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LAB N° 1356

# Test Report

## 47 CFR FCC Part 15 subpart C Intentional Radiators

Report reference no..... : 28113418-004

FCC Designation Number ..... : IT0008

FCC Test Firm Registration # ..... : 804595

Tested by (name + signature).....:

Andrea Bortolotti \ Tester

Approved by (name + signature).....:

Giovanni Molteni \ TM

Date of issue ..... : 24/06/2019

Total number of pages..... : 40 Pages

Testing Laboratory ..... : TÜV Rheinland Italia S.r.l.

Address..... : Via Mattei 3 - 20010 - Pogliano Milanese (MI) – Italy

Applicant's name ..... : IKEA of Sweden AB

Address..... : Box 702 - 343 81 Älmhult - Sweden

Test item description..... :

Trade Mark..... :



Manufacturer..... : IKEA of Sweden

Model/Type reference..... : Shortcut button

FCC ID..... : FHO-E1812

Ratings..... : 3Vdc powered by internal not rechargeable battery

Sample ..... :

Samples received on ..... : 03/05/2019

TUV reference samples ..... : 190392 (sampled by the customer)

Samples tested n. .... : 1 with RF connector

Testing ..... :

Start Date: ..... : 28/05/2019

End Date: ..... : 18/06/2019

*The results in this Test Report are exclusively referred to the tested samples. Without the written authorization of TÜV Rheinland Italia S.r.l., this document can be reproduced only integrally*



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Report No. 28113418-004

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**RELEASE CONTROL RECORD**

Test report Number	Reason of change	Date of Issue
28113418-002	Original release	24/06/2019
28113418-004	Editorial change This version cancel and replaces full test report nr. 28113418-002 issue date 24/06/2019 and its previous versions	02/08/2019

**1. Reference Standards**

Standard	Description
FCC Part 15 (Subpart C)	§15.247 Operation within the bands 902-928 MHz, 2400-2483,5 MHz, and 5725-5850 MHz.
FCC Part 15 (Subpart C)	§15.207 Conducted Limits
FCC Part 15 (Subpart C)	§15.209 Radiated emission limits; general requirements
FCC Part 15 (Subpart C)	§15.203 Antenna Requirement
ANSI C63.4:2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10:2013	American National Standard for Testing Unlicensed Wireless Devices
558074 D01 DTS Meas Guidance v05 - August 24, 2018	Guidance for performing compliance measurements on digital transmission systems (DTS) operating under §15.247

**2. Summary of testing**

§ 15.203 § 15.247 (b)(4)(i)	Antenna Requirements	PASS
§ 15.207 (a)	Power Line Conducted Emission	Not performed
§ 15.209 (a) (f)	Radiated Emission	Not performed
§ 15.215 (a) (b) (c)	Additional provisions to the general radiated emission limitations	PASS
§ 15.247 (a)	Frequency Hopping Spread Spectrum Specifications:	
§ 15.247 (a) (1)	20 dB Bandwidth	N.A. <sup>1</sup>
§ 15.247 (a) (1) (i)	Number of Hopping Channels Used, Carrier frequency Separation and Time occupancy in band 902÷908MHz	N.A. <sup>1</sup>
§ 15.247 (a) (1) (ii)	Number of Hopping Channels Used, Carrier frequency Separation and Time occupancy in band 5725÷ 5850 MHz	N.A. <sup>1</sup>
§ 15.247 (a) (1) (iii)	Number of Hopping Channels Used, Carrier frequency Separation and Time occupancy in band 2400÷2483,5 MHz	N.A. <sup>1</sup>
§ 15.247 (a) (2)	6dB Minimum Bandwidth for systems using digitally modulation	PASS
§ 15.247 (b)	Maximum Peak Output Power:	
§ 15.247 (b) (1)	Peak Output Power (conducted) in band 2400÷2483,5 MHz and 5725÷ 5850 MHz (Hopping systems)	N.A. <sup>1</sup>
§ 15.247 (b) (2)	Peak Output Power (conducted) in band 902÷908MHz (Hopping systems)	N.A. <sup>1</sup>
§ 15.247 (b) (3)	RF power output (conducted) for systems using digitally modulation	PASS
§ 15.247 (b) (4)	Antenna gain	<6dBi
§ 15.247 (c)	Operation with directional antenna gains greater than 6 dBi	N.A. <sup>2</sup>
§ 15.247 (d)	Out-of-band emissions	PASS
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edges	PASS
§ 15.247 (e)	Power Spectral Density	PASS
§ 15.247 (f)	Hybrid systems	N.A. <sup>3</sup>
§ 15.247 (g)	FHSS Transmission characteristics	N.A. <sup>1</sup>
§ 15.247 (h)	Recognition of occupied channel and multiple transmission system	N.A. <sup>1</sup>

<b>Note 1</b>	Not applicable for DTS equipment
<b>Note 2</b>	Antenna Gain <6dBi
<b>Note 3</b>	No hybrid system



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**Possible test case verdicts:**

- test case does not apply to the test object .....: N/A
- test object does meet the requirement .....: PASS
- test object does not meet the requirement .....: FAIL

**General remarks:**

**The test results presented in this report relate only to the object tested.**

**The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.**

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(see Enclosure #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.



### 3. General product information

E1812 a programmable button which give the user a quick and easy way to access certain functions in the TRÁDFRI System quickly without the need for opening the app.

Possible use cases could be :  
All OFF, Scenes, Welcome home and timer

### 4. General Chipset information

Radio Data	
<b>Radio module(s) model</b>	ZigBee module Silcon labs mod. EFR32MG1P132
<b>Modulation</b>	OQPSK
<b>Number of channels</b>	16 channels (ch.11 to ch.26)
<b>Channels Separation</b>	5MHz
<b>Frequency band</b>	2400,0 ÷ 2483,5 MHz
<b>Operating frequency</b>	2405 ÷ 2480 MHz
<b>Type of equipment</b>	Combined equipment (equipment with Plug-in radio module)
<b>Adaptive/Non Adaptive equipment</b>	Adaptive Equipment without the possibility to switch to a non-adaptive mode
<b>International Standard</b>	IEEE 802.15.4

### 5. General Antennas information

<b>Antenna</b>	<b>Gain:</b>	1.94dBi
	<b>Model:</b>	Printed Inverted-F Antenna
	<b>Type:</b>	<input checked="" type="checkbox"/> Integral <input type="checkbox"/> Dedicated <input type="checkbox"/> External



### 6. Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	Zigbee Shortcut button	IKEA	E1812	
AE	Laptop PC	DELL	Vostro 15	---

Note:

\* Use :

EUT - Equipment Under Test,  
AE - Auxiliary/Associated Equipment, or  
SIM - Simulator (Not Subjected to Test)

No other Auxiliary/Associated Equipment was connected/installed on the EUT

### 7. Input/Output Ports

#### CONNECTIONS

Port	Description	Connection	Cable length	
1	Enclosure	Plastic	Pressure	---
2	AC Power Port	---	Port not present	---
3	DC Power Port	---	Port not present (internal battery powered)	---
4	I/O	---	Port not present	---
5	WN	---	Port not present	---

\*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal Input or Output Port (Not Involved in Process Control)

WN = Wired Network

### 8. Power Interface

Mode #	Voltage (V)	Current (A)	Power (VA)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	3V	---	---	DC	---	Internal battery



**9. EUT Operation Modes**

Operation mode	Description
#1	Continuous ZigBee Modulation RF Transmission (DTS) RF setting during tests: Frequency: 2405MHz (low channel); 2445MHz (mid channel); 2480MHz (high channel); Max. Power setting. Duty cycle: 100%

**ZigBee frequency (Transmission) DTS – Declared by applicant**

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
<b>11</b>	<b>2405 MHz</b>	12	2410 MHz	13	2415 MHz	14	2420 MHz
15	2425 MHz	16	2430 MHz	17	2435 MHz	18	2440 MHz
<b>19</b>	<b>2445 MHz</b>	20	2450 MHz	21	2455 MHz	22	2460 MHz
23	2465 MHz	24	2470 MHz	25	2475 MHz	<b>26</b>	<b>2480 MHz</b>



10. EUT Configuration Modes

Description

Continuous ZigBee Modulation RF Transmission (DTS)  
RF setting during tests:  
Frequency: 2405MHz (low channel 11); 2440MHz (mid channel 18); 2480MHz (high channel 26);  
Power setting: maximum level (10dBm)  
Duty cycle: 100%

Par.	Test	EUT Operation Modes
§ 15.203 § 15.247 (b) (4) (i)	Antenna Requirements	#1
§ 15.215 (a) (b) (c)	Additional provisions to the general radiated emission limitations	#1
§ 15.247 (a) (2)	6 dB minimum Bandwidth	#1
§ 15.247 (b) (3)	RF power output (conducted) for systems using digitally modulation	#1
§ 15.247 (d)	Out-of-band emissions	#1
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edges	#1
§ 15.247 (e)	Power Spectral Density	#1
§ 15.247 (i) (§ 47CFR 1.1307(b)(1))	RF humane exposure	#1

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m}}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

$$25 \text{ dBuV/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dBuV/m}$$



**11. Test Conditions and Results**

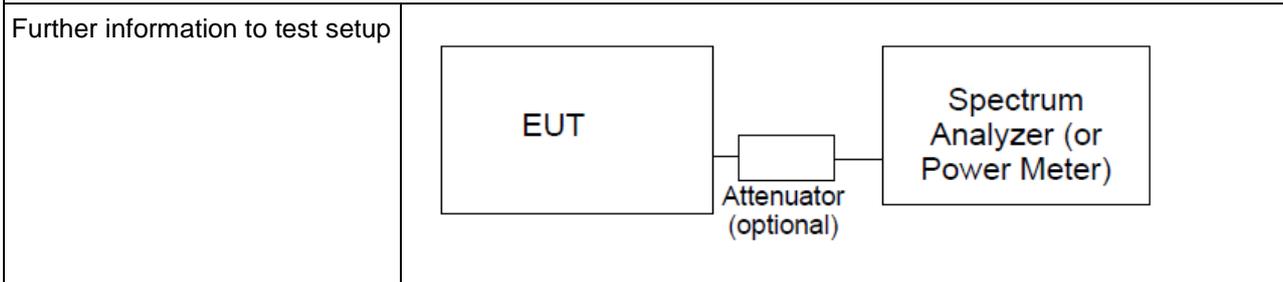
<b>11.1 TEST: Antenna requirements</b>		<b>PASS</b>
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	21°C
	Relative Humidity (%)	56%
	Air pressure (hPa)	1020
—	Power Supply / Frequency	Application Point
Fully configured sample tested at the power line frequency	3Vdc	Enclosure
Equipment mode:	Operation mode	#1
FCC Standard	§15.203 § 15.247 (B) (4) (I)	
<p>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.</p>		
<b>Antenna specifications</b>		
N° of authorized antenna types	---	
Antenna type	Integrated antenna	
Maximum total gain	1.94dBi	
External power amplifiers	Not present	



**12.2 TEST: 6dB Bandwidth** **PASS**

Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	24°C
	Relative Humidity (%)	48%
	Air pressure (hPa)	1020
—	Frequency	Application Point
Fully configured sample tested at the power line frequency	3Vdc	SMA Connector
Equipment mode:	Operation mode	#1
FCC Standard	§15.247 (A) (2)	

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.





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Report No. 28113418-004

Test Equipment Used

Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU 40	2782345	05/2019	05/2020

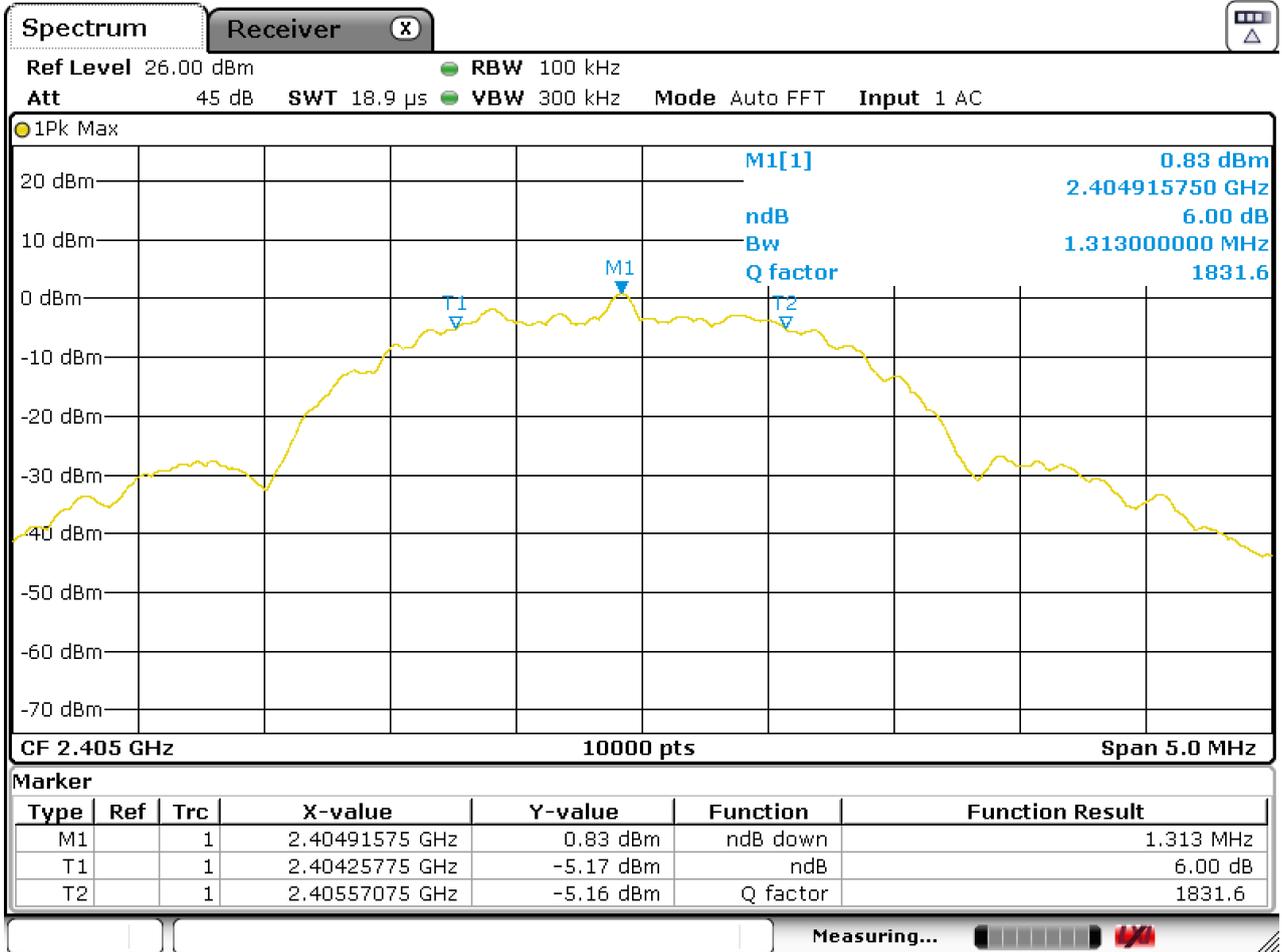
Test Method Used

**According to Par. 8.2 of KDB 558074 D01 15.247 Meas Guidance v05 (and par. 11.8.1 Option 1 of ANSI C63.10)**



Graphical representation of 6dB Bandwidth

Operation Mode: #1 – CH11



Date: 17.JUN.2019 11:10:21

Graphical representation of 6dB Bandwidth

Operation Mode: #1 – CH11

Channel (No.)	Frequency (MHz)	Channel Bandwidth at -6dB (MHz)
11	2405	1,314

Bandwidth at -6dB (Fmin and Fmax)

Fmin	Fmax
2404,24 MHz	2405,56 MHz



Graphical representation of 6dB Bandwidth

Operation Mode: #1 – CH19



Date: 17.JUN.2019 11:29:10

Graphical representation of 6dB Bandwidth

Operation Mode: #1 – Ch19

Channel (No.)	Frequency (MHz)	Channel Bandwidth at -6dB (MHz)
19	2445	1,333

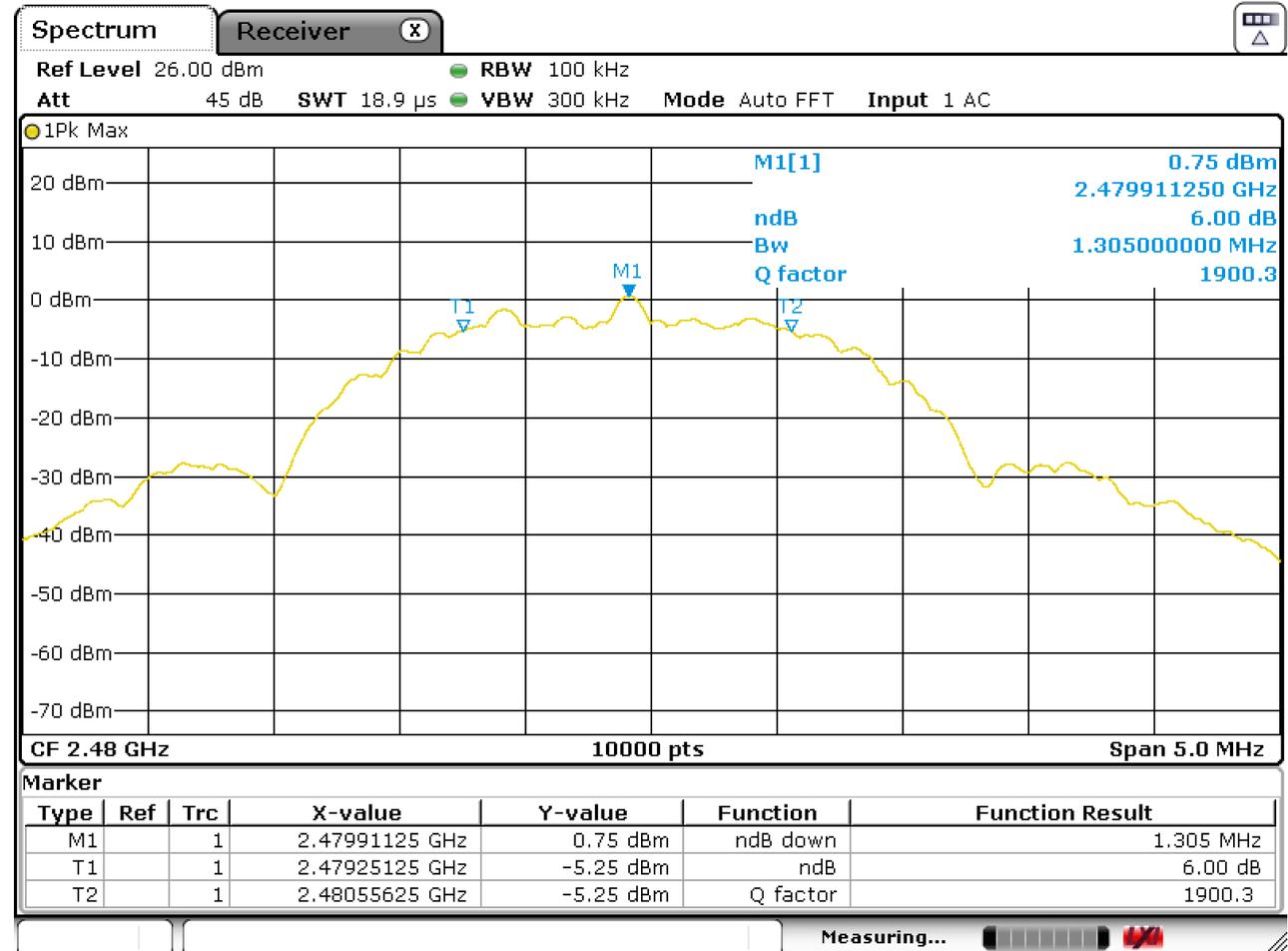
Bandwidth at -6dB (Fmin and Fmax)

Fmin	2444,23 MHz	Fmax	2445,56 MHz
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Graphical representation of 6dB Bandwidth

Operation Mode: #1 – CH26



Date: 17.JUN.2019 11:32:01

Graphical representation of 6dB Bandwidth

Operation Mode: #1 – CH26

Channel (No.)	Frequency (MHz)	Channel Bandwidth at -6dB (MHz)
26	2480	1,305

Bandwidth at -6dB (Fmin and Fmax)

Fmin	2479,25 MHz	Fmax	2480,55 MHz
------	-------------	------	-------------



11.3 TEST: RF power output, radiated (EIRP)

PASS

Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	22,5°C
	Relative Humidity (%)	51%
	Air pressure (hPa)	1020
—	Power Supply / Frequency	Application Point
Fully configured sample tested at the power line frequency	3Vdc	RF Connector
Equipment mode:	Operation mode	#1
FCC Standard	§15.247 (B) (3)	

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

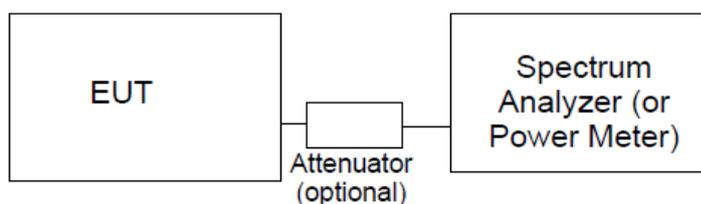
(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

(2) For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Further information to test setup





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LAB N° 1356

Report No. 28113418-004

Test Equipment Used

Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU 40	2782345	05/2019	05/2020

Test Method Used

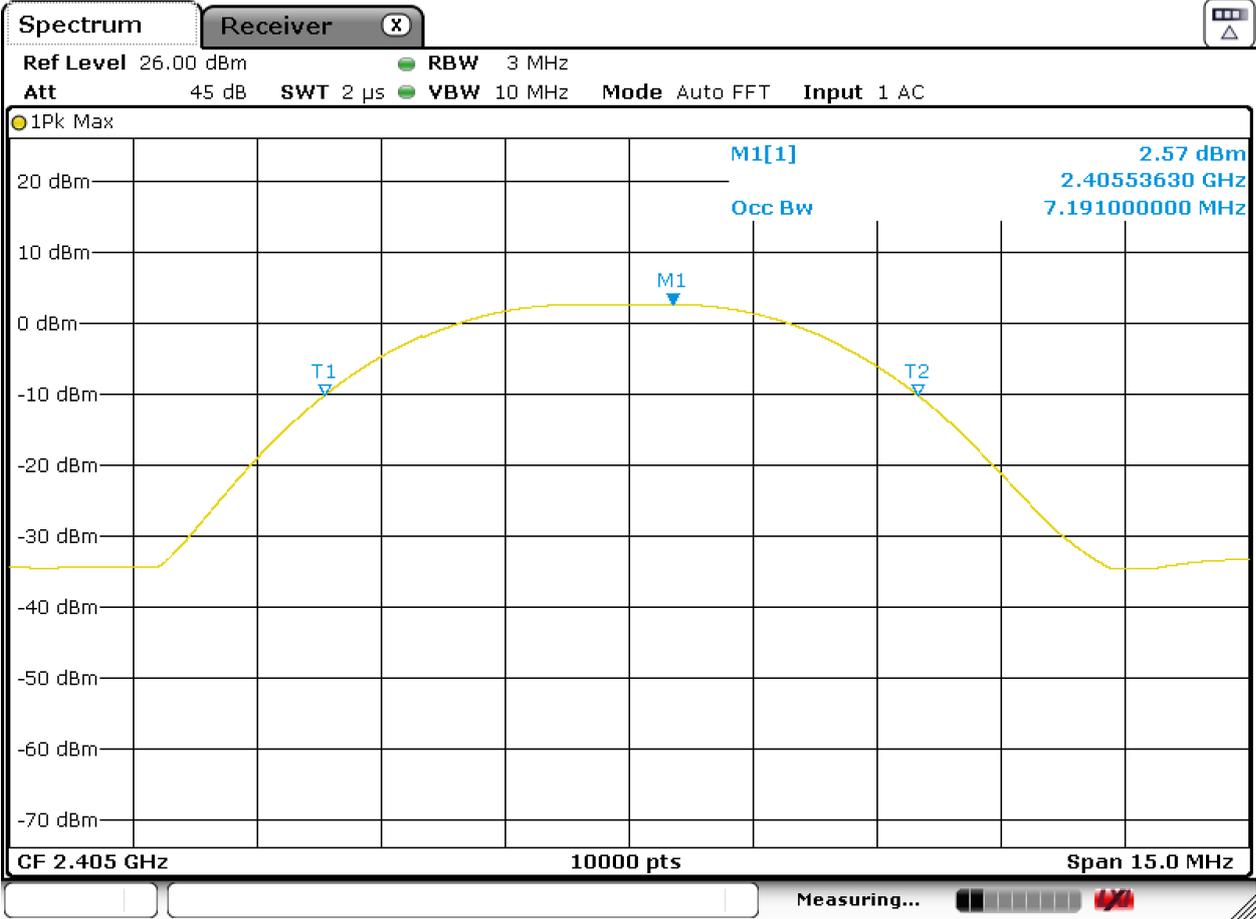
**According to Par. 8.3.1.1 of KDB 558074 D01 15.247 Meas Guidance v05 (and par. 11.9.1.1 RBW  $\geq$  DTS bandwidth of ANSI C63.10)**



Graphical representation of RF power output

Operation Mode: #1 – CH11

Plot n°1



Date: 17.JUN.2019 11:13:27

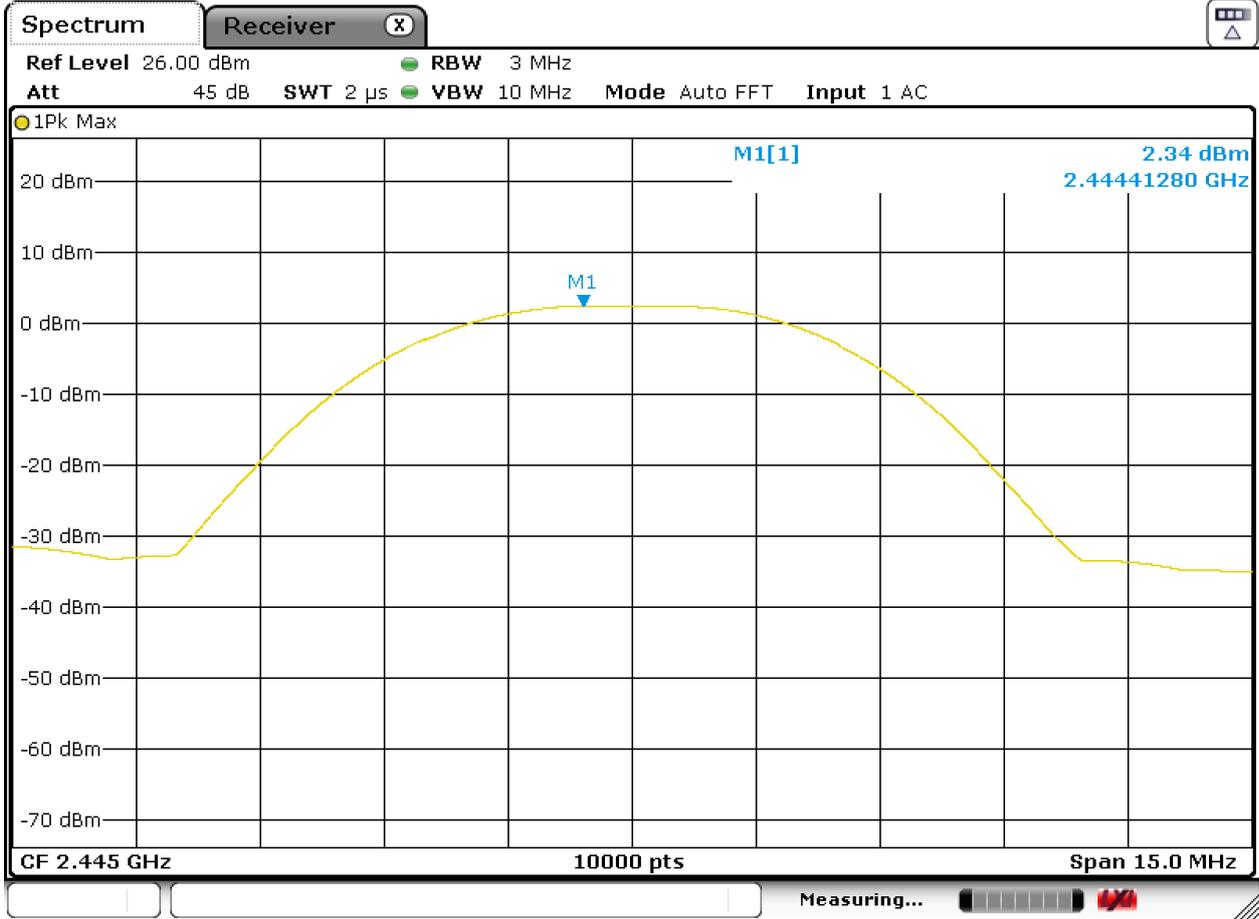
Channel (No.)	Frequency (MHz)	Conducted Output Power		Limit (W)
		(dBm)	(mW)	
11	2405	2.57	1.81	1



Graphical representation of RF power output

Operation Mode: #1 – CH19

Plot n°2



Date: 17.JUN.2019 11:23:17

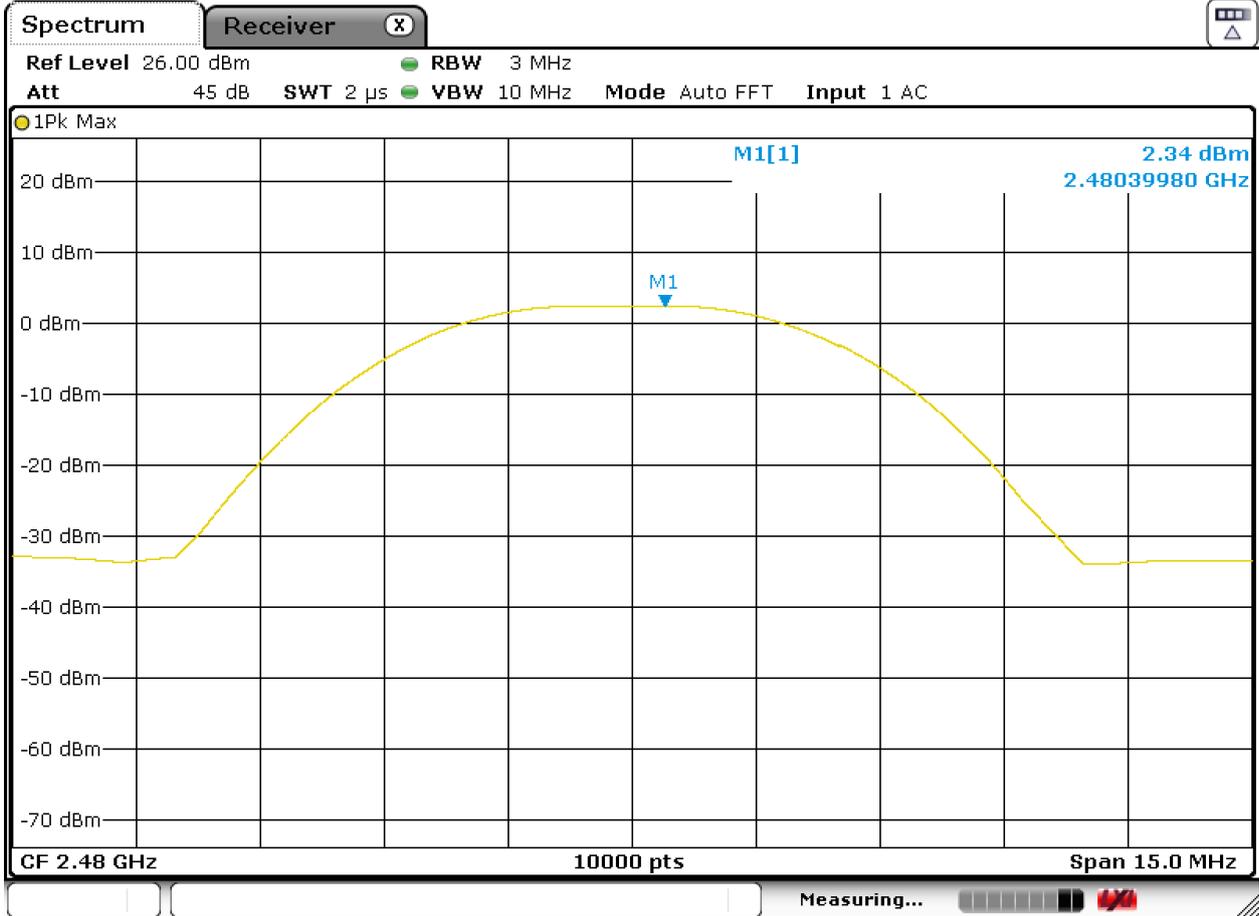
Channel (No.)	Frequency (MHz)	Conducted Output Power		Limit (W)
		(dBm)	(mW)	
19	2445	2.34	1.71	1



Graphical representation of RF power output

Operation Mode: #1 – High Channel (2480 MHz)

Plot n°3



Date: 17.JUN.2019 11:35:49

Channel (No.)	Frequency (MHz)	Conducted Output Power		Limit (W)
		(dBm)	(mW)	
26	2480	2.34	1.71	1



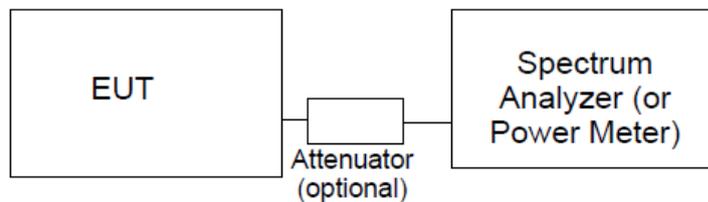
**11.4 TEST: Out-of-band emissions**

**PASS**

Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	22°C
	Relative Humidity (%)	50%
	Air pressure (hPa)	1020
—	Power Supply / Frequency	Application Point
Fully configured sample tested at the power line frequency	3Vdc	RF Connector
Equipment mode:	Operation mode	#1
FCC Standard	§15.247 (D)	

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Further information to test setup





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LAB N° 1356

Report No. 28113418-004

Test Equipment Used

Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU 40	2782345	05/2019	05/2020

Test Method Used

**According to Par. 8.5 of KDB 558074 D01 15.247 Meas Guidance v05 (and par. 11.11 of ANSI C63.10)**

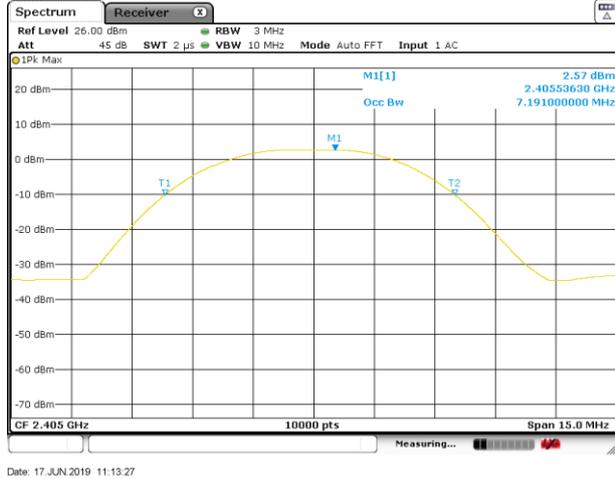
If the maximum peak conducted output power procedure was used to determine compliance as described in 11.9.1, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).



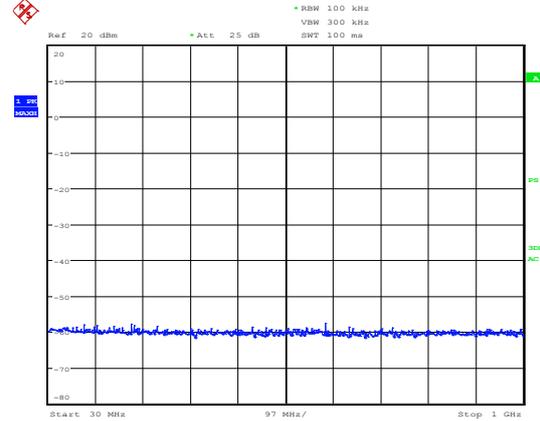
Graphical representation of Antenna Port Spurious Emission - Conducted

Operation Mode: #1 – CH11

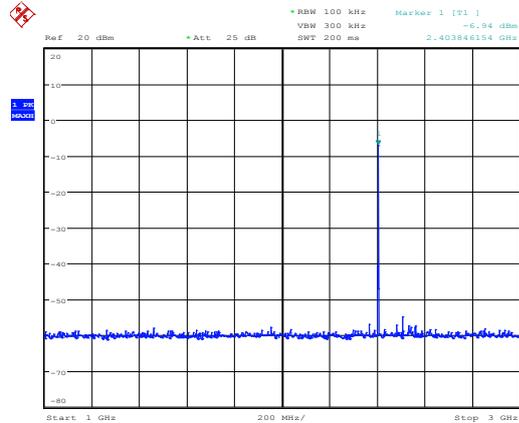
Fundamental



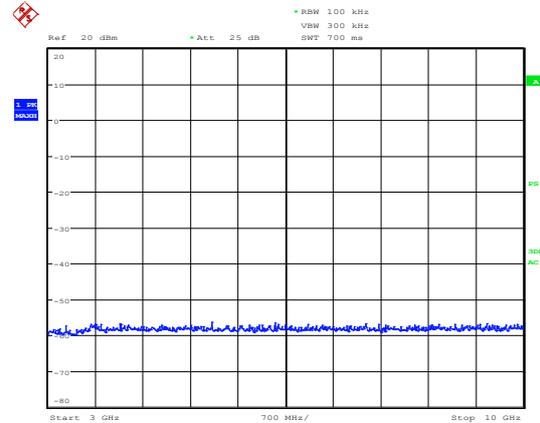
Frequency: 30MHz – 1000MHz

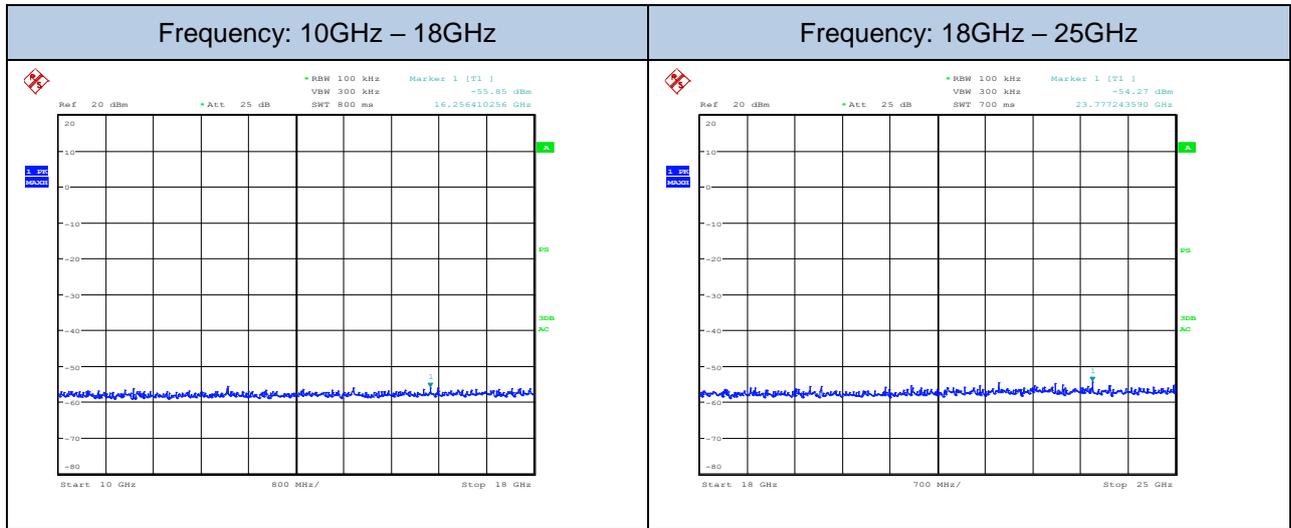


Frequency: 1GHz – 3GHz



Frequency: 3GHz – 10GHz





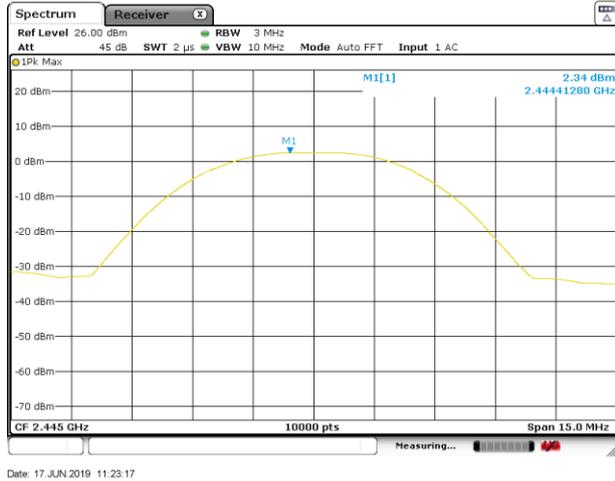
Frequency (MHz)	Measured power (dBm)	Fundamental Level (dBm)	Difference Peak / Spurious (dB)	Peak Limit at PK power -20dB (dBm)	Margin (dB)
---	---	<b>2.57</b>	---	---	---



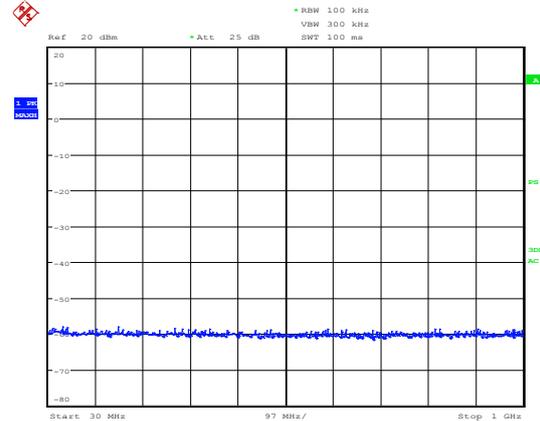
Graphical representation of Antenna Port Spurious Emission - Conducted

Operation Mode: #1 – CH19

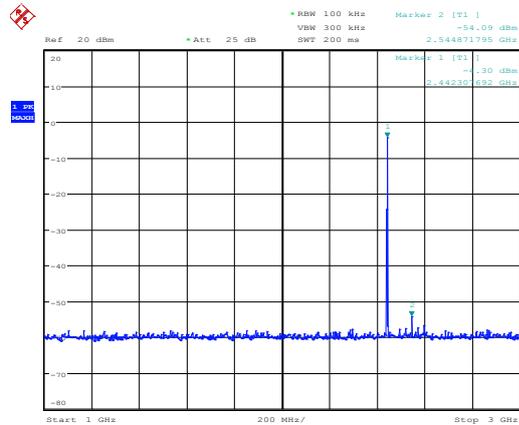
Fundamental



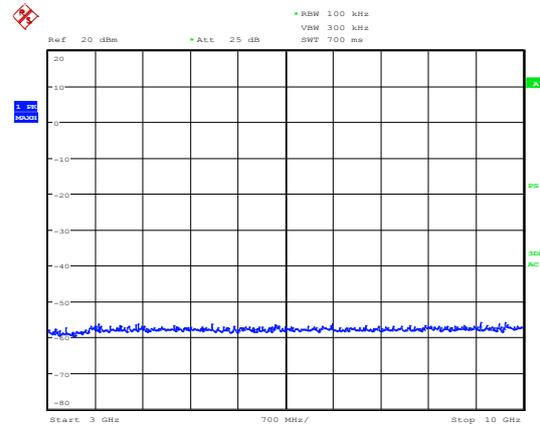
Frequency: 30MHz – 1000MHz

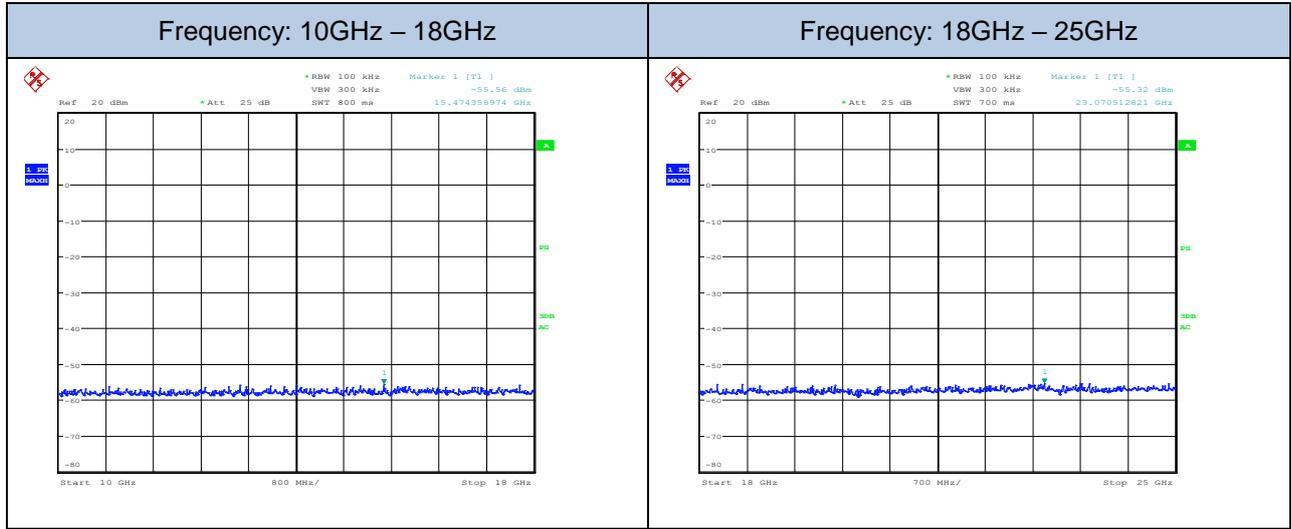


Frequency: 1GHz – 3GHz



Frequency: 3GHz – 10GHz





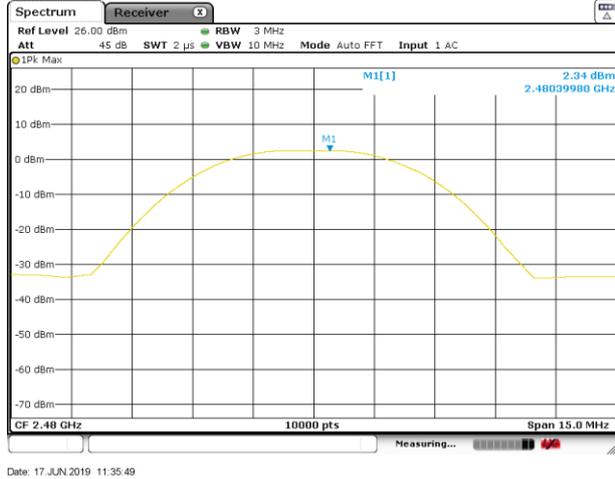
Frequency (MHz)	Measured power (dBm)	Fundamental Level (dBm)	Difference Peak / Spurious (dB)	Peak Limit at PK power -20dB (dBm)	Margin (dB)
---	---	<b>2.34</b>	---	---	---



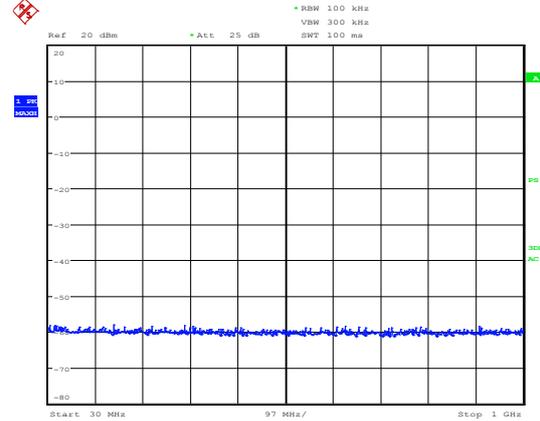
Graphical representation of Antenna Port Spurious Emission - Conducted

Operation Mode: #1 – CH26

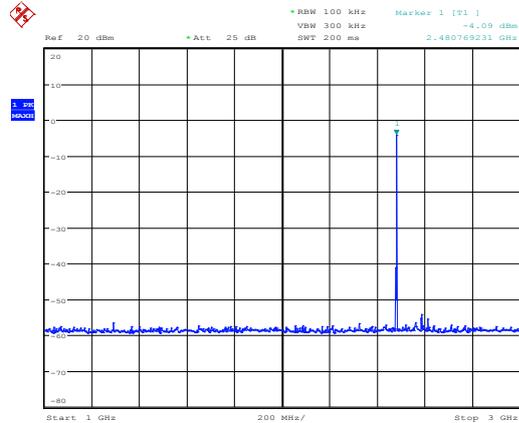
Fundamental



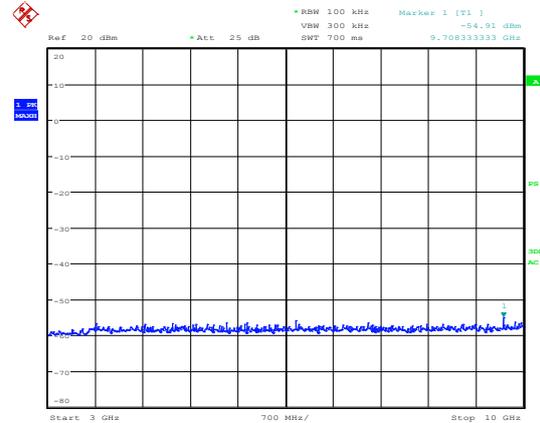
Frequency: 30MHz – 1000MHz

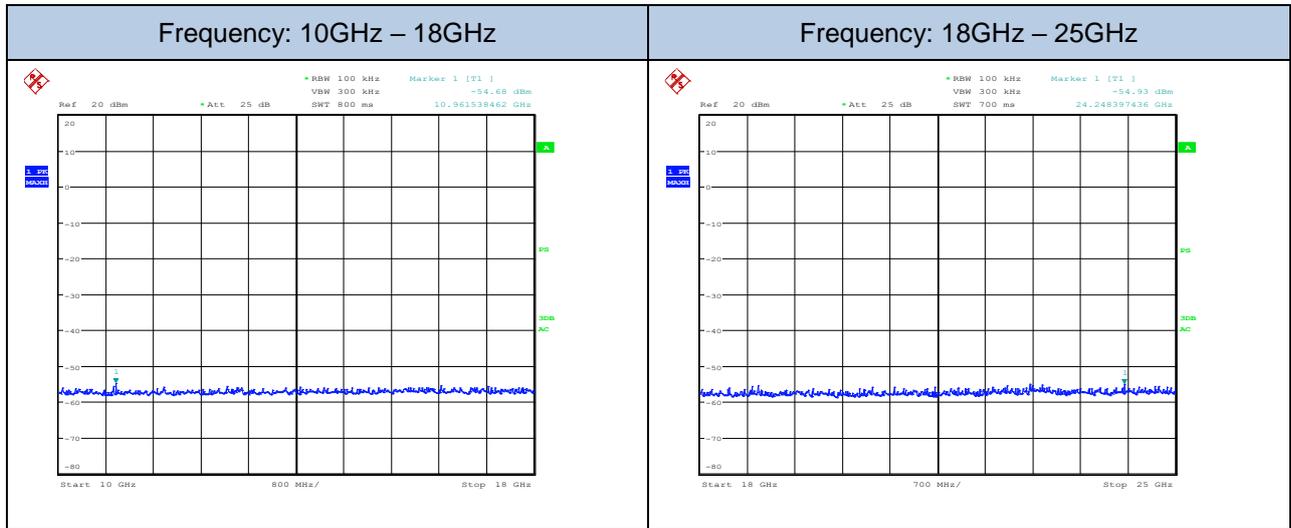


Frequency: 1GHz – 3GHz



Frequency: 3GHz – 10GHz





Frequency (MHz)	Measured power (dBm)	Fundamental Level (dBm)	Difference Peak / Spurious (dB)	Peak Limit at PK power -20dB (dBm)	Margin (dB)
---	---	<b>2.34</b>	---	---	---



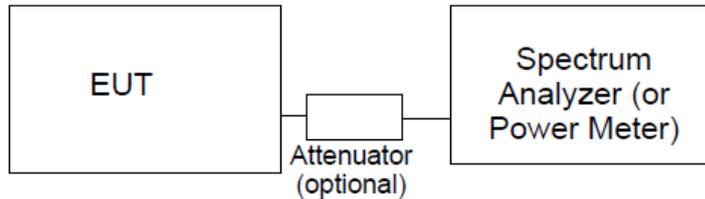
**11.5 TEST: 100 kHz Bandwidth of Frequency Band Edges**

**PASS**

Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	21°C
	Relative Humidity (%)	52%
	Air pressure (hPa)	1020
—	Power Supply / Frequency	Application Point
Fully configured sample tested at the power line frequency	3Vdc	RF Connector
Equipment mode:	Operation mode	#1
FCC Standard	§15.247 (D)	

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Further information to test setup (conducted)





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LAB N° 1356

Report No. 28113418-004

Test Equipment Used

Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU 40	2782345	05/2019	05/2020

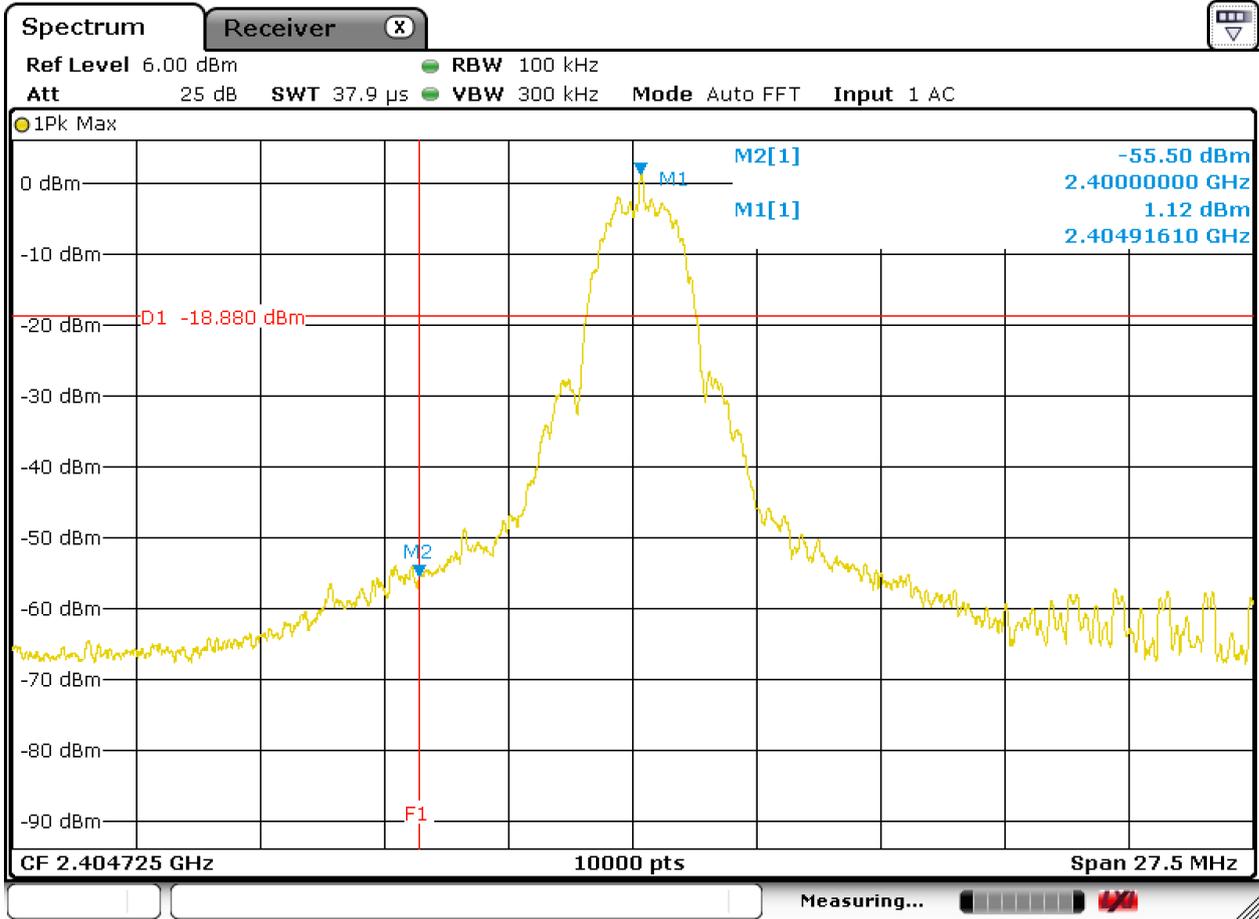
Test Method Used

**According to Par. 8.7.2 (Marker-Delta method) of KDB 558074 D01 15.247 Meas Guidance v05 (and par. 11.13.2 of ANSI C63.10)**



Graphical representation of 100 kHz Bandwidth of Frequency Band Edges - Conducted

Operation Mode: #1 – CH11



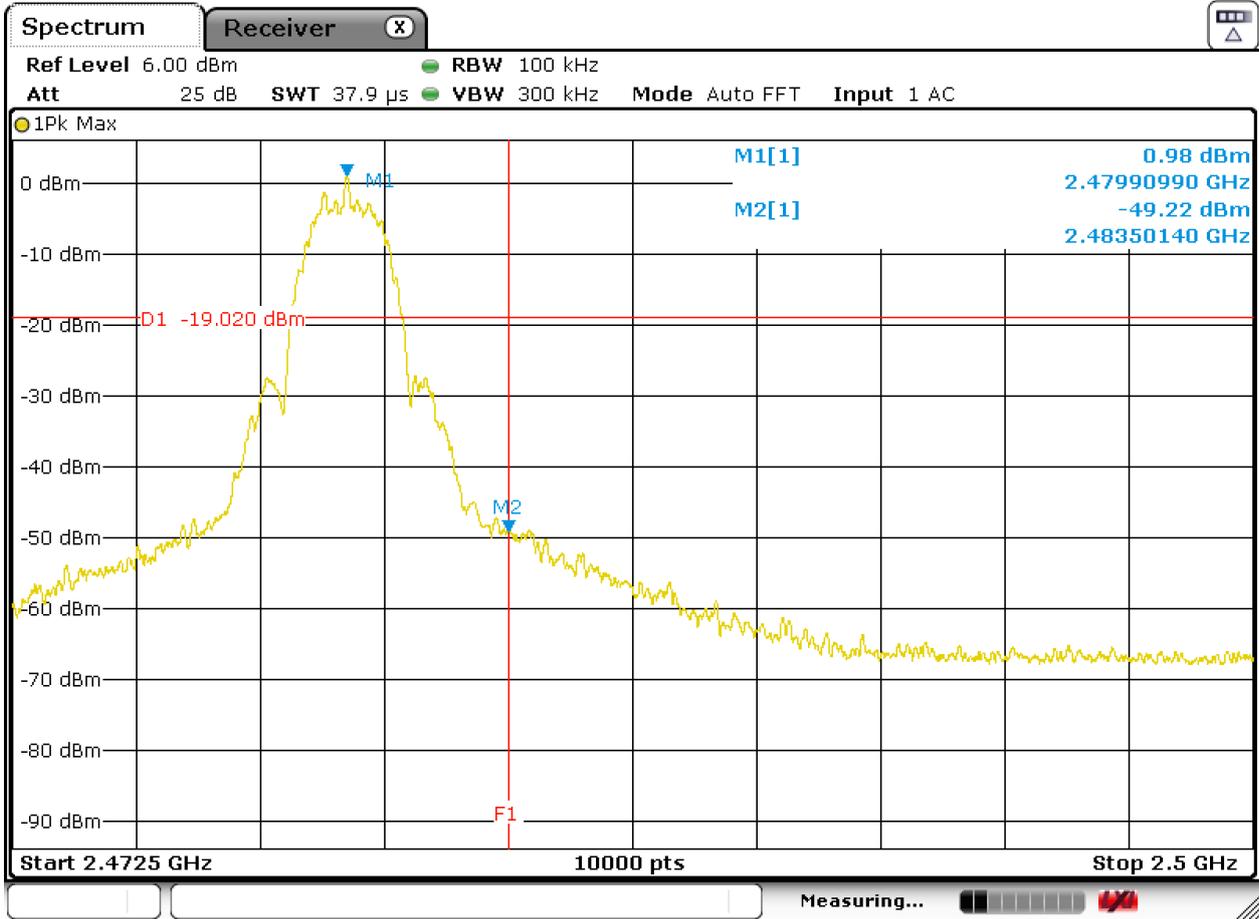
Date: 17.JUN.2019 11:54:50

Frequency (MHz)	Measured power at the band edge (dBm)	Measured peak power at fundamental frequency (dBm)	Difference Peak / band edge (dB)	Peak Limit at PK power -20 dB (dBm)	Margin (dB)
2400	-55.50	+1.12	54.38	-18.88	36,41



Graphical representation of 100 kHz Bandwidth of Frequency Band Edges - Conducted

Operation Mode: #1 – CH26



Date: 17.JUN.2019 11:45:58

Frequency (MHz)	Measured power at the band edge (dBm)	Measured peak power at fundamental frequency (dBm)	Difference Peak / band edge (dB)	Peak Limit at PK power -20 dB (dBm)	Margin (dB)
2483,5	-49.22	0.98	48.24	-19.02	30.02



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<b>11.6 TEST: Additional provisions to the general radiated emission limitations.</b>		<b>PASS</b>
Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	24°C
	Relative Humidity (%)	37%
	Air pressure (hPa)	1020
—	Power Supply / Frequency	Application Point
Fully configured sample tested at the power line frequency	3Vdc	-----
Equipment mode:	Operation mode	#1
FCC Standard	§15.215 (A) (B) (C)	
(A) The regulations in §§ 15.217-15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.		
(B) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in Section 15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.		VERDICT
		PASS
(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		VERDICT
		PASS



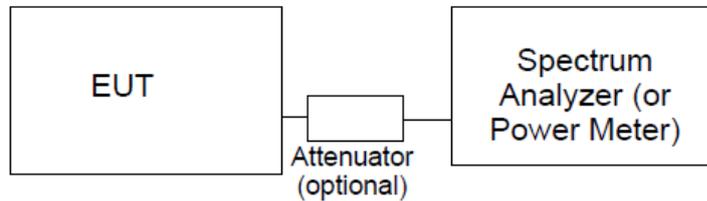
**11.7 TEST: Power Spectral Density**

**PASS**

Parameters required prior to the test	Laboratory Ambient Temperature (°C)	15 to 35 °C
	Relative Humidity (%)	30 to 60 %
Parameters recorded during the test	Laboratory Ambient Temperature (°C)	24°C
	Relative Humidity (%)	37%
	Air pressure (hPa)	1020
—	Power Supply / Frequency	Application Point
Fully configured sample tested at the power line frequency	3Vdc	RF Connector
Equipment mode:	Operation mode	#1
FCC Standard	§15.247 (E)	

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Further information to test setup





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Test Equipment Used

Description	Manufacturer	Model	Identifier	Calibration date	Calibration due
EMI Test Receiver	R&S	ESU 40	2782345	05/2019	05/2020

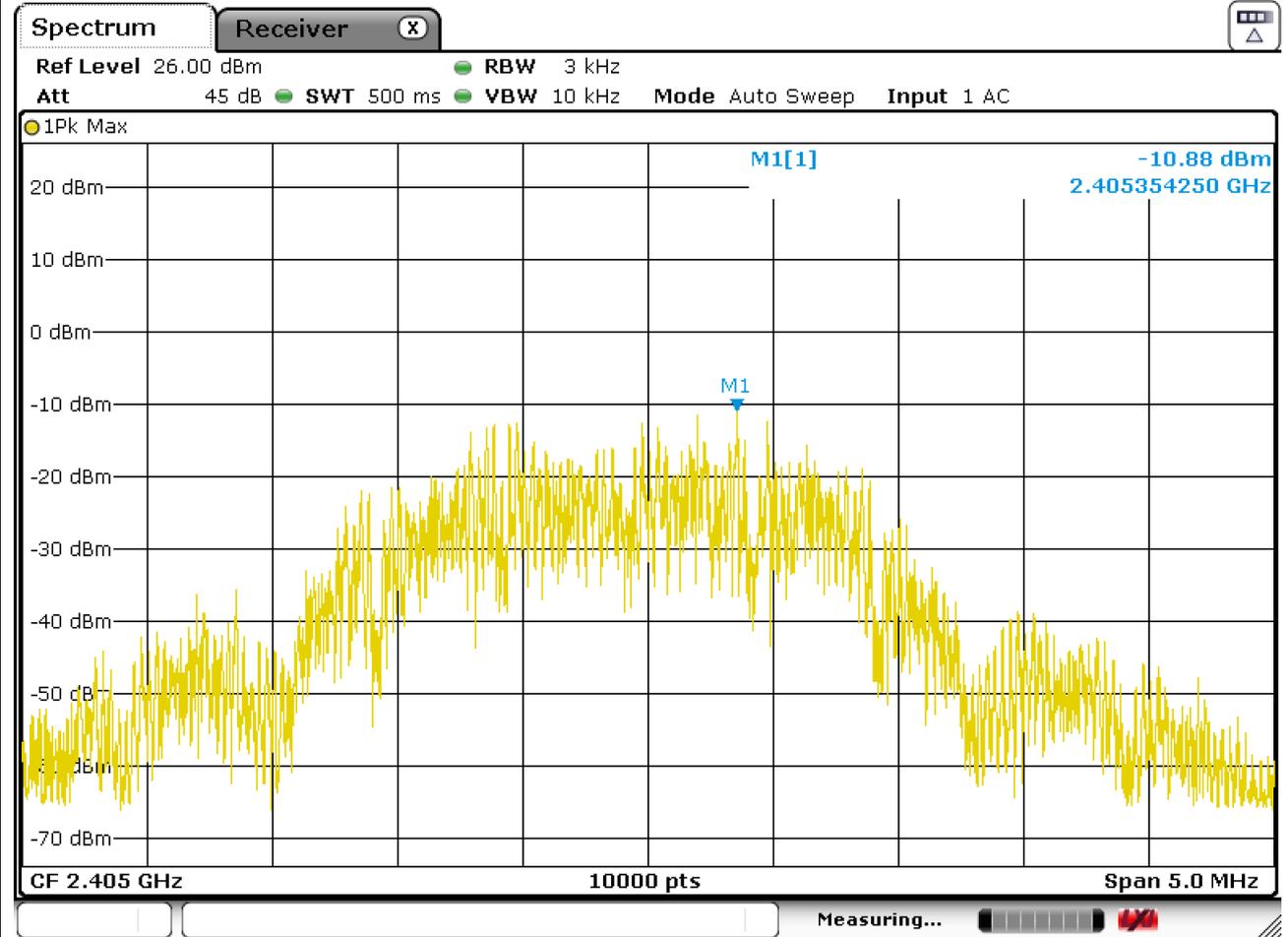
Test Method Used

**According to Par. 8.4 of KDB 558074 D01 15.247 Meas Guidance v05 (and par. 11.10.2 Method PKPSD (peak PSD))**



Graphical representation of Power Spectral Density

Operation Mode: #1 – CH11



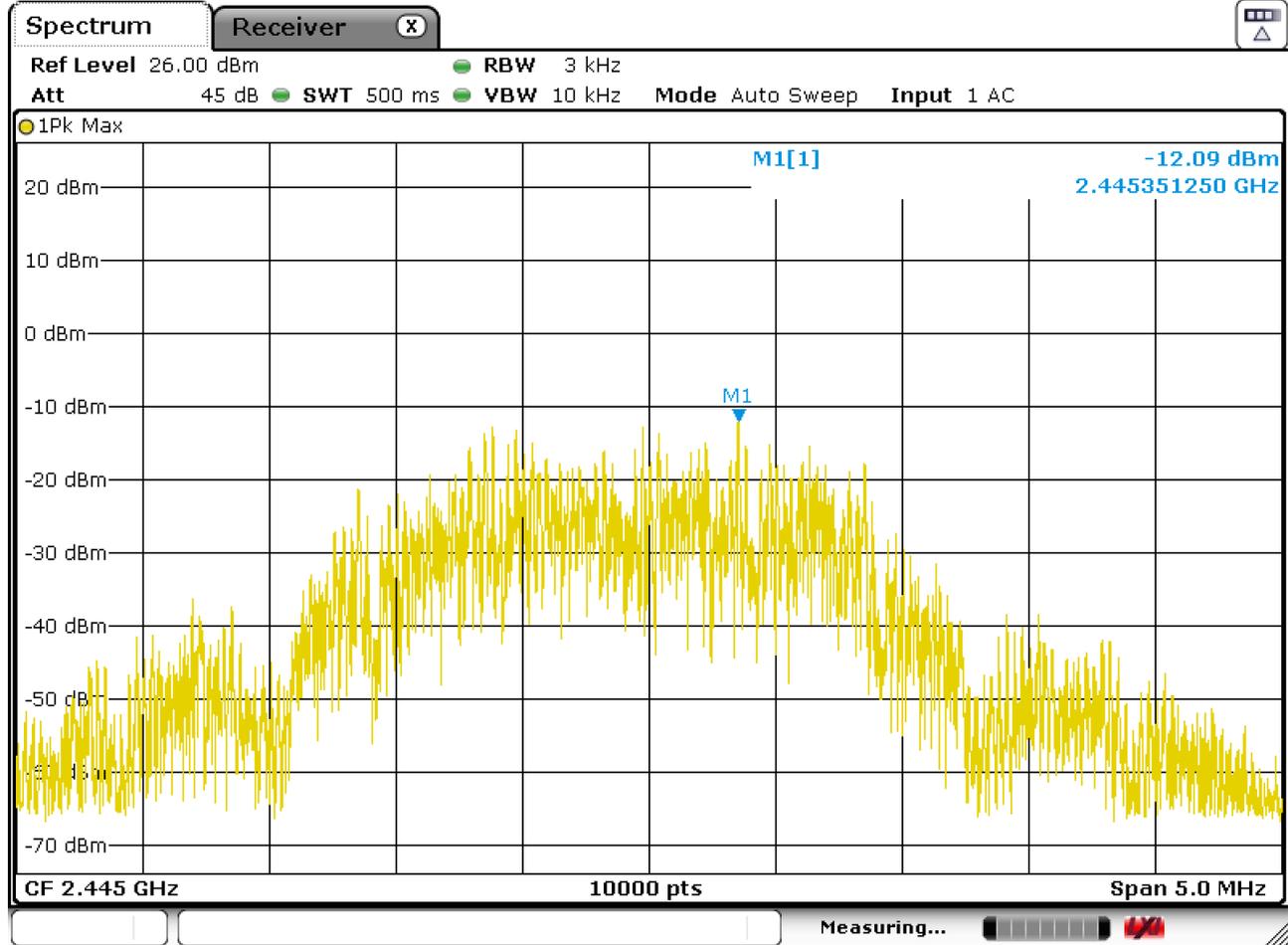
Date: 17.JUN.2019 11:17:49

Channel (No.)	Frequency (MHz)	Conducted Power Spectral Density (dBm)	Limit (dBm)
11	2405	-10.88	8



Graphical representation of Power Spectral Density

Operation Mode: #1 – Middle Channel (2445 MHz)



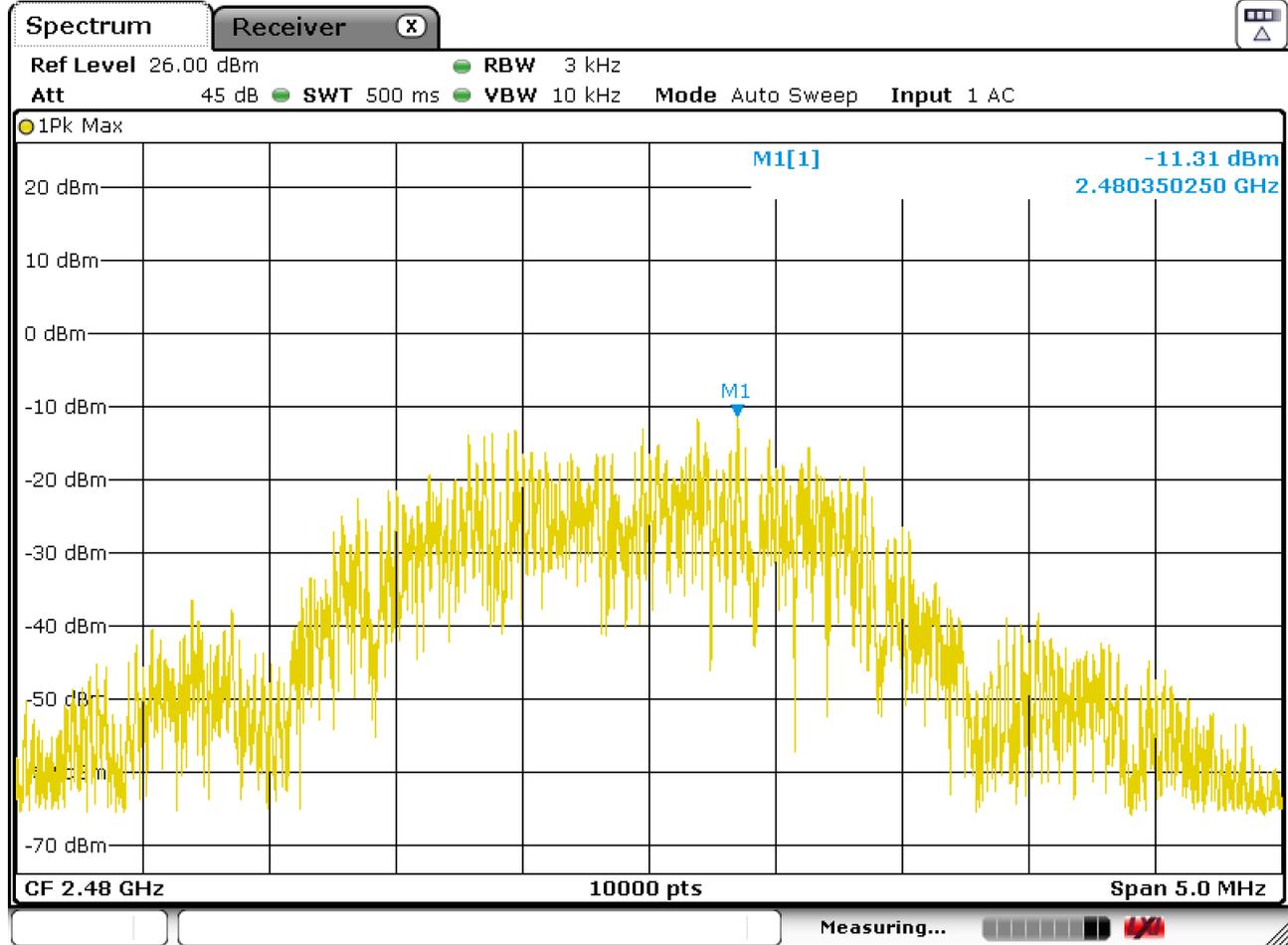
Date: 17.JUN.2019 11:21:21

Channel (No.)	Frequency (MHz)	Conducted Power Spectral Density (dBm)	Limit (dBm)
19	2445	-12.09	8



Graphical representation of Power Spectral Density

Operation Mode: #1 – CH26



Date: 17.JUN.2019 11:39:53

Channel (No.)	Frequency (MHz)	Conducted Power Spectral Density (dBm)	Limit (dBm)
26	2480	-11.31	8



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## 12. MEASUREMENT UNCERTAINTY

TEST	Expanded uncertainty	Coverage probability	Coverage factor
6 dB minimum Bandwidth	0,25% of reading value	95%	2,3
RF power output (conducted)	1,2 dB	95%	2,2
Out-of-band emissions	1,2 dB	95%	2,2
100 kHz Bandwidth of Frequency Band Edges	1,2 dB	95%	2,2
Power Spectral Density	1,2 dB	95%	2,2



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**13. ANNEX**

**Photographic Documentation**

Set-up conducted photo on  
RF connector

See Report n° 28113418-002 Annex 1

**END OF TEST REPORT**