Prüfbericht-Nr.: *Test Report No.*:	**20050404.r01**	**Auftrags-Nr.:** *Order No.*:	89004089	Seite 1 von 32 *Page 1 of 32*
Kunden-Referenz-Nr.: *Client Reference No.*:	1324261	**Auftragsdatum:** *Order date*:	2020-05-12	
Auftraggeber: *Client*:	Nedap N.V., Parallelweg 2 7141 DC Groenlo, Netherlands			
Prüfgegenstand: *Test item*:	Long-range vehicle and driver identification reader			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	TRANSIT ULTIMATE			
Auftrags-Inhalt: *Order content*:	Compliance with regulatory requirements			
Prüfgrundlage: *Test specification*:	47 CFR PART 15 (10-1-19 EDITION), Subpart 15C RSS-Gen (Issue 5 April 2018) General Requirements for Compliance of Radio Apparatus and RSS-210 (Issue 10 Dec 2019) Licence-exempt Radio Apparatus. -			

Wareneingangsdatum: *Date of receipt*:	2020-07-09
Prüfmuster-Nr.: *Test sample No.*:	FN13A0002
Prüfzeitraum: *Testing period*:	2020-07-13 / 2020-07-20
Ort der Prüfung: *Place of testing*:	Leek
Prüflaboratorium: *Testing laboratory*:	TÜV Rheinland Nederland B.V. Leek Laboratory
Prüfergebnis*: *Test result**:	Pass

gerprüft von / tested *by:*

Datum /date: 2020-07-20 — Richard van der Meer, Expert

genehmigt von / reviewed & authorized by:

2020-07-20 — Erik van der Wal, Expert

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other:* *issue date is equal to authorized date*

Zustand des Prüfgegenstandes be Anlieferung:2 *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut P(ass) = entspricht o.g.	2 = gut Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T/ = nicht getested
Legend:	*1 = very good* *P(ass) = passed a.m.*	*2 = good* *Test specification(s)*	*3 = satisfactory* *F(ail) a.m. test specification(s)*	*4 = sufficient* *N/A = not applicable*	*5 = poor* *N/T = not tested*

TÜV Rheinland Nederland B.V. · Eiberkamp 10 · 9351 VT Leek · Tel: + 31 88 8887888
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Revisions *Revisions*			
Revision Revision	**Datum** Date	**Anmerkung** Remark	**Verfasser** Author
-	2020.07.20	First release	R. van der Meer
Note: Latest revision report will replace all previous reports			

Table of contents

1 General information.

1.1 Product description.

The brand Nedap, Model TRANSIT ULTIMATE hereafter referred to as EUT, is a 2.4 GHz RFID Reader with a 433 MHz RF control Channel. As an option, the device can have an external 120 kHz Card reader. This test report is for the upgraded 2.4 GHz portion.

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 Permissive Change II in equipment authorization files under:
FCC ID: CGDTRANSITULT2 and IC: 1444A-TRANSITULT2.

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	:	Long-range vehicle and driver identification reader
Manufacturer	:	N.V. Nederlandsche Apparatenfabriek “Nedap”
Brand	:	Nedap
Model(s)	:	TRANSIT ULTIMATE
Serial Number	:	FN13A0002
Voltage input rating	:	24 Vdc
Voltage output rating	:	--
Current input rating	:	--
Antenna	:	Internal, integrated on the PCB
Antenna Gain	:	<6 dBi
Operating frequency	:	2436.0 – 2464.2 MHz
Modulation	:	CW
Firmware version	:	2.05

Auxiliary equipment 1 (AUX1)	:	Power supply adapter
Brand	:	POWER-WIN TECHNOLOGY CORP>
Model	:	PW-024A-1Y240K
Serial number	:	4571493
Voltage input rating	:	100 – 240 Vac
Voltage output rating	:	24 Vdc
Remark	:	used for powering the EUT, property applicant

Auxiliary equipment 2 (AUX2)	:	Card reader
Brand	:	Nedap
Model	:	DC130 BLUE
Serial number	:	L401 B 0029
Remark	:	-

1.4 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	DC Power	AUX1	AUX2	--	
4	Card reader	AUX2	EUT	--	

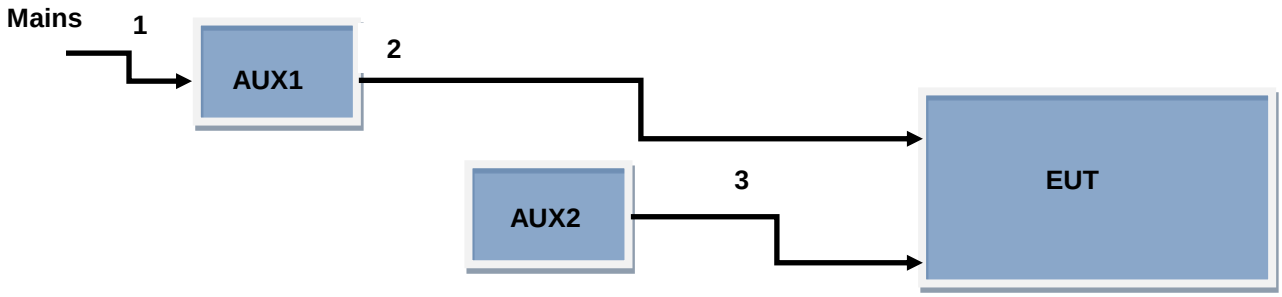


Figure 1. Basic set-up for programming

1.5 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (10-1-19 Edition), sections 15.31, 15.205,15.207, 15.209 and 15.245, RSS-GEN (ISSUE 5, APRIL 2018) RSS-210 (ISSUE 10, DECEMBER 2019).

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 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.
H-field measurements have been done in the Semi-Anechoic chamber to identify emissions from the EUT and final testing been performed on the outside facilities at 3m, 5m and 10m distance.
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.

1.7 Test conditions.

Normal test conditions:

Temperature (*) : +15°C to +35°C
Relative humidity(*) : 20 % to 75 %
Supply voltage : 24 Vdc through a 100-240Vac 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*.

1.8 Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
Radiated Emissions	30MHz - 1GHz	±5.22dB
	> 1GHz	±5.22dB
AC Power Line Conducted Emissions	150kHz - 30MHz	±3.6dB

2 System test configuration.

2.1 Justification.

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. The tests have been performed with a complete functioning EUT.

2.3 Operation modes

Operation modes for testing are:

Operation mode	Channel / frequency	Power level
Continuous Transmit	Low channel: Ch 4C $_{hex}$ / 2436.0 MHz	34 $_{hex}$
Continuous Transmit	Middle channel: Ch 63 $_{hex}$ / 2449.8 MHz	34 $_{hex}$
Continuous Transmit	High channel: Ch 7B $_{hex}$ / 2464.2 MHz	34 $_{hex}$

The operation frequency/ channel and power level could be set by means of switches inside the EUT.

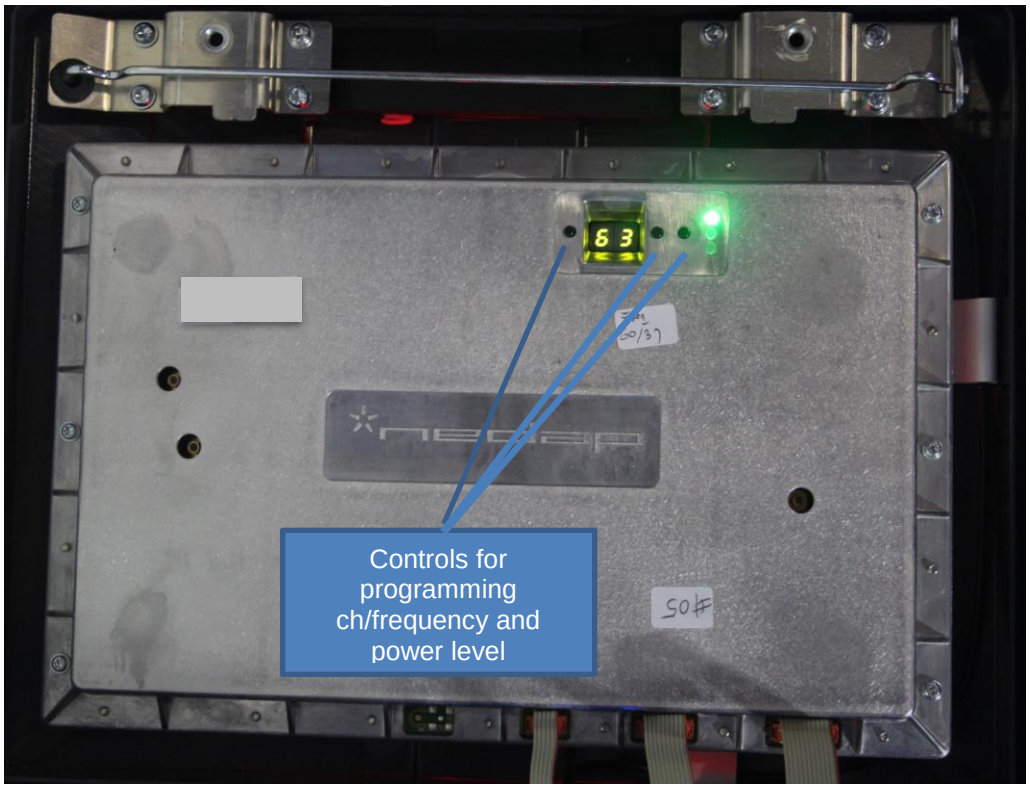


Photo 1: basic setup for programming

2.4 Special accessories.

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

2.5 Equipment modifications.

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

3 Radiated emission data.

RESULT: PASS

Date of testing: 2020-07-13
Tested by: R. van der Meer
Frequency range: 30MHz - 25GHz

Requirements:

FCC 15.205, FCC 15.209, FCC 15.245(b) and IC RSS-Gen(8.9) and RSS-210 2.2 and Annex F

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall

Frequency (MHz)	Field strength (µV/meter)	Field strength (dBµV/m)	Measurement distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0 (Av), 74 (Pk)	3

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a)/ 15.245 (b3)/ RSS-Gen (8.9) 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.

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 and the EUT orientation (X, Y, Z) 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 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 at least 10kHz 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]	EUT Orientation	Antenna Orientation	Level QP [dBµV/m]	Limit QP [dBµV/m]	Result Pass/Fail
30.7	Vertical	Vertical	36.0	40.0	Pass
41.4	Vertical	Vertical	28.2	40.0	Pass
84.0	Vertical	Vertical	24.2	40.0	Pass
90.4	Vertical	Vertical	25.3	43.5	Pass
118	Vertical	Vertical	24.4	43.5	Pass
729	Vertical	Vertical	24.5	46.0	Pass

Table 1 Radiated emissions of the EUT in the frequency range 30 – 1000 MHz.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209, 15.245(b) and RSS-210 Annex F and RSS-Gen section 8.9 with the EUT operating in continues transmit mode are depicted in Table 1.

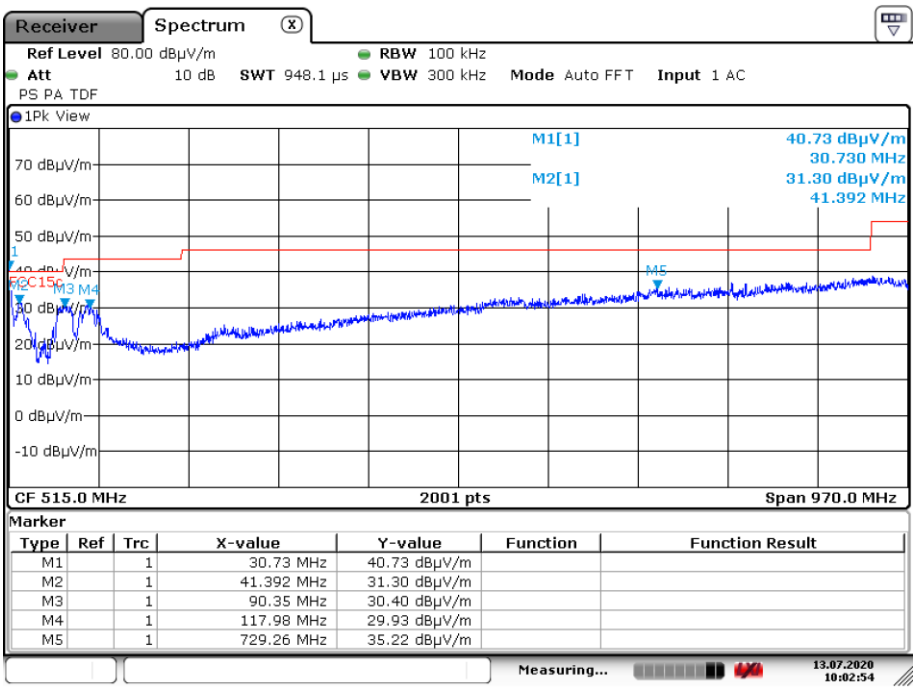
Notes:

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 ±5.22dB
3. 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).
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.
6. A selection of plots are provided on pages 12 - 13

Used test equipment and ancillaries:

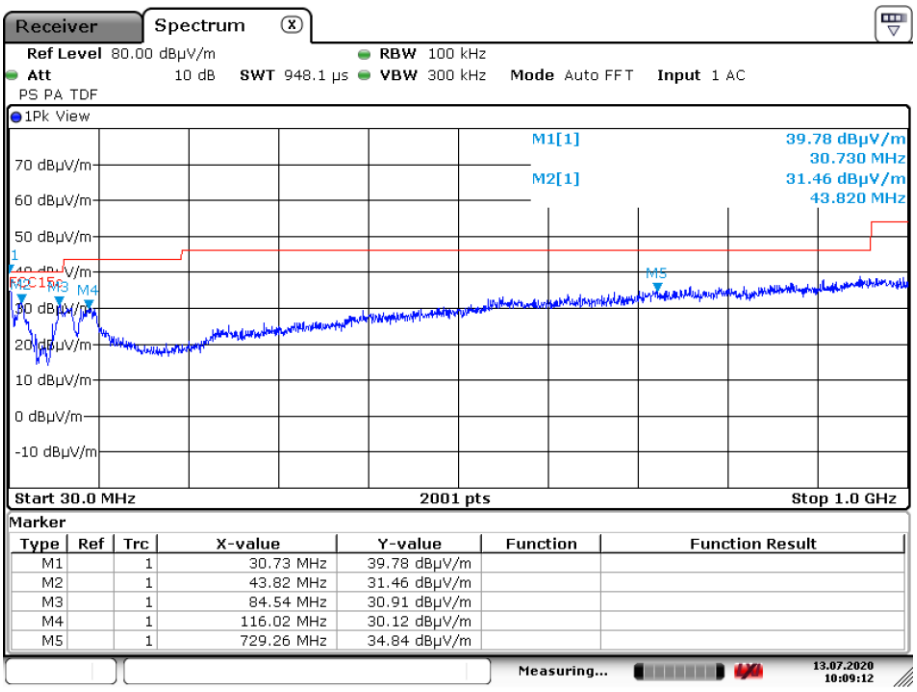
2790499	2789217	2789009	2789214	2789237	9002463	2788897

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



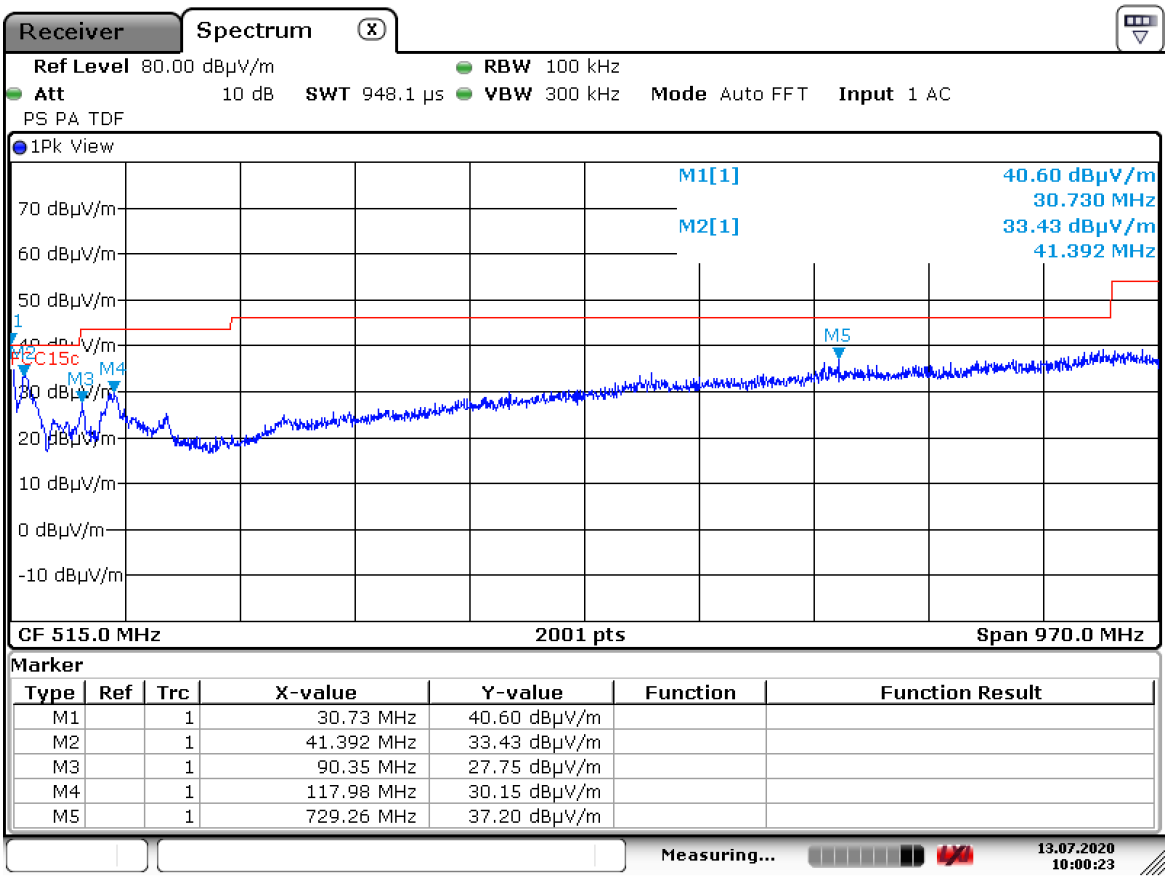
Date: 13.JUL.2020 10:02:54

Plot 1 of the emissions in the range 30 – 1000 MHz (Peak detector values shown) at 2436.0 MHz
EUT vertical, Antenna vertical



Date: 13.JUL.2020 10:09:12

Plot 2 of the emissions in the range 30 – 1000 MHz (Peak detector values shown) at 2449.8 MHz
EUT vertical, Antenna vertical



Date: 13.JUL.2020 10:00:23

Plot 3 of the emissions in the range 30 – 1000 MHz (Peak detector values shown) at 2464.2 MHz, EUT horizontal, Antenna vertical

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

3.2.1 Radiated field strength measurements (1 - 25 GHz, E-field), EUT's TX Frequency 2436.0 MHz

Frequency [MHz]	EUT Orientation	Antenna Orientation	Resolution Bandwidth (kHz)	Level [dBµV/m]	Limit [dBµV/m]	Result
1000[R]	Vertical	Vertical	1000	39.3 Pk	74 Pk 54 Av	Pass
2436.0 (fundamental)	Vertical	Horizontal	1000	111.4 Pk 111.0 Av	114 Av 134 Pk	Pass
3601	Vertical	Vertical	1000	46.0 Pk	74 Pk 54 Av	Pass
4872[H-R]	Vertical	Vertical	1000	49.7 Pk	74 Pk 54 Av	Pass
7308[H]	Vertical	Vertical	1000	54.0 Pk 49.5 Av	74 Pk 54 Av	Pass
10781[R]	Vertical	Vertical	1000	55.8 Pk 50.7 Av	74 Pk 54 Av	Pass

Table 2

3.2.2 Radiated field strength measurements (1 - 25 GHz, E-field), EUT's TX Frequency 2449.8 MHz

Frequency [MHz]	EUT Orientation	Antenna Orientation	Resolution Bandwidth (kHz)	Level [dBµV/m]	Limit [dBµV/m]	Result
1000[R]	Vertical	Vertical	1000	37.9 Pk	74 Pk 54 Av	Pass
2449.8 (fundamental)	Vertical	Horizontal	1000	111.4 Pk 111.1 Av	114 Av 134 Pk	Pass
4899[H-R]	Vertical	Vertical	1000	50.5 Pk	74 Pk 54 Av	Pass
7349[H-R]	Vertical	Vertical	1000	51.2 Pk 44.3 Av	74 Pk 54 Av	Pass
14056	Vertical	Vertical	1000	58.9 Pk 45.0 Av	74 Pk 54 Av	Pass

Table 3

3.2.3 Radiated field strength measurements (1 - 25 GHz, E-field), EUT's TX Frequency 2464.2 MHz

Frequency [MHz]	EUT Orientation	Antenna Orientation	Resolution Bandwidth (kHz)	Level [dBµV/m]	Limit [dBµV/m]	Result
1007	Vertical	Vertical	1000	38.8 Pk	74 Pk 54 Av	Pass
1302	Vertical	Vertical	1000	37.4 Pk	74 Pk 54 Av	Pass
2464.2 (fundamental)	Vertical	Horizontal	1000	111.1 Pk 110.6 Av	114 Av 134 Pk	Pass
4928.9[H-R]	Vertical	Vertical	1000	52.5 Pk	74 Pk 54 Av	Pass
7392.5[H-R]	Vertical	Vertical	1000	55.3 Pk 52.7 Av	74 Pk 54 Av	Pass

Table 4

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15 section 15.209 and 15.245(b) and RSS-210 Annex F and RSS-Gen section 8.9 with the EUT operating in continues transmit mode are depicted in Tables 2 through 4.

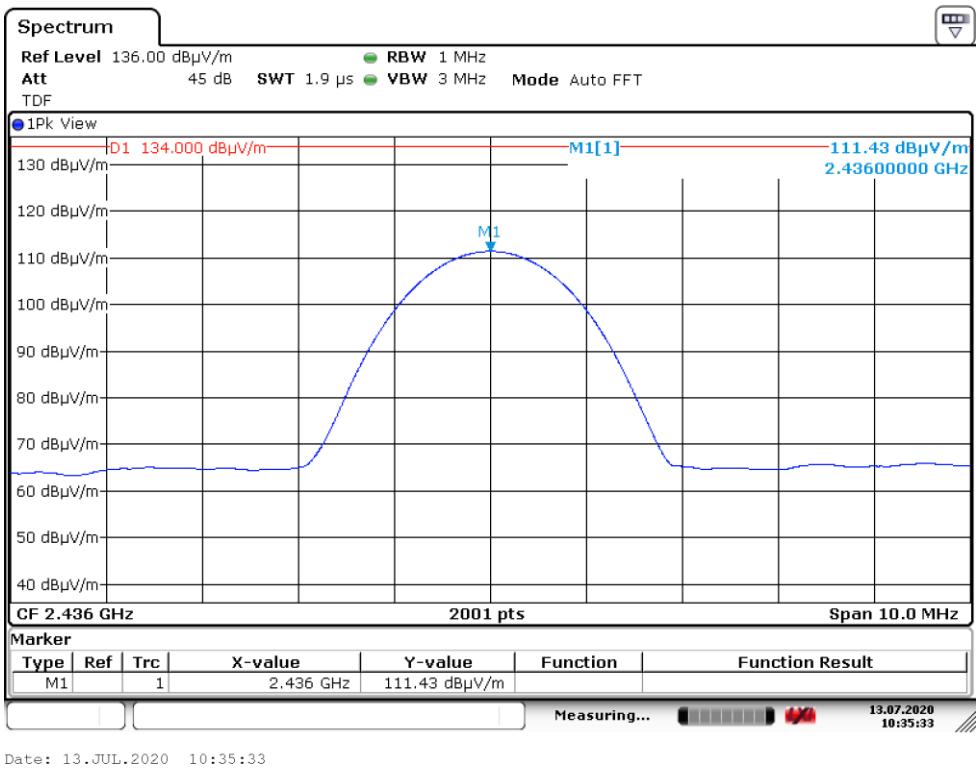
Notes:

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 ±5.22dB
3. The reported field strength values are the worst case values at the indicated frequency. The EUT was varied in 3 positions, the antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
4. The EUT was tested in on the lowest frequency (2436.0 MHz), a middle frequency (2449.8 MHz) and the highest frequency (2464.2 MHz) in the 2435 – 2465 MHz band wherein it operates.
5. $*^{H}$ indicates a harmonic frequency, $*^{R}$ indicates a frequency in the restricted band and $*^{H*R}$ indicates a harmonic frequency in a restricted band.
6. A selection of plots are provided on pages 15 – 21.

Used test equipment and ancillaries:

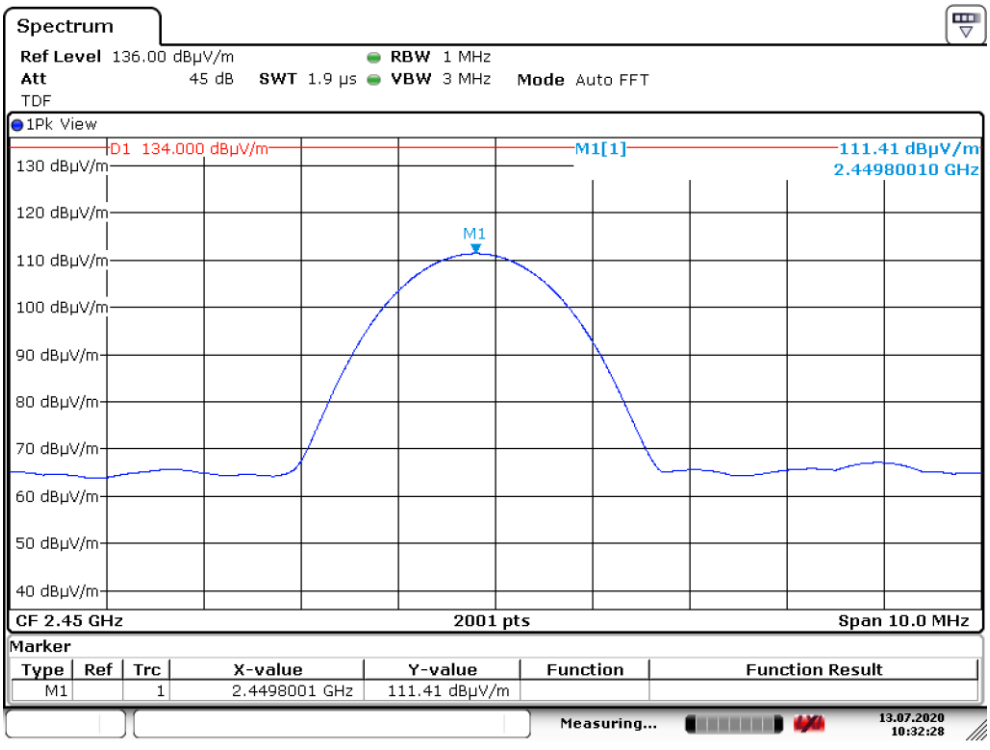
2789106	2788777	2789108/109/110	2789009	2789236	2788982	2789000		

3.2.4 Plots of the wanted and unwanted radiated emissions:



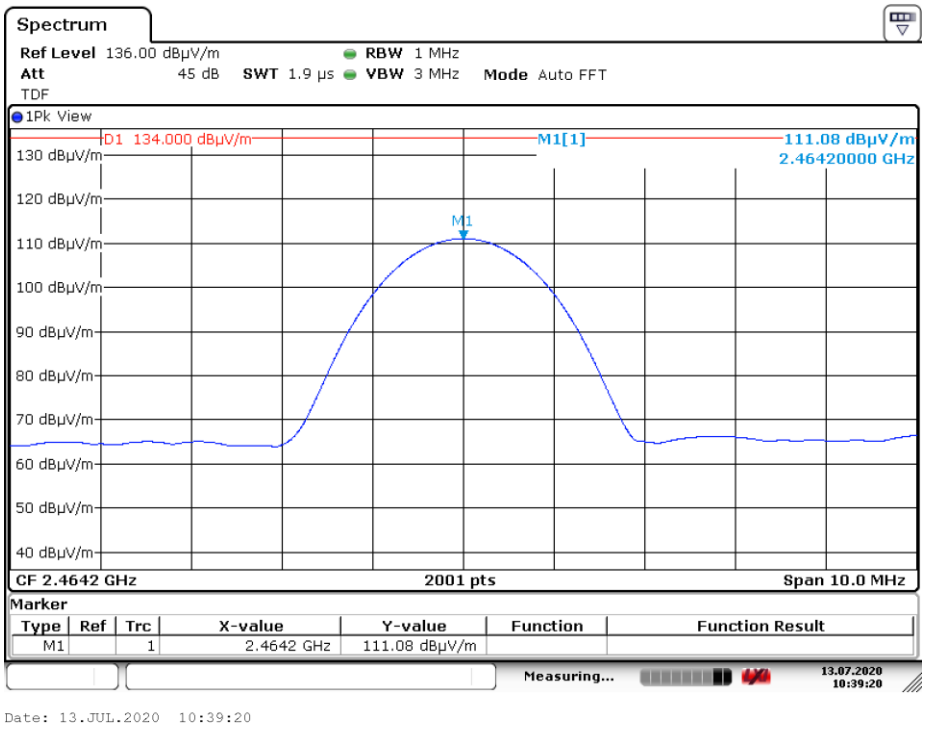
Date: 13.JUL.2020 10:35:33

Plot 4: Radiated Emission of the fundamental at 2436.0 MHz – Antenna Horizontal. (Pk)



Date: 13.JUL.2020 10:32:28

Plot 4b: Radiated Emission of the fundamental at 2449.8 MHz – Antenna Horizontal. (Pk)



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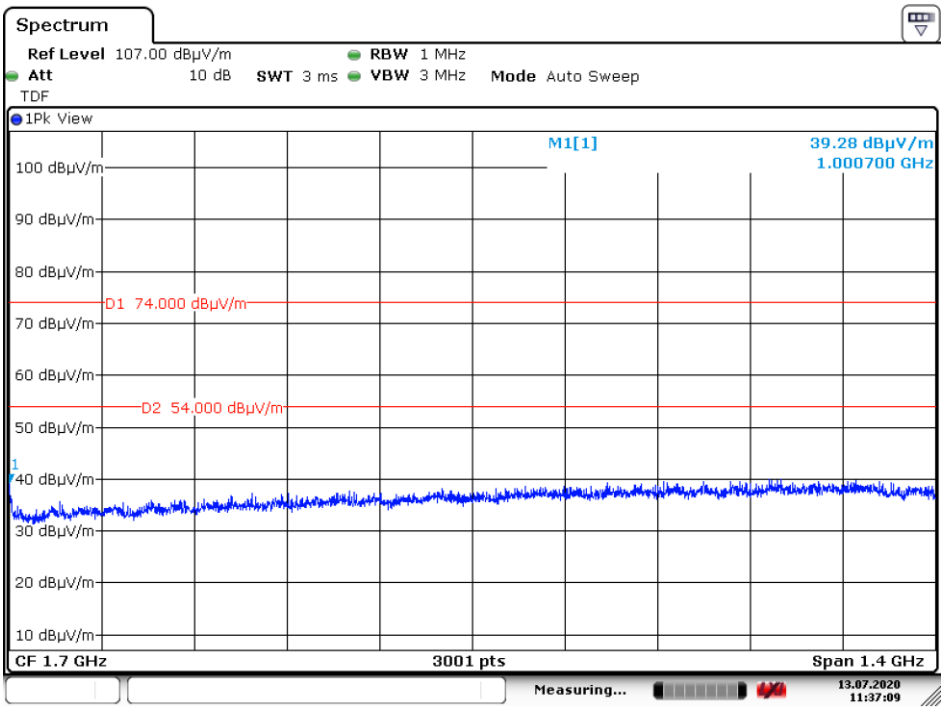
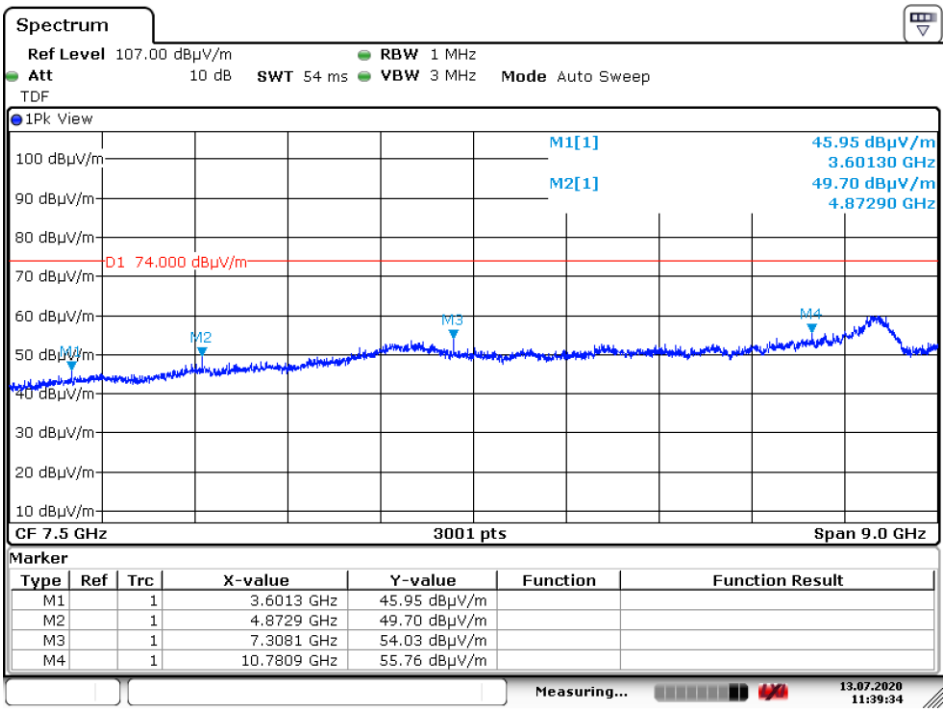
Plot 4c: Radiated Emission of the fundamental at 2464 MHz – Antenna Horizontal. (Pk)



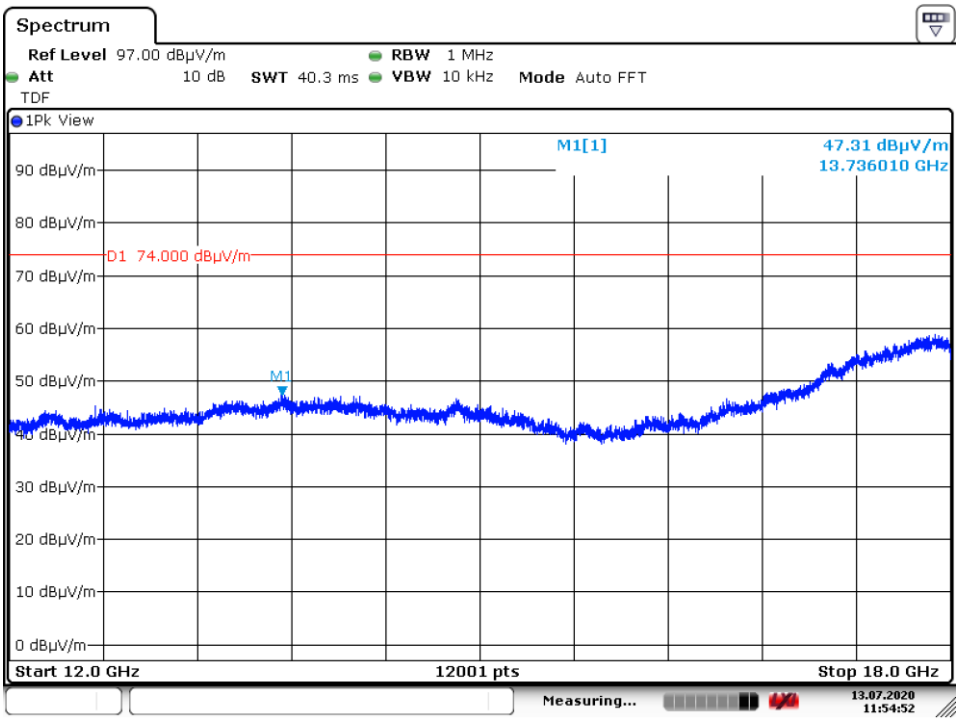
Date: 13.JUL.2020 11:37:09

Plot 5 Radiated unwanted emissions in the range 1 – 2.4 GHz at 2436.0 MHz
(Peak values, EUT Vertical, Antenna vertical position shown).



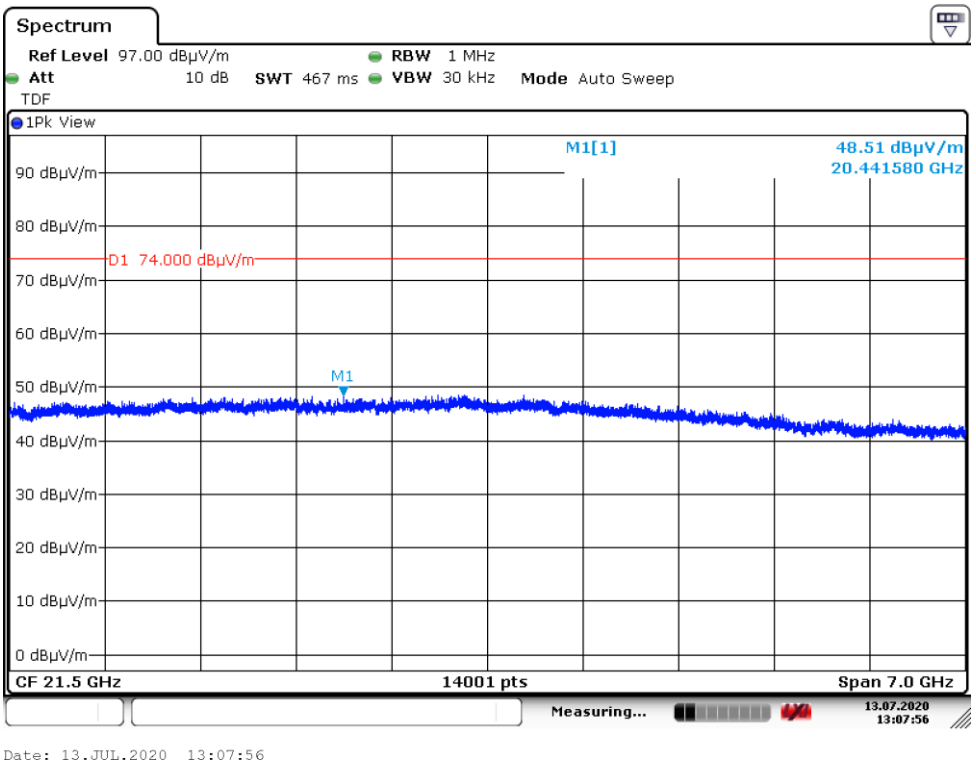
Date: 13.JUL.2020 11:39:34

Plot 6 Radiated unwanted emissions in the range 3 – 12 GHz at 2436.0 MHz
(Peak values, EUT Vertical, Antenna Vertical position shown)

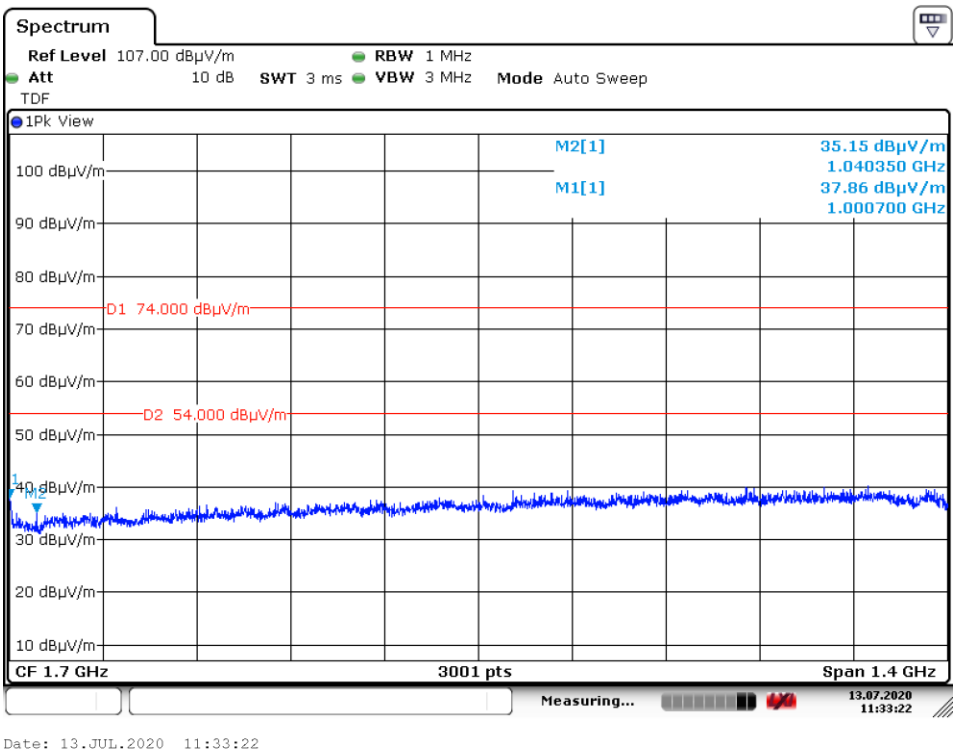


Date: 13.JUL.2020 11:54:52

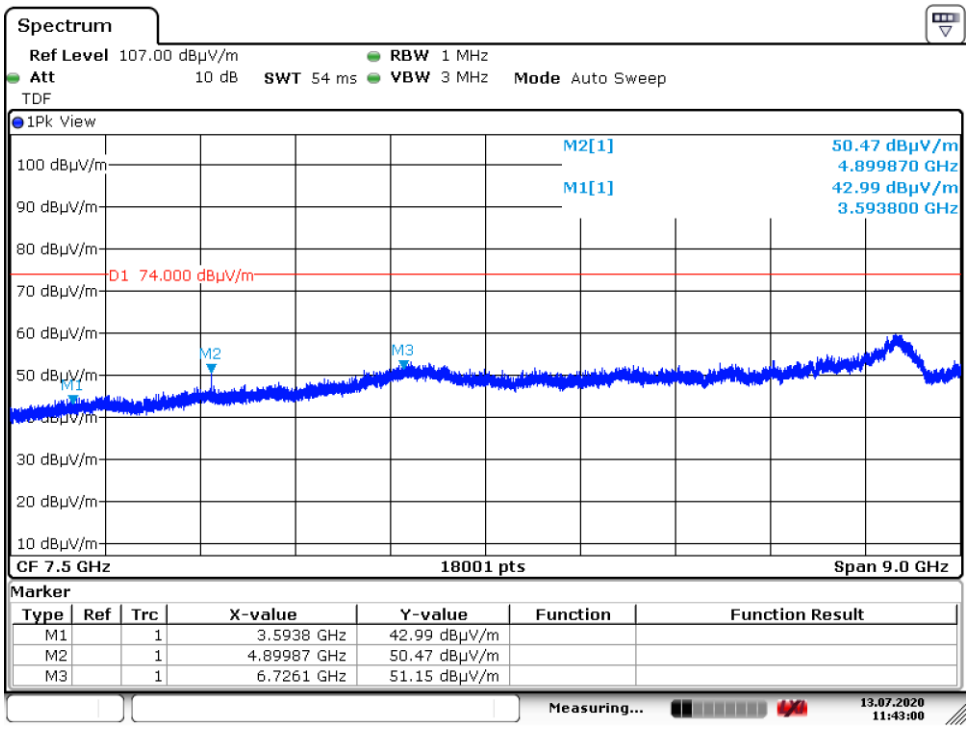
Plot 7 Radiated unwanted emissions in the range 12 – 18 GHz at 2436.0 MHz
(Reduced VBW, EUT Vertical, Antenna Vertical position shown)



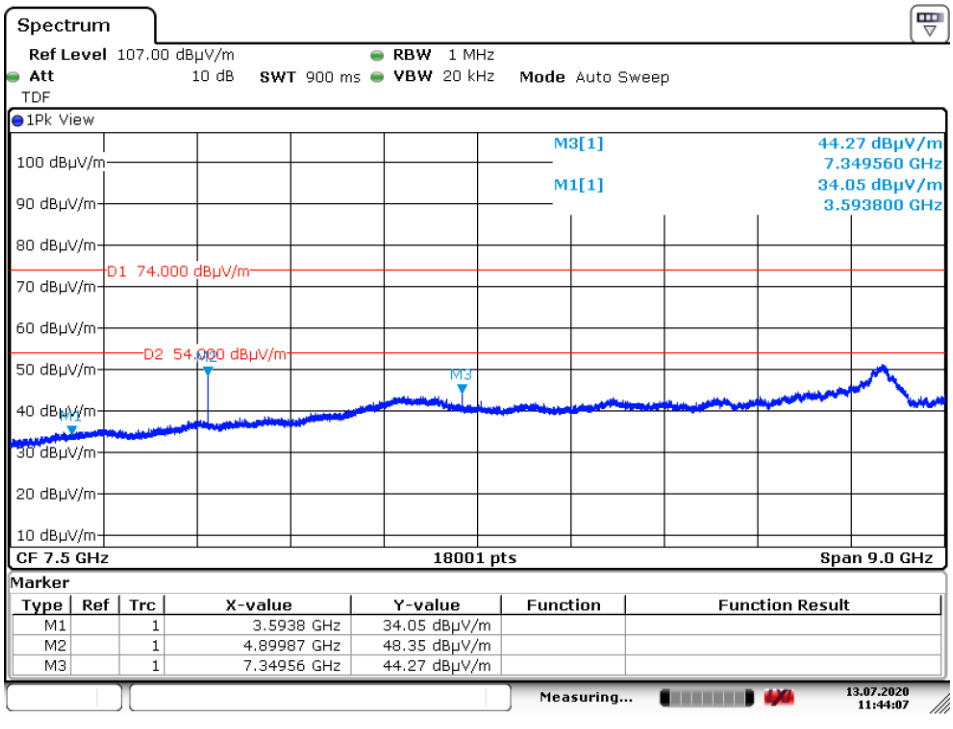
Plot 8 Radiated unwanted emissions in the range 18 – 25 GHz at 2436.0 MHz
(Peak values, Reduced VBW, EUT Vertical, Antenna horizontal position shown)



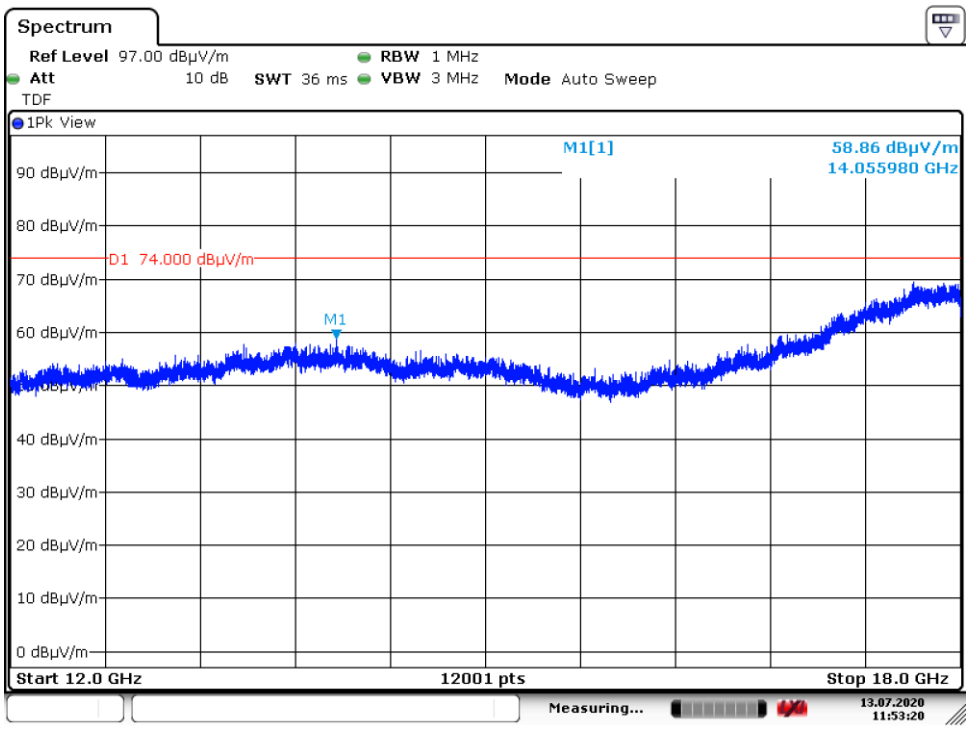
Plot 9 Radiated unwanted emissions in the range 1 – 2.4 GHz at 2449.8 MHz
(Peak values, EUT Vertical, Antenna vertical position shown).



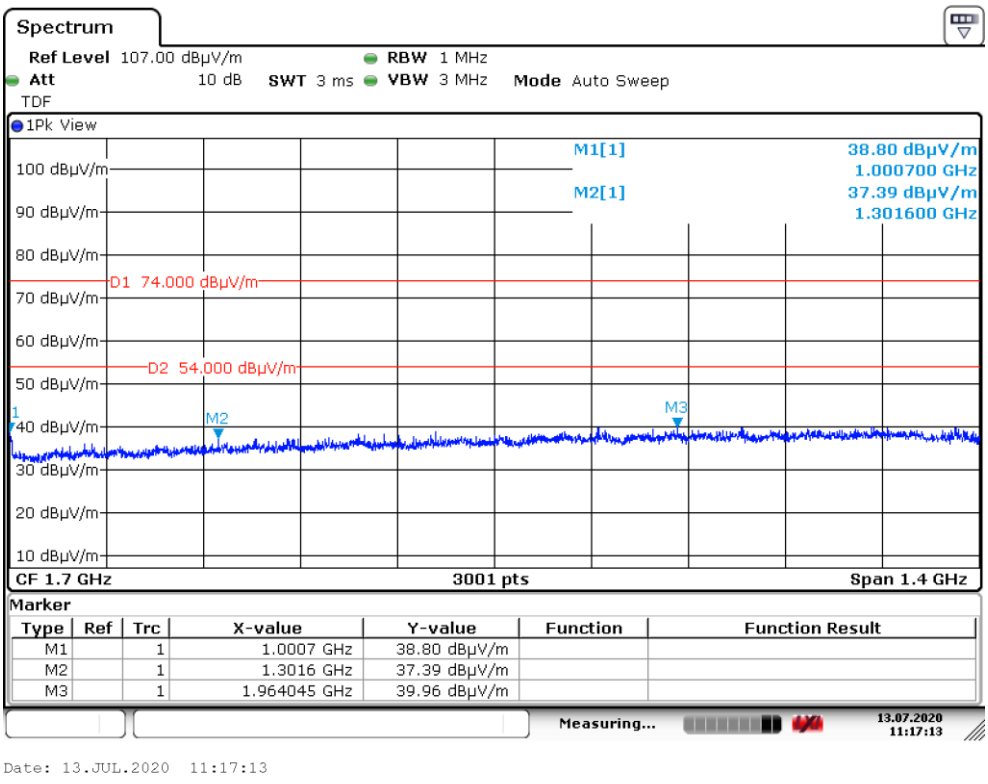
Plot 10 Radiated unwanted emissions in the range 3 – 12 GHz at 2449.8 MHz
(Peak values, EUT Vertical, Antenna Vertical position shown)



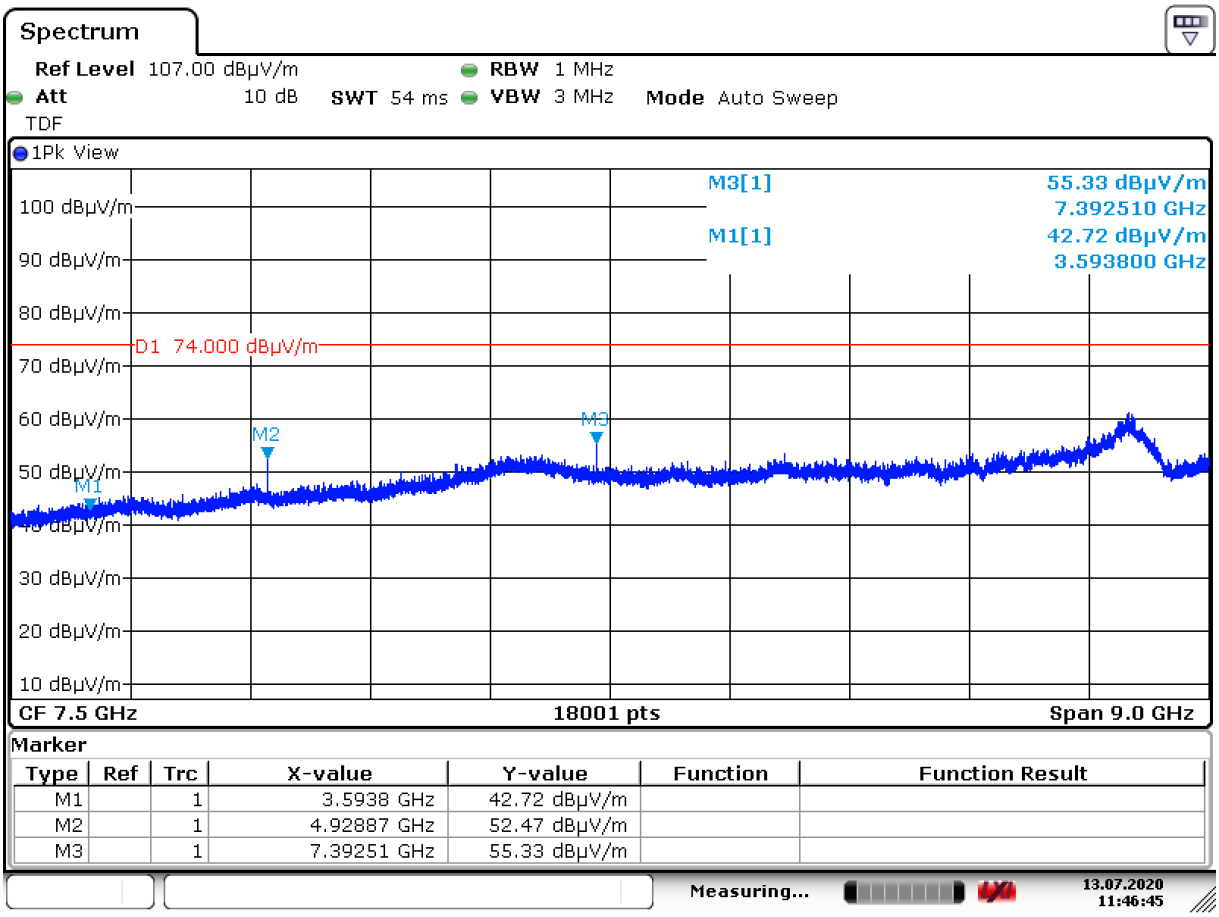
Plot 11 Radiated unwanted emissions in the range 3 – 12 GHz at 2449.8 MHz
(Peak values, reduced vbw, EUT Vertical, Antenna vertical position shown)



Plot 11 Radiated unwanted emissions in the range 12 – 18 GHz at 2449.8 MHz
(Peak values, EUT Vertical, Antenna Vertical position shown)



Plot 12 Radiated unwanted emissions in the range 1 – 2.4 GHz at 2464.2 MHz
(Peak values, EUT Vertical, Antenna vertical position shown).



Date: 13.JUL.2020 11:46:45

Plot 14 Radiated unwanted emissions in the range 3 – 12 GHz at 2464.2 MHz
(Peak values, EUT Vertical, Antenna Vertical position shown)

4 AC Power line Conducted Emission Data.

4.1 AC Power Line Conducted Emission data of the EUT

RESULT: Pass

Date of testing: 2020-07-20
Tested by: R. van der Meer

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 was positioned at least 80cm from 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	
0.160	64.6	53.5	63.8	53.4	65.5	55.5	Pass
0.210	48.0	42.2	49.5	42.3	63.2	53.2	Pass
0.430	51.6	43.3	50.9	42.7	57.3	47.3	Pass
0.540	53.0	41.5	54.3	41.9	56.0	46.0	Pass
0.590	50.1	39.9	48.8	39.2	56.0	46.0	Pass
1.020	48.3	40.0	44.6	40.0	56.0	46.0	Pass

Table 5 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.

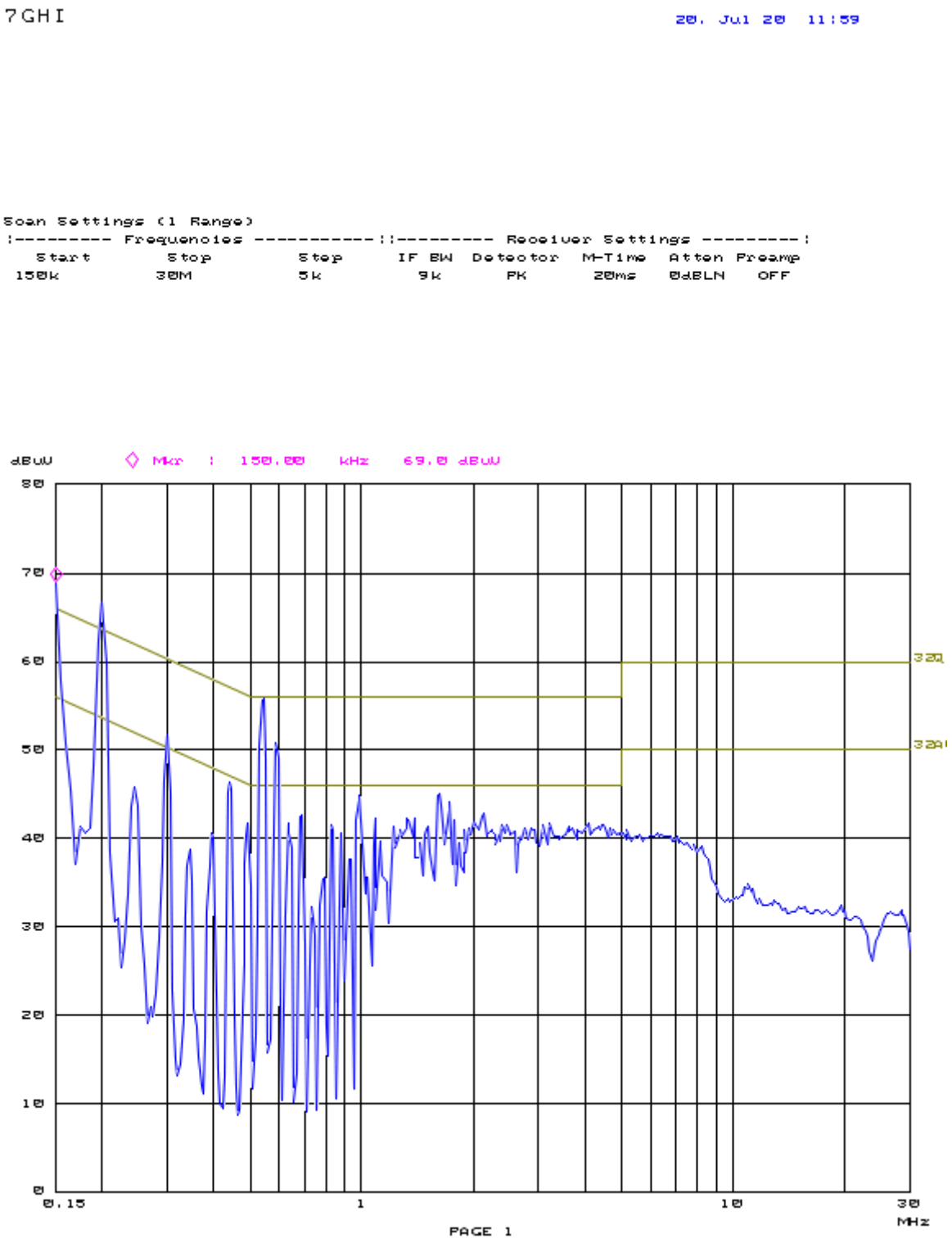
Notes:

1. The resolution bandwidth used was 9 kHz.
2. Measurement uncertainty is ±3.6 dB
3. From pre-test the worst case configuration proved to be channel 7B. The 6 Worst case values noted.
4. Plots are provided on the next pages.

Used test equipment and ancillaries:

2788823	2788794	2789421	2789207	2789211	2789000	2788897

4.1.2 Plots of the AC Power Line Conducted Emissions



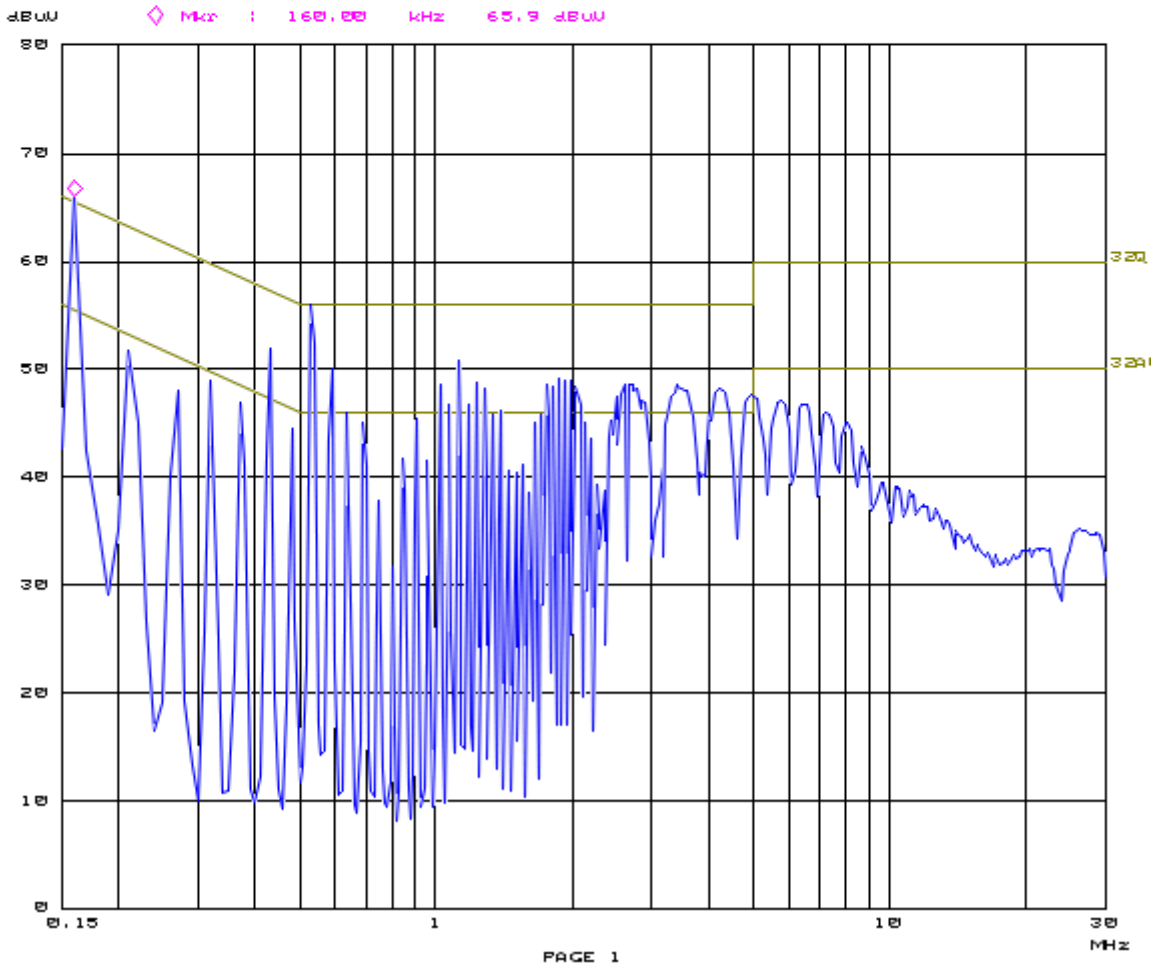
Plot of the AC Power Line Conducted Emissions on L1 (Ch 7B)

7GHI

20. Jul 20 12:19

Scan Settings (1 Range)

Frequencies				Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	
150k	30M	10k	9k	PK	20ms	0dBLN	OFF	



Plot of the AC Power Line Conducted Emissions on L2/N (Ch 7B)

5 Emissions at the band edges

RESULT: Pass

Date of testing: 2020-07-13

The tables below show compliance with the 47 CFR Part 15 section 15.245(b3) and RSS-210 section A2.9, this section requires the emissions outside the 2435 and 2465 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 6 below shows the levels at the band edges in respect to the general radiated emission limits.

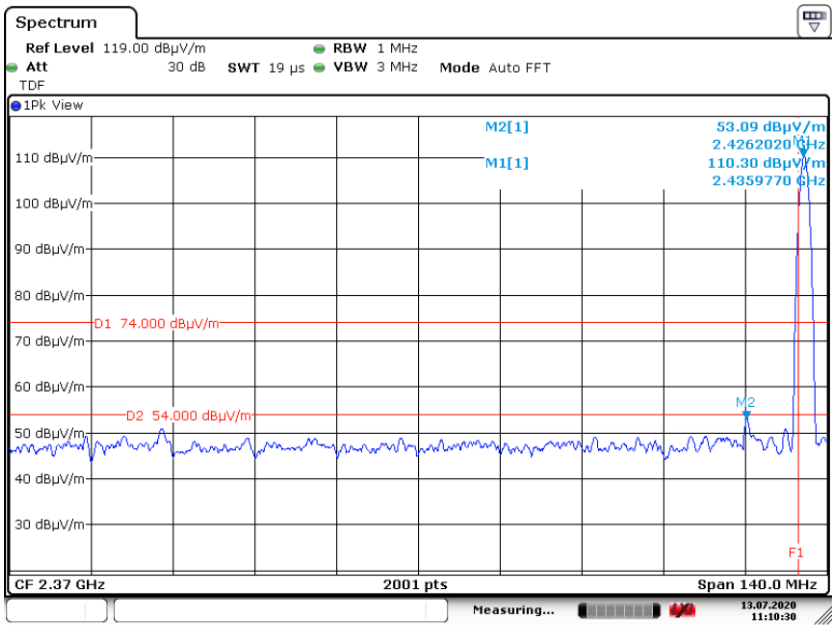
EUT Frequency [MHz]	Band Edge Frequency [MHz]	Antenna Orientation	Level Pk [dBµV/m]	Limit Pk /Av [dBµV/m]	Result Pass/Fail
2436.0	2426.2	Vertical	53.09	54 / 74	Pass
2464.2	2468.5	Vertical	51.25	54 / 74	Pass

Table 6 level of the band edge emissions, Peak values

Notes:

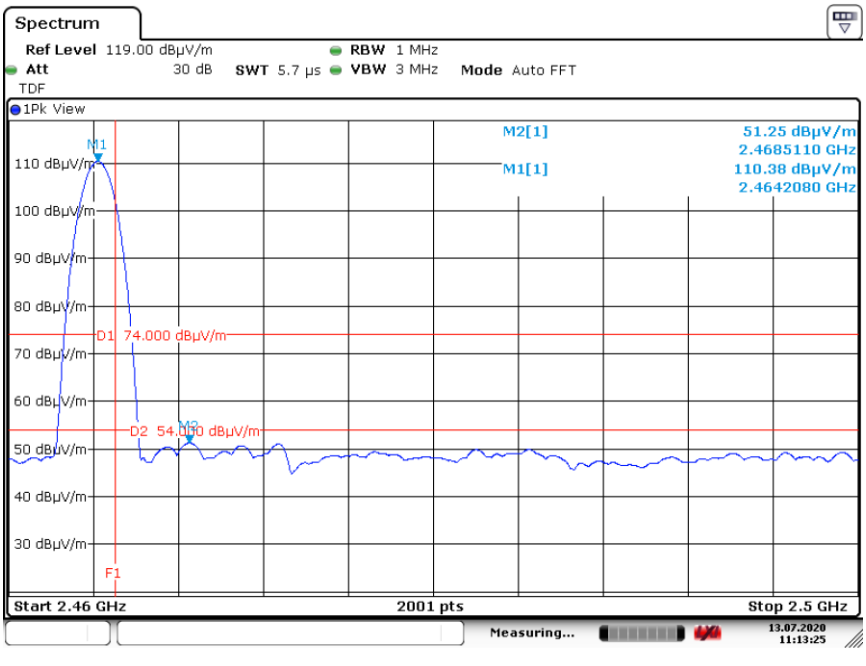
1. Measurement uncertainty is ±5.22dB
2. The reported field strength values are the worst case values at the indicated frequency. The antenna was varied in horizontal and vertical orientations and also in height (between 1m and 4m).
3. The EUT was tested in on the lowest frequency (2436.0 MHz) and the highest frequency (2464.2 MHz) in the 2435 – 2465 MHz band wherein it operates.
4. Peak (Pk) values were already within Average (Av) limits, Av therefor not tested.
5. See plots on page 27.

Used test equipment and ancillaries:



Plot 1a Band Edge (Low), Peak value, Spectral Diagram, 2436.0 MHz
F1 shows the band edge frequency of 2435 MHz.

Note: fundamental shows wide but that is because the EUT transmission is CW and the Residual bandwidth of the spectrum analyzer is in fact shown. The fundamental is therefor disregarded and the marker 2 signal is of interest.



Plot 2a Band Edge (High), Peak value, Spectral Diagram, 2464.2 MHz.
F1 shows the band edge frequency of 2465 MHz

Note: fundamental shows wide but that is because the EUT transmission is CW and the Residual bandwidth of the spectrum analyzer is in fact shown. The fundamental is therefor disregarded and the marker 2 signal is of interest.

6 Bandwidth of the emission

RESULT: PASS

Date of testing: 2020-07-13

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 15.245.

EUT Frequency [MHz]	Occupied bandwidth / 99% [kHz]	20 dB bandwidth [kHz]
2436.0	62.52	75.86
2449.8	65.57	73.86
2464.2	65.17	77.16

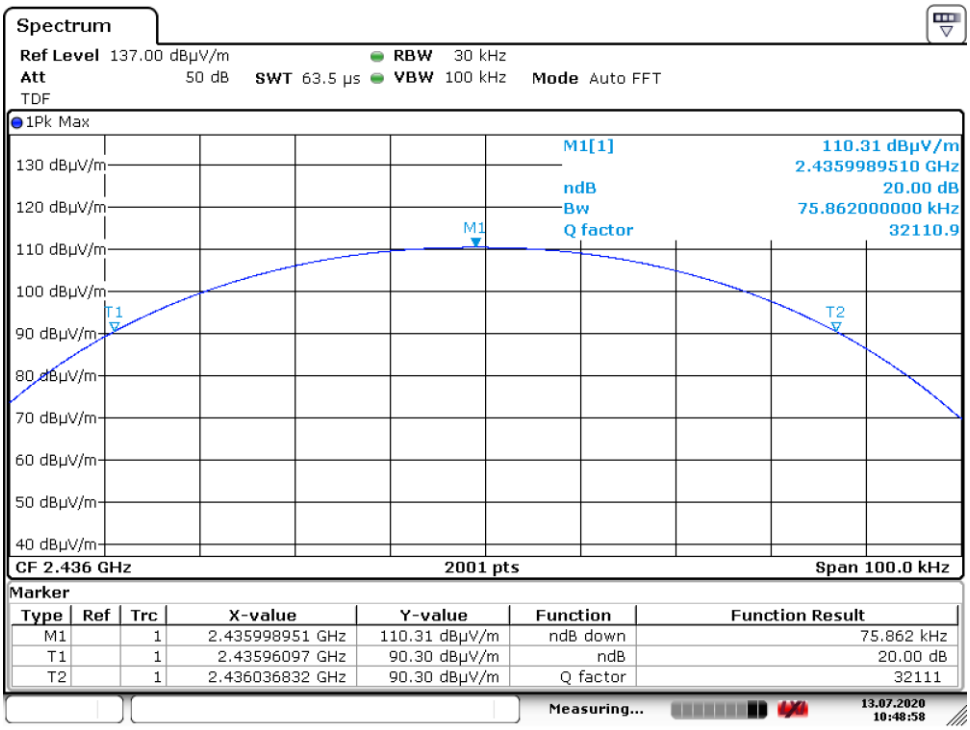
Table 7 bandwidth of the emissions

See plots on pages 28-30

Measurement uncertainty: 2 kHz.

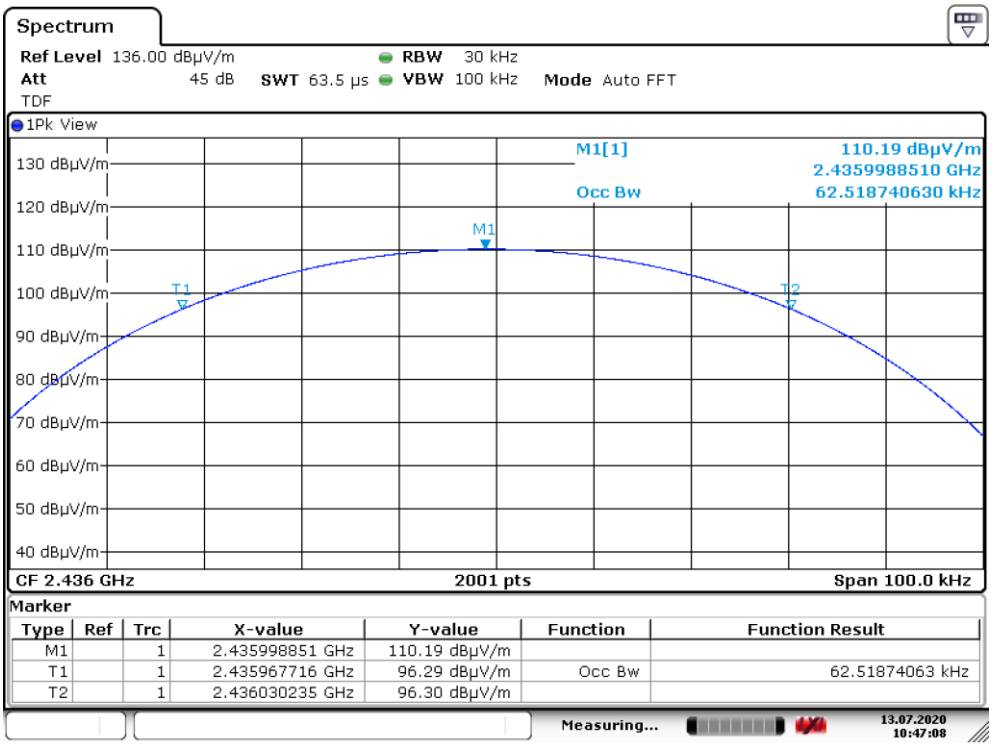
Used test equipment and ancillaries:

2789106	2788777	2789108/109/110	2789009					



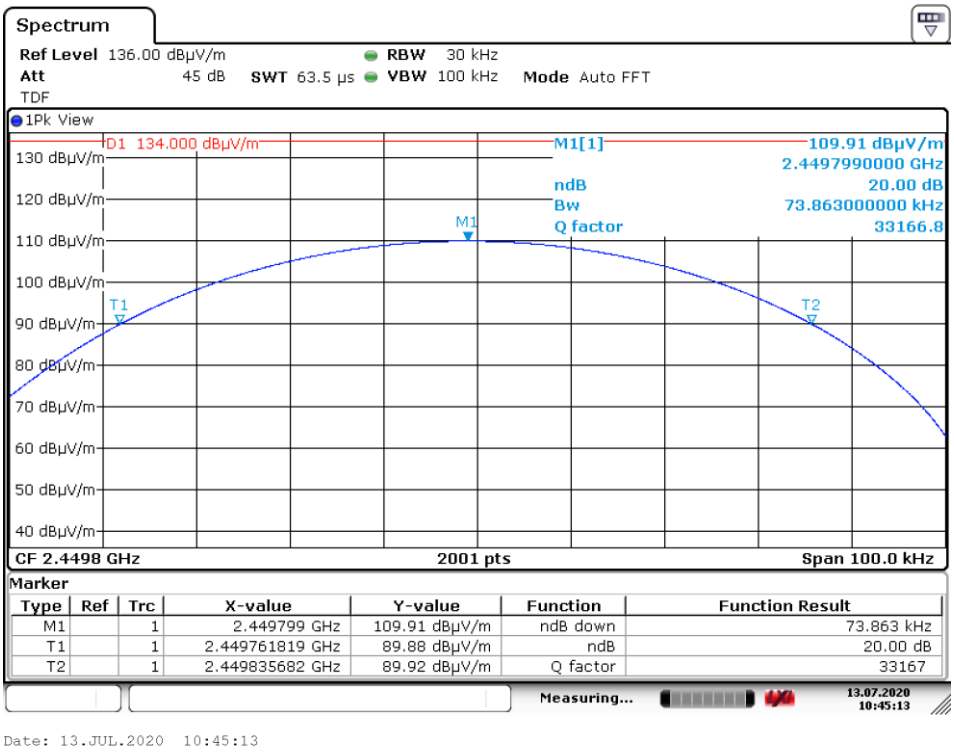
Date: 13.JUL.2020 10:48:58

Plot lowest channel 2436.0 MHz, Occupied bandwidth as measured on a spectrum analyzer.



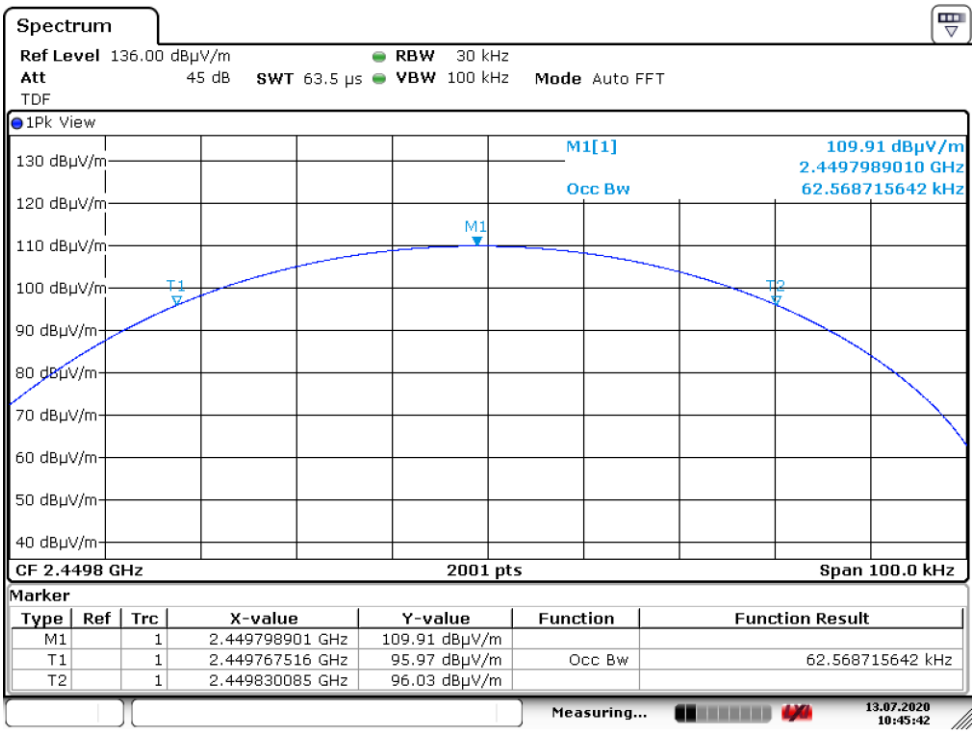
Date: 13.JUL.2020 10:47:08

Plot lowest channel 2436.0 MHz, 99% bandwidth as measured on a spectrum analyzer.



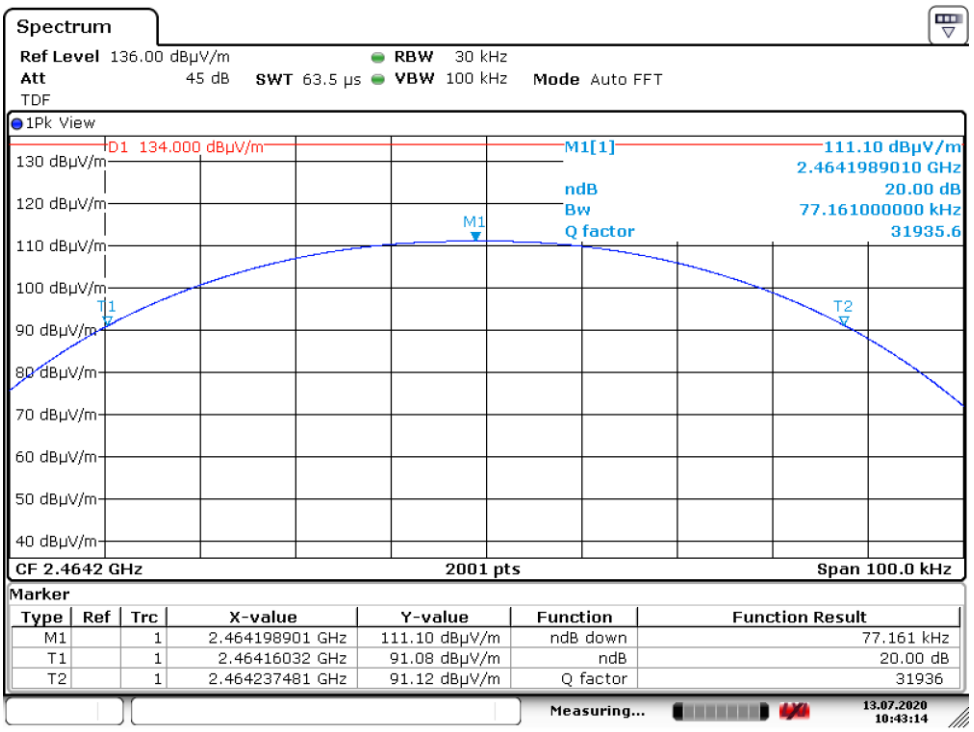
Date: 13.JUL.2020 10:45:13

Plot middle channel 2449.8 MHz, Occupied bandwidth as measured on a spectrum analyzer.



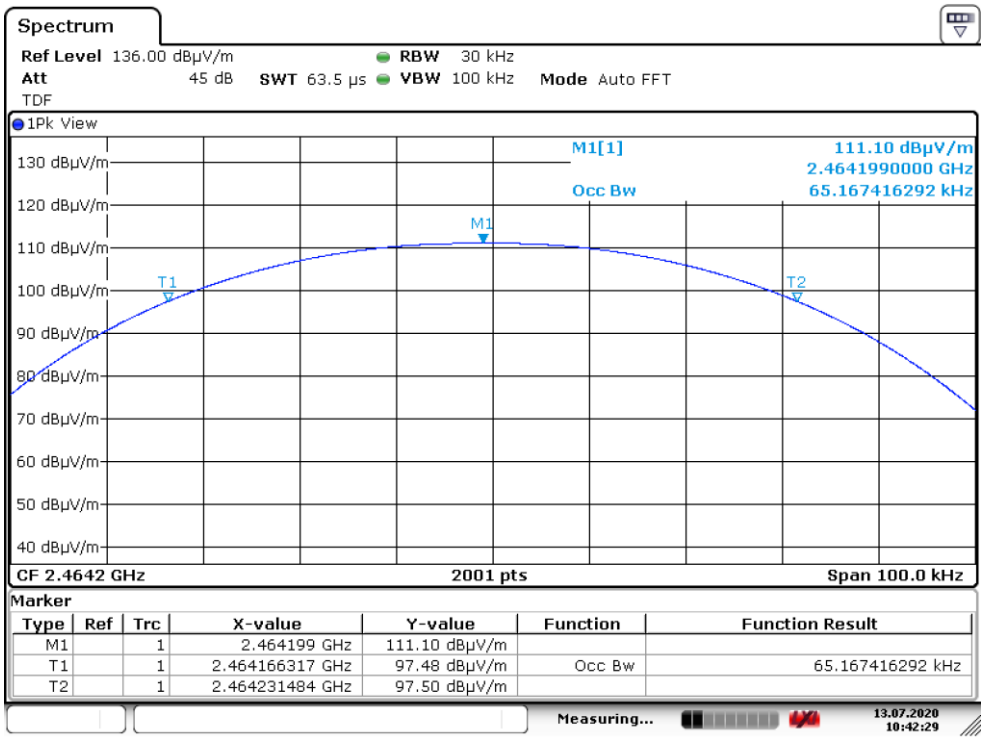
Date: 13.JUL.2020 10:45:42

Plot highest channel 2449.8 MHz, 99% bandwidth as measured on a spectrum analyzer



Date: 13.JUL.2020 10:43:14

Plot highest channel 2464.2 MHz, Occupied bandwidth as measured on a spectrum analyzer.



Date: 13.JUL.2020 10:42:29

Plot highest channel 2464.2 MHz, 99% bandwidth 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 Radiated Emissions					
Measurement Receiver	Rohde & Schwarz	ERC7	2790499	08/2019	08/2020
RF Cable S-AR	Gigalink	APG0500	2789217	03/2020	03/2021
Test facility	Comtest	FCC listed: 786213 IC: 2932G-2	2789009	03/2020	03/2022
Spectrum Analyzer	Rohde & Schwarz	FSV	2789106	08/2019	08/2020
Antenna mast+control	Innco	CO3000	9002463	N/A	N/A
Temperature-Humiditymeter	TempControl	P770	2789236	02/2020	02/2021
Biconilog Testantenna	Teseq	CBL 6111D	2789237	11/2019	11/2020
Guidehorn 1-18 GHz	EMCO	3115	2788777	02/2019	02/2022
Guidehorn 18-26.5 GHz	ETS-Lindgren	3160-09	2788982	01/2018	01/2021
Filterbox	EMCS	RFS06S	2789029	11/2019	11/2020
Cable RF >1G setup	H&S	Sucoflex 102	2789108/ 109/110	06/2020	06/2021
Power supply 120Vac/60Hz	Chroma	6463	2789000	01/2020	01/2021

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	09/2019	09/2020
LISN	Rohde & Schwarz	ESH2-Z5	2788791	06/2020	06/2022
Measurement Receiver	Rohde & Schwarz	ESCS30	2790497	07/2019	07/2021
Shielded room for Conducted emissions	--	--	2789207	NA	NA
Temperature-Humiditymeter	TempControl	P770	2789236	03/2020	03/2021
Power supply 120Vac/60Hz	Chroma	6463	2789000	01/2020	01/2021

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 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.

<< End of report >>