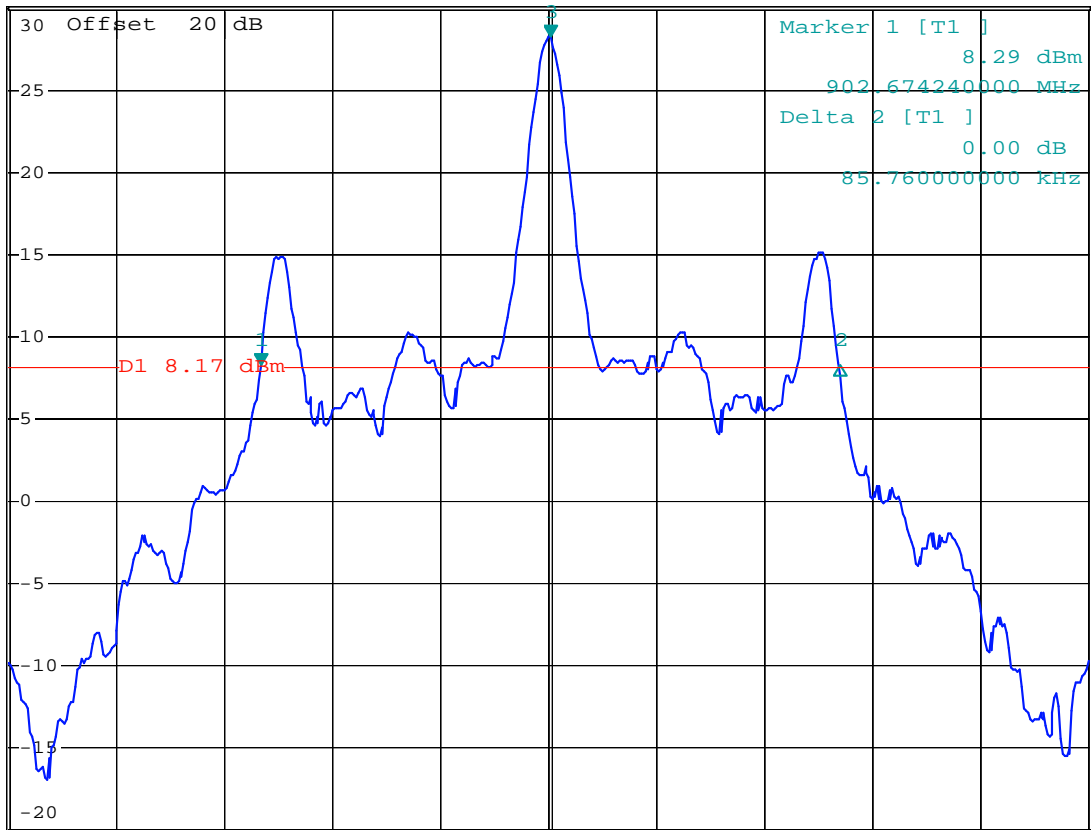


*RBW 3 kHz Marker 3 [T1]
VBW 10 kHz 28.17 dBm
SWT 20 ms 902.717120000 MHz

Ref 30 dBm

*Att 20 dB

1 PK
VIEW



FCC ID: DO4WRTZ1000

Channel 25
914.75 MHz

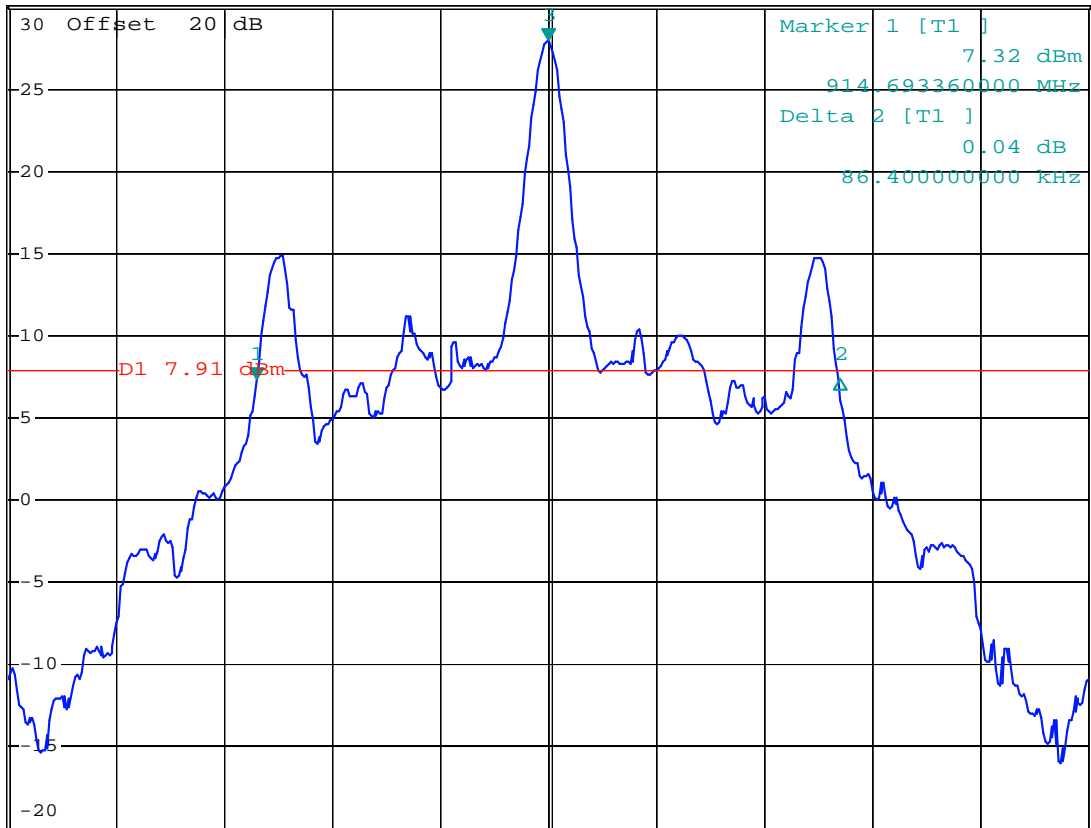


*RBW 3 kHz Marker 3 [T1]
VBW 10 kHz 27.91 dBm
SWT 20 ms 914.736560000 MHz

Ref 30 dBm

*Att 30 dB

1 PK
VIEW



Center 914.73656 MHz

16 kHz/

Span 160 kHz

FCC ID: DO4WRTZ1000

Channel 50
927.25 MHz

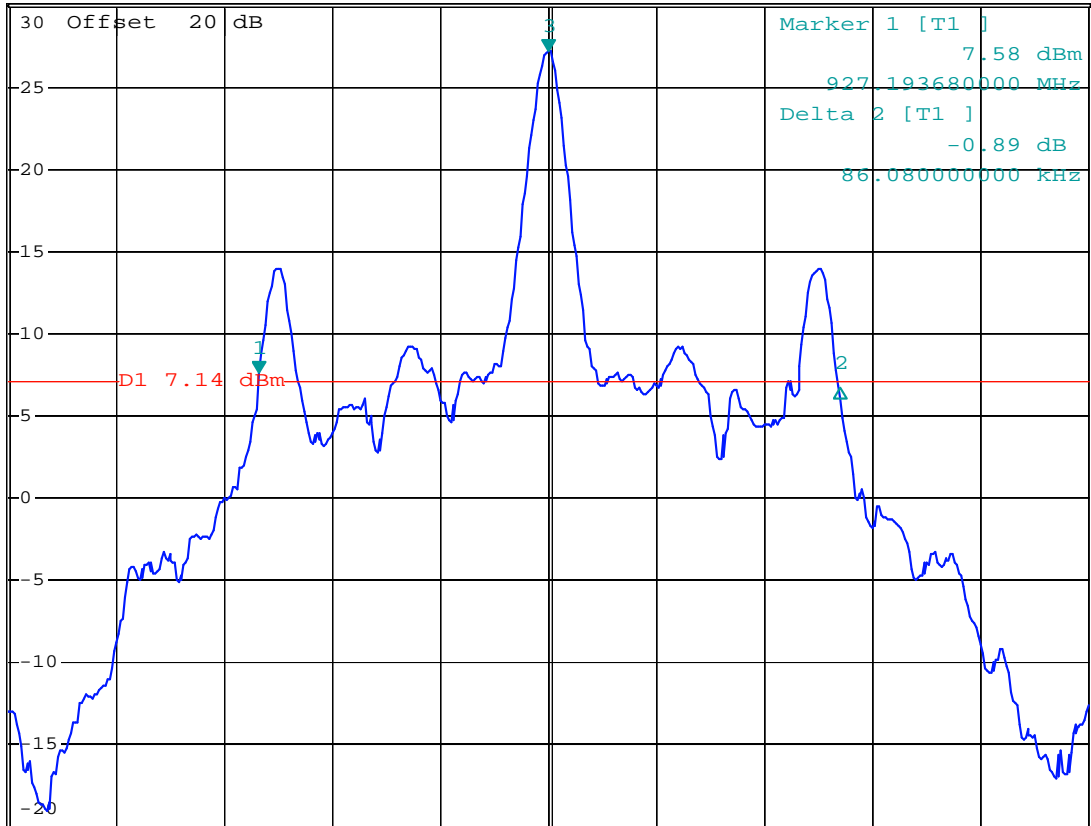


*RBW 3 kHz Marker 3 [T1]
VBW 10 kHz 27.14 dBm
SWT 20 ms 927.236560000 MHz

Ref 30 dBm

*Att 20 dB

1 PK
VIEW



Center 927.23656 MHz

16 kHz/

Span 160 kHz

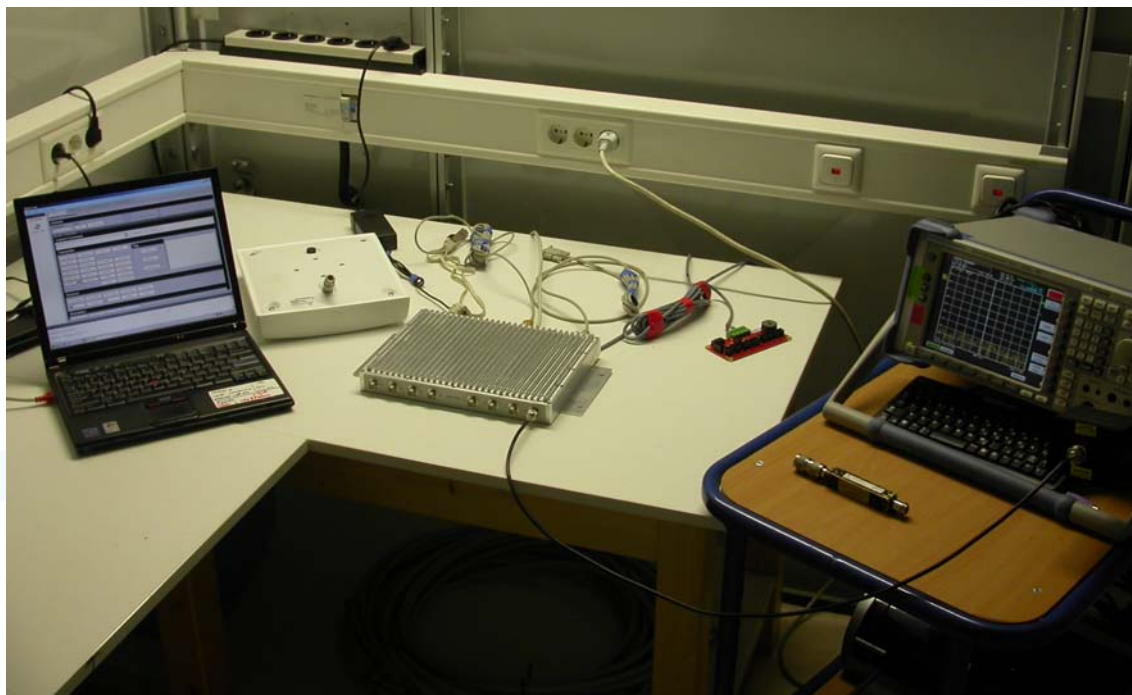
5.3 Maximum peak conducted output power

For test instruments and accessories used see section 6 Part CPC 2.

5.3.1 Description of the test location

Test location: AREA4

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.247(b)(2):

For frequency hopping systems operating in the 902-928 MHz band the maximum peak conducted output power shall not exceed the limit of 1 watt for systems employing at least 50 hopping channels.

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.4 Description of Measurement

A spectrum analyzer is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode using the assigned frequency.

Analyzer settings:

Trace:	Max. hold
Detector:	Max. peak
RBW:	greater than 20 dB bandwidth
VBW:	≥ RBW
Sweep Time:	Coupled

5.3.5 Test result

Power setting 30.0 dBm
Antenna gain: 8.2 dBic (5.2 dBi)

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Delta (dB)
1	902.75	28.3	30.0	-1.7
25	914.75	28.0	30.0	-2.0
50	927.25	27.4	30.0	-2.6

Note: Test cable loss and fixed attenuation of 20 dB are included in the analyzer reading (Transducer factor).

Peak Power Limit according to FCC Part 15C, Section 15.247(b)(2):

Frequency (MHz)	Hopping channels	Hop. CH carrier frequ. separation	Peak Power Limit	
			(dBm)	(W)
902-928	≥ 50		30	1.0

The requirements are **FULFILLED**.

Remarks:

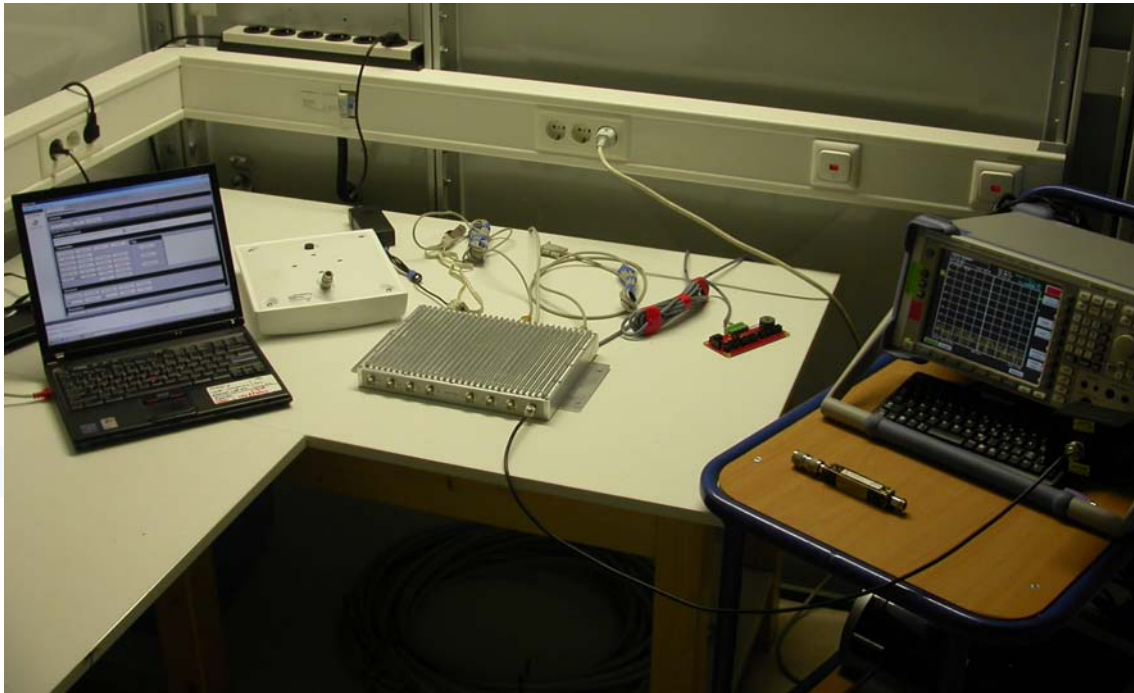
5.4 Spurious RF conducted emissions

For test instruments and accessories used see section 6 Part SEC1, SEC2 and SEC3.

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band 902 to 928 MHz, the digitally modulated 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 an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.4.4 Description of Measurement

A spectrum analyzer is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode at the assigned frequency.

Spectrum analyzer settings:

RBW	100 kHz
VBW	300 kHz
Detector	Max. peak
Trace:	Max. hold
Sweep time	auto

5.4.5 Test result

Power setting 30.0 dBm

Hopping frequency from 902.75 to 927.25 MHz, max. level 27.98 dBm			
Frequency (MHz)	Peak power * (dBm)	Limit (-20 dB) (dBm)	Delta (dB)
901.5	-37.30	7.98	-45.3

* Fixed attenuation of 20 dB is included in the Peak power.

The requirements are **FULFILLED**.

Remarks: All spurious emissions falling in restricted bands have been measured radiated.
For detailed results please refer to following test protocols.
In the frequency range from 9 kHz to 30 MHz no emissions could be measured.

FCC ID: DO4WRTZ1000

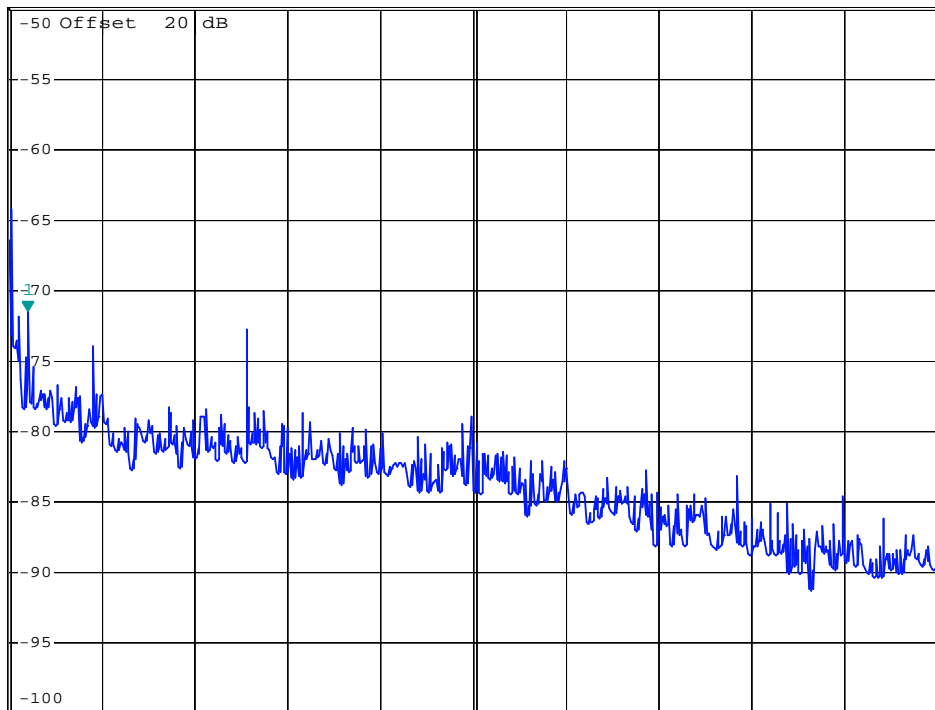
Conducted RF emission from 9 kHz to 30 MHz



*RBW 300 Hz Marker 1 [T1]
VBW 1 kHz -71.41 dBm
SWT 34 s 68.82000000 kHz

Ref -50 dBm *Att 10 dB

1 PK
VIEW



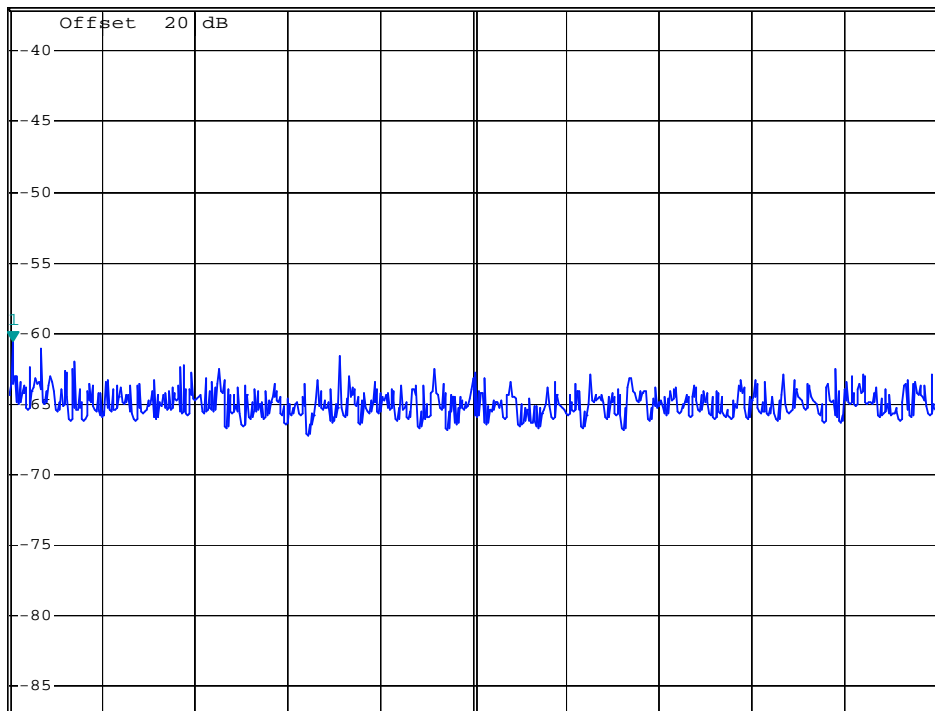
Start 9 kHz 299.1 kHz/ Stop 3 MHz



*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz -60.60 dBm
SWT 5 ms 3.108000000 MHz

Ref -37 dBm Att 10 dB

1 PK
VIEW



Start 3 MHz 2.7 MHz/ Stop 30 MHz

FCC ID: DO4WRTZ1000

Conducted RF emission from 30 to 1000 MHz

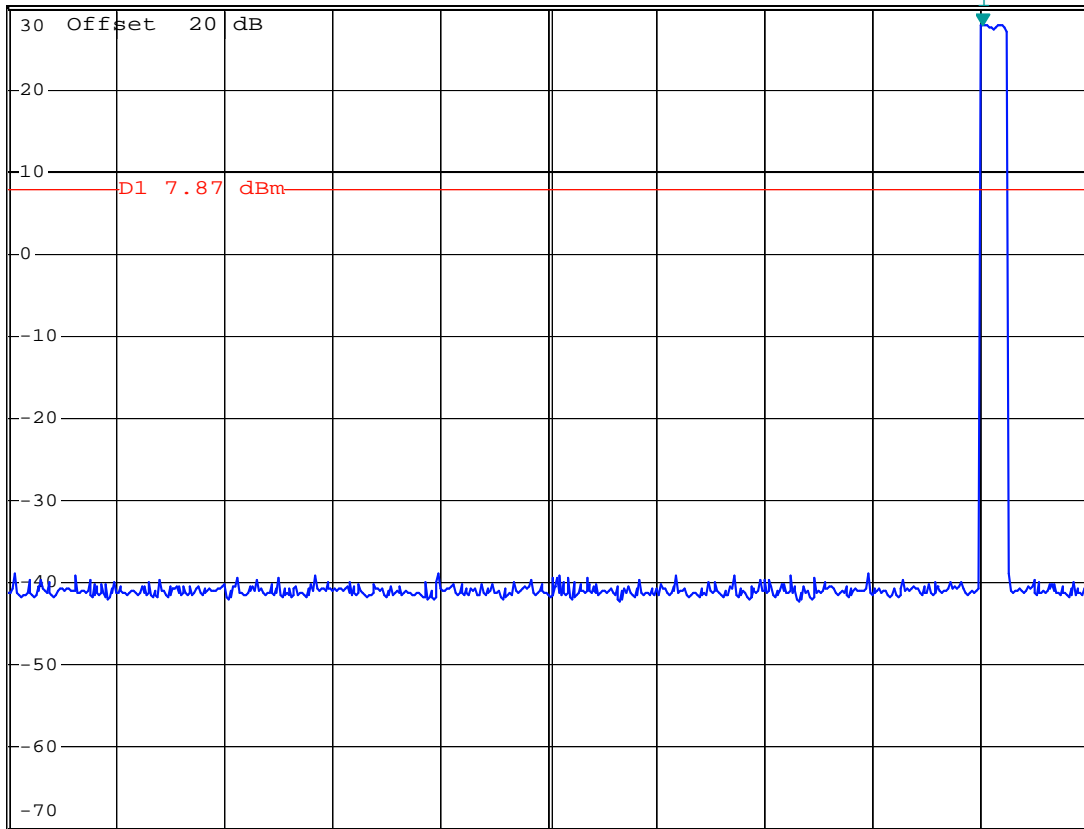


*RBW 100 kHz Marker 1 [T1]
 VBW 300 kHz 27.87 dBm
 SWT 100 ms 904.94000000 MHz

Ref 30 dBm

*Att 20 dB

1 PK
VIEW



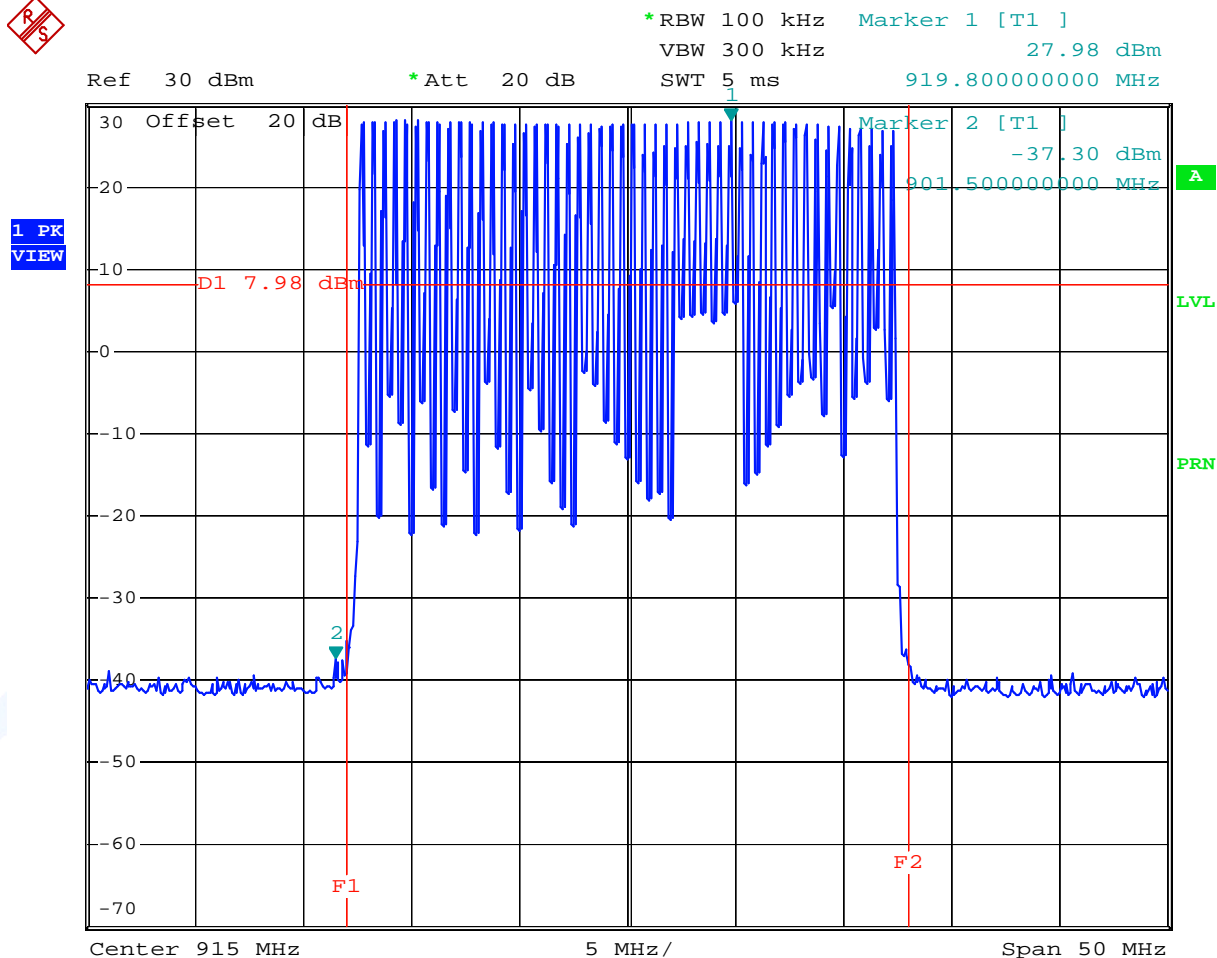
Start 30 MHz

97 MHz/

Stop 1 GHz

FCC ID: DO4WRTZ1000

Conducted RF emission from 30 to 1000 MHz
(Band edge)



FCC ID: DO4WRTZ1000

Conducted RF emission from 1 to 10 GHz

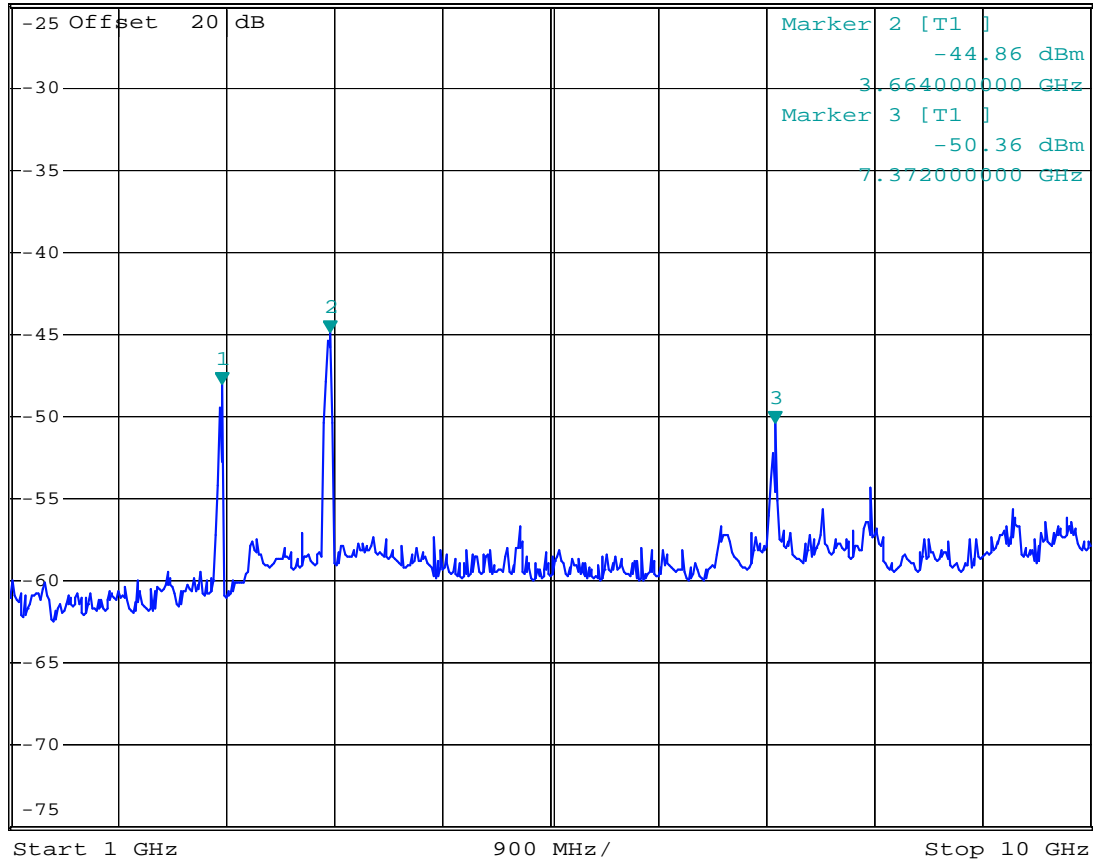


*RBW 100 kHz Marker 1 [T1]
 VBW 300 kHz -48.07 dBm
 SWT 900 ms 2.764000000 GHz

Ref -25 dBm

Att 10 dB

1 PK
VIEW



Note: Signal level no. 1, 2 and 3 are located in restricted band.

5.5 Spurious radiated emissions

For test instruments and accessories used see section 6 Part SER 1, SER 2, SER 3.

5.5.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

Test location: Anechoic Chamber A2
Test distance: 3 metres

5.5.2 Photo documentation of the test set-up

Open area test site



FCC ID: DO4WRTZ1000

Anechoic chamber



5.5.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 902 to 928 MHz, the digitally modulated 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 an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.5.4 Description of Measurement

Radiated spurious emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linear polarized antennas. The measurements are made with 120 kHz bandwidth and quasi-peak detection (200 Hz, 9 kHz up to 30 MHz). The EUT was placed on a 1.0 X 1.5 metres non-conducting table 80 centimetres above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The antenna was positioned 3 metres horizontally from the EUT. To locate maximum emissions from the EUT the antenna is shifted in height from 1 to 4 metres, after the EUT is rotated 360 degrees. The measurement scan is made in horizontal and vertical polarization of the antenna.

For the radiated measurement up from 1 GHz to maximum frequency as specified in Section 15.33, a spectrum analyzer and appropriate linear polarized antennas are used. The EUT is placed on a 1.0 X 1.5 metres non-conducting table 80 centimetres above the ground plane. The set up of the EUT will be in accordance to ANSI C63.4. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions the EUT was rotated 360 degrees in the fully anechoic chamber. The measurement scan is made in horizontal and vertical polarization of the antenna. For testing above 1 GHz, if the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

5.5.5 Test result

5.5.5.1 Radiated emission test f < 1 GHz

In the frequency range from 9 kHz to 30 MHz no radiated emissions could be measured.

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
32,00		2,1		14,0		16,1	40,0	-23,9
33,24		4,5		14,0		18,5	40,0	-21,5
35,13		6,9		14,1		21,0	40,0	-19,0
37,50		8,4		14,4		22,8	40,0	-17,2
39,82		9,0		14,8		23,8	40,0	-16,2
41,35		7,1		15,0		22,1	40,0	-17,9
48,24		15,9		15,5		31,4	40,0	-8,6
55,24		12,3		15,2		27,5	40,0	-12,5
62,50		13,4		14,6		28,0	40,0	-12,0
75,00		22,8		12,8		35,6	40,0	-4,4
78,11		19,8		12,2		32,0	40,0	-8,0
80,40		21,3		11,8		33,1	40,0	-6,9
120,98		16,8		13,7		30,5	43,5	-13,0
125,00		23,8		14,1		37,9	43,5	-5,6
132,56		17,8		14,7		32,5	43,5	-11,0
132,03		23,0		14,7		37,7	43,5	-5,8
137,49		15,7		15,1		30,8	43,5	-12,7
149,99		19,3		15,6		34,9	43,5	-8,6
156,04		17,2		15,8		33,0	43,5	-10,5
162,50		11,3		15,8		27,1	43,5	-16,4
163,07		14,8		15,7		30,5	43,5	-13,0
175,00		15,6		15,0		30,6	43,5	-12,9
187,49		19,2		14,0		33,2	43,5	-10,3
198,85		15,7		13,0		28,7	43,5	-14,8
200,00		22,8		12,9		35,7	43,5	-7,8
208,31		17,3		13,2		30,5	43,5	-13,0
212,50		18,0		13,4		31,4	43,5	-12,1
217,25		15,9		13,6		29,5	46,0	-16,5
225,00		22,0		13,9		35,9	46,0	-10,1
237,50		13,8		14,4		28,2	46,0	-17,8
245,25		6,7		14,7		21,4	46,0	-24,6
500,02		19,7		21,6		41,3	46,0	-4,7
187,50		22,4		14,0		36,4	43,5	-7,1
562,50		9,4		23,0		32,3	46,0	-13,7
575,00		5,8		23,2		29,0	46,0	-17,0
600,01		8,7		23,8		32,5	46,0	-13,5
700,00		18,6		25,4		44,0	46,0	-2,0
800,00		11,8		27,1		38,9	46,0	-7,1

FCC ID: DO4WRTZ1000

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
30,61	11,3		13,1		24,4		40,0	-15,6
35,20	13,8		13,6		27,4		40,0	-12,6
35,96	15,1		13,6		28,7		40,0	-11,3
36,74	11,7		13,7		25,4		40,0	-14,6
37,50	15,3		13,7		29,0		40,0	-11,0
39,80	14,2		13,9		28,1		40,0	-11,9
42,09	16,8		14,3		31,1		40,0	-8,9
42,85	17,2		14,4		31,6		40,0	-8,4
43,62	22,0		14,5		36,5		40,0	-3,5
47,45	17,0		15,1		32,0		40,0	-8,0
49,74	17,6		15,3		32,9		40,0	-7,1
51,30	16,0		15,3		31,3		40,0	-8,7
55,23	12,3		15,0		27,3		40,0	-12,7
56,81	14,0		14,9		28,9		40,0	-11,1
58,12	15,3		14,8		30,1		40,0	-9,9
60,01	12,9		14,6		27,5		40,0	-12,5
62,50	16,7		14,4		31,1		40,0	-8,9
64,29	13,0		14,3		27,3		40,0	-12,7
65,83	11,8		14,1		25,9		40,0	-14,1
66,60	12,3		14,1		26,4		40,0	-13,6
78,83	14,6		11,8		26,4		40,0	-13,6
80,15	21,4		11,5		32,9		40,0	-7,1
84,95	12,1		11,2		23,3		40,0	-16,7
109,55	15,4		12,1		27,5		43,5	-16,0
112,50	17,0		12,4		29,4		43,5	-14,1
114,95	13,5		12,6		26,1		43,5	-17,4
120,00	16,1		13,1		29,2		43,5	-14,3
125,00	14,9		13,5		28,4		43,5	-15,1
126,25	15,0		13,7		28,7		43,5	-14,8
130,01	9,7		14,0		23,7		43,5	-19,8
131,99	19,7		14,2		33,9		43,5	-9,6
147,25	14,3		15,3		29,6		43,5	-13,9
150,00	17,8		15,4		33,2		43,5	-10,3
154,25	18,4		15,5		33,9		43,5	-9,6
161,25	16,1		15,7		31,8		43,5	-11,7
162,50	14,6		15,6		30,2		43,5	-13,3
163,76	15,0		15,5		30,5		43,5	-13,0
187,50	18,1		14,3		32,4		43,5	-11,1
200,00	23,5		13,9		37,4		43,5	-6,1
208,31	13,6		14,2		27,8		43,5	-15,7
212,50	11,0		14,3		25,3		43,5	-18,2
225,00	16,8		14,7		31,5		46,0	-14,5
237,49	13,7		15,0		28,7		46,0	-17,3
238,25	16,9		15,1		32,0		46,0	-14,0
250,00	14,6		15,4		30,0		46,0	-16,0

FCC ID: DO4WRTZ1000

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
300,01	16,8		17,0		33,8		46,0	-12,2
312,50	17,4		17,3		34,7		46,0	-11,3
319,99	14,9		17,4		32,3		46,0	-13,7
321,52	20,0		17,5		37,5		46,0	-8,5
350,00	13,8		18,1		31,9		46,0	-14,1
362,50	8,4		18,3		26,7		46,0	-19,3
375,01	6,9		18,6		25,5		46,0	-20,5
400,00	12,0		19,1		31,1		46,0	-14,9
450,00	14,3		20,3		34,6		46,0	-11,4
500,01	14,7		21,5		36,2		46,0	-9,8
700,00	16,8		25,5		42,3		46,0	-3,7
800,00	4,7		27,2		31,9		46,0	-14,1

5.5.5.2 Radiated emission test f > 1GHz

Power setting 30.0 dBm

Antenna gain 8.2 dBic (5.2 dBi)

Frequency (GHz)	L: PK (dBµV)	Duty Cycle (dB)	L: AV (dBµV)	Bandwidth (kHz)	Correct. (dB)	L: PK dB(µV/m)	L: AV dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
2.764	59.89	0	50.48	1000	-9.2	50.7	41.3	54.0	-12.7
7.372	44.17	0	30.51	1000	7.7	51.9	38.2	54.0	-15.8

*) Average values were measured with spectrum analyzer by the following settings

RBW: 1 MHz

VBW: 10 Hz

Sweep: Auto

Radiated limits according to FCC Part 15C, Section 15.209(a) for spurious emissions:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	µV/m	dB(µV/m)	
0.009 - 0.490	2400/F(kHz)		300
0.490 - 1.705	24000/F(kHz)		30
1.705 - 30	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

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209: (Refer to section 5.5.5.1)

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The requirements are **FULFILLED**.

Remarks: During the test the EUT was set into TX continuous mode with normal modulation.
The measurement was performed up to the 10th harmonic (10000 MHz).

5.6 Hopping sequence

Requirement according to FCC Part 15C, Section 15.247(a):

The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

Remarks: The channel is represented by a pseudo-random hopping sequence hopping through the 50
RF-channels.

5.7 Equal hopping frequency use

Requirement according to FCC Part 15C, Section 15.247(a):

Each frequency must be used equally on the average by each transmitter.

Remarks: The device fulfills the requirement according to FCC Part 15C, Section 15.247(a).

The manufacturer declares in the system manual that this function is controlled via software.

5.8 Receiver input bandwidth

Requirement according to FCC Part 15C, Section 15.247(a):

The system receivers shall have input bandwidth that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signal.

Remarks: The receiver bandwidth is equal to the transmitter bandwidth in the 50 hopping channel mode.

(Declared by the manufacturer.)

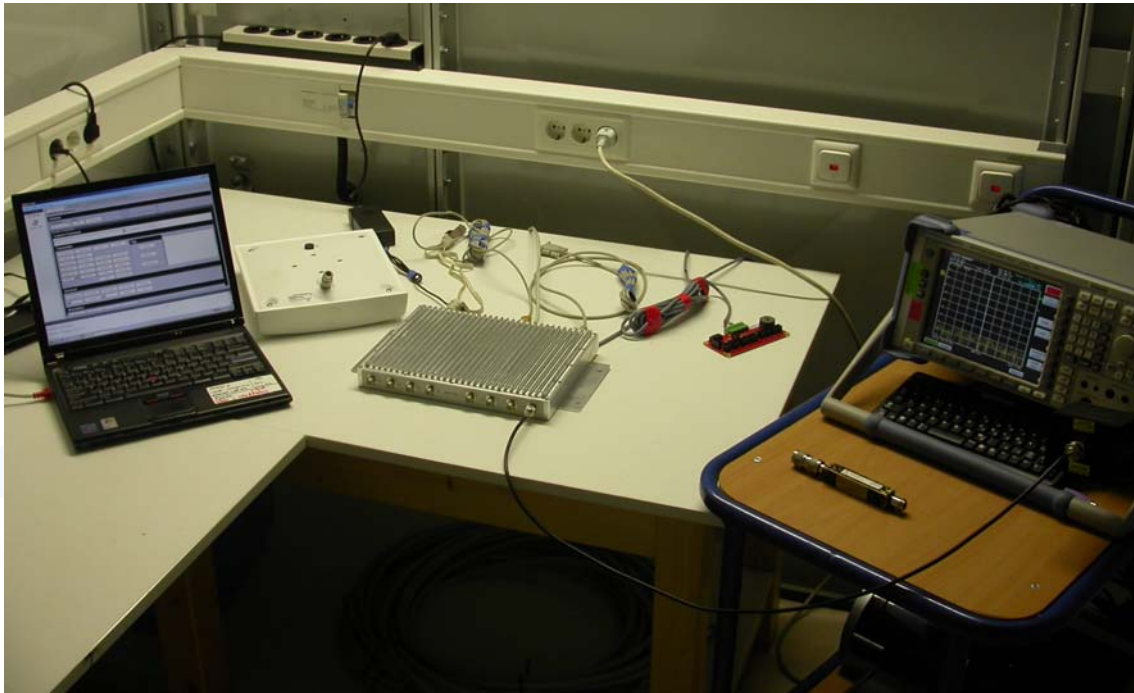
5.9 Dwell time

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

5.9.1 Description of the test location

Test location: AREA4

5.9.2 Photo documentation of the test set-up



5.9.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(i):

Frequency hopping systems operating in the 902-928 MHz band: The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

5.9.4 Description of Measurement

The measurement was done using a spectrum analyser in time domain function and able to store the maximum time of a period. This time period has been stored and added up the appropriate time intervals the hopping system has applied this channel.

5.9.5 Test result

Channel frequency (MHz)	Pulse Time (ms)	Number of Bursts (in 1 time period)	Dwell time (ms)
914.75	360	1	360

Requirement according to FCC Part15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	time of one period (s)	Limit dwell time, AV (ms)
902-928	≥ 50	20	< 400

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.

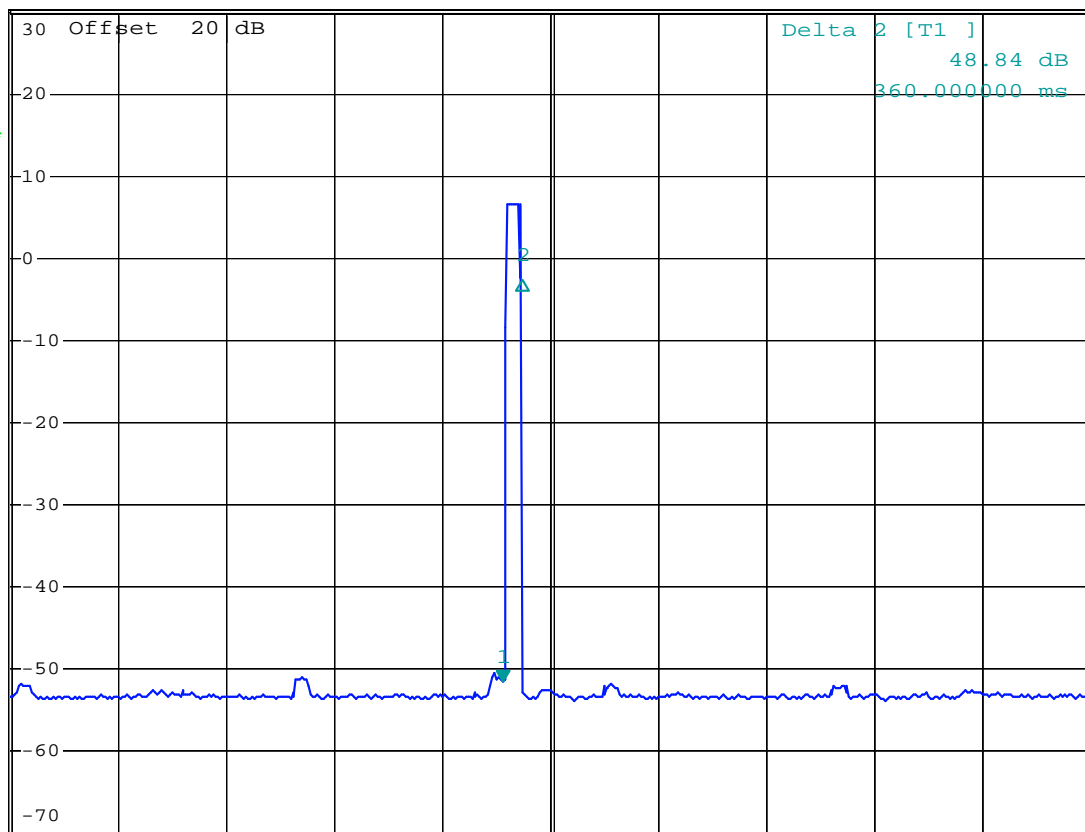
5.9.6 Test protocol

Time of occupancy (Dwell time)



Ref 30 dBm Att 40 dB RBW 10 kHz Marker 1 [T1] -51.40 dBm
 *VBW 30 kHz SWT 20 s 8.320000 s

1 AV*
VIEW



Center 914.75 MHz 2 s/

A
SGL
LVL
PRN

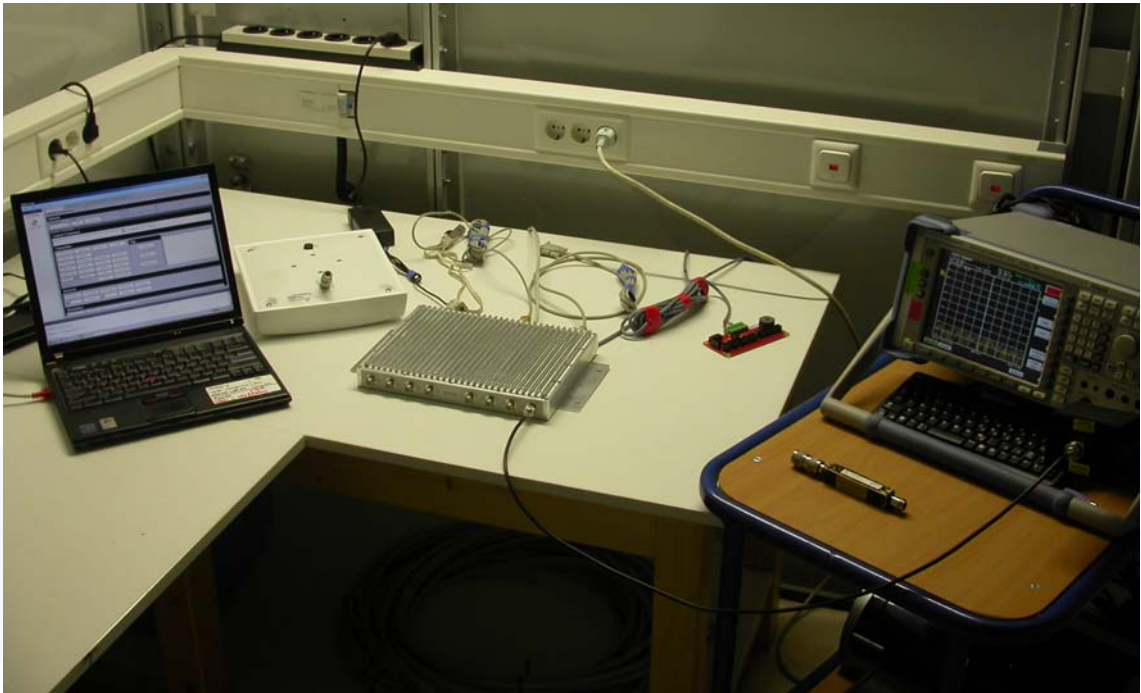
5.10 Channel separation

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

5.10.1 Description of the test location

Test location: AREA4

5.10.2 Photo documentation of the test set-up



5.10.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(1):

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.10.4 Description of Measurement

This measurement was done by using a spectrum analyser. The Span of the analyzer was set wide enough to capture 2 frequencies. The result of the channel separation was compared with the 20 dB bandwidth and recorded.

5.10.5 Test result

Channel 1 (MHz)	Channel 2 (MHz)	Channel separation (kHz)
902.75	903.25	500

Limit according to FCC Part 15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	Limit channel separation (kHz)
All systems		> 25 kHz or 20 dB bandwidth, which ever is greater
2400-2483.5	≥ 15	

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.

5.10.6 Test protocol

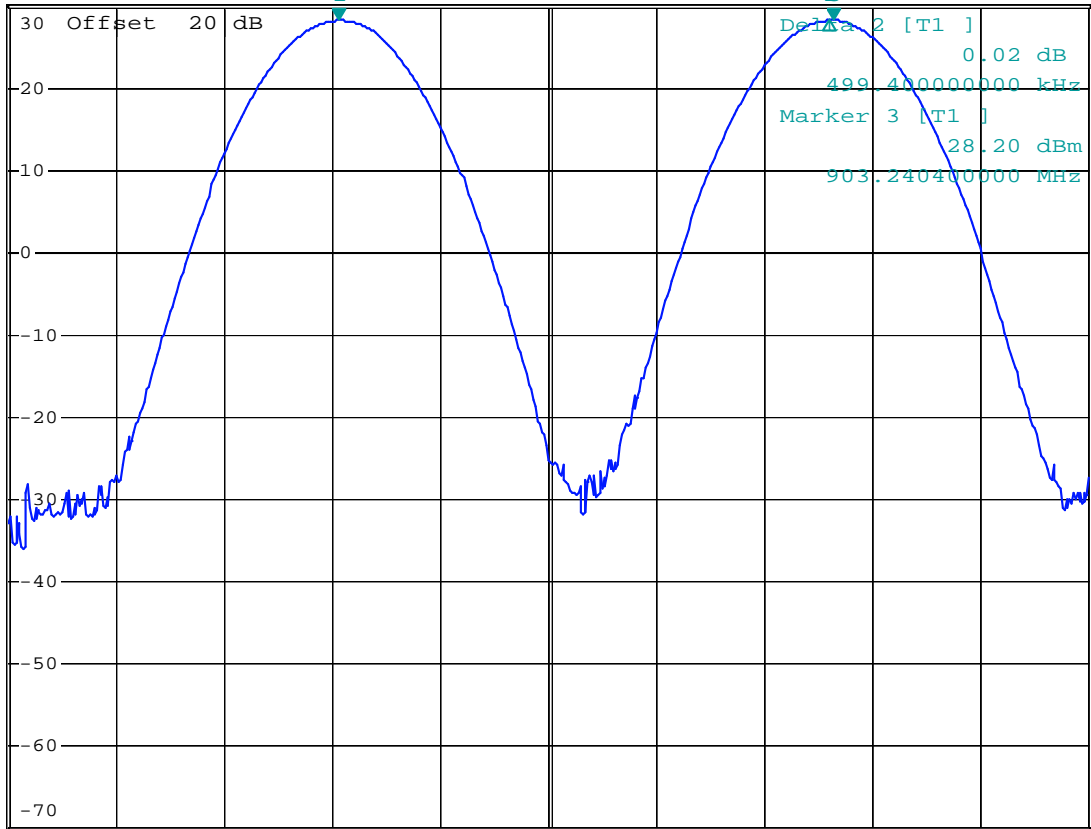
Channel separation



*RBW 100 kHz Marker 1 [T1]
 VBW 300 kHz 28.17 dBm
 SWT 2.5 ms 902.736600000 MHz

Ref 30 dBm *Att 20 dB

1 PK
VIEW



Start 902.4 MHz 110 kHz/ Stop 903.5 MHz

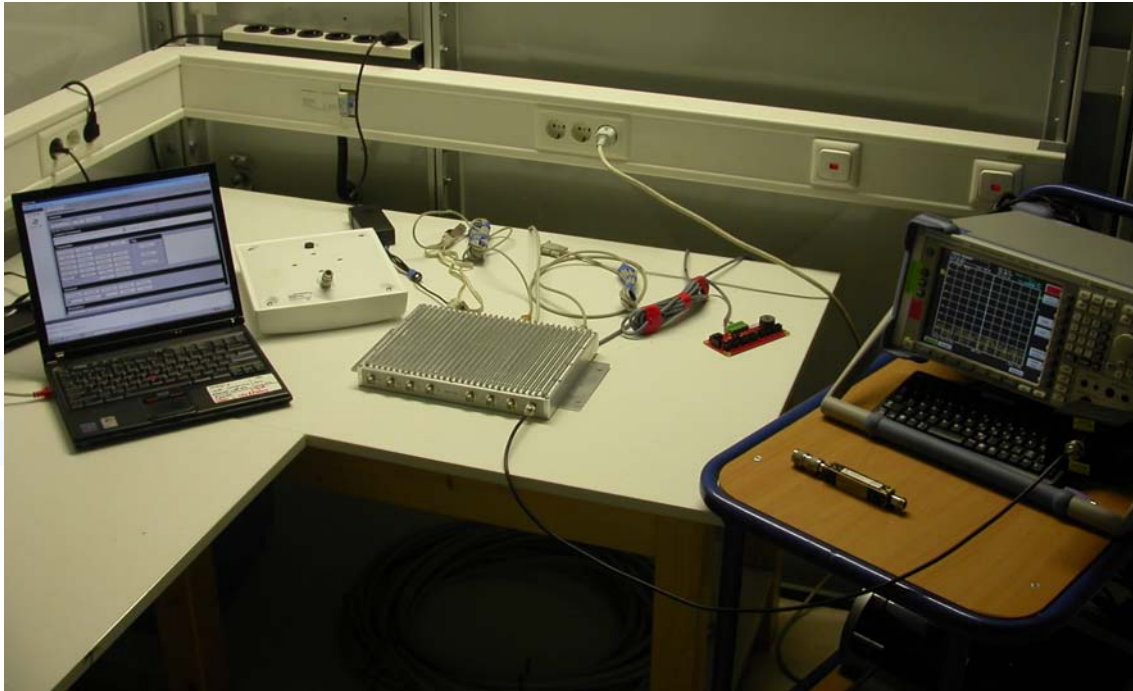
5.11 Quantity of hopping channels

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

5.11.1 Description of the test location

Test location: AREA4

5.11.2 Photo documentation of the test set-up



5.11.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(1)(i):

For frequency hopping systems operating in the 902-928 MHz band: If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

5.11.4 Description of Measurement

This measurement was done by using a spectrum analyser. The EuT was transmitting at its maximum data rate. The Span of the analyzer was set wide enough to capture the frequency band from 902-928 MHz.

5.11.5 Test result

Hopping channel frequency range	Quantity of hopping channels value	Quantity of hopping channels minimum limit
902-928 MHz	50	50

Limit according to FCC Part 15C, Section 15.247(1):

Frequency range (MHz)	LIMIT (Quantity of Hopping Channels)			
	20dB Bandwidth < 250kHz	20dB Bandwidth > 250kHz	20dB Bandwidth < 1 MHz	20dB Bandwidth > 1MHz
902 - 928	50	25	---	---

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocol.



5.11.6 Test protocol

Quantity of hopping channel

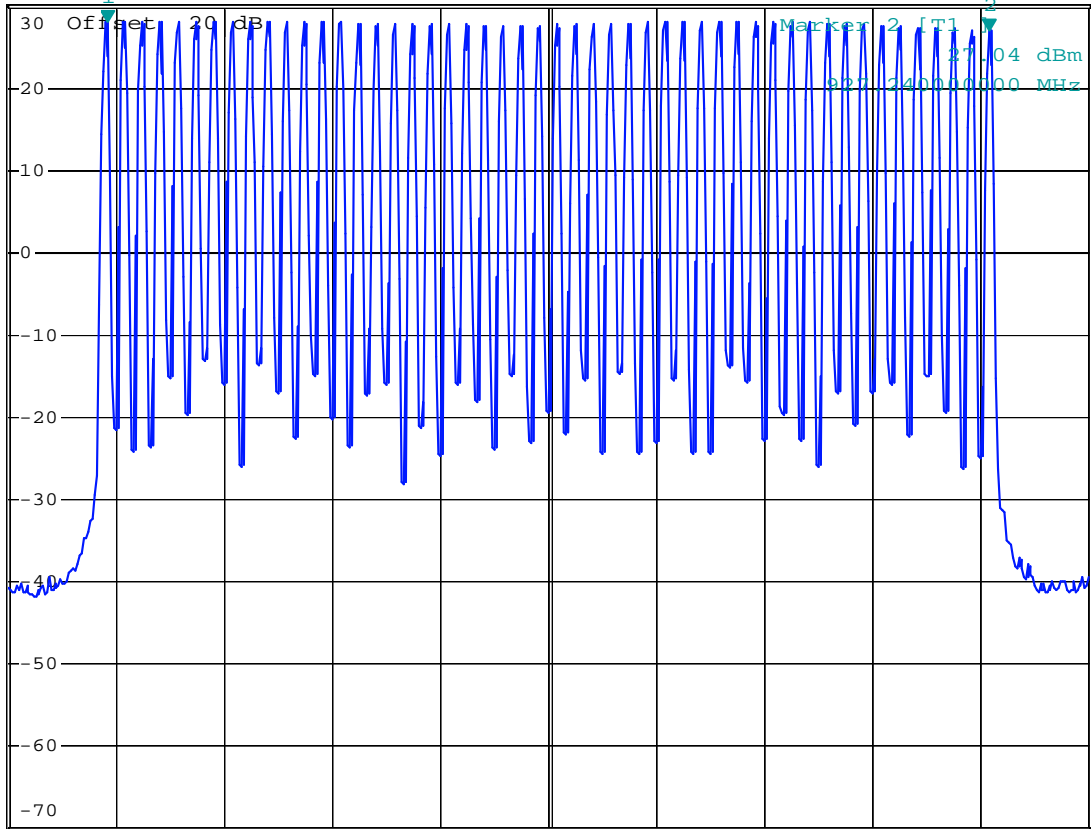


*RBW 100 kHz Marker 1 [T1]
VBW 300 kHz 28.08 dBm
SWT 5 ms 902.760000000 MHz

Ref 30 dBm

*Att 20 dB

1 PK
VIEW



Start 900 MHz 3 MHz/ Stop 930 MHz

5.12 Antenna application - Detailed photos see Attachment A

5.12.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has reverse TNC plugs to connect the defined antennas supplied by the manufacturer.
All supplied antennas meet the requirements of part 15.203 and 15.204.

5.12.2 Antenna requirements

According to FCC Part 15C, Section 15.247 (b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

mikes

5.13 Maximum permissible exposure (MPE) – See Attachment B

For test instruments and accessories used see section 6 Part **CPC 2**.

5.13.1 Description of the test location

Test location: None

5.13.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission’s guidelines.

The test methods used comply with ANSI/IEEE C95.1, “IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”.

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

5.13.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, the MPE can be calculated in a defined distance away from the product.

Friis transmission formula:
$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

P_d = power density (mW/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

Remarks: For detailed test result please refer Attachment B.

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.
A 4	ESHS 30	02-02/03-05-002	05/06/2010	05/06/2009		
	NNLK 8129	02-02/20-05-001			06/22/2010	12/22/2009
	ESH 2 - Z 5	02-02/20-05-004	03/13/2011	03/13/2008	05/17/2010	11/17/2009
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155			04/06/2010	10/06/2009
	SP 103 /3.5-60	02-02/50-05-182				
CPC 2	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	Inmet 18N50W-20 dB	02-02/50-10-001				
DC	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	Inmet 18N50W-20 dB	02-02/50-10-001				
MB	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	Inmet 18N50W-20 dB	02-02/50-10-001				
SEC 1-3	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	WHJS 1000-10EE	02-02/50-05-070				
	Inmet 18N50W-20 dB	02-02/50-10-001				
SER 1	FMZB 1516	01-02/24-01-018			02/15/2011	02/15/2010
	ESCI	02-02/03-05-005	11/10/2010	11/10/2009		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	08/05/2010	08/05/2009		
	VULB 9168	02-02/24-05-005	05/06/2011	05/06/2008	04/08/2010	10/08/2009
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 3	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	AFS4-01000400-10-10P-4	02-02/17-05-003				
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	02/10/2011	02/10/2010		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				

7 Constructional dataform for testing

Licence holder:	Checkpoint Systems Inc.		
Address:	101 Wolf Drive, Thorofare, NJ 08086, USA		
Manufacturer:	RM Gerätebau		
Address:	Hirschbachstr. 47, 64354 Reinheim, Germany		
Type / Model Name:	WRTZ -1000		
Product Description:	UHF RFID Reader		
Serial-No.:	Prototype	Protection class:	

Additional information to the above named model:

Antenna: transmitter:	Type:		
	Length/size:		
	receiver:	Type:	
		Length/size:	
Power supply of the transmitter: Type:	nominal voltage:	12 V	
	lowest voltage:	10,2 V	
	highest voltage:	13,8 V	
	current consumption	2,2 A	
Power supply of the receiver: Type:	Same as Transmitter		
	nominal voltage:	V	
	lowest voltage:	V	
	highest voltage:	V	
	current consumption	A	

Ancillary equipment:

Description:	PSU	Type:	AEB70US12	Serial-no.:	70120-0002201
Description:	PSU	Type:	LFZVC60NP12E4	Serial-no.:	1007
Description:	TX Antenna	Type:	Kathrein 52010073	Serial-no.:	

Extreme temperature range in which the approval test should be performed:

X Category I: General (-20°C to +55°C) if fail please test according to III

O Category II: Portable (-10°C to +55°C)

O Category III: Equipment for normal indoor use (0°C to +55°C)

Connectable cables:

Name of the cable	Digital	Length/m	shielded
Ethernet cable	X yes O no	5	X yes O no
I/O cable	X yes O no	4,2	X yes O no
Serial cable	X yes O no	3	X yes O no
USB cable	X yes O no	5	X yes O no
	O yes O no		O yes O no

Type designation: UHF RFID Reader			
Name and type designation of individual units comprising the radio equipment:			
Type of equipment:			
<input type="checkbox"/> Radiotelephone equipment	<input type="checkbox"/> Remote-control equipment	<input type="checkbox"/> Radio maritime equipment	<input type="checkbox"/> LPD
<input type="checkbox"/> One-way radiotelephone equipment	<input type="checkbox"/> Inductive loop system	<input type="checkbox"/> Inland waterways equipment	<input type="checkbox"/> RLAN
<input type="checkbox"/> Personal paging system	<input type="checkbox"/> Radio-relay system	<input type="checkbox"/> Radio navigation equipm.	<input checked="" type="checkbox"/> RFID
<input type="checkbox"/> Satellite earth station	<input type="checkbox"/> CB radiotelephone equipment	<input type="checkbox"/> Antenna	<input type="checkbox"/>
<input type="checkbox"/> Data transmission equipment	<input type="checkbox"/> Movement detector	<input type="checkbox"/> Aeronautical equipment	<input type="checkbox"/>
Technical characteristics:			
	Transmitter-receiver EU	Transmitter-receiver US	Receiver
Frequency range	865 -868 MHz	902-928 MHz	
Maximum no. of channels	15	50	
Channel spacing	200 kHz	500 kHz	
Class of emission ()	A7X	A7X	
Maximum RF output power	30 dBm	30 dBm	
Maximum effective radiated power (ERP)	33 dBm	33 dBm	
Output power variable	Yes	Yes	
Channel switching frequency range		<input type="checkbox"/>	
Method of frequency generation	<input checked="" type="checkbox"/> Synthesizer	<input type="checkbox"/> Crystal	<input type="checkbox"/> Other
Lowest generated frequency			
Modulation	<input type="checkbox"/> Analogue Type:	<input checked="" type="checkbox"/> Digital	Type:
Frequency generation RX			
IF	1st IF	2nd IF	3rd IF
Integral selective calling			
Audio-frequency interface level at external data socket			
Modes of operation	<input checked="" type="checkbox"/> Duplex mode	<input type="checkbox"/> Semi-duplex mode	<input type="checkbox"/> Simplex mode
Power source	<input type="checkbox"/> Mains	<input type="checkbox"/> Vehicle-regulated	<input checked="" type="checkbox"/> 12 V DC
Antenna socket	<input type="checkbox"/> BNC <input type="checkbox"/> M <input type="checkbox"/> None	<input type="checkbox"/> TNC <input type="checkbox"/> UHF <input type="checkbox"/> UFL	<input type="checkbox"/> N <input type="checkbox"/> Adapter <input checked="" type="checkbox"/> TNC-RP
Test specifications:			

FCC ID: DO4WRTZ1000

Declarations:

- We declare that the above information are correct and the named model was supplied with the maximum configuration to the accredited test laboratory.

Heppenheim, date 28.03/10
place of issue



Checkpoint Systems International GmbH
Postfach 1805 · D-64636 Heppenheim
Seal and signature of applicant

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