

FCC ID: RW3RFS2

Issue date: 2004-03-29



Test Report
acc. to the relevant standard:
47 CFR Part 15 C – Intentional Radiators
Measurement Procedure:
ANSI C63.4 - 1992
relating to
Bron Elektronik AG
RFS Transceiver Module
Variants: L7272.01 / L7272.11 / L7272.21
Variants: L7272.03 / L7272.13 / L7272.23

Measurement of Radio- Noise Emissions
from Low- Voltage Electrical and Electronic Equipment
Technical characteristics and test methods for radio equipment
in the frequency range 9 kHz to 40 GHz

FCC ID: RW3RFS2

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Manufacturers Details	
Manufacturer	Bron Elektronik AG
Manufacturers Grantee Code	RW3
Manufacturers Address	Hagmattstrasse 7
	CH-4123 Allschwil
	Switzerland
	Phone : 0041/614 85 85
	Fax : 0041/614 8585
	E- Mail:uzeltner@bron.ch
Relevant Standard Used	47 CFR Part 15C - Intentional Radiators
	ANSI C63.4-1992

Test Report prepared by	
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Equipment Under Test (EUT)	
Equipment Category	Transceiver
Trade Name	
Type designation	RFS Transceiver Module L7272.XX
Serial No.	None / Sample No.1,2,3(916.5MHz), Sample No.4,5,6(914.0MHz)
Variants	L7272.01 / L7272.11 / L7272.21(916.5MHz)
	L7272.03 / L7272.13 / L7272.23 (914.0MHz)

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0 Test result

CFR Section	Report Chapter	Requirements headline	Test result		
			OK		
15.203	10.1	Antenna Requirement	pass	fail	na
15.249 (a)	10.2	Field Strength Limits (Fundamental)	pass	fail	na
15.249(d) 15.209	10.2	Radiated Spurious Emissions	pass	fail	na
15.207	10.3	Conducted Emissions	pass	fail	na
15.215 (c)	10.4	20 dB Bandwidth	pass	fail	na

Test requirements kept	yes no
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Signature Test Personnel



.....
Ralf Trepper

Signature of the Company Official



.....
Manfred Dudde

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1 Testing laboratory

Company Name: m.dudde high frequency technology
Street: Rottland 5a
City: 51429 Bergisch Gladbach
Country: Germany

Laboratory:

FCC Registration Number: 699717

This site has been fully described in a report submitted to the FCC, and
accepted in the letter dated

Registration Number .699717

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2 Introduction

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of m. dudde hochfrequenz - technik.

This report contains the result of tests performed by m. dudde hochfrequenz - technik for the purpose of a type approval. The order for the carrying out of these tests has been placed by:

Manufacturer

Company name : Bron Elektronik AG
Address : Hagmattstrasse 7
Postcode : CH-4123
City/town : Allschwil
Country : Schweiz
Telephone : 0041/614 85 85
Telefax : 0041/614 8585
E-Mail : uzeltner@bron.ch
Date of order : 2004-02-20
References : Herr Zeltner

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3 Product

Samples of the following apparatus were submitted for testing:

Type of equipment	: Transceiver
Trademark	: broncolor
Type designation	: RFS Transceiver Module
Hardware version	: L7272.X1 (916.5 MHz) / L7272.X3 (914.0 MHz)
Serial number	: none (Sample No.1 / Sample No.2)
Software release	: ---
Equipment used power	: 5.0VDC
Transmit frequency	: 914.0MHz / 916.5MHz
Generated or used frequencies	: 6MHz / 8MHz
FCC ID	: RW3RFS2

4 Test schedule

Tests were carried out in accordance with the specifications detailed in chapter 7 “Summary“ of this report.

Tests were carried out at:

- m. dudde hochfrequenz - technik, D-51429 Bergisch Gladbach.

The sample of the product was received on:

- **2004-02-20**

The tests were carried out in the following period of time:

- **2004-03-02 - 2004-03-20**

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5 Product and Measurement documentation

For issuing this report the following product documentation was used and Annexes was created:

Description:	Date:	Identifications:
External Photographs of the Equipment Under Test		Annex No. 1
Internal Photographs of the Equipment Under Test		Annex No. 2
Occupied Bandwith Plot		Annex No. 3
FCC ID Label Sample		Annex No. 4
Technical Description		Annex No. 5
Test Setup Photos		Annex No. 6
Block diagram		Annex No. 7
Schematics		Annex No. 8

The above-mentioned documentation will be filed at m. dudde hochfrequenz - technik for a period of 10 years following the issue of this report.

6 Observations and comments

7 Summary

The product is intended for use in the following areas of application:
Radio- Noise Emissions from Low- Voltage Electrical and Electronic Equipment
in the frequency range 9 kHz to 40 GHz

The samples were tested according to the following specification:

47 CFR Part 15 – Intentional Radiators, ANSI C63.4 - 1992

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8 Conclusions

Samples of the apparatus were found to **CONFORM WITH** the specifications stated in chapter 7 "Summary" of this report.

In the opinion of m. dudde hochfrequenz - technik, the samples satisfied all applicable requirements relating to the network interface types specified in chapter 7 "Summary".

The results of the type tests as stated in this report, are exclusively applicable to the product item as identified in this report. m. dudde hochfrequenz - technik does not accept any responsibility for the results stated in this report, with respect to the properties of product items not involved in these tests.

This report consists of a main module, modules with test results and listed Annexes in chapter 5 "Product documentation". All pages have been numbered consecutively and bear the m. dudde hochfrequenz - technik logo, the report number and sub numbers.
The total number of pages in this report is **23**.

Tester:

Date : 2004-03-29

Name : Ralf Trepper

Signature : 

Technical responsibility for area of testing:

Date : 2004-03-29

Name : Manfred Dudde

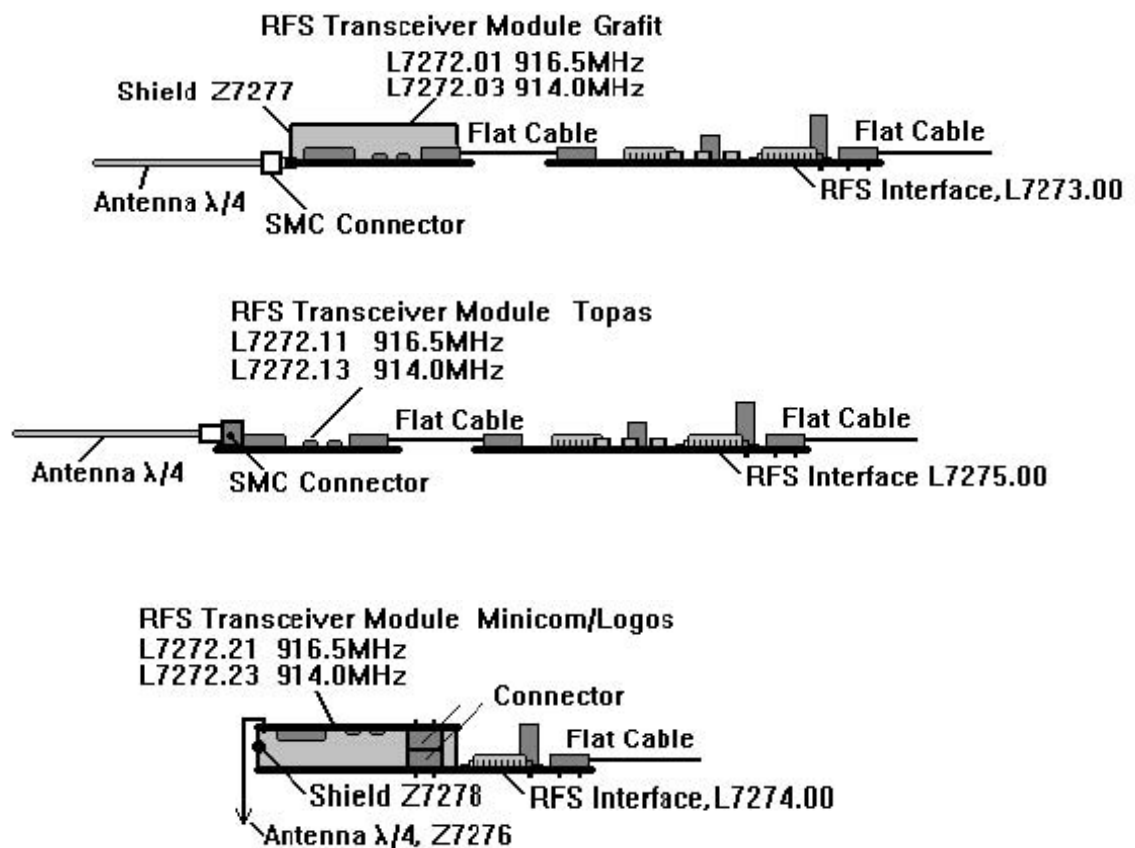
Signature : 

9 Operation Description

9.1 EUT Details

Transceiver Module, The application concerns the data transmission from an operator console (MAC/PC) to the flash units of a Photo Studio, in both directions, as well as the transmission of a flash trigger signal from the camera to all of the flash units.

9.2 EUT Configuration



9.3 EUT Measurement Description

The device was operated with an interface testboard which the manufacturer has provided. With help of this the EUT could be activated in different operation modes. In a pre- test we studied all operation modes and used for the final measurement the adjustment with the highest established emission.

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10.1 Antenna Requirement

10.1.1 Regulation

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 Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31 (d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

10.1.2 Result

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a ^x see page no. 29

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10.2 Radiated emissions

10.2.1 Regulation

Test Requirement: FCC CFR47, Part 15C Section 15.249 Test Procedure: ANSI C63.4:1992

Fundamental Frequency (MHz)	Field Strength of Fundamental (millivolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24.0-24.25 GHz	250	2500

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in Section 15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in Section 15.209, whichever limit permits a higher field strength

Section 15.33 Frequency range of radiated measurements: (a) Unless otherwise noted in the specific rule section under which the equipment operates for an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph: (1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

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Test Requirement: FCC CFR47, Part 15C Section 15.209 Test Procedure: ANSI C63.4:1992

Section 15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.

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10.2.2 Test equipment

Type	Manufacturer/ Model No.	Serial No.	Last Calibration	Next Calibration
Receiver (9 kHz –26.5 GHz)	Hewlett Packard Spectrum Analyzer 8593E (171)	3528U00990	2004/02	2006/02
Pre Amplifier (100kHz - 1.3GHz)	Hewlett Packard 8447 E (166a)	1726A00705	2002/04	2006/04
Loop Antenna (0.009- 30 MHz)	Schwarzbeck			
Bilog Antenna (30- 1000 MHz)	CHASE CBL611A (167)	1517	2002/04	2008/04
Hornantenna (0,86-8,5 GHz)	Schwarzbeck BBHA 9120 A (284)	236	1998/01	2008/01

10.2.2 Test procedures

The EUT and this peripheral (when additional equipment exist) are placed on a turn table which is 0.8m above ground. The turn table would be allowed to rotate 360 degrees to determine the position of the maximum emission level. The test distance between The EUT and the receiving antenna are 3m. To find the maximum emission, the polarization of the receiving antenna are changed in horizontal and vertical polarization, the position of the EUT was changed in different orthogonal determinations.
ANSI C63.4: 1992 Section 8 “Radiated Emissions Testing”

Radiated Emissions Test Characteristics	
Frequency range	0.009 MHz - 10,000 MHz
Test distance	3 m*(for frequencies above 30 MHz)
Test instrumentation resolution bandwidth	9 kHz (0.009 – 30MHz)
	120 kHz (30 MHz - 1,000 MHz)
	1 MHz (1000 MHz - 10,000 MHz)
Receive antenna scan height	1 m (0.009 MHz - 30 MHz)
	1 m - 4 m (30 MHz - 10,000 MHz)
Receive antenna polarization / orientation	0 – 360°
	Vertical/Horizontal (30 MHz - 1,000 MHz)

* According to Section 15.31 (f)(1): At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

10.2.3 Calculation of field strengths Section 15.209 below 30 MHz

The Receiver reading gives not directly the field strength result in (dB μ V/m). The antenna factors of the loop antenna and cable losses must be added to find the correct result.

For frequencies below 30 MHz and for an test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f) (2) the field strength is calculated by adding additionally an extrapolation factor of 40 dB/decade (inverse linear distance for field strength measurements).

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor

Corrected Level = Receiver Level + Correction Factor – Pre-Amplifier (with the use of an Pre-Amplifier)

Receiver Level : Receiver reading without correction factors

Correction Factor : Loop Antenna factor + cable loss

$$FS = 40.7 - 40 = 0.7 \text{ [dB}\mu\text{V/m]}$$

Level in μ V/m Common Antilogarithm $(0.7/20) = 1.1$

10.2.3 Calculation of field strengths Section 15.209 above 30 MHz

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor (without the use of an Pre-Amplifier)

Corrected Level = Receiver Level + Correction Factor – Pre-Amplifier (with the use of an Pre-Amplifier)

Receiver Level : Receiver reading without correction factors

Correction Factor : Antenna factor + cable loss

For test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f)(1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements).

10.2.4 Calculation of average correction factor

The average correction factor is computed by analyzing the "worst case" on time in any 100msec time period and using the formula: Corrections Factor + $20 \cdot \log(\text{worst case on time}/100\text{msec})$ Analysis of the remote transmitter worst case on time in any 100msec time period is an on time of 50msec, there for the correction factor is $20 \cdot \log(50/100) = -6$ dB. The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules.

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10.2.5 Calculation of the field strengths Section 15.249

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor (without the use of an Pre-Amplifier)

Corrected Level = Receiver Level + Correction Factor – Pre-Amplifier (with the use of an Pre-Amplifier)

Receiver Level : Receiver reading without correction factors

Correction Factor : Antenna factor + cable loss

For example:

The receiver reading is 32.7 dB μ V. The Antenna Factor for the measured frequency is +2.5 dB(1/m) and the Cable Factor for the measured frequency is 0.71 dB, giving a field strength of 35.91dB μ V/m. The 35.91dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

Level in μ V/m = Common Antilogarithm (35.91/20) = 39.8

For test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f)(1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements).

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10.2.6 Result

RFS Transceiver Module Variant: L7272.01 (916.5 MHz)

TRANSMITTER SPURIOUS RADIATION (Section 15.249(a),(d))											
f (MHz)	Bandwidth (kHz)/Type of Detector	Noted Receiver level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	AV Correction Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polaris. EUT / Antenna	Antenna Height cm
916.4520	100; AV	96.31	3	7.20	0	-18.99	84.34	94	9.66	V/V	160
1832.9040	1000; AV	22.93	3	6.40	0	-18.99	10.34	54	43.66	V/V	250
2749.3560	1000; AV	22.01	3	13.5	0	-18.99	16.52	54	37.48	V/V	150
3665.8080	1000; AV	≤ 10	3	17.4	0	-18.99	8.41	54	45.59	H,V/H,V	100-400
4582.2600	1000; AV	≤ 10	3	8.5* ⁶	0	-18.99	-0.49	54	54.49	H,V/H,V	100-400
5498.7120	1000; AV	≤ 10	3	10.9* ⁶	0	-18.99	1.91	54	52.09	H,V/H,V	100-400
6415.1640	1000; AV	≤ 14	3	11.8* ⁶	0	-18.99	6.81	54	47.19	H,V/H,V	100-400
7331.616	1000; AV	≤ 14	3	12.4* ⁶	0	-18.99	7.41	54	46.59	H,V/H,V	100-400
8248.068	1000; AV	≤ 14	3	14.8* ⁶	0	-18.99	9.81	54	44.19	H,V/H,V	100-400
9164.5200	1000; AV	≤ 14	3	15.9* ⁶	0	-18.99	10.91	54	43.09	H,V/H,V	100-400
10080.972	1000; AV	≤ 14	3	16.55* ⁶	0	-18.99	11.56	54	42.44	H,V/H,V	100-400
Measurement uncertainty			4 dB								

* Bandwidth = the measuring receiver bandwidth

Remark: *¹ noise floor noise level of the measuring instrument ≤ 6.5dBμV @ 3m distance (30 – 1,000 MHz)
Remark: *² noise floor noise level of the measuring instrument ≤ 10 dBμV @ 3m distance (1,000 – 2,000 MHz)
Remark: *³ noise floor noise level of the measuring instrument ≤ 17 dBμV @ 3m distance (2,000 – 5,500 MHz)
Remark: *⁴ for using an Pre Amplifier in the range between 100kHz and 1,000MHz

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a ^x see page no. 29

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10.2.6 Result

RFS Transceiver Module Variant: L7272.03 (914.0 MHz)

TRANSMITTER SPURIOUS RADIATION (Section 15.249(a),(d))											
f (MHz)	Bandwidth (kHz)/Type of Detector	Noted Receiver level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	AV Correction Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polaris. EUT / Antenna	Antenna Height cm
914.0430	100; AV	92.56	3	7.20	0	-18.99	80.77	94	13.23	V/V	155
1828.0860	1000; AV	19.22	3	6.40	0	-18.99	6.63	54	47.37	V/V	238
2742.1290	1000; AV	18.87	3	13.5	0	-18.99	13.38	54	40.62	V/V	150
3656.1720	1000; AV	≤ 10	3	17.4	0	-18.99	8.41	54	45.59	H,V/H,V	100-400
4570.2150	1000; AV	≤ 10	3	8.5* ⁶	0	-18.99	-0.49	54	54.49	H,V/H,V	100-400
5484.2580	1000; AV	≤ 10	3	10.9* ⁶	0	-18.99	1.91	54	52.09	H,V/H,V	100-400
6398.3010	1000; AV	≤ 14	3	11.8* ⁶	0	-18.99	6.81	54	47.19	H,V/H,V	100-400
7312.3440	1000; AV	≤ 14	3	12.4* ⁶	0	-18.99	7.41	54	46.59	H,V/H,V	100-400
8226.3870	1000; AV	≤ 14	3	14.8* ⁶	0	-18.99	9.81	54	44.19	H,V/H,V	100-400
9140.4300	1000; AV	≤ 14	3	15.9* ⁶	0	-18.99	10.91	54	43.09	H,V/H,V	100-400
10054.4730	1000; AV	≤ 14	3	16.55* ⁶	0	-18.99	11.56	54	42.44	H,V/H,V	100-400
Measurement uncertainty			4 dB								

* Bandwidth = the measuring receiver bandwidth

Remark: *¹ noise floor noise level of the measuring instrument ≤ 6.5dBμV @ 3m distance (30 – 1,000 MHz)
Remark: *² noise floor noise level of the measuring instrument ≤ 10 dBμV @ 3m distance (1,000 – 2,000 MHz)
Remark: *³ noise floor noise level of the measuring instrument ≤ 17 dBμV @ 3m distance (2,000 – 5,500 MHz)
Remark: *⁴ for using an Pre Amplifier in the range between 100kHz and 1,000MHz

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a ^x see page no. 29

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10.2.6 Result

RFS Transceiver Module Variant: L7272.11 (916.5 MHz)

TRANSMITTER SPURIOUS RADIATION (Section 15.249(a),(d))											
f (MHz)	Bandwidth (kHz)/Type of Detector	Noted Receiver level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	AV Correction Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polaris. EUT / Antenna	Antenna Height cm
916.4500	100; AV	91.67	3	7.20	0	-18.99	79.88	94	14.12	V/V	160
1832.9000	1000; AV	20.36	3	6.40	0	-18.99	7.77	54	46.23	V/V	240
2749.3500	1000; AV	≤ 10	3	13.5	0	-18.99	4.51	54	49.49	H,V/H,V	100-400
3665.8000	1000; AV	≤ 10	3	17.4	0	-18.99	8.41	54	45.59	H,V/H,V	100-400
4582.2500	1000; AV	≤ 10	3	8.5* ⁶	0	-18.99	-0.49	54	54.49	H,V/H,V	100-400
5498.7000	1000; AV	≤ 10	3	10.9* ⁶	0	-18.99	1.91	54	52.09	H,V/H,V	100-400
6415.1500	1000; AV	≤ 14	3	11.8* ⁶	0	-18.99	6.81	54	47.19	H,V/H,V	100-400
7331.6000	1000; AV	≤ 14	3	12.4* ⁶	0	-18.99	7.41	54	46.59	H,V/H,V	100-400
8248.0500	1000; AV	≤ 14	3	14.8* ⁶	0	-18.99	9.81	54	44.19	H,V/H,V	100-400
9164.5000	1000; AV	≤ 14	3	15.9* ⁶	0	-18.99	10.91	54	43.09	H,V/H,V	100-400
10080.9500	1000; AV	≤ 14	3	16.55* ⁶	0	-18.99	11.56	54	42.44	H,V/H,V	100-400
Measurement uncertainty			4 dB								

* Bandwidth = the measuring receiver bandwidth

Remark: *¹ noise floor noise level of the measuring instrument ≤ 6.5dBμV @ 3m distance (30 – 1,000 MHz)

Remark: *² noise floor noise level of the measuring instrument ≤ 10 dBμV @ 3m distance (1,000 – 2,000 MHz)

Remark: *³ noise floor noise level of the measuring instrument ≤ 17 dBμV @ 3m distance (2,000 – 5,500 MHz)

Remark: *⁴ for using an Pre Amplifier in the range between 100kHz and 1,000MHz

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a ^x see page no. 29

FCC ID: RW3RFS2

Issue date: 2004-03-29

10.2.6 Result

RFS Transceiver Module Variant: L7272.13 (914.0 MHz)

TRANSMITTER SPURIOUS RADIATION (Section 15.249(a),(d))											
f (MHz)	Bandwidth (kHz)/Type of Detector	Noted Receiver level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	AV Correction Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polaris. EUT / Antenna	Antenna Height cm
914.0500	100; AV	88.45	3	7.20	0	-18.99	76.66	94	17.34	V/V	152
1828.1000	1000; AV	16.60	3	6.40	0	-18.99	4.01	54	49.99	V/V	235
2742.1500	1000; AV	≤ 10	3	13.5	0	-18.99	4.51	54	49.49	H,V/H,V	100-400
3656.2000	1000; AV	≤ 10	3	17.4	0	-18.99	8.41	54	45.59	H,V/H,V	100-400
4570.2500	1000; AV	≤ 10	3	8.5* ⁶	0	-18.99	-0.49	54	54.49	H,V/H,V	100-400
5484.3000	1000; AV	≤ 10	3	10.9* ⁶	0	-18.99	1.91	54	52.09	H,V/H,V	100-400
6398.3500	1000; AV	≤ 14	3	11.8* ⁶	0	-18.99	6.81	54	47.19	H,V/H,V	100-400
7312.4000	1000; AV	≤ 14	3	12.4* ⁶	0	-18.99	7.41	54	46.59	H,V/H,V	100-400
8226.4500	1000; AV	≤ 14	3	14.8* ⁶	0	-18.99	9.81	54	44.19	H,V/H,V	100-400
9140.5000	1000; AV	≤ 14	3	15.9* ⁶	0	-18.99	10.91	54	43.09	H,V/H,V	100-400
10054.5500	1000; AV	≤ 14	3	16.55* ⁶	0	-18.99	11.56	54	42.44	H,V/H,V	100-400
Measurement uncertainty			4 dB								

* Bandwidth = the measuring receiver bandwidth

Remark: *¹ noise floor noise level of the measuring instrument ≤ 6.5dBμV @ 3m distance (30 – 1,000 MHz)
Remark: *² noise floor noise level of the measuring instrument ≤ 10 dBμV @ 3m distance (1,000 – 2,000 MHz)
Remark: *³ noise floor noise level of the measuring instrument ≤ 17 dBμV @ 3m distance (2,000 – 5,500 MHz)
Remark: *⁴ for using an Pre Amplifier in the range between 100kHz and 1,000MHz

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a ^x see page no. 29

FCC ID: RW3RFS2

Issue date: 2004-03-29

10.2.6 Result**RFS Transceiver Module Variant: L7272.21 (916.5 MHz)**

TRANSMITTER SPURIOUS RADIATION (Section 15.249(a),(d))											
f (MHz)	Bandwidth (kHz)/Type of Detector	Noted Receiver level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	AV Correction Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polaris. EUT / Antenna	Antenna Height cm
916.4520	100; AV	85.02	3	7.20	0	-18.99	73.23	94	20.77	V/V	160
1832.9040	1000; AV	17.35	3	6.40	0	-18.99	4.76	54	49.24	V/V	250
2749.3560	1000; AV	≤ 10	3	13.5	0	-18.99	4.51	54	49.49	H,V/H,V	100-400
3665.8080	1000; AV	≤ 10	3	17.4	0	-18.99	8.41	54	45.59	H,V/H,V	100-400
4582.2600	1000; AV	≤ 10	3	8.5* ⁶	0	-18.99	-0.49	54	54.49	H,V/H,V	100-400
5498.7120	1000; AV	≤ 10	3	10.9* ⁶	0	-18.99	1.91	54	52.09	H,V/H,V	100-400
6415.1640	1000; AV	≤ 14	3	11.8* ⁶	0	-18.99	6.81	54	47.19	H,V/H,V	100-400
7331.616	1000; AV	≤ 14	3	12.4* ⁶	0	-18.99	7.41	54	46.59	H,V/H,V	100-400
8248.068	1000; AV	≤ 14	3	14.8* ⁶	0	-18.99	9.81	54	44.19	H,V/H,V	100-400
9164.5200	1000; AV	≤ 14	3	15.9* ⁶	0	-18.99	10.91	54	43.09	H,V/H,V	100-400
10080.972	1000; AV	≤ 14	3	16.55* ⁶	0	-18.99	11.56	54	42.44	H,V/H,V	100-400
Measurement uncertainty			4 dB								

* Bandwidth = the measuring receiver bandwidth

Remark: *¹ noise floor noise level of the measuring instrument ≤ 6.5dBμV @ 3m distance (30 – 1,000 MHz)Remark: *² noise floor noise level of the measuring instrument ≤ 10 dBμV @ 3m distance (1,000 – 2,000 MHz)Remark: *³ noise floor noise level of the measuring instrument ≤ 17 dBμV @ 3m distance (2,000 – 5,500 MHz)Remark: *⁴ for using an Pre Amplifier in the range between 100kHz and 1,000MHz

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a.^x see page no. 29

FCC ID: RW3RFS2

Issue date: 2004-03-29

10.2.6 Result

RFS Transceiver Module Variant: L7272.23 (914.0 MHz)

TRANSMITTER SPURIOUS RADIATION (Section 15.249(a),(d))											
f (MHz)	Bandwidth (kHz)/Type of Detector	Noted Receiver level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	AV Correction Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polaris. EUT / Antenna	Antenna Height cm
914.0200	100; AV	84.33	3	7.20	0	-18.99	72.54	94	21.46	V/V	155
1828.0400	1000; AV	18.05	3	6.40	0	-18.99	5.46	54	48.54	V/V	239
2742.0600	1000; AV	≤ 10	3	13.5	0	-18.99	4.51	54	49.49	H,V/H,V	100-400
3656.0800	1000; AV	≤ 10	3	17.4	0	-18.99	8.41	54	45.59	H,V/H,V	100-400
4570.1000	1000; AV	≤ 10	3	8.5* ⁶	0	-18.99	-0.49	54	54.49	H,V/H,V	100-400
5484.1200	1000; AV	≤ 10	3	10.9* ⁶	0	-18.99	1.91	54	52.09	H,V/H,V	100-400
6398.1400	1000; AV	≤ 14	3	11.8* ⁶	0	-18.99	6.81	54	47.19	H,V/H,V	100-400
7312.1600	1000; AV	≤ 14	3	12.4* ⁶	0	-18.99	7.41	54	46.59	H,V/H,V	100-400
8226.1800	1000; AV	≤ 14	3	14.8* ⁶	0	-18.99	9.81	54	44.19	H,V/H,V	100-400
9140.2000	1000; AV	≤ 14	3	15.9* ⁶	0	-18.99	10.91	54	43.09	H,V/H,V	100-400
10054.2200	1000; AV	≤ 14	3	16.55* ⁶	0	-18.99	11.56	54	42.44	H,V/H,V	100-400
Measurement uncertainty			4 dB								

* Bandwidth = the measuring receiver bandwidth

Remark: *¹ noise floor noise level of the measuring instrument ≤ 6.5dBμV @ 3m distance (30 – 1,000 MHz)

Remark: *² noise floor noise level of the measuring instrument ≤ 10 dBμV @ 3m distance (1,000 – 2,000 MHz)

Remark: *³ noise floor noise level of the measuring instrument ≤ 17 dBμV @ 3m distance (2,000 – 5,500 MHz)

Remark: *⁴ for using an Pre Amplifier in the range between 100kHz and 1,000MHz

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a.^x see page no. 29

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RFS Transceiver Module Variants: L7272.01 / L7272.11 / L7272.12 (916.5 MHz)

RFS Transceiver Module Variants: L7272.03 / L7272.13 / L7272.13 (914.0 MHz)

TRANSMITTER SPURIOUS RADIATION BELOW 30MHz(Section 15.205, 15.209)									
f (MHz)	Bandwidth (kHz), Type of Detector	Noted Receiver- level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polarisation EUT / Antenna orientation
0.1200	PK/0.2kHz	< 4.0	10	20.2	-59.1	-34.90	Pk46.0- @ 300	80.90	V, H/0-360°
	AV/0.2kHz	< 4.0	10	20.2	-59.1	-34.90	AV26.0 @ 300	80.90	V, H/0-360°
0.5000	AV/0.2kHz	< 4.0	10	20.2	-19.1	5.10	AV33.6 @ 30	28.5	V, H/0-360°
1.5000	AV/0.2kHz	< 4.0	10	20.2	-19.1	5.10	AV24.1 @ 30	19.00	V, H/0-360°
3.0000	AV/9.0kHz	< 4.0	10	20.2	-19.1	5.10	AV29.5 @ 30	24.4	V, H/0-360°
5.0000	AV/9.0kHz	< 4.0	10	20.2	-19.1	5.10	AV29.5 @ 30	24.4	V, H/0-360°
8.0000	AV/9.0kHz	< 4.0	10	20.2	-19.1	5.10	AV29.5 @ 30	24.4	V, H/0-360°
10.0000	AV/9.0kHz	< 4.0	10	20.2	-19.1	5.10	AV29.5 @ 30	24.4	V, H/0-360°
20.0000	AV/9.0kHz	< 4.0	10	20.2	-19.1	5.10	AV29.5 @ 30	24.4	V, H/0-360°
30.0000	AV/9.0kHz	< 4.0	10	20.2	-19.1	5.10	AV29.5 @ 30	24.4	V, H/0-360°
no emissions detected									
Measurement uncertainty			4 dB						

Remark: *¹ Noise level of the measuring instrument ≤ 4.0dBμV @ 10m distance (0.009 MHz –30 MHz)

Remark: * Peak Limit according to Section 15.35 (b).

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a.^x see page no. 29

FCC ID: RW3RFS2

Issue date: 2004-03-29

RFS Transceiver Module Variants: L7272.01 / L7272.11 / L7272.12 (916.5 MHz)**RFS Transceiver Module Variants: L7272.03 / L7272.13 / L7272.13 (914.0 MHz)**

TRANSMITTER SPURIOUS RADIATION ABOVE 30MHz(Section 15.205, 15.209)											
f (MHz)	Bandwidth (kHz)/Type of Detector	Noted Receiver level dBμV	Test Distance m	Correction Factor dB	Distance Extrapol. Factor dB	AV Correction Factor dB	Level Corrected dBμV/m	Limit dBμV/m	Margin dBμV/m	Polaris. EUT / Antenna	Antenna Height cm
30.0000	100, AV	≤ 3.5	3	-2.60	0	0	0.90	40.00	39.10	H,V/H,V	100-400
88.0000	100, AV	≤ 3.5	3	-10.80	0	0	-7.30	40.00	47.30	H,V/H,V	100-400
216.0000	100, AV	≤ 3.5	3	-10.30	0	0	-6.80	43.50	50.30	H,V/H,V	100-400
960.0000	100, AV	≤ 3.5	3	8.50	0	0	12.00	43.50	31.50	H,V/H,V	100-400
1700.0000	1000, AV	≤ 4.5	3	3.80	0	0	8.30	54.00	45.70	H,V/H,V	100-400
2250.0000	1000, AV	≤ 10	3	8.00	0	0	18.00	54.00	36.00	H,V/H,V	100-400
4000.0000	1000, AV	≤ 10	3	8.40* ⁶	0	0	18.40	54.00	35.60	H,V/H,V	100-400
5000.0000	1000, AV	≤ 10	3	9.10* ⁶	0	0	19.40	54.00	34.60	H,V/H,V	100-400
7500.0000	1000, AV	≤ 14	3	12.9* ⁶ ₀	0	0	26.90	54.00	27.10	H,V/H,V	100-400
8300.0000	1000, AV	≤ 14	3	14.80* ⁶	0	0	28.80	54.00	25.20	H,V/H,V	100-400
9400.0000	1000, AV	≤ 14	3	16.00* ⁶	0	0	30.00	54.00	24.00	H,V/H,V	100-400
11000.0000	1000, AV	≤ 14	3	18.25* ⁶	0	0	32.25	54.00	21.75	H,V/H,V	100-400
Measurement uncertainty			4 dB								

* Bandwidth = the measuring receiver bandwidth

Remark: *¹ noise floor noise level of the measuring instrument ≤ 6.5dBμV @ 3m distance (30 – 1,000 MHz)Remark: *² noise floor noise level of the measuring instrument ≤ 10 dBμV @ 3m distance (1,000 – 2,000 MHz)Remark: *³ noise floor noise level of the measuring instrument ≤ 17 dBμV @ 3m distance (2,000 – 5,500 MHz)Remark: *⁴ for using an Pre Amplifier in the range between 100kHz and 1,000MHz

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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n.a ^x see page no. 29

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10.3 Conducted emissions

10.3.1 Regulation

Section 15.207 (a) For an intentional radiator which 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 450 kHz to 30 MHz shall not exceed 250 μ V. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

Section 15.207 (d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which-do not operate from the AC power lines or

contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or Battery eliminators or connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

10.3.2 Test Equipment

Type	Manufacturer/ Model no.	Serial no.	Last calibration	Next calibration	Remarks
Receiver (9 kHz - 30MHz)	Rhode & Schwarz ESH2 (22)	882902/007	01 / 04	01 / 06	---
Protector limiter 9 kHz - 30MHz, 10 dB	Rhode & Schwarz ESH 3Z2 (272)	357,881052	01 / 04	01 / 06	---
V-LISN 50 ohms/(50 uH+5 ohms)	RFT NNB 11 (72)	13835240	08 / 02	01 / 05	---
V-LISN 50 ohms/(50 uH+5 ohms)	Dudde (73)	---	08 / 02	01 / 05	---

10.3.3 Test procedures

The EUT and the additional equipment (if in case needful) are connected to the main power through a line impedance stabilization network (LISN). The LISN must be appropriate to ANSI C63.4: 1992 Section 7 Additional equipment must also connected to an second LISN with the same specifications described in the above sentence (if in case needful).

The devices have been tested with the standard power supply unit of the **brnccolor** series.

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10.3.4 Test results

RFS Transceiver Module Variants: L7272.01 / L7272.11 / L7272.21 (916.5 MHz)**RFS Transceiver Module Variants: L7272.03 / L7272.13 / L7272.23 (914.0 MHz)**

TRANSMITTER CONDUCTED EMISSIONS (Section 15.207)						
Tested Line	Emission Frequency [MHz]	Receiver Bandwidth [kHz]	Result [dBμV]	Spec Limit [dBμV]	Margin [dB]	Remarks
L1	0.160	10	≤-2	55.8	57.8	* ¹
N	0.160	10	≤-2	55.8	57.8	* ¹
L1	0.304	10	≤-2	51.7	53.7	* ¹
N	0.304	10	≤-2	51.7	53.7	* ¹
L1	0.475	10	≤-2	47	49	* ¹
N	0.475	10	≤-2	47	49	* ¹
L1	0.600	10	≤-2	46	48	* ¹
N	0.600	10	≤-2	46	48	* ¹
L1	0.725	10	≤-2	46	48	* ¹
N	0.725	10	≤-2	46	48	* ¹
L1	0.850	10	≤-2	46	48	* ¹
N	0.850	10	≤-2	46	48	* ¹
L1	1.000	10	≤-2	46	48	* ¹
N	1.000	10	≤-2	46	48	* ¹
L1	1.125	10	≤-2	46	48	* ¹
N	1.125	10	≤-2	46	48	* ¹
L1	2.000	10	≤-2	46	48	* ¹
N	2.000	10	≤-2	46	48	* ¹
L1	4.000	10	≤-2	46	48	* ¹
N	4.000	10	≤-2	46	48	* ¹
L1	6.7644	10	≤-2	50	52	* ¹
N	6.7644	10	≤-2	50	52	* ¹
L1	13.5288	10	≤-2	50	52	* ¹
N	13.5288	10	≤-2	50	52	* ¹
L1	20.2931	10	≤-2	50	52	* ¹
N	20.2931	10	≤-2	50	52	* ¹
L1	27.0575	10	≤-2	50	52	* ¹
N	27.0575	10	≤-2	50	52	* ¹

Remark: *¹ Noise level of the measuring instrument ≤ -2 dBμV (0.009 – 30MHz)

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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FCC ID: RW3RFS2

Issue date: 2004-03-29

10.4 Bandwidth

10.4.1 Regulation

15.231 (c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

10.4.2 Calculation of the 20 dB bandwidth limit

The 20 dB bandwidth limit = $0.005 * 914.5 \text{ MHz} = 4.5725 \text{ MHz}$ (first Frequency)

The 20 dB bandwidth limit = $0.005 * 916.5 \text{ MHz} = 4.5825 \text{ MHz}$ (second Frequency)

10.4.3 Test equipment

Type	Manufacturer/ Model No.	Serial No.	Last Calibration	Next Calibration
Receiver (30MHz - 1GHz)	Hewlett Packard Spectrum Analyzer (171) 8593 E	3528U00990	02/2004	02/2006
Test fixture for Relative measurement	Dudde	---	---	---
Power Supply	Hewlett Packard (DC Power Supply) (226)		02/2004	02/2006

10.4.4 Test procedure

ANSI C63.4-1992 Section 13.1.7 Occupied Bandwidth Measurements. The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce worst-case (i.e., the widest) bandwidth. In order to measure the modulated signal properly, a resolution bandwidth that is small compared to the bandwidth required by the procuring or regulatory agency shall be used on the measuring instrument. However, the 6 dB resolution bandwidth of the measuring instrument shall be set to a value greater than 5% of the bandwidth requirements.

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10.4.5 Test result

The measured 20 dB bandwidth is:320.00 kHz

RFS Transceiver Module Variant: L7272.01 (916.5 MHz)

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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The measured 20 dB bandwidth is:250.00 kHz

RFS Transceiver Module Variant: L7272.11 (916.5 MHz)

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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The measured 20 dB bandwidth is:240.00 kHz

RFS Transceiver Module Variant: L7272.21 (916.5 MHz)

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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FCC ID: RW3RFS2

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10.4.5 Test result

The measured 20 dB bandwidth is:314.50 kHz

RFS Transceiver Module Variant: L7272.03 (914.0 MHz)

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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The measured 20 dB bandwidth is:235.00 kHz

RFS Transceiver Module Variant: L7272.13 (914.0 MHz)

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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The measured 20 dB bandwidth is:223.70 kHz

RFS Transceiver Module Variant: L7272.23 (914.0 MHz)

The equipment meets the requirements	yes	no	n.a.
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Further test results are attached	yes	no	page no:
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FCC ID: RW3RFS2

Issue date: 2004-03-29

11 Additional information to this Test Report

Remarks

- | | |
|-------------------|---|
| n.a. ¹ | not applicable, because antenna is part of the PCB |
| n.a. ² | not applicable, because EUT is directly battery powered |

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End of test report