GARMIN
Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062
P: 913-397-8200 F: 913-397-8282

13-Feb-26

Manufacturer: Garmin International, Inc.
Address: 1200 E. 151st St.
Olathe, KS 66062-3426
U.S.A.
Chile Representative: Matías Rodríguez Correa
Rosario Norte 660 piso 24, Las Condes Santiago
Province CP 7550083, Chile
Contact Email: matias.rodriguez@garmin.com

Subject: SUBTEL, Chile (Resolution 737) Certification Compliance 2026

Commercial Name: Tacx, Flow Smart

	Información (Information)
Tipo de equipo (Equipment type)	Portable Digital Transceiver
Marca (Brand)	TACX
Modelo (Model)	T2240
Tecnología o modulación (Technology or modulation)	GFSK for ANT
Frecuencias (Frequencies)	2402-2480 MHz
Ganancia de antena (dBi) (Antenna gain (dBi)	ANT 2.00 dBi
P.i.r.e. (E.I R P.)	-5.46 dBm, 0.28 mW
Módulos (Modules)	ANT

Declaration of Conformity Statement: the equipment previously identified complies with the provisions established in the Technical Standard for Small Range Equipment, approved by Exempt Resolution No.1,985 of 2017, of the Undersecretary of Telecommunications.

Declaración de conformidad: El equipo anteriormente identificado cumple con las disposiciones establecidas en la Norma Técnica para Equipos de Corto Alcance, aprobada mediante la Resolución Exenta N° 1.985 de 2017, de la Subsecretaría de Telecomunicaciones.

TÜVRheinland®
Precisely Right.

Test Report No.:	**16012203.fcc01**		*Page 1 of 40*
Client:	**Tacx b.v.** Rijksstraatweg 52, 2241BW Wassenaar, Netherlands		
Test Item:	**Digital Transmission System (DTS)** **ANT+**		
Identification:	**T2240**	*Serial Number:*	**951500057 (conducted tests) and 951500042 (radiated tests)**
Project No.:	**16012203**	*Date of Receipt:*	**March 16, 2016**
Testing Location:	**TÜV Rheinland Nederland B.V.** Eiberkamp 10 9351VT Leek		
Test Specification:	FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-14 Edition) RSS-Gen (Issue 4, November 2014) and RSS-247 (Issue 1, May 2015) ANSI C63.10-2013		

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:*		
2016-04-28	R. van der Meer / Inspector		2016-04-28	P. de Beer / Reviewer	
Date	*Name/Position*	*Signature*	*Date*	*Name/Position*	*Signature*

Other Aspects:-.

Abbreviations: ***P(ass)*** = ***passed*** ***F(ail)*** = ***failed*** ***N/A*** = ***not applicable*** ***N/T*** = ***not tested***

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

5.1.6 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER IN RESTRICTED BANDS
RESULT: PASS

5.2.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER
RESULT: Pass

Contents

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 90828. 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.

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	04-13/2016	04-13/2017
Spectrum Analyzer	Rohde & Schwarz	FSV	A01744	07/2015	07/2016
RF Cable	Rohde & Schwarz	WF	A01830	07/2015	07/2016
For Radiated Emissions					
Measurement Receiver	Rohde & Schwarz	ESCI	A00314	03/2016	03/2017
RF Cable S-AR	Gigalink	APG0500	A00447	01/2016	01/2017
Controller	Maturo	SCU/088/ 8090811	A00450	N/A	N/A
Controller	EMCS	DOC202	A00257	N/A	N/A
Test facility	Comtest	FCC listed: 90828 IC: 2932G-2	A00235	04/2014	04/2017
Spectrum Analyzer	Rohde & Schwarz	FSV	A00377	05/2015	05/2016
Antenna mast	EMCS	AP-4702C	A00258	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	A00444	04-13/2016	04-13/2017
Guidehorn 1-18 GHz	EMCO	3115	A00009	04-14/2016	04-14/2017
Guidehorn 18-40 GHz	EMCO	RA42-K-F-4B-C	A00012	04-14/2016	04-14/2017
Biconilog Testantenna	Teseq	CBL 6111D	A00466	06/2015	06/2016
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	02/2016	02/2017

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	01/2016	01/2017
Variac	RFT	LSS020	A00171	NA	NA
LISN	EMCO	3625/2	A00022	01/2016	01/2018
Measurement Receiver	Rohde & Schwarz	ESCS30	A00726	09/2015	09/2016
Shielded room for Conducted emissions	--	--	A00437	NA	NA
Temperature-Humidity meter	Extech	SD500	A00444/	04-13/2016	04-13/2017

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	< 1GHz	±0.5dB
	> 1GHz	±0.7dB
Radiated Emission	150kHz - 30MHz	±5.0dB
	30MHz - 1GHz	±5.0dB
	> 1GHz	±5.5dB
AC Power Line Conducted Emissions	150kHz - 30MHz	±3.5dB

3. General Product Information

3.1 Product Function and Intended Use

The brand Tacx model T2240, hereafter referred to as EUT, is a transmitter used in 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 1 Mbps is used. The system also incorporates a BLE transceiver but both transmitters never transmit at the same time. The BLE 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, ANT
Manufacturer	:	Tacx b.v.
Brand	:	Tacx
Model(s)	:	T2240
Serial Number	:	951500057 (conducted tests) and 951500042 (radiated tests)
Voltage input rating	:	40 Vac (through AUX3)
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	Internal, integrated on the PCB
Antenna Gain	:	+ 2.0 dBi
Operating frequency	:	2403 MHz-2480 MHz.
Modulation	:	GFSK
Data-rate	:	1 Mbps
Remarks	:	n.a.

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.

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**.**

For details, see under each test item.

4.2 Operation Modes

Testing was performed at the lowest operating frequency (2403 MHz), at the operating frequency in the middle of the specified frequency band (2442 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	2403	4
Transmit (Tx)	On	2442	4
Transmit (Tx)	On	2480	4

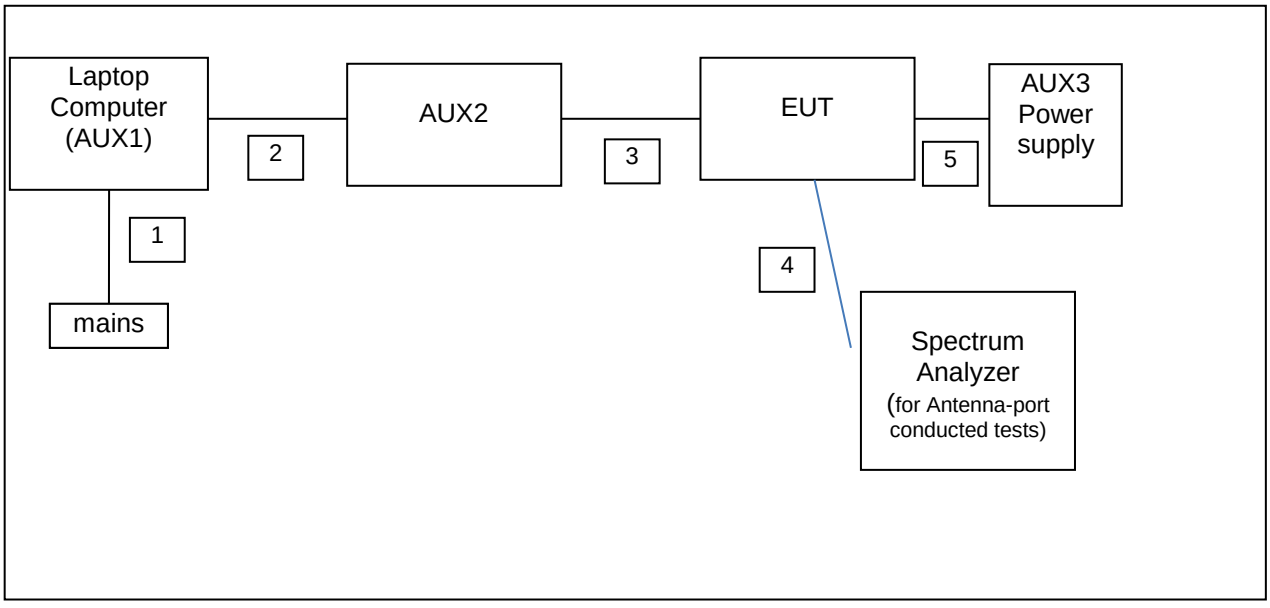
4.3 Physical Configuration for Testing

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	AUX2	--
3.	Data com.	AUX2	EUT	--
4.	Antenna port	EUT	Spectrum analyzer	Conducted tests
5.	Power supply	AUX3	EUT	40 Vac

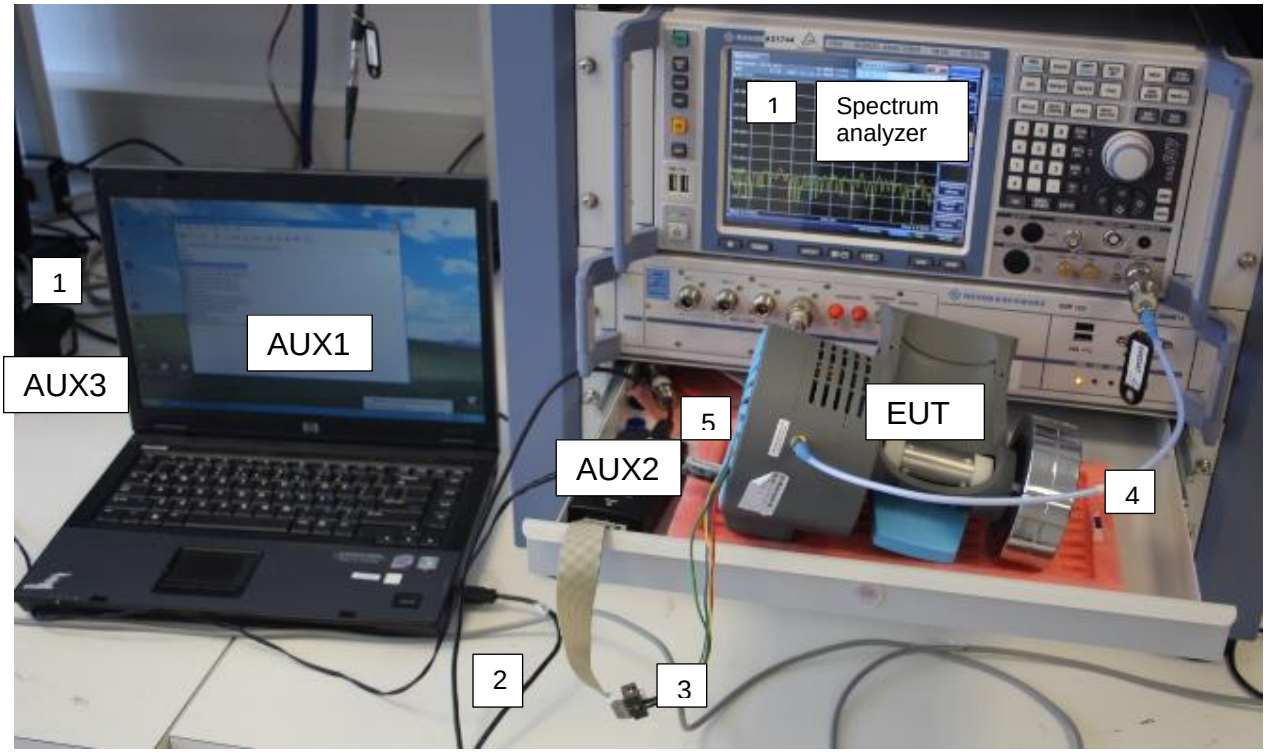


Figure 2b: Test Setup Photos – conducted tests and programming.

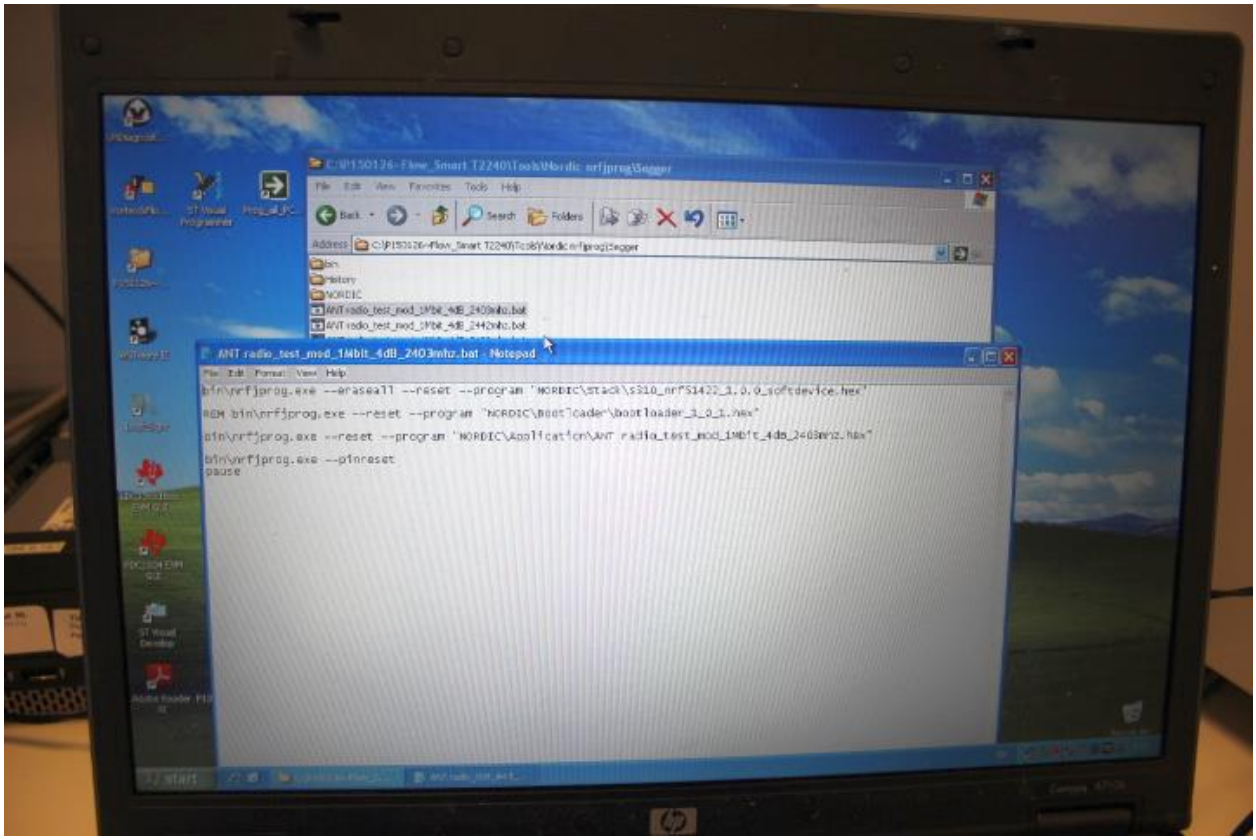
4.4 Test Software

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 : nRFTools 51422 v1.0.0

Batch files programmed by the applicant are used to make the required settings.

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.



Photograph of the software (and settings) as used on AUX1

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:	Compaq 6710b
Serial Number:	CNU8150MD3
Remark:	host for test software, property applicant

2. AUX2

Product:	Programming interface
Brand:	Segger
Model:	J-Link Base version 9.3
Serial Number:	59307055
Remark:	property applicant

3. AUX3

Product:	Power Supply Adapter
Brand:	--
Model:	FW 6299
Serial Number:	4197
Input voltage:	230 Vac 50 Hz
Output voltage:	40 Vac
Remark:	property applicant

5. Test Results

5.1 Conducted Measurements at Antenna Port

5.1.1 Conducted Output Power

RESULT: PASS

Date of testing: 2016-04-14

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.

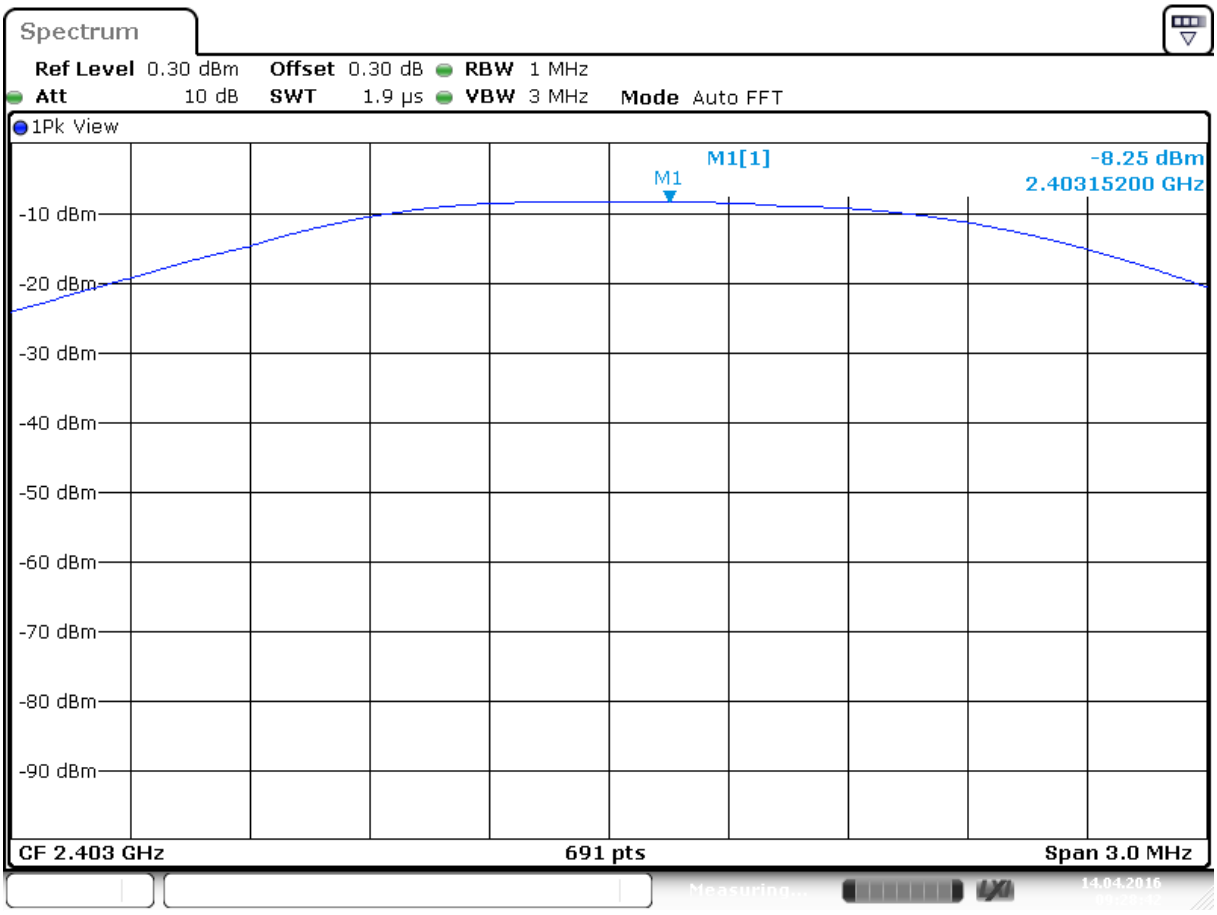
Measurement uncertainty is +/- 0.7 dB.

Notes: mW = 10 ^ (dBm/10)
dBm = 10 x log(mW)

plots : Peak power plots,
Figures 1a, 1b and 1c show plots of the Peak Power outputs, correction factors (= 0.3dB Cableloss) included in the reading.

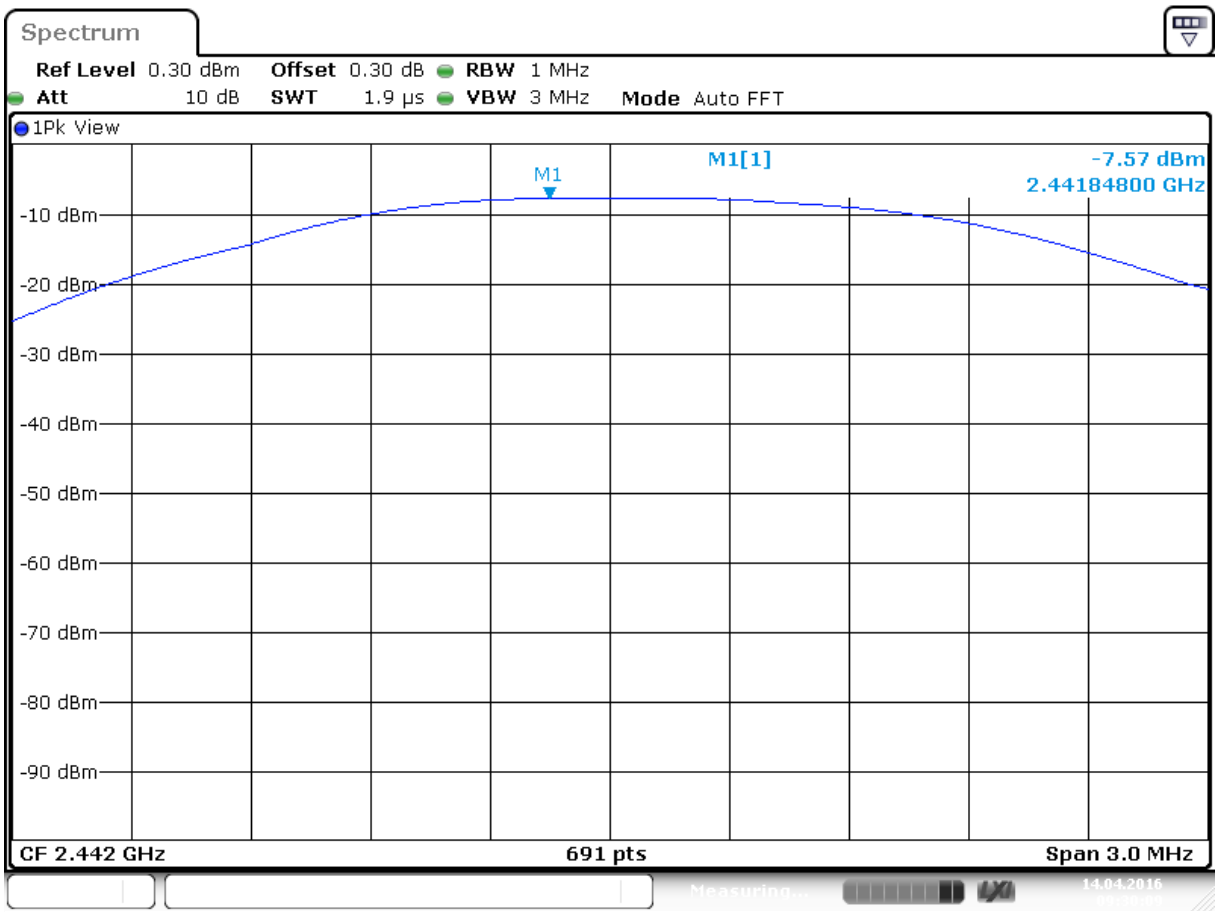
Conducted Output Power

Frequency [MHz]	Output Power [dBm]	Limit [dBm]	Verdict [Pass/Fail]	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Plot number
2403	-8.25 (0.15mW)	+30	Pass	+2.0	-6.25	0.24	1A
2442	-7.57 (0. 18mW)	+30	Pass	+2.0	-5.57	0.28	1B
2480	-7.46 (0. 18mW)	+30	Pass	+2.0	-5.46	0.28	1C



Date: 14.APR.2016 09:28:42

Plot A



Date: 14.APR.2016 09:30:09

Plot B

Date: 14.APR.2016 09:30:59

Plot C

5.1.2 6dB and 99% Bandwidth

RESULT: PASS

Date of testing: 2016-04-14

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.

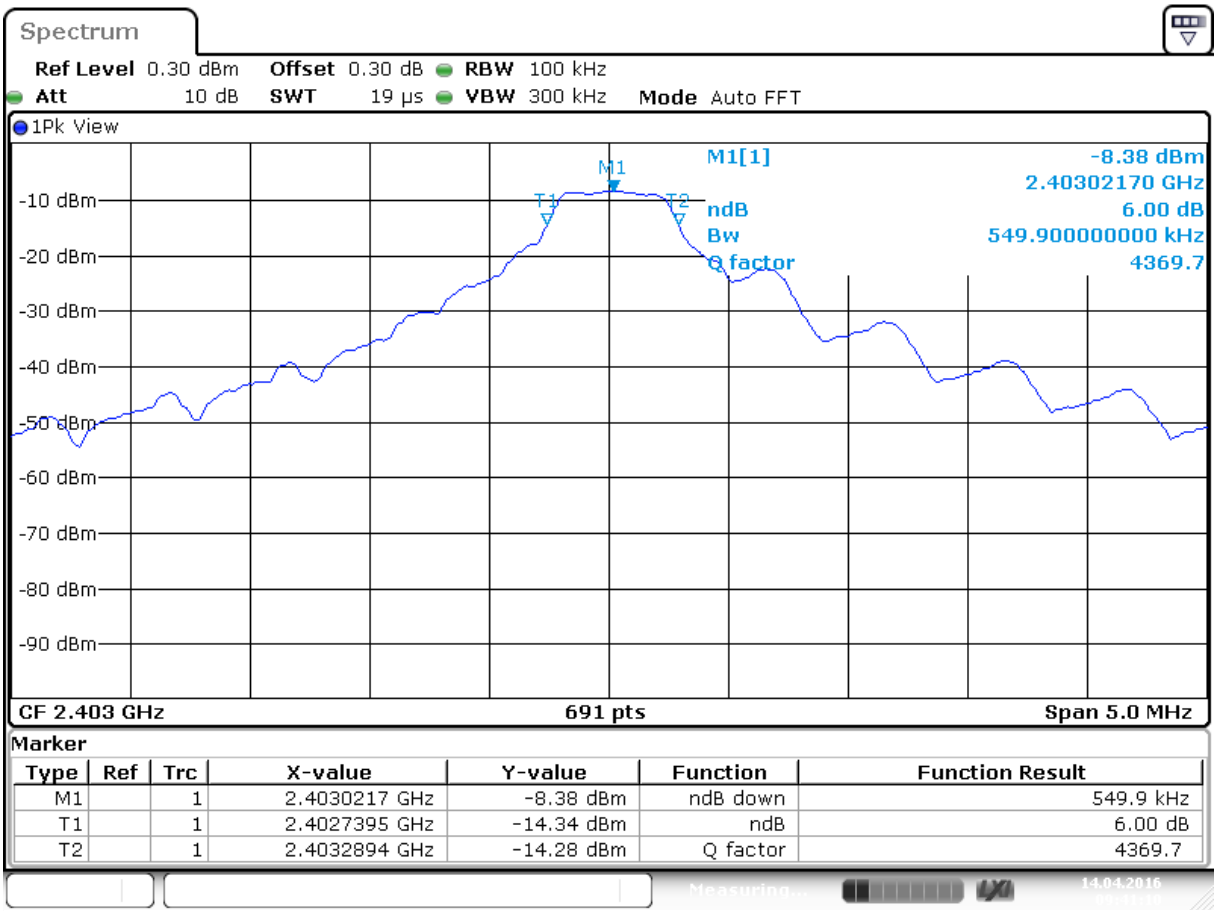
The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission sideskirts. The resolution bandwidth shall be set as close to 1% of the selected span as 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 +/-

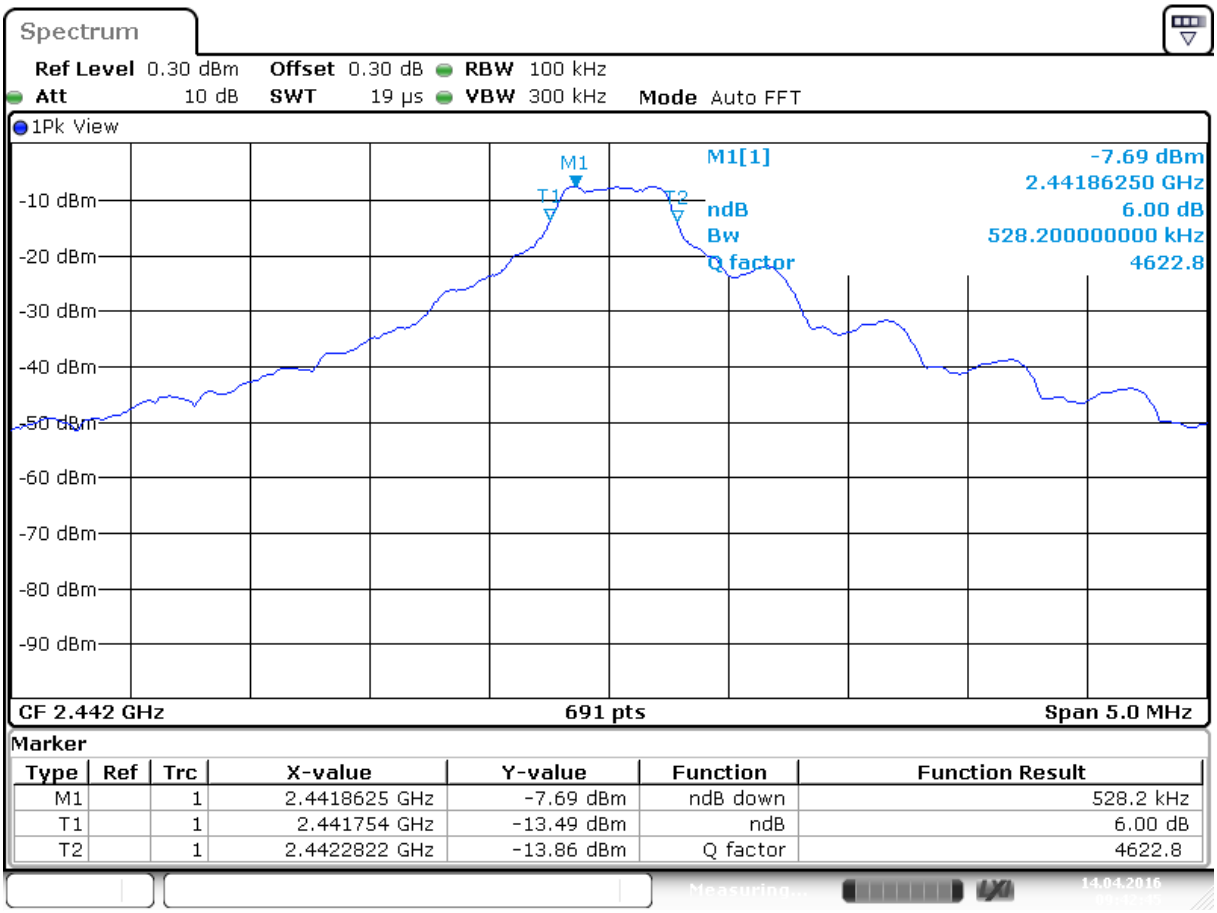
Plots A1,B1 and C1 shown on the next pages are of the 6 dB bandwidth.
Plots A2,B2 and C2 shown on the next pages are of the 99% bandwidth

6dB Bandwidth

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Verdict [Pass/Fail]	Plot number
2403	1425.47	549.90	>500	Pass	A1/A2
2442	1396.53	528.20	>500	Pass	B1/B2
2480	1338.64	506.50	>500	Pass	C1/C2

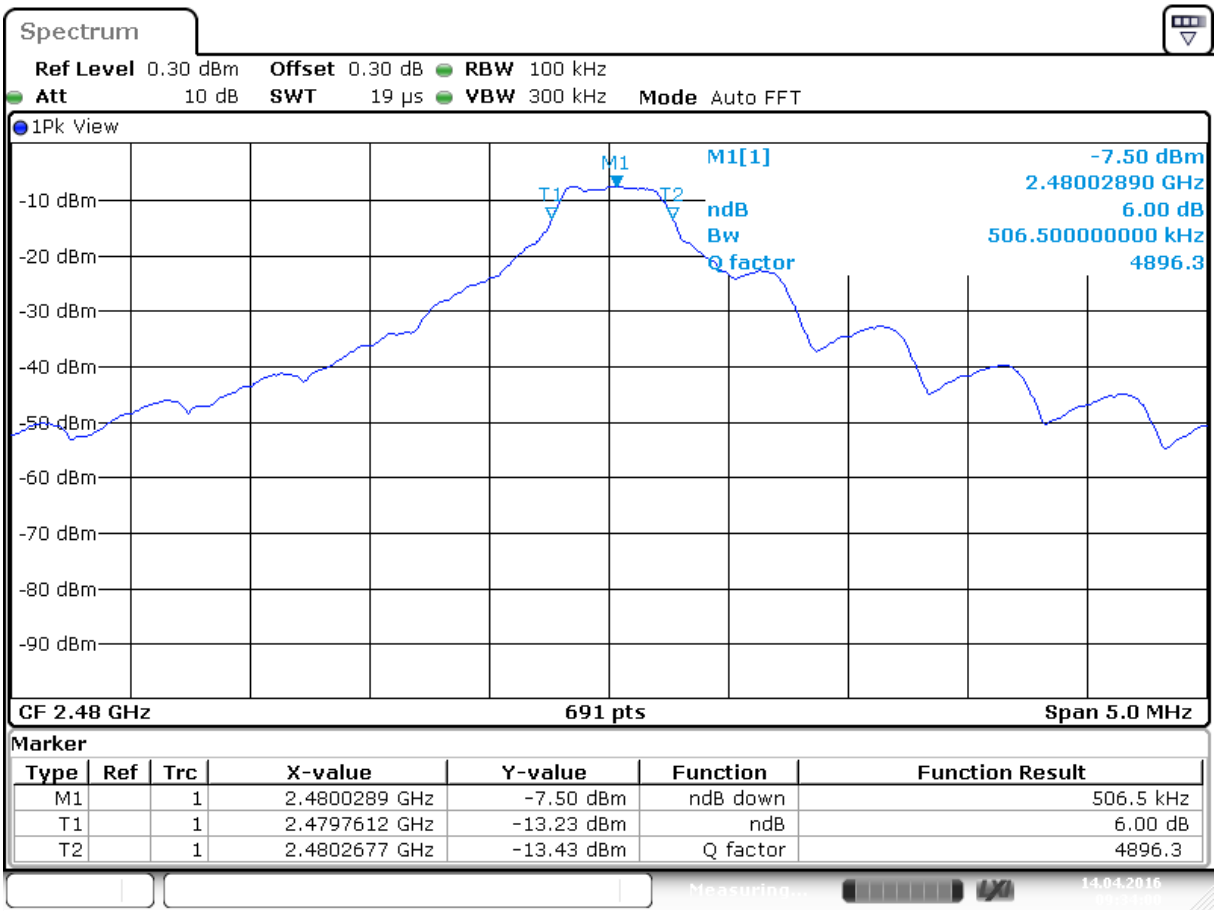


Plot A1



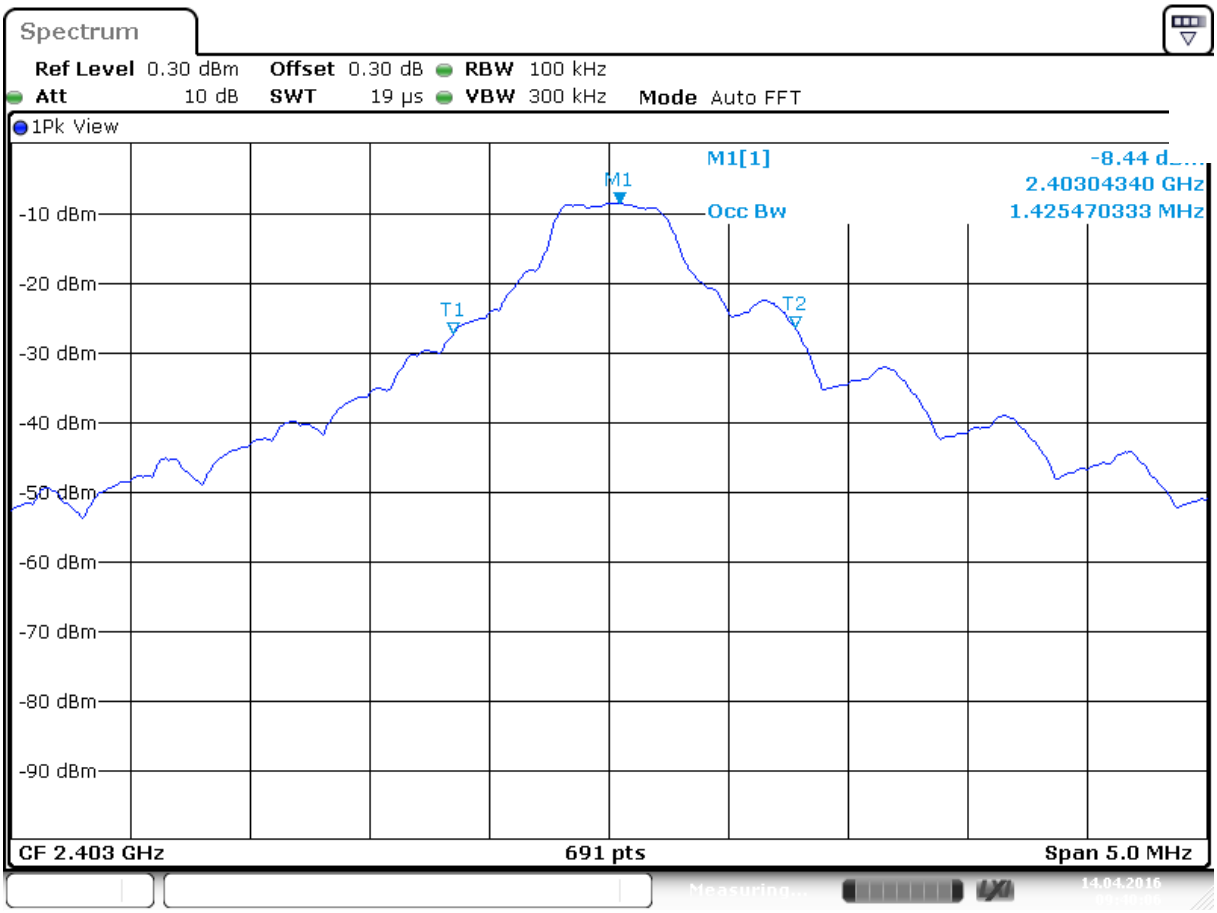
Date: 14.APR.2016 09:42:45

Plot B1



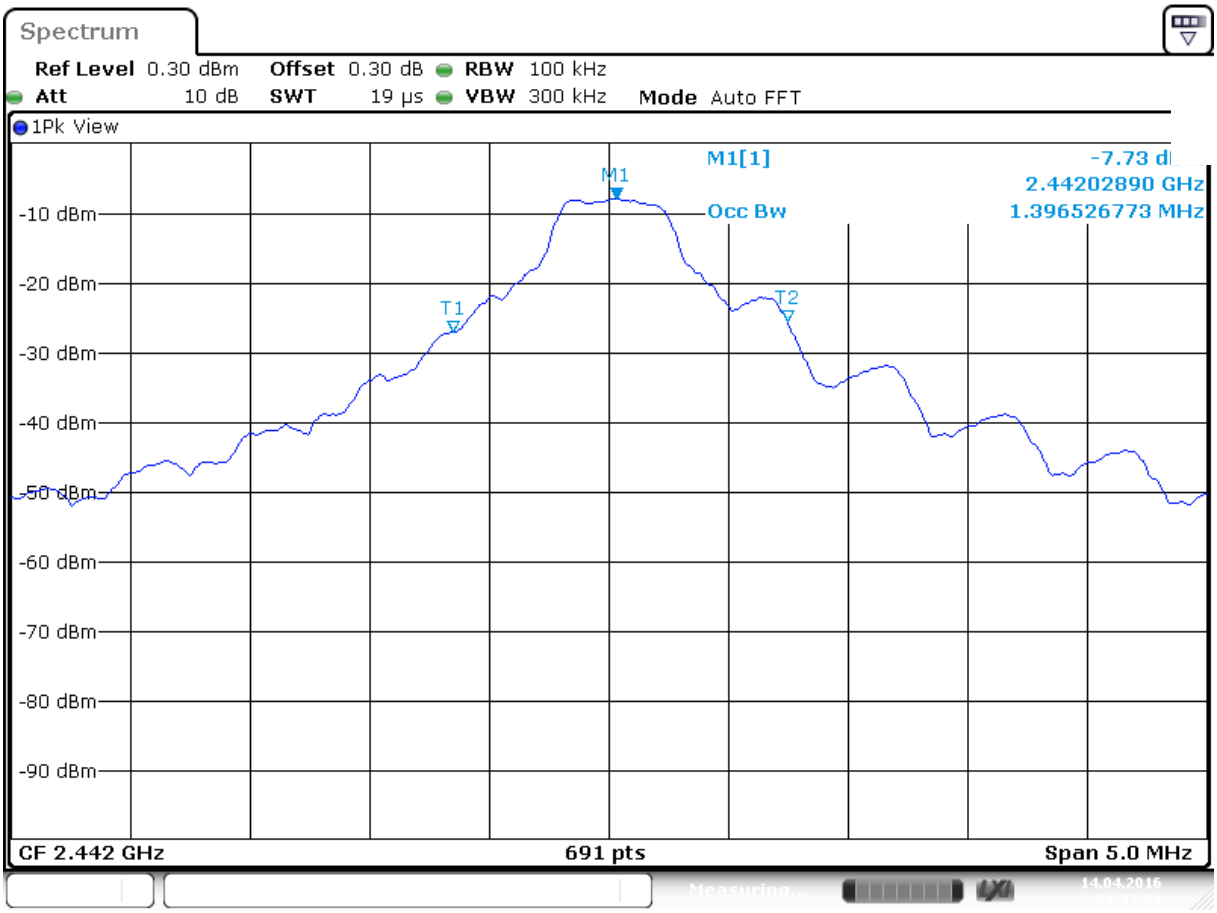
Date: 14.APR.2016 09:34:00

Plot C1



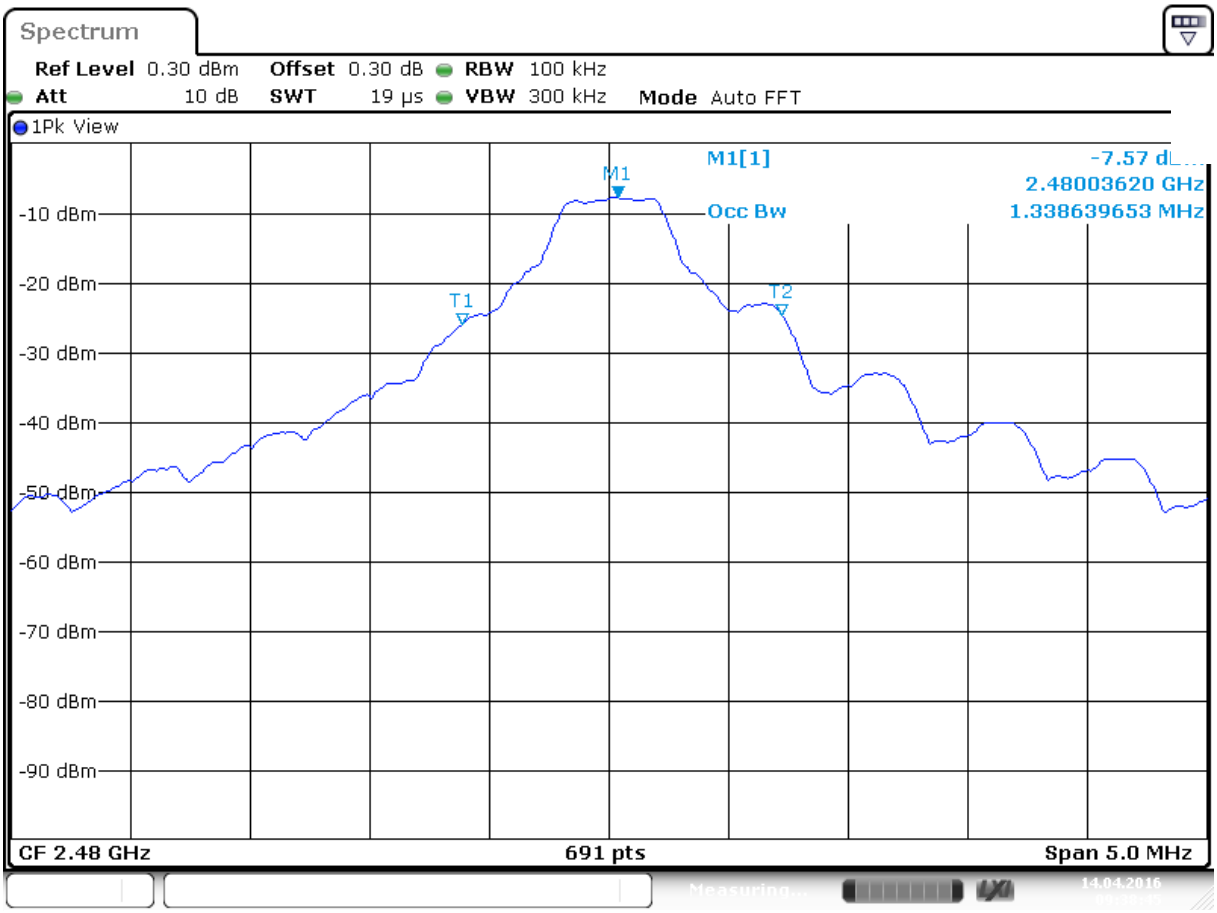
Date: 14.APR.2016 09:40:06

Plot A2



Date: 14.APR.2016 09:37:08

Plot B2



Date: 14.APR.2016 09:38:45

Plot C2

5.1.3 Peak Power Spectral Density

RESULT: PASS

Date of testing: 2016-04-14

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:

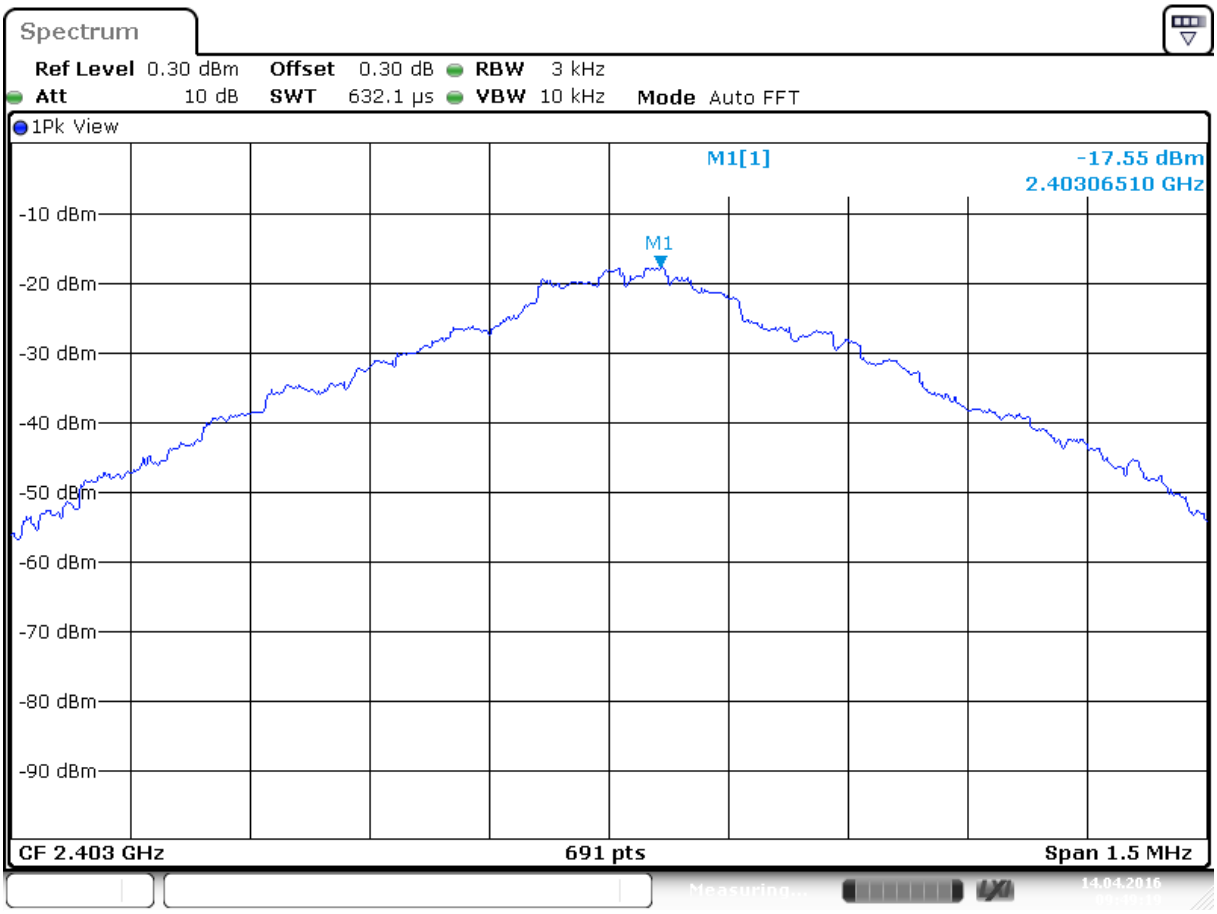
ANSI C63.10-2013

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 (0.3 dB).

Measurement uncertainty is +/- 0.7 dB.

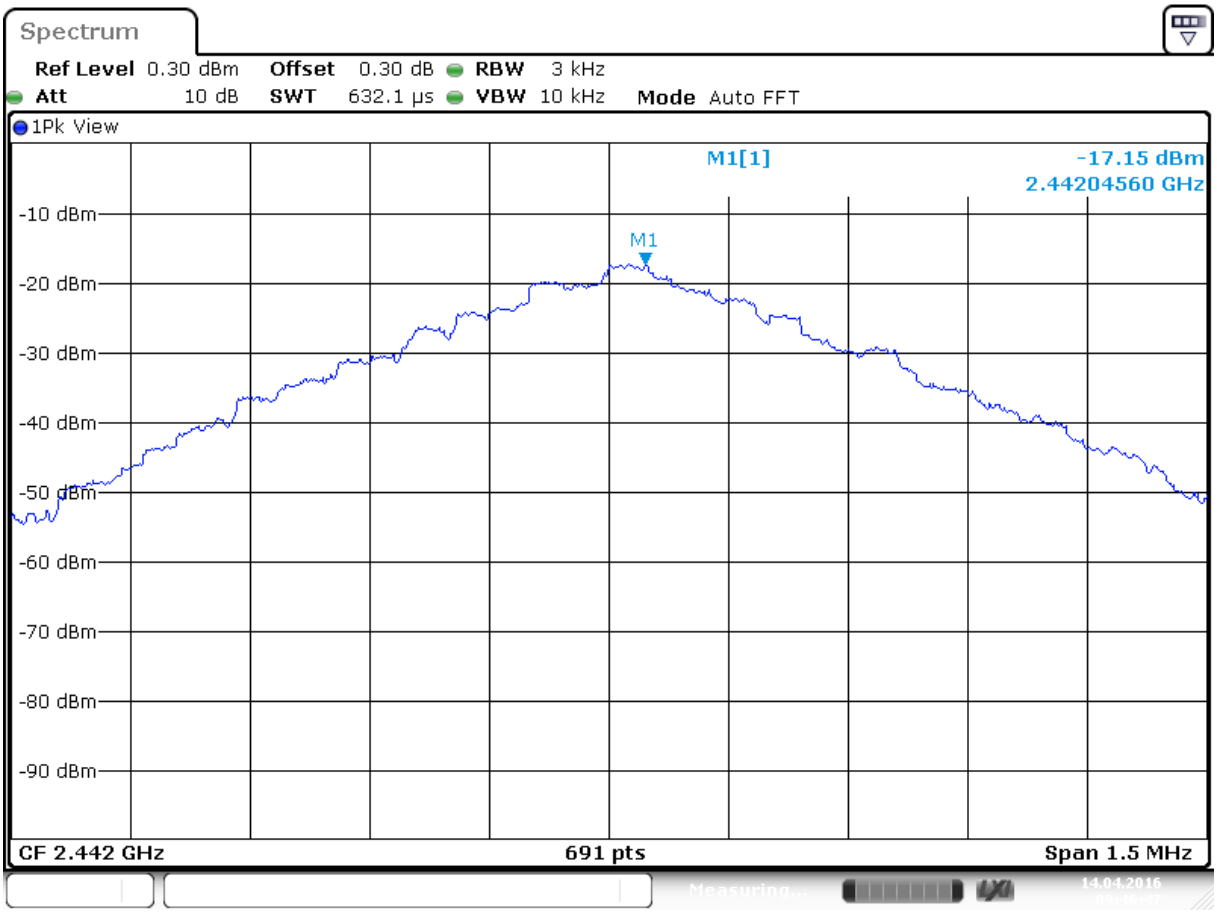
Peak Power Spectral Density

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Verdict [Pass/Fail]	Plot
2403	-17.55	8	Pass	A
2442	-17.15	8	Pass	B
2480	-16.55	8	Pass	C



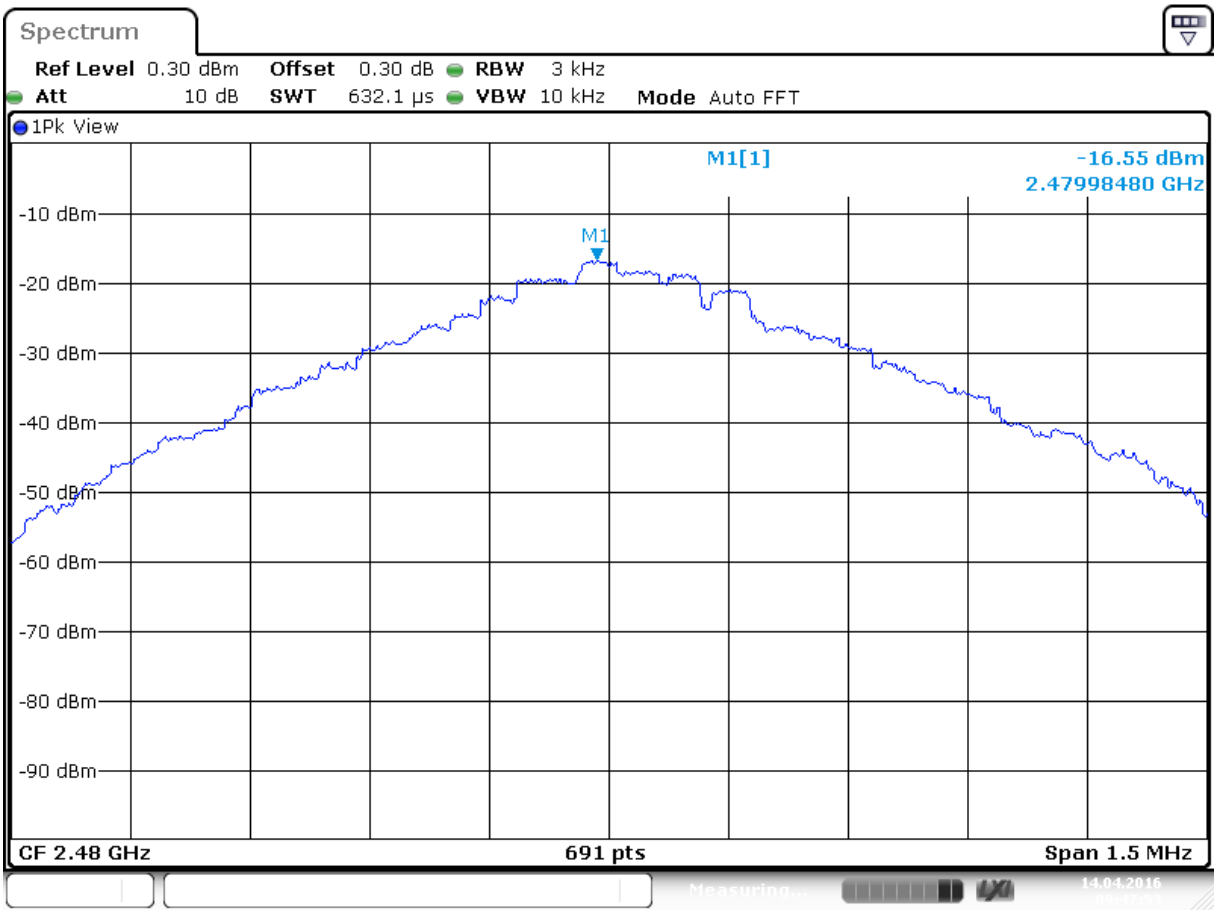
Date: 14.APR.2016 09:49:19

Plot A



Date: 14.APR.2016 09:46:47

Plot B



Date: 14.APR.2016 09:47:53

Plot C

5.1.4 Band Edge Conducted Emissions

RESULT: Pass

Date of testing: 2016-04-14

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:

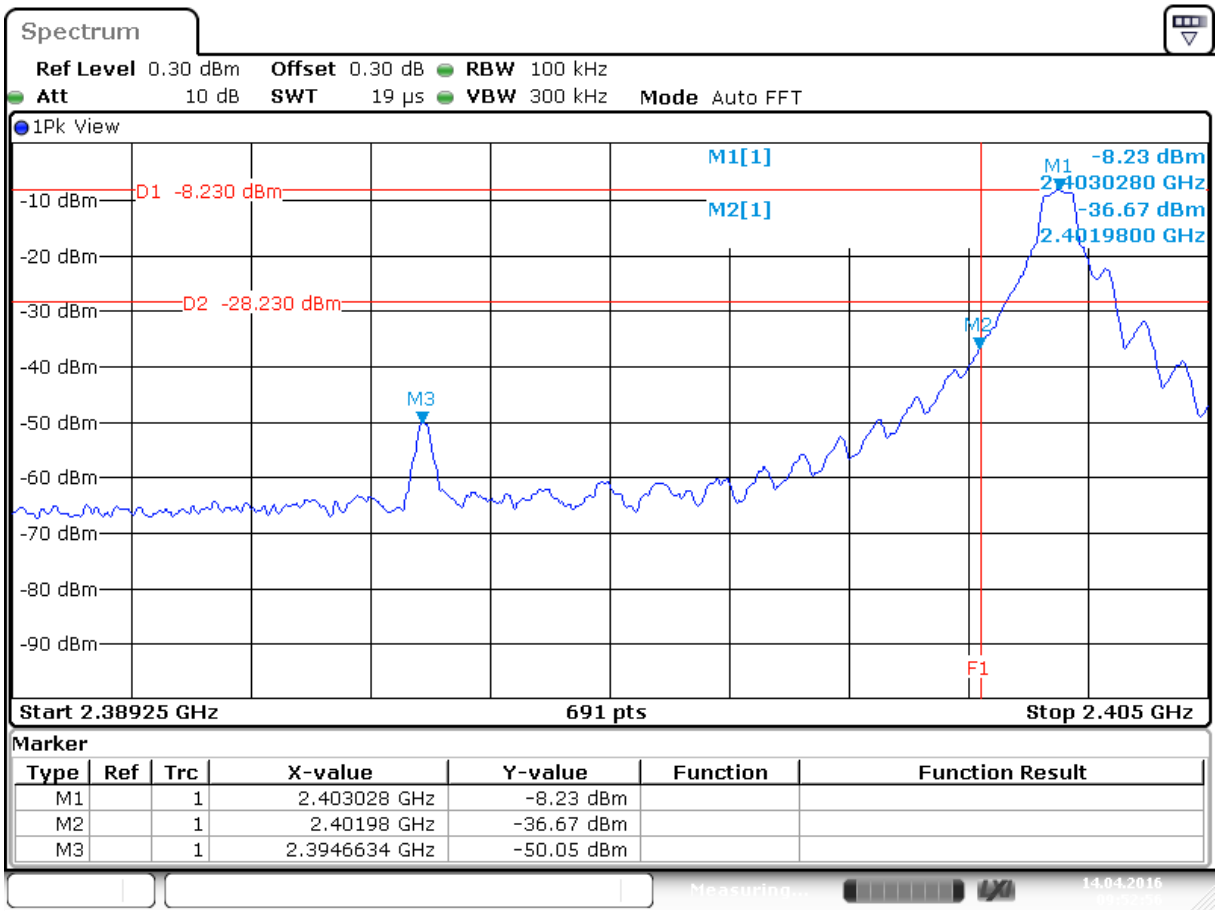
ANSI C63.10-2013
Section 11.13

The marker-delta method, as described in ANSI C63.10 was used.

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 +/- 0.7 dB.

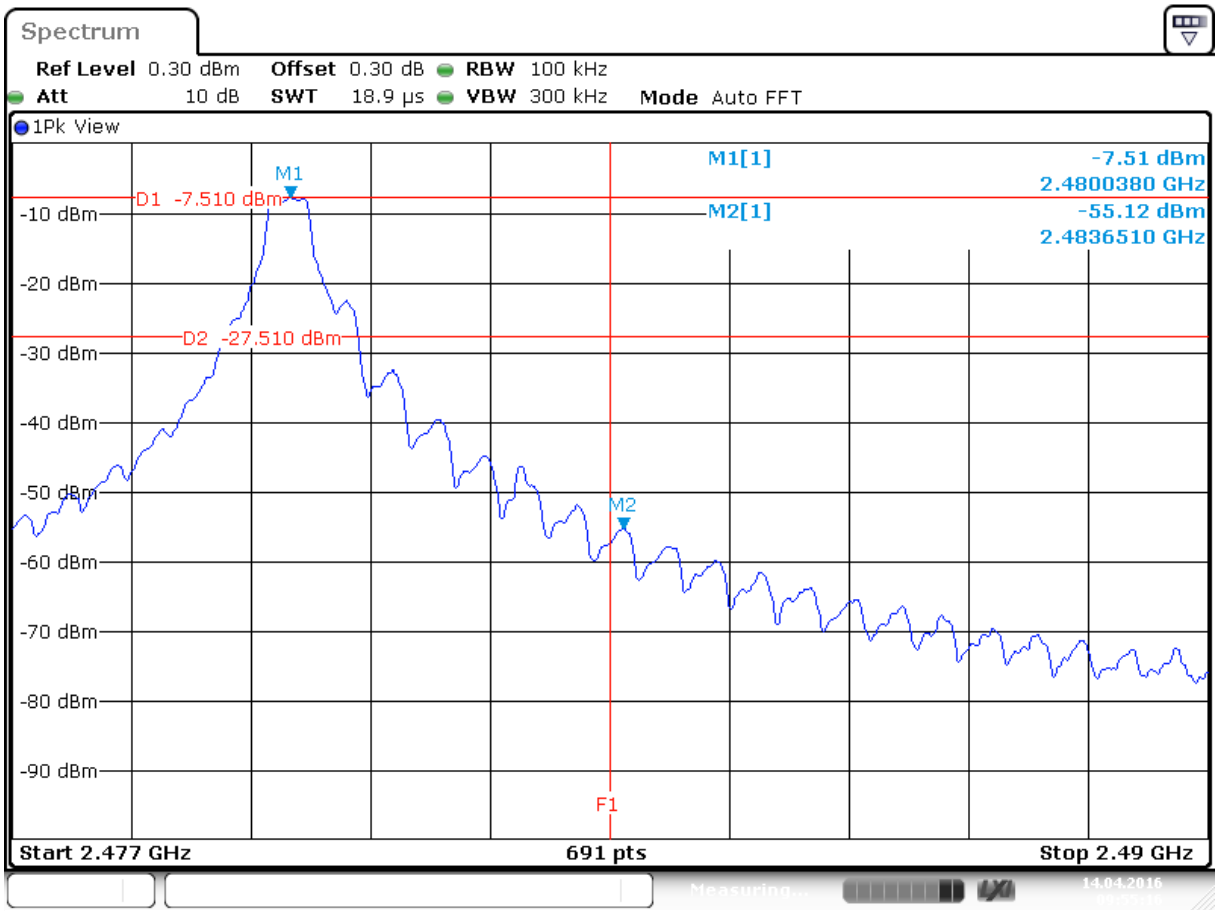
Results: All out of band spurious emissions are more than 20 dB below the fundamental.
See the figures on the following pages.



Date: 14.APR.2016 09:52:56

Plot: Band Edge Conducted Emission, Spectral Diagram, 2403 MHz

Plot showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 2400 MHz.



Date: 14.APR.2016 09:55:16

Plot: Band Edge Conducted Emission, Spectral Diagram, 2480 MHz.
Plot showing more than 20 dB band edge attenuation.
F1 shows the band edge frequency of 2483.5 MHz.

The radiated emissions in the restricted band would be:
-55.12 dBm (M2 level of above plot)+ 2 dBi antenna gain +95.2 conversion factor = 52.2 dBµV/m at 3m where the limit is 54 dBµV/m at 3m.

5.1.5 Radiated Spurious Emissions of Transmitter

RESULT: PASS

Date of testing: 2016-04-05

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

The EUT is considered as floor-standing equipment not typically installed with its base in direct electrical contact with, or connected to, a metal floor or grid. The EUT was placed on the testsite turntable with insulation material in-between of 4mm thickness to prevent electric contact.

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. The levels are expressed in dBm which are derived from dBm = E(dBµV/m) – 95.2dB. Where Peak (Pk) values where at least 6 dB under the Average (Av) limits, Av value was not tested. Were Average values were tested, Average values were measured using a 10Hz Video Bandwidth.

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

Frequency [MHz]	Antenna Orientation	Level QP [dBµV/m]	Limit QP [dBµV/m]	Verdict [Pass/Fail]
111.48*^{R}	Vertical	24.8	43.5	Pass
208.48	Vertical	24.0	43.5	Pass
258.92*^{R}	Vertical	28.1	46.0	Pass
522.76	Vertical	35.5	46.0	Pass
858.38 (noise)	Vertical	41.7	46.0	Pass
947.62 (noise)	Vertical	43.2	46.0	Pass

Note: - 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.
- *^{R} refers to a frequency in a restricted band
- Quasi Peak detector used with a bandwidth of 120 kHz.
- Measurement uncertainty is +/- 5.0 dB.

Radiated Emissions, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 2403 MHz.

Frequency [MHz]	Antenna Orientation	Detector	Bandwidth (MHz)	Level [dBm]	Limit [dBm]	Result
1258.3*[R]	Vertical	Pk	1	-34.5	-21.2	Pass
1258.3*[R]	Vertical	Av	1	-47.7	-41.2	Pass
1440.8*[R]	Vertical	Pk	1	-55.8	-41.2 (Av) -21.2 (Pk)	Pass
4806*[H*R]	Vertical	Pk	1	-45.8	-21.2	Pass
4806*[H*R]	Vertical	Av	1	-52.8	-41.2	Pass
7210*[HR]	Vertical	Pk	1	-51.7	-41.2 (Av) -21.2 (Pk)	Pass
7408*[R]	Vertical	Pk	1	-53.5	-41.2 (Av) -21.2 (Pk)	Pass

Radiated Emissions, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 2442 MHz.

Frequency [MHz]	Antenna Orientation	Detector	Bandwidth (MHz)	Level [dBm]	Limit [dBm]	Result
1086*[R]	Horizontal	Pk	1	-51.0	-41.2 (Av) -21.2 (Pk)	Pass
1441.8*[R]	Vertical	Pk	1	-50.3	-41.2 (Av) -21.2 (Pk)	Pass
1554*[R]	Vertical	Pk	1	-54.2	-41.2 (Av) -21.2 (Pk)	Pass
4884[*H*R]	Vertical	Pk	1	-47.4	-41.2 (Av) -21.2 (Pk)	Pass
7326*[HR]	Vertical	Pk	1	-59.0	-41.2 (Av) -21.2 (Pk)	Pass

Radiated Emissions, 1 - 25GHz, Horizontal and Vertical Antenna Orientations, 2480 MHz.

Frequency [MHz]	Antenna Orientation	Detector	Bandwidth (MHz)	Level [dBm]	Limit [dBm]	Result
1234*R	Vertical	Pk	1	-35.0	-21.2	Pass
1234*R	Vertical	Av	1	-47.0	-41.2	Pass
3891*R	Vertical	Pk	1	-50.7	-41.2 (Av) -21.2 (Pk)	Pass
4924*H*R	Vertical	Pk	1	-46.9	-41.2 (Av) -21.2 (Pk)	Pass
7452*H*R	Vertical	Pk	1	-54.2	-41.2 (Av) -21.2 (Pk)	Pass
9920.2*H	Vertical	Pk	1	-50.0	-41.2 (Av) -21.2 (Pk)	Pass

Radiated field strength measurements (1 - 25 GHz, E-field), EUT normal operation

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (MHz)	Level [dBm]	Limit [dBm]	Result
1431	Horizontal	Peak	1	-47.7	-41.2 Av -21.2 Pk	Pass
4810*R	Horizontal	Peak	1	-46.0	-21.2	Pass
4810*R	Horizontal	Average	1	<-50	-41.2	Pass
4884*R	Horizontal	Peak	1	-46.2	-21.2	Pass
4884*R	Horizontal	Average	1	<-50	-41.2	Pass
4921*H*R	Vertical	Peak	1	-45.7	-41.2 Av -21.2 Pk	Pass
4921*H*R	Vertical	Average	1	<-50	-41.2	Pass
4960*H*R	Vertical	Peak	1	-45.9	-41.2 Av -21.2 Pk	Pass
4960*H*R	Vertical	Average	1	<-50	-41.2	Pass
7212*H	Vertical	Peak	1	-49.1	-41.2 Av -21.2 Pk	Pass
7360*H*R	Vertical	Peak	1	-54.0	-41.2 Av -21.2 Pk	Pass

Notes:
- *R refers to a frequency in a restricted band,
- *H refers to a frequency which is a harmonic of the fundamental.
- Both transmitters were transmitting at the same time.
- 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.

5.2 AC Power Line Conducted Measurements

RESULT: Pass.

Date of testing: 2016-04-18

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 μH/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 (dBμV) Quasi-Peak	Conducted Limit (dBμV) 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 μH / 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 is considered a floor-standing device. The EUT is placed on a non-conductive plate of 5mm thick above the ground plane, so to isolate it from the ground plane because the EUT normally does not make electrical contact with a ground plane. The EUT was positioned at least 80cm from the LISN. The power cable was routed over the non-conductive plate to the LISN.

5.2.1 AC Power Line Conducted Emission of Transmitter

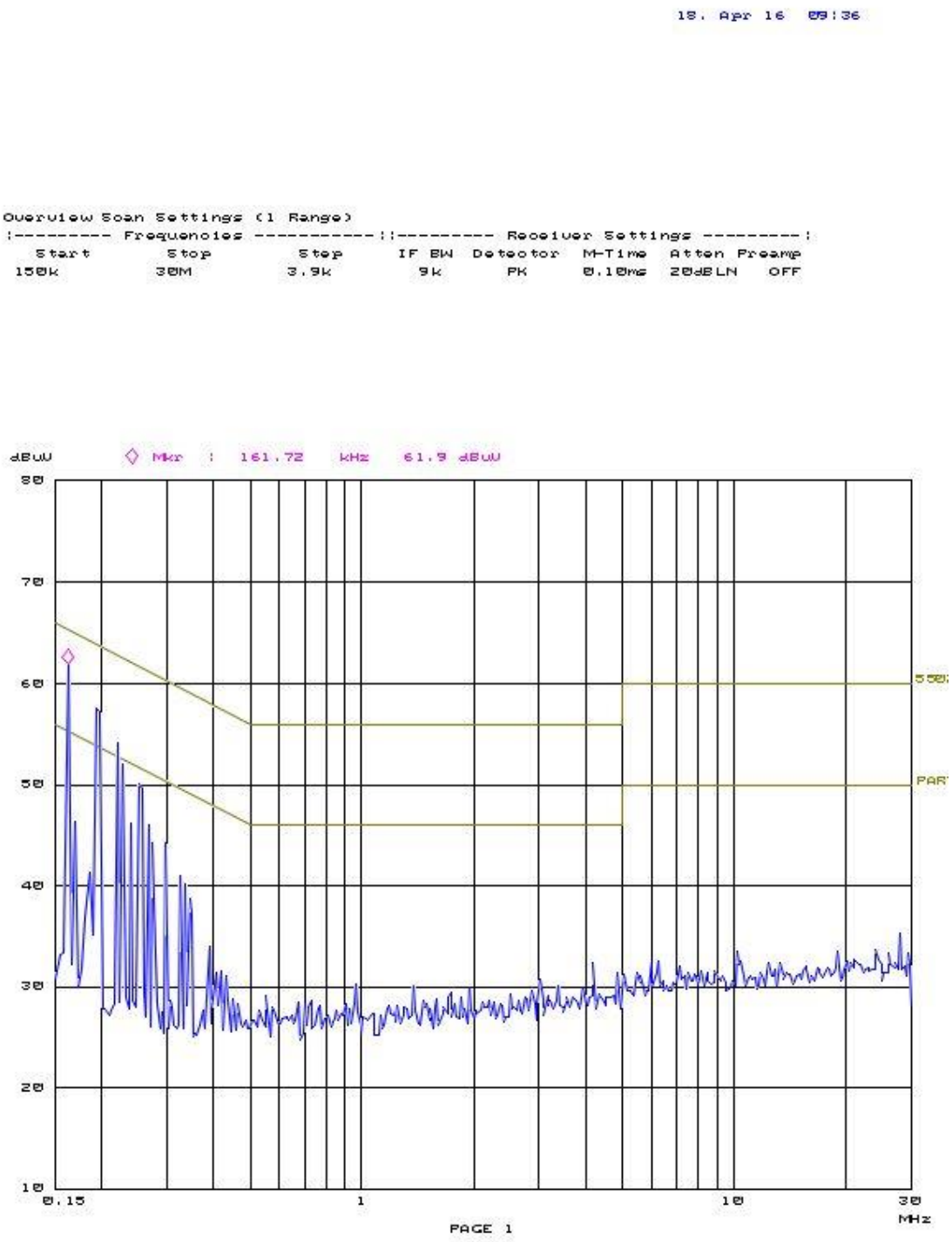
Frequency (MHz)	Measurement results (dBµV) L1		Measurement results (dBµV) L2/Neutral		Limits (dBµV)		Verdict (Pass/Fail)
	QP	AV	QP	AV	QP	AV	
0.15000	50.0	25.0	54.0	24.3	66.0	56.0	Pass
0.16172	52.6	24.7	52.4	23.8	65.5	55.5	Pass
0.16953	51.6	23.0	50.9	23.0	65.0	55.0	Pass
0.19297	48.4	22.9	48.8	22.5	64.0	54.0	Pass
0.22031	44.9	19.7	44.8	19.6	62.8	52.8	Pass
0.22813	43.9	20.5	43.9	20.4	62.4	52.4	Pass
0.25156	41.0	19.7	41.5	19.5	61.8	51.8	Pass
0.26719	39.2	15.9	39.2	15.9	61.1	51.1	Pass
0.27500	38.0	15.5	37.1	15.0	60.8	50.8	Pass
0.29844	35.3	15.5	35.2	15.4	60.2	50.2	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 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.

5.2.2 Plots of the AC Power-line Conducted Emissions



Plot of the AC Power-line Conducted emissions on L1

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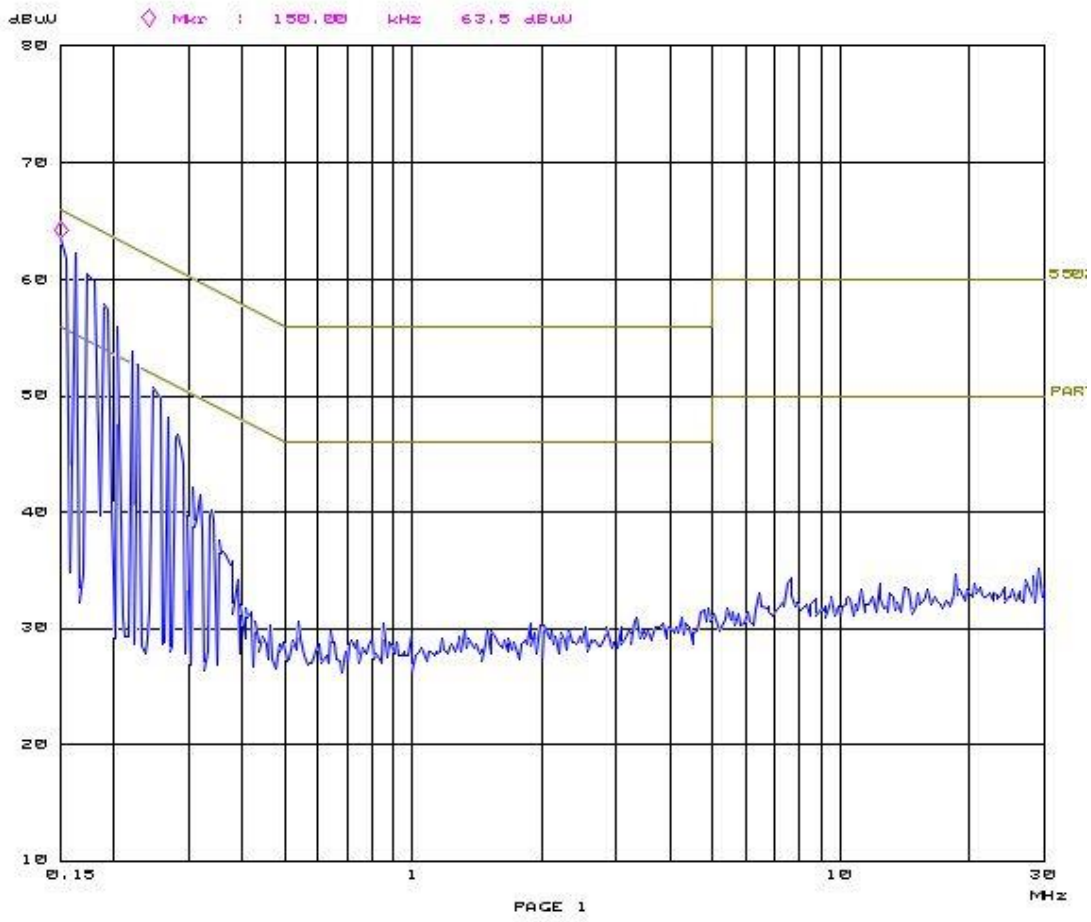
Overview Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	3.9k	9k	PK	0.10ms	20dBLN	OFF



Plot of the AC Power-line Conducted emissions on L2

End of report

TEST REPORT CONCERNING THE COMPLIANCE OF A Low Power Communication Device Transmitter (DXX) OPERATING IN THE FREQUENCYRANGE 2402 – 2480 MHz, BRAND Tacx, MODEL T2240 WITH 47 CFR PART 15 (10-1-14 Edition) and RSS-Gen (Issue 4, November 2014) and RSS-210 (Issue 8, December 2010)

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April 28, 2016

FCC listed : 90828
Industry Canada : 2932G-2
R&TTE and, EMC Notified Body : 1856

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MEASUREMENT/TECHNICAL REPORT

Brand: Tacx
Model: T2240

FCC ID: 2AAMI-T2240
IC: 11353A-T2240

This report concerns:	Original grant,certification / ~~Limited Single Modular Approval~~ ~~Class 2 change Verification~~
Equipment type:	Low Power Communication Device Transmitter (DXX)

Report prepared by:		
	Name	: Richard van der Meer
	Company name	: TÜV Rheinland Nederland B.V.
	Address	: Eiberkamp 10
	Postal code/city	: 9351VT Leek
	Mailing address	: P.O. Box 37
	Postal code/city	: 9350AA Leek
	Country	: The Netherlands
	Telephone number	: + 31 594 505 005
	Telefax number	: + 31 594 504 804
	E-mail	: products@nl.tuv.com

The data taken for this test and report herein was done in accordance with 47 CFR Part 15 (10-1-14 Edition), RSS-Gen (Issue 4, November 2014) and RSS-210 (Issue 8, December 2010) and the measurement procedures of ANSI C63.10-2013. TÜV Rheinland Nederland B.V. at Leek, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: April 28, 2016 Signature: 

Pieter de Beer
Technical Manager
TÜV Rheinland Nederland B.V.

Description of test item

EUT	:	Low Power Communication Device Transmitter (DXX)
Manufacturer	:	Tacx b.v.
Brand	:	Tacx
Model(s)	:	T2240
Serial Number	:	951500057 (conducted tests) and 951500042 (radiated tests)
Voltage input rating	:	40 Vac
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
Remarks	:	n.a.

Applicant information

Applicant's representative	:	Martin Smits
Company	:	Tacx b.v.
Address	:	Rijksstraatweg 52
Postal code	:	2241BW,
City	:	Wassenaar
Country	:	Netherlands
Telephone number	:	+31705119259
Telefax number	:	+31705116411

Test(s) performed

Location	:	Leek
Test(s) started	:	April 04, 2016
Test(s) completed	:	April 18, 2016
Purpose of test(s)	:	Equipment Authorization (Original grant/certification)

Test specification(s)	:	47 CFR Part 15, Subpart C, Section 15.249 (10-1-14 Edition) and RSS-GEN (ISSUE 4, NOVEMBER 2014) AND RSS-210 (ISSUE 8, DECEMBER 2010).
Test engineer(s)	:	R. van der Meer 
Report written by	:	R. van der Meer 
Report date	:	April 28, 2016

Table of contents

1 General information.

1.1 Product description.

The brand Tacx, Model T2240, hereafter referred to as EUT, is a Low Power Communication Device Transmitter (DXX), BlueTooth Low Energy used in an Interactive Smart Trainer with Electric Motor Brake for bicycles to transmit performance data to PC, Tablet or smartphone. The EUT is factory configured for the 2402-2480 MHz band. The EUT also contains a Digital Transmission System (DTS) operating in the frequencyband 2403-2480 MHz, based on ANT technology, although the two transmitters never transmit at the same time. The DTS transmitter is covered in a separate report.

1.1.1 Introduction.

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

1.2 Related submittal(s) and/or Grant(s).

1.2.1 General.

This test report supports the original grant/certification in equipment authorization files under:
FCC ID: 2AAMI-T2240 and IC: 11353A-T2240.

1.3 Tested system details.

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

EUT	:	Low Power Communication Device Transmitter (DXX)
Manufacturer	:	Tacx b.v.
Brand	:	Tacx
Model(s)	:	T2240
Serial Number	:	951500057 (conducted tests) and 951500042 (radiated tests)
Voltage input rating	:	40 Vac
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
Spreading technique	:	Digital modulation
Remarks	:	n.a.

Auxiliary equipment 1 (AUX1)	:	Notebook computer
Brand	:	Hewlett-Packard
Model	:	Compaq 6710b
Serial number	:	CNU8150MD3
Remark	:	used for programming the EUT, property applicant

Auxiliary equipment 2 (AUX2)	:	Programming interface
Brand	:	Segger
Model	:	J-Link Base version 9.3
Serial number	:	59307055
Remarks	:	used for programming the EUT, property applicant

1.3.1 Description of input and output ports.

No input and output connections ports on the EUT during testing, but for programming the following connections were used.

Number	Terminal	From	To	Remarks
1	Mains	Mains	(AUX1)	--
2	Usb	AUX1	AUX2	--
3	datacom	AUX2	EUT	--
4	Power	AUX3	EUT	--

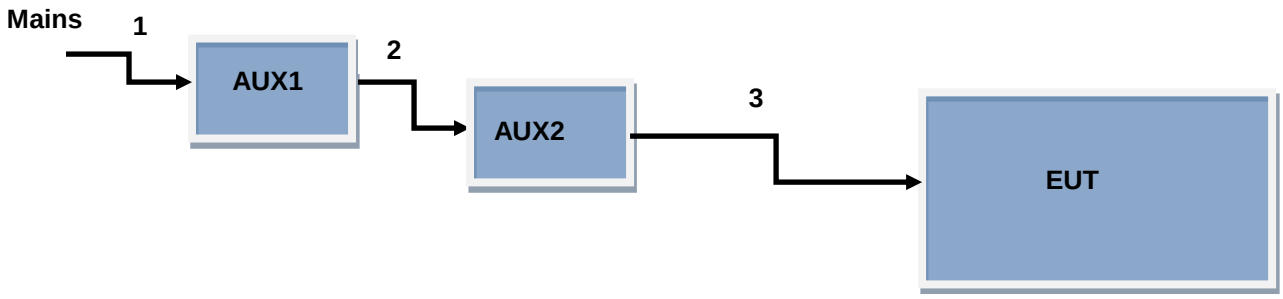


Figure 1. Basic set-up for programming

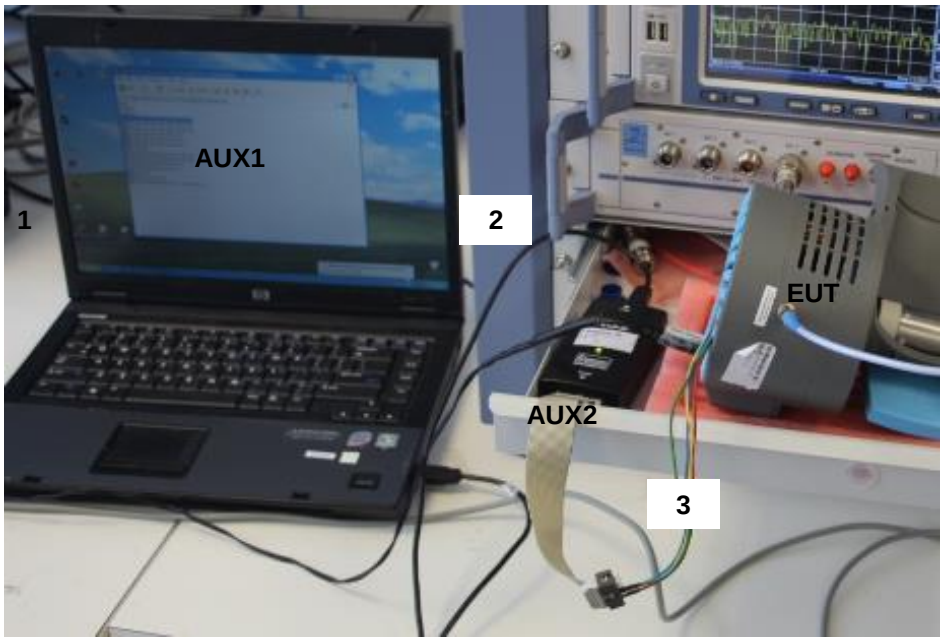


Photo 1: basic setup for frequency programming

The testsoftware (as installed on AUX1) is used to program the operating frequency of the EUT. AUX2 were used only to program the operating frequency and once set the auxiliary items were removed from the test-setup and the EUT operates on it's own.

1.4 Test results summary

The EUT was tested in accordance with the specifications given in the table below.

Test Standard		Description		Pass / Fail
47 CFR Part 15 (10-1-14 Edition)	**RSS-Gen /RSS-210**		**Page**	
15.207(a)	RSS-Gen(8.8)	AC Power Line Conducted Emissions	16 - 19	Not Applicable
15.205 and 15.209	RSS-Gen(8.9, 8.10) and RSS-210 (A2.5)	Radiated Emissions	11 - 15	Pass
15.249(d)	RSS-210 (section A2.9)	Band Edge Emissions	20 - 22	Pass
15.215(c)	RSS-Gen(6.6)	Occupied Bandwidth	23 - 28	Pass

Table : testspecifications

Testmethods: ANSI C63.10-2013 and RSS-Gen Issue 4, November 2014

1.5 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-14 Edition), sections 15.31, 15.205,15.207, 15.209 and 15.249, RSS-GEN (ISSUE 4, NOVEMBER 2014) RSS-210 (ISSUE 8, DECEMBER 2010).

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

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

1.6 Test facility.

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 90828. 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.

1.7 Test conditions.

Normal test conditions:

Temperature (*) : +15°C to +35°C
Relative humidity(*) : 20 % to 75 %
Supply voltage : 40 Vac through a 230Vac Power Supply Adapter (AUX1)

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.

2 System test configuration.

2.1 Justification.

As load, a system with a driving control and motor was applied to drive the wheel. The performance could be monitored on a smartphone.
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.

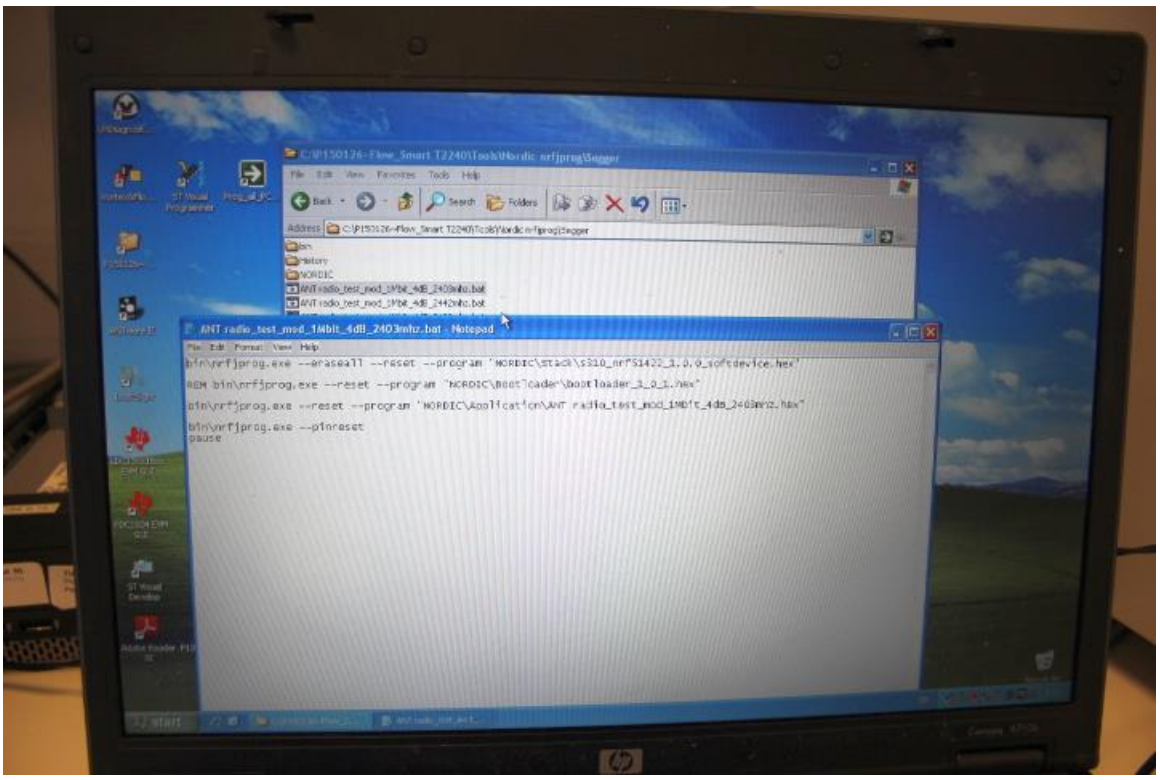
2.2 EUT mode of operation.

The EUT has been tested in continues transmit mode with a modulated carrier. The intentional radiator tests have been performed with a complete functioning EUT.

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 : nRFTools 51422 v1.0.0

Batch files programmed by the applicant are used to make the required settings.
This software was running on a laptop computer (AUX1).



Photograph of the software (and settings) as used on AUX1

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance.

2.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance.

2.5 Product Labeling

The product labeling information is available in the technical documentation package.

2.6 Block diagram of the EUT.

The block diagram is available in the technical documentation package.

2.7 Schematics of the EUT.

The schematics are available in the technical documentation package.

2.8 Part list of the EUT.

The part list is available in the technical documentation package.

3 Radiated emission data.

RESULT: PASS

Date of testing: 2016-04-05

Frequency range: 30MHz - 25GHz

Requirements:

FCC 15.205, FCC 15.209, FCC 15.249 and IC RSS-Gen(8.9, 8.10) and RSS-210(A2.5)

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a)/ RSS-Gen (8.8) 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).

Test procedure:

ANSI C63.10-2013.

The EUT is considered as **floor-standing equipment** not typically installed with its base in direct electrical contact with, or connected to, a metal floor or grid. The EUT was placed on the floor with insulation material in-between of 4mm thickness to prevent electric contact.

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. The levels are expressed in dBm which are derived from dBm = E(dBµV/m) – 95.2dB. Where Peak (Pk) values where at least 6 dB under the Average (Av) limits, Av value was not tested. Were Average values were tested, Average values were measured using a 10Hz Video Bandwidth.

3.1 Radiated field strength measurements (30 MHz – 1 GHz, E-field)

3.1.1 Radiated field strength measurements (30 MHz- 1 GHz, E-field)

Frequency [MHz]	Antenna Orientation	Level QP [dBµV/m]	Limit QP [dBµV/m]	Result Pass/Fail
111.48*R	Vertical	24.8	43.5	Pass
208.48	Vertical	24.0	43.5	Pass
258.92*R	Vertical	28.1	46.0	Pass
522.76	Vertical	35.5	46.0	Pass
858.38 (noise)	Vertical	41.7	46.0	Pass
947.62 (noise)	Vertical	43.2	46.0	Pass

Table 1 Radiated emissions of the EUT in the frequency range 30 MHz – 1 GHz.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, 15.249 and RSS-210 Section A2.9 and RSS-Gen section 8.9 with the EUT operating in continues transmit mode are depicted in Table 1.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit. The 6 highest values are noted
2. Measurement uncertainty is ±5.0dB
3. The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in 2 positions (horizontal and vertical) because of it's physical limitations, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
4. Preliminary measurements indicated that the radiated emissions from EUT were not affected by the EUT's operating mode or frequency.
5. A Quasi-peak detector was used with a resolution bandwidth of 120 kHz.

Used test equipment and ancillaries:

A00314	A00447	A00450	A00257	A00235	A00258	A00444	A00466	

3.2 Radiated field strength measurements (1 - 25 GHz, E-field)

3.2.1 Radiated field strength measurements (1 - 25 GHz, E-field), EUT's TX Frequency 2402 MHz

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level [dBm]	Limit [dBm]	Result
2402 (fundamental)	Horizontal	Peak	1000	-4.7	-1.2 Av +18.9 Pk	Pass
1258.3*[R]	Vertical	Peak	1000	-36.2	-41.2 (Av) -21.2 (Pk)	Pass
1440.8*[R]	Vertical	Peak	1000	<-55.0	-41.2 (Av) -21.2 (Pk)	Pass
4806*[H*R]	Vertical	Peak	1000	-47.5	41.2 (Av) -21.2 (Pk)	Pass
7210*[HR]	Vertical	Peak	1000	<-50.0	-41.2 (Av) -21.2 (Pk)	Pass
7408*[R]	Vertical	Peak	1000	<-50.0	-41.2 (Av) -21.2 (Pk)	Pass

Table 2

3.2.2 Radiated field strength measurements (1 - 25 GHz, E-field), EUT's TX Frequency 2440 MHz

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level [dBm]	Limit [dBm]	Result
2440 (fundamental)	Horizontal	Peak	1000	-5.1	-1.2 Av +18.9 Pk	Pass
1086*[R]	Horizontal	Peak	1000	-51.0	-41.2 Av -21.2 Pk	Pass
1441.8*[R]	Vertical	Peak	1000	-50.0	-41.2 Av -21.2 Pk	Pass
1554*[R]	Vertical	Peak	1000	-53.3	-41.2 Av -21.2 Pk	Pass
4884*[H*R]	Vertical	Peak	1000	-47.9	-21.2 Pk	Pass
7326*[HR]	Vertical	Peak	1000	<-55.0	-41.2 Av -21.2 Pk	Pass

Table 3

3.2.3 Radiated field strength measurements (1 - 25 GHz, E-field), EUT's TX Frequency 2480 MHz

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level [dBm]	Limit [dBm]	Result
2480 (fundamental)	Horizontal	Peak	1000	-5.8	-1.2 Av +18.9 Pk	Pass
1234*R	Vertical	Peak	1000	-37.4	-41.2 (Av) -21.2 (Pk)	Pass
4924*H*R	Vertical	Peak	1000	-48.0	-41.2 (Av) -21.2 (Pk)	Pass
7452*H*R	Vertical	Peak	1000	-55.0	-41.2 (Av) -21.2 (Pk)	Pass
9920.2*H	Vertical	Peak	1000	-50.0	-41.2 (Av) -21.2 (Pk)	Pass

Table 4

3.2.4 Radiated field strength measurements (1 - 25 GHz, E-field), EUT normal operation

Frequency [MHz]	Antenna Orientation	Detector	Resolution Bandwidth (kHz)	Level [dBm]	Limit [dBm]	Result
1431	Horizontal	Peak	1000	-47.7	-41.2 Av -21.2 Pk	Pass
4810*R	Horizontal	Peak	1000	-46.0	-21.2	Pass
4810*R	Horizontal	Average	1000	<-50	-41.2	Pass
4884*R	Horizontal	Peak	1000	-46.2	-21.2	Pass
4884*R	Horizontal	Average	1000	<-50	-41.2	Pass
4921*H*R	Vertical	Peak	1000	-45.7	-41.2 Av -21.2 Pk	Pass
4921*H*R	Vertical	Average	1000	<-50	-41.2	Pass
4960*H*R	Vertical	Peak	1000	-45.9	-41.2 Av -21.2 Pk	Pass
4960*H*R	Vertical	Average	1000	<-50	-41.2	Pass
7212*H	Vertical	Peak	1000	-49.1	-41.2 Av -21.2 Pk	Pass
7360*H*R	Vertical	Peak	1000	-54.0	-41.2 Av -21.2 Pk	Pass

Table 5

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 and 15.249 and RSS-210 section A2.9 and RSS-Gen section 8.9 with the EUT operating in continues transmit mode are depicted in Tables 2 through 5.

Notes:

1. Field strength values of radiated emissions at frequencies not listed in the table above are more than 20 dB below the applicable limit.
2. Measurement uncertainty is ±5.0dB
3. The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in 2 positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
4. The EUT was tested on the lowest frequency (2402 MHz), a middle frequency (2440 MHz) and the highest frequency (2480 MHz) in the 2402 – 2480 MHz band wherein it operates and the normal operation with both transmitters (ANT and BLE) active, although they never transmit simultaneously.
5. Peak values were within Average limits, therefor not retested with Average detector,
6. $*^{H}$ indicates a harmonic frequency, $*^{R}$ indicates a frequency in the restricted band and $*^{H*R}$ indicates a harmonic frequency in a restricted band.

Used test equipment and ancillaries:

A00450	A00235	A00337	A00258	A00444	A00009	A00012	A00255	A00247
A00151	A00131	A00065						

4 AC Powerline Conducted Emission Data.

4.1 AC Power Line Conducted Emission data of the EUT

RESULT: Pass

Date of testing: 2016-04-18

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 µH/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 (dBµV) Quasi-Peak	Conducted Limit (dBµV) 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 µH / 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 is considered a floor-standing device. The EUT is placed on a non-conductive plate of 5mm thick above the ground plane, so to isolate it from the ground plane because the EUT normally does not make electrical contact with a ground plane. The EUT was positioned at least 80cm from the LISN. The power cable was routed over the non-conductive plate to the LISN.

4.1.1 AC Power Line Conducted Emissions

Frequency (MHz)	Measurement results (dBµV) L1		Measurement results (dBµV) L2/Neutral		Limits (dBµV)		Verdict (Pass/Fail)
	QP	AV	QP	AV	QP	AV	
0.15000	50.0	25.0	54.0	24.3	66.0	56.0	Pass
0.16172	52.6	24.7	52.4	23.8	65.5	55.5	Pass
0.16953	51.6	23.0	50.9	23.0	65.0	55.0	Pass
0.19297	48.4	22.9	48.8	22.5	64.0	54.0	Pass
0.22031	44.9	19.7	44.8	19.6	62.8	52.8	Pass
0.22813	43.9	20.5	43.9	20.4	62.4	52.4	Pass
0.25156	41.0	19.7	41.5	19.5	61.8	51.8	Pass
0.26719	39.2	15.9	39.2	15.9	61.1	51.1	Pass
0.27500	38.0	15.5	37.1	15.0	60.8	50.8	Pass
0.29844	35.3	15.5	35.2	15.4	60.2	50.2	Pass

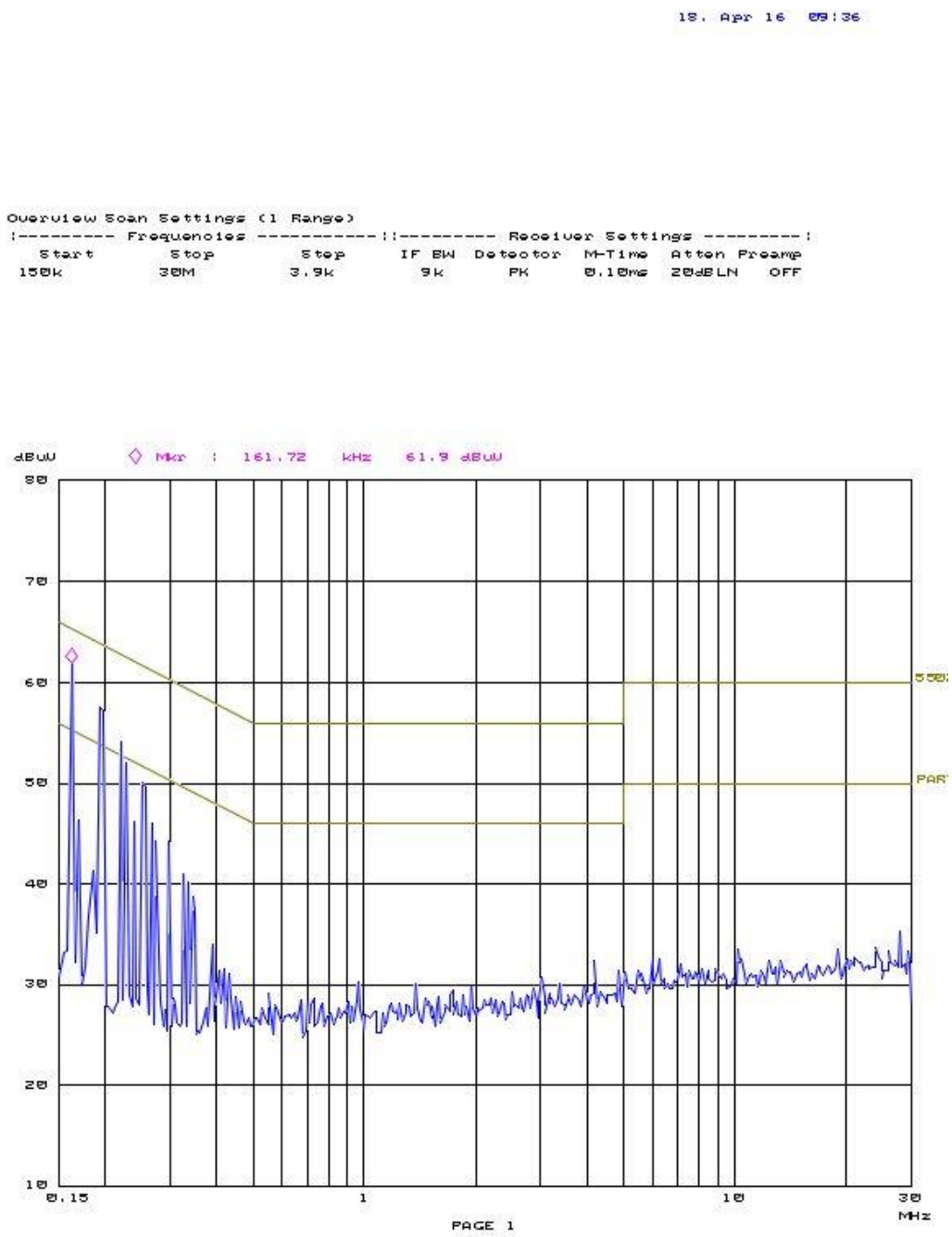
Table 6 AC Power Line Conducted Emissions results

The results of the conducted emission tests, carried out in accordance with 47 CFR Part 15 section 15.207(a) and RS-Gen section 8.8, at the 120 Volts/ 60 Hz AC mains connection terminals of the AUX1 that connects to 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.

4.1.2 Plots of the AC Power Line Conducted Emissions

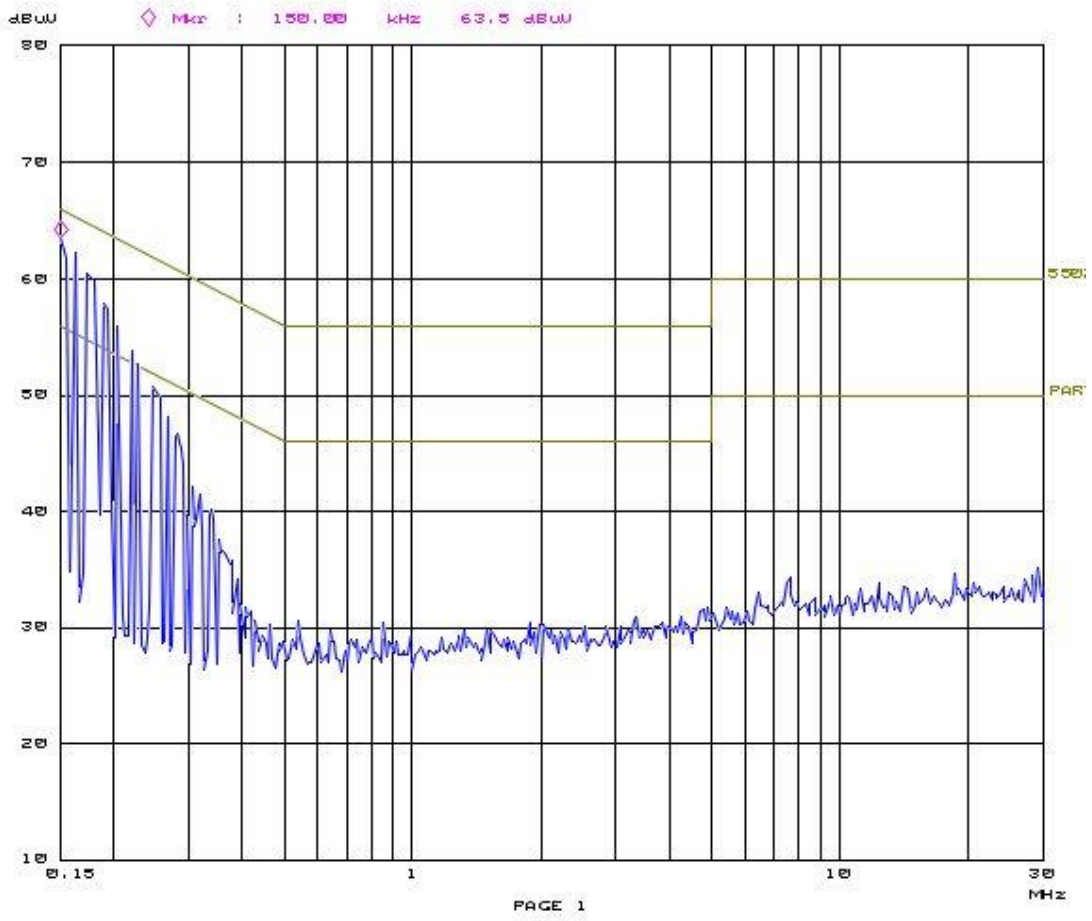


Plot of the AC Power Line Conducted Emissions on L1

18. Apr 16 09:45

Overview Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	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 on L2

5 Emissions at the band edges

RESULT: Pass

Date of testing: 2016-04-14

The tables below show compliance with the 47 CFR Part 15 section 15.249(d) and RSS-210 section A2.9, this section requires the emissions outside the 2400 and 2483.5 MHz frequency band to be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209 and RSS-Gen section 7.2.5, whichever is the lower attenuation.
Table 7 below shows the levels at the band edges in respect to the general radiated emission limits.

EUT Frequency [MHz]	Band Edge Frequency [MHz]	Antenna Orientation	Level Pk [dBm]	Limit Pk /Av [dBm]	Result Pass/Fail	Plot number
2402	2393.89	Horizontal	-47.4	-21.2 / -41.2	Pass	1a
2480	2514.39	Horizontal	-45.7	-21.2 / -41.2	Pass	1b

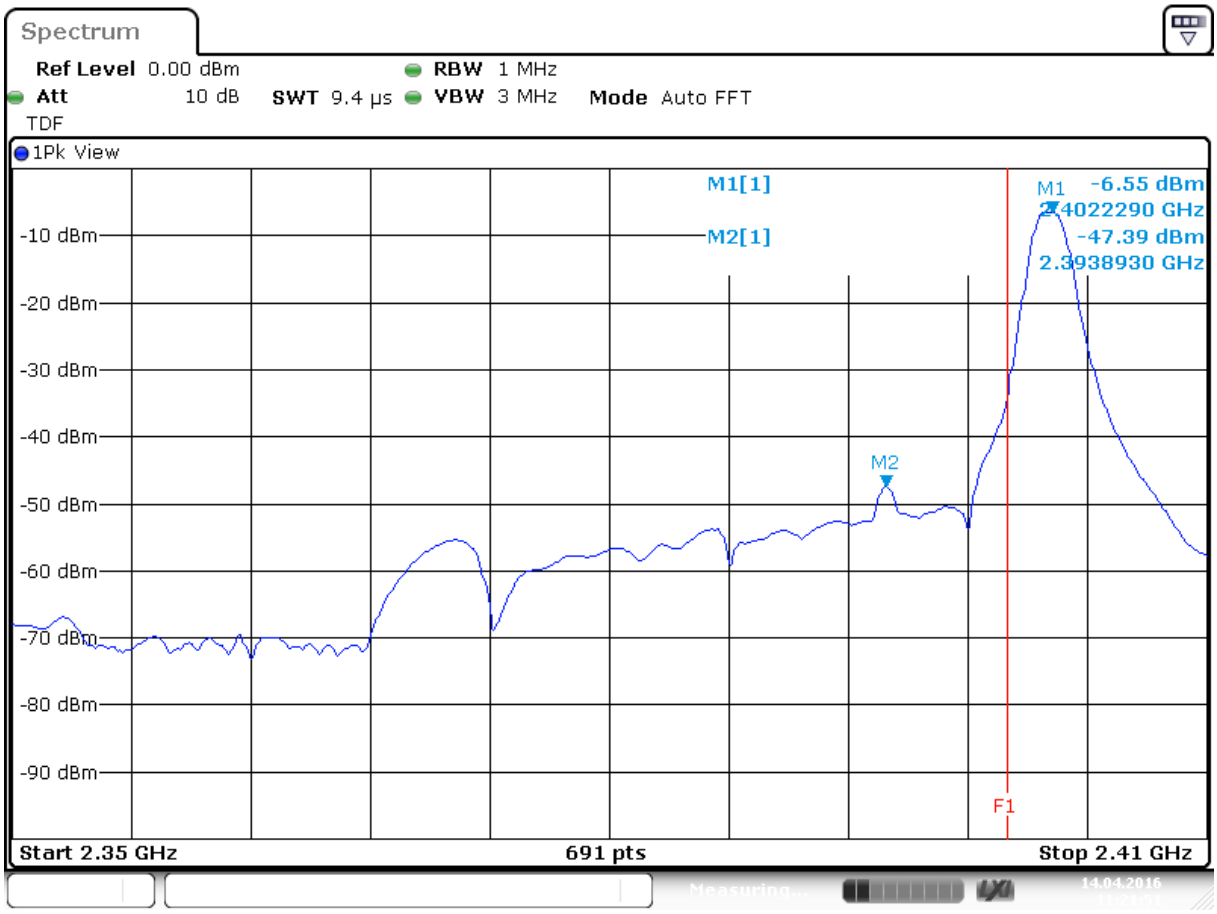
Table 7 level of the band edge emissions, Peak values

Notes:

1. Measurement uncertainty is ±5.0dB
2. The reported field strength values are the worst case values at the indicated frequency. The antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
3. The EUT was tested in on the lowest frequency (2402 MHz) and the highest frequency (2480 MHz) in the 2402 – 2480 MHz band wherein it operates.
4. Peak (Pk) values were already within Average (Av) limits, Av therefor not tested.
5. See plots on pages 21-22.

Used test equipment and ancillaries:

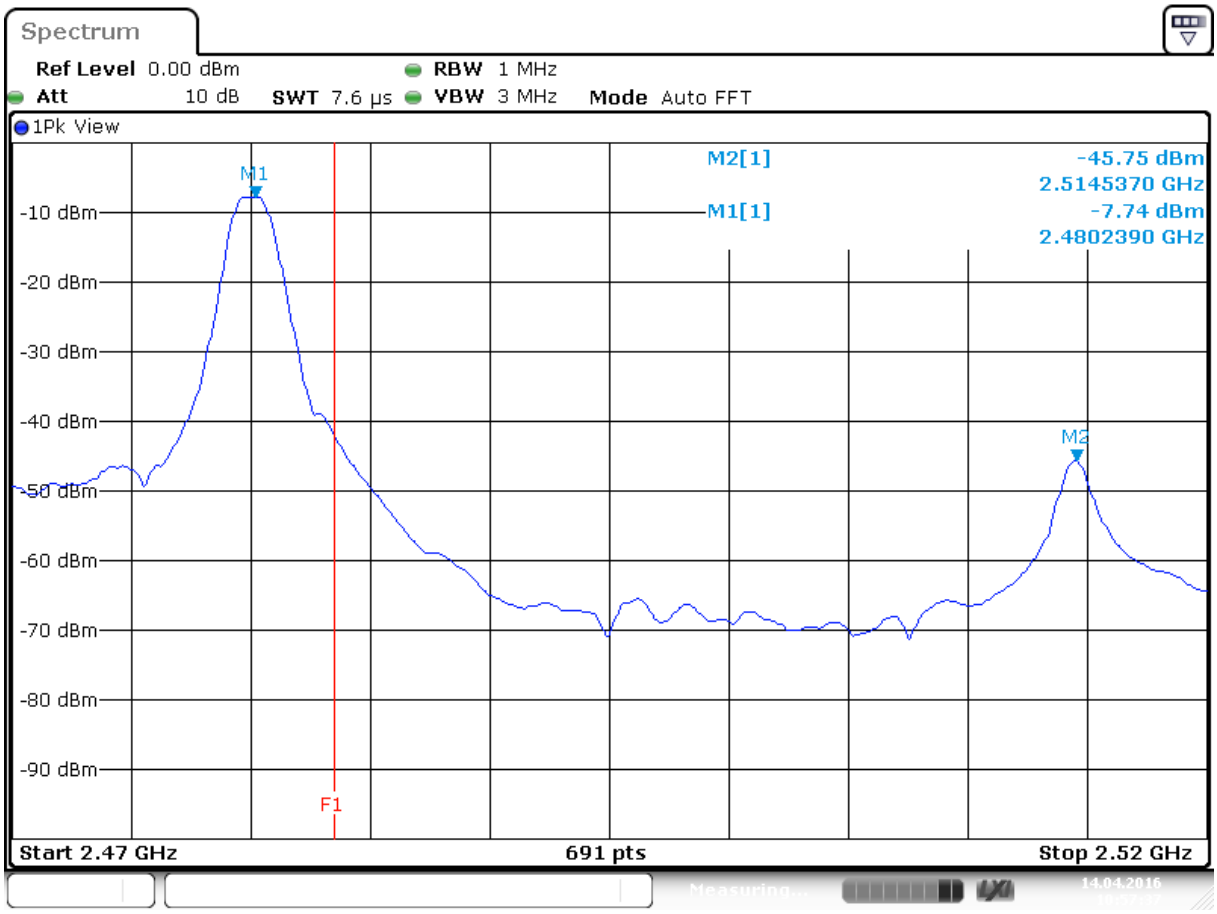
A00450	A00235	A00337	A00258	A00444	A00009	A00012	A00255	A00247



Date: 14.APR.2016 11:21:52

Plot 1a Band Edge (Low), Peak value, Spectral Diagram, 2402 MHz

F1 shows the band edge frequency of 2400 MHz.



Date: 14.APR.2016 10:57:37

Plot 2a Band Edge (High), Peak value, Spectral Diagram, 2480 MHz.

F1 shows the band edge frequency of 2483.5 MHz

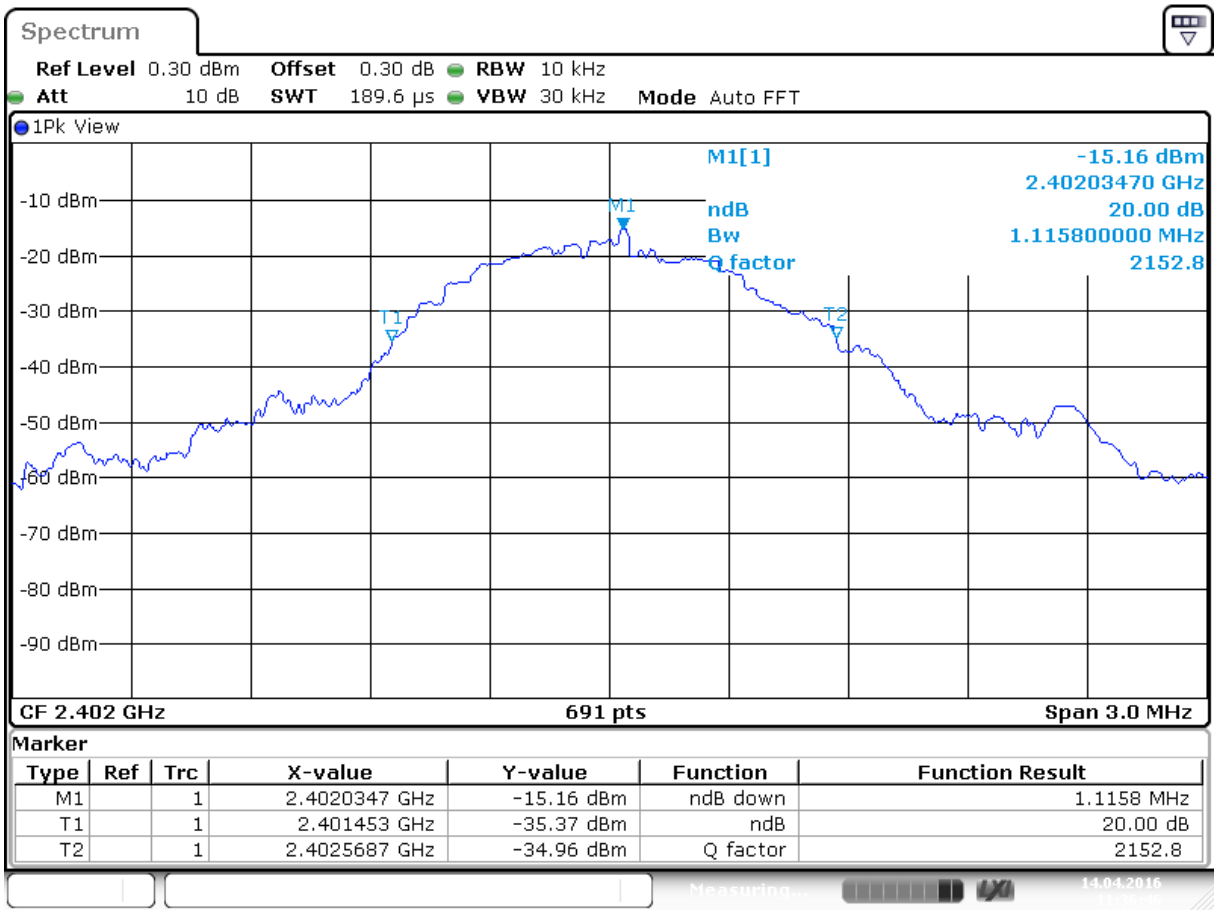
6 Bandwidth of the emission

RESULT: PASS

Date of testing: 2016-04-14

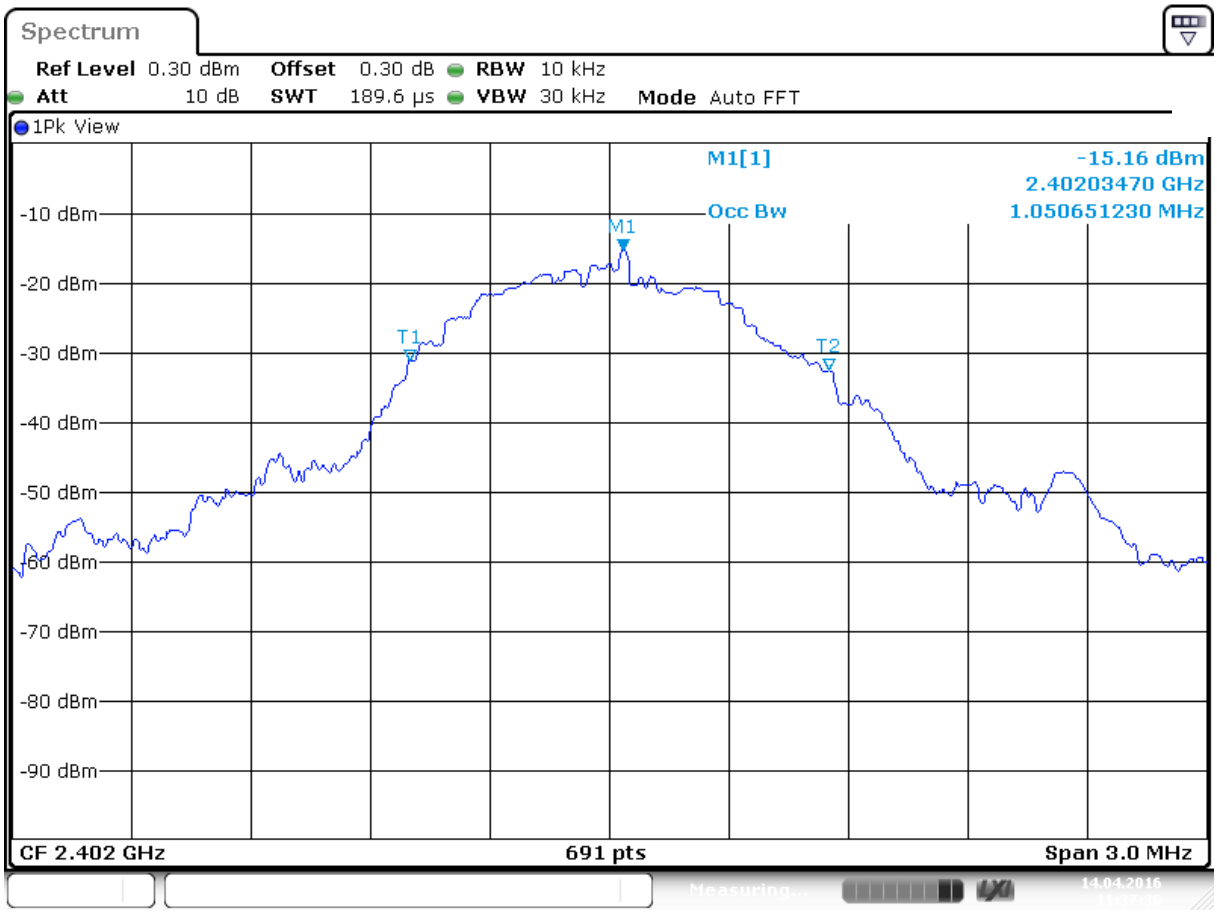
This was tested with a spectrum analyzer connected by a RF cable to the EUT antenna connector. Power level therefor differs from the radiated power levels.

The plots below show compliance with the 47 CFR Part 15 section 15.215(c), this section requires the 20 dB emission bandwidth is within the frequencyband designated in section 15.249.



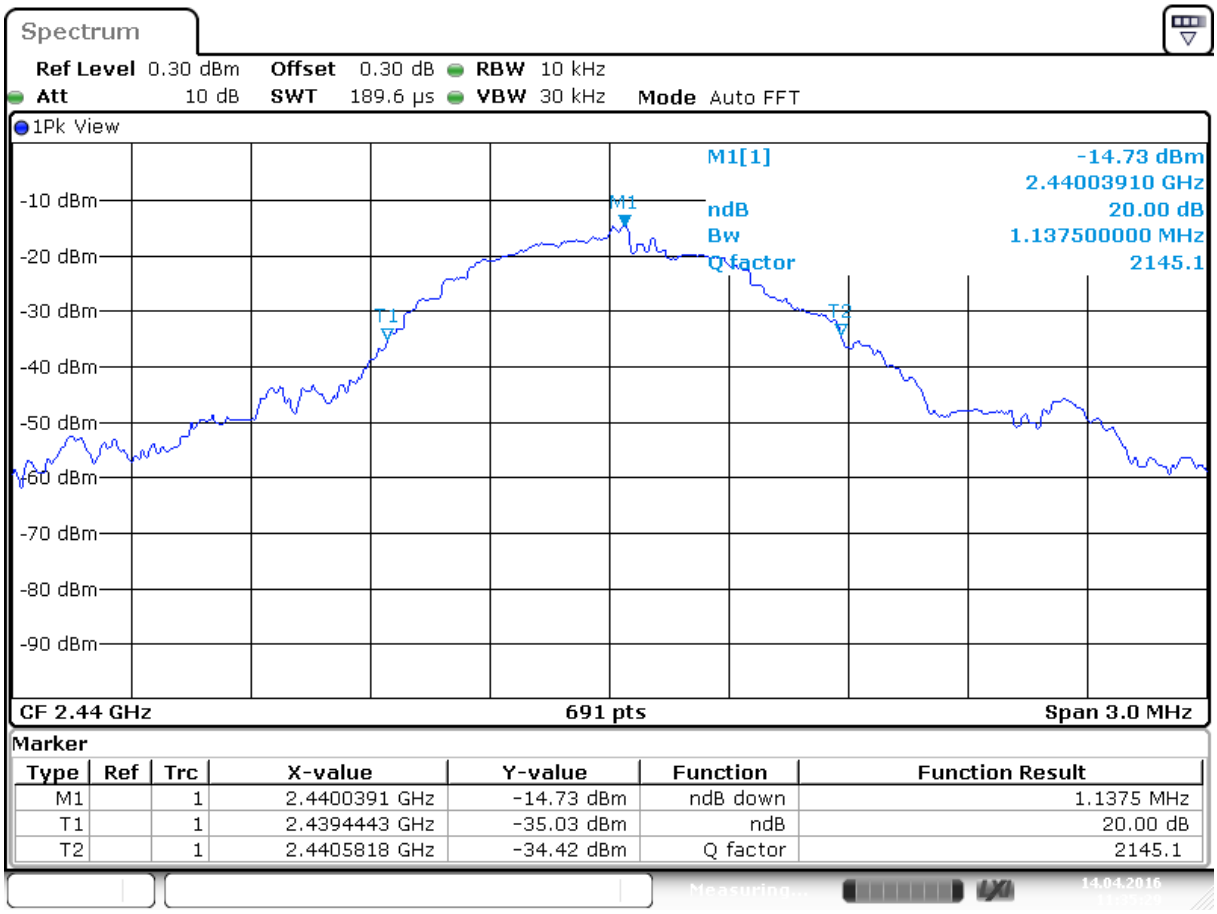
Date: 14.APR.2016 11:36:46

Plot lowest channel - 2402 MHz, Occupied bandwidth is 1115.80 kHz as measured on a spectrum analyzer.

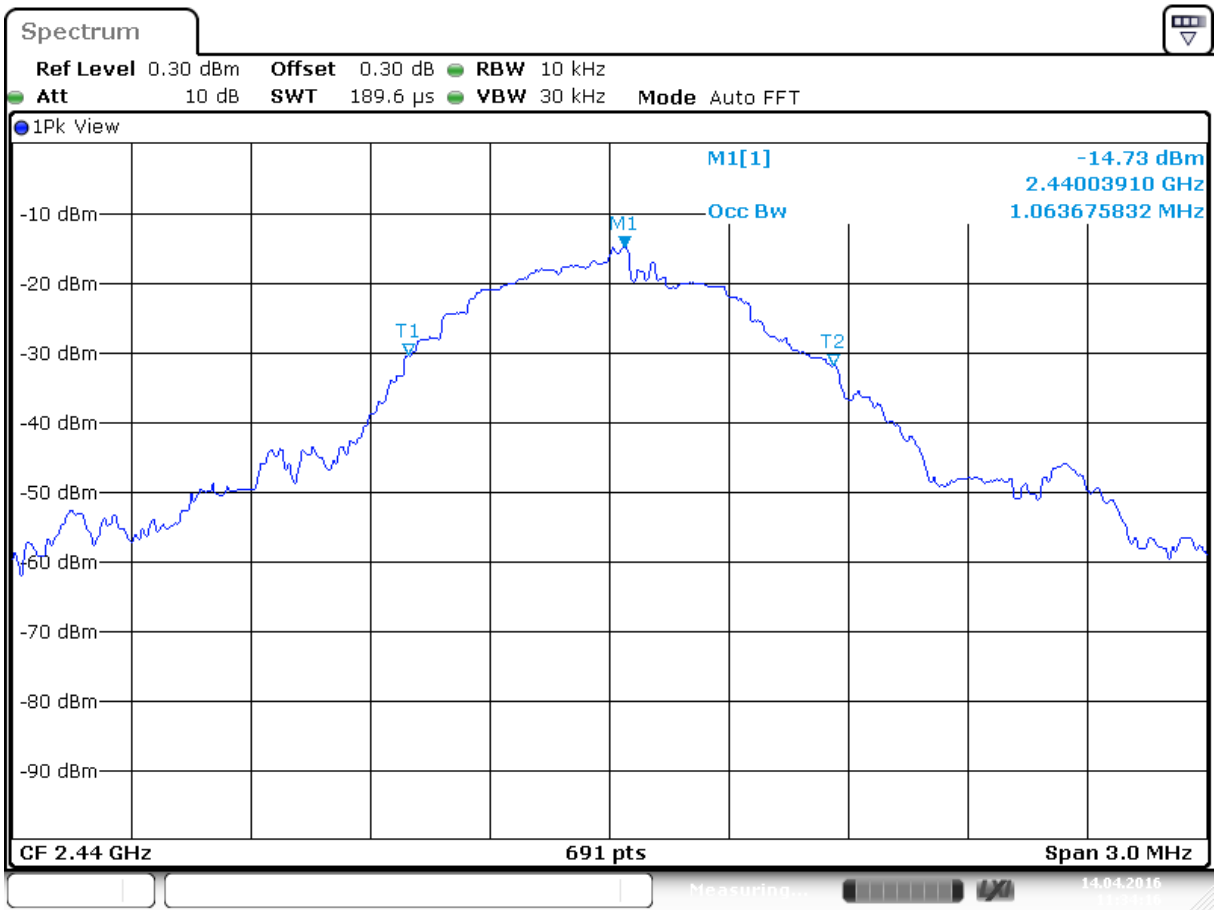


Date: 14.APR.2016 11:37:37

Plot lowest channel - 2402 MHz, 99% bandwidth is 1050.65 kHz as measured on a spectrum analyzer.

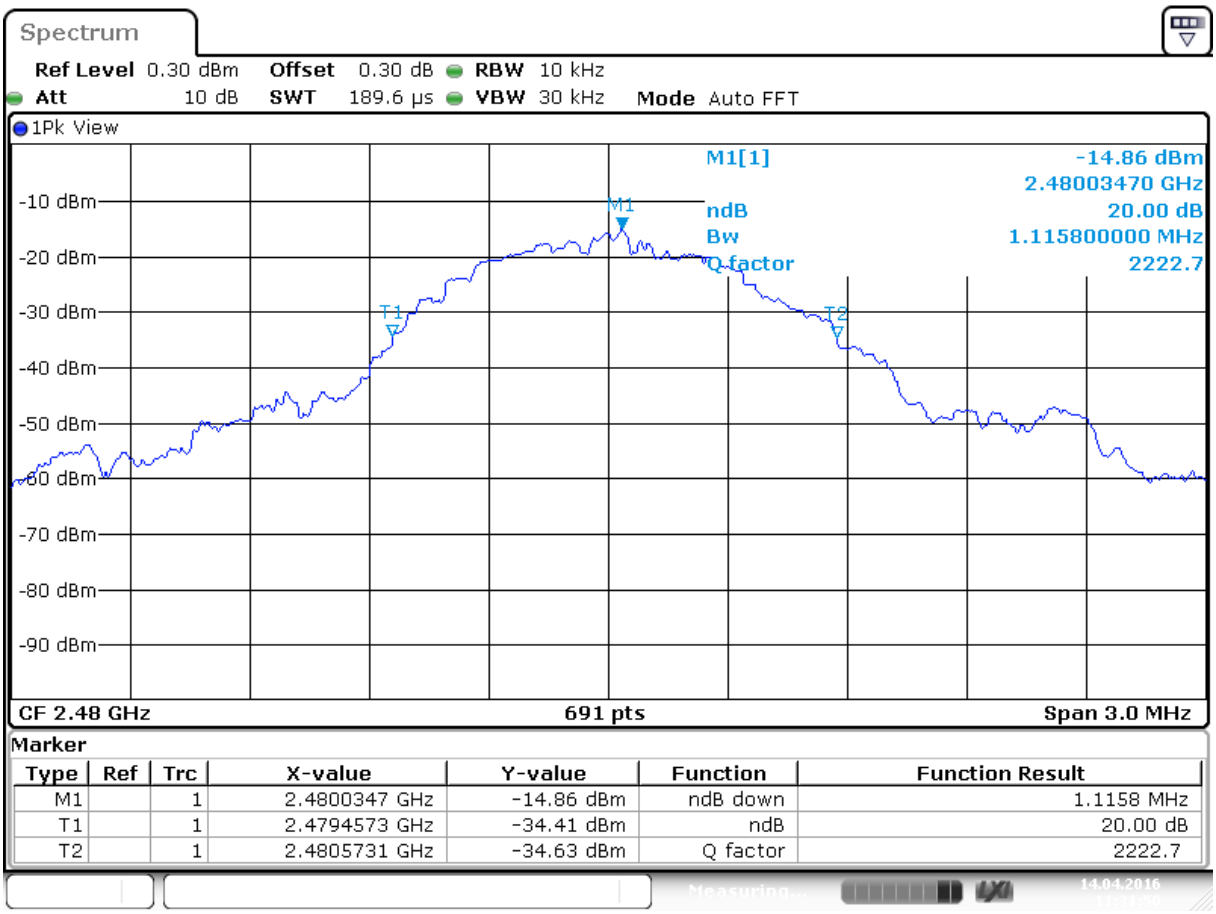


Plot middle channel - 2440 MHz, Occupied bandwidth is 1137.50 kHz as measured on a spectrum analyzer.



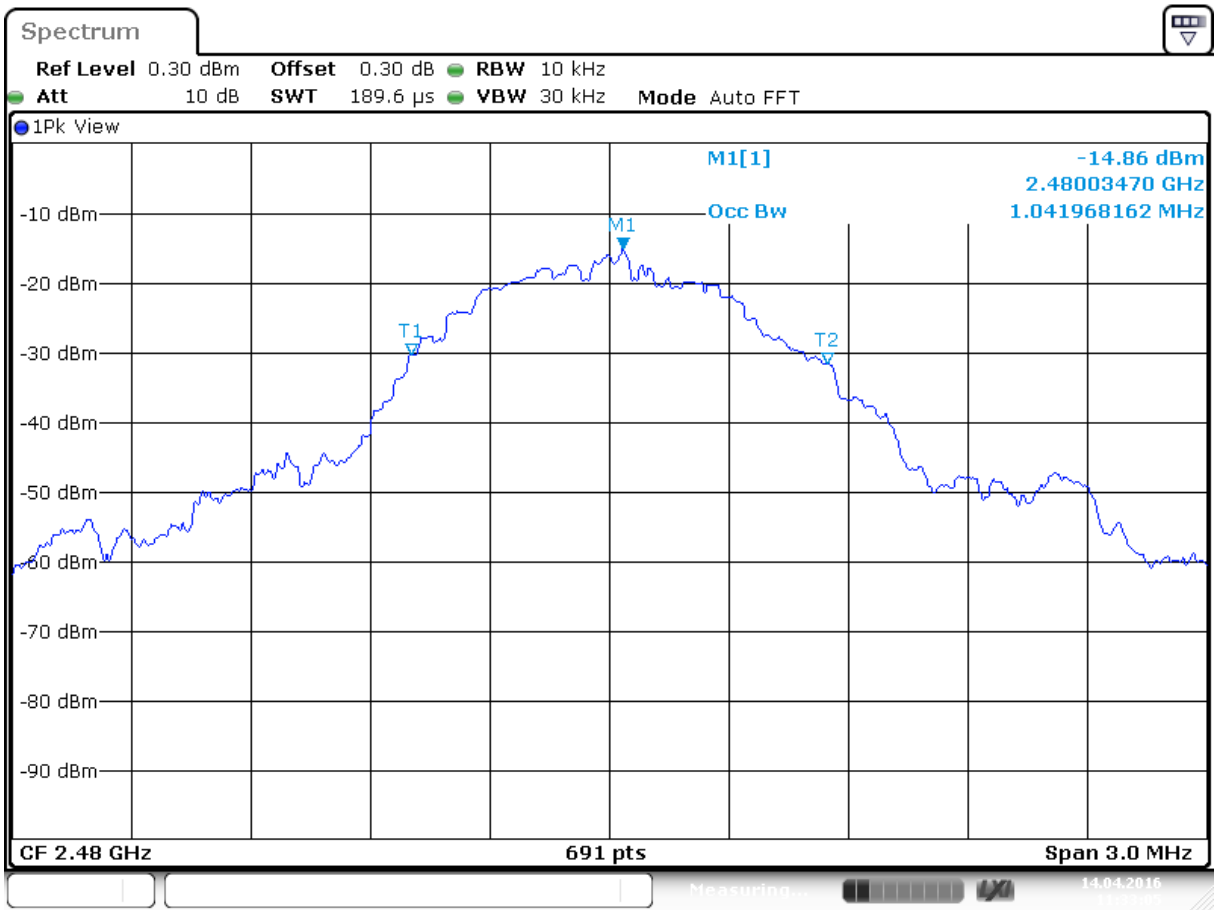
Date: 14.APR.2016 11:34:16

Plot middle channel - 2440 MHz, 99% bandwidth is 1063.68 kHz as measured on a spectrum analyzer



Date: 14.APR.2016 11:31:50

Plot highest channel - 2480 MHz, Occupied bandwidth is 1115.8 kHz as measured on a spectrum analyzer.



Date: 14.APR.2016 11:33:05

Plot highest channel - 2480 MHz, 99% bandwidth is 1041.96 kHz as measured on a spectrum analyzer

7 List of utilized test 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	04-13/2016	04-13/2017
Spectrum Analyzer	Rohde & Schwarz	FSV	A01744	07/2015	07/2016
RF Cable	H+S	Secuflex	A00347	04-15/2015	04-15/2016
For Radiated Emissions					
Measurement Receiver	Rohde & Schwarz	ESCI	A00314	03/2016	03/2017
RF Cable S-AR	Gigalink	APG0500	A00447	01/2016	01/2017
Controller	Maturo	SCU/088/ 8090811	A00450	N/A	N/A
Controller	EMCS	DOC202	A00257	N/A	N/A
Test facility	Comtest	FCC listed: 90828 IC: 2932G-2	A00235	04/2014	04/2017
Spectrum Analyzer	Rohde & Schwarz	FSV	A00337	05/2015	05/2016
Antenna mast	EMCS	AP-4702C	A00258	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	A00444	04-13/2016	04-13/2017
Guidehorn 1-18 GHz	EMCO	3115	A00009	04-14/2015	04-14/2016
Guidehorn 18-40 GHz	EMCO	RA42-K-F-4B-C	A00012	04-14/2015	04-14/2016
Biconilog Testantenna	Teseq	CBL 6111D	A00466	06/2015	06/2016
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	02/2016	02/2017

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	01/2016	01/2017
Variac	RFT	LSS020	A00171	NA	NA
LISN	EMCO	3625/2	A00022	01/2016	01/2018
Measurement Receiver	Rohde & Schwarz	ESCS30	A00726	09/2015	09/2016
Shielded room for Conducted emissions	--	--	A00437	NA	NA
Temperature-Humiditymeter	Extech	SD500	A00444/	04-14/2016	04-14/2017

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

<< End of report >>

ACB
Certification Department
6731 Whittier Avenue, Suite C110
McLean, Virginia 22101
USA

Date
18-05-2016

To whom it may concern,

On behalf of our customer Tacx B.V., we hereby declare the following device:

FCC ID : 2AAMI-T2240
Brand : Tacx
Model : T2240
Description : Wireless Communication Device

The EUT has 2 transmitters (BLE and ANT+) which never send simultaneously. The highest output power is from the BLE part. BLE is a DXX application and no RF exposure assessment is required for the BLE part. The RF exposure assessment is based on the ANT+ mode. The EUT is considered as 'Mobile' use.
The EUT has a maximum radiated output power in ANT+ mode of -5.46 dBm, equals 0.28 mW in the frequency range of 2402 – 2480 MHz which means that the worst case prediction of power density (100% reflection) at 20 cm distance (worst case) can be calculated as follows :

$$S = \frac{EIRP}{4 * \pi * R^2}$$ (power density without reflection)

$$S = \frac{2^2 * EIRP}{4 * \pi * R^2}$$ (power density with 100% reflection)

$$S = \frac{2^2 * EIRP}{4 * \pi * R^2} = \frac{EIRP\ (mW)}{\pi * (20cm)^2} = \frac{0.28}{\pi * (20)^2} = 0.00022\ mW/cm^2$$

(limit =10 W/m^2 is 1.0 mW/cm^2)

For certain devices that are designed to be used in both mobile and portable configurations similar to those described in 47 CFR §2.1091(d)(4), such as this device, compliance for mobile configurations is also satisfied when the same device is evaluated for SAR compliance in portable configurations .
The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR,

For this device this is calculated as:
= 0.28mW / 5mm * $\sqrt{2.48}$ GHz = 0.088 (requirement: ≤ 3.0)

SAR Test Exclusion Thresholds is < 10mW and 3.0 for separation distance 5mm.
Therefore, SAR test is not required.

This means that the equipment is in compliance with EC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01).

Eiberkamp 10
P.O. Box 37
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Fax:+31 594 504804

Best regards,
TÜV Rheinland Nederland B.V.

R .van der Meer
Test Engineer