





Test Report No.:		19092605.r01	Page 1 of 47
<i>Client:</i>	Nedap N.V. , Parallelweg 2 7141 DC Groenlo Netherlands, R. Ooijman , L. Hones		
<i>Test Item:</i>	Digital Transmission System (DTS) Luxon Bridge		
<i>Identification: HVIN</i>	9987134	<i>Serial Number:</i>	see page 2
<i>Project No.:</i>	19092605	<i>Date of Receipt:</i>	October 01, 2018
<i>Testing Location:</i>	TÜV Rheinland Nederland B.V. Eiberkamp 10 9351VT Leek		
<i>Test Specification:</i>	FCC 47 CFR Part 15, Subpart C, Section 15.247 (10-1-18 Edition) RSS-Gen (Issue 5, March 2019 (Amendment 1) and RSS-247 (Issue 2, February 2017) ANSI C63.10-2013 KDB 558074 D0115.247 Meas Guidance v05r01, February 11, 2019		
<i>Test Result:</i>	The test item passed the test specification(s).		
<i>Testing Laboratory:</i>	TÜV Rheinland Nederland B.V. Eiberkamp 10 9351 VT Leek		
<i>Tested by:</i>		<i>Reviewed & Approved by:</i>	
2020-01-23	R. van der Meer / Inspector	2020-01-23	E. van der Wal
<i>Date</i>	<i>Name/Position</i>	<i>Signature</i>	<i>Date</i> <i>Name/Position</i> <i>Signature</i>
<i>Other Aspects: report issue date is equal to review & approval date.</i>			
<i>Abbreviations:</i> P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested			
<p>This report shall not be reproduced, except in full, without the written permission of TÜV Rheinland Nederland B.V. The test results relate only to the item(s) tested. The content of this report and measurement results have not been changed other than the way of presenting the data.</p>			

Test Report No.:

19092605.r01

Page 2 of 47

Prufbericht-Nr: 19092605.r01

Test report No:

Seite 2 von 47

Page 2 of 47



EUT front side



EUT back side

Samples tested:
Antenna port conducted tests:
0193471 (2408 MHz)
0193423 (2450 MHz)
0193457 (2475 MHz)

Radiated tests:
0193431 (2408 MHz)
V000271272 (2450 MHz)
0193510 (2475 MHz)



Test Report No.:

19092605.r01

Page 3 of 47

TEST SUMMARY

Test Specification Clause	Test Case	Pass	Fail	Not applicable	Not performed
§15.247(a2)	Spectrum Bandwidth of a DTS System / 6dB BW	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 15.247 (b) (3)	Maximum output power (conducted)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (e)	Peak power spectral density	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (d)	Band-edge compliance of conducted emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.205	Band-edge compliance of radiated emissions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (d)	Spurious Emission - conducted (Transmitter)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 15.209	Spurious Emission - radiated (Transmitter)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§ 15.207	AC Power Line Conducted Emissions <30 MHz	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Revisions Revisions

Revision Revision	Datum Date	Anmerkung Remark	Verfasser Author
-	08.01.2020	First release	R. van der Meer
01	23.01.2020	corrected Cal data 2790260	R. van der Meer

Note: Latest revision report will replace all previous reports



Contents

1.	GENERAL REMARKS	5
1.1.1	<i>Complementary Materials</i>	<i>5</i>
1.1.2	<i>Special Accessories</i>	<i>5</i>
1.1.3	<i>Equipment modifications</i>	<i>5</i>
2.	TEST SITES	6
2.1	TEST FACILITIES	6
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS TABLE 1: LIST OF TEST AND MEASUREMENT EQUIPMENT.....	7
2.3	MEASUREMENT UNCERTAINTY	8
3.	DISCLAIMER, GENERAL PRODUCT INFORMATION	9
3.1	COUNTERMEASURES TO ACHIEVE COMPLIANCE	9
3.2	OPERATION MODES	9
3.3	PHYSICAL CONFIGURATION FOR TESTING	10
3.4	TEST SOFTWARE	12
3.5	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	12
4.	TEST RESULTS	13
4.1.1	<i>DTS (6dB) and 99% Bandwidth</i>	<i>13</i>
4.1.2	<i>Conducted Output Power</i>	<i>18</i>
4.1.3	<i>Peak Power Spectral Density</i>	<i>21</i>
4.1.4	<i>Out of Band Conducted Emissions</i>	<i>24</i>
4.1.5	<i>Radiated Spurious Emissions of Transmitter</i>	<i>27</i>
4.1.6	<i>Plot of the emissions in the range 30 -1000 MHz</i>	<i>29</i>
4.1.7	<i>Plots of the radiated unwanted emissions 1 – 25 GHz</i>	<i>33</i>
4.2	AC POWER LINE CONDUCTED MEASUREMENTS.....	41
4.2.1	<i>AC Power Line Conducted Emission of Transmitter</i>	<i>42</i>
9.2.2	<i>Plots of the AC Power-line Conducted Emissions</i>	<i>43</i>

Test Report No.:

19092605.r01

Page 5 of 47

1. General Remarks

1.1.1 Complementary Materials

There is no attachment to this test report.

1.1.2 Special Accessories

None.

1.1.3 Equipment modifications

None

2. Test Sites

2.1 Test Facilities

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meters. The site is listed with the FCC and ISED and accredited by RvA (Cert #L484). The 3 meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meter

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 Designation Number NL0005 (test site 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 CABID number NL0002 (test site 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 / 60 Hz.

()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.*

Test Report No.:

19092605.r01

Page 7 of 47

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	2789216	07/2019	07/2020
Spectrum Analyzer	Rohde & Schwarz	FSV	2790260	07/2018	07/2020
RF Cable	Rohde & Schwarz	WF	2789116 (A00347)	07/2019	07/2020
For Radiated Emissions					
Measurement Receiver	Rohde & Schwarz	ESR7	2790499	08/2019	08/2020
RF Cable S-AR	Gigalink	APG0500	2789217	01/2019	01/2020
Controller	Maturo	SCU/088/8090811	2789220	N/A	N/A
Controller	EMCS	DOC202	2789031	N/A	N/A
Test facility	Comtest	FCC listed: 786213 IC: 2932G-2	2789009	03/2017	03/2020
Spectrum Analyzer	Rohde & Schwarz	FSV	2790260	07/2018	07/2020
Antenna mast	EMCS	AP-4702C	2789032	N/A	N/A
Temperature-Humiditymeter	Extech	SD500	2789214	07/2019	07/2020
Guidehorn 1-18 GHz	EMCO	3115	2788776	12/2017	12/2020
Guidehorn 18-40 GHz	EMCO	RA42-K-F-4B-C	2788780	01/2018	01/2021
Biconilog Testantenna	Teseq	CBL 6111D	2789237	11/2019	11/2020
AC source	EM test	DPA500	2789197	11/2019	11/2021
Filterbox	EMCS	RFS06S	2789029	10/2019	10/2020



Test Report No.:

19092605.r01

Page 8 of 47

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	2788823 (A00051)	09/2019	09/2020
LISN	R&S	ESH2-Z5	2788791 (A00019)	06/2018	06/2020
Measurement Receiver	Rohde & Schwarz	ESCS30	2789241	11/2019	11/2020
Shielded room for Conducted emissions	--	--	2789207	NA	NA
Temperature-Humidity meter	Extech	SD500	2789211	07/2019	07/2020
AC source	EM test	DPA500	2789197	11/2019	11/2021

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

Accreditation

The reported tests were performed under ISO17025:2005 accreditation, unless otherwise specified as 'not under Accreditation'

An overview of all TÜV Rheinland Nederland B.V. accreditations, notifications and designations, please visit our website www.tuv.com/nl. You can find the relevant declarations under the download link.

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	±5.0dB
	> 1GHz	±5.5dB
AC Power Line Conducted Emissions	150kHz - 30MHz	±3.5dB

3. Disclaimer, General Product Information

The EUT main function is providing sensor data to Luxon light controller wirelessly. The EUT has the capability of operating in the 2.4 GHz frequency band and uses propriety protocol.

Technical Specifications

Technical Specifications	Value
Operating Frequency band	2408 – 2475 MHz , Non Hopping
Default operating channel	2450 MHz
Modulation	GFSK
Antenna Gain	0 dBi

By factory default, the center frequency for the RF communication is 2450MHz. It can be changed in a range from 2408 to 2475 MHz, which must be performed by Nedap service personnel in rare case that there is too much interference present on 2450 MHz.

There are no interface ports present on the EUT.

3.1 Countermeasures to achieve compliance

No additional measures were employed to achieve compliance.

3.2 Operation Modes

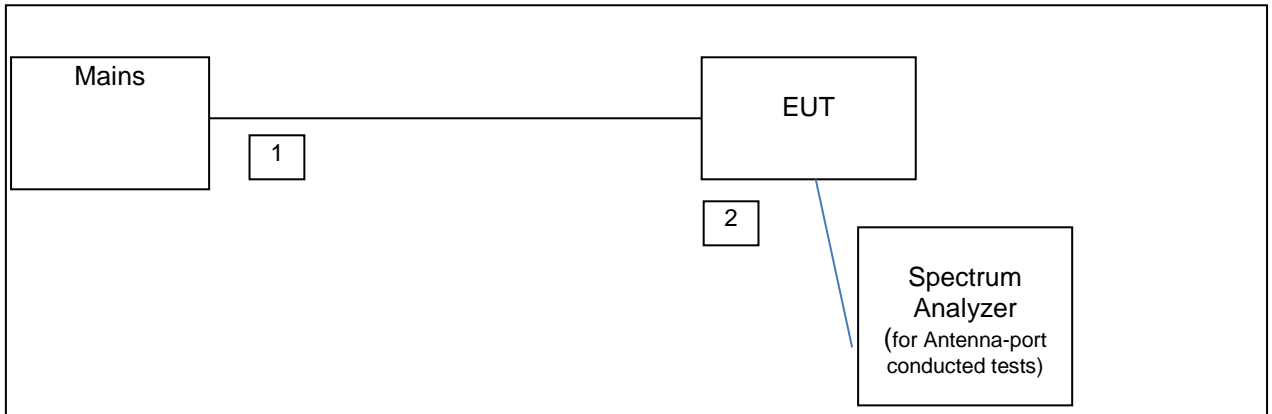
Testing was performed at the lowest operating frequency (2408 MHz), at the operating frequency in the middle of the specified frequency band (2450 MHz) and at the highest operating frequency (2475 MHz). These operation modes were selected after review of the capabilities and characteristics of the EUT.

3.3 Physical Configuration for Testing

The EUT was tested on a stand-alone basis as per Figure 1.

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



No.	Port	From	To	Remarks
1.	Mains	Mains	Power Supply	-
2.	Antenna port	EUT	Spectrum analyzer	Conducted tests

Test Report No.:

19092605.r01

Page 11 of 47

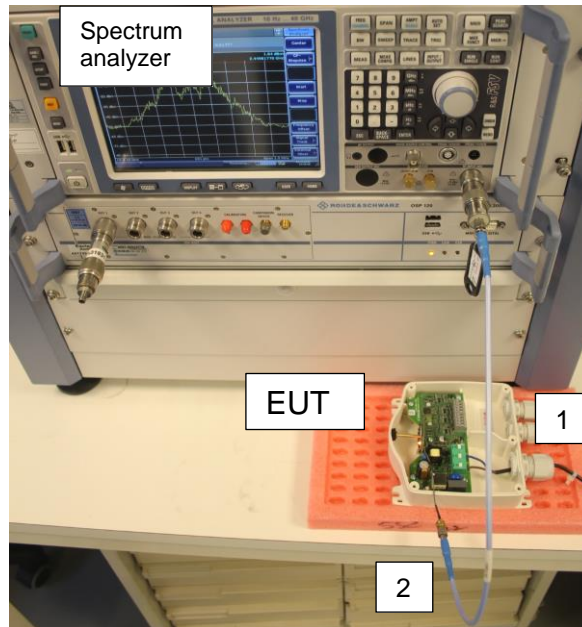


Figure 2: Test Setup Photos – conducted tests

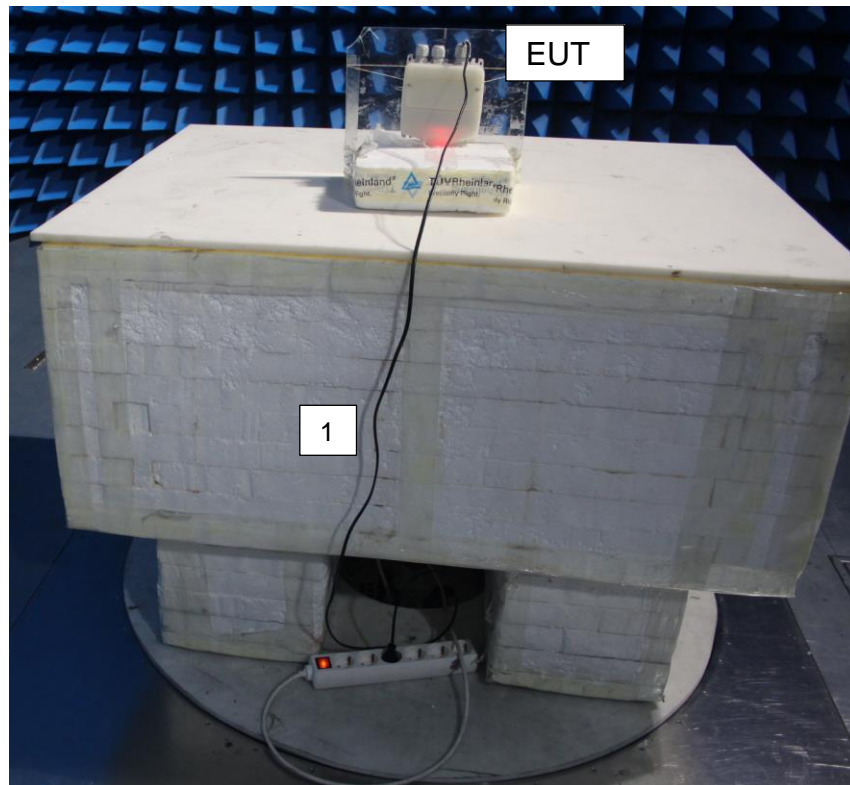


Figure 3: Test Setup Photos – radiated tests

Test Report No.:

19092605.r01

Page 12 of 47

3.4 Test Software

No test software was used. Dedicated samples for each test frequency was provided by the applicant for conducted and radiated emissions tests.

3.5 Special Accessories and Auxiliary Equipment

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

- None.

Test Report No.:

19092605.r01

Page 13 of 47

4. Test Results

4.1.1 DTS (6dB) and 99% Bandwidth

RESULT: Pass

Date of testing: 2019-12-05

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:

Test procedure: 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

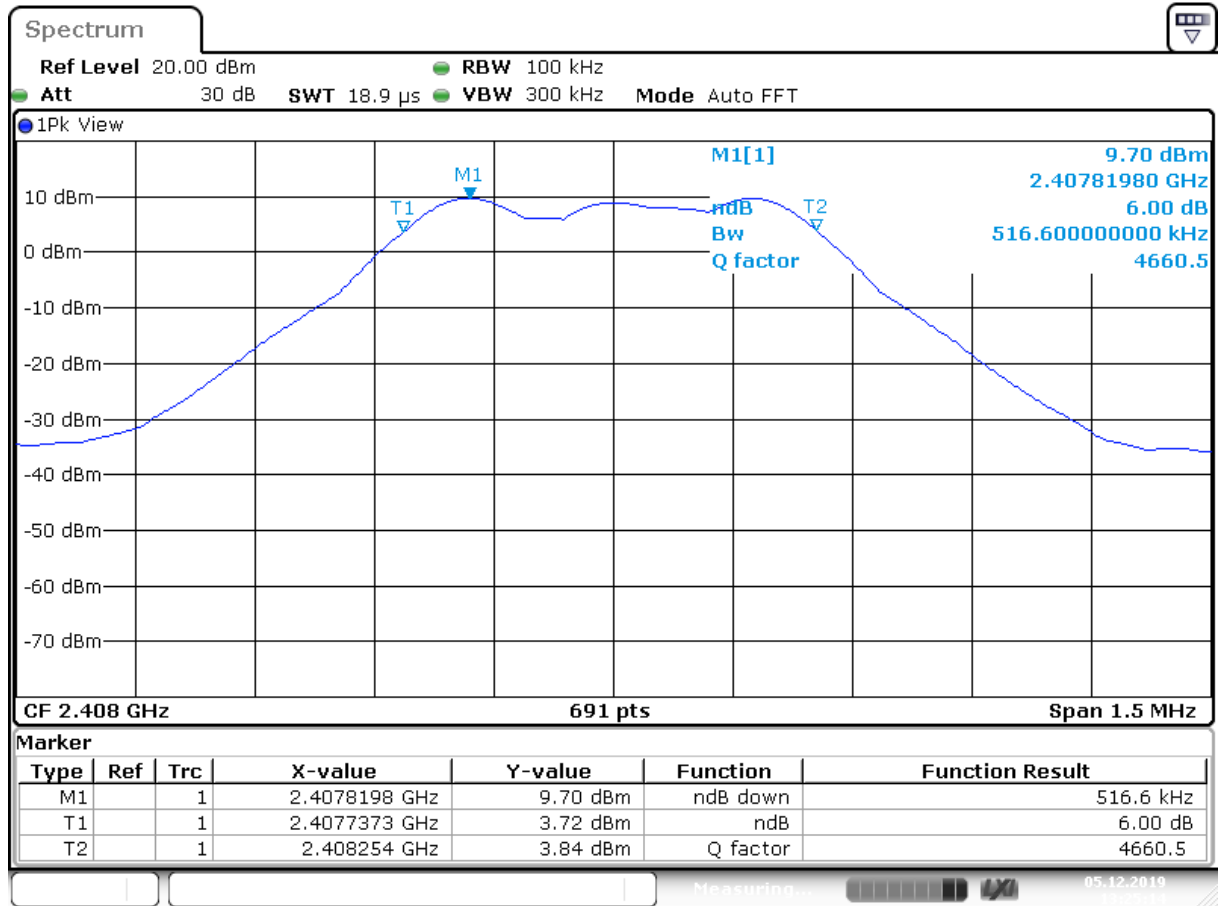
Test Report No.:

19092605.r01

Page 14 of 47

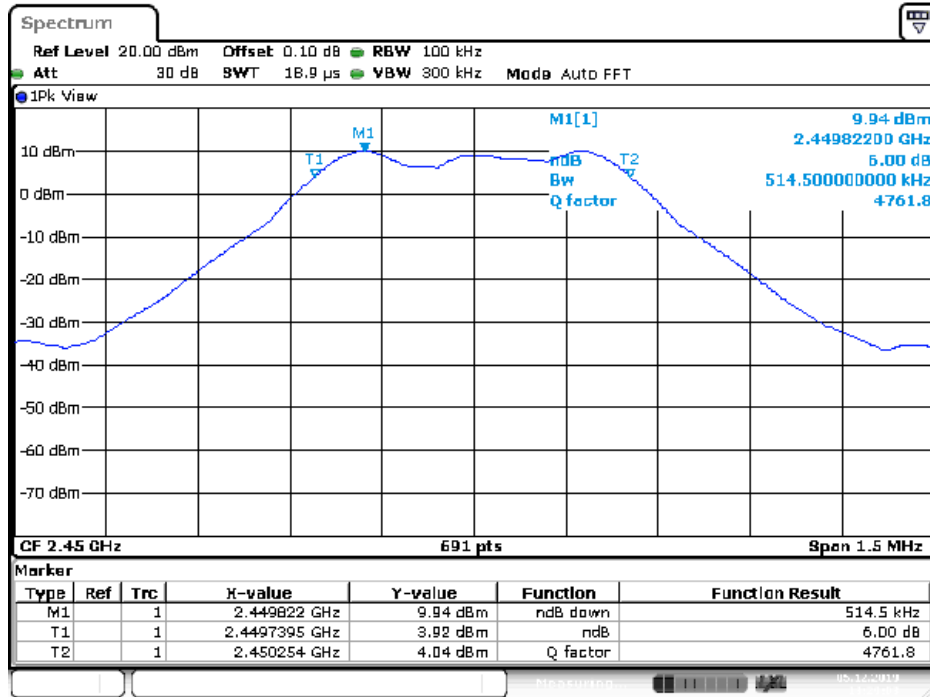
DTS (6dB) and 99% Bandwidth

Operating Frequency [MHz]	99% Bandwidth [kHz]	6dB Bandwidth [kHz]	Limit [kHz]	Verdict [Pass/Fail]	Plot number
2408	625.2	516.6	>500	Pass	A1/A2
2450	616.5	514.5	>500	Pass	B1/B2
2475	627.4	518.8	>500	Pass	C1/C2



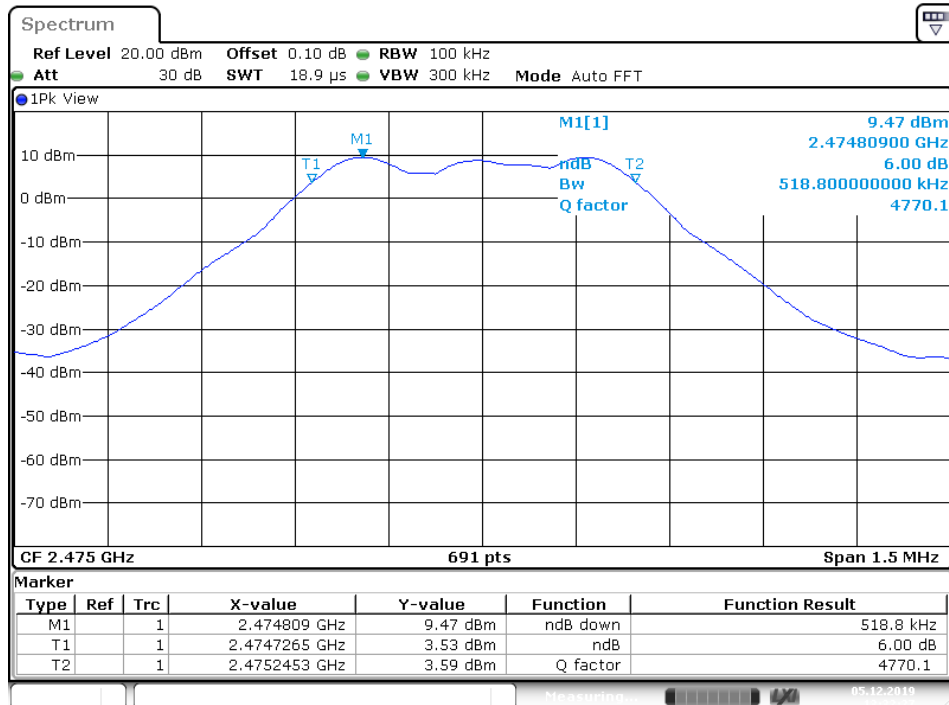
Date: 5 DEC 2019 13:25:13

Plot A1



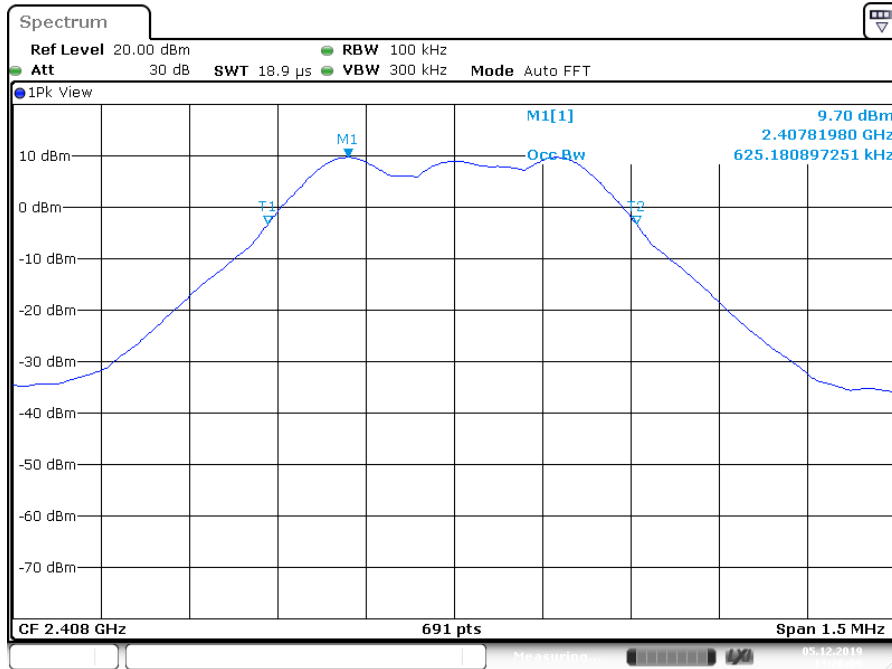
Date: 5 DEC 2019 13:29:03

Plot B1

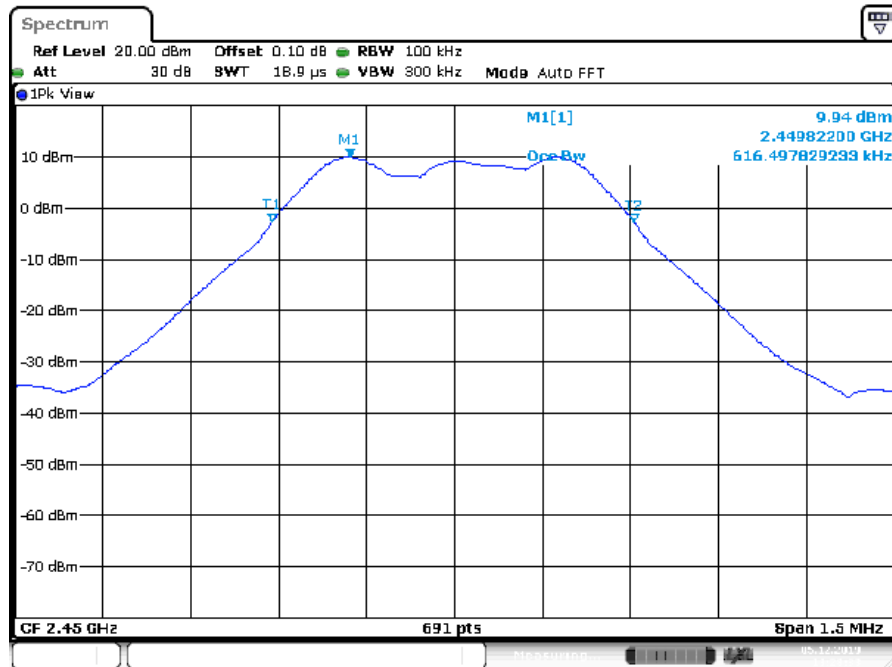


Date: 5 DEC 2019 13:32:27

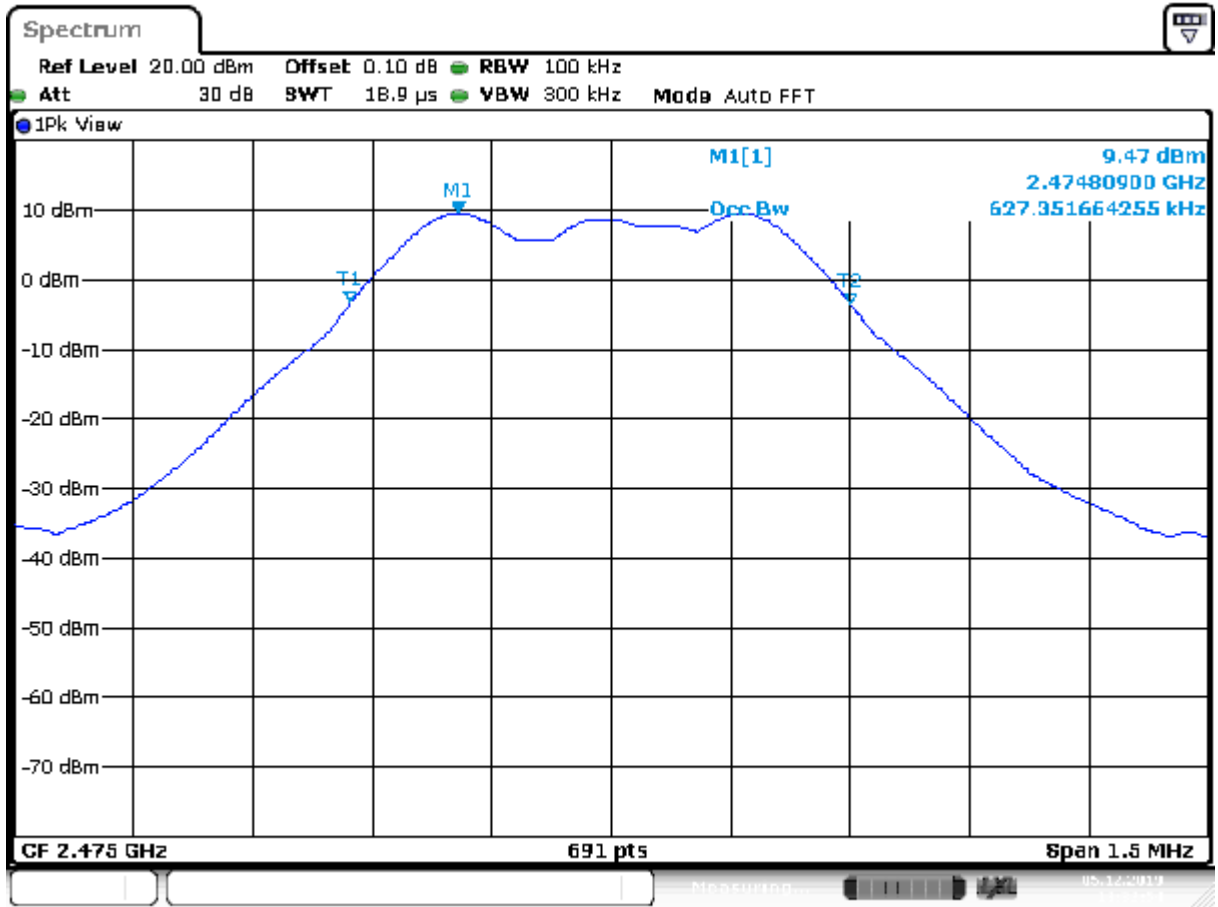
Plot C1



Plot A2



Plot B2



Date: 5 DEC 2019 13:22:54

Plot C2

Test Report No.:

19092605.r01

Page 18 of 47

4.1.2 Conducted Output Power

RESULT: Pass

Date of testing: 2019-12-05

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

plots : Peak power plots,

Figures 1a, 1b and 1c show plots of the Peak Power outputs, correction factors (= 0.1dB Cable loss) included in the reading.



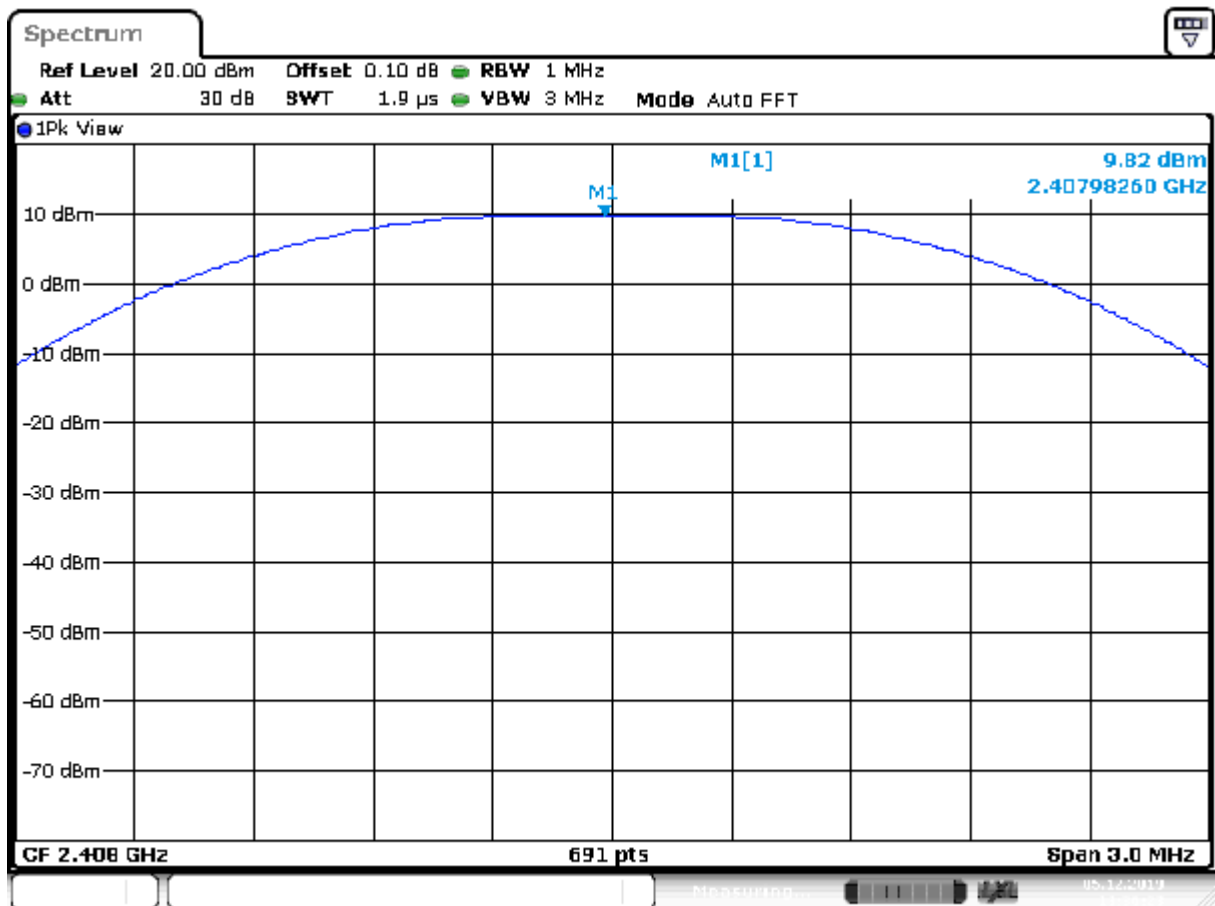
Test Report No.:

19092605.r01

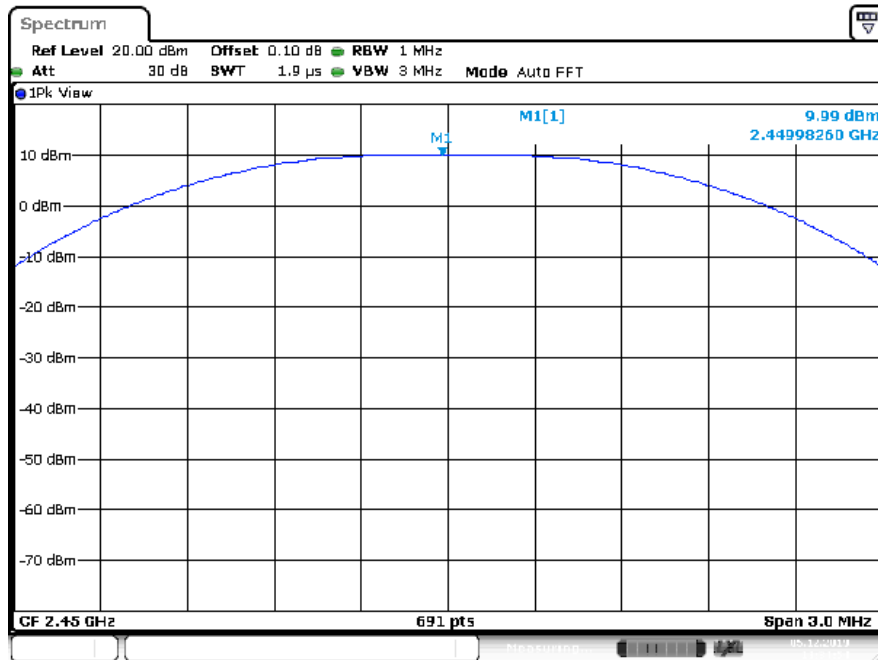
Page 19 of 47

Conducted Output Power

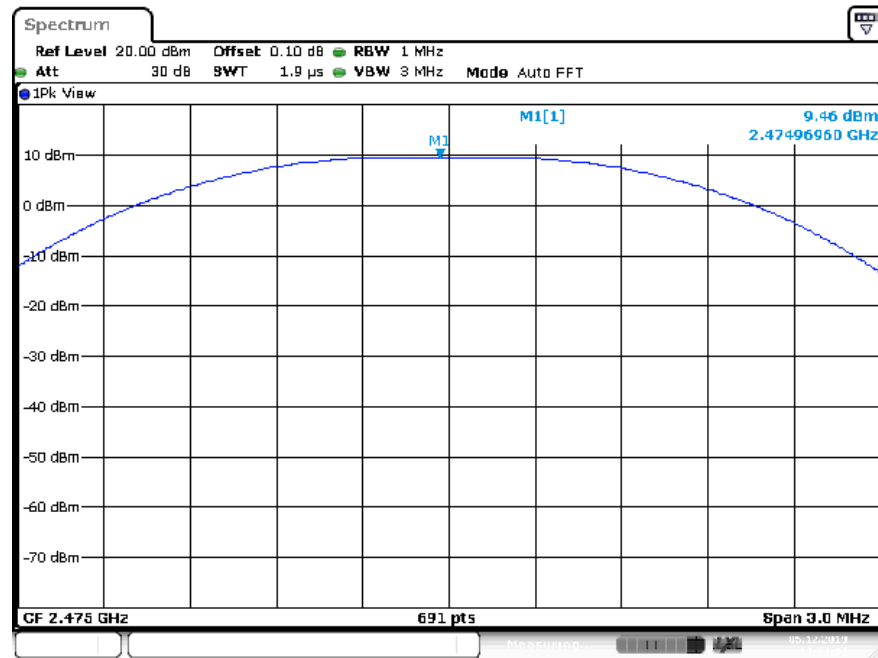
Frequency [MHz]	Output Power [dBm]	Limit	Verdict [Pass/Fail]	Plot number
2408	9.82 (9.59 mW)	+30 dBm / 1W	Pass	1A
2450	9.99 (9.98 mW)	+30 dBm / 1W	Pass	1B
2475	9.46 (8.83 mW)	+30 dBm / 1W	Pass	1C



Plot A



Plot B



Plot C

Test Report No.:

19092605.r01

Page 21 of 47

4.1.3 Peak Power Spectral Density

RESULT: Pass

Date of testing: 2019-12-05

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.

Measurement uncertainty is +/- 0.7 dB.



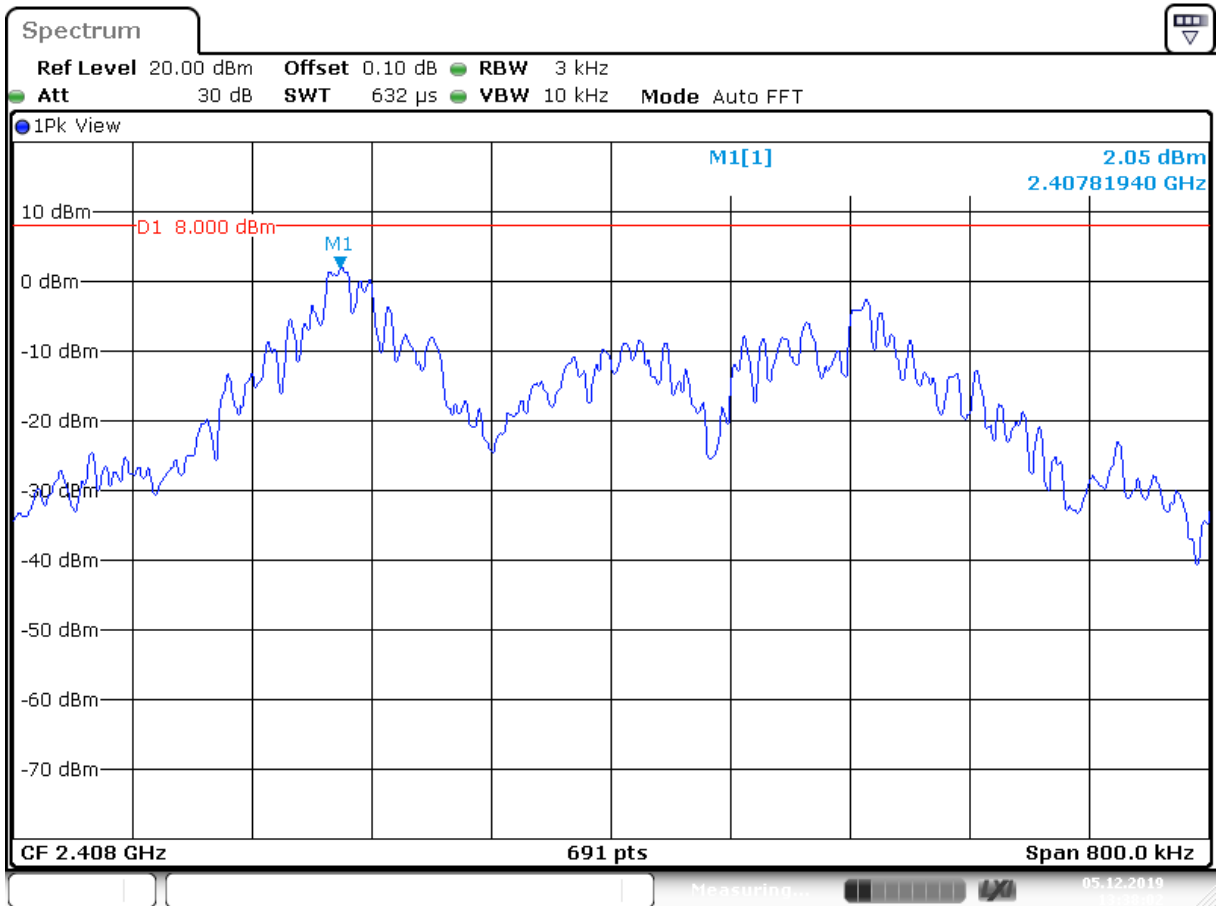
Test Report No.:

19092605.r01

Page 22 of 47

Peak Power Spectral Density

Operating Frequency [MHz]	Max PSD [dBm]	Limit [dBm]	Verdict [Pass/Fail]	Plot
2408	2.05	8	Pass	A
2450	2.25	8	Pass	B
2475	1.84	8	Pass	C



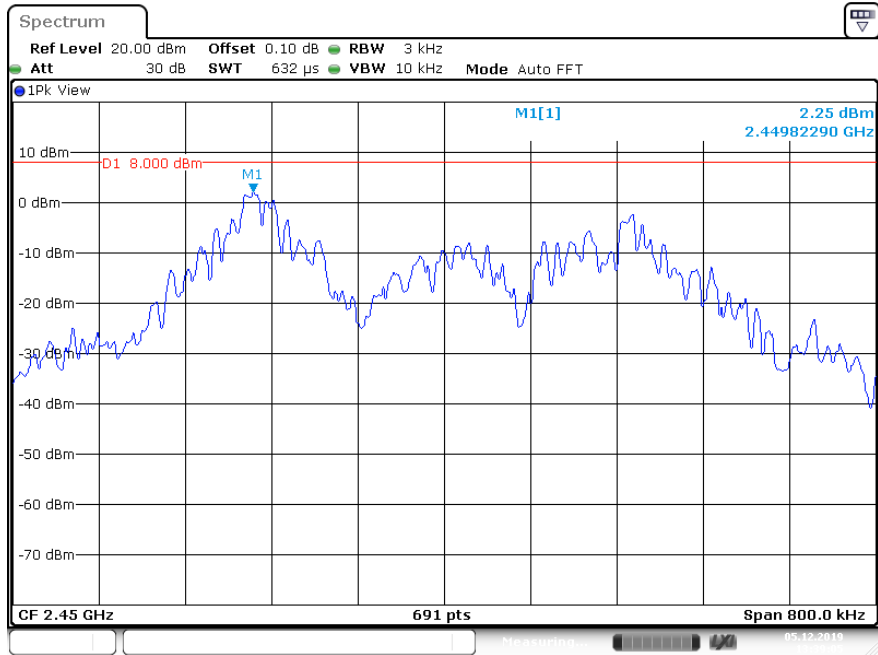
Date: 5 DEC 2019 13:38:03

Plot A

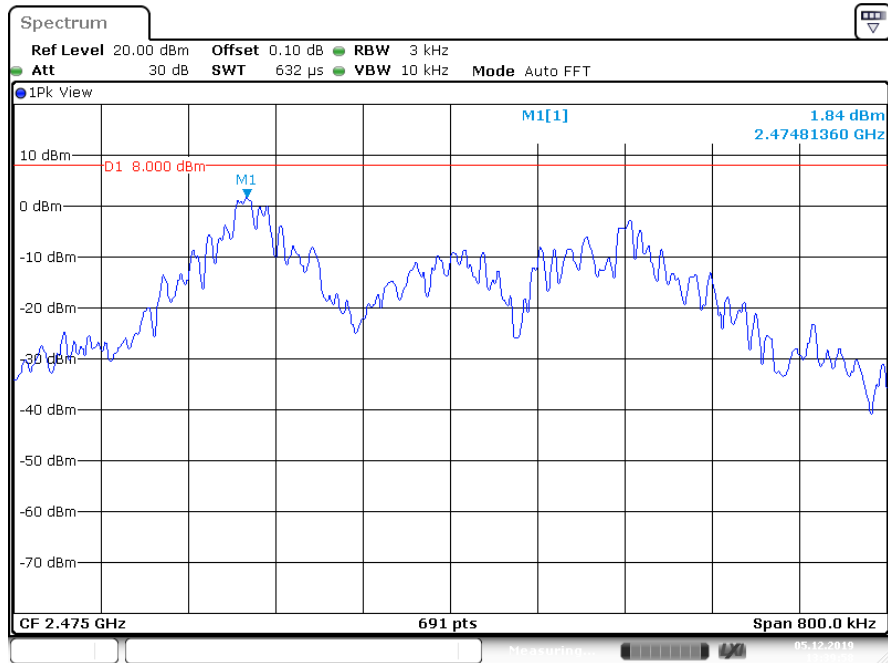
Test Report No.:

19092605.r01

Page 23 of 47



Plot B



Plot C

Test Report No.:

19092605.r01

Page 24 of 47

4.1.4 Out of Band Conducted Emissions

RESULT: Pass

Date of testing: 2019-12-05

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 D0115.247 Meas Guidance v05r01, February 11, 2019
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.

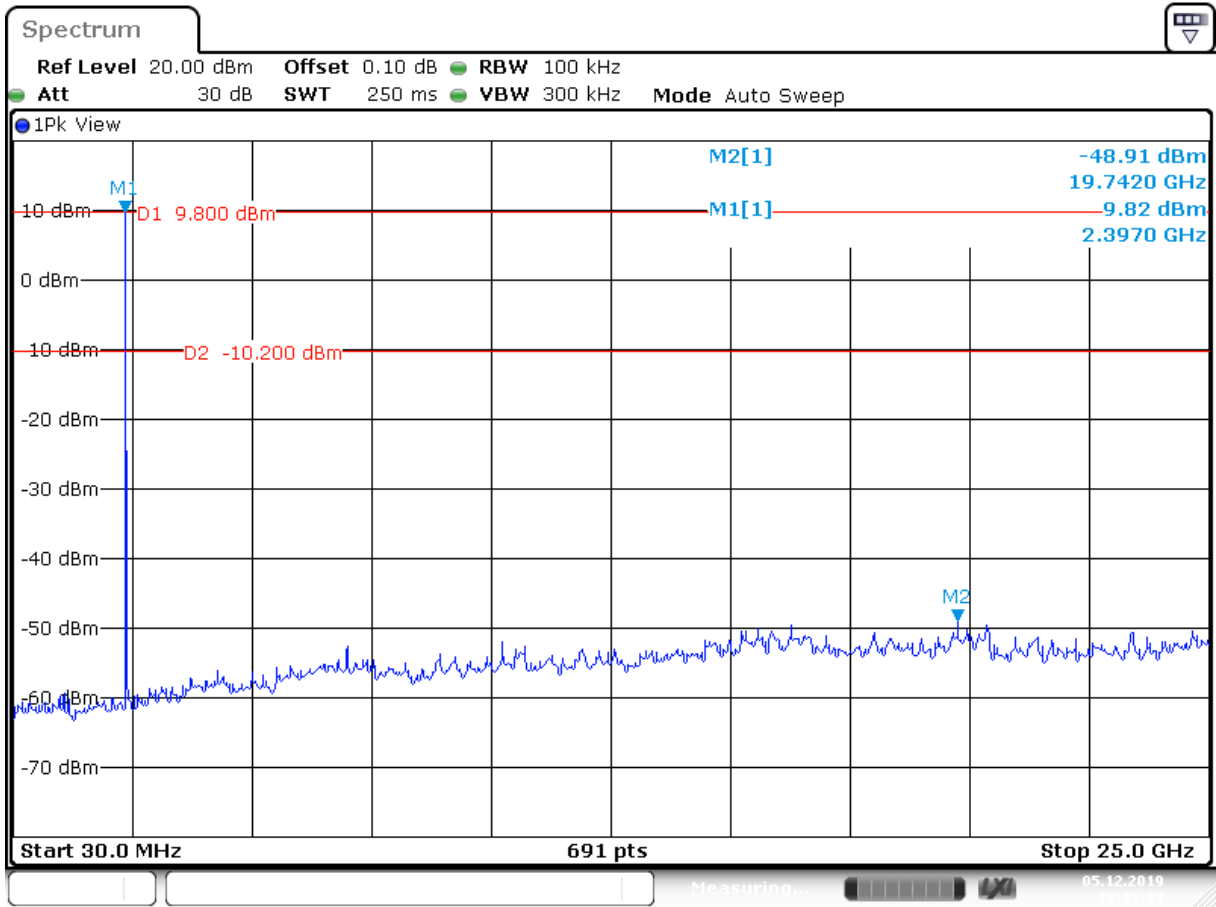
Measurement uncertainty is +/- 0.7 dB.

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

Test Report No.:

19092605.r01

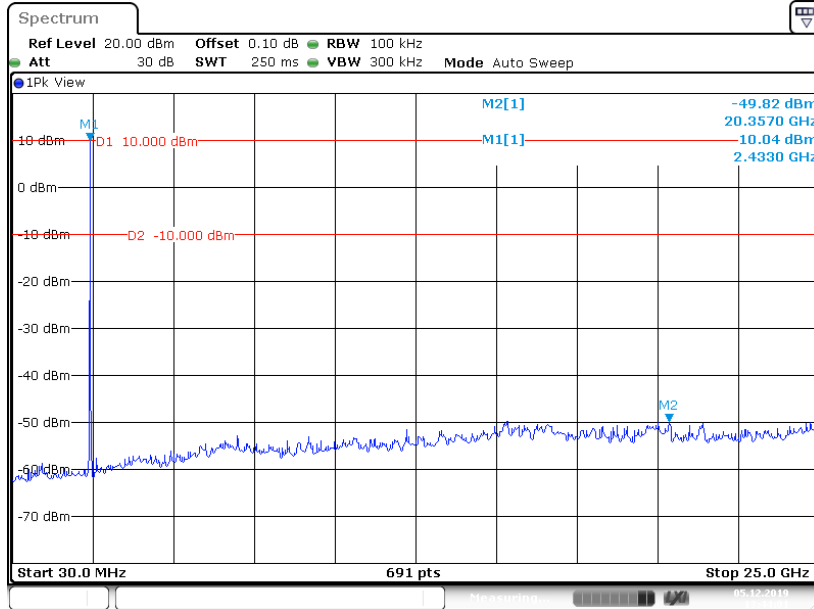
Page 25 of 47



Date: 5 DEC 2019 13:45:33

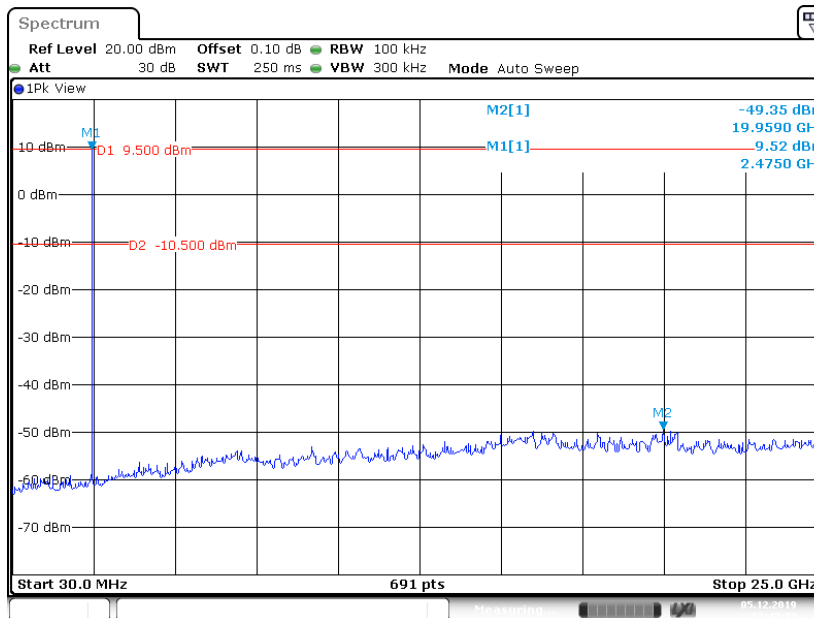
Plot: Band Edge Conducted Emission, Spectral Diagram, 2408 MHz

Plot showing more than 20 dB attenuation.



Date: 5 DEC 2019 13:44:02

Plot: Out of Band Edge Conducted Emission, Spectral Diagram, 2450 MHz
Plot showing more than 20 dB band edge attenuation.



Date: 5 DEC 2019 13:42:34

Plot: Out of band Conducted Emission, Spectral Diagram, 2475 MHz.
Plot showing more than 20 dB attenuation.

Test Report No.:

19092605.r01

Page 27 of 47

4.1.5 Radiated Spurious Emissions of Transmitter

RESULT: Pass

Date of testing: 2019-11-27

Frequency range: 30MHz - 25GHz

Requirements:

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

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 D0115.247 Meas Guidance v05r01, February 11, 2019

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.

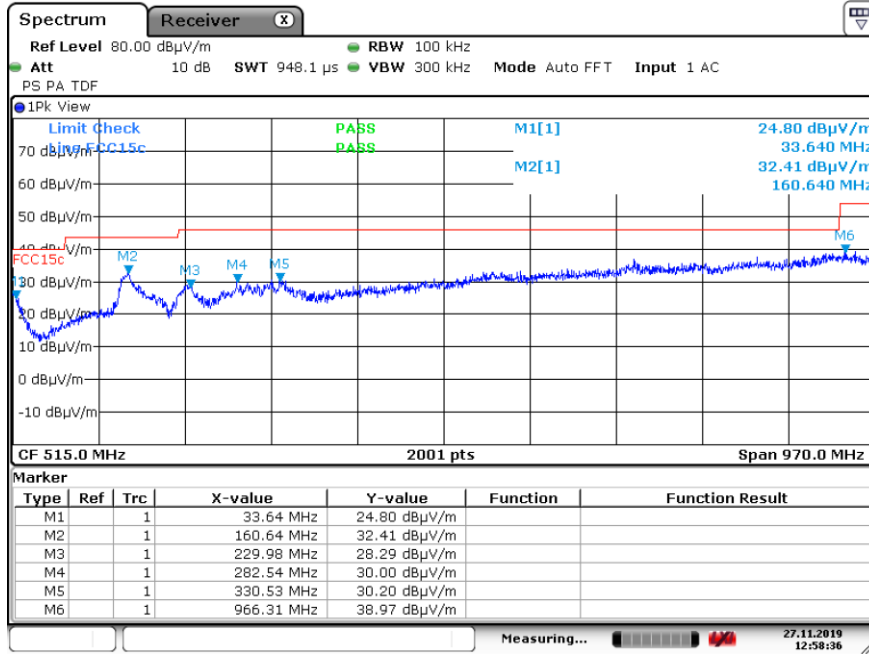
The highest emission amplitudes relative to the appropriate limit were recorded in this report. Field strength values of radiated emissions at frequencies not listed in the tables are more than 20 dB below the applicable limit. Where Peak (Pk) values were at least 6 dB under the Average (Av) limits,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

1.1.4 Radiated Emissions, 30MHz - 1GHz

Frequency [MHz]	EUT Orientation	Antenna Orientation	Level QP [dBµV/m]	Limit QP [dBµV/m]	Verdict [Pass/Fail]
33.6	Vertical	Vertical	20.1	40.0	Pass
160.0	Vertical	Vertical	28.8	43.5	Pass
230.0	Vertical	Horizontal	21.0	43.5	Pass
292.0	Vertical	Vertical	19.9	46.0	Pass
341.0	Vertical	Vertical	22.5	46.0	Pass
844-960 noise	-	Vertical	32.0	46.0	Pass

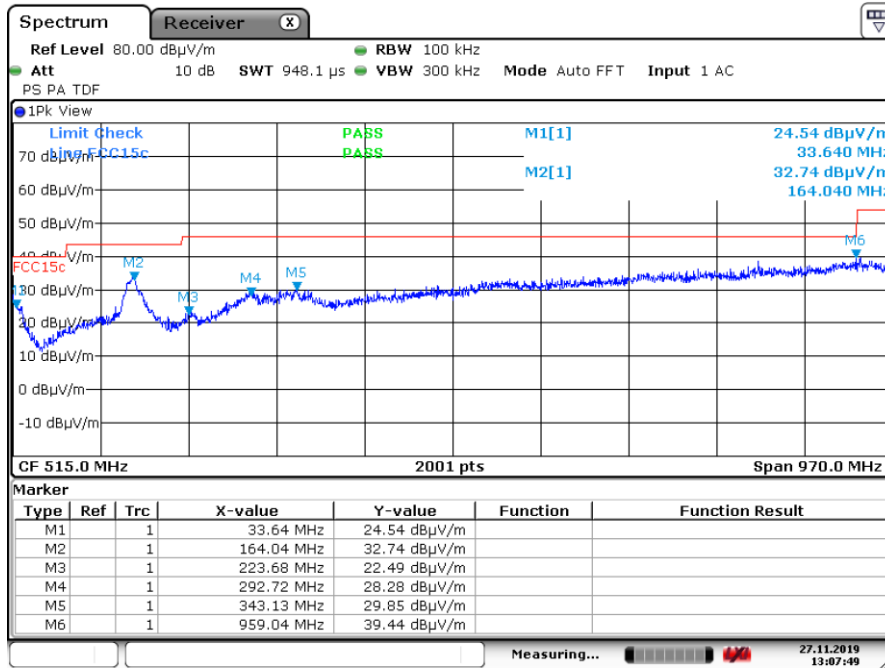
- Note:
- Level QP = Reading QP + Factor
 - Tested in modes as described in section 3.2, the 6 highest values noted. Preliminary measurements indicated that the radiated emissions from EUT were not affected by the EUT's frequency.
 - Quasi Peak detector used with a bandwidth of 120 kHz.
 - Measurement uncertainty is +/- 5.0 dB.
 - a selection of plots are provided on the next pages

1.1.5 Plot of the emissions in the range 30 -1000 MHz



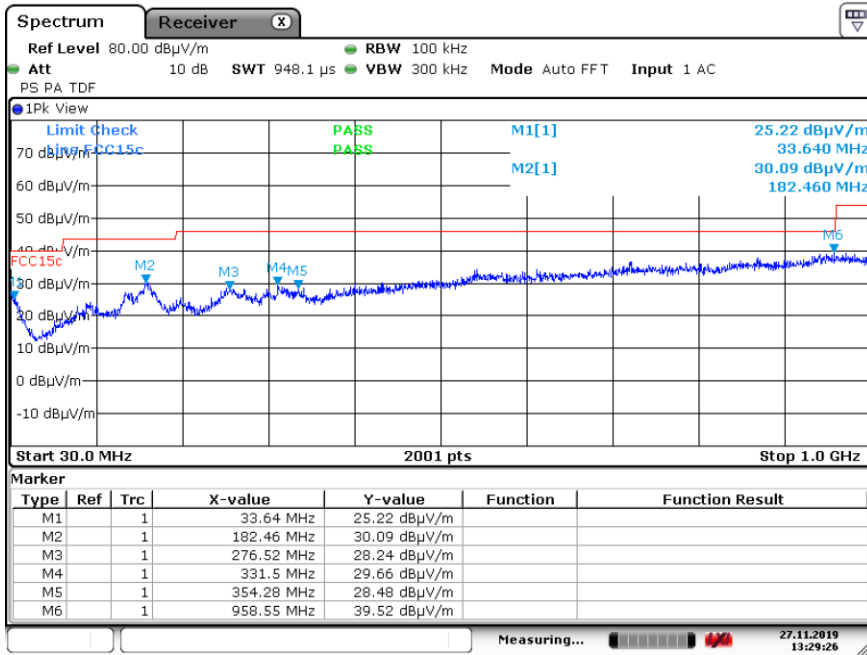
Date: 27.NOV.2019 12:58:37

Plot of the emissions in the range 30 – 1000 MHz (Peak detector values shown),
 EUT Horizontal Antenna Horizontal, 2408 MHz



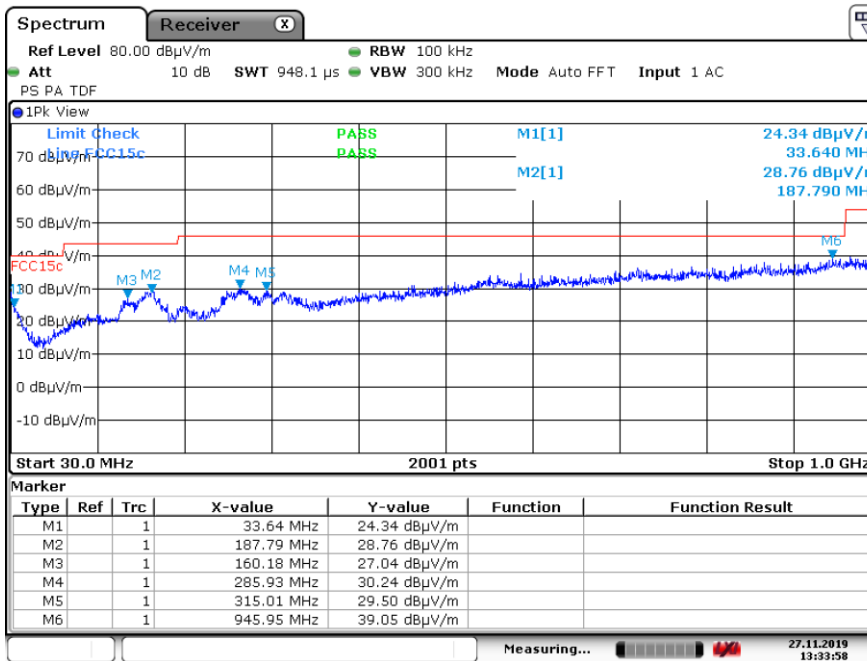
Date: 27.NOV.2019 13:07:49

Plot of the emissions in the range 30 – 1000 MHz (Peak detector values shown),
 EUT Vertical- Antenna Vertical, 2408 MHz



Date: 27.NOV.2019 13:29:25

Plot of the emissions in the range 30 – 1000 MHz (Peak detector values shown),
 EUT Vertical-Antenna Vertical, 2450 MHz



Date: 27.NOV.2019 13:33:57

Plot of the emissions in the range 30 – 1000 MHz (Peak detector values shown),
 EUT Vertical-Antenna Vertical, 2475 MHz



Test Report No.:

19092605.r01

Page 31 of 47

Radiated Emissions, 1 - 25GHz, 2408 MHz.

Frequency [MHz]	EUT Orientation	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
1080* ^R	Side	Horizontal	Pk	38.8	74 Pk 54 Av	Pass
6804	Vertical	Vertical	Pk	52.4	74 Pk 54 Av	Pass
8829	Vertical	Vertical	Pk	51.6	54 (Av) 74 (Pk)	Pass
9810	Vertical	Vertical	Pk	52.1	54 (Av) 74 (Pk)	Pass
10470	Vertical	Vertical	Pk	52.8	54 (Av) 74 (Pk)	Pass
21950 noise	-	Vertical	Pk	52.7	54 (Av) 74 (Pk)	Pass

Radiated Emissions, 1 - 25GHz, 2450 MHz.

Frequency [MHz]	EUT Orientation	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
1080* ^R	Vertical	Horizontal	Pk	40.7	54 (Av) 74 (Pk)	Pass
1440* ^R	Vertical	Vertical	Pk	38.5	54 (Av) 74 (Pk)	Pass
7372* ^H * ^R	Vertical	Horizontal	Pk	50.9	54 (Av) 74 (Pk)	Pass
10679	Vertical	Horizontal	Pk	52.2	54 (Av) 74 (Pk)	Pass
14027	Horizontal	Horizontal	Pk	57.4 Pk 53.0 Av	54 (Av) 74 (Pk)	Pass



Test Report No.:

19092605.r01

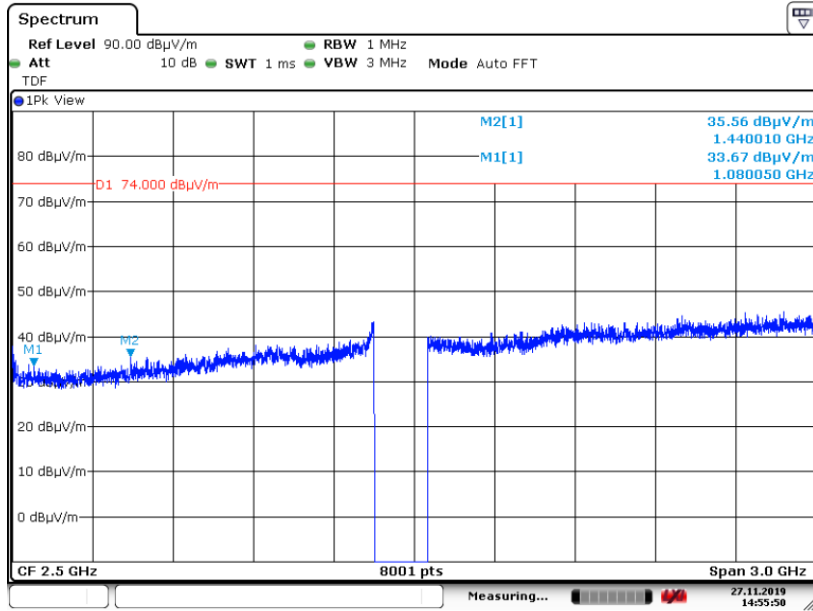
Page 32 of 47

Radiated Emissions, 1 - 25GHz, 2475 MHz.

Frequency [MHz]	EUT Orientation	Antenna Orientation	Detector	Level [dBµV/m]	Limit [dBµV/m]	Result
1080*R	Vertical	Horizontal	Pk	39.2	54 (Av) 74 (Pk)	Pass
1440*R	Vertical	Vertical	Pk	37.6	54 (Av) 74 (Pk)	Pass
11386 noise	-	Vertical	Pk	61.4 Pk 50.3 Av	54 (Av) 74 (Pk)	Pass
17250 noise	-	Vertical	Pk	58.6 Pk 50.0 Av	54 (Av) 74 (Pk)	Pass

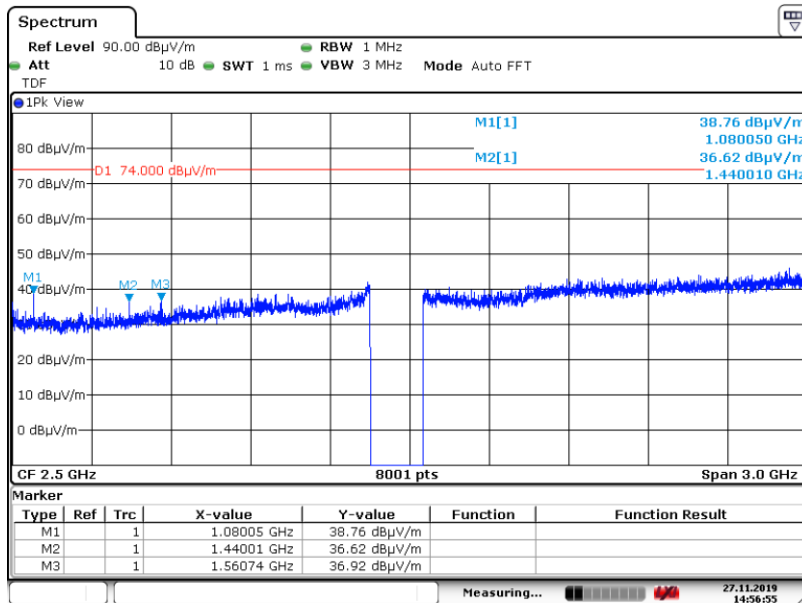
- Notes:
- *R refers to a frequency in a restricted band,
 - *H refers to a frequency which is a harmonic of the fundamental.
 - 1 MHz residual bandwidth filter setting used.
 - Field strength values of radiated emissions not listed in the tables above are more than 20 dB below the applicable limit.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

1.1.6 Plots of the radiated unwanted emissions 1 – 25 GHz



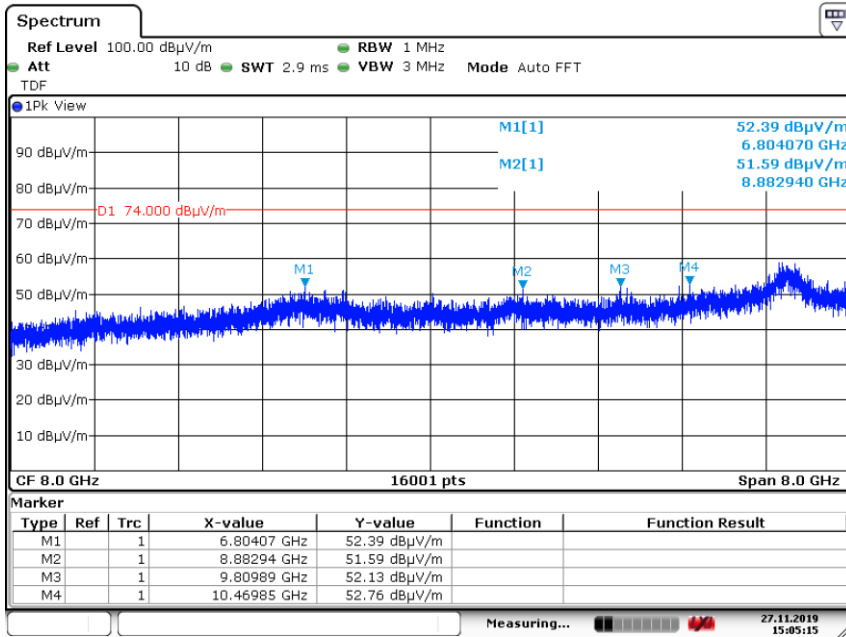
Date: 27.NOV.2019 14:55:51

Radiated unwanted emissions in the range 1 – 4 GHz at 2408 MHz
 (Peak values, EUT Vertical, Antenna Vertical position shown, gap is of the 2.4G Notch filter).



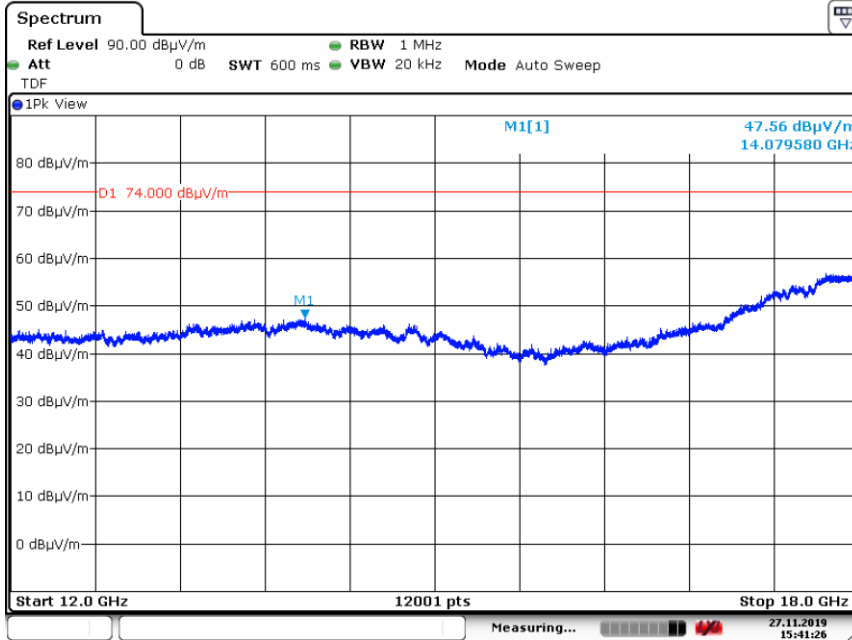
Date: 27.NOV.2019 14:56:56

Radiated unwanted emissions in the range 1 – 4 GHz at 2408 MHz
 (Peak values, EUT side ways, Antenna horizontal position shown, gap is of the 2.4G Notch filter)



Date: 27.NOV.2019 15:05:15

Radiated unwanted emissions at 4 - 12 GHz, at 2408 MHz
 (Peak values, EUT Vertical, Antenna vertical position shown)



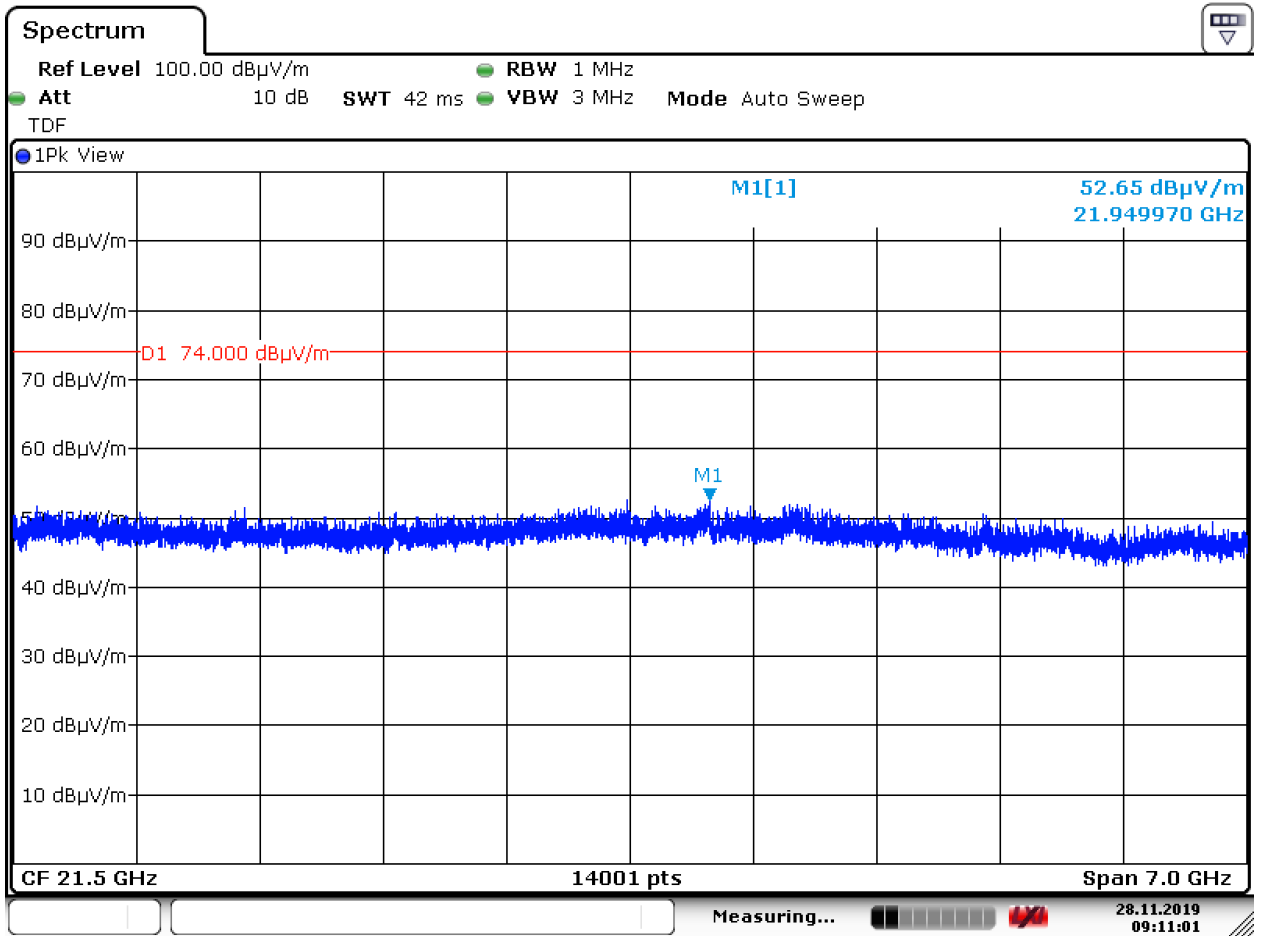
Date: 27.NOV.2019 15:41:26

Radiated unwanted emissions in the range 12 – 18 GHz at 2408 MHz
 (Peak values, EUT Vertical, Antenna vertical position, reduced bw shown)

Test Report No.:

19092605.r01

Page 35 of 47



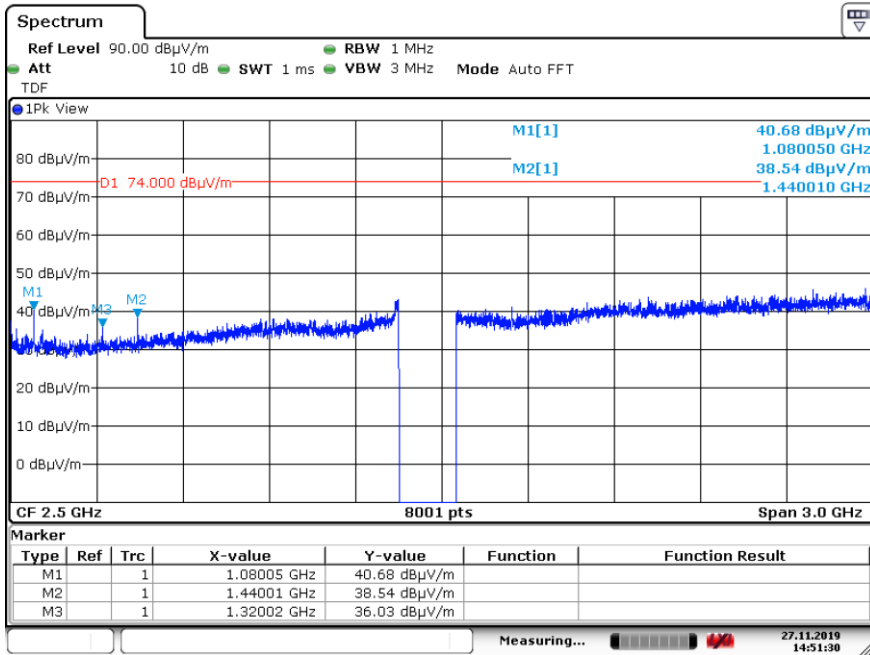
Date: 28.NOV.2019 09:11:01

Radiated unwanted emissions in the range 18 – 25 GHz at 2408 MHz
(Peak values, EUT Vertical, Antenna vertical position shown)

Test Report No.:

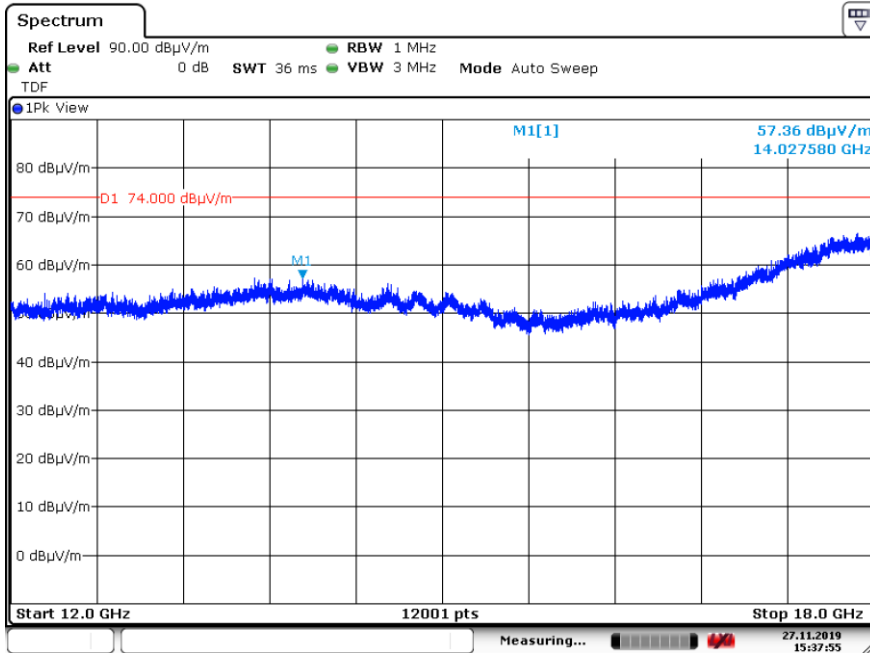
19092605.r01

Page 36 of 47



Date: 27.NOV.2019 14:51:30

Radiated unwanted emissions in the range 1 – 4 GHz at 2450 MHz
 (Peak values, EUT Vertical, Antenna horizontal position shown, gap is by the 2.4G Notch filter)



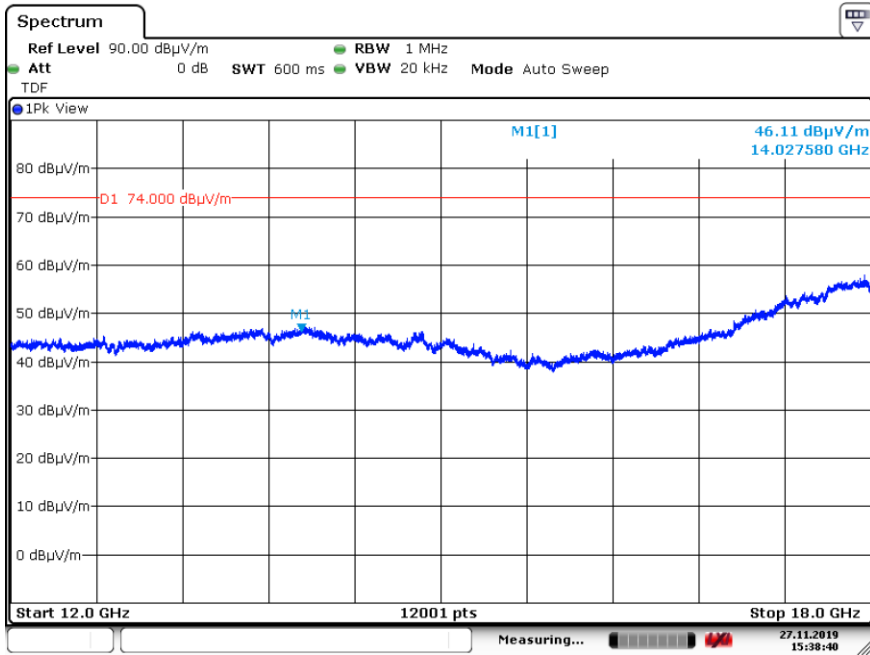
Date: 27.NOV.2019 15:37:56

Radiated unwanted emissions in the range 12 – 18 GHz at 2450 MHz
 (Peak values, EUT horizontal, Antenna horizontal position shown)

Test Report No.:

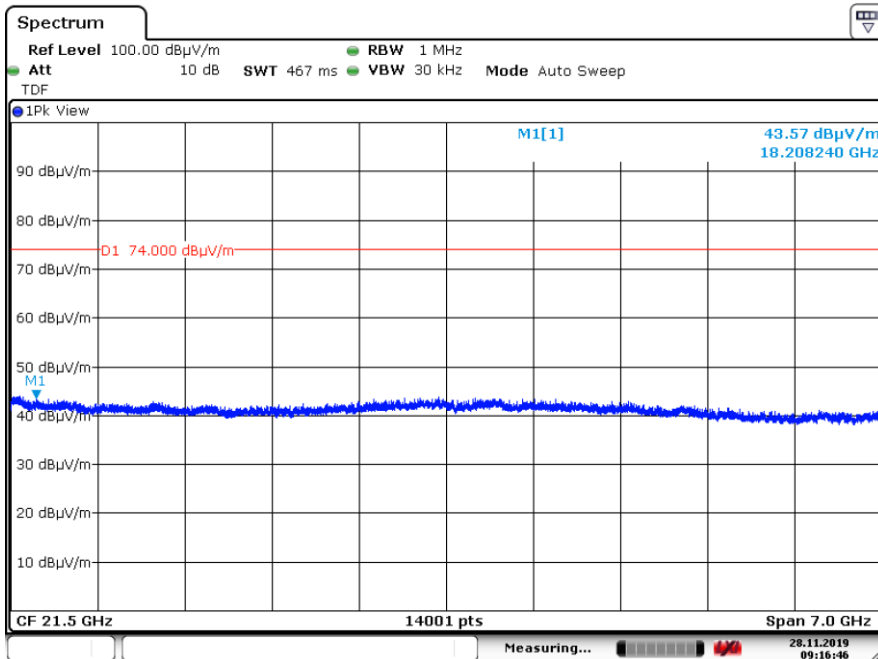
19092605.r01

Page 37 of 47



Date: 27.NOV.2019 15:38:40

Radiated unwanted emissions in the range 12 – 18 GHz at 2450 MHz
(Peak values, EUT horizontal, Antenna horizontal position shown, reduced video bandwidth)



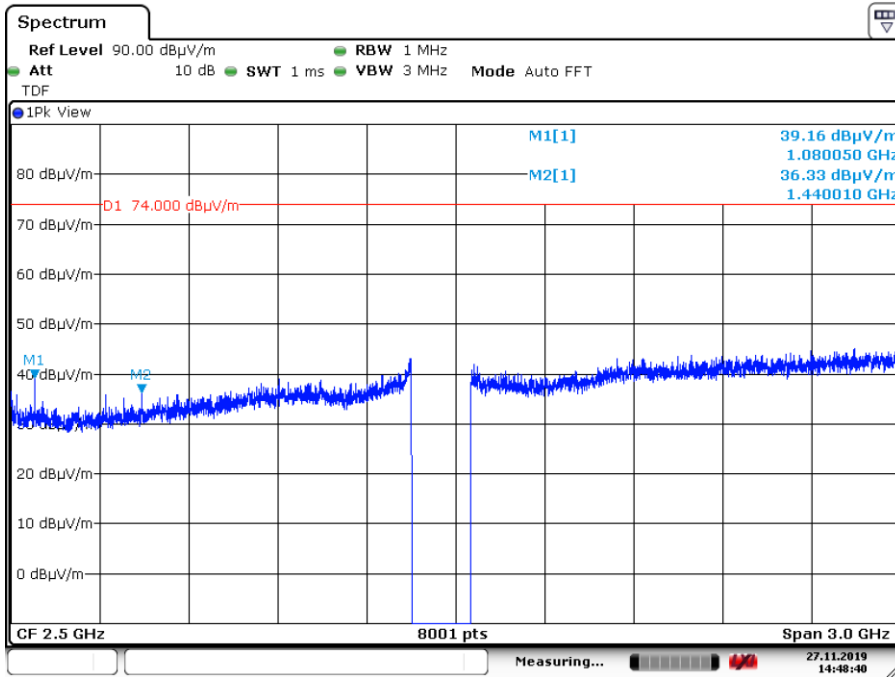
Date: 28.NOV.2019 09:16:46

Radiated unwanted emissions in the range 18 – 25 GHz at 2450 MHz
(Peak values, EUT vertical, Antenna vertical position shown, reduced video bandwidth)

Test Report No.:

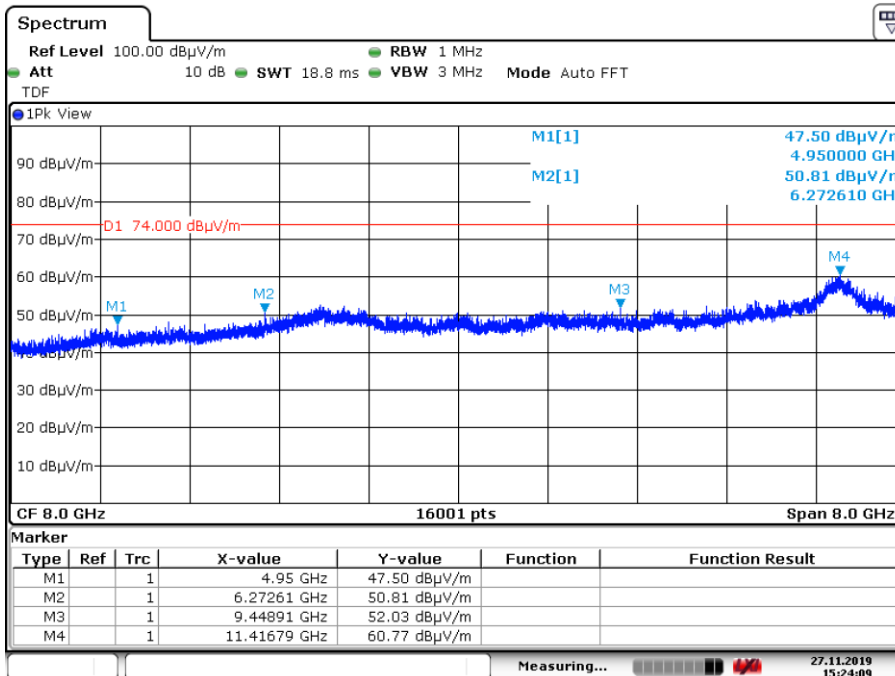
19092605.r01

Page 38 of 47



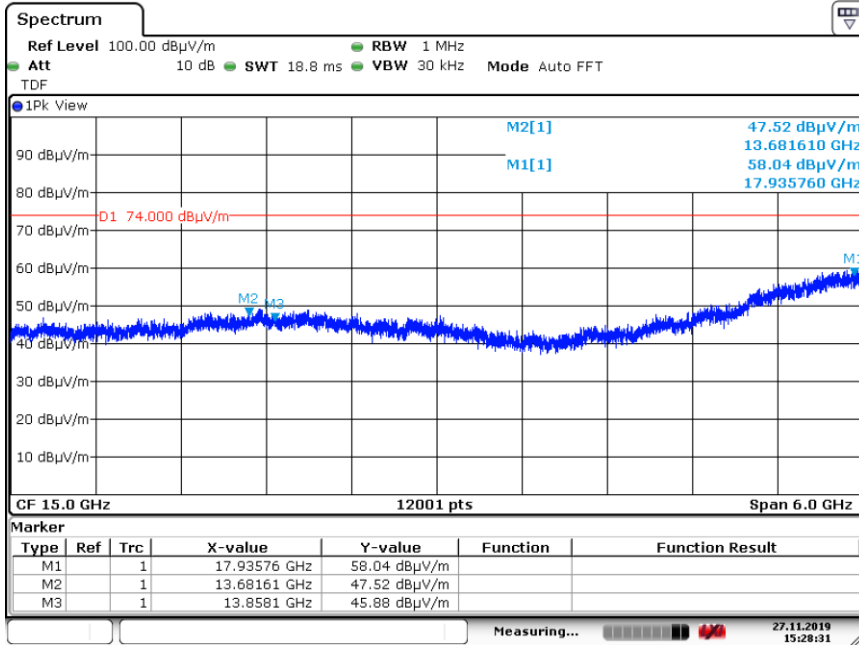
Date: 27.NOV.2019 14:48:41

Radiated unwanted emissions in the range 1 – 4 GHz at 2475 MHz
 (Peak values, EUT Vertical, Antenna horizontal position shown, gap is by the 2.4G Notch filter)



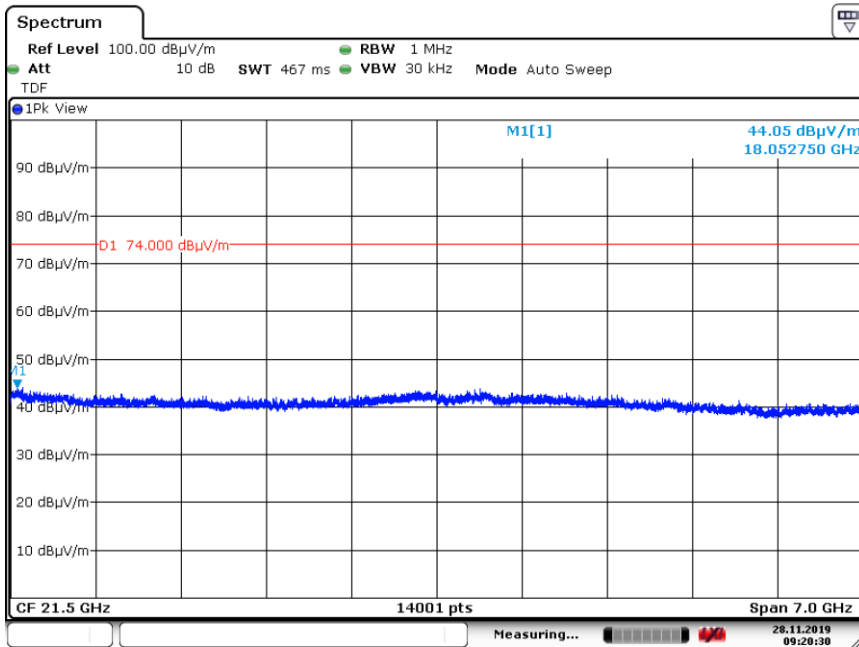
Date: 27.NOV.2019 15:24:09

Radiated unwanted emissions in the range 4 – 12 GHz at 2475 MHz
 (Peak values, EUT vertical, Antenna vertical position shown)



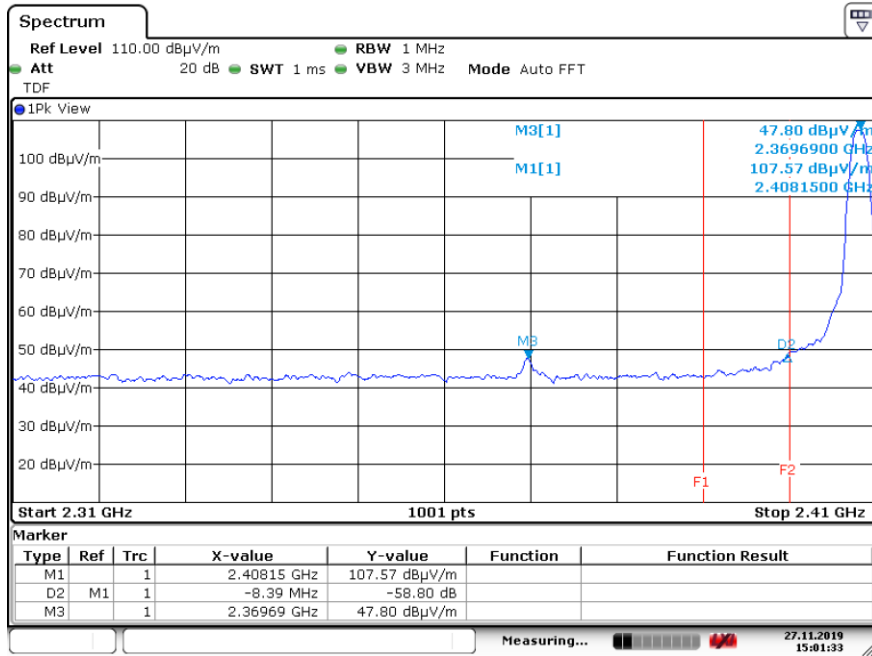
Date: 27.NOV.2019 15:28:31

Radiated unwanted emissions in the range 12 – 18 GHz at 2475 MHz
 (Peak values, EUT vertical, Antenna horizontal position shown, reduced video bandwidth)



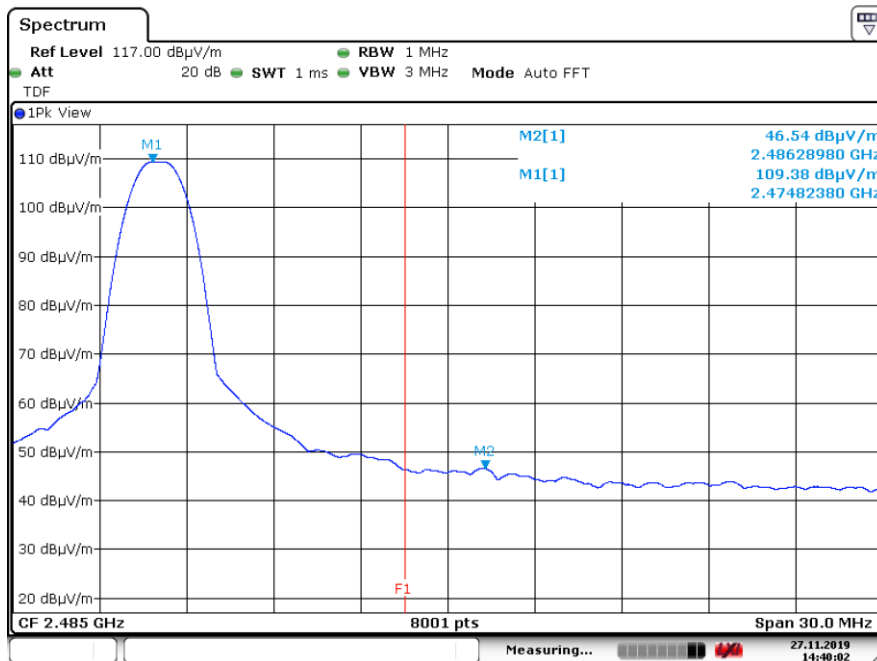
Date: 28.NOV.2019 09:20:30

Radiated unwanted emissions in the range 18 – 25 GHz at 2475 MHz
 (Peak values, EUT horizontal, Antenna vertical position shown, reduced video bandwidth)



Date: 27.NOV.2019 15:01:33

Low Band Edge, Radiated unwanted emissions in the range at 2408 MHz
 (Peak values, EUT Vertical, Antenna vertical position shown)



Date: 27.NOV.2019 14:40:01

High Band Edge, Radiated unwanted emissions at 2475MHz
 (Peak values, EUT vertical, Antenna vertical position shown)



Test Report No.:

19092605.r01

Page 41 of 47

4.2 AC Power Line Conducted Measurements

RESULT: Pass.

Date of testing: 2020-01-03

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.



Test Report No.:

19092605.r01

Page 42 of 47

4.2.1 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	
0.220	42.2	*3	40.0	*3	62.8	52.8	Pass
0.230	43.2	*3	42.0	*3	62.4	52.4	Pass
0.235	40.0	*3	43.1	*3	62.1	52.1	Pass
0.340	35.0	*3	38.3	*3	59.2	49.2	Pass
0.345	36.6	*3	35.0	*3	59.0	49.0	Pass
0.455	32.4	*3	32.0	*3	56.9	46.9	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 results proved not to be depended on EUT's operational frequency. Worst case values noted.
3. Qp values already within Av limits, therefor Av not tested.
4. Measurement uncertainty is +/- 3.5 dB.
5. A selection of plots are provided on the next pages.



Test Report No.: **19092605.r01**

Page 43 of 47

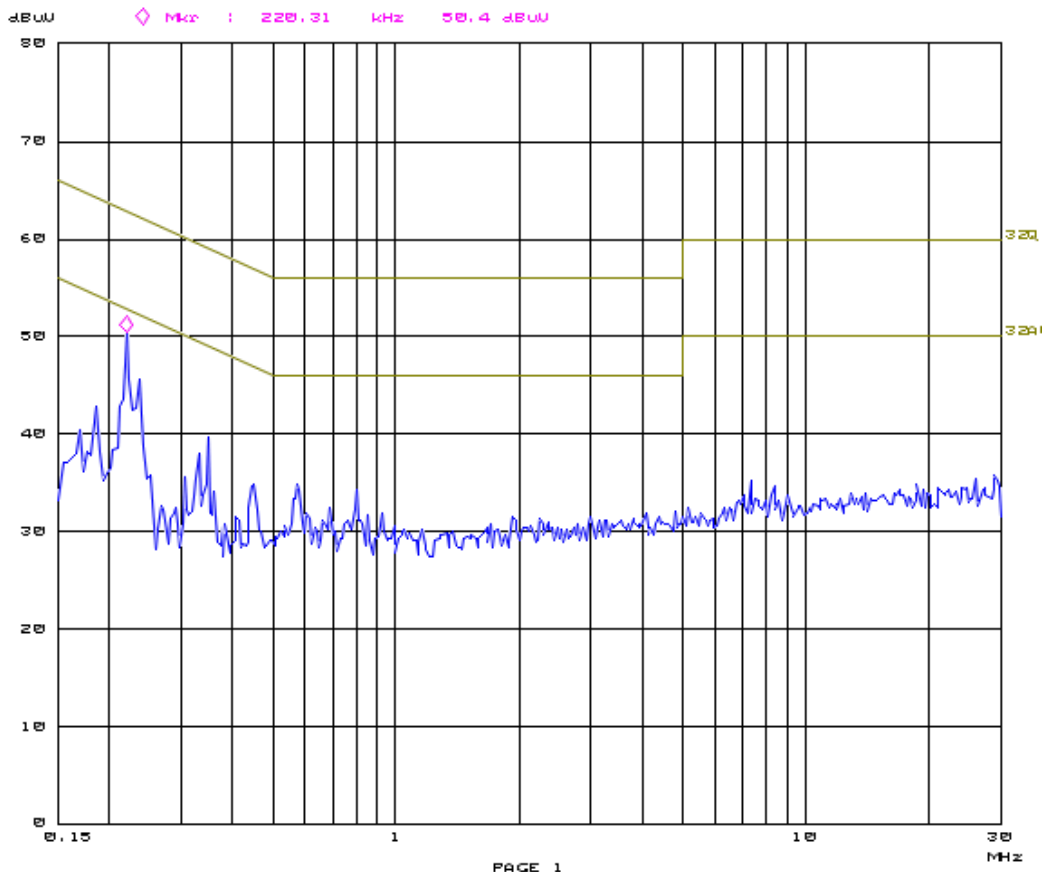
6.2.2 Plots of the AC Power-line Conducted Emissions

7GHI

ES, Jan 28 11:02

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 L1, 2408 MHz



Test Report No.:

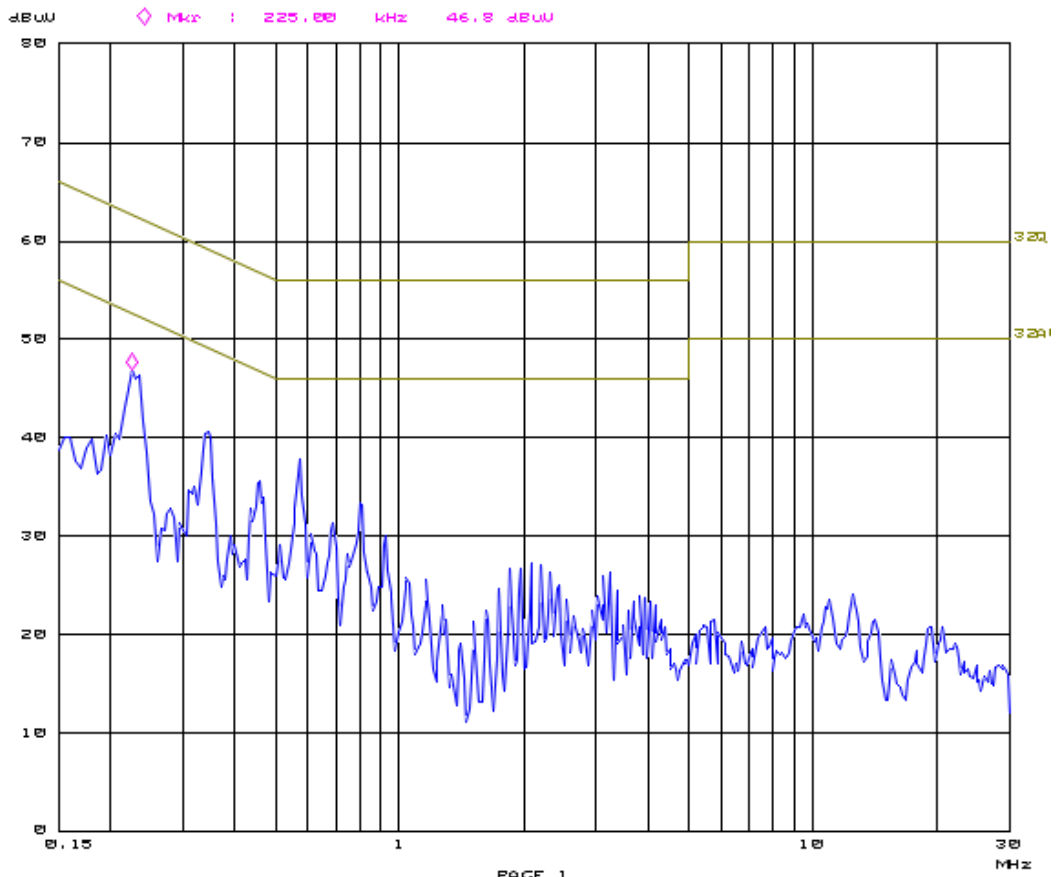
19092605.r01

Page 44 of 47

7GHI

08. Jan 20 11:39

```
Scan Settings (1 Range)
:----- Frequencies -----:----- Receiver Settings -----:
  Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
  150k       30M       5k        9k     PK        20ms   0dBLN OFF
```



Plot of the AC Power-line Conducted emissions on L1, 2475 MHz



Test Report No.:

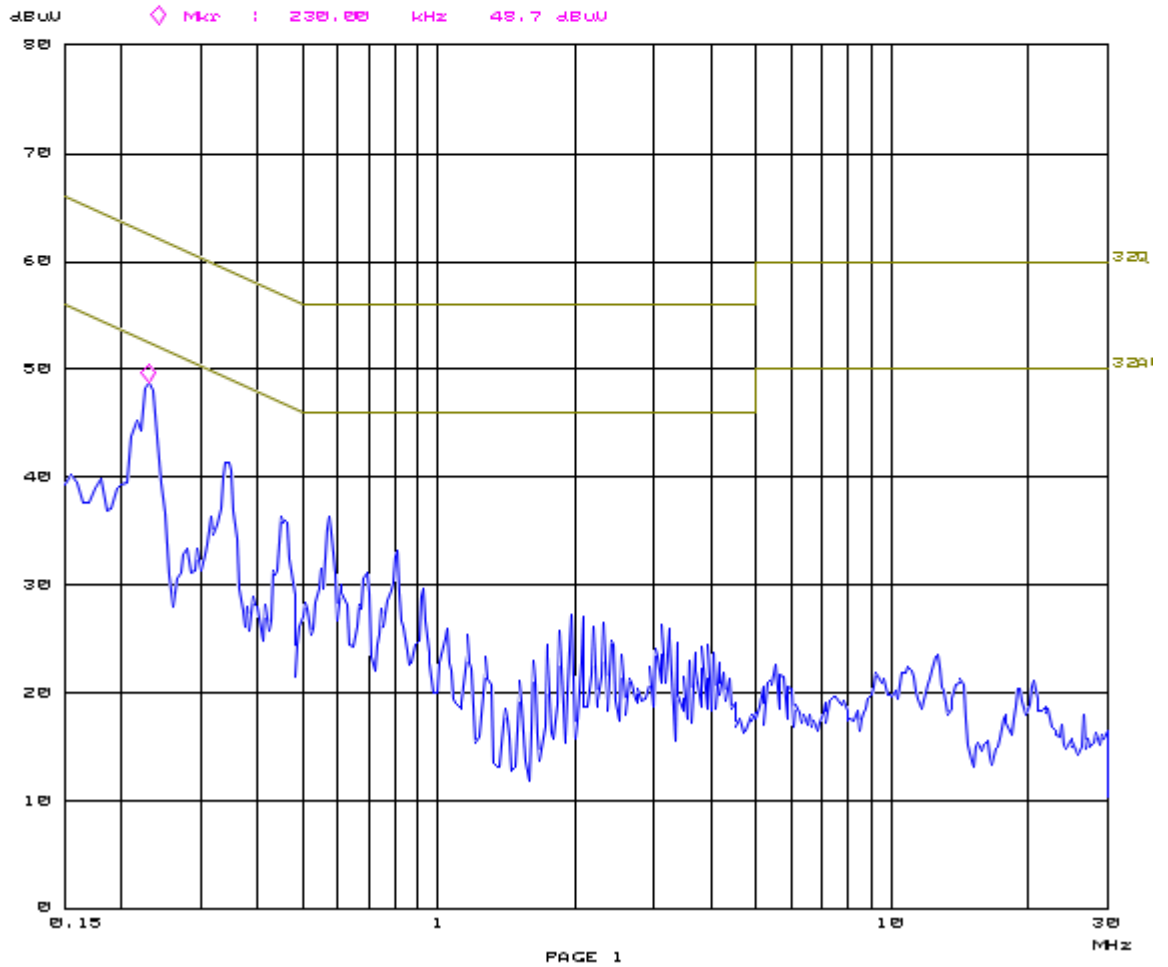
19092605.r01

Page 45 of 47

7GH1

03. Jan 20 11:15

Scan Settings (1 Range) :----- Receiver Settings -----!
 :----- Frequencies -----!
 Start Stop Step IF BW Detector M-Time Atten Preamp
 150k 30M 5k 9k PK 20ms 0dB LN OFF



Plot of the AC Power-line Conducted emissions on L2, 2408 MHz



Test Report No.:

19092605.r01

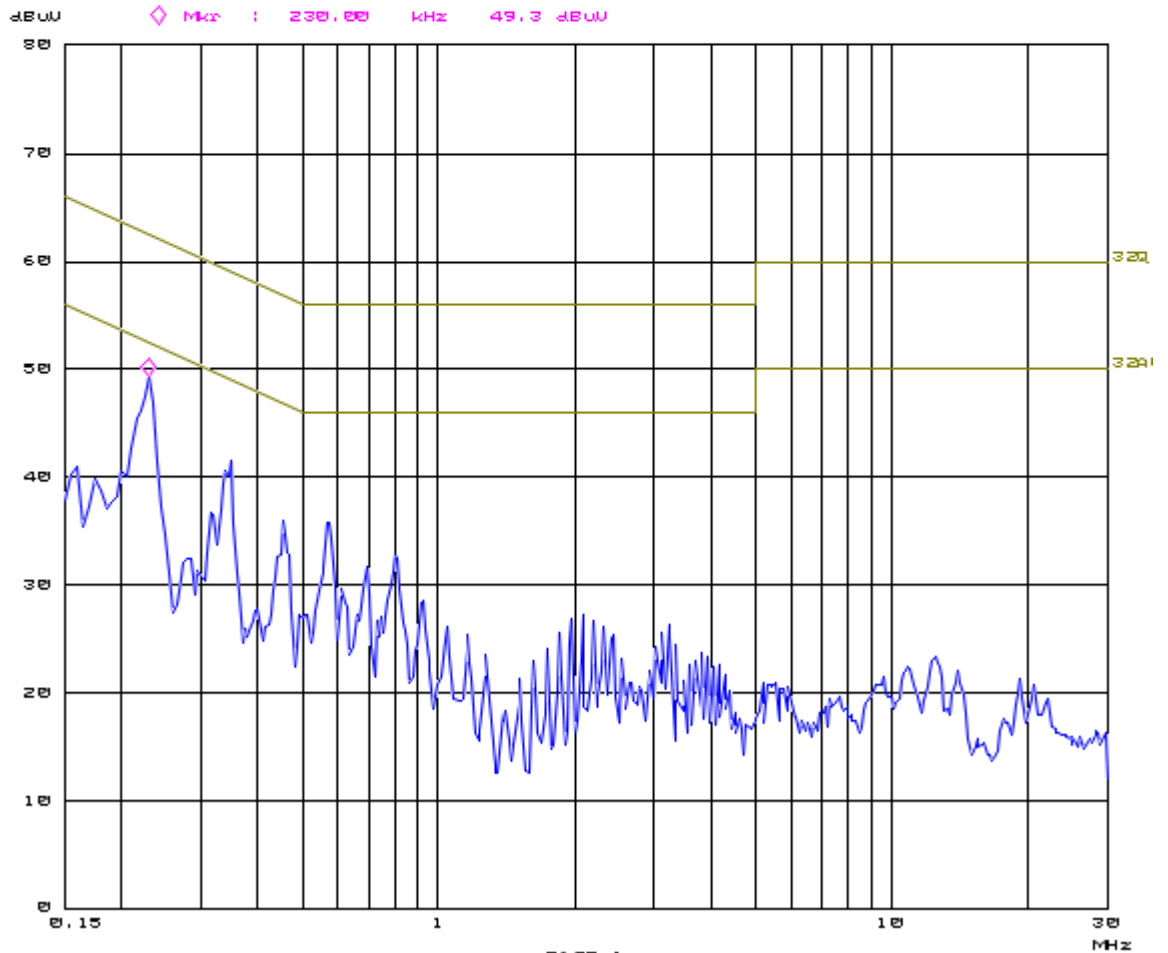
Page 46 of 47

7GH1

03. Jan 20 11:34

```

Scan Settings (1 Range)
:----- Frequencies -----: Receiver Settings -----:
  Start      Stop      Step      IF BW  Detector  M-Time  Atten  Preamp
  150k       30M       5k        9k     PK        20ms   0dB    OFF
  
```



Plot of the AC Power-line Conducted emissions on L2, 2475 MHz



Test Report No.:

19092605.r01

Page 47 of 47

End of report