

Königswinkel 10 32825 Blomberg Germany Phone +49 5235 9500-0 Fax +49 5235 9500-10

TEST REPORT

Test Report Reference: F113239E2

Equipment under Test:

Digital-Indoor-Base-Transceiver DIB-500 R4.1

Applicant:

Rohde & Schwarz Professional Mobile Radio GmbH

Manufacturer:

Rohde & Schwarz Professional Mobile Radio GmbH

Laboratory (CAB) accredited by
Deutsche Gesellschaft für Akkreditierung mbH
in compliance with DIN EN ISO/IEC 17025
under the Reg. No. DGA-PL-105/99-22,
FCC Test site registration number 90877 and
Industry Canada Test site registration IC3469A-1



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1 IDENTIFICATION

1.1 APPLICANT

Name:	Rohde & Schwarz Professional Mobile Radio GmbH	
Address:	Fritz-Hahne-Straße 7	
	31848 Bad Muender	
Country:	Germany	
Name for contact purposes:	Mr. Dominik Vatovic	
Tel:	+49-(0)-5042-998-384	
Fax:	+49-(0)-5042-998-305	
e-mail address:	dominik.vatovic@rohde-schwarz.com	

1.2 MANUFACTURER

Name:	Rohde & Schwarz Professional Mobile Radio GmbH	
Address:	Fritz-Hahne-Straße 7	
	31848 Bad Muender	
Country:	Germany	
Name for contact purposes:	Mr. Dominik Vatovic	
Tel:	+49-(0)-5042-998-384	
Fax:	+49-(0)-5042-998-305	
e-mail address:	dominik.vatovic@rohde-schwarz.com	

1.3 DATES

Date of receipt of test sample:	1 September 2011
Start of test:	1 September 2011
End of test:	9 September 2011

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1.4 TEST LABORATORY

The tests were carried out at: PHOENIX TEST-LAB GmbH

Königswinkel 10

D-32825 Blomberg Phone: +49 (0) 52 35 / 95 00-0 Germany Fax: +49 (0) 52 35 / 95 00-10

accredited by DGA Deutsche Gesellschaft für Akkreditierung mbH in compliance with DIN EN ISO/IEC 17025 under Reg. No. DGA-PL-105/99-22, FCC Test site registration number 90877 and Industry Canada Test site registration IC3469A-1.

Test engineer:	Raimund BLASK	Bll	20 December 2011
_	Name	Signature	Date
Authorized reviewer:	Bernd STEINER	B. Sher	21 December 2011
-	Name	Signature	Date

1.5 RESERVATION

This test report is only valid in its original form.

Any reproduction of its contents without written permission of the accredited test laboratory PHOENIX TEST-LAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TEST-LAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TEST-LAB Logo and the TEST REPORT REFERENCE.

1.6 NORMATIVE REFERENCES

[1] FCC 47 CFR Part 90 (October 2010)

Private Land Mobile Radio Service

[2] FCC 47 CFR Part 2 (October 2010)

[3]RSS119 Issue 11 (June 2011)

Radio Transmitters and Receivers Operating in the Land Mobile and Fixed Services in the Frequency range 27.41 to 960 MHz.

[4] FCC Waiver for Tetra FCC 11-63 and FCC DA 11-1604

1.7 TEST RESULTS

The requirements of this test document are fulfilled by the equipment under test. The complete test results are presented in the following.

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2 TECHNICAL DATA OF EQUIPMENT

2.1 DEVICE UNDER TEST

Type of equipment:	Digital Indoor Base Transceiver
Type designation:	DIB-500 R4.1
Operating frequency range:	851.000 MHz to 869.000 MHz
Transmitter output power:	+47.0 dBm (nominal for single carrier)
Channel spacing:	25 kHz

^{*} declared by the applicant

The following external I/O cables were used:

Cable	Length	Shielding	Connector
Ethernet	2m	yes	RJ45
RF-Connector	3m	yes	7/16
AC-Power	3m	no	AC-Plug

2.2 PERIPHERY DEVICES

The ancillary equipment mentioned below was in use*:

Type of equipment:	Type designation:
Cabinet:	19"-SMARACT
Power-Supply:	EATON AC/DC-Converter
Antenna Coupling Unit:	ACS-500
Fan Unit:	Fan Unit
Controller:	SC200

^{*} declared by the applicant

2.3 MODIFICATIONS

No modifications were necessary to fulfil the requirements.

2.4 OPERATIONAL STATES

The EUT (Transmitter) was operating in normal operation mode according to ETSI EN 300 392-1 during the tests (unless otherwise stated).

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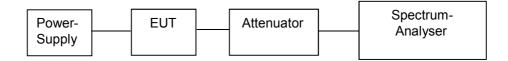


3 TEST PROCEDURES

The test procedures were performed as follows (according to TIA/EIA-603-C (17 August 2004)).

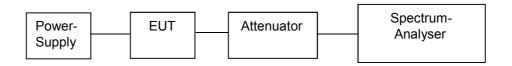
3.1 Power Output at Terminals FCC 2.1046, FCC 90.205

The conducted RF output power is the available power at the output terminals of the transmitter when the output terminals are connected to the standard transmitter load. The test sample is connected to a radio communication analyser. The power output at the transmitter antenna port is determined by adding the value of the cable loss to the power reading. The tests are performed at the frequencies as shown in chapter 4 of this Test Report with full rated power level of the transmitter.



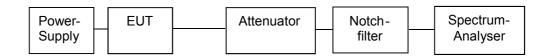
3.2 Occupied Bandwidth FCC 2.1049, 90.210

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.



3.3 Spurious Emissions at Antenna Terminals FCC 2.1051

Conducted spurious emissions are emissions at the antenna terminal on frequencies outside the operating band. In order to suppress inter-modulation products in the spectrum analyser a notch filter is used (if applicable). The test is performed according the principle below:



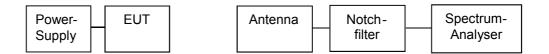
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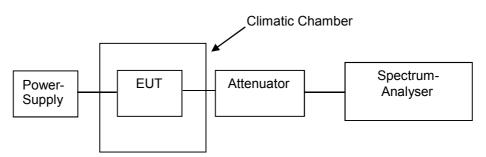
3.4 Radiated Spurious Emissions FCC 2.1053, FCC 90.210

Radiated spurious emissions are emissions from the EUT when transmitting in non-radiating load on frequencies outside the operating band. ERP-Measurement of spurious emission were done to the general substitution method. In order to suppress inter-modulation products in the spectrum analyser a notch filter is used (if applicable).



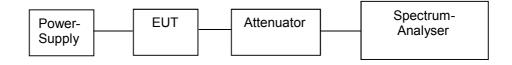
3.5 Frequency Stability with Temperature Variation FCC 2.1055, FCC 90.213

The carrier frequency is the stability of the transmitter to maintain an assigned carrier frequency. The frequency stability was measured with variation of ambient temperature from +5°C to +45°C and variation of the primary voltage.



3.6 Frequency Stability with Primary Voltage Variation FCC 2.1055, FCC 90.213

The carrier frequency is the stability of the transmitter to maintain an assigned carrier frequency. The frequency stability was measured with variation of the primary voltage.



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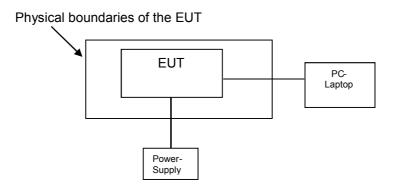
4 OPERATIONAL STATES AND PHYSICAL BOUNDARIES

The Occupied Bandwidth was measured in 25 kHz-Mode.

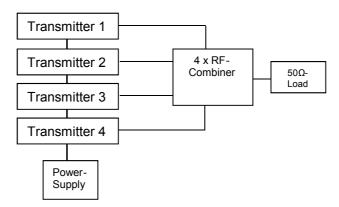
The tests were performed at the lowest, middle and highest frequency of the equipment under test as defined below:

EUT:	Channel:	Transmit frequency:
	1	851.025 MHz
1	2	860.000 MHz
	3	868.975 MHz

The physical boundaries of the Equipment Under Test are shown below:



Transmitter combining network to Antenna port:



Transmitter:	Transmitter	Combiner:	Combiner loss:	Output Power:
	Output Power:			,
1	50 W / +47 dBm	-	0 dB	50 W / +47 dBm
1	50 W / +47 dBm			
2	50 W / +47 dBm	yes	9.4 dB	22.9 W /
3	50 W / +47 dBm			+43.6 dBm
4	50 W / +47 dBm			

Remark: The highest output power is reached by using the equipment as single transmitter. While using 4 Transmitters the sum of the rf-output power is less due to the combiner loss of 9.4 dB.

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5 LIST OF MEASUREMENTS

Test Type:	Application:	Reference clauses in 47 CFR	Appendix No. in Test Report	Result:
RF Power Output at Terminals	RF Terminals	2.1046	5.1	No Limit specified
Occupied Bandwidth 25 kHz-mode	RF Terminals	2.1049 and 90.210 c	5.2	Passed
Occupied Bandwidth 12.5 kHz-mode	RF Terminals	2.1049 and 90.210 d	-	No 12.5 kHz-Mode available
Spurious Emissions at Antenna Terminal	RF Terminals	2.1051 and 90.210	5.3	Passed
Field Strength of Spurious Radiation	Antenna	2.1053 and 90.210	5.4	Passed
Frequency stability with temperature variation	RF Terminals	2.1055 a / i and 90.213	5.5	Passed
Frequency stability with primary voltage variation	RF Terminals	2.1055 d / i and 90.213	5.6	Passed
Transmitter Transient Frequency Behaviour	RF Terminals	90.214	-	Not carried out. EUT operates in continuous transmission mode (100%-Duty-Cycle).
Transmitter intermodulation (colocated transmitter)	RF Terminals	-	5.7	-

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5.1 RF POWER OUTPUT AT TERMINALS

47CFR2.1046

Ambient temperature	20 °C	Relative humidity	55 %
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Test methods: The test was carried out in transmit mode according to TIA-603-C.

All results are shown in the following.

Operation mode: Transmit (single carrier) with nominal Power P=50W/+47dBm

Power measurement (conducted):

Channel:	Transmit frequency:	Carrier Power:
1	851.025 MHz	+46.5 dBm
2	860.000 MHz	+46.8 dBm
3	868.975 MHz	+46.9 dBm
Measurement uncertainty		+0.66 dB / - 0.72 dB

LIMITS:

No Limits are specified in the standard.
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5.2 OCCUPIED BANDWIDTH

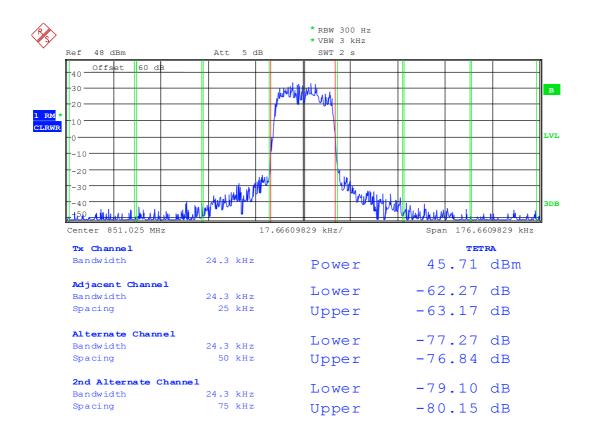
47CFR2.1049

Ambient temperature	20 °C	Relative humidity	50 %
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Test methods: The test was carried out in transmit mode according to TIA-603-C.

All results are shown in the following.

Operation mode: Transmit (single carrier) with nominal Power P=50W/+47dBm



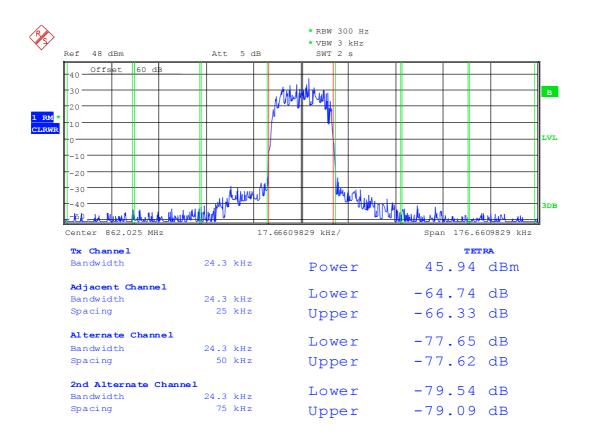
Date: 5.SEP.2011 14:15:39

851ACP: Transmit 851.025 MHz, 25 kHz channel separation

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Date: 5.SEP.2011 14:21:40

862ACP025: Transmit 862.025 MHz, 25 kHz channel separation

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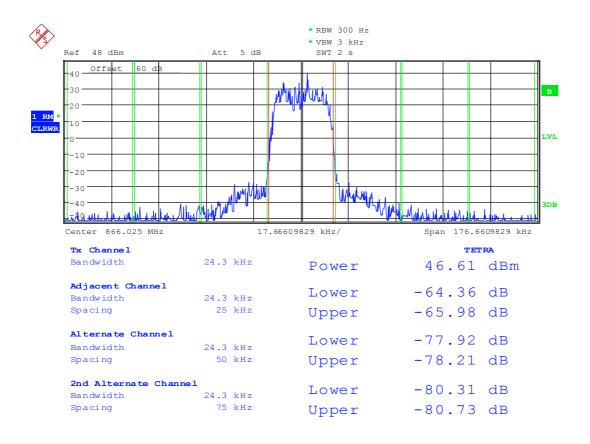
Date: 5.SEP.2011 14:17:05

865ACP975: Transmit 865.975 MHz, 25 kHz channel separation

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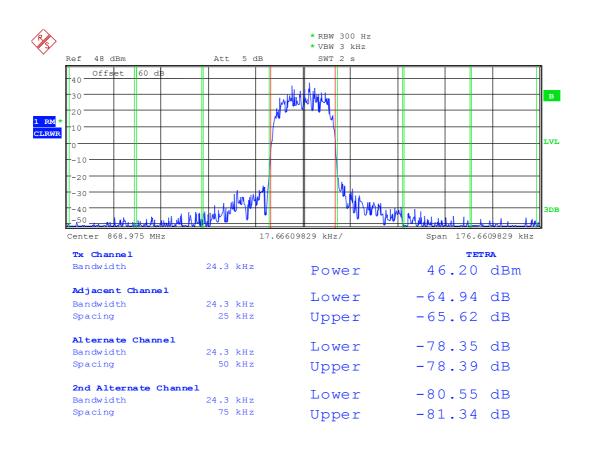
Date: 5.SEP.2011 14:18:30

866ACP025: Transmit 866.025 MHz, 25 kHz channel separation

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Date: 5.SEP.2011 14:20:44

868ACP925: Transmit 868.975 MHz, 25 kHz channel separation

LIMITS: Maximum adjacent power levels for frequencies above 700MHz:

Frequency Offset	Maximum ACP (dBc) for	Maximum ACP (dBc) for
	devices less than 15 watts	devices 15 watts and above
25 kHz	-55 dBc	-55 dBc
50 kHz	-65 dBc	-65 dBc
75 kHz	-65 dBc	-70 dBc

In any case, no requirement in excess of -36 dBm shall apply.

TEST EQUIPMENT USED FOR THE TEST:

9, 23 – 25		
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5.3 SPURIOUS EMISSIONS AT ANTENNA TERMINALS 47CFR2.1051 AND 90.210

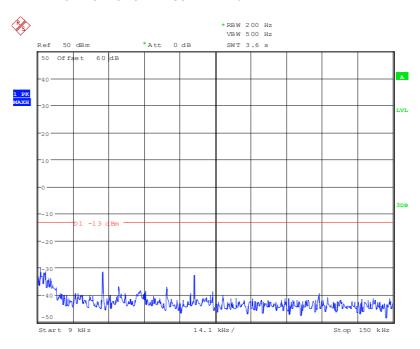
Ambient temperature	20 °C	Relative humidity	55 %
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Test methods: The test was carried out in transmit mode according to TIA-603-C.

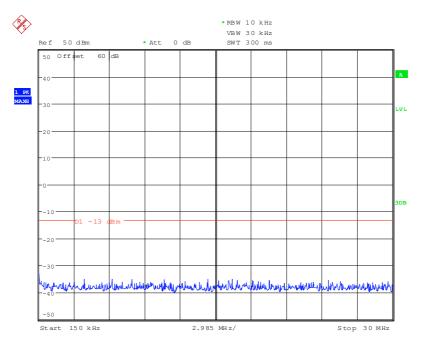
All results are shown in the following.

Operation mode: Transmit, single carrier with f = 851.025 MHz with

nominal Power P = 50W / +47 dBm



851tx1.wmf: 9 kHz to 150 kHz

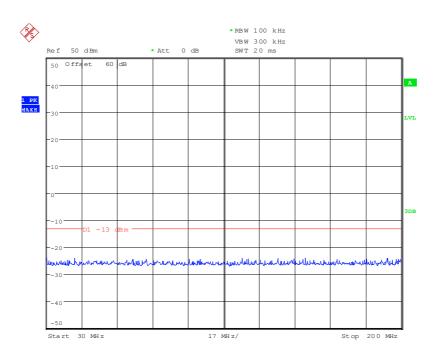


851tx2.wmf: 150 kHz to 30 MHz

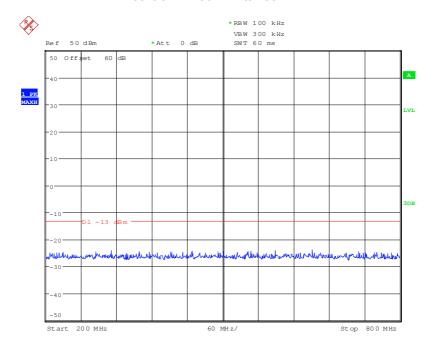
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851tx3.wmf: 30 MHz to 200 MHz

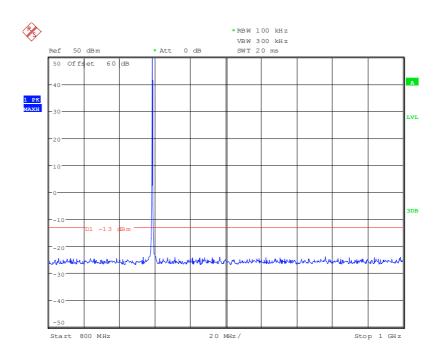


851tx4.wmf: 200 MHz to 800 MHz

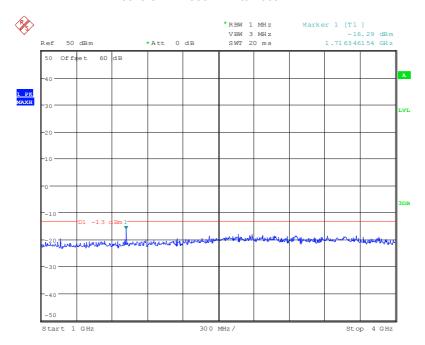
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851tx5.wmf: 800 MHz to 1000 MHz

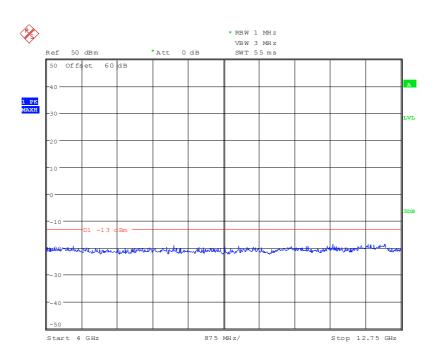


851tx6.wmf: 1 GHz to 4 GHz

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851tx7.wmf: 4 GHz to 12.75 GHz

Measurement results:

	SPURIOUS EMISSIONS LEVEL (CONDUCTED)					
f	f Level Bandwidth f Level					
1702.050 MHz	-16.2 dBm	1 MHz	-	-	-	
-	-	-	-	-	-	
-	_ All significant spurious emission at least 10 dB below the limit.				-	
-	-	-	-	-	-	
Measuremer	nt uncertainty		+ 0.66 dB /	- 0.72 dB		

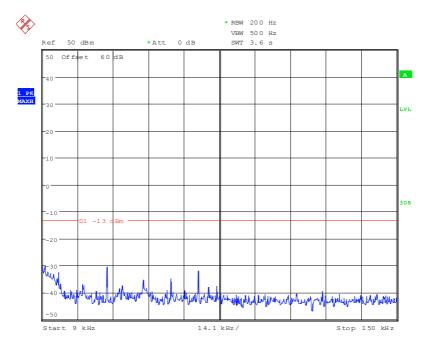
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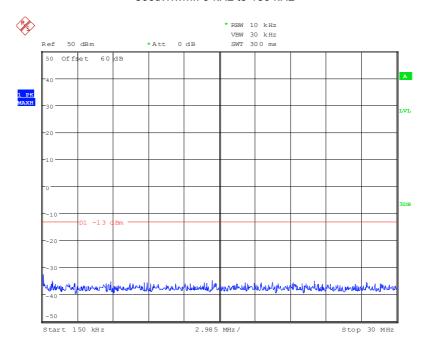


Operation mode:

Transmit, single carrier with f = 868.975 MHz with nominal Power P = 50W / +47 dBm



869tx1.wmf: 9 kHz to 150 kHz

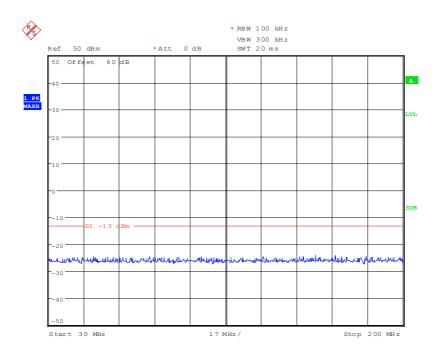


869tx2.wmf: 150 kHz to 30 MHz

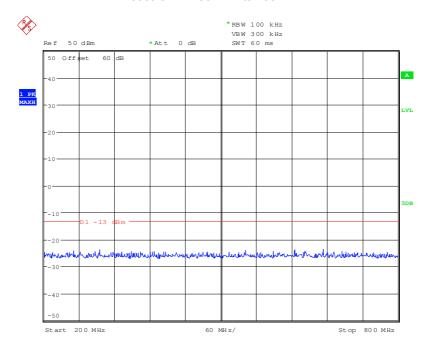
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869tx3.wmf: 30 MHz to 200 MHz

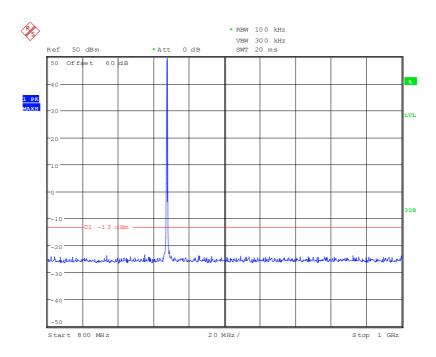


869tx4.wmf: 200 MHz to 800 MHz

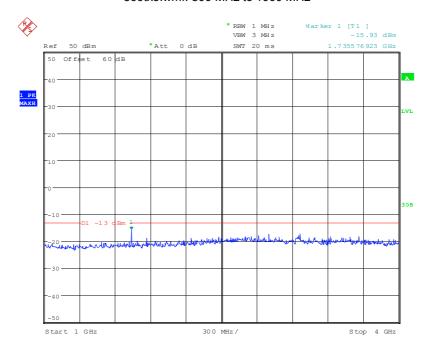
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869tx5.wmf: 800 MHz to 1000 MHz

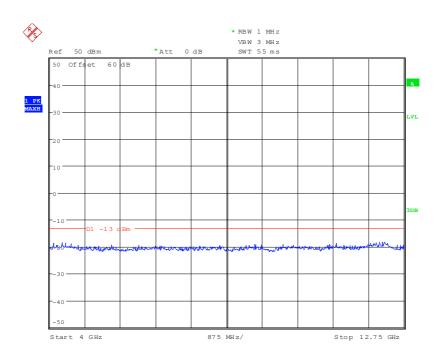


869tx6.wmf: 1 GHz to 4 GHz

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869tx7.wmf: 4 GHz to 12.75 GHz

Measurement results:

	SPURIOUS EMISSIONS LEVEL (CONDUCTED)					
f	f Level Bandwidth f Level					
1737.950 MHz	-15.9 dBm	1 MHz	-	-	-	
-						
-	All significant spurious emission at least 10 dB below the limit.				-	
					-	
Measuremer	nt uncertainty		+ 0.66 dB /	′ - 0.72 dB		

LIMITS:

P (dBm) - (43+10 log (P))	P = Carrier Power in Watts
P = -13 dBm	

TEST EQUIPMENT USED:

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5.4 FREQUENCY STABILITY WITH TEMPERATURE VARIATION 47CFR2.1055 AND 90.213

Ambient temperature	20 °C	Relative humidity	50 %
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Test methods: The test was carried out according to TIA-603-C.

All results are shown in the following.

Operation mode: Transmit, single carrier with nominal Power P = 50W / +47 dBm

Measuring results: Channel 1 / 851.025 MHz

Temperature: Voltage:		Measured	Frequency error:	Relative error:
-	_	frequency:		
+20° C		851.025041 MHz	+41 Hz	+0.05ppm
+5° C	120 V AC / 60 Hz	851.025047 MHz	+47 Hz	+0.06ppm
+45° C		851.025046 MHz	+46 Hz	+0.06ppm

Measuring results: Channel 2 / 860.000 MHz

Temperature:	Voltage:	Measured	Frequency error:	Relative error:
		frequency:		
+20° C		860.000043 MHz	+43 Hz	+0.06ppm
+5° C	120 V AC / 60 Hz	860.000048 MHz	+48 Hz	+0.06ppm
+45° C		860.000046 MHz	+46 Hz	+0.06ppm

Measuring results: Channel 3 / 868.975 MHz

Temperature:	Voltage:	Measured	Frequency error:	Relative error:
		frequency:		
+20° C		868.975048 MHz	+48 Hz	+0.06ppm
+5° C	120 V AC / 60 Hz	868.975051 MHz	+51 Hz	+0.06ppm
+45° C		868.975053 MHz	+53 Hz	+0.06ppm

Remark:

The frequency stability with temperature variation test was carried out in 10°C-Steps from +5°C to +45°C. The extreme values at +5°C and +45°C were documented in this Test-Report.

The device is equipped with a wide range power supply. During the test the input voltage was variated between 100 V to 240 V AC and with 60 Hz and no influence in the measurement results were detected.

Limits: §90.213

±2.5 ppm

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5.5 FREQUENCY STABILITY WITH PRIMARY VOLTAGE VARIATION 47CFR2.1055 / 90.213

Ambient temperature	20 °C	Relative humidity	50 %
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Test methods: The test was carried out according to TIA-603-C.

All results are shown in the following.

Operation mode: Transmit, single carrier with nominal Power P = 50W / +47dBm

Measuring results: Channel 1

Temp:	Voltage:	Measured frequency:	Frequency Error:	Relative Error:
	102 V AC	851.025047 MHz	+47 Hz	+0.06ppm
+20° C	120 V AC	851.025047 MHz	+47 Hz	+0.06ppm
	138 V AC	851.025047 MHz	+47 Hz	+0.06ppm

Measuring results: Channel 2

Temp:	Voltage:	Measured frequency:	Frequency Error:	Relative Error:
	102 V AC	860.000048 MHz	+48 Hz	+0.06ppm
+20° C	120 V AC	860.000048 MHz	+48 Hz	+0.06ppm
	138 V AC	860.000048 MHz	+48 Hz	+0.06ppm

Measuring results: Channel 3

Temp:	Voltage:	Measured frequency:	Frequency Error:	Frequency Error:
	102 V AC	868.975051 MHz	+51 Hz	+0.06ppm
+20° C	120 V AC	868.975051 MHz	+51 Hz	+0.06ppm
	138 V AC	868.975051 MHz	+51 Hz	+0.06ppm

Remark:

The device is equipped with a wide range power supply. During the test the input voltage was variated between 100 V to 240 V AC and with 60 Hz and no influence in the measurement results were detected.

LIMITS: §90.213

± 0.2 ppm

TEST EQUIPMENT USED FOR THE TEST:

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5.6 RADIATED SPURIOUS EMISSIONS

47CFR2.1053 / 90.210

Ambient temperature 20 °C Relative humidity 5

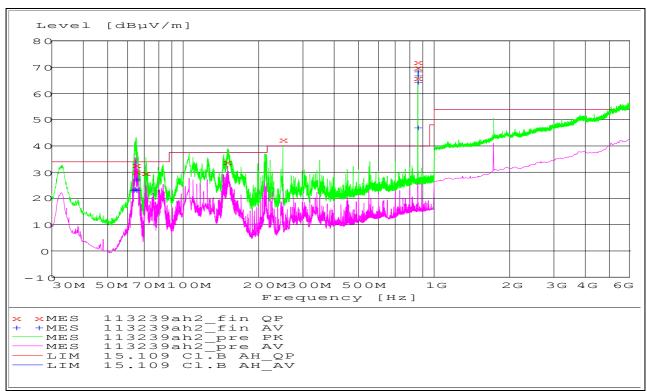
Test methods: The test was carried out according to TIA-603-C Section 2.2.12.

All results are shown in the following.

Operation mode: Multicarrier mode with 4 carriers on the following frequencies:

860.025 MHz, 860.225 MHz, 860.500 MHz, 860.900 MHz

Preliminary measurement results (radiated):



Data record name: 113239ah2

The following frequencies have been carried out from the preliminary measurement and measured at an open area-test-site OATS:

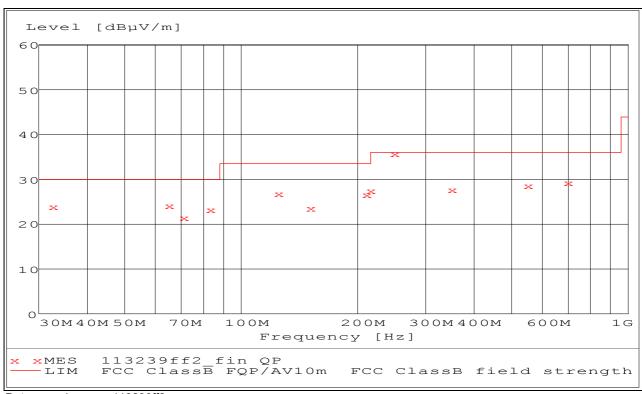
32.600 MHz, 65.004 MHz, 70.860 MHz, 83.200 MHz, 124.560 MHz, 150.636 MHz, 211.360 MHz, 215.120 MHz, 250.000 MHz, 350.000 MHz, 550.000 MHz, 700.000 MHz

The results from the standard subsequent measurements on the open area test site are presented in the following.

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Data record name: 113239ff2

The results of the standard subsequent measurement on the open area test site are indicated in the table below. The limits as well as the measured results (levels) refer to the above mentioned standard while taking account of the specified requirements for a 10 m measuring distance.

Result measured with the quasipeak detector (marked by x):

Frequency MHz	Level dBµV/m	Transducer dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
32.600000	24.10	18.4	30.0	5.9	117.0	315.00	VERTICAL
65.004000	24.20	7.6	30.0	5.8	234.0	142.00	VERTICAL
70.860000	21.50	8.4	30.0	8.5	171.0	134.00	VERTICAL
83.200000	23.40	10.4	30.0	6.6	124.0	314.00	VERTICAL
124.560000	27.00	13.9	33.5	6.5	100.0	107.00	VERTICAL
150.636000	23.80	13.7	33.5	9.7	153.0	180.00	VERTICAL
211.360000	26.70	11.9	33.5	6.8	369.0	180.00	HORIZONTAL
215.120000	27.40	11.9	33.5	6.1	400.0	180.00	HORIZONTAL
250.000000	35.80	16.2	36.0	0.2	100.0	325.00	VERTICAL
350.000000	27.70	18.4	36.0	8.3	100.0	215.00	VERTICAL
550.000000	28.70	24.2	36.0	7.3	350.0	250.00	VERTICAL
700.000000	29.30	25.4	36.0	6.7	100.0	286.00	VERTICAL

TEST EQUIPMENT USED FOR THE TEST:

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5.7 TRANSMITTER INTERMODULATION (CO-LOCATED TRANSMITTER)

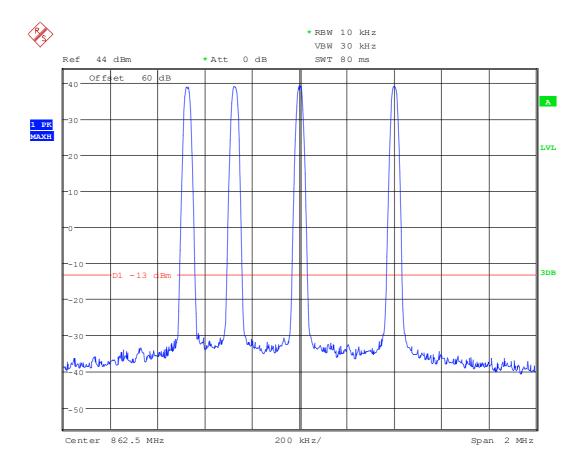
Ambient temperature 20 °C Relative humidity 50 %

Test methods: The test was carried out according to TIA-603-C.

All results are shown in the following.

Operation mode: Multicarrier mode with 4 carriers on the following frequencies:

860.025 MHz, 860.225 MHz, 860.500 MHz, 860.900 MHz



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6 MEASUREMENT EQUIPMENT

No.	Test equipment	Туре	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. due
1	Open area test site	-	Phoenix Test-Lab	-	480085	Weekly verification (system cal.)	
2	Measuring receiver	ESIB7	Rohde & Schwarz	100304	480521	03/15/2010	03/2012
3	Controller	HD100	Deisel	100/670	480139	-	-
4	Turntable	DS420HE	Deisel	420/620/80	480087	-	-
5	Antenna support	AS615P	Deisel	615/310	480086	-	-
6	Antenna	CBL6111 A	Chase	1643	480147	08/01/2007	08/2012
7	EMI Software	ES-K1	Rohde & Schwarz	-	480111	-	-
8	Fully anechoic chamber M20	-	Albatross Projects	B83107-E2439-T232	480303	Weekly ve (systen	
9	Spectrum analyser	FSU	Rohde & Schwarz	200125	480956	04/15/2010	04/2012
10	Measuring receiver	ESI 40	Rohde & Schwarz	100064	480355	03/17/2010	03/2012
11	Controller	MCU	Maturo	MCU/043/971107	480832	-	-
12	Turntable	DS420HE	Deisel	420/620/80	480315	-	-
13	Antenna support	AS615P	Deisel	615/310	480187	-	-
14	Antenna	CBL6112 B	Chase	2688	480328	04/2011	04/2014
15	Antenna	3115 A	EMCO	9609-4918	480183	04/11/2008	11/2011
16	RF-cable No. 30	RTK 081	Rosenberger	-	410141	Weekly ve (systen	
17	RF-cable No. 31	RTK 081	Rosenberger	-	410142	Weekly ve	
21	Power Meter	NRVD	Rohde & Schwarz	828110/026	480267	03/2010	03/2012
22	Thermal Power Sensor	NRV-Z51	Rohde & Schwarz	825489/004	480247	03/2010	03/2012
23	Coaxial-Attenuator	200W / 30dB	Spinner	29971	480232	Weekly ve	
24	Coaxial-Attenuator	25W / 10dB	Weinschel	BH4856	410130	Weekly ve (systen	
25	Coaxial-Attenuator	10W / 20dB	Weinschel	7539	410113	Weekly ve (systen	
26	Climatic chamber	MK240	Binder	-	480462	02/2011	08/2012

7 TEST REPORT HISTORY

Report Number	Date	Comment
F113239E2	20 December 2011	Document created
-	-	-
-	-	-

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8 LIST OF ANNEXES

ANNEX A	PHOTOS OF THE TEST SETUP:	3 pages
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Test set-up preliminary radiated spurious emissions 113239emi1.jpg
Test set-up final radiated spurious emissions 113239emi2.jpg
Test set-up climatic chamber 113239clima1.jpg

ANNEX B EXTERNAL PHOTOS OF THE EUT: 2 pages

EUT, front view 113239eut1.jpg EUT, rear view 113239eut2.jpg

ANNEX C INTERNAL PHOTOS OF THE EUT: 9 pages

Controller-PCB 113239eut5.jpg RF-PCB, front-view 113239eut6.jpg RF-PCB, rear-view 113239eut7.jpg 113239eut8.jpg Prozessor-Unit Controller-Unit, front-view 113239eut9.jpg Controller-Unit, rear-view 113239eut10.jpg DSP-Board 113239eut13.jpg Synthesiser 113239eut14.jpg Power-Supply 113239eut15.jpg

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