



FCC ID:NDX-MICROMAX

Registration No. DAT-P-207/05

EMI -- TEST REPORT

- FCC Part 15.209 -

Test Report No. :	T32037-02-00HU	02. September 2009 Date of issue
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Type / Model Name : MICROMAX

Product Description : RF-ID Pocket Reader

Applicant : Datamars SA

Address : Via ai Prati

CH – 6930 Bedano

Manufacturer : Datamars SA

Address : Via ai Prati

CH – 6930 Bedano

Licence holder : Datamars SA

Address : Via ai Prati

CH – 6930 Bedano

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 C- Intentional Radiators (October 01, 2007)

Part 15, Subpart C, Section 15.209(a)	Radiated emissions, general requirements
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Part 15, Subpart C, Section 15.207(a)	AC Line conducted emissions
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2 SUMMARY

GENERAL REMARKS:

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 : 31. August 2009

Testing concluded on : 01. September 2009

Checked by:

Tested by:

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

Huber Markus

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT

Front view:



Rear view:

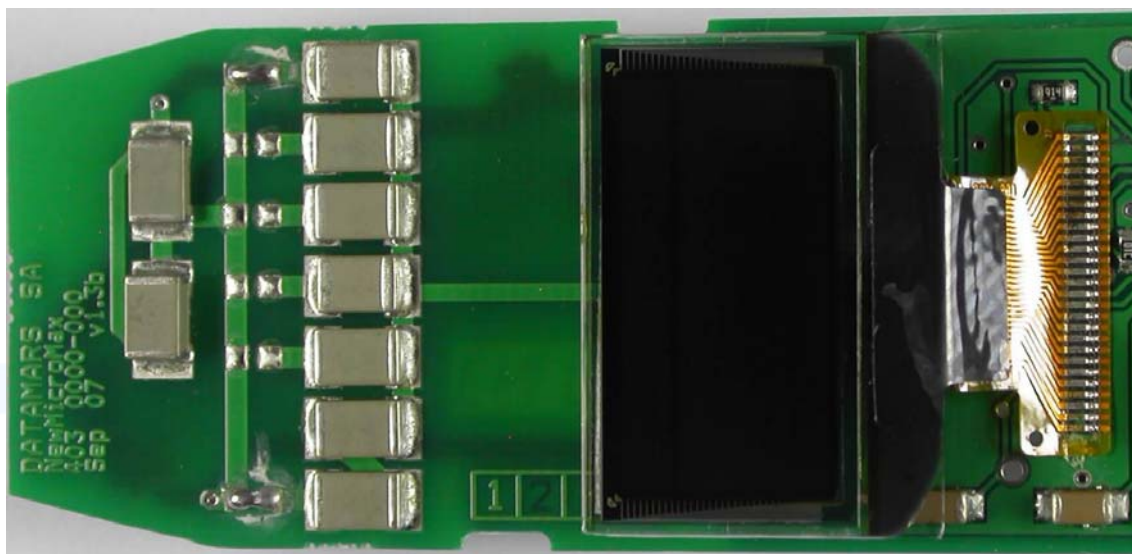


Rear view open battery cover:



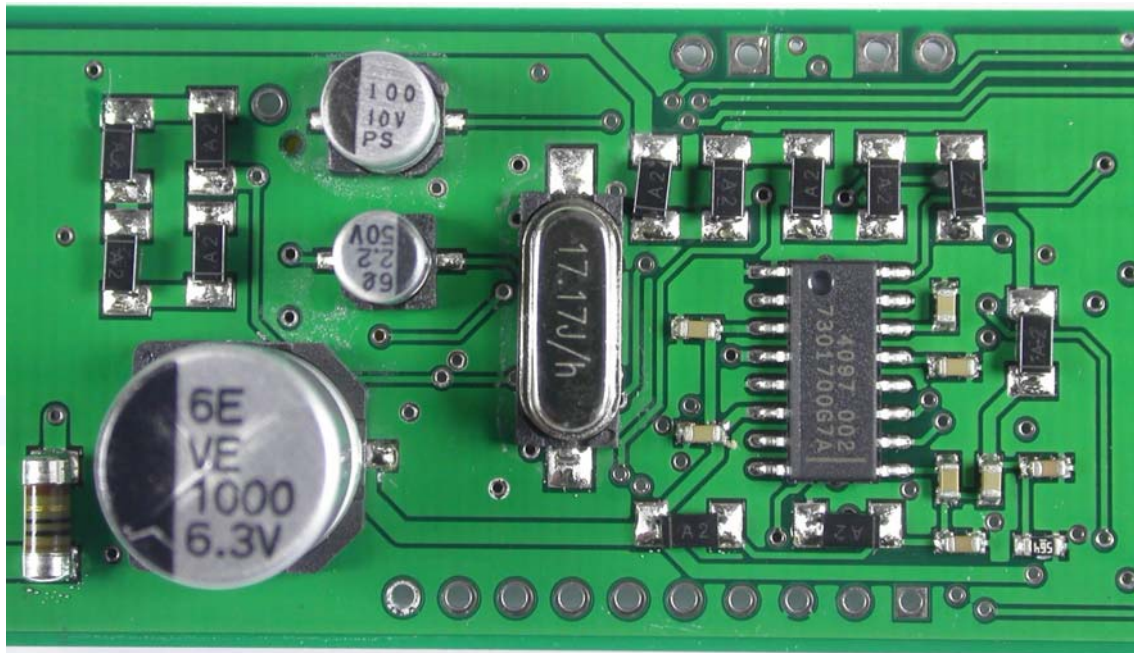
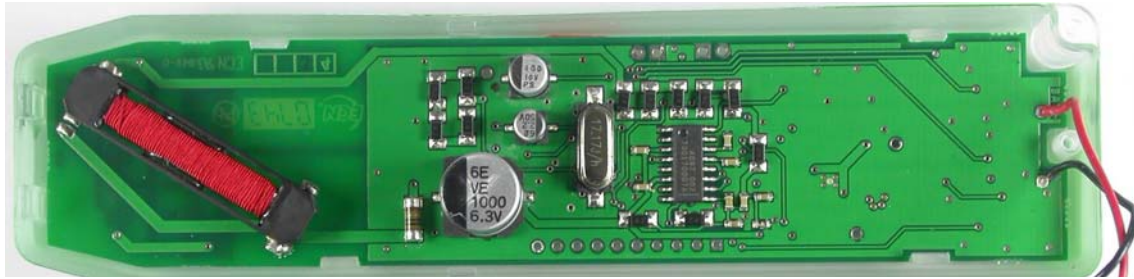
FCC ID:NDX-MICROMAX

Internal Front view:



FCC ID:NDX-MICROMAX

Internal Rear view:



3.2 Power supply system utilised

Power supply voltage : 3.0 V / DC

3.3 Short description of the Equipment under Test (EuT)

The EuT is a RFID Handheld Reader which will be used in veterinary doctors office.

Number of tested samples: 1
Serial number: see Photo documentation of the EuT under Point 3 / Equipment Under Test

EuT operation mode:

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

- Tag reading mode at 134.2KHz

- Standby

-

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:

- _____	Model : _____
- _____	Model : _____
- _____	Model : _____
- _____	Model : _____
- _____	Model : _____
- _____	Model : _____

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 is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 /11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer 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, European Standard EN 55022 as shown under section 1 of this report.

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using 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.

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 C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

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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

5.1.2 Photo documentation of the test set-up

5.1.3 Description of Measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR limit.

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

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

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

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 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters 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 on the data sheets.

5.1.4 Test result

Remarks: The measurement is not applicable.

The EuT is battery powered and has no AC mains connections.

5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part CPR 1.

5.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



5.2.3 Description of Measurement

The magnetic field strength from the EuT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in $\text{dB}\mu\text{V}/\text{m}$, is arrived at by taking the reading from the EMI receiver (Level $\text{dB}\mu\text{V}$) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: ResBW: 200 Hz

150 kHz – 30 MHz: ResBW: 9 kHz

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Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level (dBμV/m)	Limit (dBμV/m)	=	Delta (dB)
1.705	5	+	20	=	25	30	=	5

5.2.4 Test result

Measured 3m:

Frequency [kHz]	L: PK [dBμV]	L: AV [dBμV]	L: QP [dBμV]	Correct. [dB]	L: PK [dBμV/m]	L: AV [dBμV/m]	L: QP [dBμV/m]	Limit [dBμV/m]	Delta [dB]
134.2	72.2	71.8	71.7	20	92.2	91.8	91.7	105.05	13.35

Calculated 30m:

Frequency [kHz]	L: PK [dBμV]	L: AV [dBμV]	L: QP [dBμV]	Correct. [dB]	L: PK [dBμV/m]	L: AV [dBμV/m]	L: QP [dBμV/m]	Limit [dBμV/m]	Delta [dB]
134.2	32.2	31.8	31.7	20	52.2	51.8	51.7	65.05	13.35

Calculated 300m:

Frequency [kHz]	L: PK [dBμV]	L: AV [dBμV]	L: QP [dBμV]	Correct. [dB]	L: PK [dBμV/m]	L: AV [dBμV/m]	L: QP [dBμV/m]	Limit [dBμV/m]	Delta [dB]
134.2	-7.8	-8.2	-8.3	20	12.2	11.8	11.7	25.05	13.35

Limit according to FCC Part 15 Subpart 15.209(a)

Frequency (MHz)	Field strength of fundamental wave		Measurement distance (meters)
	(μV/m)	dB (μV/m)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks:

5.3 Spurious emissions (Magnetic field) 9 kHz – 30 MHz

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

5.3.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.3.2 Photo documentation of the test set-up



5.3.3 Description of Measurement

The spurious emissions from the EuT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31 (f) (2) [2]. The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the EMI receiver (Level dB μ V) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: ResBW: 200 Hz

150 kHz – 30 MHz: ResBW: 9 kHz

Example:

Frequency (MHz)	Level (dB μ V)	+	Factor (dB)	=	Level (dB μ V/m)	Limit (dB μ V/m)	=	Delta (dB)
1.705	5	+	20	=	25	30	=	5

5.3.4 Test result

Extract of the critical values:

Measured 3m:

Frequency [kHz]	L: PK [dBμV]	L: QP [dBμV]	L: AV [dBμV]	Correct. [dB]	L: PK [dBμV/m]	L: QP [dBμV/m]	L: AV [dBμV/m]	Limit [dBμV/m]	Delta [dB]
402.6	31.6	28.1	27.1	20	51.6	48.1	47.1	95.51	48.41
671.0	29.2	22.9	19.7	20	49.2	42.9	39.7	71.07	28.17
939.4	30.9	16.9	12.4	20	50.9	36.9	32.4	68.15	31.25
1207.8	25.3	16.5	10.2	20	45.3	36.5	30.2	65.96	29.46
1476.2	30.5	14.9	9.5	20	50.5	34.9	29.5	64.22	29.32

Calculated 30m:

Frequency [kHz]	L: PK [dBμV]	L: QP [dBμV]	L: AV [dBμV]	Correct. [dB]	L: PK [dBμV/m]	L: AV [dBμV/m]	L: AV [dBμV/m]	Limit [dBμV/m]	Delta [dB]
402.6	-8.4	-11.9	-12.9	20	11.6	8.1	7.1	55.51	48.41
671.0	-10.8	-17.1	-20.3	20	9.2	2.9	-0.3	31.07	28.17
939.4	-9.1	-23.1	-27.6	20	10.9	-3.1	-7.6	28.15	31.25
1207.8	-14.7	-23.5	-29.8	20	5.3	-3.5	-9.8	25.96	29.46
1476.2	-9.5	-25.1	-30.5	20	10.5	-5.1	-10.5	24.22	29.32

Calculated 300m:

Frequency [kHz]	L: PK [dBμV]	L: QP [dBμV]	L: AV [dBμV]	Correct. [dB]	L: PK [dBμV/m]	L: QP [dBμV/m]	L: AV [dBμV/m]	Limit [dBμV/m]	Delta [dB]
402.6	-48.4	-51.9	-52.9	20	-28.4	-31.9	-32.9	15.51	48.41

Limit according to FCC Part 15 Subpart 15.209(a)

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (meters)
	(μV/m)	dB (μV/m)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks:

5.4 Radiated emissions (electric field) 30 MHz – 1 GHz

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

5.4.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.4.2 Photo documentation of the test set-up



5.4.3 Description of Measurement

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 polarized 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 meter non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003. 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 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 polarization's and the EuT are rotated 360 degrees.

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

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The resolution bandwidth during the measurement is as follows:
30 MHz – 1000 MHz: ResBW: 120 kHz

Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level (dBμV/m)	Limit (dBμV/m)	=	Delta (dB)
719	75	+	32.6	=	107.6	110	=	-2.4

5.4.4 Test result

Extract of the critical values:

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 - 1000					< 20	< 20	40,0	> 20

Limit according to FCC Part 15 Subpart 15.209(a)

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (meters)
	(μV/m)	dB (μV/m)	
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:

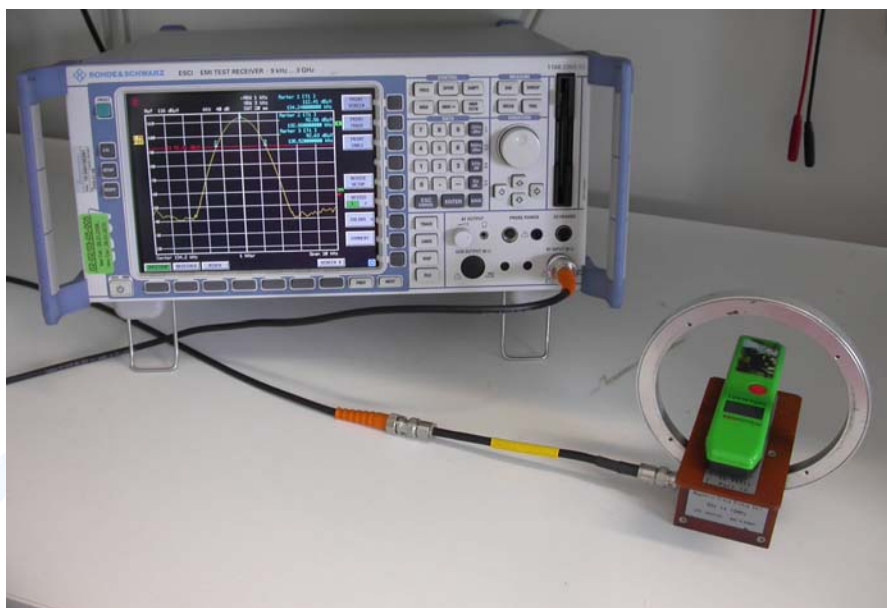
5.5 Emission Bandwidth

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

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up



5.5.3 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.

The resolution bandwidth of measuring instrument was set to a value as shown in the following table below according to ANSI C63.4-2003.

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1kHz
30 to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

5.5.4 Test result

Fundamental [kHz] See Plot 1	20dB Bandwidth F1	20dB Bandwidth F2	Measured Bandwidth [kHz]
134.24	132.88	135.52	2.64

5.5.5 Test protocol

Emission Bandwidth plots



*RBW 1 kHz

Marker 1 [T1]

VBW 3 kHz

112.41 dBμV

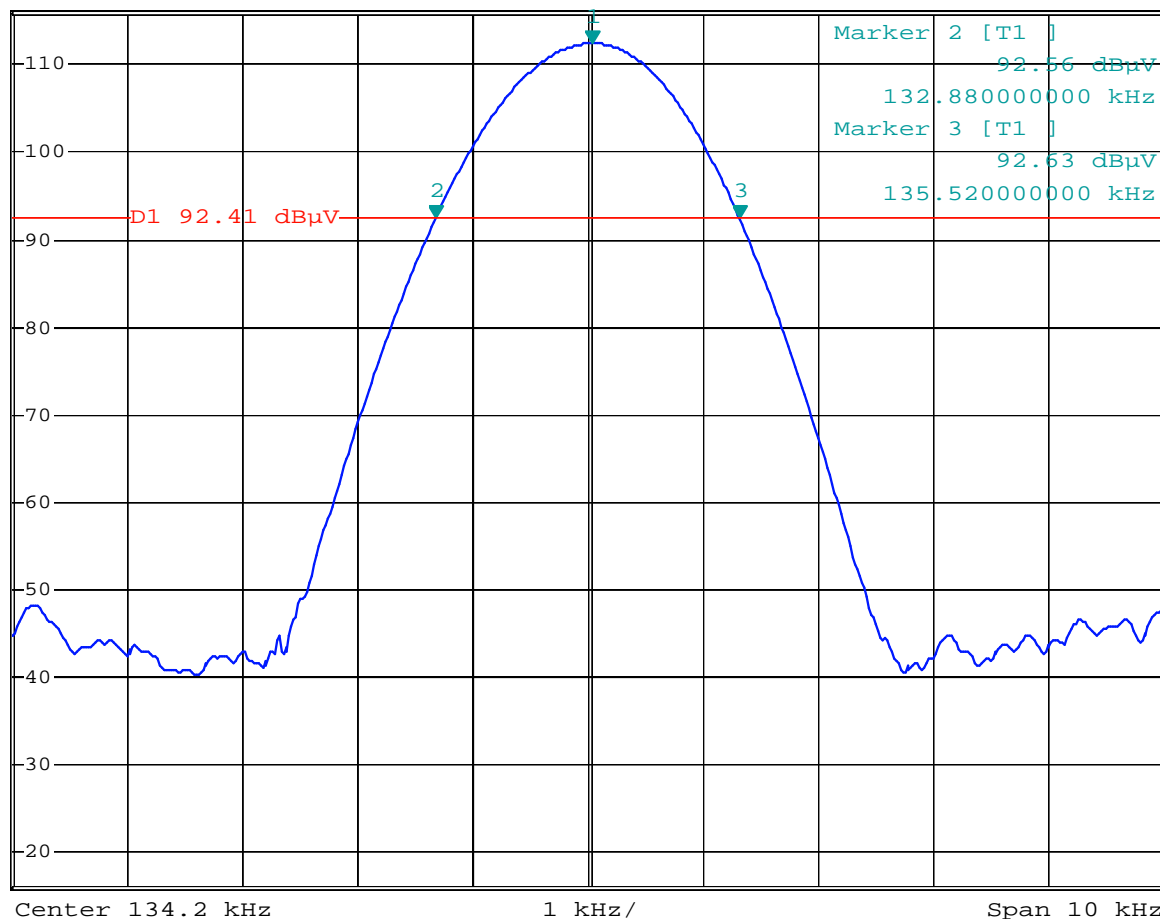
SWT 20 ms

134.240000000 kHz

Ref 116 dBμV

Att 40 dB

1 PK
VIEW



6 USED TEST EQUIPMENT AND ACCESSORIES

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

The calibration intervals and the calibration history will be given out on request.

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.
CPR 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektron	01-02/24-01-018
	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-004
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
MB	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-004
	HZ-10	Magnetic Field Antenna	Rohde & Schwarz München	02-02/24-05-012
SER 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektron	01-02/24-01-018
	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-004
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	VULB 9168	Trilog Broad Band Anten	Schwarzbeck Mess-Elektron	02-02/24-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113

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Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 1				
01-02/24-01-018	02/23/2010	02/23/2009		
02-02/03-05-004	01/19/2010	01/19/2009		
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
MB				
02-02/03-05-004	01/19/2010	01/19/2009		
02-02/24-05-012				
SER 1				
01-02/24-01-018	02/23/2010	02/23/2009		
02-02/03-05-004	01/19/2010	01/19/2009		
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
SER 2				
02-02/03-05-006	08/05/2010	08/05/2009		
02-02/24-05-005	05/06/2011	05/06/2008	02/28/2010	08/31/2009
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				