

Test Report No.: **18052904A.r01**

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Client: **Tacx b.v.**
Rijksstraatweg 52, 2241BW Wassenaar, Netherlands

Test Item: **Digital Transmission System (DTS)**
BLE

Identification: **T8000D** **Serial Number:** -

Project No.: **18052904A** **Date of Receipt:** **February 09, 2019**

Testing Location: **TÜV Rheinland Nederland B.V.**
Eiberkamp 10
9351VT Leek

Test Specification: FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-18 Edition)
RSS-Gen (Issue 5, April 2018) and RSS-247 (Issue 2, February 2017)
ANSI C63.10-2013
KDB 558074 D01 DTS Meas Guidance v05.02

Test Result: *The test item passed the test specification(s).*

Testing Laboratory: **TÜV Rheinland Nederland B.V.**
Eiberkamp 10
9351 VT Leek

Tested by:



Reviewed by:



2019-04-25 R. van der Meer / Inspector

2019-04-25 E. van der Wal / Reviewer

Date	Name/Position	Signature	Date	Name/Position	Signature
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Other Aspects:-

Abbreviations:		
<i>P(ass)</i>	=	<i>passed</i>
<i>Fail)</i>	=	<i>failed</i>
<i>N/A</i>	=	<i>not applicable</i>
<i>N/T</i>	=	<i>not tested</i>

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TÜV Rheinland Nederland B.V.
The test results relate only to the item(s) tested.

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TEST SUMMARY

5.1.1 CONDUCTED MEASUREMENTS AT ANTENNA PORT

RESULT: PASS

5.1.2 6dB AND 99% BANDWIDTH

RESULT: PASS

5.1.3 PEAK POWER SPECTRAL DENSITY

RESULT: PASS

5.1.4 BAND EDGE CONDUCTED EMISSIONS

RESULT: Pass

5.1.5 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER

RESULT: PASS

5.2.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER

RESULT: Pass

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1. General Remarks

1.1 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

The Federal Communications Commission and Industry Canada has reviewed the technical characteristics of the test facilities at TÜV Rheinland Nederland B.V., located in Leek, 9351VT Eiberkamp 10, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 786213. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The description of the test facilities has been filed to Industry Canada under registration number 2932G-2. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

Normal test conditions:

Temperature (*) : +15°C to +35°C

Relative humidity(*) : 20 % to 75 %

Supply voltage : 120 VAC.

(*)When it was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

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2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For Antenna Port Conducted Emissions					
Temperature-Humiditymeter	Extech	SD500	A00446	06/2018	06/2019
Spectrum Analyzer	Rohde & Schwarz	FSV	A01744	07/2018	07/2020
RF Cable	Huber + Suhner	Sucoflex 102	A00347	06/2018	06/2019
For Radiated Emissions					
Measurement Receiver	Rohde & Schwarz	ESCI	A00314	03-29/2018	03-29/2019
RF Cable S-AR	Gigalink	APG0500	A00447	03-4th/2019	03-4th/2020
Controller	Maturo	SCU/088/8090811	A00450	N/A	N/A
Controller	EMCS	DOC202	A00257	N/A	N/A
Test facility	Comtest	FCC listed: 786213 IC: 2932G-2	A00235	10/2017	10/2020
Spectrum Analyzer	Rohde & Schwarz	FSV	A00337	07/2018	07/2019
Antenna mast	EMCS	AP-4702C	A00258	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	A00444	06/2018	06/2019
Guidehorn 1-18 GHz	EMCO	3115	A00008	12/2017	12/2020
Guidehorn 18-40 GHz	EMCO	RA42-K-F-4B-C	A00012	01/2018	01/2021
Biconilog Testantenna	Teseq	CBL 6111D	A00466	11/2018	11/2019
2.4 GHz bandreject filter	BSC	XN-1783	A00065	N/A	N/A
Bandpass filter 4-10 GHz	Reactel	7AS-7G-6G-511	A00131	N/A	N/A
Bandpass filter 10-26 GHz	Reactel	9HS-10G/26.5G-S11	A00151	N/A	N/A
Preamplifier 0.5 - 18 GHz	Miteq	AMF-5D-005180-28-13p	A00247	N/A	N/A
Filterbox	EMCS	RFS06S	A00255	04/2018	04/2019

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Kind of Equipment	Manufacturer	Model Name	Inventory number	Calibration date (mm/yyyy)	Calibration due date (mm/yyyy)
For AC Powerline Conducted Emissions					
Pulse limiter	R&S	ESH3-Z2	A00051	11/2018	11/2019
Variac	RFT	LSS020	A00171	NA	NA
LISN	R&S	ESH2-Z5	A00354	06/2018	06/2020
Measurement Receiver	Rohde & Schwarz	ESCS30	A00726	06/2018	06/2019
RF Cable	-	-	A01844	NA	NA
Shielded room for Conducted emissions	--	--	A00437	NA	NA
Temperature-Humidity meter	Extech	SD500	A00441	06/2018	06/2019

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing. NA= Not Applicable

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1.3GHz	1.7dB
	1.3 - 40GHz	2.9 – 3.4dB
Radiated Emission	150kHz - 30MHz	±5.0dB
	30MHz - 1GHz	±5.22dB
	> 1GHz	±5.22dB
AC Power Line Conducted Emissions	150kHz - 30MHz	±3.6dB

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3. General Product Information

3.1 Product Function and Intended Use

The brand Tacx model T8000D, hereafter referred to as EUT, is a Bluetooth Low Energy (BLE) transmitter used in a display unit for an Interactive Smart Trainer with Electric Motor Brake for bicycles to transmit performance data to PC, Tablet or smartphone. The transmitter will support and utilizes GFSK modulation techniques. Although the chip used is capable of multiple data-rates only 2 Mbps is used. The EUT also contains ANT+ transceiver operating in the frequency band 2403-2480 MHz. The ANT+ transceiver is covered in a separate test report.

The content of this report and measurement results have not been changed other than the way of presenting the data.

3.2 System Details

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Digital Transmission System, BLE
Manufacturer	:	Tacx b.v.
Brand	:	Tacx
Model(s)	:	T8000D
Voltage input rating	:	5 Vdc (through AUX2)
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	Internal, integrated on the PCB
Antenna Gain	:	+ 2.0 dBi
Operating frequency	:	2402 MHz-2480 MHz.
Modulation	:	GFSK
Data-rate	:	2 Mbps
Remarks	:	n.a.

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Table 3: Interfaces present on the EUT

There are no interface ports present on the EUT.

3.3 Countermeasures to achieve compliance

No additional measures were employed to achieve compliance.

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4. Test Set-up and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of RSS-GEN, RSS-247, 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209, 15.247.

The test methods, which have been used, are based on ANSI C63.10-2013 and KDB 558074.

4.2 Operation Modes

Testing was performed at the lowest operating frequency (2402 MHz), at the operating frequency in the middle of the specified frequency band (2440 MHz) and at the highest operating frequency (2480 MHz). These operation modes were selected after review of the capabilities and characteristics of the EUT. The test software as mentioned in section 4.4 enabled the settings of these modes.

The EUT has been tested in the modes as described in table below

Operation Mode	EUT Status	Frequency (MHz)	TX power control setting
Transmit (Tx)	On	2402	2
Transmit (Tx)	On	2440	2
Transmit (Tx)	On	2480	2

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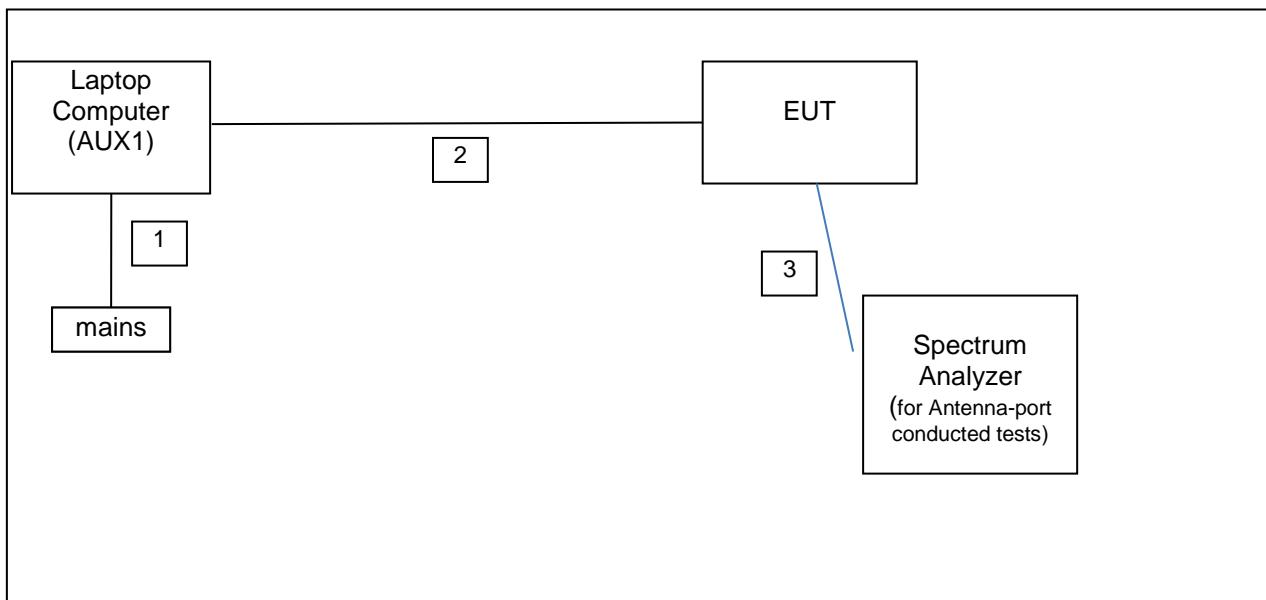
4.3 Physical Configuration for Testing

For programming purposes only the EUT was connected to the usb port of a laptop computer. The laptop computer was used to configure the EUT to continuously transmit at a specified output power and channel as specified in the test data. See section 4.5 for Auxiliary details.

The EUT was tested on a stand-alone basis and the test system was configured in a way that a load condition was emulated by a bicycle wheel that was spun by a controllable speed.

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10-2013.

Figure 1a: Test Setup Diagram – antenna port conducted tests and programming.



No.	Port	From	To	Remarks
1.	Mains	Mains	Laptop (AUX1)	Through a power supply
2.	Data com.	Laptop USB	EUT	--
3.	Antenna port	EUT	Spectrum analyzer	Conducted tests

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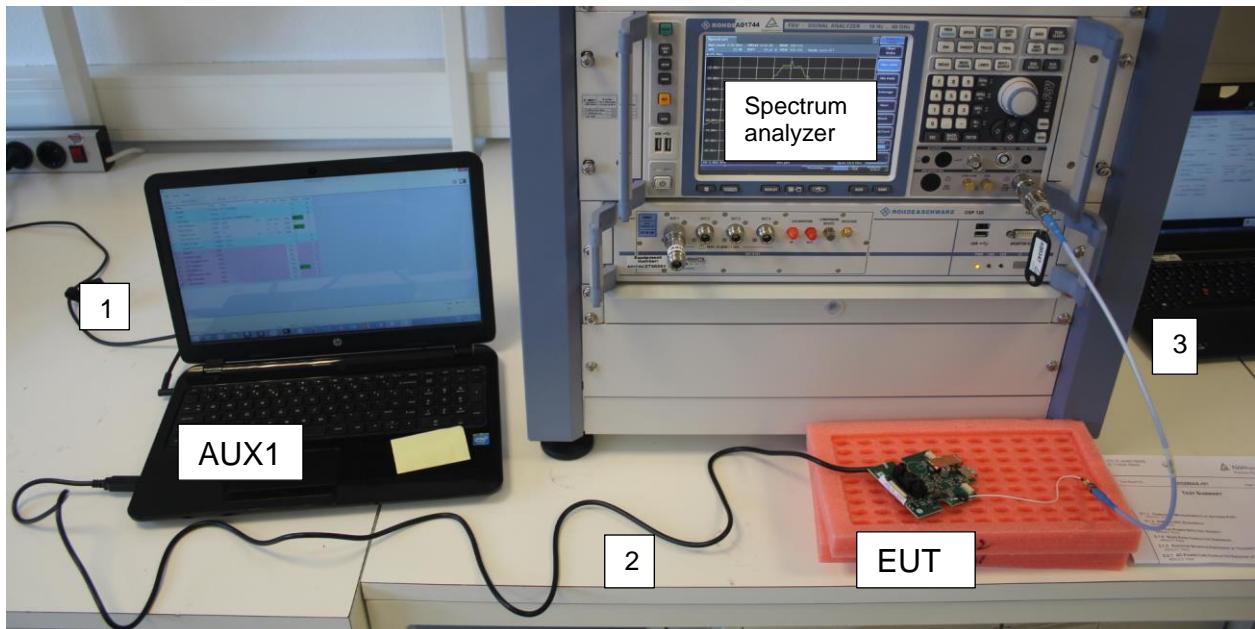


Figure 2b: Test Setup Photos – conducted tests and programming

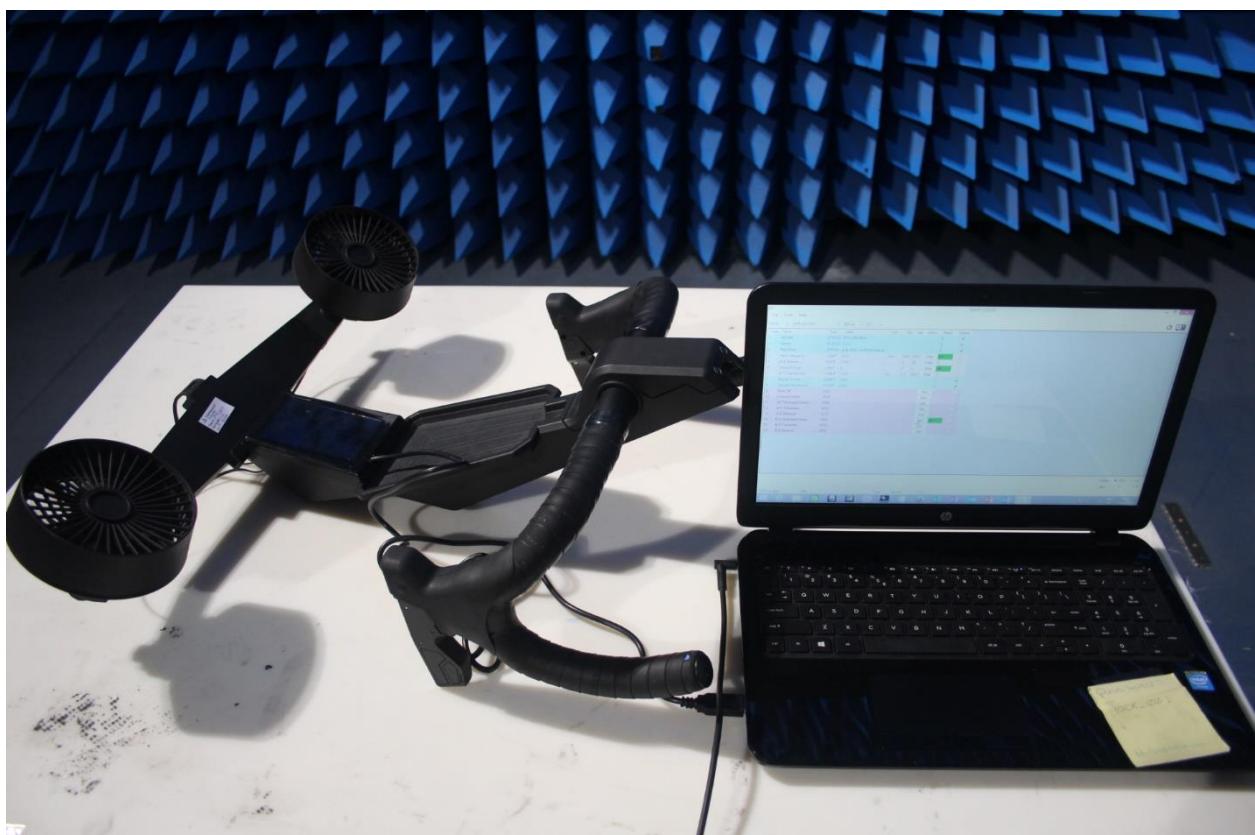


Figure 3c: Test Setup Photos – radiated tests and programming

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4.4 Test Software

A continuous transmit mode could be initiated by using test software as supplied by the applicant. The test software was used to define various different operational modes of the EUT for the purpose of compliance testing. The version of the test software, as supplied by the applicant and used during all tests is:

Test software : RASP v2.0.20

This software was running on a laptop computer (AUX1). It was used to enable the test operation modes listed in section 4.2 as appropriate.

Parameter Configuration							
Index	Name	Type	Value	Unit	Min	Max	Action
0	Identifier	STRING	RTF_NE02MC				0 <input checked="" type="checkbox"/>
1	Version	STRING	0.1.2				0 <input checked="" type="checkbox"/>
2	Test Mode	STRING	ANT MOD. CARRIER 1Mb/s				0 <input checked="" type="checkbox"/>
3	Radio Frequency	U16BIT	2442	MHz	2400	2483	Write OK <input type="checkbox"/>
4	BLE Channel	U8BIT	0.000		0	39	Write 0 <input type="checkbox"/>
5	Transmit Power	U8BIT	0.400		0	4	Write 0 <input type="checkbox"/>
6	ANT Channel Freq.	U16BIT	0.400	Hz	0.2	200.0	Write 0 <input type="checkbox"/>
7	Packet Counter	U32BIT	0.000				0 <input checked="" type="checkbox"/>
8	Packets Per Second	U16BIT	0.000				0 <input checked="" type="checkbox"/>
9	Radio Off	VOID			Start		<input type="checkbox"/>
10	Constant Carrier	VOID			Start		<input type="checkbox"/>
11	ANT Modulated Carrier	VOID			Start	OK	<input type="checkbox"/>
12	ANT Transmitter	VOID			Start	OK	<input type="checkbox"/>
13	ANT Receiver	VOID			Start		<input type="checkbox"/>
14	BLE Modulated Carrier	VOID			Start		<input type="checkbox"/>
15	BLE Transmitter	VOID			Start		<input type="checkbox"/>
16	BLE Receiver	VOID			Start		<input type="checkbox"/>

Screenshot of the software as used on AUX1

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4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

The auxiliary items were not used during testing, but instead are only used to make the required settings for testing. For setting the transmit frequency, enable modulation etc.

1. AUX1
Product: Laptop Computer
Brand: HP
Model: J3T34EA#ABH
Serial Number: CND424BVDG
Remark: host for test software, property applicant



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5. Test Results

5.1 Conducted Measurements at Antenna Port

5.1.1 Conducted Output Power

RESULT: PASS

Date of testing: 2019-04-02

Requirements:

FCC 15.247(b)(3)

For systems using digital modulation in the 2400-2483.5 MHz band, the maximum peak output power is 1W (+30dBm).

RSS-247 section 5.4(4): the e.i.r.p. shall not exceed 4 W (+36 dBm).

Test procedure:

The Peak Conducted Output Power was measured using the method according to section 11.9.1.1 in ANSI C63.10-2013.

The maximum peak output power (conducted) was measured at the antenna connector with a spectrum analyzer. The final measurement takes into account the loss generated by all the involved cables.

Measurement uncertainty is +/- 2.5 dB.

Notes: $mW = 10 ^ {(dBm/10)}$
 $dBm = 10 \times \log(mW)$

plots : Peak power plots,

Figures 1a, 1b and 1c show plots of the Peak Power outputs, correction factors (= 0.24dB Cableloss) included in the reading.

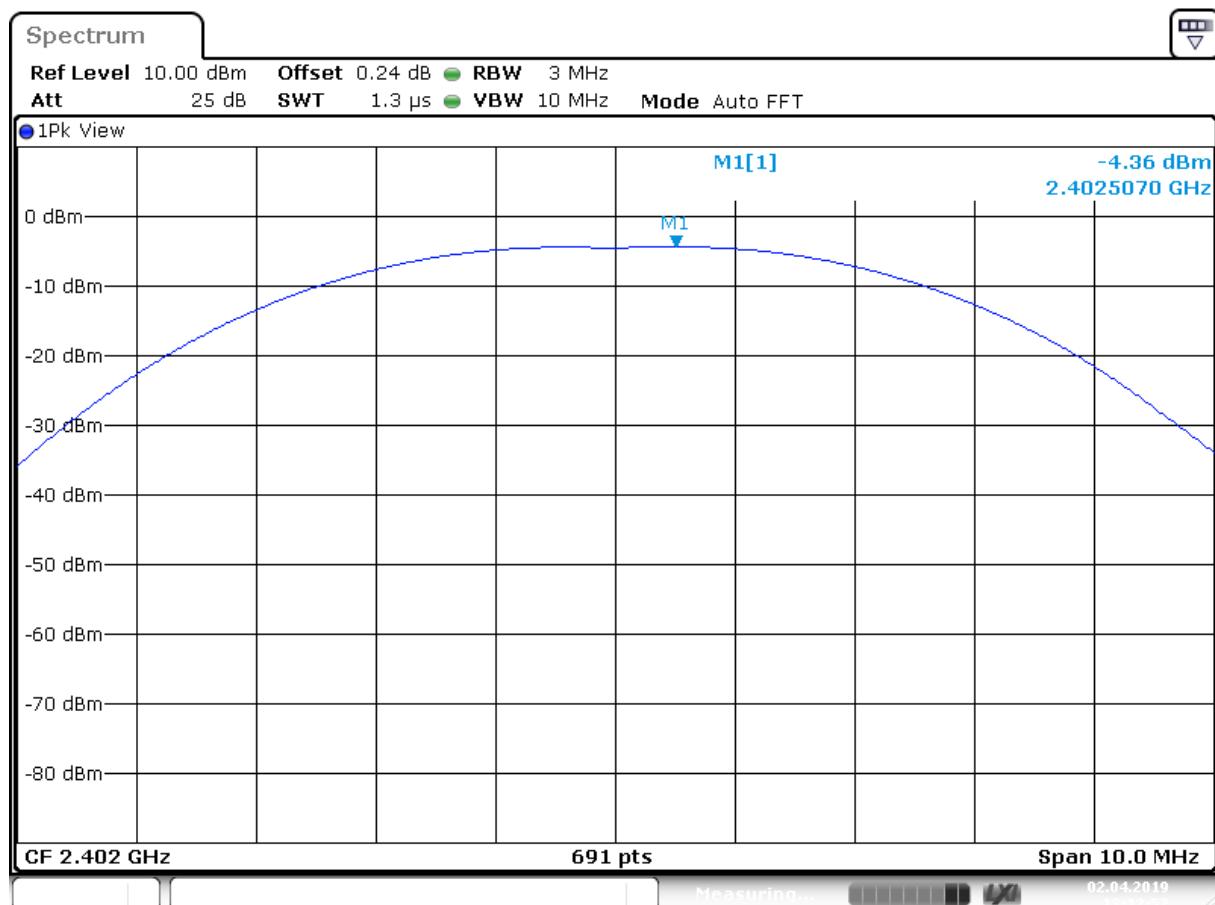
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Conducted Output Power

Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Verdict [Pass/Fail]	Plot number
2402	-4.36 (0.37 mW)	+30	Pass	A
2440	-4.05 (0.39 mW)	+30	Pass	B
2480	-4.37 (0.37 mW)	+30	Pass	C



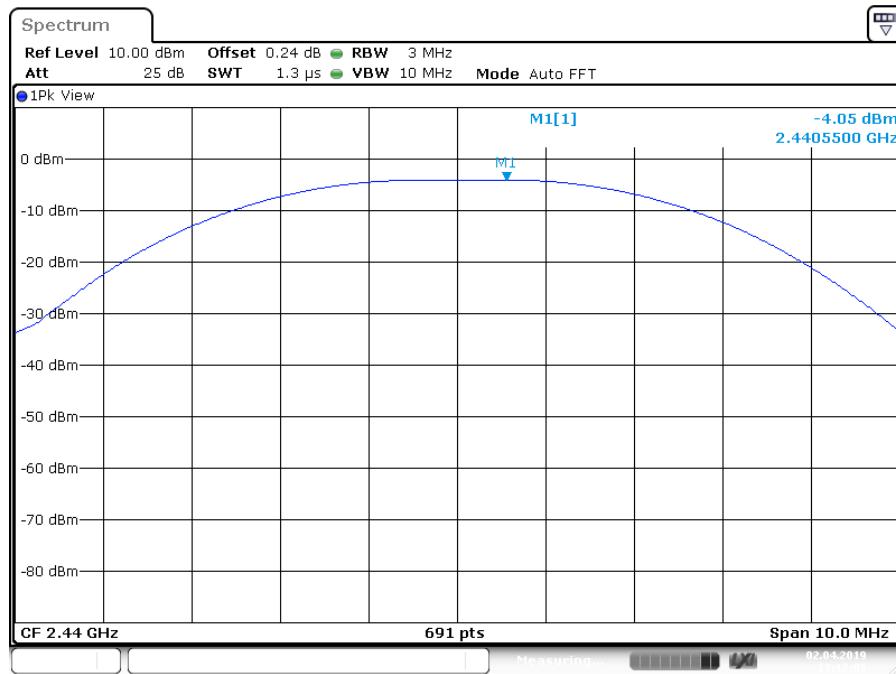
Date: 2 APR 2019 13:12:57

Plot A

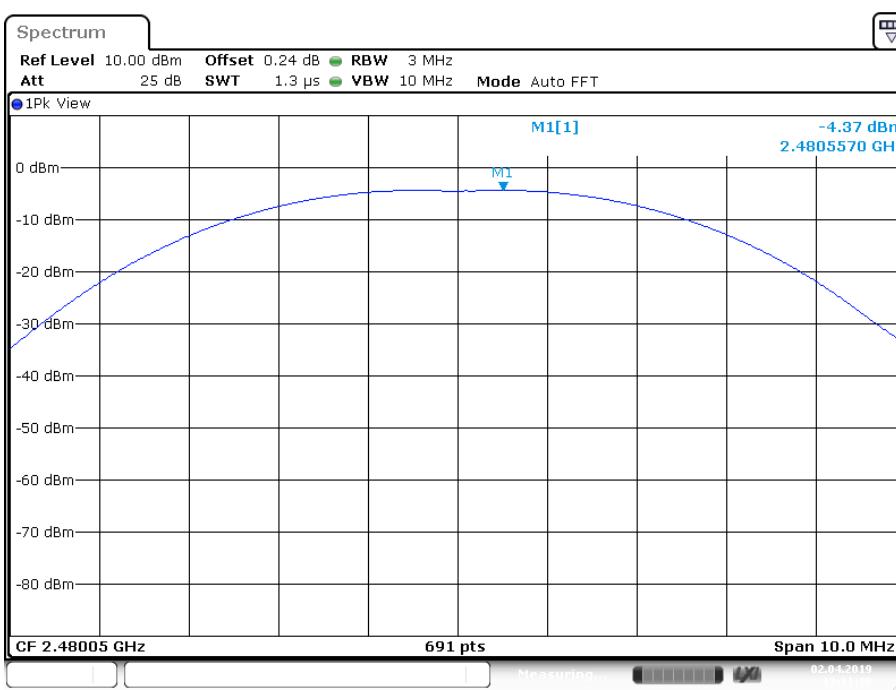
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Plot B



Plot C

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5.1.2 6dB and 99% Bandwidth

RESULT: PASS

Date of testing: 2019-04-02

Requirements:

FCC 15.247(a)(2) and RSS-247 Section 5.2(1)

For systems using digital modulation in the 2400-2483.5MHz band, the 6dB bandwidth shall be at least 500kHz.

For 99% Bandwidth: RSS-Gen Section 4.6.1: No requirement is given.

Test procedure 6dB bandwidth:

ANSI C63.10-2013 section 11.8.1 Option 1

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 100kHz, video bandwidth to 300kHz and the span wide enough to capture the modulated carrier.

For 99% Bandwidth:

RSS-Gen.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission sideskirts. The resolution bandwidth shall be set as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

A spectrum analyzer was connected to the antenna port of the EUT. The spectrum analyzer resolution bandwidth was set to 1% of the selected span, Video bandwidth was set to 3 times the resolution bandwidth. The span was set to capture the whole modulation process. The Spectrum analyzers automated function for 99% BW was used.

Measurement uncertainty is +/- 26kHz.

Plots A1,B1 and C1 shown on the next pages are of the 6 dB bandwidth.

Plots A2,B2 and C2 shown on the next pages are of the 99% bandwidth

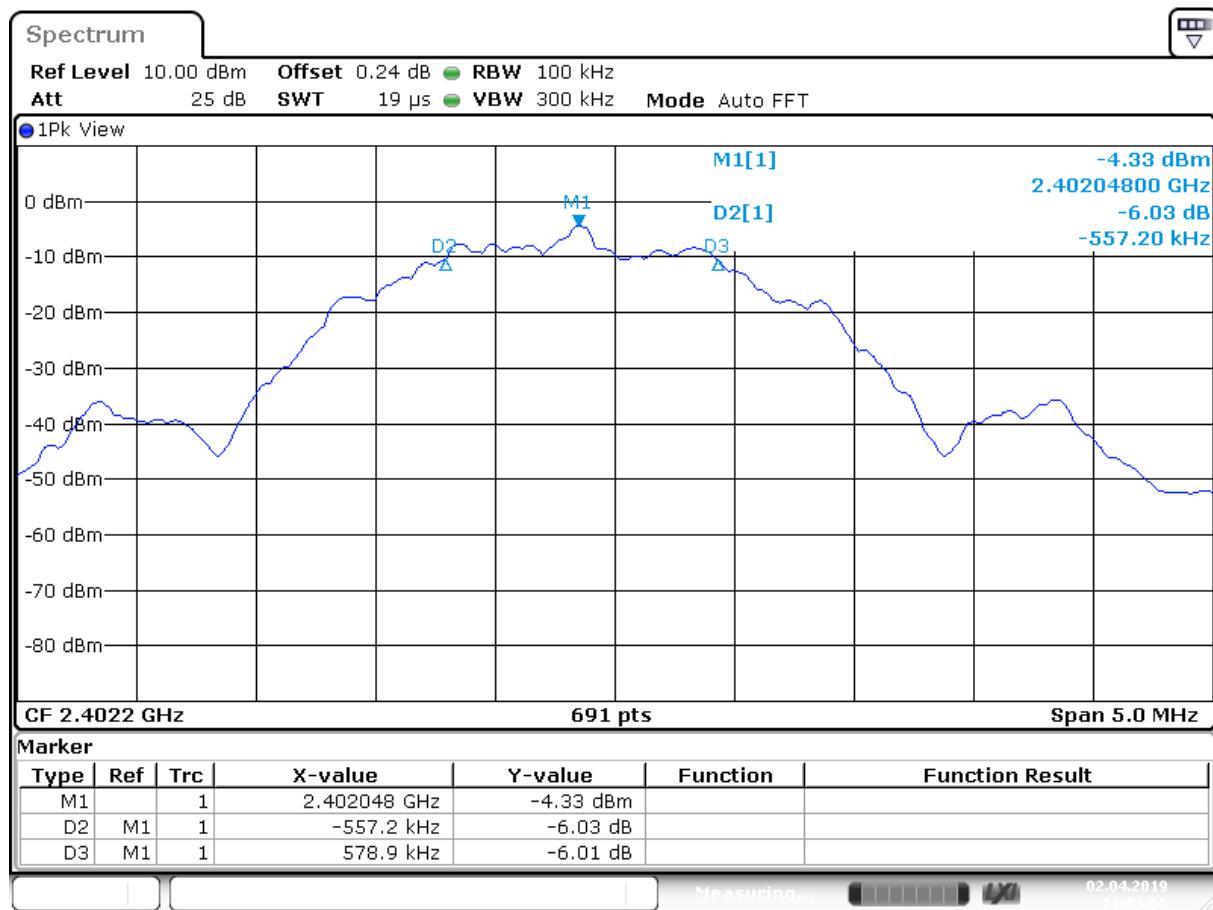
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6dB Bandwidth

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit 6dB BW [kHz]	Verdict [Pass/Fail]	Plot number
2402	2077	557.2	>500	Pass	A1/A2
2440	2077	564.4	>500	Pass	B1/B2
2480	2077	557.2	>500	Pass	C1/C2



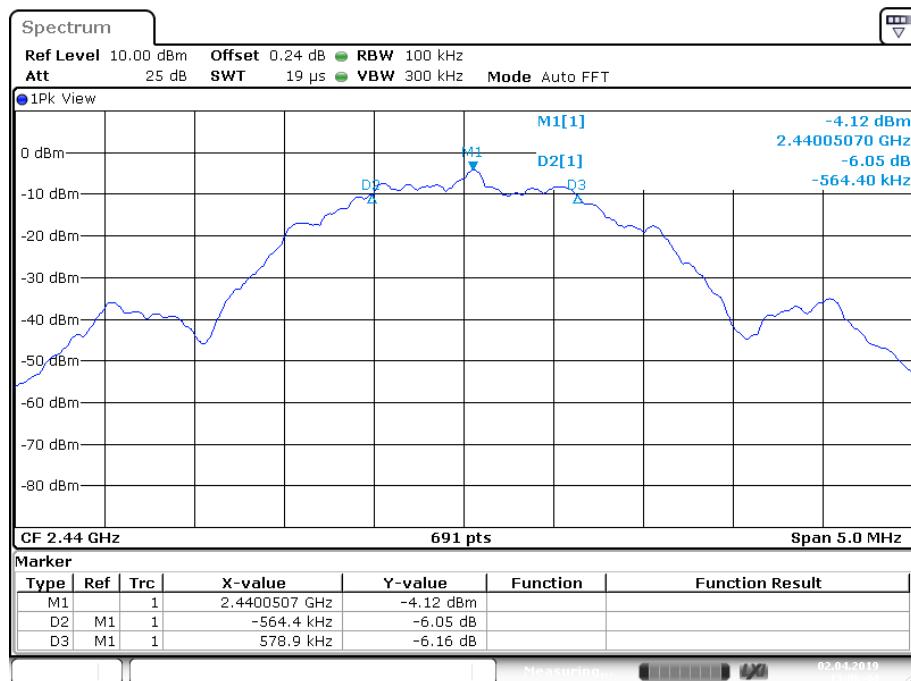
Date: 2 APR 2019 13:03:55

Plot A1

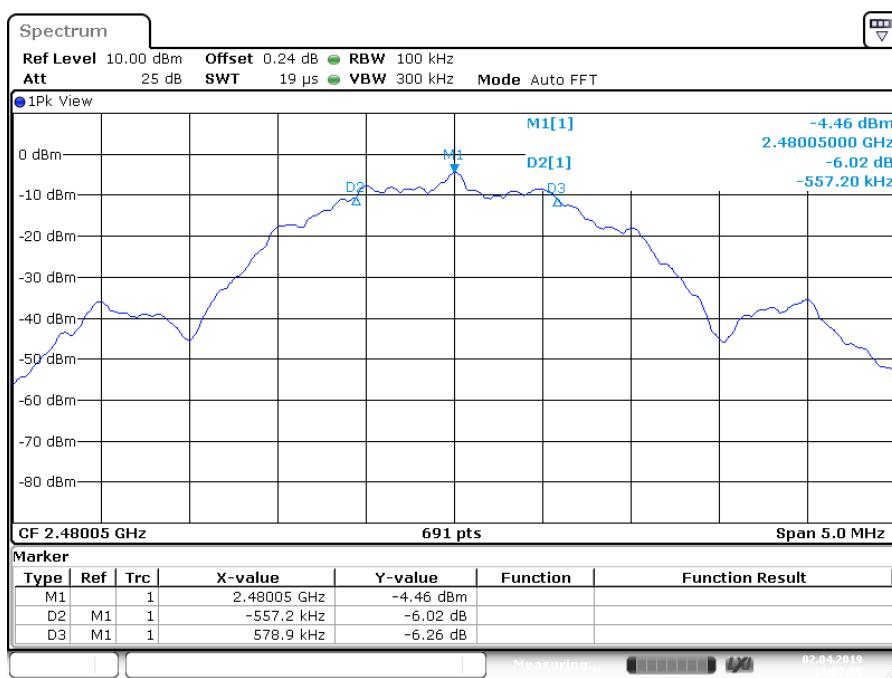
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Plot B1

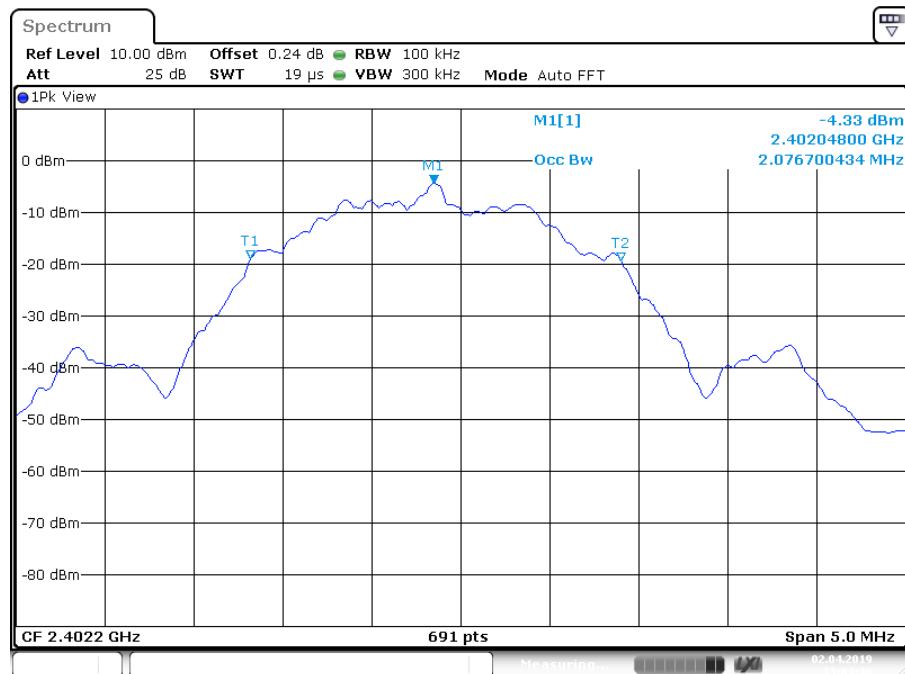


Plot C1

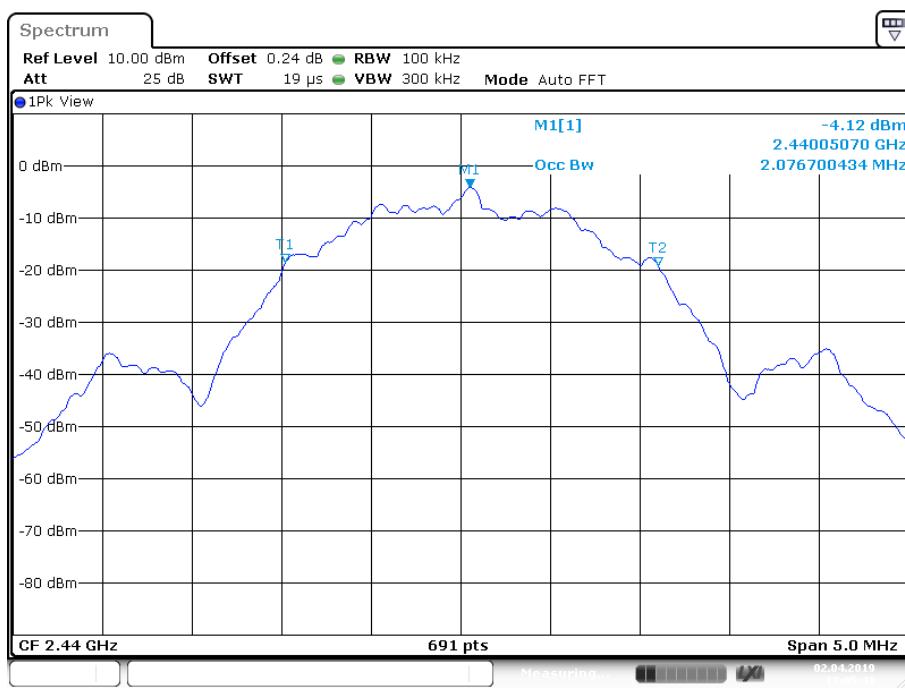
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Plot A2

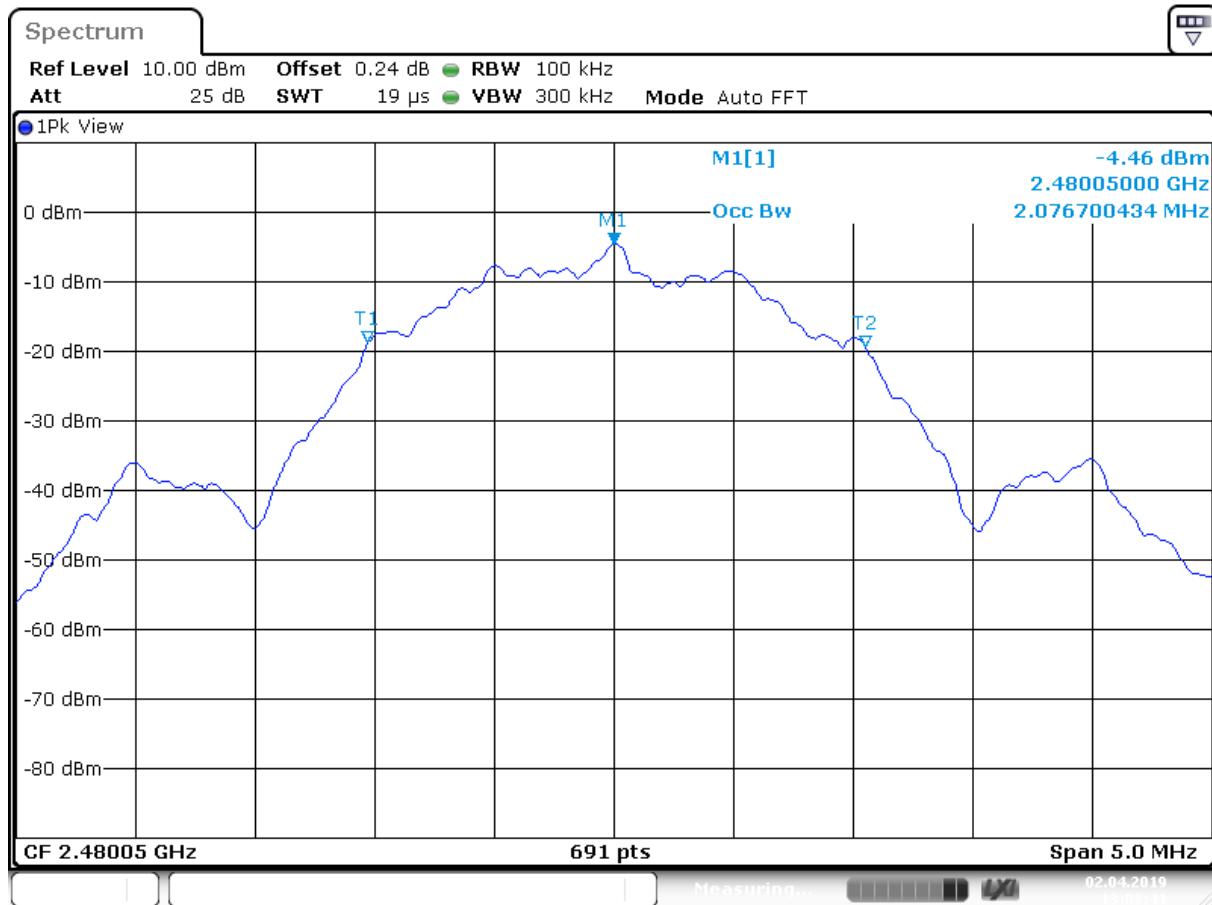


Plot B2

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Date: 2 APR 2019 13:08:41

Plot C2

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5.1.3 Peak Power Spectral Density

RESULT: PASS

Date of testing: 2019-04-02

Requirements:

FCC 15.247(e) and RSS-247 section 5.2(2)

For digitally modulated systems, the power spectral density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Test procedure:

ANSI C63.10-2013

The section 11.10.2 PKPSD peak PSD procedure was used. A spectrum analyzer was connected to the antenna port of the EUT. The analyzer resolution bandwidth was set to 3kHz and the video bandwidth was set to 10kHz. The sweep time was set to auto couple and the trace was allowed to stabilize before making the final measurement. By using the Peak marker function the maximum amplitude was determined. The final measurement takes into account the loss generated by all the involved cables (0.24 dB).

Measurement uncertainty is +/- 1.1 dB.

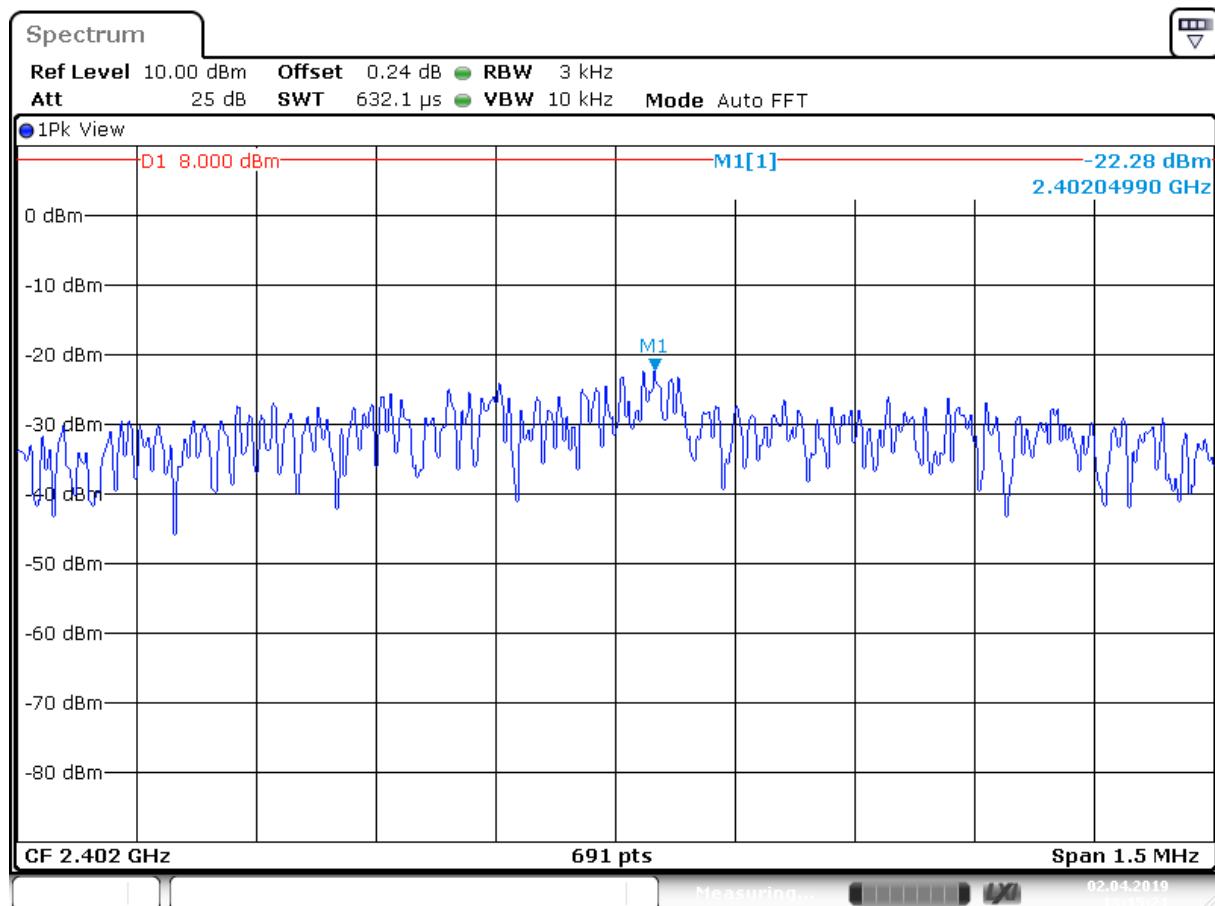
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Peak Power Spectral Density

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Verdict [Pass/Fail]	Plot
2402	-22.3	8	Pass	A
2440	-22.0	8	Pass	B
2480	-22.3	8	Pass	C

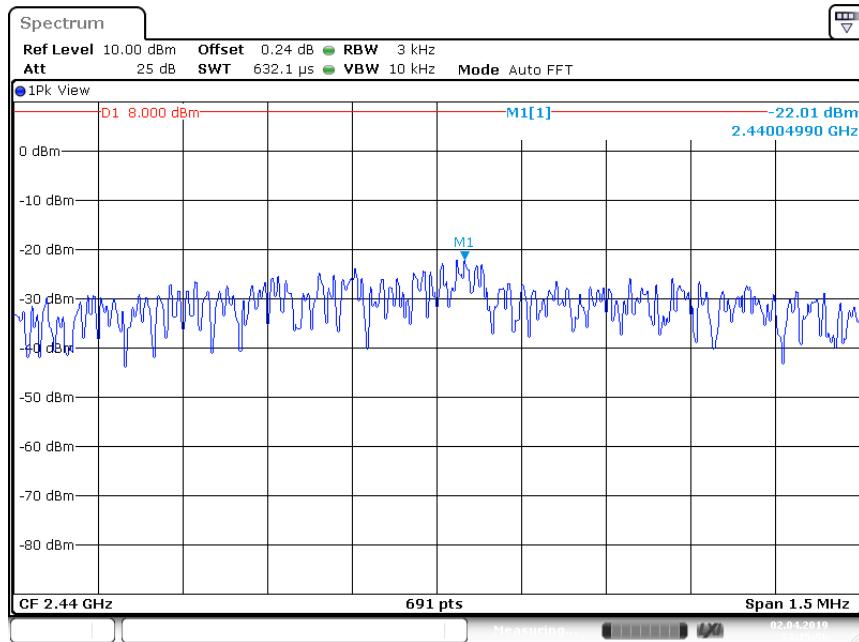


Plot A

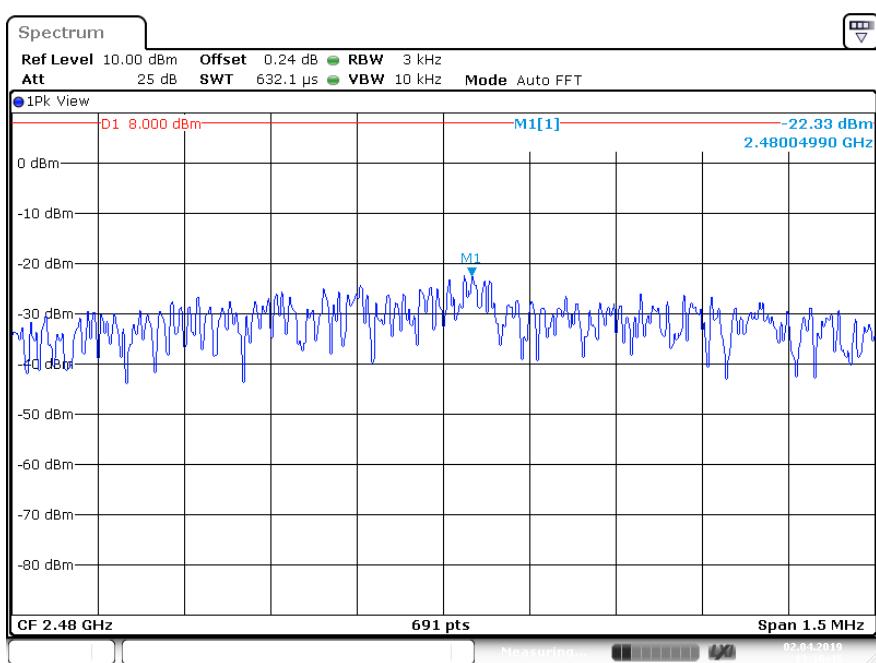
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Plot B



Plot C

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5.1.4 Band Edge Conducted Emissions

RESULT: Pass

Date of testing: 2019-03-27

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d) and RSS-247 section 5.5

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.

Test procedure:

ANSI C63.10-2013

KDB 558074 D01 DTS Meas Guidance v05.02

Section 11.13

An RF conducted measurement was done using the marker-delta method, as described in ANSI C63.10.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the peak of the fundamental and using the following settings:

RBW = 100kHz, VBW = 300kHz.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

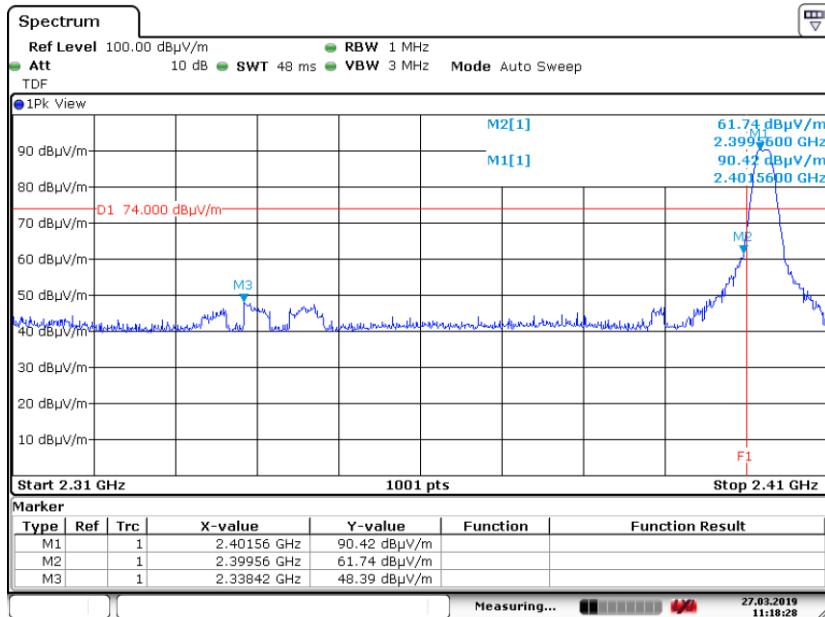
Measurement uncertainty is +/- 2.5 dB.

Results: All out of band spurious emissions are more than 20 dB below the fundamental. See the figures on the following pages.

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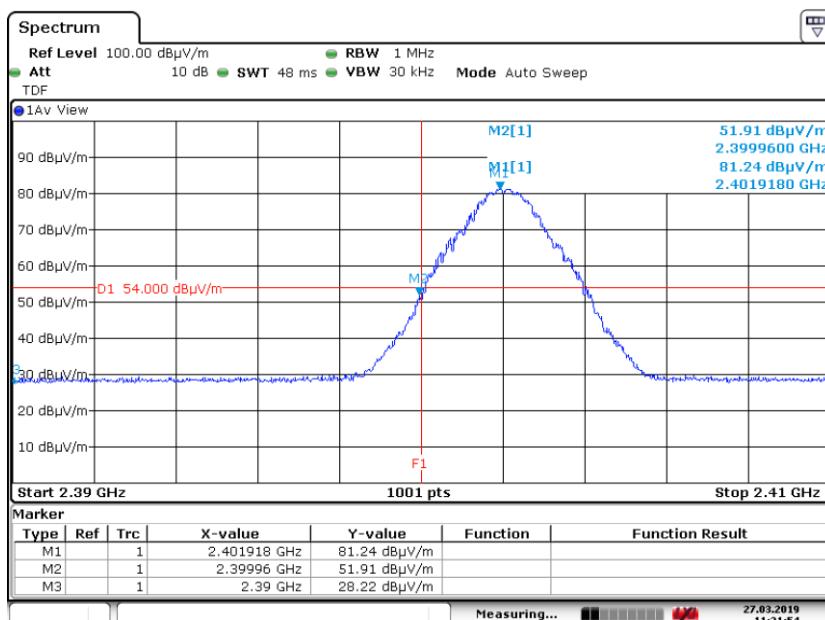
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Date: 27.MAR.2019 11:18:28

Plot: Band Edge Conducted Emission, Spectral Diagram, 2402 MHz- EUT Hor-Ant Hor (worst case situation). Peak values, F1 shows the band edge frequency of 2400 MHz.



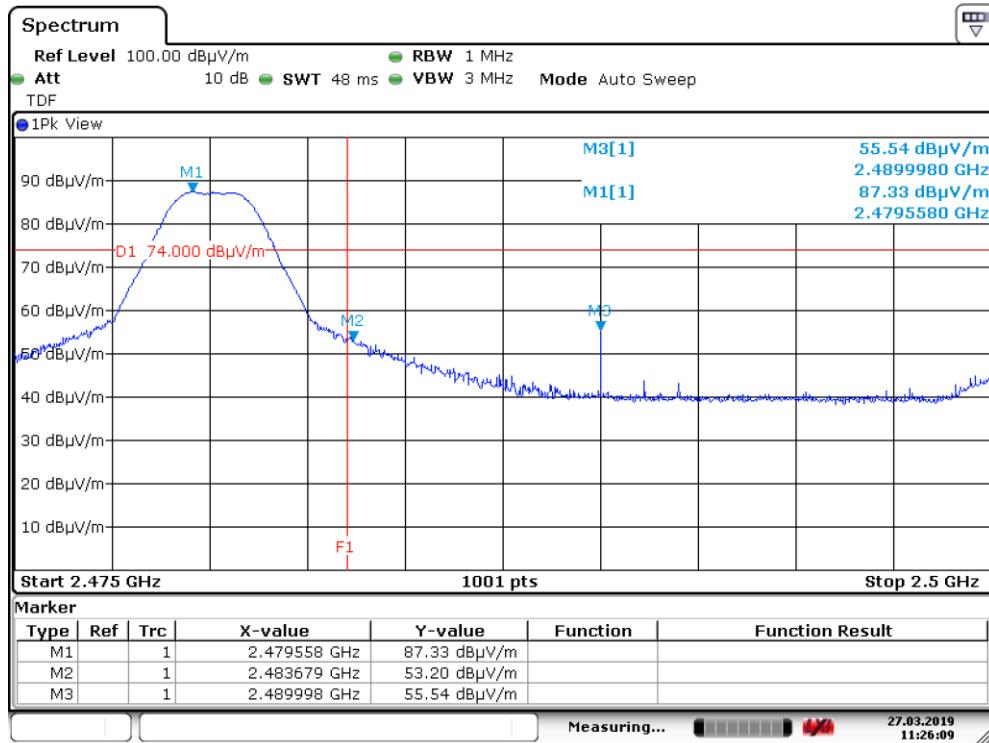
Date: 27.MAR.2019 11:21:54

Plot: Band Edge Conducted Emission, Spectral Diagram, Average value
F1 shows the band edge frequency of 2400 MHz

Test Report No.:

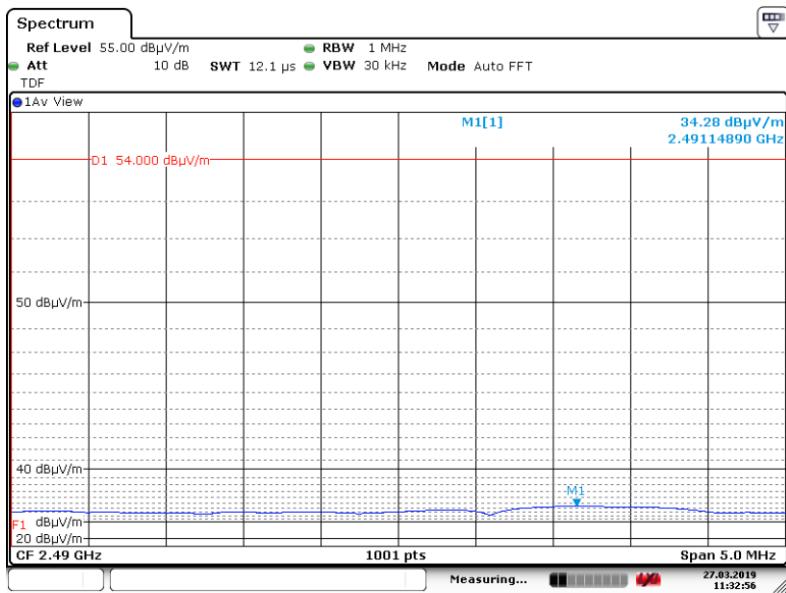
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Date: 27.MAR.2019 11:26:09

Plot: Band Edge Conducted Emission, Spectral Diagram, 2480 MHz. Eut Hor-Ant Hor (worst case situation). Peak values. F1 shows the band edge frequency of 2483.5 MHz.



Date: 27.MAR.2019 11:32:56

Plot: Band Edge Conducted Emission, Spectral Diagram, Eut Hor-Ant Hor (worst case situation). Average values.

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5.1.5 Radiated Spurious Emissions of Transmitter

RESULT: PASS

Date of testing: 2019-03-27

Frequency range: 30MHz - 25GHz

Requirements:

FCC 15.209 and FCC 15.247(d) and RSS-Gen

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen Table 6, must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen Table 4.

Test procedure:

ANSI C63.10-2013

KDB 558074 D01 DTS Meas Guidance v05.02

The EUT was placed on the testsite turntable. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 30MHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit. Where Peak (Pk) values were at least 6 dB under the Average (Av) limits, Av value was not tested. Where Average values were tested, Average values were measured using at least 10 kHz Video Bandwidth.

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Radiated Emissions, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations

Frequency [MHz]	Antenna Orientation	Level QP [dB μ V/m]	Limit QP [dB μ V/m]	Verdict [Pass/Fail]
47.9 (noise from laptop)	Vertical	28.0	40.0	Pass
169.0	Vertical	19.0	43.5	Pass
229.1	Horizontal	32.3	46.0	Pass
457.8	Vertical	27.3	46.0	Pass
662.4	Vertical	23.3	46.0	Pass
800-960 noise	Vertical	28.2	46.0	Pass

Notes: - Level QP = Reading QP + Factor

- Tested in modes as described in section 4.2, the 6 highest values noted.

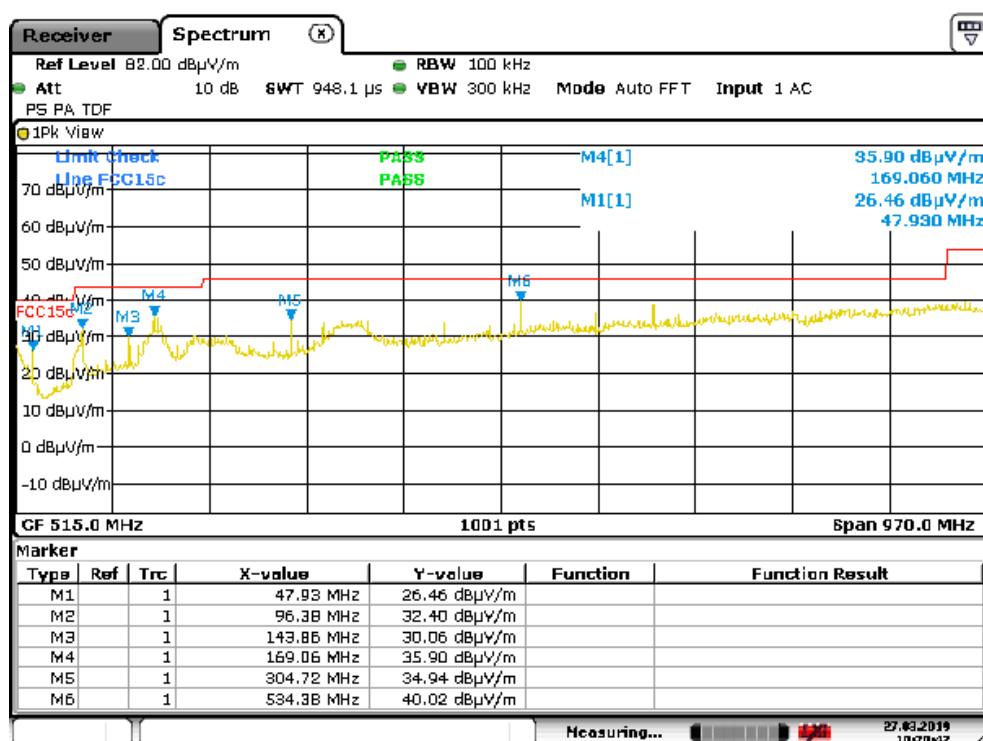
Preliminary measurements indicated that the radiated emissions from EUT were not affected by the EUT's operating mode or frequency.

- Preliminary measurements indicated that the radiated emissions from EUT were not affected by the power supplies (AUX2a / AUX2b) used, worst case (AUX2a) shown.

- *R refers to a frequency in a restricted band

- Quasi Peak detector used with a bandwidth of 120 kHz.

- Measurement uncertainty is +/- 5.22 dB.



Date: 27.MAR.2019 10:20:42

Plot of the emissions (Peak detector values shown)
M1, M2, M3 are from the AUX1 (laptop)

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Radiated Emissions, 1 - 25GHz, 2402 MHz.

Frequency [MHz]	Antenna Orientation	Detector	Bandwidth (MHz)	Level [dB μ V/m]	Limit [dB μ V/m]	Result
1917	Horizontal	Pk	1	49.8	54 (Av) 74 (Pk)	Pass
2274	Horizontal	Pk	1	53.5 Pk 50.5 Av	54 (Av) 74 (Pk)	Pass
2295	Horizontal	Pk	1	51.7	54 (Av) 74 (Pk)	Pass
2666	Horizontal	Pk	1	52.8	54 (Av) 74 (Pk)	Pass
4804 ^{*H}	Vertical	Pk	1	69.3 Pk 50.1 Av	54 (Av) 74 (Pk)	Pass

Radiated Emissions, 1 - 25GHz, 2440 MHz.

Frequency [MHz]	Antenna Orientation	Detector	Bandwidth (MHz)	Level [dB μ V/m]	Limit [dB μ V/m]	Result
1333.7	Vertical	Pk	1	46.0	54 (Av) 74 (Pk)	Pass
1976.6	Vertical	Pk	1	44.1	54 (Av) 74 (Pk)	Pass
2295.0	Vertical	Pk	1	48.7	54 (Av) 74 (Pk)	Pass
2274.0	Vertical	Pk	1	51.2	54 (Av) 74 (Pk)	Pass
2666.5	Vertical	Pk	1	50.1	54 (Av) 74 (Pk)	Pass
4880 ^{*H}	Horizontal	Pk	1	59.6 Pk 50.9 Av	54 (Av) 74 (Pk)	Pass
11395	Horizontal	Pk	1	62.0 Pk Av	54 (Av) 74 (Pk)	Pass
13794	Horizontal	Pk	1	59.6 Pk 50.0 Av	54 (Av) 74 (Pk)	Pass

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Radiated Emissions, 1 - 25GHz, 2480 MHz.

Frequency [MHz]	Antenna Orientation	Detector	Bandwidth [MHz]	Level [dB μ V/m]	Limit [dB μ V/m]	Result
4105	Vertical	Pk	1	45.9	54 (Av) 74 (Pk)	Pass
4960*H	Horizontal	Pk	1	57.8 Pk 53.7 Av	54 (Av) 74 (Pk)	Pass
10574*H	Horizontal	Pk	1	55.2 Pk 48.5 Av	54 (Av) 74 (Pk)	Pass

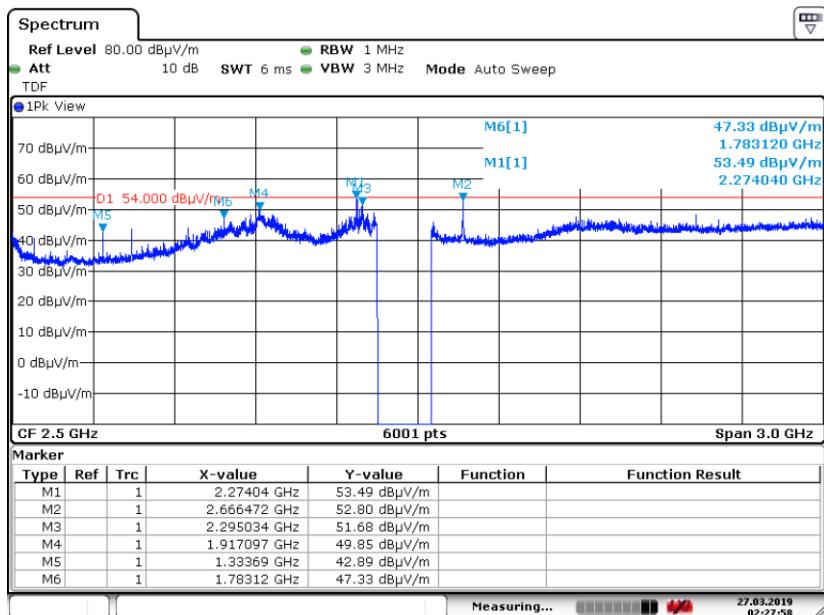
Notes: - *R refers to a frequency in a restricted band,
- *H refers to a frequency which is a harmonic of the fundamental.
- Field strength values of radiated emissions not listed in the tables above are
more than 20 dB below the applicable limit.
- Measurement uncertainty is +/- 5.5 dB.
- a selection of plots is provided on the next pages

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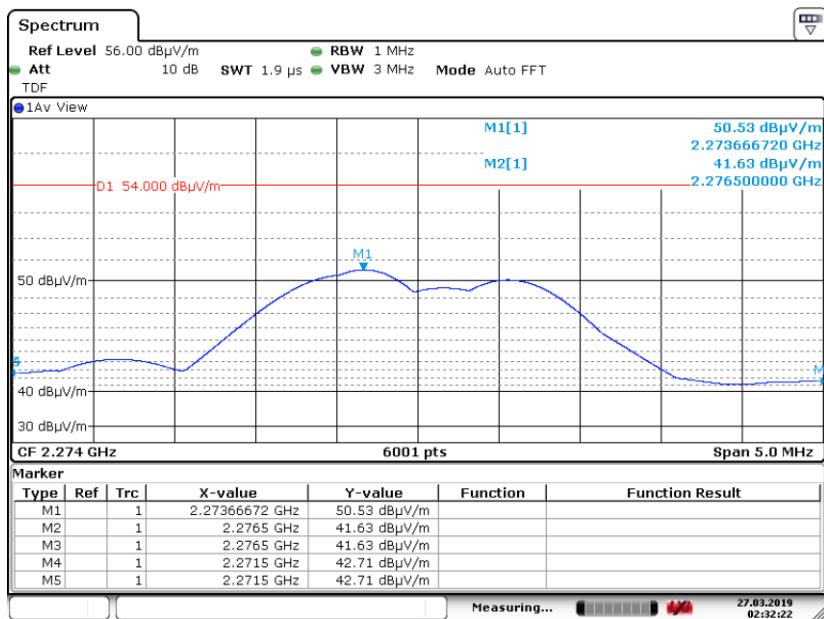
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Plots of the radiated emissions



Date: 27.MAR.2019 02:27:58

Plot of the emissions at 2402 MHz, Horizontal polarization, Peak values shown
gap in the plot is of the used Notch filter



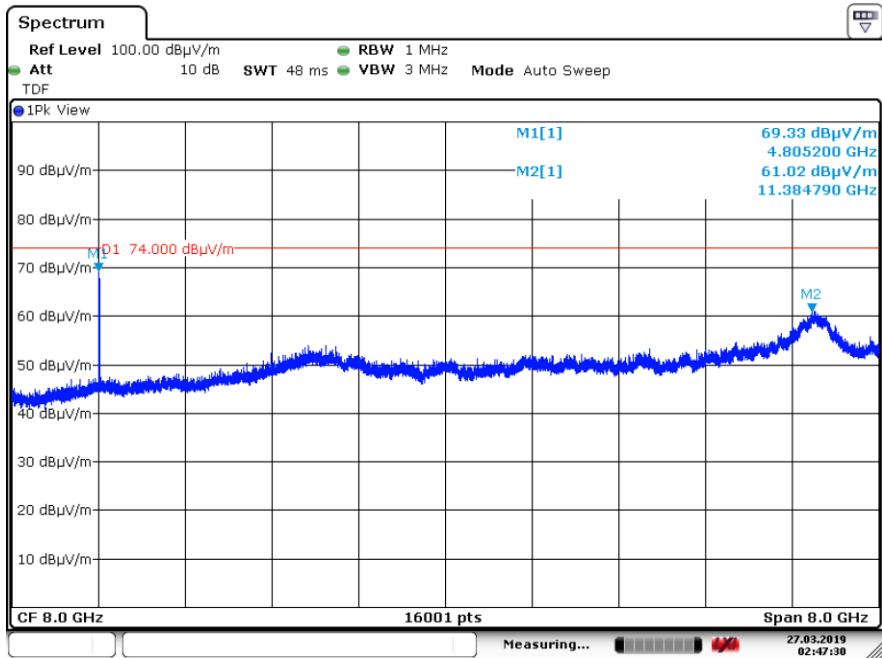
Date: 27.MAR.2019 02:32:22

Plot of the emissions at 2402 MHz, Vertical polarization, Average value shown

Test Report No.:

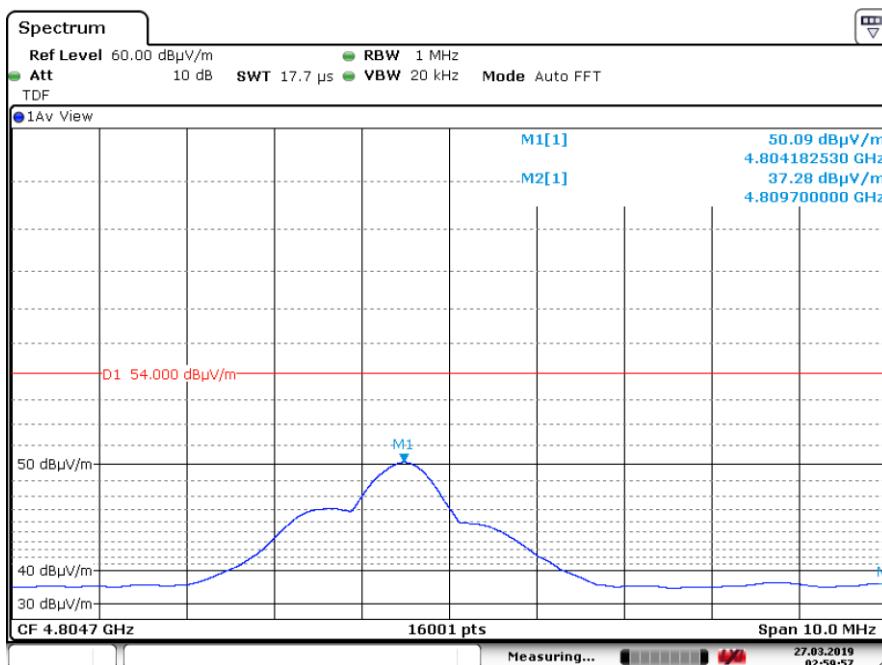
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Date: 27.MAR.2019 02:47:30

Plot of the emissions at 2402 MHz, range 4 to 12 GHz, Horizontal polarization, Peak values shown



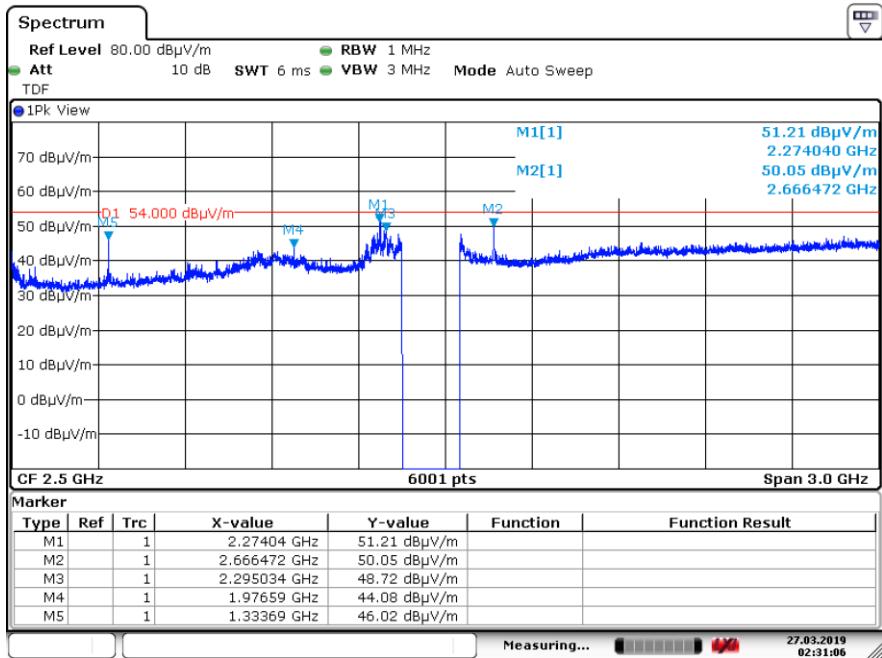
Date: 27.MAR.2019 02:59:57

Plot of the emissions at 2402 MHz, Horizontal polarization, 4.8 GHz, Average value shown

Test Report No.:

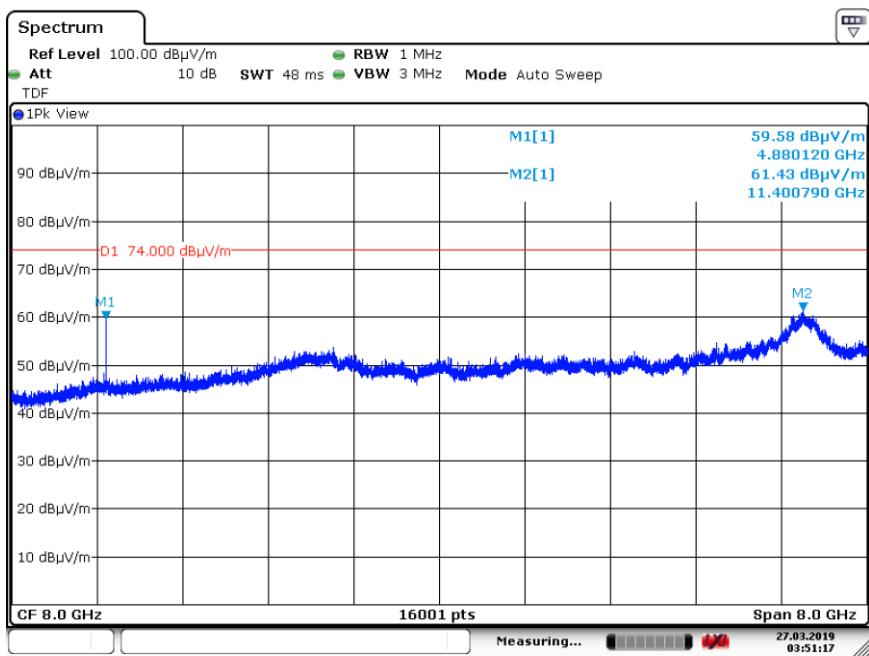
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Date: 27.MAR.2019 02:31:06

Plot of the emissions at 2440 MHz, Horizontal polarization, Peak values shown, gap in the plot is of the used Notch filter



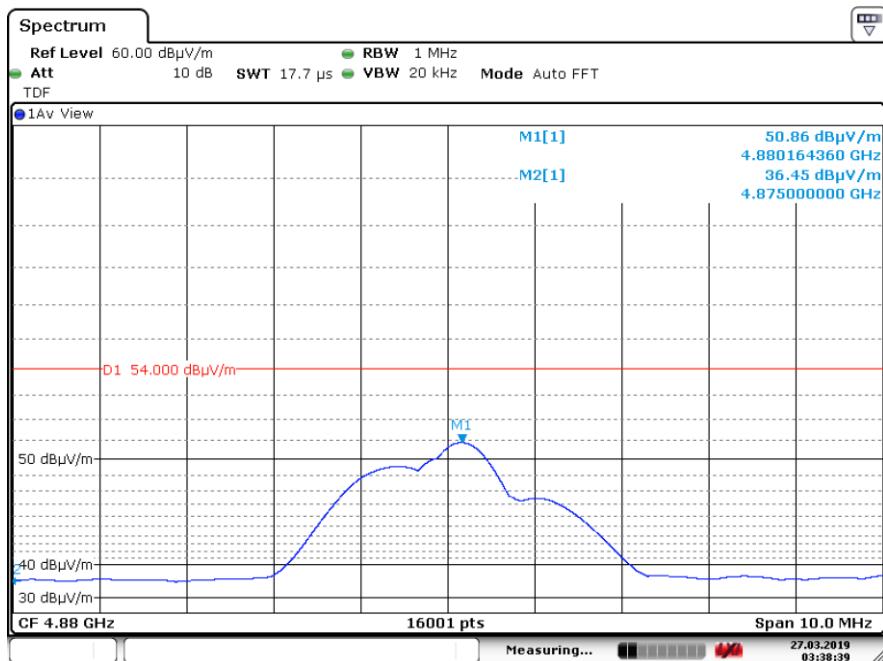
Date: 27.MAR.2019 03:51:17

Plot of the emissions at 2440 MHz, in the range 4 to 12 GHz, Vertical polarization, Peak values shown

Test Report No.:

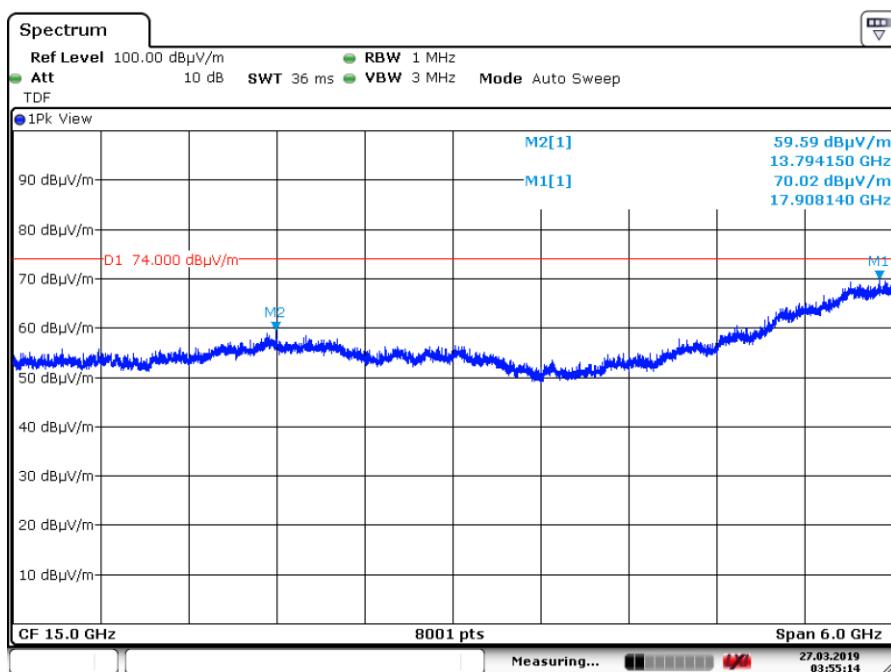
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Date: 27.MAR.2019 03:38:39

Plot of the emissions at 2440 MHz, harmonic at 4880 GHz, Vertical polarization, Average values shown



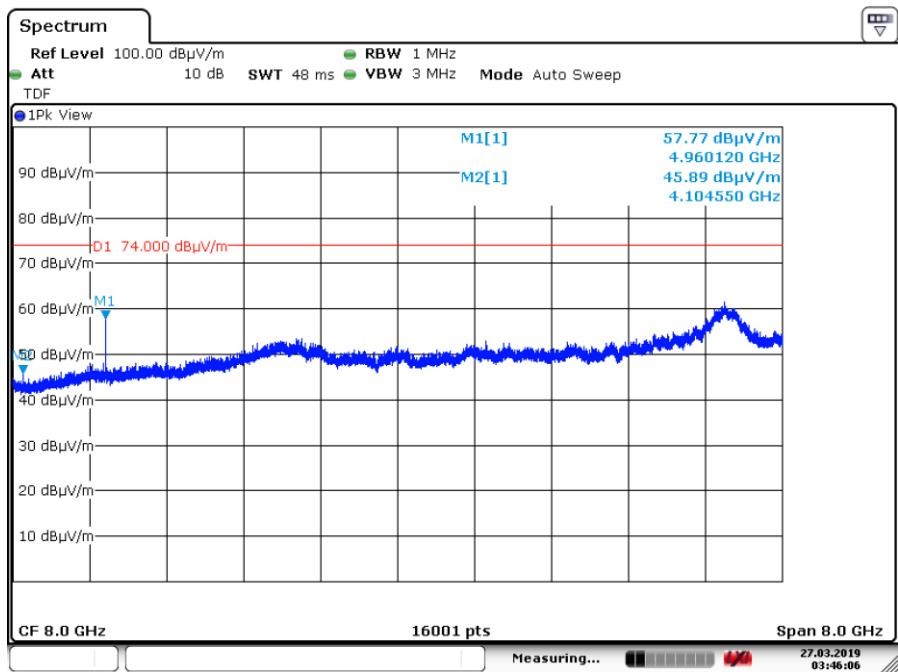
Date: 27.MAR.2019 03:55:14

Plot of the emissions at 2440 MHz, in the range 12 to 18 GHz, Vertical polarization, Peak values shown

Test Report No.:

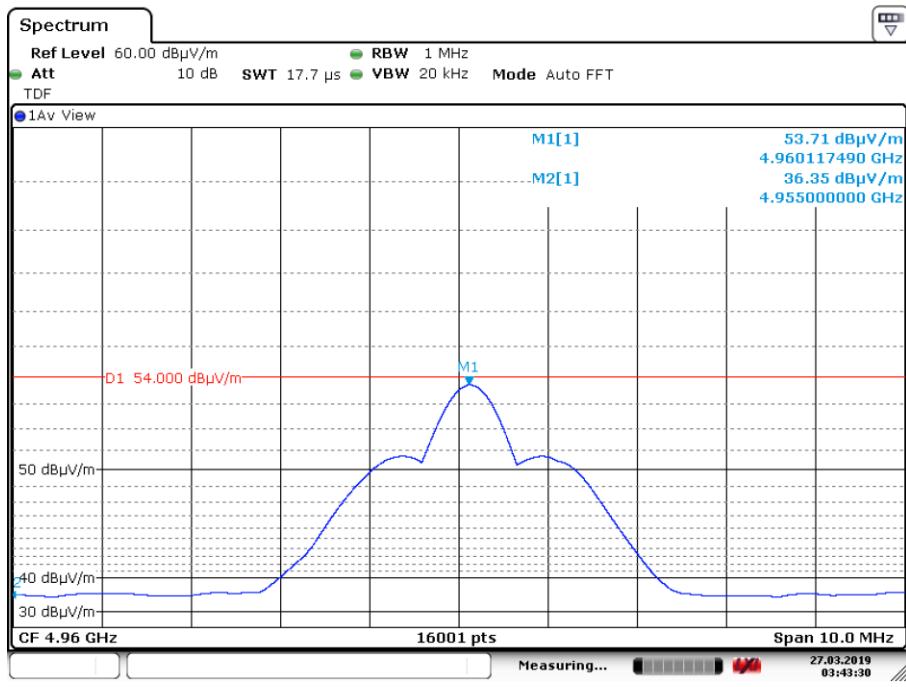
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Date: 27.MAR.2019 03:46:05

Plot of the emissions at 2480 MHz, in the range 4 to 12 GHz, Vertical polarization, Peak values shown



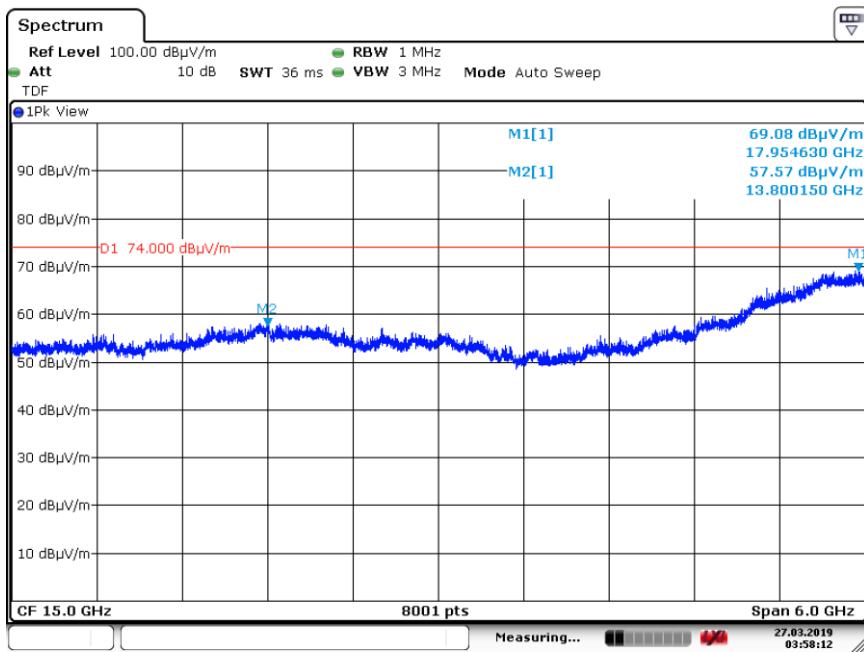
Date: 27.MAR.2019 03:43:30

Plot of the emissions at 2480 MHz, harmonic at 4960 GHz, Vertical polarization, Average values shown

Test Report No.:

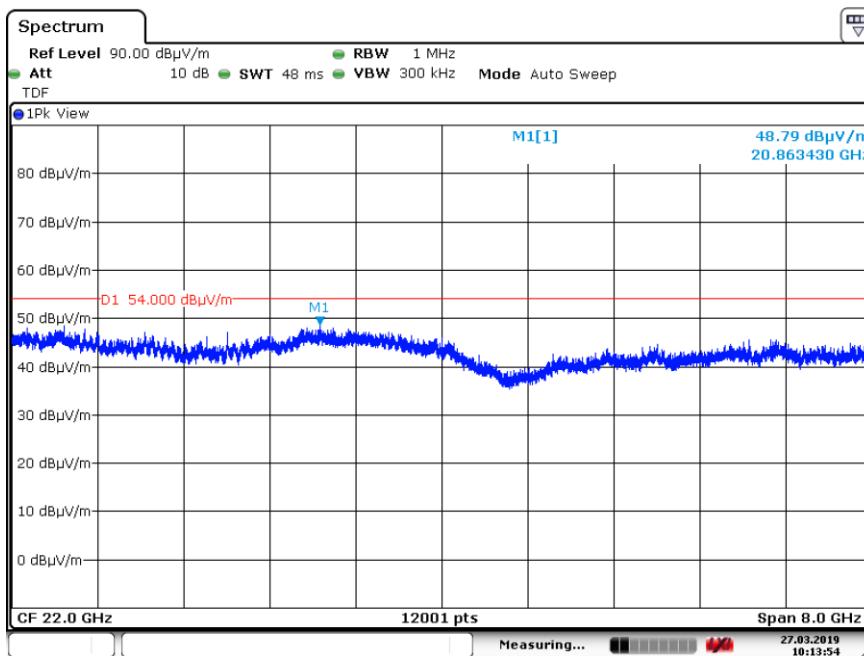
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Date: 27.MAR.2019 03:58:11

Plot of the emissions at 2480 MHz, in the range 12 to 18 GHz, Horizontal polarization, Peak values shown



Plot Radiated unwanted emissions in the range 18 – 25 GHz at 2480 MHz, reduced Video BW (Peak values, Antenna Vertical position shown).

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5.2 AC Power Line Conducted Measurements

RESULT: Pass.

Date of testing: 2019-04-17

Requirements: 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	Conducted Limit (dB μ V) Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 - 30	46	50

*Decreases with the logarithm of the frequency.

Test procedure:

ANSI C63.10-2013.

Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a 50 μ H / 50 Ω LISN. The frequency range from 150kHz to 30MHz was searched. The six highest EUT emissions relative to the limit were noted. The EUT was positioned at least 80cm from the LISN. The power cable was routed over the non-conductive plate to the LISN. As the EUT is build into the end product (the Neo Bike) and gets its power supply from the Neo Bike, the EUT is tested as complete system. The system is regarded as floor standing equipment and an isolation plate of thickness <12mm is used.

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5.2.1 AC Power Line Conducted Emission of Transmitter

Frequency (MHz)	Measurement results (dB μ V) L1		Measurement results (dB μ V) L2/Neutral		Limits (dB μ V)		Verdict (Pass/Fail)
	QP	AV	QP	AV	QP	AV	
0.1539	<40	<40	47.9	<40	66.0	56.0	Pass
0.1617	43.3	<40	<40	<40	65.5	55.5	Pass
0.2477	42.0	<40	51.5	41.7	61.8	51.8	Pass
0.2515	51.6	<40	<40	<40	61.8	51.8	Pass
0.2633	49.3	45.5	51.5	46.0	61.4	51.4	Pass
0.2906	48.7	<40	48.8	<40	60.5	50.5	Pass

The results of the AC power line conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207(a) and RSS-Gen section 8.8, at the 120 Volts/ 60 Hz AC mains connection terminals of the power supply adapter (GST40) that connects to the Neo Bike (that feeds the EUT), are depicted in the table above.

Notes:

1. The resolution bandwidth used was 9 kHz.
2. From pre-test the worst case configuration proved to be the normal operation mode wherein both DTS transmitter and Bluetooth were operational but not transmitting simultaneously. Worst case values noted.
3. Measurement uncertainty is +/- 3.5 dB.
4. Plots are provided on the next pages.

Test Report No.:

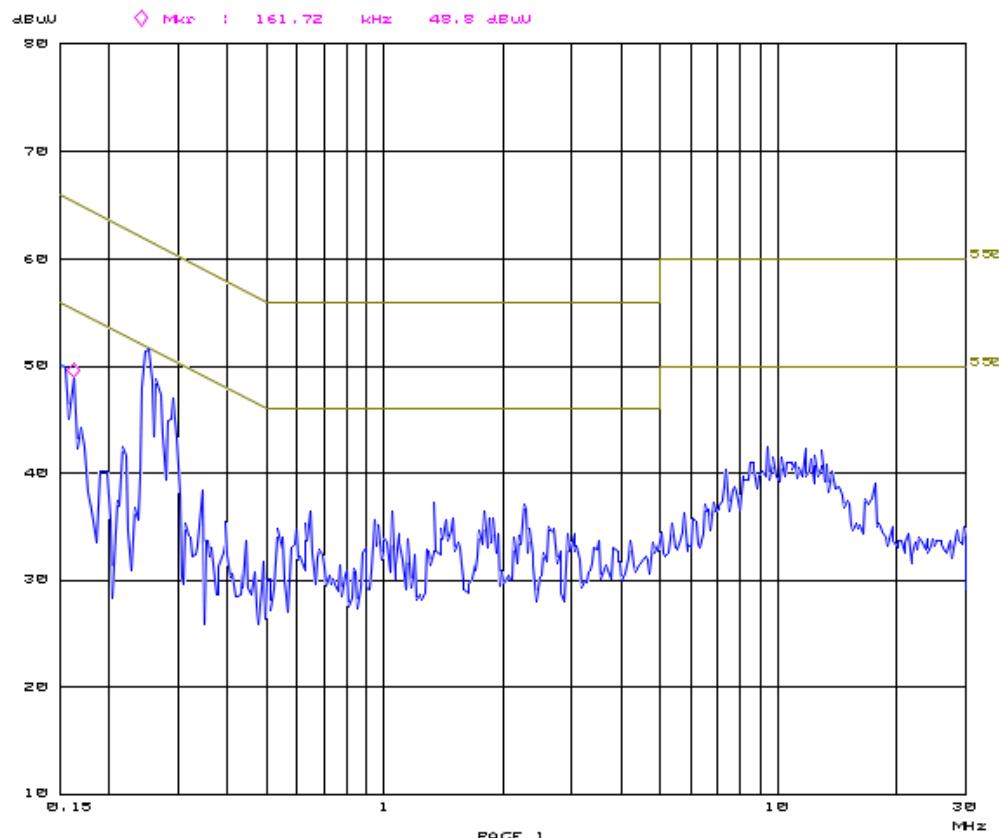
18052904A.r01

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5.2.2 Plots of the AC Power-line Conducted Emissions

17. Apr 19 11:18

Overview Scan Settings (1 Range)
----- Frequencies ----- ;----- Receiver Settings ----- ;
Start Stop Step IF BW Detector MT-Time Atten Preamp
150K 30M 3.9K 9K PK 0.10ms 20dB LN OFF



Plot of the AC Power-line Conducted emissions on L1, @2402 MHz

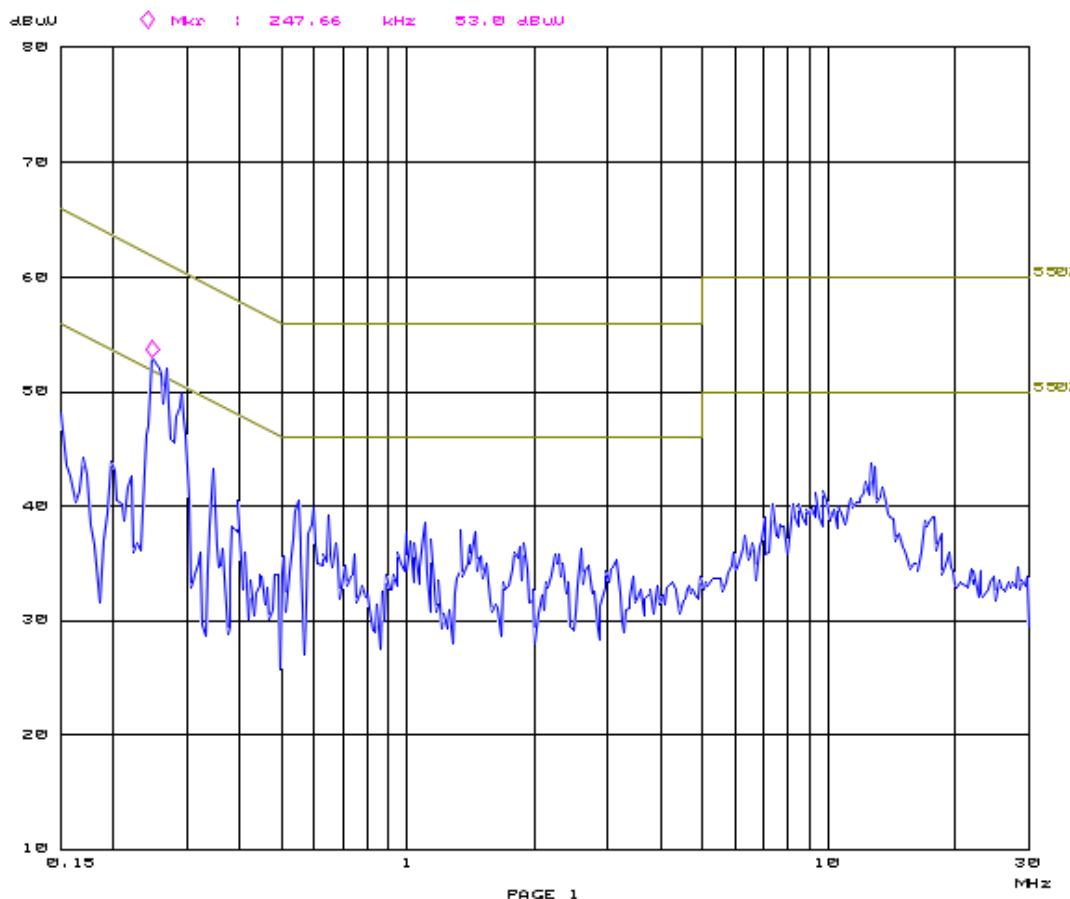
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17. Apr 19 11:16

Overview Scan Settings (1 Range)
----- Frequencies ----- !----- Receiver Settings -----!
Start Stop Stop IF BW Detector M-Time Atten Preamp
158K 38M 3.9K 9K PK 0.10ms 20dBBLN OFF



Plot of the AC Power-line Conducted emissions N, @2402 MHz

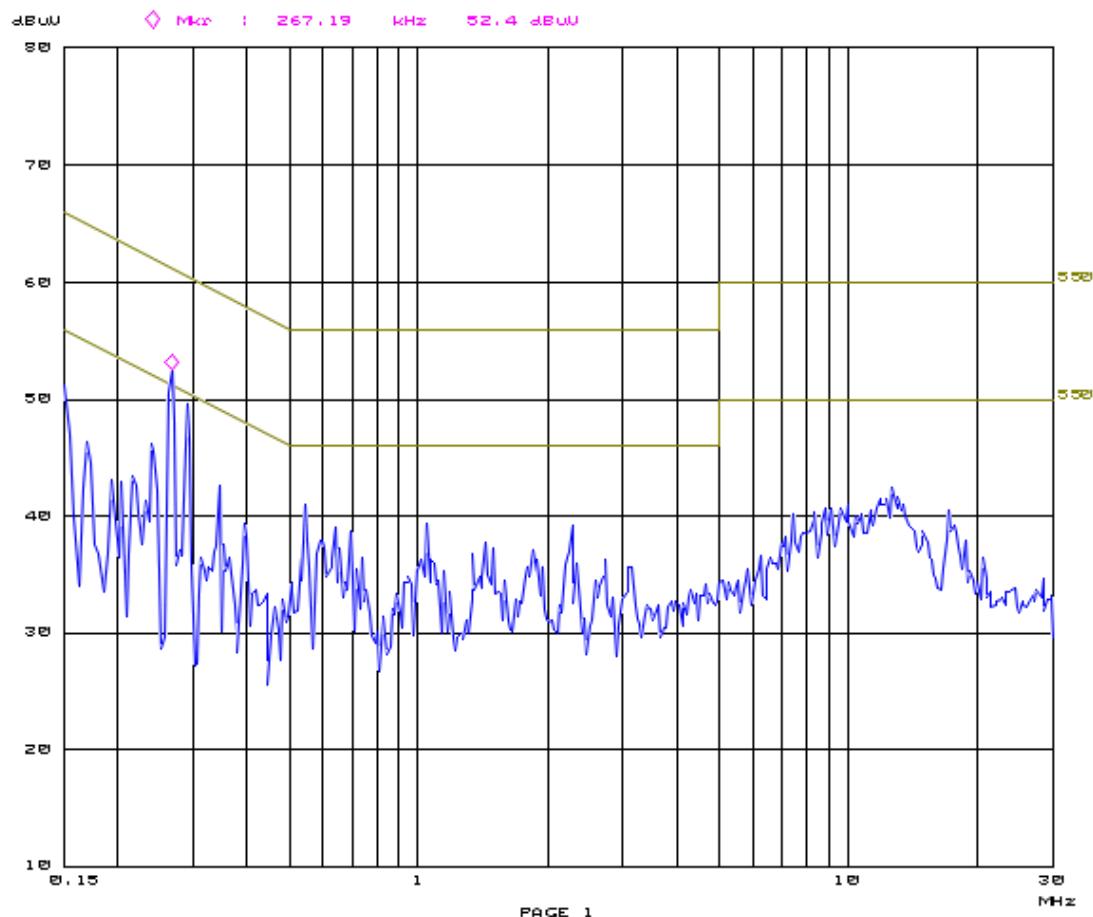
Test Report No.:

18052904A.r01

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17. Apr 19 11:27

Overview Scan Settings (1 Range)
----- Frequencies ----- ;----- Receiver Settings ----- ;
Start Stop Stop IF BW Detector M-Time Atten Preampe
150k 30M 3.9k 9k PK 0.10ms 20dB LN OFF



Plot of the AC Power-line Conducted emissions N, @2440 MHz

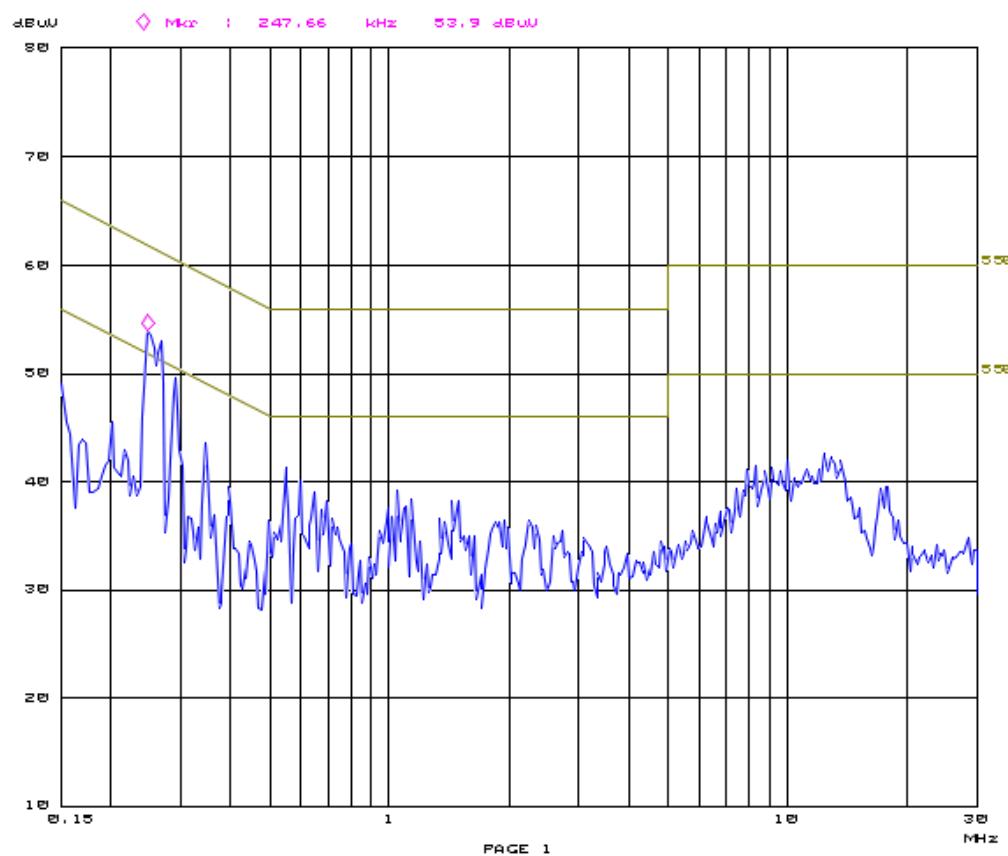
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17. Apr 19 11:43

Overview Scan Settings (1 Range)
----- Frequencies ----- :----- Receiver Settings -----:
Start Stop Stop IF BW Detector M-Time Atten Preamp
150k 30M 3.9k 9k PK 0.10ms 20dB LN OFF



Plot of the AC Power-line Conducted emissions N, @2480 MHz

End of report