FCC- TEST REPORT

Report Number	:	**68.930.15.030.01**	Date of Issue:	September 15, 2015

Model	:	**COM-DEX**
Product Type	:	Wireless headset for hearing aid
Applicant	:	Widex A/S
Address	:	Nymoellevej 6, DK-3540 Lynge, Denmark
Production Facility	:	Widex A/S
Address	:	Nymoellevej 6, DK-3540 Lynge, Denmark

Test Result	:	■ **Positive**	☐ **Negative**
Total pages including Appendices	:	23	

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1 Table of Contents

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2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration No.:	502708
IC Registration No:	10320A-1
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3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	Wireless headset for hearing aid
Model no.:	COM-DEX
Brand Name:	Widex
FCC ID:	TTY-CMDEX
Options and accessories:	NIL
Rating:	DC 3.0V by Li-ion Battery
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Integral Antenna
Antenna Gain:	0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Bluetooth Low Energy Module operated at 2.4GHz

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 and ANSI C63.10 (2014).

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5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	---	---	☐	☐	☒
§15.247 (b) (1)	Conducted peak output power	10	Site 1	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)	6dB bandwidth	11	Site 1	☒	☐	☐
§15.247(e)	Power spectral density	13	Site 1	☒	☐	☐
§15.247(d)	Spurious RF conducted emissions	14	Site 1	☒	☐	☐
§15.247(d)	Band edge	18	Site 1	☒	☐	☐
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	20	Site 1	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses an integral antenna, which gain is 0dBi. According to §15.203 and RSSGEN 8.3, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: TTY-CMDEX complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

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SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: August 3, 2015

Testing Start Date: August 4, 2015

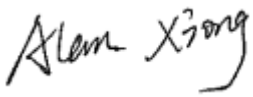
Testing End Date: September 14, 2015

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch-

Reviewed by:

John Zhi
EMC Project Manager

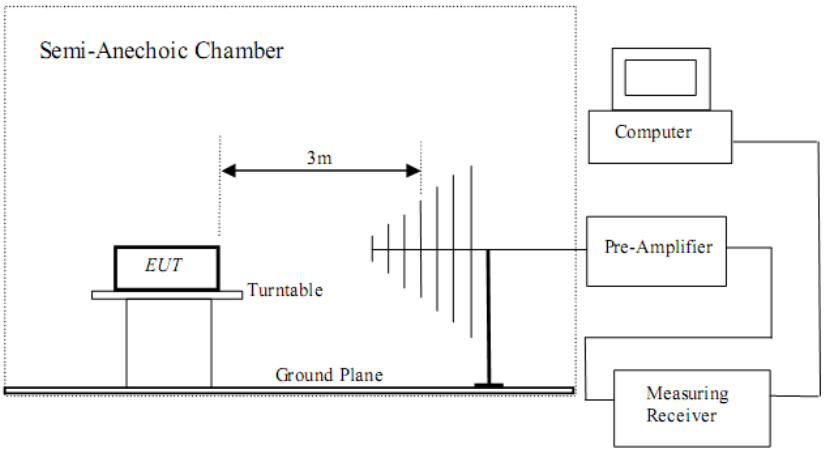
Prepared by:



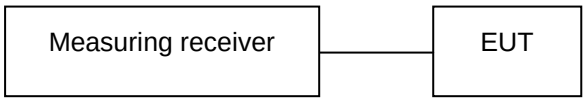
Alan Xiong
EMC Project Engineer

7 Test Setups

7.1 Radiated test setups



7.2 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenovo	X220	---

Test software: Bluetooth 3

The system was configured to channel 0, 19, and 39 for the test.

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9 Technical Requirement

9.1 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   RBW > the 6 dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Limits

According to §15.247 (b) (1), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Top channel 2402MHz	0.20	Pass
Middle channel 2440MHz	1.34	Pass
Bottom channel 2480MHz	0.81	Pass

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9.2 6dB bandwidth

Test Method

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

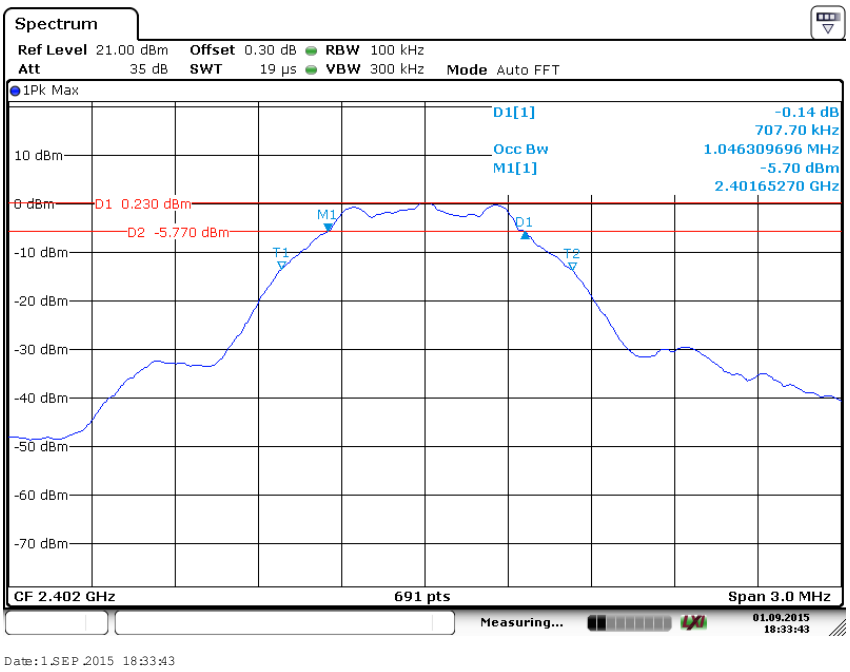
According to §15.247 (a) (2), 6dB bandwidth limit as below:

Limit [kHz]
≥500

Test result

Frequency MHz	6dB bandwidth kHz	Result
Top channel 2402MHz	707.7	Pass
Middle channel 2440MHz	699.0	Pass
Bottom channel 2480MHz	699.0	Pass

2402MHz



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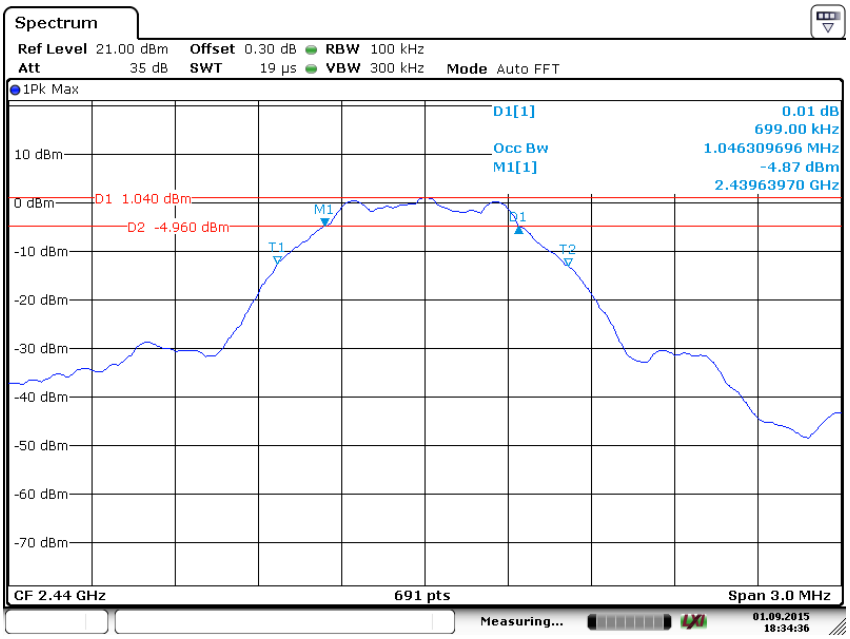
2440MHz



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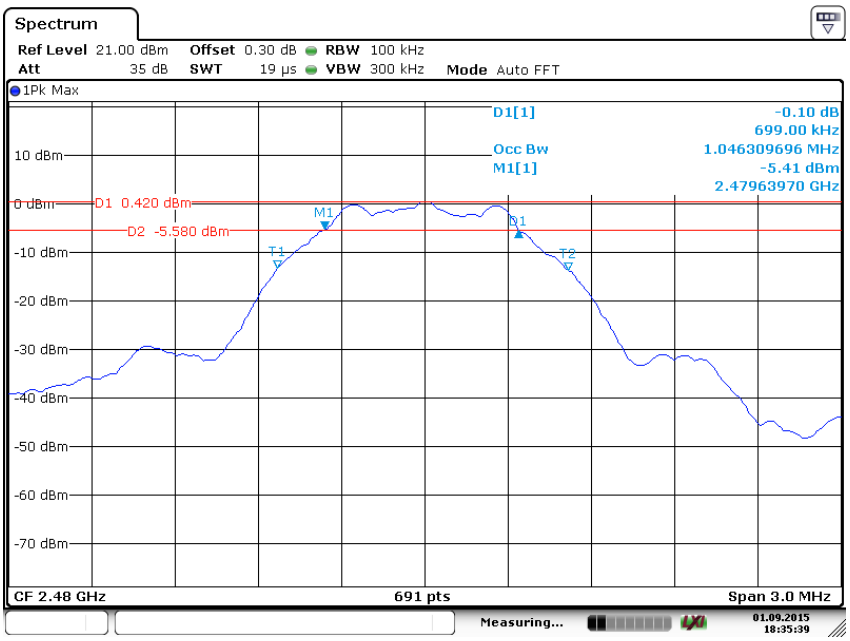
2480MHz



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9.3 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

According to §15.247 (e) (2), power spectral density limit as below:

Limit [dBm]
≤8

Test result

Frequency	Power spectral density	Result
MHz	**dBm**	
Top channel 2402MHz	-15.66	Pass
Middle channel 2440MHz	-14.63	Pass
Bottom channel 2480MHz	-15.15	Pass

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9.4 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

Limit

According to §15.247 (d), spurious RF conducted emissions limit as below:

Frequency Range MHz	Limit (dBc)
30-25000	-20

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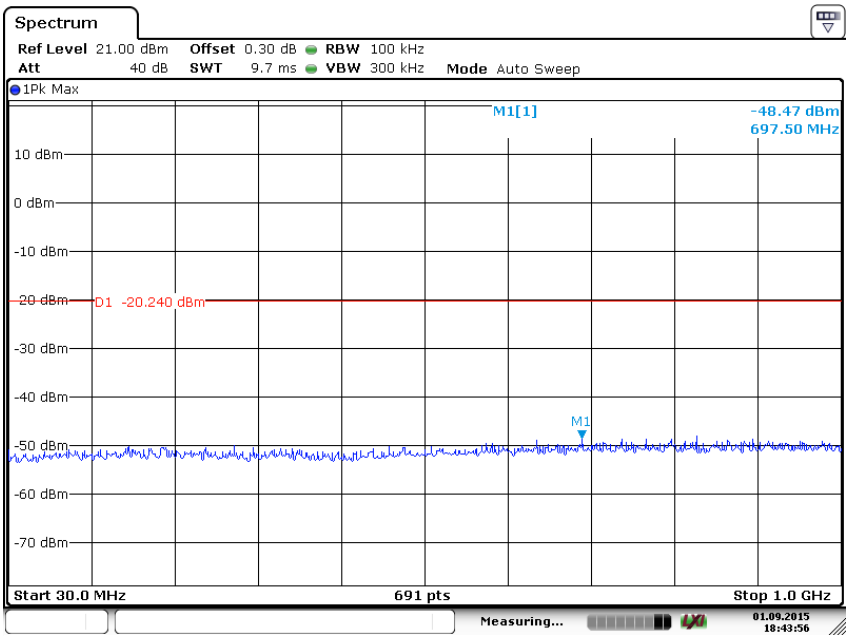
Spurious RF conducted emissions

2402MHz



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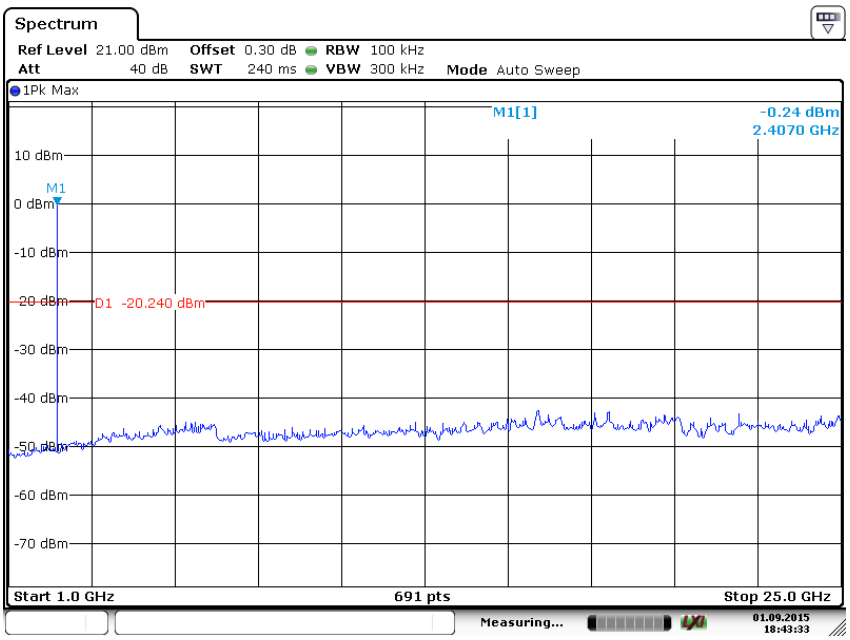

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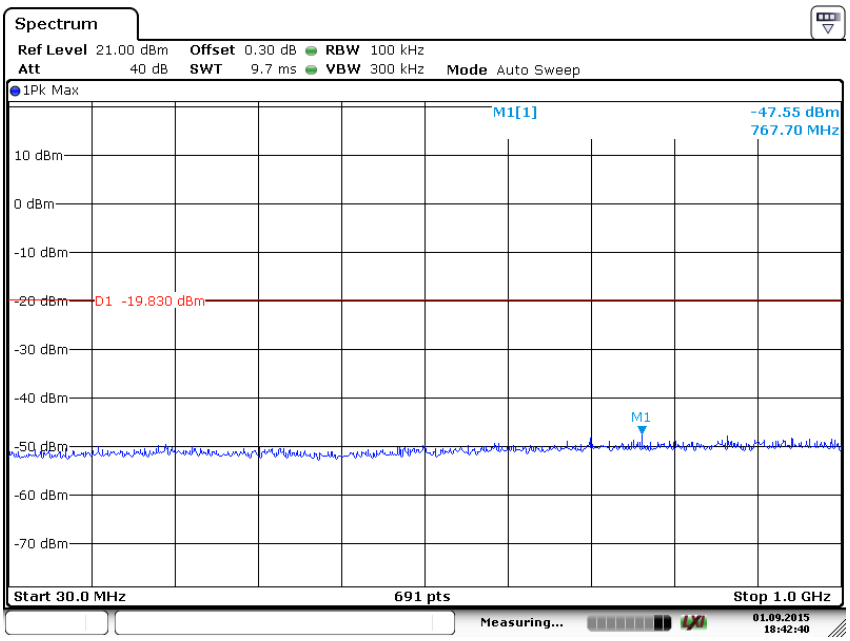
2440MHz



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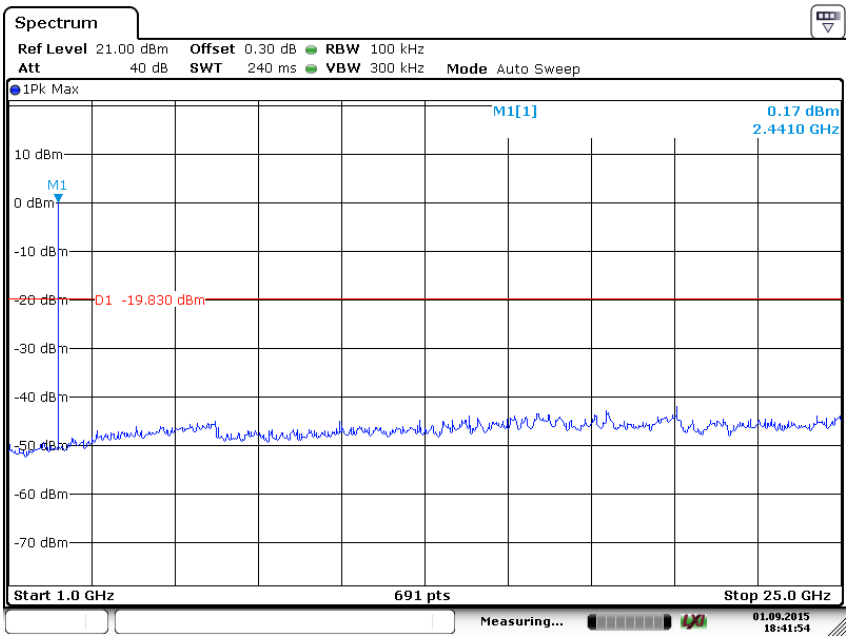

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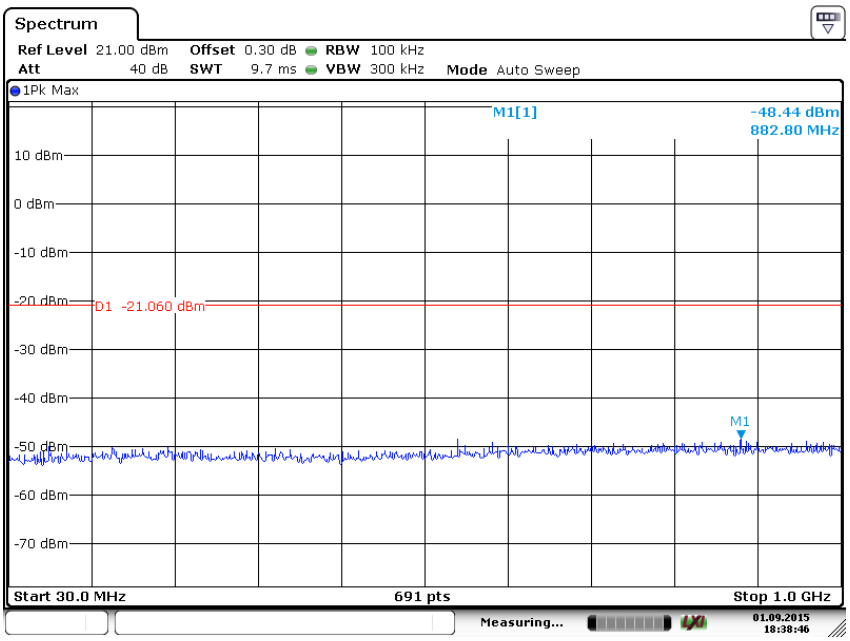
2480MHz



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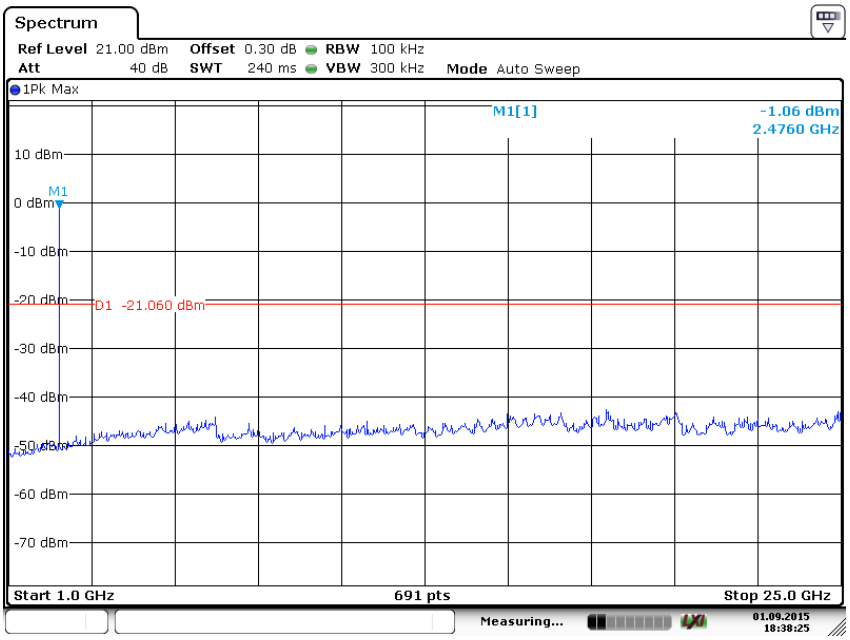

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9.5 Band edge

Test Method

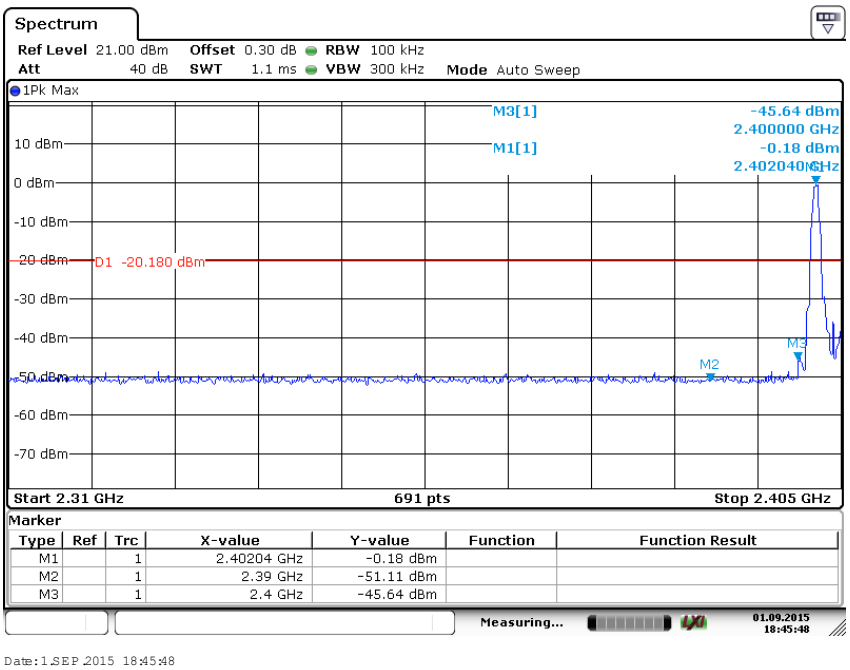
1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

Limit

According to §15.247 (d), band edge limit as below:

Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result



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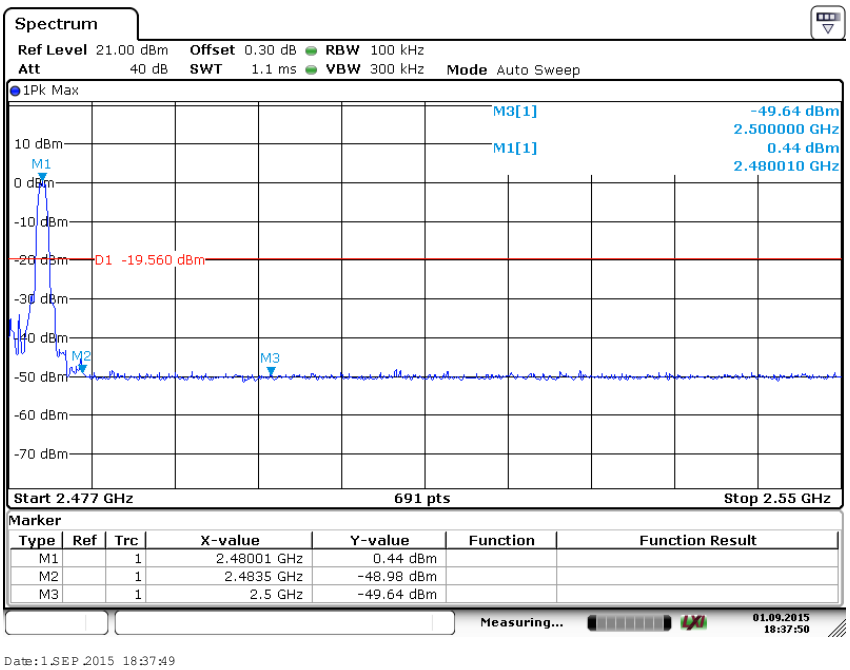

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9.6 Spurious radiated emissions for transmitter

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
   The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

According to part 15.247(d), the radio emission outside the operating frequency band 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. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

2402MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBμV/m		dBμV/m	
95.96	26.22	Horizontal	43.50	QP	17.28	Pass
167.98	22.16	Horizontal	43.50	QP	21.34	Pass
391.08	28.23	Horizontal	46.00	QP	17.77	Pass
604.00	36.14	Horizontal	46.00	QP	9.86	Pass
96.02	16.67	Vertical	43.50	QP	26.83	Pass
397.02	26.22	Vertical	46.00	QP	19.78	Pass
604. 00	35.77	Vertical	46.00	QP	10.23	Pass
2557.67	45.85	Horizontal	74	PK	28.15	Pass
2558.00	45.99	Vertical	74	PK	28.01	Pass
*4804	43.33	Horizontal	74	PK	30.67	Pass
*4804	43.13	Vertical	74	PK	30.87	Pass

2440MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBμV/m		dBμV/m	
*4880	45.71	Horizontal	74	PK	28.29	Pass
*4880	42.94	Vertical	74	PK	31.06	Pass

2480MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBμV/m		dBμV/m	
*4960	44.26	Horizontal	74	PK	29.74	Pass
*4960	41.82	Vertical	74	PK	32.18	Pass

Remark:

(1) AV Emission Level= PK Emission Level+20log (dutycycle)

(2) Data of measurement within 30-1000MHz frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

(3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

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10 Test Equipment List

List of Test Instruments

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2016-7-24
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2016-8-14
Horn Antenna	Rohde & Schwarz	HF907	102294	2016-7-24
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2016-7-24
3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-26000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Conducted RF test	Power level test involved: 2.04dB Frequency test involved:1.1×10^{-7}

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