

TEST REPORT # EMCC-950432.1Y, 2013-08-20**EQUIPMENT UNDER TEST:**

Trade Name:	Radio receiver module 2-channel
Type:	RM02-310-2 / RM02-310-2-C
Serial No:	01B043C / 01AB662 / 01B043B
Equipment Category:	Receiver (module)
Manufacturer:	SOMMER Antriebs- und Funktechnik GmbH
Address:	Hans-Boeckler-Strasse 21-27 73230 Kirchheim unter Teck Germany
Client:	SOMMER Antriebs- und Funktechnik GmbH
Address:	Hans-Boeckler-Strasse 21-27 73230 Kirchheim unter Teck Germany
Name for contact purposes:	Mr Ali Badran
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Email:	a.badran@sommer.eu

RELEVANT STANDARD: 47 CFR Part 15 B**MEASUREMENT PROCEDURE USED:**

☒ ANSI C63.4-2009 ☐ ANSI C63.10-2009 ☐ Other

TEST REPORT PREPARED BY:

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TEST PERSONNEL:

Zakaria Khalek

HEAD OF GROUP:

Wolfgang Doering

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1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for Subpart B - Unintentional Radiators.

1.2 Limits and Reservations

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Test results relate only to the items tested in the configuration as recorded. This test report shall not be reproduced except in full without the written permission of EMCCons DR. RAŠEK GmbH & Co. KG.

1.3 Test Location

Company Name: EMCCons DR. RAŠEK GmbH & Co. KG
Accreditation No.: D-PL-12067-01-01
Address: Moggast, Boelwiese 8
91320 Ebermannstadt
Germany

Test Laboratory: EMCCons DR. RAŠEK GmbH & Co. KG Test Laboratory IV
located at Stoernhofer Berg 15, 91364 Unterleinleiter, Germany.
The 3 m & 10 m semi-anechoic chamber site has been fully described
in a report submitted to the FCC, and accepted under Registration
Number 878769. This 3 m/10 m alternative test site is approved by
Industry Canada under file number 3464C.

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E-Mail: z.khalek@emcc.de

1.4 Manufacturer

Company Name: SOMMER Antriebs- und Funktechnik GmbH
Street: Hans-Boeckler-Strasse 21-27
City: 73230 Kirchheim unter Teck
Country: Germany

1.5 Client

Company Name: SOMMER Antriebs- und Funktechnik GmbH
Street: Hans-Boeckler-Strasse 21-27
City: 73230 Kirchheim unter Teck
Country: Germany

Name for contact purposes: Mr Ali Badran
Phone: +49 7021 8001-412
Fax: +49 7021 8001-403
E-Mail: a.badran@sommer.eu

1.6 Dates and Test Location

The SOMMER Antriebs- und Funktechnik GmbH Radio receiver module 2-channel type RM02-310-2 / RM02-310-2-C was tested at EMCCons DR. RAŠEK GmbH & Co. KG test laboratory located in Unterleinleiter in CW 31/2013.

Mr Ali Badran of SOMMER Antriebs- und Funktechnik GmbH brought along the test sample and support equipment.

1.7 Climatic Conditions

Date	Temperature	Relative Humidity	Air Pressure
2013-07-31	23 °C	56 %	976 hPa
2013-08-20	22 °C	57 %	977 hPa

2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT)

Trade Name: Radio receiver module 2-channel
Type: RM02-310-2 / RM02-310-2-C
Serial Number: 01B043C / 01AB662 / 01B043B
Equipment Category: Receiver (module)
Application: Receiver module for garage door opener
Power: 5 VDC
Max. Internal Generated Frequency: 320.7 MHz
Interface ports: Refer to customer
Variants: Refer to customer

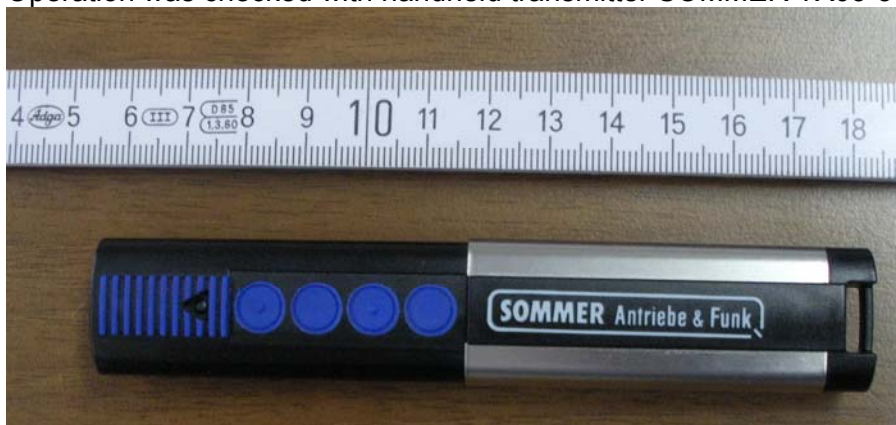
NOTE:

The receiver module was installed in three typical applications:

Test setup	#1	#2	#3
Application	Pro 1000	synoris 550/800 duo, AM 310 MHz	2-channel radio receiver RX04-RM02-310-2-C
Receiver-Module	RM02-310-2-C	RM02-310-2	RM02-310-2-C
Serial number	01AB662	01B043C	01B043B
Powered by	AC 115 V/ 60 Hz	AC 115 V/ 60 Hz	Power supply: In 115 V/60 Hz; Out 12 VDC Model: MW3R15GS NTS 1500 EuP

2.2 EUT Peripherals

Operation was checked with handheld transmitter SOMMER TX03-315-4.



2.3 Mode of Operation During Testing

Receiver in receive mode.
During test no motor operation was performed.

2.4 Modifications Required for Compliance

None.

3 TEST RESULTS SUMMARY

Summary of Test Results for the following EUT:

Manufacturer: SOMMER Antriebs- und Funktechnik GmbH
Device: Radio receiver module 2-channel
Model No.: RM02-310-2 / RM02-310-2-C
Serial Number: 01B043C / 01AB662 / 01B043B

Requirement	CFR Section	Report Section	Test Result
AC Line Conducted Emissions	15.107	4	Pass
Radiated Emissions	15.109	5	Pass

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4 - 2003 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report.

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report.

Test Personnel: Zakaria Khalek
Issuance Date: 2013-08-20

4 POWER LINE CONDUCTED EMISSIONS TEST

Test Requirement: FCC 47 CFR, Part 15B

Test Procedure: ANSI C63.4-2009

4.1 Regulation

(a) Except for Class A digital devices, for equipment 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, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	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.

4.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
EMI Test Receiver	Rohde & Schwarz / ESU	3846	2013-07	2014-07
V-LISN 50 Ω /(50 μ H + 5 Ω)	Rohde & Schwarz / ESH2-Z5	1901	2011-10	2013-10
Termination	Radiall / R404011000	1748	2012-11	2014-11
Protector Limiter	Rohde & Schwarz / ESH3-Z2	719	2013-01	2015-01
AC Power Source	Calif. Ins. / 3001TCA	35	n.a.	n.a.
Multimeter	Agilent / U1241B	3880	2012-02	2014-02

4.3 Test Procedures

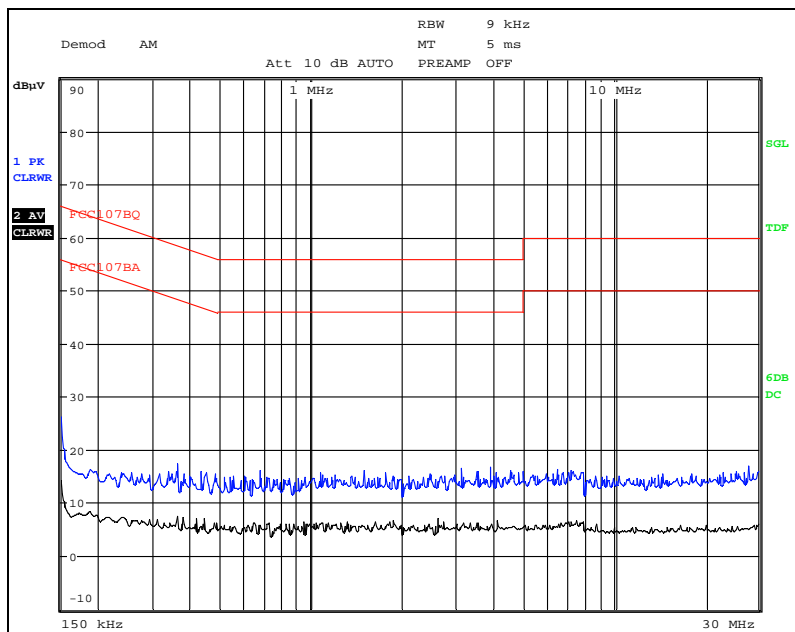
The EUT was placed on a wooden table of nominal size 1 m by 1.5 m, raised 80 cm above the reference groundplane. The vertical conducting wall of the screened room was located 40 cm to the rear of the EUT.

The excess length of the power cord of the ac adapter to the EUT was folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

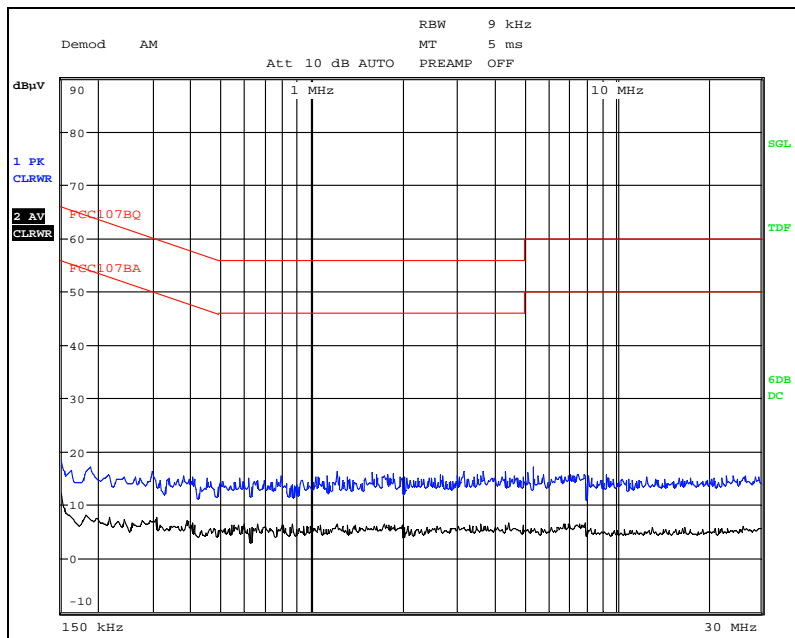
LISN housing, measuring instrument case, reference ground plane and the vertical conducting wall of the screened room were bonded together.

4.4 Test Results

Ambient noise measurement



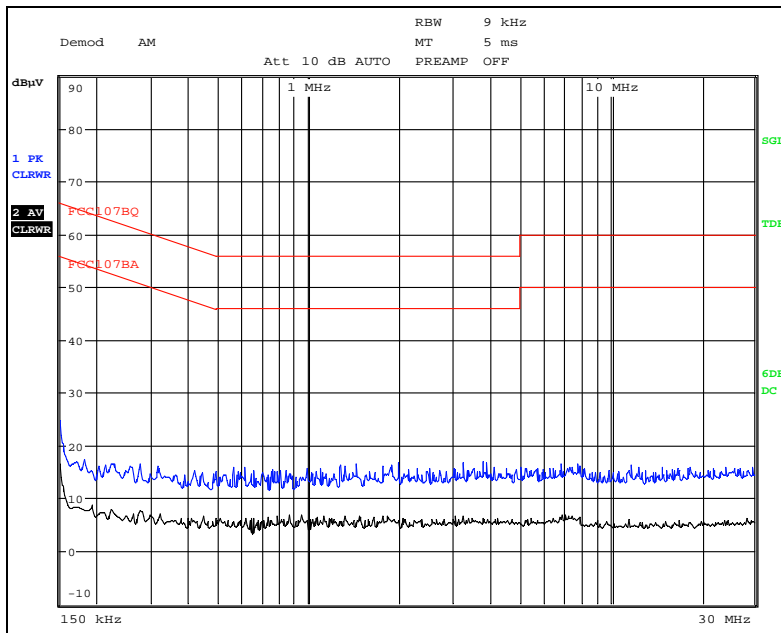
Test on Line L



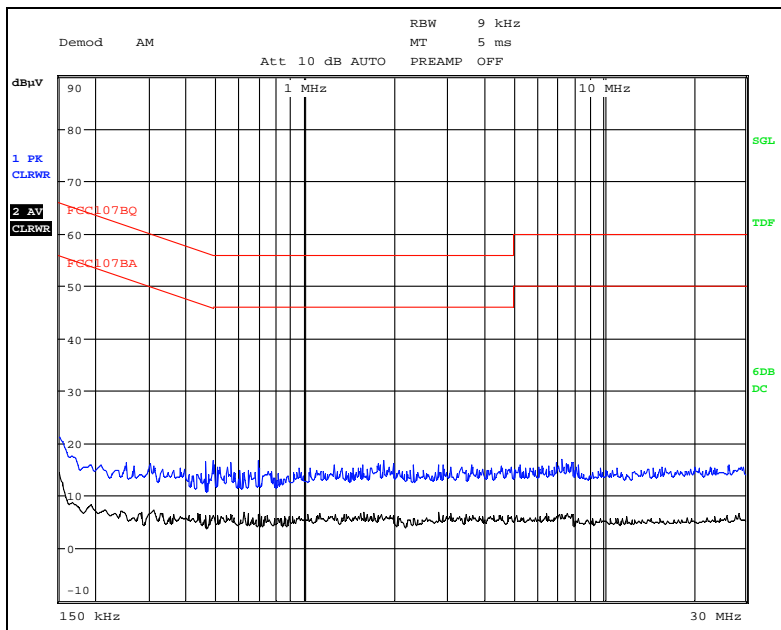
Test on Line N

Tests of Radio receiver module 2-channel Type RM02-310-2 / RM02-310-2-C to 47 CFR Part 15 B

Test setup #1

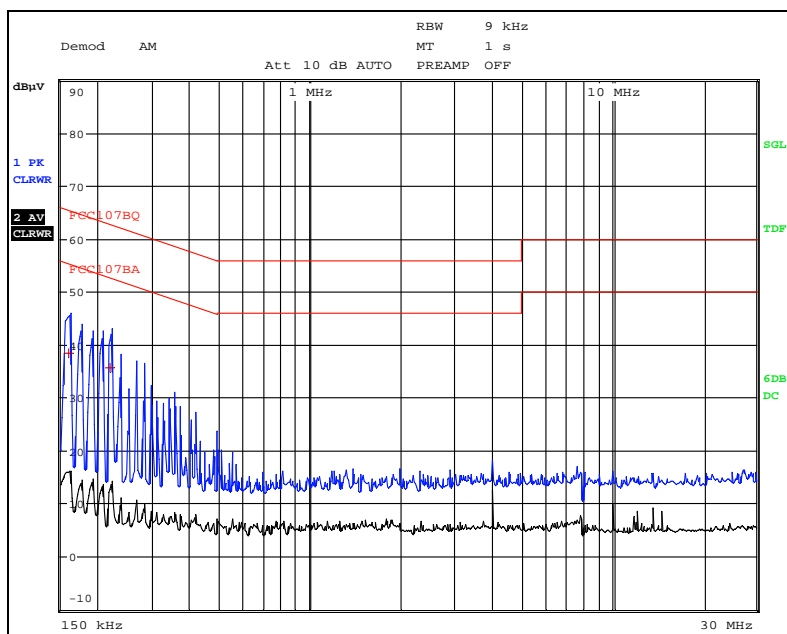


Test on Line L

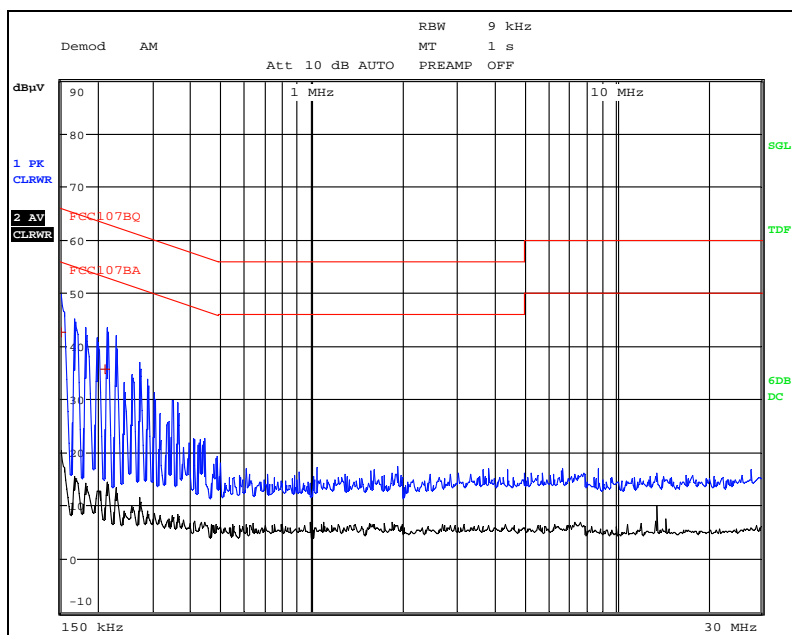


Test on Line N

Test setup #2



Test on Line L



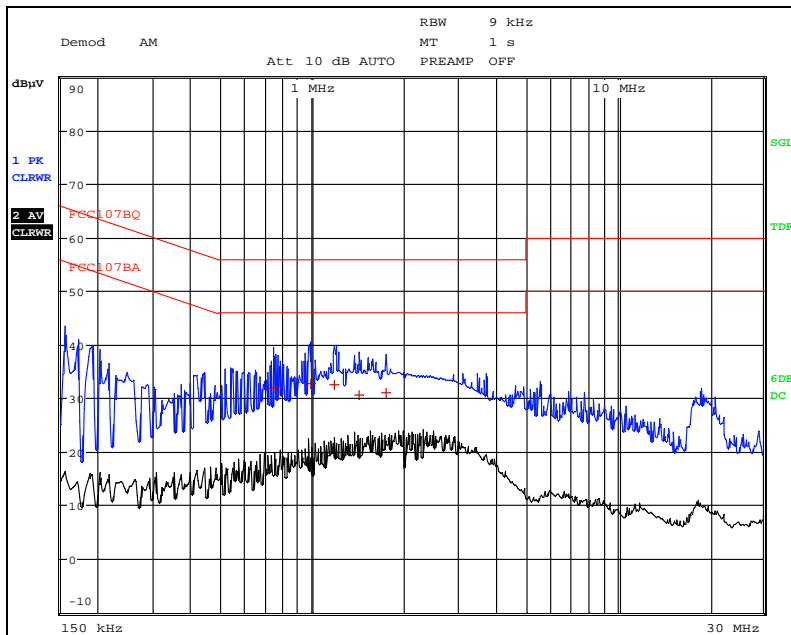
Test on Line N

Final measurement table

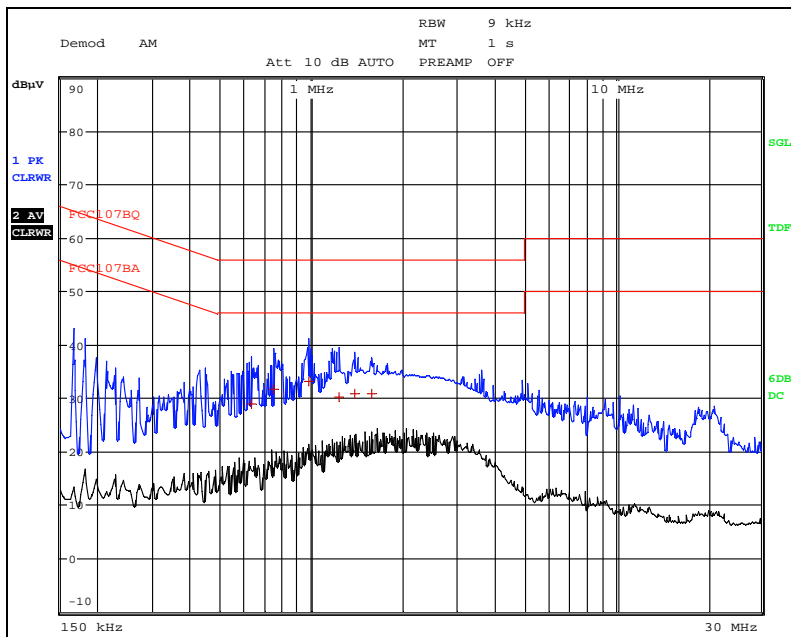
Tested Line	Freq [MHz]	Result [dBμV]	Margin [dB]	Detector
L	0.160	38.4	27.1	QP
L	0.220	35.7	27.1	QP
N	0.150	42.5	23.5	QP
N	0.210	35.8	27.4	QP

Tests of Radio receiver module 2-channel Type RM02-310-2 / RM02-310-2-C to 47 CFR Part 15 B

Test setup #3



Test on Line L



Test on Line N

Final measurement table

Tested Line	Freq [MHz]	Result [dBμV]	Margin [dB]	Detector
L	0.740	31.9	24.1	QP
L	0.980	32.7	23.3	QP
L	1.175	32.5	23.5	QP
L	1.415	30.7	25.3	QP
L	1.740	31.0	25.0	QP
N	0.630	29.0	27.0	QP
N	0.750	31.7	24.3	QP
N	0.975	33.1	22.9	QP
N	1.225	30.2	25.8	QP
N	1.380	30.9	25.1	QP
N	1.565	30.8	25.2	QP

Test Personnel: Zakaria Khalek

Test Date: 2013-07-31

2013-08-20

The EUT meets the requirements of this section.

5 RADIATED EMISSIONS

Test Requirement: FCC 47 CFR Part 15B

Test Procedure: ANSI C63.4-2009

5.1 Regulation

Section 15.33 Frequency range of radiated measurements:

(b) For unintentional radiators:

(3) Except for a CB receiver, a receiver employing superheterodyne techniques shall be investigated from 30 MHz up to at least the second harmonic of the highest local oscillator frequency generated in the device. If such receiver is controlled by a digital device, the frequency range shall be investigated up to the higher of the second harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range specified for the digital device in paragraph (b)(1) of this section.

Section 15.35 Measurement detector functions and bandwidths.

The conducted and radiated emission limits shown in this part are based on the following, unless otherwise specified elsewhere in this part:

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified.

Section 15.109 Radiated emission limits.

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/meter)
30-88	100
88-216	150
216-960	200
Above 960	500

(c) In the emission tables above, the tighter limit applies at the band edges. Sections 15.33 and 15.35 which specify the frequency range over which radiated emissions are to be measured and the detector functions and other measurement standards apply.

5.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
AC Power Source	Calif. Ins. / 3001TCA	35	n.a.	n.a.
Multimeter	Agilent / U1241B	3880	2012-02	2014-02
Biconilog. Antenna	EMCO / 3143	898	2013-05	2015-05
EMI Test Receiver	Rohde & Schwarz / ESS	303	2013-02	2014-02

5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Ceiling or wall-mounted devices also is positioned on a tabletop for testing purposes. Floor standing equipment is placed either directly on the groundplane or on insulating material if normally placed on a nonconducting floor [*Remark: Not applicable*]. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter [*Remark: Not applicable*].

With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating of the EUT on the turntable.

The test setup is made in accordance with the customer's order, the EUT was placed in a typical configuration.

Worst case emissions are listed under chapter: test results.

Radiated Emissions Test Characteristics	
Frequency range	30 MHz – 1,000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

5.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where

FS = Field Strength in dB μ V/m

RA = Receiver Amplitude in dB μ V

AF = Antenna Factor in dB(1/m)

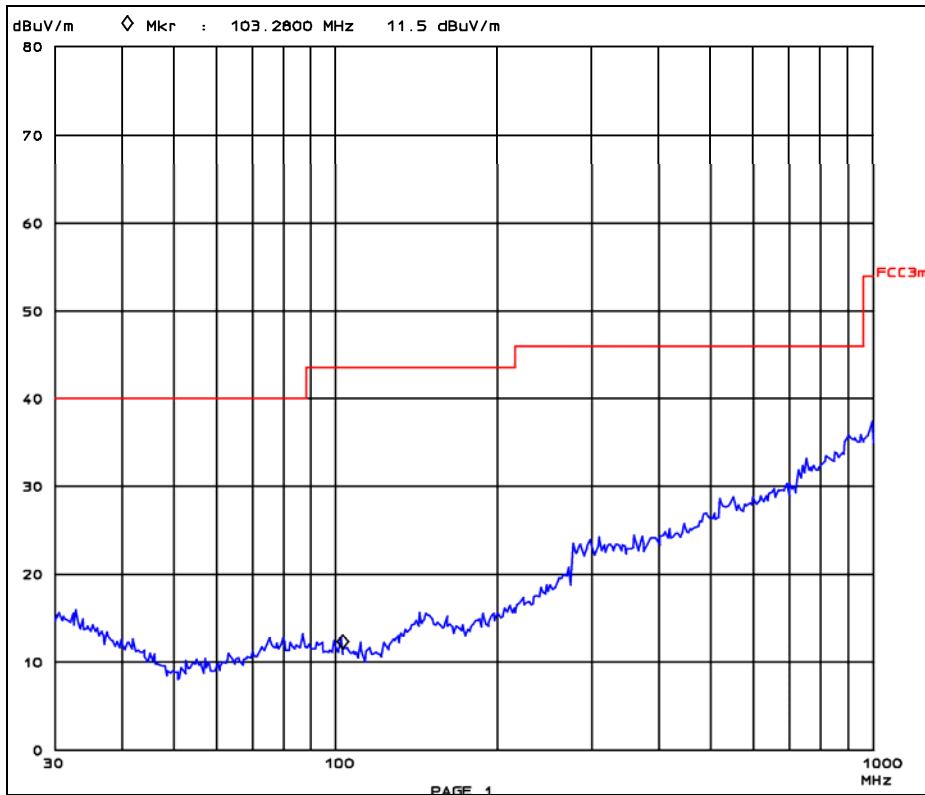
CF = Cable Attenuation Factor in dB

Assume a receiver reading of 23.5 dB μ V is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dB μ V/m. The 32 dB μ V/m value can be mathematically converted to its corresponding level in μ V/m.

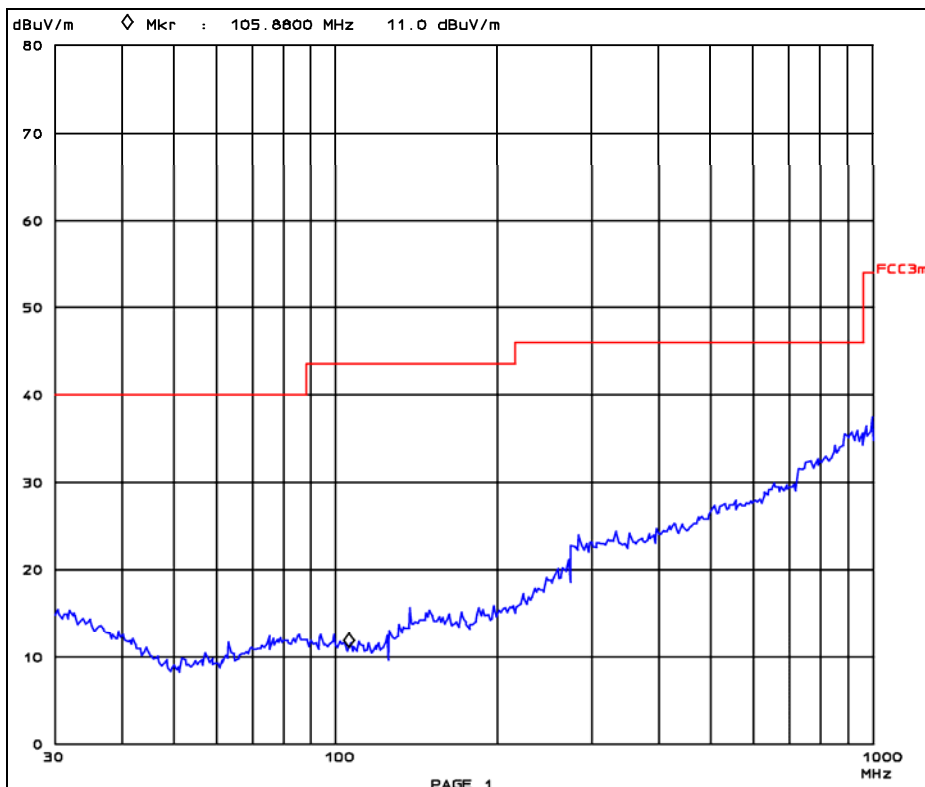
$$FS = 23.5 + 7.4 + 1.1 = 32 \text{ [dB}\mu\text{V/m]}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } (32/20) = 39.8$$

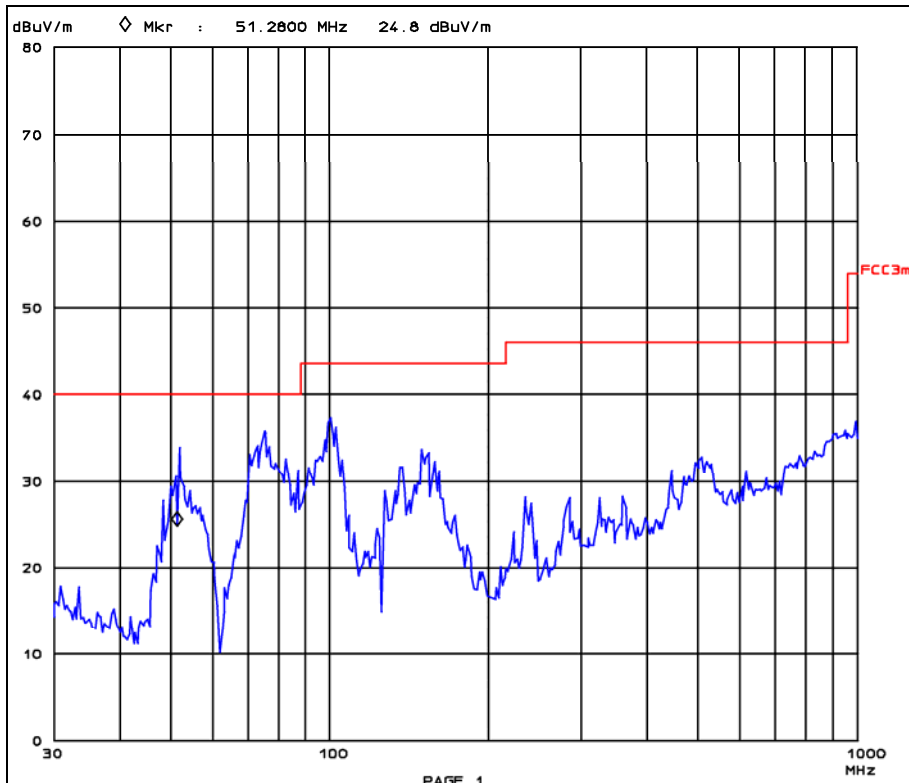
5.5 Test Results Prescan



Prescan test setup #1; worst case emissions only.



Prescan test setup #2; worst case emissions only.



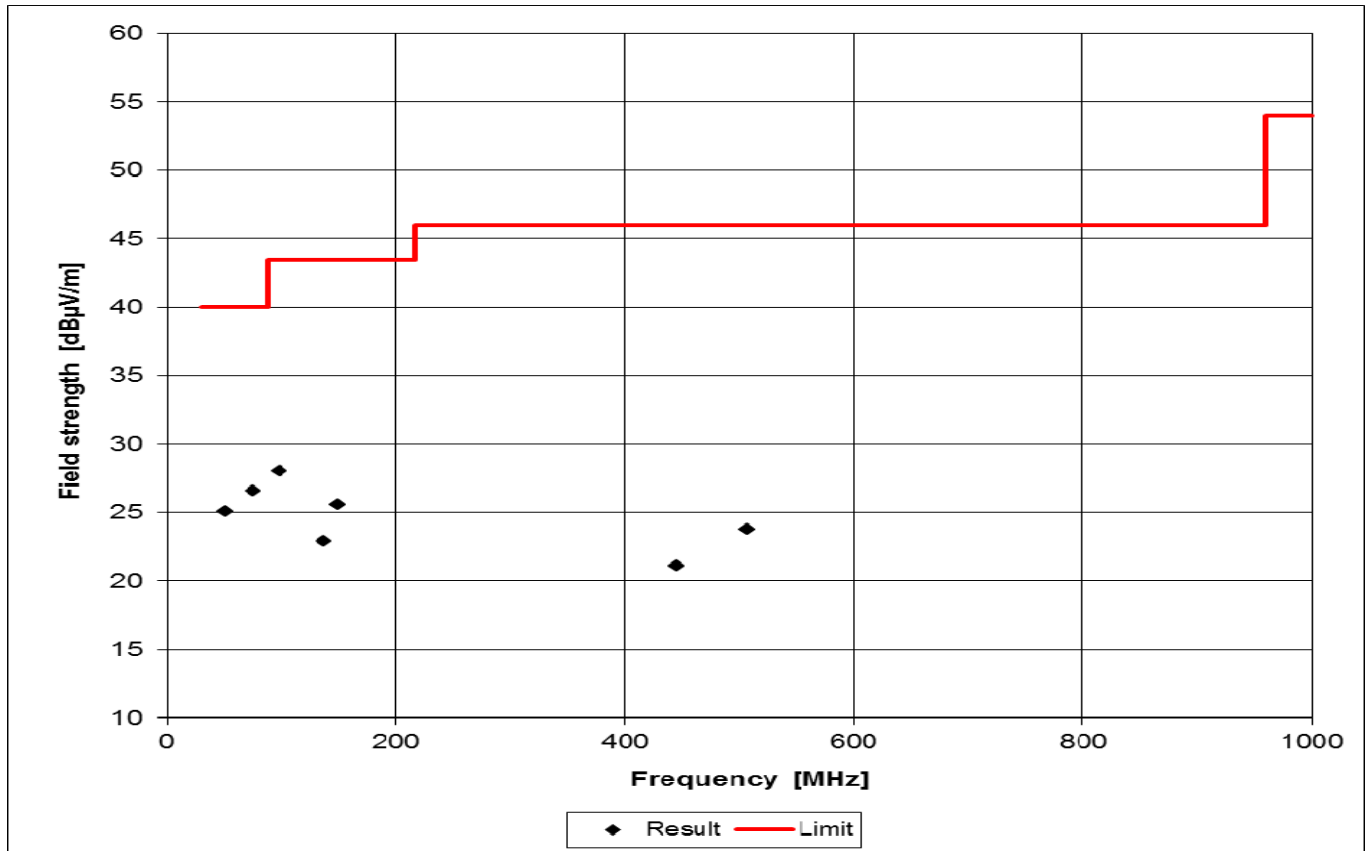
Prescan test setup #3; Worst case emissions only.

Remarks:

Prescan emission measurements performed using peak detector (limit is based on QP detector).

Prescan emission measurements performed using the test receiver's transducer factor setting capability, i.e. the field strength value measured directly without the necessity of additional correction factors.

5.6 Test Results Final Measurement



Final measurement test setup #3; worst case emissions only.

Final measurement table test setup #3

Frequency [MHz]	Reading [dB(μV)]	Antenna factor [dB(1/m)]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]	Polarisation h / v
51.50	17.4	7.7	25.1	40	14.9	v
75.50	17.1	9.5	26.6	40	13.4	v
99.00	18.8	9.2	28.0	43.5	15.5	v
136.80	11.6	11.4	22.9	43.5	20.6	v
149.00	13.3	12.3	25.6	43.5	17.9	v
445.00	0.6	20.5	21.1	46	24.9	h
507.00	1.2	22.6	23.8	46	22.2	h

Final measurement test setup #3; worst case emissions only.

Remarks:

Final measurement performed using Quasipeak detector

Antenna Factor includes the Cable Attenuation Factor

Test Personnel: Zakaria Khalek

Test Date: 2013-07-31
2013-08-20

The EUT meets the requirements of this section.

6 MISCELLANEOUS COMMENTS AND NOTES

None.

APPENDIX 1 - PHOTOGRAPHS OF TEST SETUP

Test setup #1



Conducted measurement



Radiated measurement



Close-up view



Labelling receiver module

Test setup #2



Conducted measurement



Radiated measurement



Close-up view test position 1



Close-up view test position 2

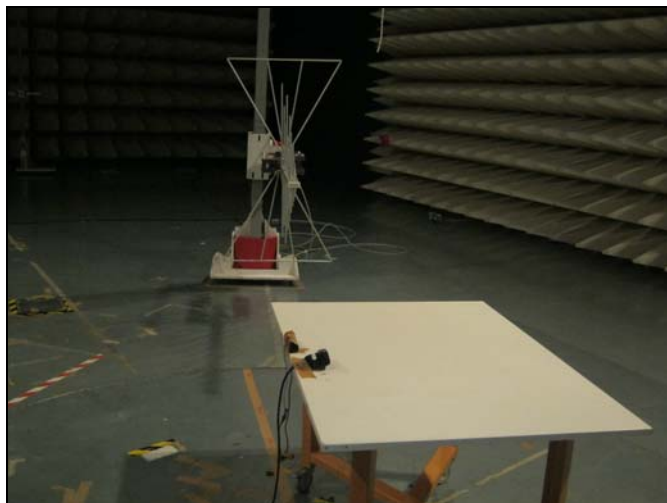


Labelling receiver module

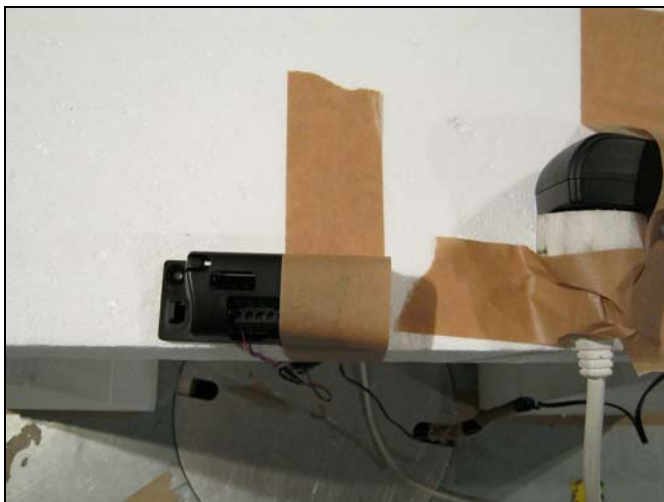
Test setup #3



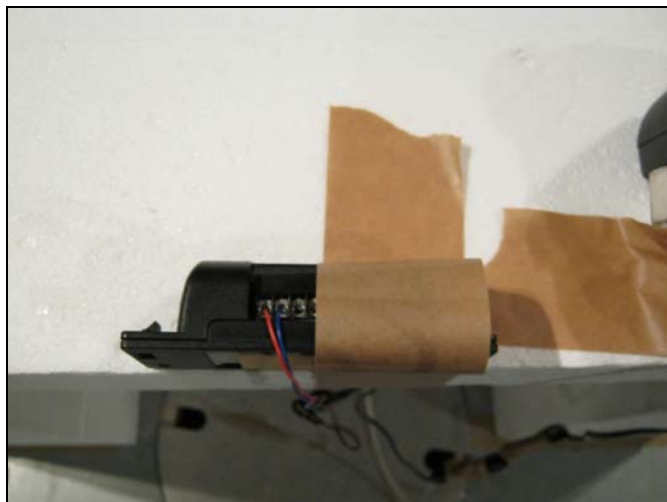
Conducted measurement



Radiated measurement



Close-up view test position 1



Close-up view test position 2



Labelling



Power supply used for testing

APPENDIX 2 - PHOTOGRAPHS OF EUT; EXTERNAL VIEW

Test setup #1



Front view



Rear side view

Test setup #2



Front view



Rear side view

Test setup #3



Test setup #2

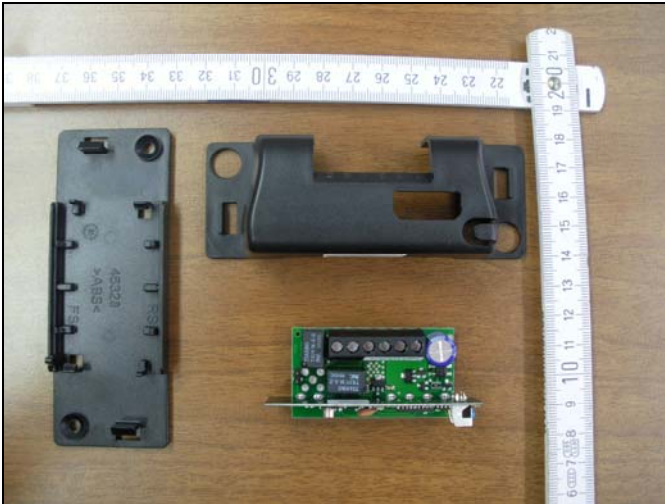


EUT opened



PCB view

Test setup #3



EUT opened



Receiver module PCB view