

Report No. 297302-1

Test Report

Product Wireless Audio XLR Transceiver

Name and address of the

applicant

RØDE Microphones 107 Carnarvon Street

Silverwater NSW 2128 Australia

Name and address of the

manufacturer

RØDE Microphones 107 Carnarvon Street Silverwater NSW 2128

Australia

Model TX-XLR

Rating 3.0 V DC

Trademark RØDELink

Serial number Not stated

Additional information /

Tested according to FCC Part 15.247

Digital Transmission Systems
Industry Canada RSS-247, Issue 1

Low Power Licence-Exempt Radiocommunications Devices

Order number 297302

Tested in period 2015.12.10 to 2015.12.18 and 2016.01.21

Issue date 2016.01.20

Name and address of the testing laboratory

Nemko

FCC No: 994405 IC OATS: 2040D-1

Instituttveien 6 Kjeller, Norway

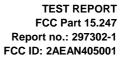
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1 INFORMATION

1.1 Test Item

Name :	RØDELink
FCC ID :	2AEAN405001
Industry Canada ID :	20091-405001
Model/version :	TX-XLR
Serial number :	/
Hardware identity and/or version:	15a
Software identity and/or version :	V0006
Frequency Range :	2403 – 2481 MHz
Number of Channels :	40
Operating Modes :	TDMA
Type of Modulation :	GFSK
User Frequency Adjustment :	None
Rated Output Power :	7.0 mW
Type of Power Supply :	Primary Batteries (2xAA Alkaline Batteries) USB Power
Antenna Connector :	None (Integral Antennas)
Number of Antennas :	2
Antenna Diversity Supported :	Yes
Desktop Charger :	N/A

Description of Test Item

The EUT is a Wireless Audio XLR Transmitter using 2.4 GHz digital transmission. The unit covered by this report is the audio transmitter part. Both the audio transmitter and receiver are capable of transmitting and receiving on 2.4 GHz.

Exposure Evaluation

The EUT is a portable device and is designed to be used held to face when used, however the EUT is exempted from SAR evaluation since the output power is below the exemption limit.

The EUT is exempted from RF Exposure Evaluation to Industry Canada requirements since the output power complies with the power levels of section 2.5.1 of RSS-102 Issue 5.



1.2 Test Environment

1.2.1 Normal test condition

Temperature: 20.1 - 23.6 °C

Relative humidity: 20 – 43 %

Normal test voltage: 5.0 V DC (Powered from USB)

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen / Thomas Danglé

1.4 Test Equipment

See list of test equipment in clause 5.



2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for the purpose of demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and Industry Canada RSS-247 Issue 1.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 3m and 10m.

A description of the test facility is on file with the FCC and Industry Canada.

New Submission	□ Production Unit
Class II Permissive Change	☐ Pre-production Unit
DTS Equipment Code	☐ Family Listing



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 1, RSS-GEN Issue 4 reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
Antenna Requirement	15.203	8.3 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	8.8 (RSS-GEN)	Complies
Occupied Bandwidth	N/A	6.6 (RSS-GEN)	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	Complies
Peak Power Output	15.247(b)	5.4 (RSS-247)	Complies
Power Spectral Density	15.247(d)	5.2 (2) (RSS-247)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	5.5 (RSS-247) 6.13 (RSS-GEN) 8.9 (RSS-GEN)	Complies

2.3 Description of modification for Modification Filing

Not applicable.

2.4 Comments

All ports were populated during spurious emission measurements.

2.5 Family List Rational

Not Applicable.



3 TEST RESULTS

3.1 Power Line Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: Thomas Danglé Date of Test: 19-Jan-2016

Measurement procedure: ANSI C63.4-2014 using 50 μH/50 ohms LISN

Test Results: Complies

Measurement Data: See attached graph, (Peak detector)

The test was performed with the EUT transmitting and powered from a 5W USB adaptor. The power into the USB adaptor was 120V 60Hz AC. The USB adaptor used for this test was a Trust 19160 Mfd. 2015-08-07.

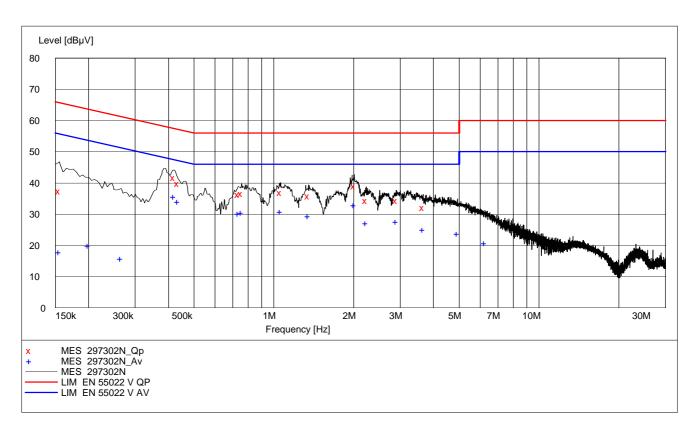


Highest measured value (L1 and N):

Powered from USB:

Frequency	Level	Af	Limit	Margin	Det	Position	Verdict
[MHz]	[dBuV]	[dB]	[dBuV]	[dB]			[Pass/Fail]
0.155000	37.40	10.70	65.70	28.30	QP	N	Pass
0.420000	41.70	10.30	57.40	15.70	QP	L1	Pass
0.435000	39.90	10.30	57.20	17.30	QP	L1	Pass
0.735000	36.30	10.20	56.00	19.70	QP	L1	Pass
0.755000	36.60	10.20	56.00	19.40	QP	L1	Pass
1.060000	36.90	10.40	56.00	19.10	QP	L1	Pass
1.350000	35.80	10.40	56.00	20.20	QP	L1	Pass
2.015000	39.00	10.40	56.00	17.00	QP	L1	Pass
2.230000	34.50	10.40	56.00	21.50	QP	L1	Pass
2.900000	34.40	10.40	56.00	21.60	QP	L1	Pass
3.655000	32.20	10.40	56.00	23.80	QP	L1	Pass
0.155000	18.00	10.70	55.70	37.70	AV	N	Pass
0.200000	20.00	10.70	53.60	33.60	AV	N	Pass
0.265000	15.80	10.60	51.30	35.50	AV	N	Pass
0.420000	35.60	10.30	47.40	11.80	AV	L1	Pass
0.435000	34.00	10.30	47.20	13.20	AV	L1	Pass
0.735000	30.20	10.20	46.00	15.80	AV	L1	Pass
0.755000	30.50	10.20	46.00	15.50	AV	L1	Pass
1.060000	30.90	10.40	46.00	15.10	AV	L1	Pass
1.350000	29.50	10.40	46.00	16.50	AV	L1	Pass
2.015000	32.90	10.40	46.00	13.10	AV	L1	Pass
2.230000	27.20	10.40	46.00	18.80	AV	L1	Pass
2.900000	27.60	10.40	46.00	18.40	AV	L1	Pass
3.655000	25.00	10.40	46.00	21.00	AV	L1	Pass
4.940000	23.80	10.50	46.00	22.20	AV	L1	Pass
6.250000	20.80	10.60	50.00	29.20	AV	L1	Pass





Powered from USB



TEST REPORT FCC Part 15.247 Report no.: 297302-1

FCC ID: 2AEAN405001

3.2 Minimum 6 dB Bandwidth

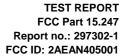
Para. No.: 15.247 (a)(2) **Test Results: Complies**

Measurement Data:

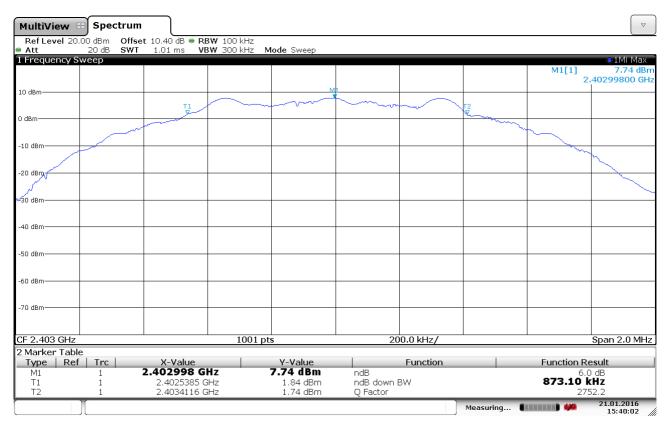
Measured 6 dB Bandwidth (kHz)					
2403 MHz 2441 MHz 2481 MHz					
873	863	859			

Requirements:

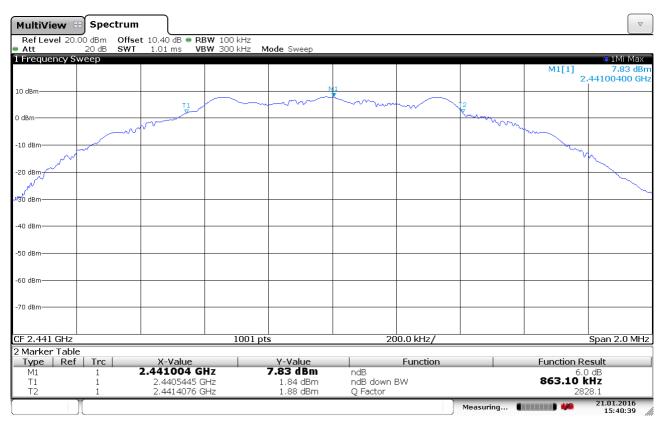
For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.





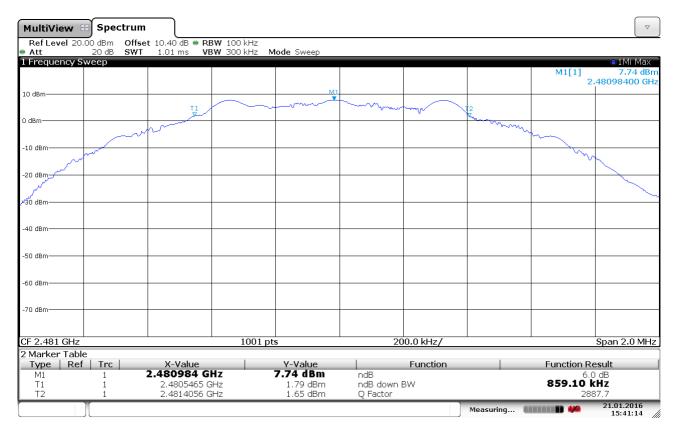


6 dB Bandwidth at 2403 MHz



6 dB Bandwidth at 2441 MHz





6 dB Bandwidth at 2481 MHz



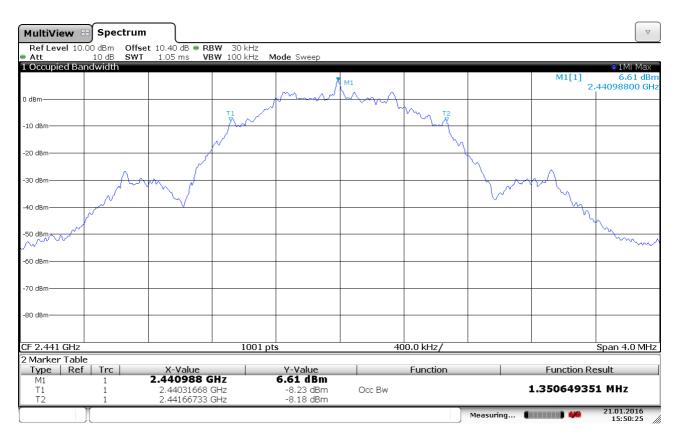
3.3 Occupied Bandwidth

Measurement Data:

Measured 99% Bandwidth (MHz)
2441 MHz
1.35

Requirements:

No requirements. Reported for information only.



99% Bandwidth



3.4 Power Spectral Density (PSD)

Para. No.: 15.247 (d) Test Results: Passed

Measured and Calculated Data:

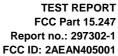
	2403 MHz	2441 MHz	2481 Mhz
Measured value (dBm)	-5.1	-4.9	-5.0

The measured values with 10kHz RBW are corrected by a Bandwidth Correction Factor of -5.2 dB.

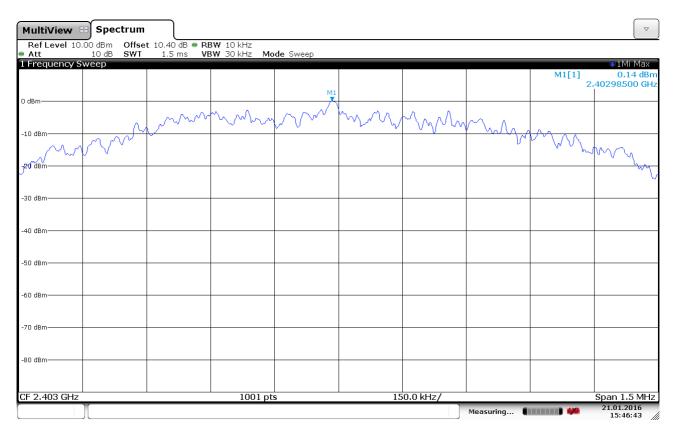
Requirements:

The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz hand

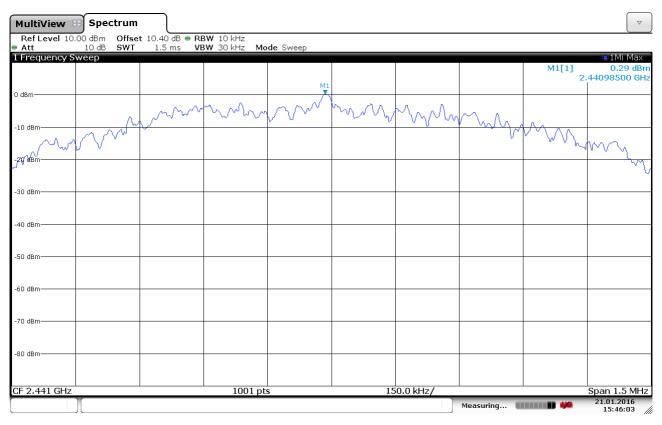
No requirements for Frequency Hopping Systems.





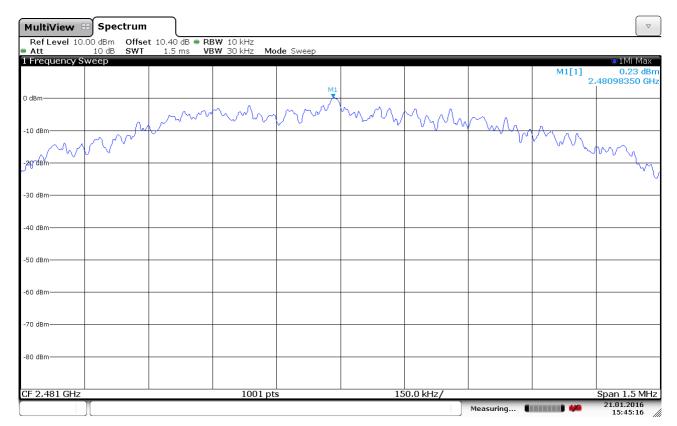


Power Spectral Density 10 kHz, 2403 MHz



Power Spectral Density 10 kHz, 2441 MHz





Power Spectral Density 10 kHz, 2481 MHz



3.5 Peak Power Output

Para. No.: 15.247 (b)

Test Results: Complies

Measurement Data:

RF channel	2403 MHz	2441 MHz	2481 MHz
Measured Maximum Field strength (dBµV/m) –VP	104.3	104.6	102.4
Calc. Radiated Power (dBm)	9.1	9.4	7.1
Calc. Radiated Power (mW)	8.1	8.7	6.7
Measured Conducted Power (dBm)	8.3	8.4	8.4
Measured Conducted Power (mW)	6.8	7.0	6.9
Calculated Antenna Gain (dBi)	0.8	1.0	-1.3

EIRP is calculated from measured field strength by the formulas in KDB 412172 D01 Determining ERP and EIRP v01.

See attached graph.					
Detachable antenna?	☐ Yes	⊠ No			
If detachable, is the antenna connector non-standard?	☐ Yes	□No			

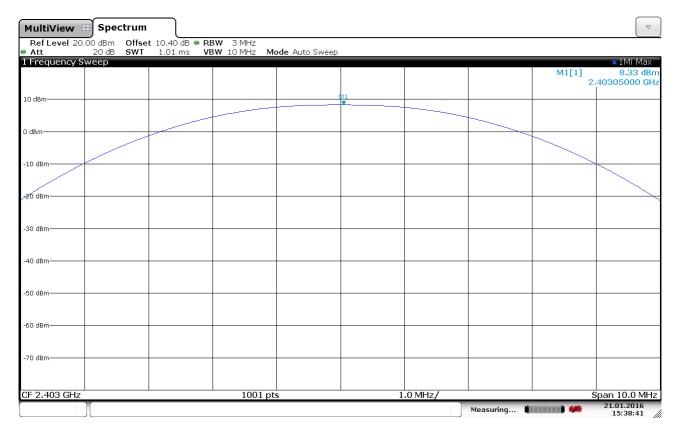
Requirements:

The maximum peak output power shall not exceed the following limits:

For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

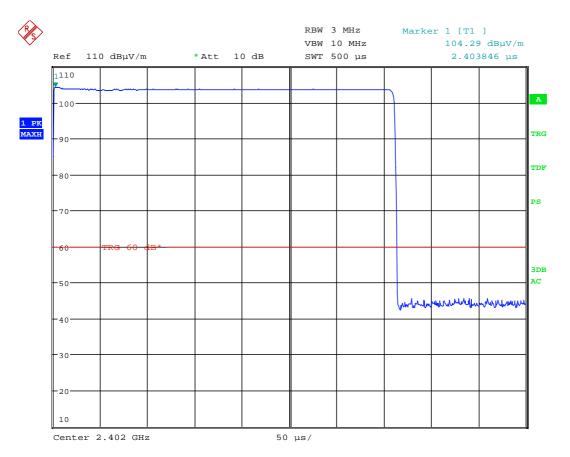
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.





Conducted Power, 2403 MHz

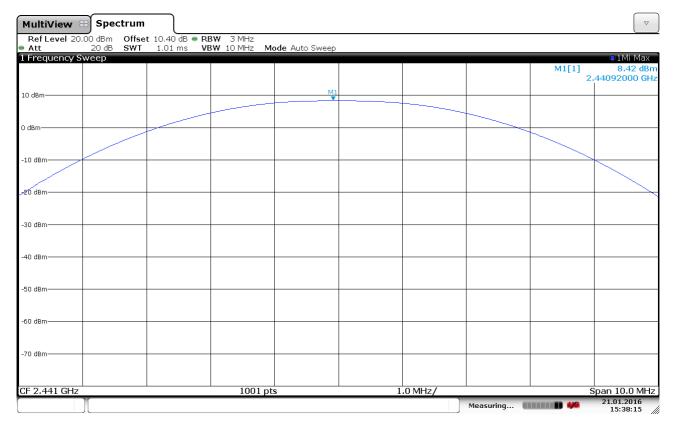




Date: 17.DEC.2015 16:02:51

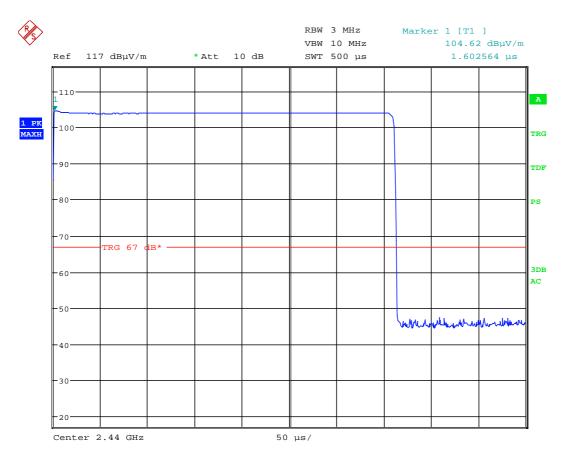
Radiated Power, 2402 MHz (EUT V, VP, Ant 2)





Conducted Power, 2441 MHz

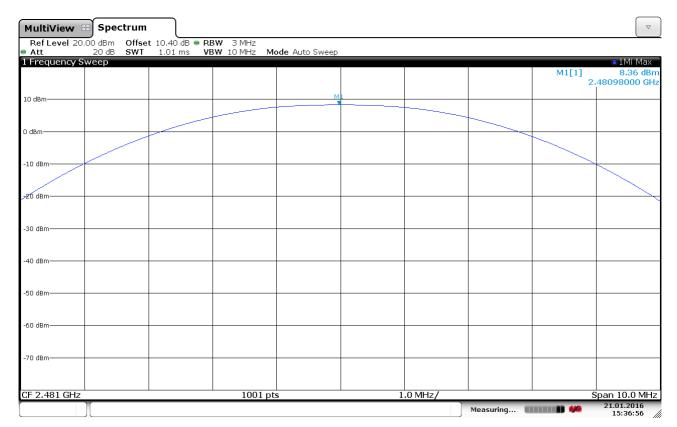




Date: 17.DEC.2015 16:22:38

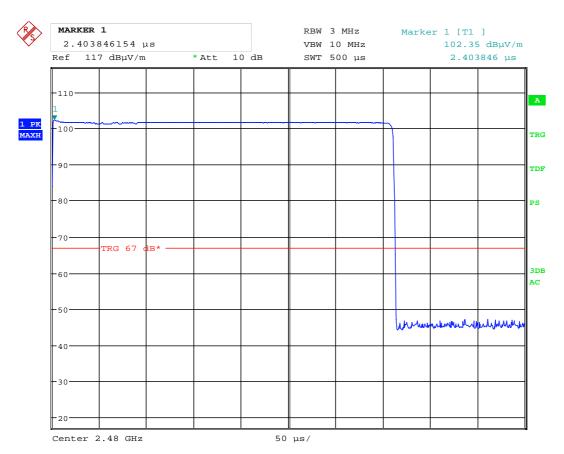
Radiated Power, 2440 MHz (EUT V, VP, Ant 2)





Conducted Power, 2481 MHz





Date: 17.DEC.2015 16:24:52

Radiated Power, 2480 MHz (EUT V, VP, Ant 2)



3.6 Spurious Emissions (Radiated)

Para. No.: 15.247 (c)

Test Results: Complies

Measurement Data:

Band-edge conducted power

	Measured field st	Limit	imit Margin		
	2390 MHz	2483.5 MHz	dBμV/m	dB	
Peak Detector	42.3	53.1	74	28.9	13.7
Average Detector	35.2	46.0	54	16.0	0.8

Average Detector values are measured with Peak Detector and corrected for Duty Cycle. See attached plots.

Duty Cycle Correction Factor Calculation:

Maximum Duty Cycle declared by manufacturer: 44.4 %

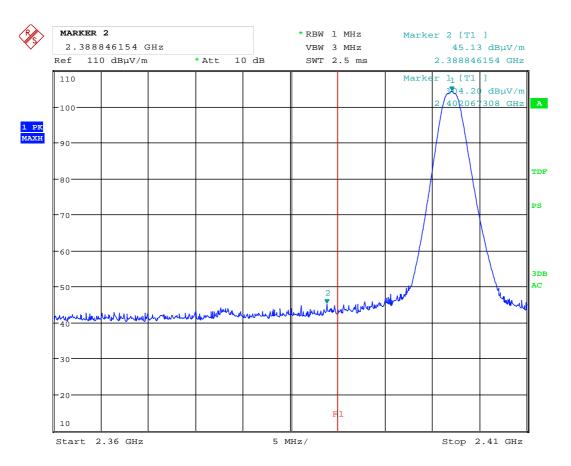
Duty Cycle Correction factor = -20 x log(Duty Cycle) = **7.1 dB**

RF conducted power to 25 GHz see attached graph.

Maximum RF level outside operating band:

RF 2403 MHz: >50 dB/C, margin >30 dB RF 2441 MHz: >50 dB/C, margin >30 dB RF 2481 MHz: >50 dB/C, margin >30 dB

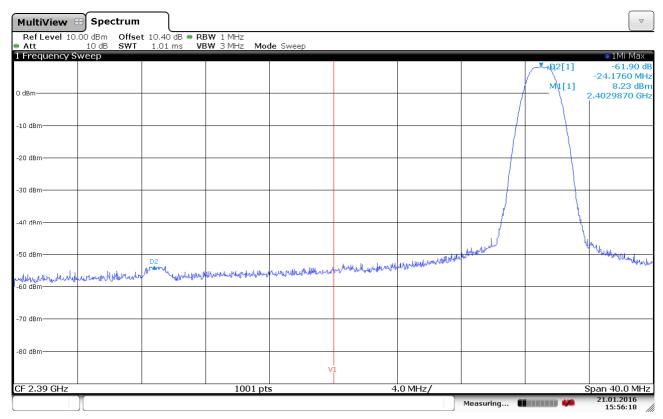




Date: 17.DEC.2015 16:06:35

Lower Band Edge, Radiated, 2402 MHz

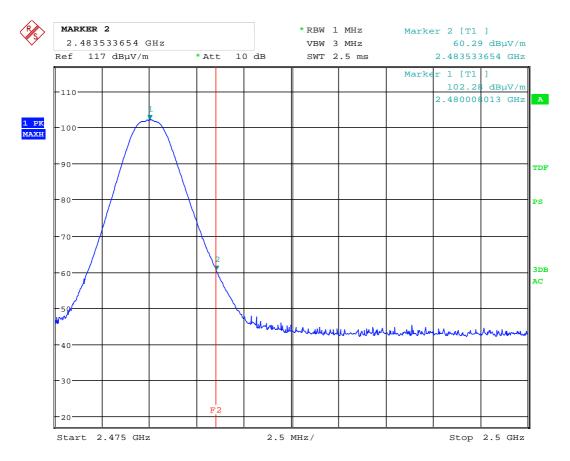




Date: 21.JAN.2016 15:56:18

Lower Band Edge, Delta, Conducted, 2403 MHz

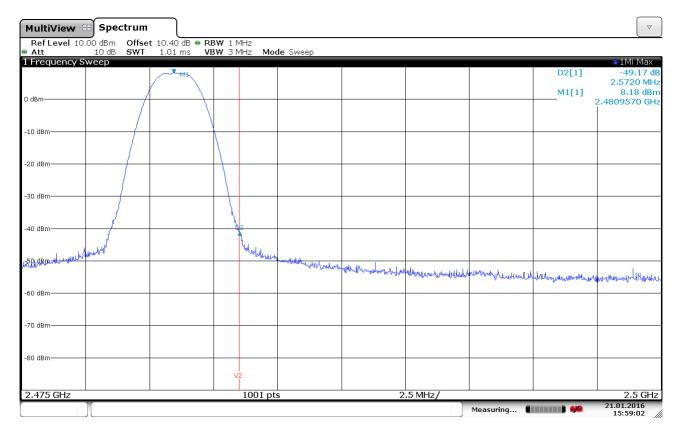




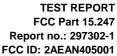
Date: 17.DEC.2015 16:26:22

Upper Band Edge, Radiated, 2480 MHz

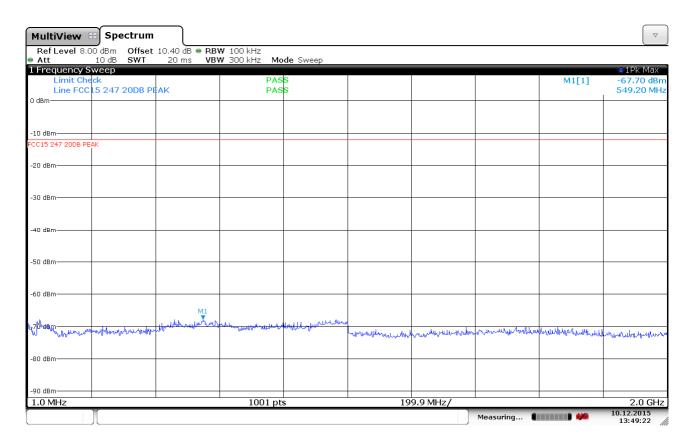




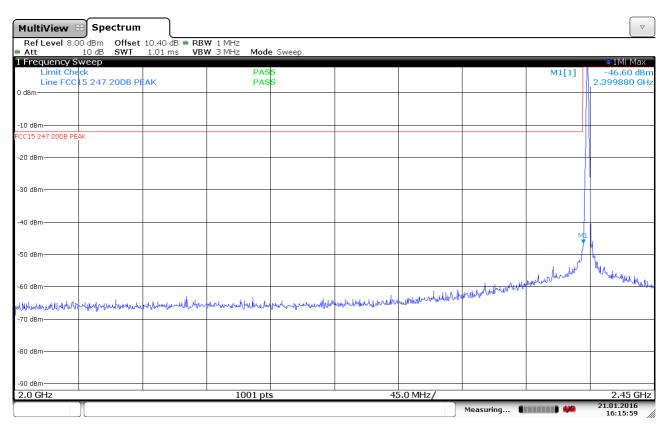
Upper Band Edge, Delta, Conducted, 2481 MHz



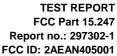




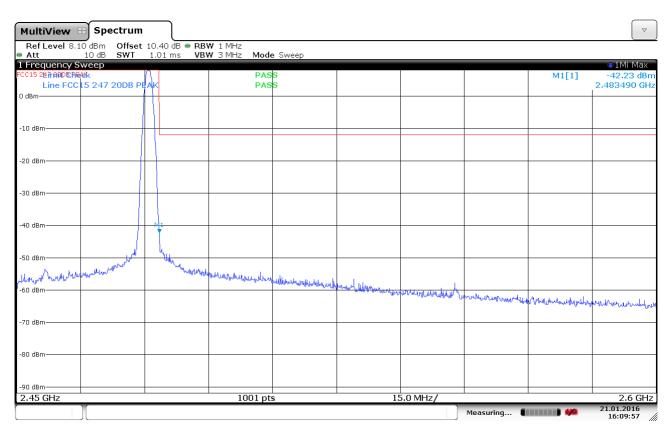
Conducted Emissions, 1 -2000 MHz, 2402 MHz



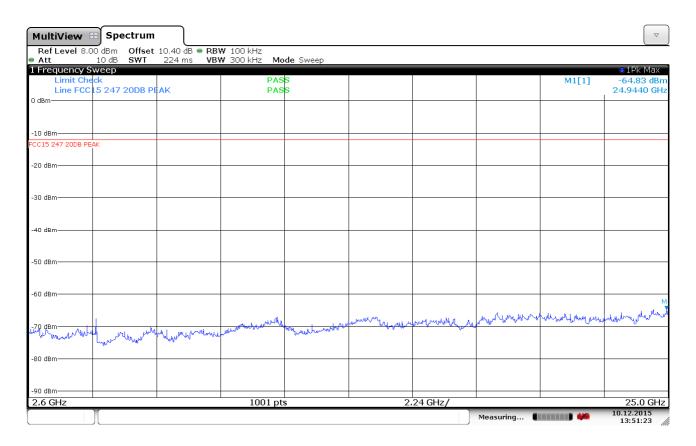
Conducted Emissions, 2000 -2450 MHz, 2403 MHz







Conducted Emissions, 2450 -2600 MHz, 2481 MHz



Conducted Emissions, 2600 -25000 MHz, 2440 MHz

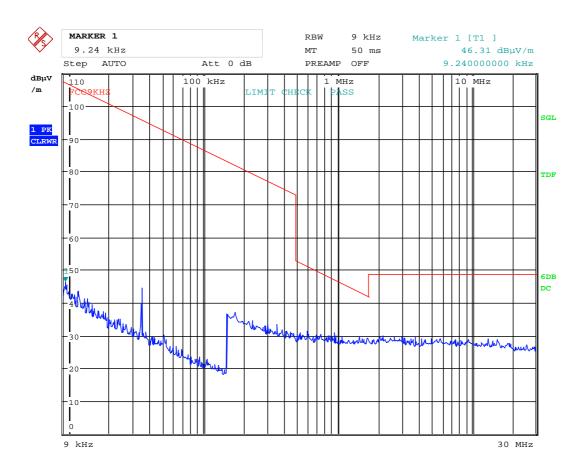


Radiated emissions 9 kHz-30 MHz.

Measuring distance 10 m, measured with Peak detector.

No component detected, see attached graph.

Limit is converted to 10 m using 40 dB/decade according to 15.31 (f) (2).



Date: 18.DEC.2015 11:32:46



Radiated emission 30 - 1000 MHz.

Detector: Quasi-Peak Measuring distance 3 m.

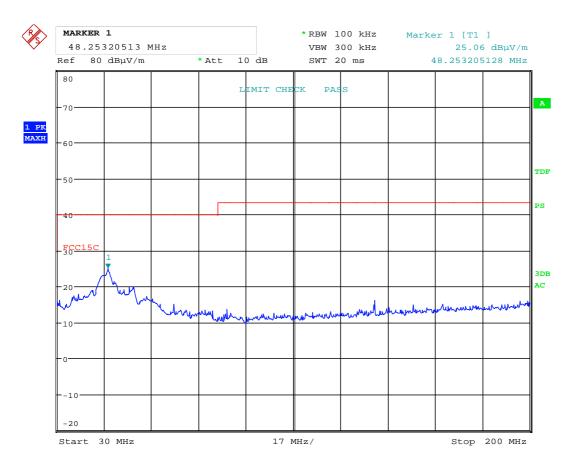
Tested with active connection.

Frequency	Operational condition	Field strength	Measuring distance	Limit	Margin
				FCC15.209	
MHz		dBμV/m	metres	dBμV/m	dB
All freqs	TX on	/	3	/	>10

Tested only with Peak Detector.

See attached graphs.

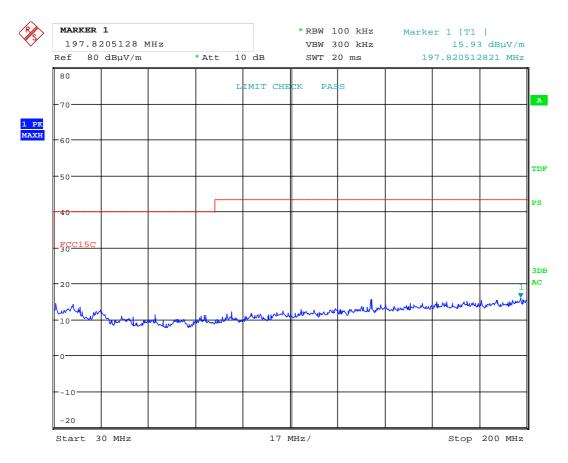




Date: 18.DEC.2015 10:48:39

Radiated Emissions, 30 -200MHz, VP

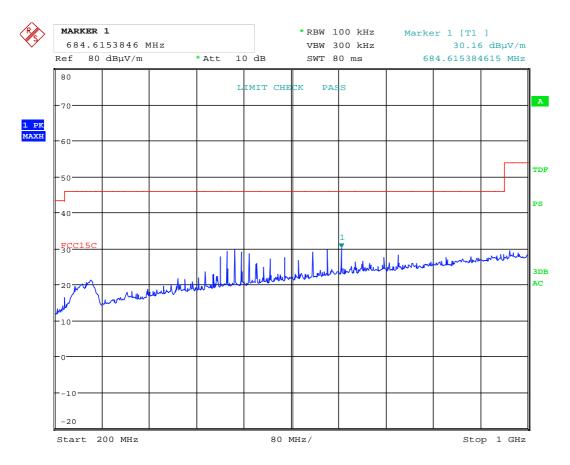




Date: 18.DEC.2015 10:53:13

Radiated Emissions, 30 -200MHz, HP

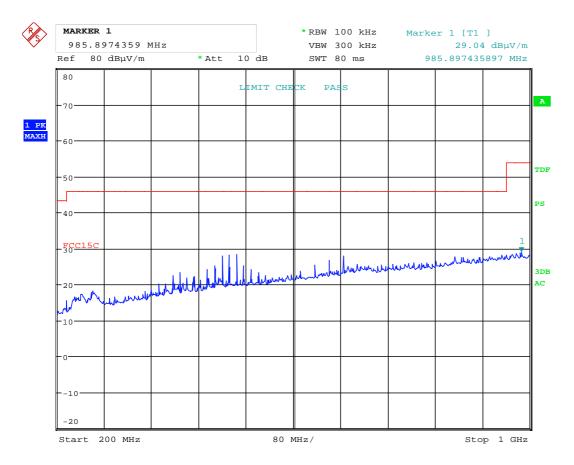




Date: 18.DEC.2015 11:10:22

Radiated Emissions, 200 -1000MHz, VP





Date: 18.DEC.2015 11:16:12

Radiated Emissions, 200 -1000MHz, HP



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Radiated Emissions, 1-25 GHz

3m (1 – 8.5 GHz) 1m (5.5 – 25 GHz) Measuring distance:

Peak Detector:

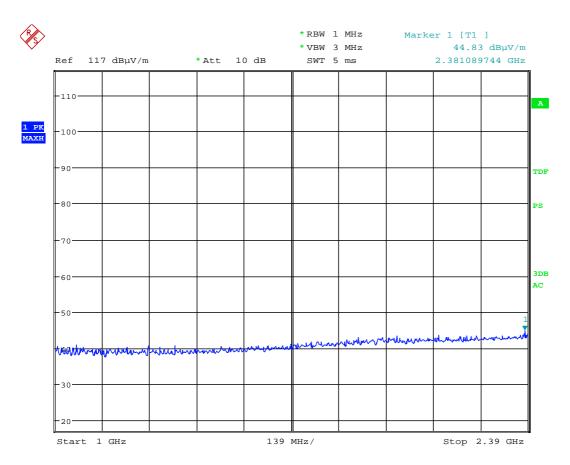
Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dBμV/m	dB	dBμV/m	dB
All freqs	М	/	None detected	7.1	74	>20

Average Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dBμV/m	dB	dBμV/m	dB
All freqs	М	/	None detected	7.1	54	>20

Average Detector values are calculated from Peak values by Duty Cycle Correction Factor. Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor". See plots.

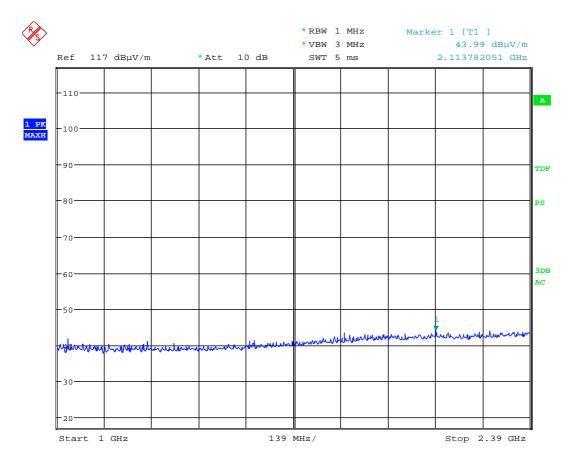




Date: 17.DEC.2015 16:10:02

Radiated Emissions, 1000 -2390MHz, EUT H1, VP

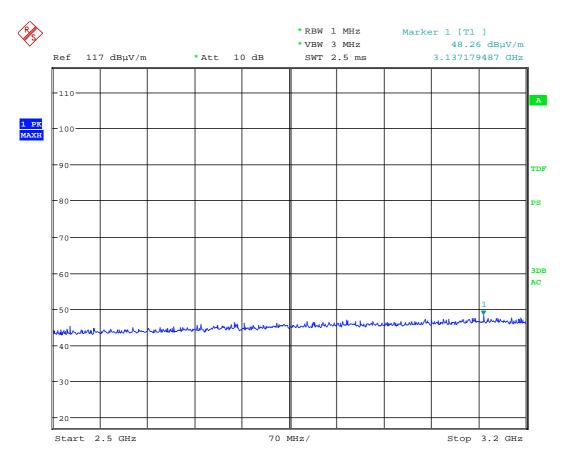




Date: 17.DEC.2015 16:11:53

Radiated Emissions, 1000 -2390MHz, EUT H1, HP

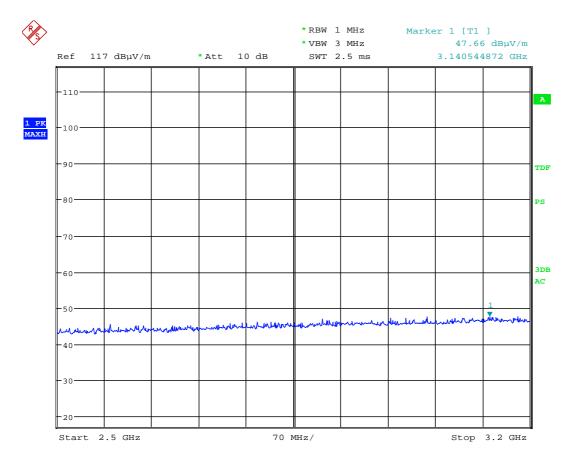




Date: 17.DEC.2015 16:29:27

Radiated Emissions, 2500 -3200MHz, EUT H1, VP

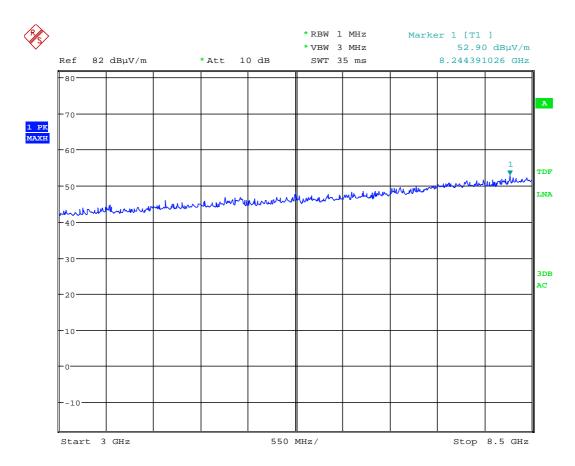




Date: 17.DEC.2015 16:31:18

Radiated Emissions, 2500 -3200MHz, EUT H1, HP

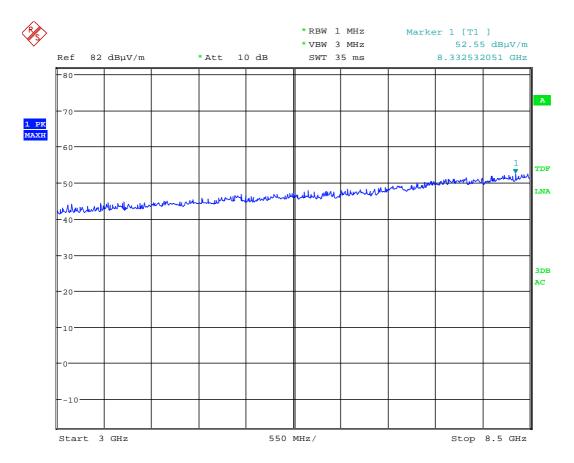




Date: 17.DEC.2015 18:33:40

Radiated Emissions, 3000 -8500MHz, VP

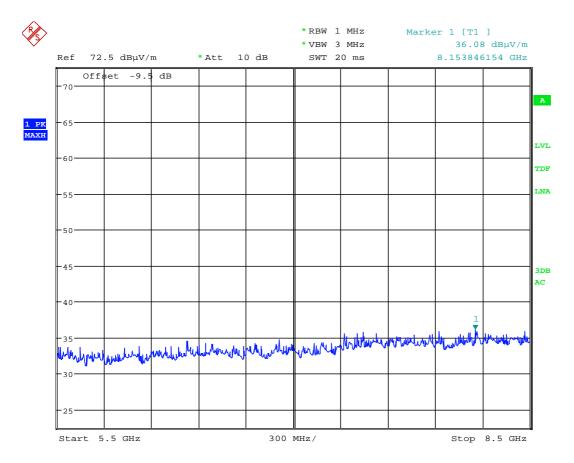




Date: 17.DEC.2015 18:35:33

Radiated Emissions, 3000 -8500MHz, HP

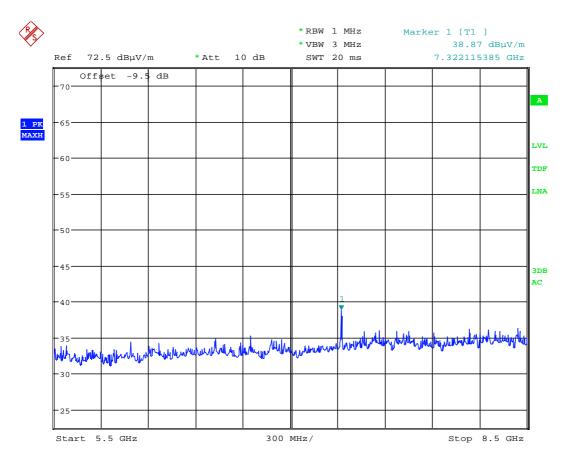




Date: 17.DEC.2015 18:46:53

Radiated Emissions, 5500 -8500MHz, VP, 1m

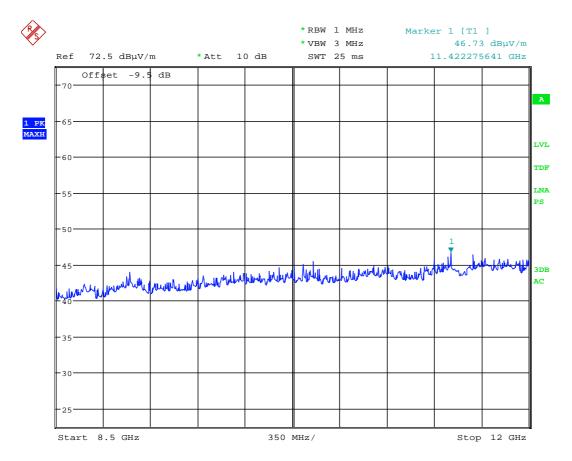




Date: 17.DEC.2015 18:48:45

Radiated Emissions, 5500 -8500MHz, HP, 1m

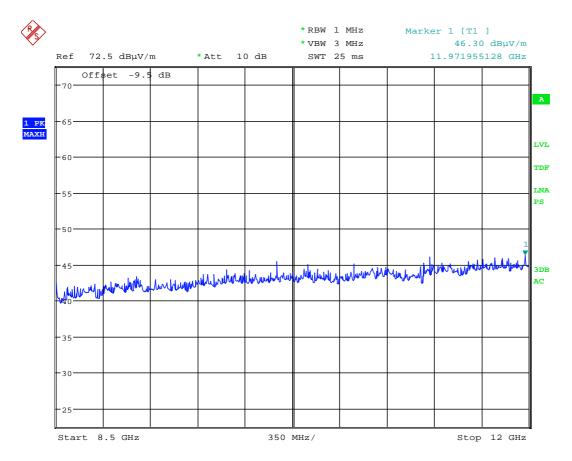




Date: 17.DEC.2015 18:54:20

Radiated Emissions, 8500 -12000MHz, VP, 1m

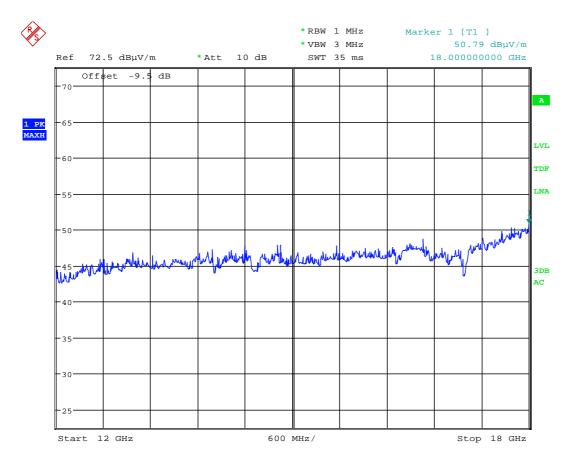




Date: 17.DEC.2015 18:56:12

Radiated Emissions, 8500 -12000MHz, HP, 1m

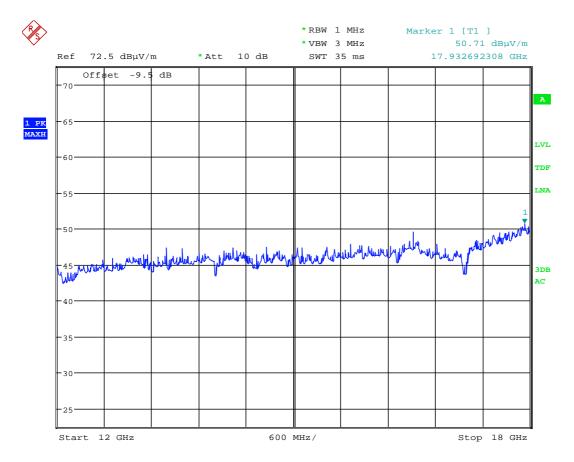




Date: 17.DEC.2015 18:59:57

Radiated Emissions, 12000 -18000MHz, VP, 1m

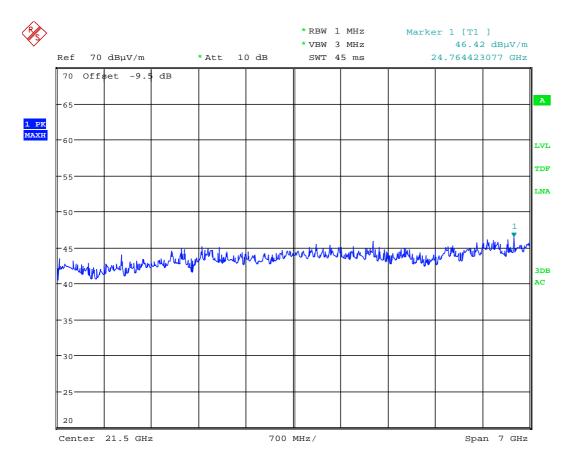




Date: 17.DEC.2015 19:01:50

Radiated Emissions, 12000 -18000MHz, HP, 1m





Date: 17.DEC.2015 19:15:59

Prescan, 18000 -25000MHz, VP, approx. 10cm



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4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item	Uncertainty	
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error	·	±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2



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LIST OF TEST EQUIPMENT 5

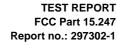
To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW26	Spectrum Analyzer	Rohde & Schwarz	LR 1640	2015.10	2016.10
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2015.11	2016.11
3	6810.17B	Attenuator	Suhner	LR 1669	Cal b4 use	
4	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	Cal b4 use	
5	HK116	Biconical Antenna	Rohde & Schwarz	LR 1260	2013.12	2017.12
6	HL223	LPDA antenna	Rohde & Schwarz	LR 1261	2013.12	2017.12
7	3115	Horn Antenna	EMCO	LR 1226	2013.12	2018.12
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2015.10	2016.10
9	HP 10855A	Pre-amplifier	Hewlett Packard	LR 1445	2015.10	2016.10
10	PM7320X	Antenna horn	Siverts lab	LR 103	2009.01.26	2017.01.26
11	DBF-520-20	Antenna horn	Systron Donner	LR 101	2009.01.26	2017.01.26
12	638	Antenna Horn	Narda	LR 1480	2010.06	2020.06
14	642	Antenna Horn	Narda	LR 220	2009.01	2017.01
15	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 1660	2014.10	2016.10
16	Model 87V	Multimeter	Fluke	N-4669	2015.10	2016.10
17	ESHS10	EMI	Rohde & Schwarz	N-3528	2015.08	2016.08
18	ESH3-Z5	Two-line V-Network	Rohde & Schwarz	LR 1076	2014.04.23	2016.04.23
19	ESH3-Z2	Pulse limiter	Rohde & Schwarz	LR 1074	2015.03.05	2017.03.05
20	6812B	AC power Source	Agilent	LR 1515	2015.12	2016.12

USB Power Adaptors Used during testing:

Power Line Conducted tests: Trust 19160, Mfd. 2015-08-07 Radiated Emissions tests: Apple A1400 (iPad Mini adaptor)

Both adaptor are property of Nemko and has EU plugs, but all tests were performed with 120V 60Hz AC.

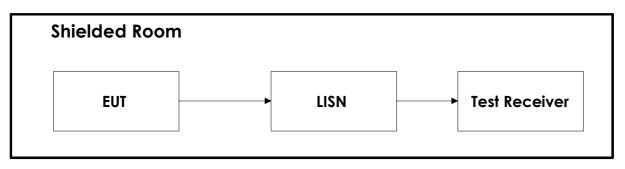


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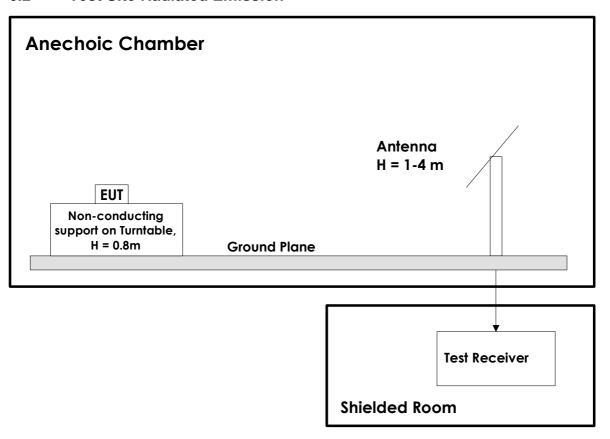


BLOCK DIAGRAM 6

6.1 **Power Line Conducted Emission**



6.2 **Test Site Radiated Emission**





TEST REPORT FCC Part 15.247 Report no.: 297302-1 FCC ID: 2AEAN405001

Revision history

Version	Date	Comment	Sign
1.0	2016.01.19	Version for TCB review	FS