EUT: EKTSDG-01
FCC ID: W34EKTSDG01

Date of issue: 2012-05-11

Deutsche Akkreditierungsstelle D-PL-12053-01-01

Test Report acc. to FCC Title 47 CFR Part 15
relating to
s.m.s. smart microwave sensors GmbH
EKTSDG-01

Title 47 - Telecommunication
Part 15 - Radio Frequency Devices
Subpart C – Intentional Radiators
Measurement Procedure:
ANSI C63.4-2009

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

EUT: EKTSDG-01
FCC ID: W34EKTSDG01

Date of issue: 2012-05-11

Manufacturer's details	
Manufacturer	s.m.s. smart microwave sensors GmbH
Manufacturer's grantee code	W34
Manufacturer's address	s.m.s. smart microwave sensors GmbH
	In den Waashainen 1
	38108 Braunschweig
	Germany
	Phone: + 49 (0) 531 390230
	Fax: + 49 (0) 531 39023599
	Email: Ralph.Mende@smartmicro.de
Relevant standard used	47 CFR Part 15C - Intentional Radiators
	ANSI C63.4-2009

Test Report prepared by	
Technical engineer	Ralf Trepper
	m. dudde hochfrequenz-technik (laboratory)
	Rottland 5a
	51429 Bergisch Gladbach
	Germany
	Phone: +49 2207 96890
	Fax: +49 2207 968920
	Email: m.duddelabor@dudde.com

Equipment **U**nder **T**est **(EUT)**	
Equipment category	Transceiver
Trade name	EKTSDG
Type designation	EKTSDG-01
Serial no.	---
Variants	---

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

EUT: EKTSDG-01
FCC ID: W34EKTSDG01

Date of issue: 2012-05-11

1. Test results

Clause	Requirements headline	Test result			Report page number
8.1	Antenna Requirement	**Pass**	~~Fail~~	~~N.t.*~~	9
8.2	Field Strength limit (fundamental)	**Pass**	~~Fail~~	~~N.t.*~~	10 to 16
8.3	Radiated emission limits	**Pass**	~~Fail~~	~~N.t.*~~	17 to 18
8.4	Bandwidth (20 dB)	**Pass**	~~Fail~~	~~N.t.*~~	19 to 20

* Not tested

The equipment meets the requirements	**Yes**	~~No~~

Signature: ..... (Technician)

Signature: ..... (Manager)

m. dudde hochfrequenz-technik

Andreas Morsbach
International Management Assistant
International Office Manager

m. dudde high frequency technology
Rottland 5a
D-51429 Berg. Gladbach / Germany
Telefon: +49 22 07 - 96 89-0
Telefax: +49 22 07 - 96 89-20
email: m.duddeconsult@dudde.com
www.dudde.com

Digital unterschrieben von Andreas Morsbach
DN: cn=Andreas Morsbach, o=m.dudde hf-technik, ou=Management, email=m.duddeconsult@dudde.com, c=DE
Datum: 2012.05.29 17:59:10 +02'00'

Table of contents

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

2. Introduction

This test report consists of:

- Test result summary
- List of contents
- Introduction and further information
- Performance assessment
- Detailed test information

All pages have been numbered consecutively and bear the m. dudde hochfrequenz-technik logo, the test report number, the date, the test specification in its current version as well as the type designation of the EUT. The total number of pages in this report is **25**.

The tests were carried out at:

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

in a representative assembly and in accordance with the test methods and/or requirements stated in:

FCC Title 47 CFR Part 15 Subpart C & ANSI C63.4-2009

The sample of the product was received on:

- 2012-03-19

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

- 2012-03-29 – 2012-04-23

3. Testing laboratory

m. dudde hochfrequenz-technik
Rottland 5a, 51429 Bergisch Gladbach, Germany

Phone: +49 - (0) 22 07 / 96 89-0
Fax: +49 - (0) 22 07 / 96 89-20

- FCC Registration Number: **699717**

Accredited by:

DAkkS Deutsche Akkreditierungsstelle GmbH
DAkkS accreditation number: D-PL-12053-01

4. Applicant

Company name	: s.m.s. smart microwave sensors GmbH
Address	: In den Waashainen 1 38108 Braunschweig
Country	: Germany
Telephone	: + 49 (0) 531 390230
Fax	: + 49 (0) 531 39023599
Email	: ralph.mende@smartmicro.de
Date of order	: 2012-03-02
References	: Dr. Ralph Mende

5. Product and product documentation

Samples of the following apparatus were submitted for testing:

Manufacturer	: s.m.s. smart microwave sensors GmbH
Trademark	: smartmicro
Type designation	: **EKTSDG-01**
Hardware version	: EKTSDG-01
Serial number	: ---
Software release	: ---
Type of equipment	: Transceiver
Power used	: 5.0 V DC (USB)
Frequency used	: 24.0 GHz – 24.250 GHz
Generated frequencies	: 24.050 GHz – 24.250 GHz
ITU emission class	: 195M FON
FCC ID	**:** W34EKTSDG01

For issuing this report the following product documentation was used:

Description	Date	Identifications
External photographs of the **E**quipment **U**nder **T**est (EUT)	2012-05-11	Annex no. 1
Internal photographs of the **E**quipment **U**nder **T**est (EUT)	2012-05-11	Annex no. 2
Channel occupancy / bandwidth	2012-05-11	Annex no. 3
Label sample	2012-05-11	Annex no. 4
Functional description / User manual	2012-05-11	Annex no. 5
Test setup photos	2012-05-11	Annex no. 6
Block diagram	2012-05-11	Annex no. 7
Operational description	2012-05-11	Annex no. 8
Schematics	2012-05-11	Annex no. 9
Parts list	2012-05-11	Annex no. 10

6. Conclusions, observations and comments

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

The results of the tests as stated in this report are exclusively applicable to the EUT as identified in this report. m. dudde hochfrequenz-technik cannot be held liable for properties of the EUT that have not been observed during these tests.

m. dudde hochfrequenz-technik assumes the sample to comply with the requirements of FCC Title 47 CFR Part 15 for the respective test sector, if the test results turn out positive.

Comments: ---

Date	: 2012-05-11	Date	: 2012-05-11
Name	: Ralf Trepper	Name	: Manfried Dudde
Function	: Technician	Function	: Manager
Signature	:	Signature	: .....

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

7. Operational description

Transceiver, Field disturbance sensor,
The main task of the EKTSDG-01xxxx is to generate a simulated target at its location, while it will be illuminated by a 24GHz Radar sensor. The radar sensor will then detect the EKTSDG and measure its position. This position information may then be used to align the radar sensor to point to a certain point.

7.2 EUT configuration

Operation: As soon as the equipment is powered up and will be illuminated by a 24GHz Radar sensor the EKTSDG-01xxxx begins to transmit. The EKTSDG-01xxxx does not transmit any signal by itself. It only starts transmitting when it is illuminated by a separate radar transmitter. The transmit signal frequency of the original radar sensor must be with in the 24.0 to 24.25GHz range. The EKTSDG-01xxxx will transmit exactly the same signal back – but the frequency will be increased by the Doppler shift, which can be selected by the user.
Purpose of operation : see User Manual

7.3 EUT measurement description

Radiated emissions
One configuration will be tested as standalone device. In order to establish the maximum radiation, firstly, there have been viewed all orthogonal adjustments of the test sample. Secondly the test sample have been rotated at all adjustments around the own axis between 0° and 360°, and thirdly, the antenna polarization between horizontal and vertical has been varied. All generated frequencies, the lowest and the highest frequency of the EKTSDG-01xxxx, have been viewed. The device was tested on a standalone basis.

In all measurement distances the 3 dB beam width of the measuring antenna, for measurements above 1 GHz, is greater than the EUT's dimensions.

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

8. Compliance assessment

8.1 Antenna requirement

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

8.1.2 Result

The equipment meets the requirements	**Yes***	~~No~~	~~N.t.~~

Further test results are attached	~~Yes~~	**No**	Page no.

*** Patch array antenna! RX and TX separated.**

N.t.* See page no. 21

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

8.2 Fundamental frequencies / Field strength limits

8.2.1 Regulation

Test requirement: FCC CFR47, Part 15C Section 15.249 Test procedure: ANSI C63.4:2009

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

(f) Parties considering the manufacture, importation, marketing or operation of equipment under this section should also note the requirement in §15.37(d).

Fundamental frequency	**Field strength of fundamental (µV/m)**	**Field strength of spurious emissions (µV/m)**
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	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 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.

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

8.2.2 Test equipment

Type	Manufacturer/ Model no.	Serial no.	Last calibration	Next calibration	Calibration executed by
Test fixture	Dudde	---	04/2012	04/2013	Dudde
Magnetic loop antenna (9 kHz - 30 MHz)	Schwarzbeck FMZB 1516 (23)	---	05/2010	05/2013	Dudde
Pre-amplifier (100kHz - 1.3GHz)	Hewlett Packard 8447 E (166a)	1726A00705	01/2012	01/2014	Dudde
Horn antenna (2.0-14.0 GHz)	Schwarzbeck BBHA 9120 C (169)	305	03/2011	03/2013	Dudde
Mixer WR15 V-Band (50-75 GHz)	OM Labs MA2744A (295a)	V41027-1	03/2010	03/2013	Dudde
Mixer WR22 Q-Band (33-50 GHz)	OM Labs MA2742A (269a)	Q40512-1	04/2010	04/2013	Dudde
Mixer WR10 W-Band (75-110 GHz)	OM Labs MA2746A (296a)	W40706-2	03/2010	03/2013	Dudde
Pre-amplifier (1GHz - 18GHz)	Narda (345)	---	01/2012	01/2014	Dudde
Receiver (9 kHz –40.0 GHz) (40.0 GHz -110 GHz)	Anritsu Spectrum Analyzer MS2668 (359a)	6200163244	05/2011	05/2014	Rohde & Schwarz
Gain Horn antenna (33-50 GHz)	Dorado GH-22-25 (383)	040810	04/2012	04/2014	Dorado
Gain Horn antenna (50-75 GHz)	Dorado GH-15-25 (384)	031003	04/2012	04/2014	Dudde
Gain Horn antenna (75-110 GHz)	Dorado GH-10-25 (385)	040808	04/2012	04/2014	Dudde
Bilog antenna (30- 1000 MHz)	Schwarzbeck VULP 9168 (406)	---	04/2011	04/2014	Schwarzbeck
Logt. Per, Antenne (1- 18 GHz)	Schwarzbeck STLP 9148 (445)	---	09/2009	09/2012	Schwarzbeck
Horn antenna (15.0-40.0 GHz)	Schwarzbeck BBHA 9170 (442)	BBHA9170378	09/2011	09/2014	Schwarzbeck
Harmonic Mixer E-Band 60-90 GHz	Rohde & Schwarz FSZ-90 (501)	100062	03/2010	03/2013	Rohde & Schwarz
Signal Analyzer (9 kHz –30.0 GHz)	Rohde & Schwarz FSV 30 (502)	100932	02/2010	02/2013	Rohde & Schwarz
Harmonic Mixer U-Band (40-60 GHz)	Farran FSZ-60 (515)	100037	08/2010	08/2013	Farran
Gain Horn antenna (40-60 GHz)	Dorado GH-19-20 (518)	070106	08/2010	08/2013	Dudde
RF- cable	Kabelmetal 18m [N]	K1a	04/2012	04/2013	Dudde
RF- cable	Sucoflex 104 2m [APC]	K17a	03/2012	03/2013	Dudde
RF- cable	Sucoflex 104 2m [APC]	K18a	03/2012	03/2013	Dudde
RF- cable	Aircell 0.5m [BNC]	K40	10/2011	10/2012	Dudde
RF- cable	Aircell 1m [BNC/N]	K56	10/2011	10/2012	Dudde
RF- cable	Sucoflex 106 Suhner 6,4m [N]	K74	10/2011	10/2012	Dudde
RF- cable	Sucoflex 106 Suhner 6,4m [N]	K75	10/2011	10/2012	Dudde
RF- cable	Sucoflex Suhner 13 m [N]	K144	04/2012	04/2013	Dudde

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

8.2.3 Test procedure

The EUT and this peripheral (when additional equipment exists) are placed on a turn table which is 0.8m above the 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: 2009 Section 8 “Radiated emission measurements”

Measurement procedures for electric field radiated emissions above 1 GHz are covered in Clause 8 of ANSI C63.4-2009. The C63.4-2009 measurement procedure consists of both an exploratory test and a final measurement. The exploratory test is critical to determine the frequency of all significant emissions. For each mode of operation required to be tested, the frequency spectrum is monitored. Variations in antenna height, antenna orientation, antenna polarization, EUT azimuth, and cable or wire placement is explored to produce the emission that has the highest amplitude relative to the limit.

The final measurements are made based on the findings in the exploratory testing. When making exploratory and final measurements it is necessary to maximize the measured radiated emission. Subclause 8.3.1.2 of C63.4-2009 states that the measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” We consider the “cone of radiation” to be the 3 dB beamwidth of the measurement antenna.

While the “bore-sighting” technique is not explicitly mentioned in C63.4-2009, it is a useful technique for measurements using a directional antenna, such as a double-ridged waveguide antenna. Several precautions must be observed, including: knowledge of the beamwidth of the antenna and the resulting illumination area relative to the size of the EUT, estimation for source of the emission and general location within larger EUTS, measuring system sensitivity, etc.

C63.4-2009 requires that the measurement antenna is kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. That means that if the directional radiation pattern of the EUT results in a maximum emission at an upwards angle from the EUT, when a directional antenna is used to make the measurement it will be necessary for it to be pointed towards the source of the emission within the EUT. This can be done by either pointing the antenna at an angle towards the source of the emission, or by rotating the EUT, in both height and polarization, to maximize the measured emission. The emission must be kept within the illumination area of the 3 dB beamwidth of the antenna so that the maximum emission from the EUT is measured.

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

Radiated emissions test characteristics	
Frequency range	30 MHz - 12,000 MHz
Test distance	10m, 3 m*
Test instrumentation resolution bandwidth	9 kHz (20 kHz – 30 MHz)
	120 kHz (30 MHz - 1,000 MHz)
	1 MHz (1000 MHz - 12,000 MHz)
Receive antenna height	1 m (20 kHz – 30 MHz)
Receive antenna polarization	0° - 90° (20 kHz – 30 MHz)
Receive antenna scan height	1 m - 4 m (30 MHz - 12,000 MHz)
Receive antenna polarization	vertical/horizontal (30 MHz - 12,000 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 20dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

8.2.4 Calculation of the 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*log (worst case on time/100msec). Analysis of the remote transmitter worst case on time in any 100msec time period is an on time of 50msec, therefore the correction factor is 20*log (50/100) = - 6 dB. The maximum correction factor to be applied is 20 dB per section 15.35 of the FCC rules.

8.2.5 Calculation of the field strengths

The field strength is calculated by the following calculation:

Corrected Level = Receiver Level + Correction Factor (without the use of a pre-amplifier)

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

Receiver Level : Receiver reading without correction factors
Correction Factor : Antenna factor + cable loss

For example:
The receiver reading is 32.7 dBµV. 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 35.91dBµV/m.
The 35.91dBµV/m value can be mathematically converted to its corresponding level in µV/m.

Level in µV/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).

8.2.7 Result

Peak antenna vertically

FUNDAMENTAL EMISSIONS (Section 15.249)										
f (GHz)	Bandwidth (kHz), Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	Level corrected **dBµV/m**	Peak Limit **dBµV/m @ meter**	Margin **dBµV/m**	Polaris. EUT / antenna orientation	height/cm
24.0552	PK/1MHz	**63.8**	3	18.6	0	**82.4**	127.9	**45.5**	V, 0°/V	141
24.1400	PK/1MHz	**64.6**	3	19.2	0	**83.8**	127.9	**44.1**	V, 0°/V	141
24.2316	PK/1MHz	**66.0**	3	19.5	0	**85.5**	127.9	**42.4**	V, 0°/V	141
Measurement uncertainty	± 6 dB									

Bandwidth = the measuring receiver bandwidth

Peak antenna horizontally

FUNDAMENTAL EMISSIONS (Section 15.249)										
f (GHz)	Bandwidth (kHz), Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	Level corrected **dBµV/m**	Peak Limit **dBµV/m @ meter**	Margin **dBµV/m**	Polaris. EUT / antenna orientation	height/cm
24.0644	PK/1MHz	**87.4**	3	18.6	0	**106.0**	127.9	**21.9**	V, 0°/H	124
24.1424	PK/1MHz	**87.3**	3	19.2	0	**106.5**	127.9	**21.4**	V, 0°/H	124
24.24.60	PK/1MHz	**88.7**	3	19.5	0	**108.2**	127.9	**19.7**	V, 0°/H	124
Measurement uncertainty	± 6 dB									

Bandwidth = the measuring receiver bandwidth

The equipment meets the requirements	**Yes**	~~No~~	~~N.t.~~

Further test results are attached	~~Yes~~	**No**	

N.t.* See page no. 21

Average antenna vertically

FUNDAMENTAL EMISSIONS (Section 15.249)										
f (GHz)	Bandwidth (kHz), Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	Level corrected **dBµV/m**	Average Limit **dBµV/m @ meter**	Margin **dBµV/m**	Polaris. EUT / antenna orientation	height/cm
24.0552	AV/1MHz	**53.8**	3	18.6	0	**72.4**	107.9	**35.5**	V, 0°/V	141
24.1400	AV/1MHz	**54.1**	3	19.2	0	**73.3**	107.9	**34.6**	V, 0°/V	141
24.2316	AV/1MHz	**55.1**	3	19.5	0	**74.6**	107.9	**33.3**	V, 0°/V	141
Measurement uncertainty	± 6 dB									

Bandwidth = the measuring receiver bandwidth

Average antenna horizontally

FUNDAMENTAL EMISSION (Section 15.249)										
f (GHz)	Bandwidth (kHz), Type of detector	Noted receiver level **dBµV**	Test distance **m**	Correction factor **dB**	Distance extrapol. factor **dB**	Level corrected **dBµV/m**	Average Limit **dBµV/m @ meter**	Margin **dBµV/m**	Polaris. EUT / antenna orientation	height/cm
24.0644	AV/1MHz	**78.2**	3	18.6	0	**96.8**	107.9	**11.1**	V, 0°/H	124
24.1424	AV/1MHz	**78.0**	3	19.2	0	**97.2**	107.9	**10.7**	V, 0°/H	124
24.24.60	AV/1MHz	**78.9**	3	19.5	0	**98.4**	107.9	**9.5**	V, 0°/H	124
Measurement uncertainty	+ 6 dB									

Bandwidth = the measuring receiver bandwidth

The equipment meets the requirements	**Yes***	~~No~~	~~N.t.~~

Further test results are attached	~~Yes~~	**No**	

N.t.* See page no. 21

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

Peak antenna vertically

HARMONICS (Section 15.249)										
f (GHz)	Bandwidth (kHz), Type of detector	Noted receiver level dBµV	Test distance m	Correction factor dB	Distance extrapol. factor dB	Level corrected dBµV/m	Average Limit dBµV/m @ meter	Margin dBµV/m	Polaris. EUT / antenna orientation height/cm	
	PK/1MHz		0.50	32.7	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	32.9	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	34.2	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	34.2	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	34.3	-15.5		87.9		V, 360°/V	0
Measurement uncertainty		± 6 dB								

Bandwidth = the measuring receiver bandwidth

Peak antenna horizontally

HARMONICS (Section 15.249)										
f (GHz)	Bandwidth (kHz), Type of detector	Noted receiver level dBµV	Test distance m	Correction factor dB	Distance extrapol. factor dB	Level corrected dBµV/m	Average Limit dBµV/m @ meter	Margin dBµV/m	Polaris. EUT / antenna orientation height/cm	
	PK/1MHz		0.50	32.7	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	32.9	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	34.2	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	34.2	-15.5		87.9		V, 360°/V	0
	PK/1MHz		0.50	34.3	-15.5		87.9		V, 360°/V	0
Measurement uncertainty		+ 6 dB								

Bandwidth = the measuring receiver bandwidth

The equipment meets the requirements	**Yes***	~~No~~	~~N.t.~~

Further test results are attached	**Yes**	~~No~~	Page no.

***All emissions lower than the noise level of the measuring equipment!**

N.t.* See page no. 21

8.3 Radiated emission limits

Test requirement: FCC CFR47, Part 15C Section 15.209 Test procedure: ANSI C63.4:2009

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 (µV/m)	Measurement distance (m)
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. lf 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.

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

8.3.1 Result

TRANSMITTER SPURIOUS RADIATION (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	0.2, QPK	< 4.0	10	20.2	-59.1	-34.9	46.0- @ 300 m	80.90	V, H/0-360°
	0.2, QPK	< 4.0	10	20.2	-59.1	-34.9	26.0 @ 300 m	80.90	V, H/0-360°
0.5000	0.2, AV	< 4.0	10	20.2	-19.1	5.1	33.6 @ 30 m	28.5	V, H/0-360°
1.5000	0.2, AV	< 4.0	10	20.2	-19.1	5.1	24.1 @ 30 m	19.00	V, H/0-360°
3.0000	9, AV	< 4.0	10	20.2	-19.1	5.1	29.5 @ 30 m	24.4	V, H/0-360°
5.0000	9, AV	< 4.0	10	20.2	-19.1	5.1	29.5 @ 30 m	24.4	V, H/0-360°
8.0000	9, AV	< 4.0	10	20.2	-19.1	5.1	29.5 @ 30 m	24.4	V, H/0-360°
10.0000	9, AV	< 4.0	10	20.2	-19.1	5.1	29.5 @ 30 m	24.4	V, H/0-360°
20.0000	9, AV	< 4.0	10	20.2	-19.1	5.1	29.5 @ 30 m	24.4	V, H/0-360°
30.0000	9, AV	< 4.0	10	20.2	-19.1	5.1	29.5 @ 30 m	24.4	V, H/0-360°
35.0000	100, AV	≤ 3.5	3	-3.1*[6]	0	0	0.4	40.0	H,V/H,V
88.0000	100, AV	≤ 3.5	3	-10.8*[6]	0	-7.3	40.0	47.3	H,V/H,V
216.0000	100, AV	≤ 3.5	3	-10.3*[6]	0	-6.8	43.5	50.3	H,V/H,V
960.0000	100, AV	≤ 3.5	3	8.5*[6]	0	12.0	43.5	31.5	H,V/H,V
1700.0000	1000, AV	≤ 4.5	3	3.8*[7]	0	8.3	54.0	45.7	H,V/H,V
2250.0000	1000, AV	≤ 10	3	8.0*[7]	0	18.0	54.0	36.0	H,V/H,V
4000.0000	1000, AV	≤ 10	3	8.4*[7]	0	18.4	54.0	35.6	H,V/H,V
5000.0000	1000, AV	≤ 10	3	9.1*[7]	0	19.4	54.0	34.6	H,V/H,V
7500.0000	1000, AV	≤ 14	3	12.9*[7]	0	26.9	54.0	27.1	H,V/H,V
***All other emissions than harmonics are lower than the noise level of the measuring equipment!**									
Measurement uncertainty	4 dB								

Blue marked: restricted bands
Bandwidth = the measuring receiver bandwidth

Remark: *[1] noise floor noise level of the measuring instrument ≤ 4.0dBµV @ 10m distance (0.009 MHz –30 MHz)
Remark: *[2] noise floor noise level of the measuring instrument ≤ 3.5dBµV @ 3m distance (30 – 1,000 MHz)
Remark: *[3] noise floor noise level of the measuring instrument ≤ 4.5dBµV @ 3m distance (1,000 – 2,000 MHz)
Remark: *[4] noise floor noise level of the measuring instrument ≤ 10dBµV @ 3m distance (2,000 – 5,500 MHz)
Remark: *[5] noise floor noise level of the measuring instrument ≤ 14dBµV @ 3m distance (5,500 – 14,500 MHz)
Remark: *[6] for using a pre-amplifier in the range between 100 kHz and 1,000 MHz
Remark: *[7] for using a pre-amplifier in the range between 1.0 GHz and 18.0 GHz

The equipment meets the requirements	**Yes***	~~No~~	~~N.t.~~

Further test results are attached	**Yes**	~~No~~	Page no.

N.t.* See page no. 21

8.4 Bandwidth (20 dB)

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

8.4.1 Test equipment

Type	Manufacturer/ Model no.	Serial no.	Last calibration	Next calibration	Calibration executed by
Test fixture	Dudde	---	04/2012	04/2013	Dudde
Low noise signal generator (10kHz – 5.4GHz)	Marconi Instruments 2042 (6)	119347/003	01/2012	01/2014	Dudde
Frequency counter (10MHz -26.5GHz)	Hewlett & Packard 5351A Microwave frequency counter (130)	2432A00054	09/2011	09/2014	Rohde & Schwarz
Receiver (9 kHz –18.0 GHz)	Rohde & Schwarz Spectrum Analyzer FSL 18 (171a)	100.117	11/2010	11/2012	Rohde & Schwarz
Frequency Counter	Hewlett Packard 5351B (432)	3049A01217	08/2011	08/2013	DKD
Signal Analyzer (9 kHz –30.0 GHz)	Rohde & Schwarz FSV 30 (502)	100932	02/2010	02/2013	Rohde & Schwarz
RF- cable	Sucoflex 104 P Suhner 2,13m [APC 3.5]	K17a	03/2012	03/2013	Dudde
RF- cable	Sucoflex 104 P Suhner 2,13m [APC 3.5]	K18a	03/2012	03/2013	Dudde
RF- cable	Sucoflex Suhner 8m [SMA]	K145	04/2012	04/2013	Dudde
RF- cable	Sucoflex Suhner 8m [SMA]	K146	04/2012	04/2013	Dudde

8.4.2 Test procedure

ANSI C63.4-2009 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.

8.4.3 20 dB bandwidth limit

The 20 dB bandwidth limit = 200 MHz

8.4.4 Result

The maximum measured 20 dB bandwidth is: 193.28 MHz
The maximum measured 26 dB bandwidth is: 194.41 MHz

The equipment meets the requirements	**Yes**	~~No~~	~~N.t.~~

Further test results are attached	**Yes**	~~No~~	**Annex No. 3**

N.t.* See page no. 21

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

9. Additional information to the test report

Remarks

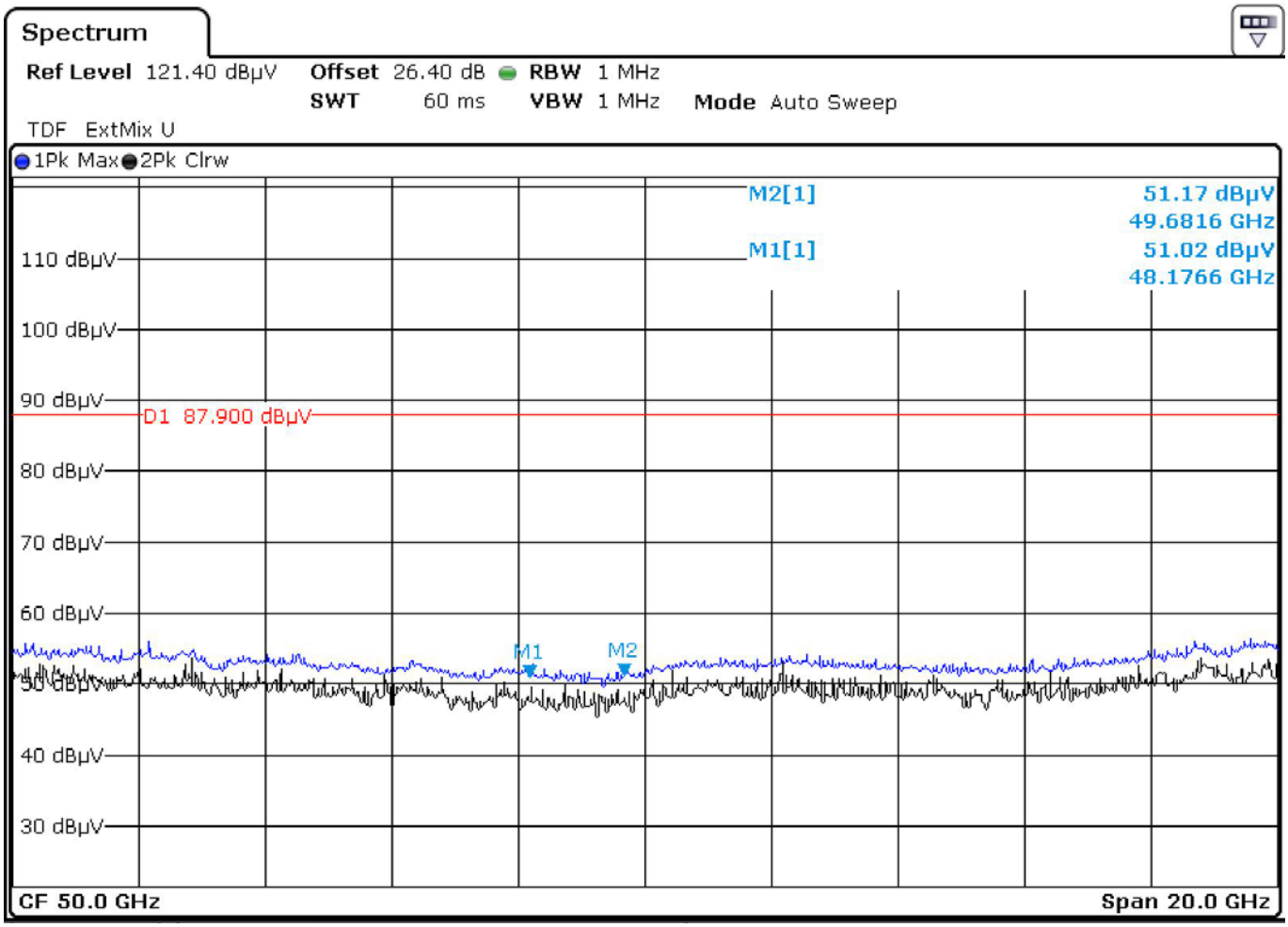
N.t.[1]	Not tested, because the antenna is part of the PCB
N.t.[2]	Not tested, because the EUT is directly battery powered
N.t.[3]	Not tested, because not applicable to the EUT
N.t.[4]	Not tested, because not ordered

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

EUT: EKTSDG-01
FCC ID: W34EKTSDG01

Date of issue: 2012-05-11

Plot to the test: Spurious emissions, harmonics 40 – 60 GHz

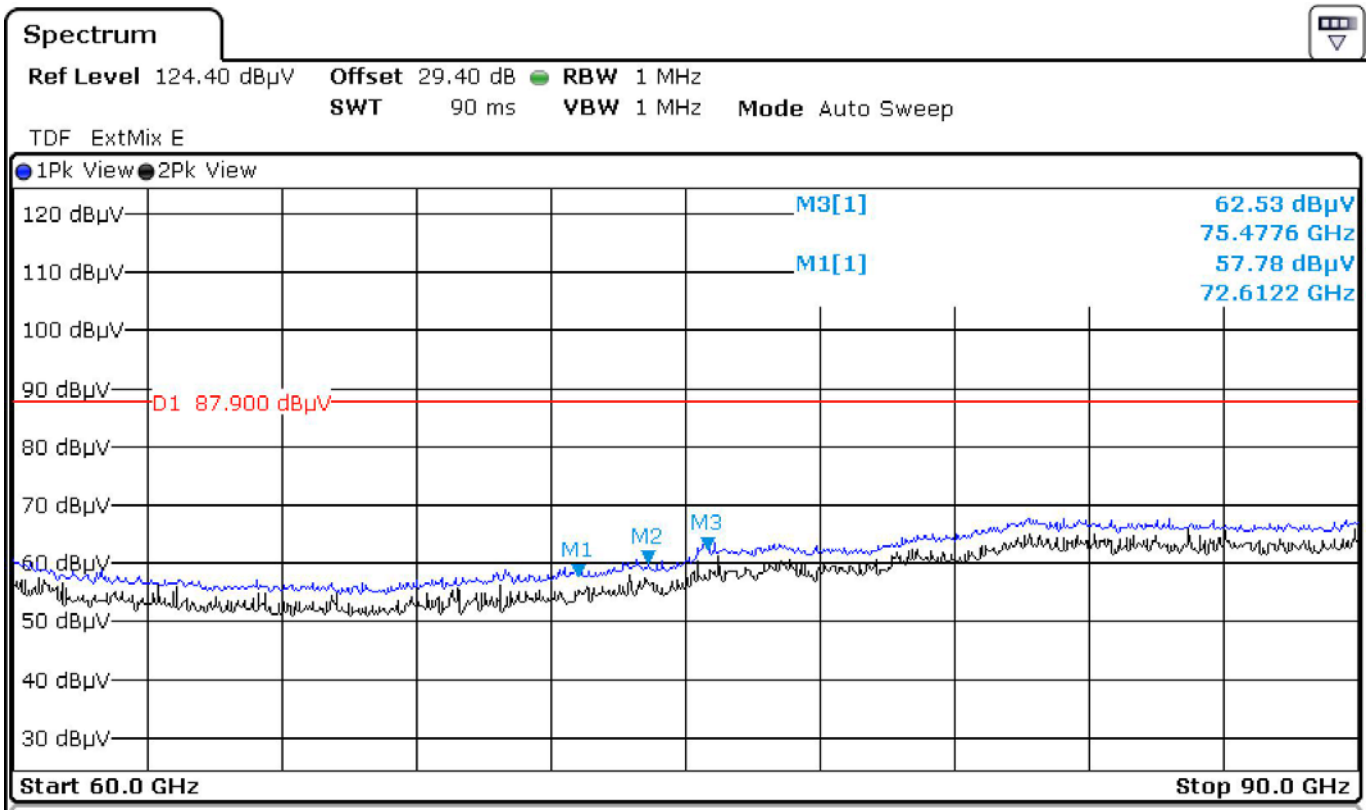


m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

EUT: EKTSDG-01
FCC ID: W34EKTSDG01

Date of issue: 2012-05-11

Plot to the test: Spurious emissions, harmonics 60 – 90 GHz



Marker

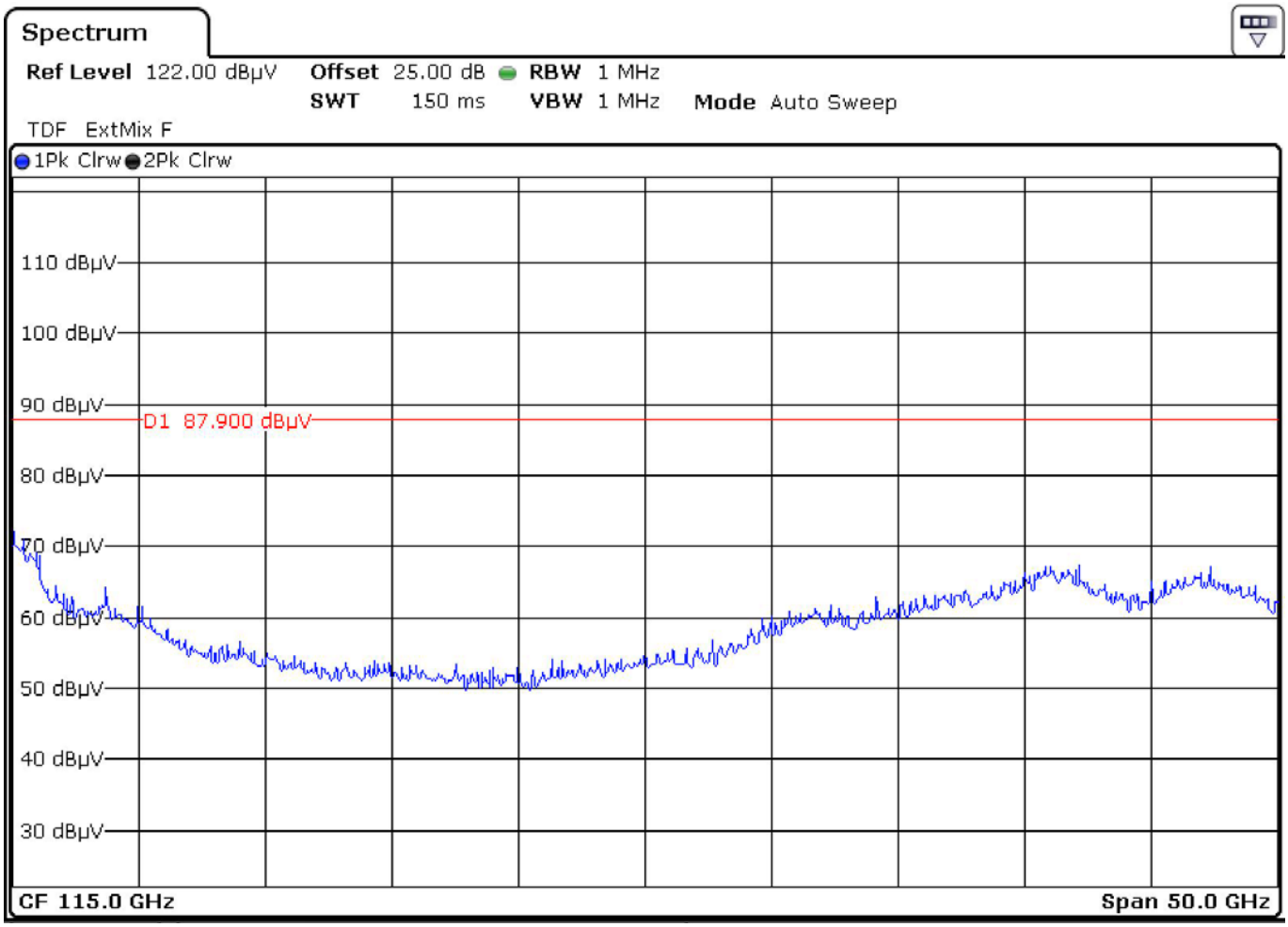
No	Type	Trc	Stimulus	Response	Function	Function Result
1	1N	1	72.6122 GHz	57.78 dBµV		
2	2N	1	74.1751 GHz	60.02 dBµV		
3	3N	1	75.4776 GHz	62.53 dBµV		

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

EUT: EKTSDG-01
FCC ID: W34EKTSDG01

Date of issue: 2012-05-11

Plot to the test: Spurious emissions, harmonics 90 – 120 GHz



m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920

End of test report

m. dudde hochfrequenz-technik Rottland 5a D-51429 Bergisch Gladbach/ Germany Tel: +49 2207-96890 Fax +49 2207-968920