

Test Report

Product	DECT Base Station with Bluetooth
Name and address of the applicant	Panasonic Corporation of North America Two Riverfront Plaza, 9 th Floor Newark, 07102-5490, NJ, USA
Name and address of the manufacturer	Panasonic Corporation 1-62, 4-chome, Minoshima, Hakata-ku Fukuoka, 812-8531, Japan
Model	KX-TGF770 / KX-TGF780 / KX-TGF970 KX-TGF770C / KX-TGF780C / KX-TGF790C / KX-TGF980C
Rating	120V 60Hz (Input: 120V ~60Hz 0.1A; Output: 5.5V 0.5A, 2.75W)
Trademark	Panasonic
Serial number	See page 3
Additional information	DECT 6.0, Bluetooth Basic Rate
Tested according to	Parts of FCC Part 15, subpart D Isochronous UPCS Device, 1920 – 1930 MHz Parts of Industry Canada RSS 213, Issue 3 2 GHz License-Exempt Personal Communications Services (LE-PCS) Devices
Order number	410056
Tested in period	2020-11-17 to 2020-12-16
Issue date	2021-01-11
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50   An accredited technical test executed under the Norwegian accreditation scheme
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1 INFORMATION

1.1 Tested Item

Name	Panasonic
Model name	KX-TGF770 / KX-TGF780 / KX-TGF970 (US Models) KX-TGF780C / KX-TGF790C / KX-TGF980C (Canadian Models)
FCC ID	ACJ96NKX-TGF780A
ISED ID	216A-KXTGF780A
Serial number	Conducted Sample: 4100560001 Radiated Sample: 4100560002
Hardware identity and/or version	PNLB2793
Software identity and/or version	SW200
Frequency Range	1921.536 – 1928.448 MHz
Number of Channels	5 RF Channels, 5x12 = 60 TDMA Duplex Channels
Type of Modulation	Digital (Gaussian Frequency Shift Keying)
Conducted Output Power	71 mW (Peak)
Antenna Connector	None
Number of Antennas	2
Antenna Diversity	Yes
Power Supply	AC Adaptor PNLV226 (Input: 120V ~60Hz 0.1A, Output: 5.5V _{DC} 0.5A, 2.75W)
Interfaces	PSTN

1.2 Description of Tested Device

The EUT is a DECT Base Station and is a responding device as described in ANSI C63.17 and is designed to operate together with a DECT Handset, which is the initiating device.

The tested model KX-TGF970 is identical to the already certified models KX-TGF770 / KX-TGF780 (FCC ID: ACJ96NKX-TGF780), except that the Bluetooth Part is changed in the new models.

1.3 Normal Test Conditions

Temperature:	20 – 23 °C
Relative humidity:	30 – 50 %
Normal test voltage:	120 V 60 Hz

The values are the limit registered during the test period.

1.4 Test Engineer(s)

Frode Sveinsen

1.5 Digital Modulation Techniques

The EUT uses Multi Carrier / Time Division Multiple Access / Time Division Duplex and Digital GFSK modulation. For further details see the operational description provided by the applicant.

Requirement, FCC 15.319(b), RSS-213 Issue 3, clause 5.1:

All transmissions must use only digital modulation techniques.

1.6 Labeling Requirements

See separate documents showing the label design and the placement of the label on the EUT.

Requirements FCC 15.19

The FCC Identifier shall be displayed on the label, and the device(s) shall bear the following statement in a conspicuous location on the device or in the user manual if the device is too small:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The label itself shall be of a permanent type, not a paper label, and shall last the lifetime of the equipment.

1.7 Antenna Requirement

Does the EUT have detachable antenna(s)?	☐ YES	☒ NO
If detachable, is the antenna connector(s) non-standard?	☐ YES	☐ NO
The tested equipment has only integral antennas. The conducted tests were performed on a sample with a temporary antenna connector.		

Requirement: FCC 15.203, 15.204, 15.317, RSS-GEN Issue 5, clause 6.8

1.8 Test Configurations

Test Configuration	The test was performed with the EUT connected to a 120 V 60 Hz power source During all RF tests, the EUT was programmed with batch commands from a computer connected to a USB-Serial dongle by a 3-wire interface. The batch commands programmed the Base Station to transmit on a fixed frequency with standard DECT Frames, GFSK modulation and a Pseudo-Random bit sequence. Output Power was fixed and was not selectable from the test software.
AC adaptors	All tests were performed with the supplied AC adaptor PNLV226.
Connections	The PSTN line was terminated in 50 Ohm during all tests.

1.9 Channel Frequencies

UPCS CHANNEL	FREQUENCY (MHz)
Upper Band Edge	1930.000
0 (Highest)	1928.448
1	1926.720
2	1924.992
3	1923.264
4 (Lowest)	1921.536
Lower Band Edge	1920.000

Requirement: FCC 15.303, RSS-213 Issue 3, clause 5.1:

Within 1920 -1930 MHz band for isochronous devices.

1.10 Other Comments

The tested EUT supports both normal DECT slot length and DECT Long Slot. Long Slot is an extended DECT slot that allows higher data rate for bit rates higher than 32kbps and allows for HD speech.

All tests except Power-Line Conducted Emissions were performed in conducted mode with a temporary antenna connector. Power-Line Conducted Emissions tests were performed with all ports populated and operating.

This report contains only spot-check results, all other tests for the DECT Part are covered by Nemko Test Report No. 363985-1.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC CFR47 Part 15D for Isochronous UPCS Devices and Industry Canada RSS-213 Issue 3 / RSS-GEN Issue 5 / RSP-100 Issue 11.

All tests were conducted in accordance with ANSI C63.4-2014 and ANSI C63.17-2013.

Antenna Gain tests were made in a 3m fully-anechoic chamber.

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

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

PUB 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 CFR 47 Paragraph #	IC RSS-213 Paragraph #	Verdict
Power Line Conducted Emission	15.107(a) 15.207(a)	5.4 RSS-GEN 7.2 / 8.8	Complies
Digital Modulation Techniques	15.319(b)	5.1	Complies
Labeling requirements	15.19(a)(3)	RSP-100 3.1	Complies
Antenna Requirement	15.317, 15.203	RSS-GEN 6.8	Complies
Channel Frequencies	15.303	5.1	Complies
Automatic discontinuation of transmission	15.319(f)	5.2	Complies
Emission Bandwidth	15.323(a)	5.5	Complies
Occupied Bandwidth	N/A	RSS-GEN 6.7	Complies
In-band emissions	15.323(d)	5.8.2	Complies
Out-of-band emissions	15.323(d)	5.8.1	Complies
Peak Transmit Power and Antenna Gain	15.319(c)(e), 15.31(e)	5.6 RSS-GEN 8.3	Complies
Power Spectral Density	15.319(d)	5.7	Complies
Carrier frequency stability	15.323(f)	5.3	Complies ⁴
Frame repetition stability	15.323(e)	5.2 (13)	Complies ⁴
Frame period and jitter	15.323(e)	5.2 (13)	Complies ⁴
Monitoring threshold, Least interfered channel	15.323(c)(2)(5)(9)	5.2 (2)(5)(9)	Complies ⁴
Monitoring of intended transmit window and maximum reaction time	15.323(c)(1)	5.2 (1)	Complies ⁴
Threshold monitoring bandwidth	15.323(c)(7)	5.2 (7)	Complies ⁴
Reaction time and monitoring interval	15.323(c)(1)(5)(7)	5.2 (1)(5)(7)	Complies ⁴
Access criteria test interval	15.323(c)(4)(6)	5.2 (4)(6)	Complies ⁴
Access Criteria functional test	15.323(c)(4)(6)	5.2 (4)(6)	Complies ¹
Acknowledgements	15.323(c)(4)	5.2 (4)	Complies ⁴
Transmission duration	15.323(c)(3)	5.2 (3)	N/A ¹
Dual access criteria	15.323(c)(10)	5.2 (10)	N/A ¹
Alternative monitoring interval	15.323(c)(11)(12)	5.2 (11)(12)	N/A ²
Spurious Emissions (Radiated)	15.319(g) 15.109(a) 15.209(a)	RSS-GEN 7.3 / 8.9	N/A ³

¹ Only applies for EUT that can be initiating device

² The client declares that the tested equipment does not implement this provision

³ Not required if the Conducted Out-of-Band Emissions test is Passed

⁴ See Nemko Test Report No. 363985-1

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.207

ISED RSS-213 Issue 3, Clause 6.3

RSS-GEN Issue 5, Clause 7.2 / 8.8

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

Test Results: Complies

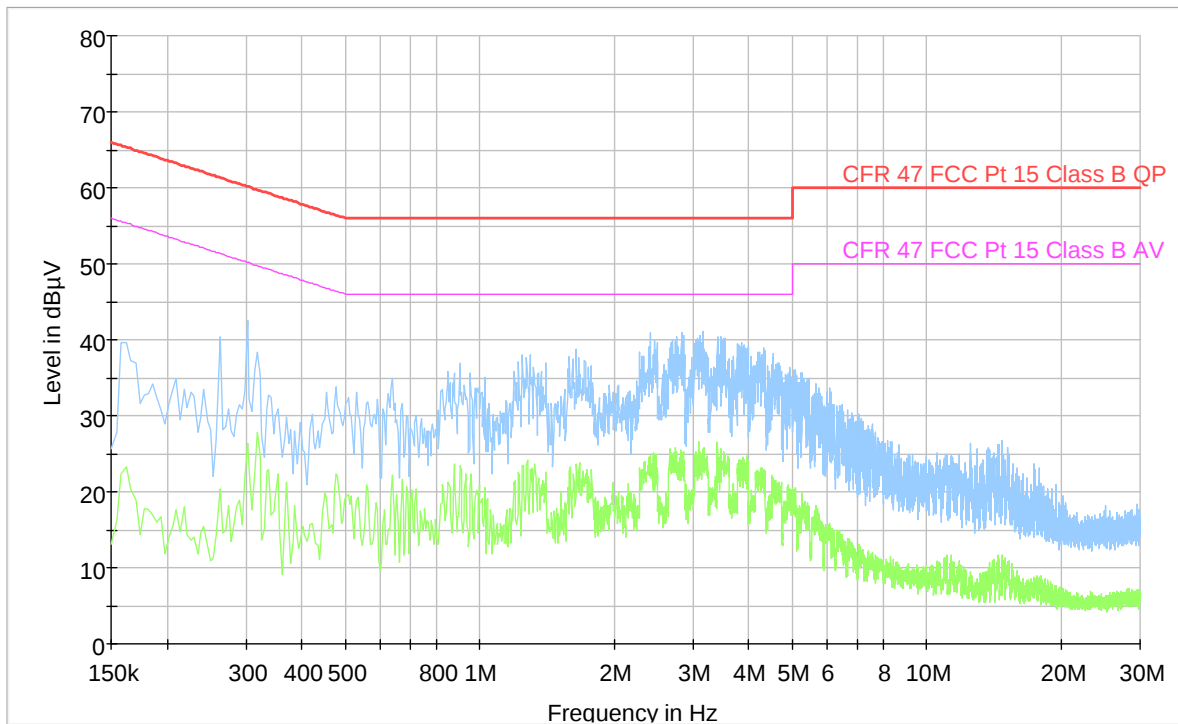
Measurement Data: See attached plots

Highest measured value (L1 and N):

All values are below the Average Limit even when measured with Peak Detector.

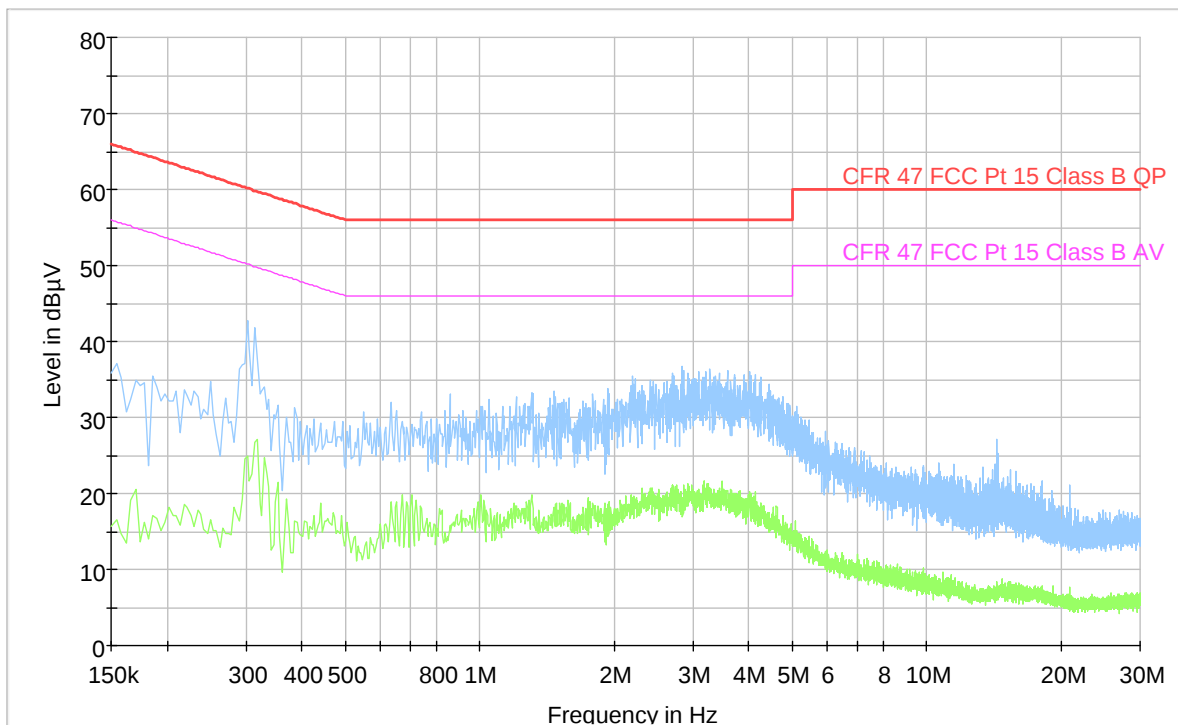
PNLV226, On-Hook, Handset Charging, 120V 60Hz:

Full Spectrum



PNLV226, Off-Hook, 120V 60Hz:

Full Spectrum



3.2 Automatic Discontinuation of Transmission

Does the EUT transmit Control and Signaling Information?	☒ YES	☐ NO
TYPE OF EUT :	☐ INITIATING DEVICE	☒ RESPONDING DEVICE

The following tests simulate the reaction of the EUT in case of either absence of information to transmit or operational failure after a connection with the companion device is established.

Number	Test	EUT Reaction	Verdict
1	Power removed from EUT	A	Pass
2	Switch Off EUT	N/A	Pass
3	Hook-On by EUT	N/A	Pass
4	Power Removed from Companion Device	B	Pass
5	Switch Off Companion Device	B	Pass
6	Hook-On by Companion Device	B	Pass

- A - Connection breakdown, Cease of all transmissions
 B - Connection breakdown, EUT transmits control and signaling information
 C - Connection breakdown, Companion Device transmits control and signaling information
 N/A - Not Applicable (EUT does not have On/Off switch and cannot perform Hook-On)

Requirements, FCC 15.319(f), RSS-213 Issue 3, Clause 5.2:

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

3.3 Peak Power Output

Test Method:

ANSI C63.17, clause 6.1.2.

Test Results: Complies

Measurement Data:

Maximum Conducted Output Power

Channel No.	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Maximum Antenna Gain (dBi)	Maximum Radiated Output Power (dBm)
4	1921.536	18.4	0.0*	18.4
2	1924.992	18.5	0.0*	18.5
0	1928.448	18.4	0.0*	18.4

*Antenna Gain is value declared by manufacturer

Values above are RMS value measured in RF burst with Max Hold function of Spectrum Analyzer.

BASE: For this test it was also checked that input voltage variation of 85 and 115% of nominal value did not have any effect on the measured output power.

Limit:

Conducted: $100 \mu\text{W} \times \text{SQRT}(B)$ where B is the measured Emission Bandwidth in Hz

FCC 15.319(c)(e): 20.70 dBm (117 mW)

ISED RSS-213, Issue 3: 20.45 dBm (111 mW)

The antenna gain is below 3 dBi, no reduction in transmit power is necessary.

Requirements,

FCC 15.319(c)(e):

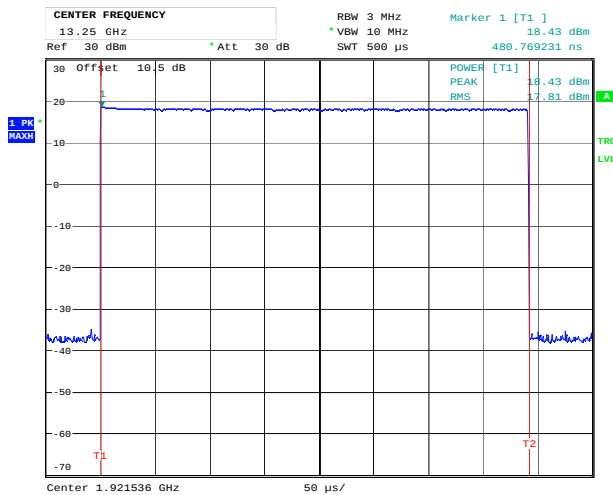
Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz.

RSS-213 Issue 3, clause 5.6:

Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the occupied bandwidth in Hertz.

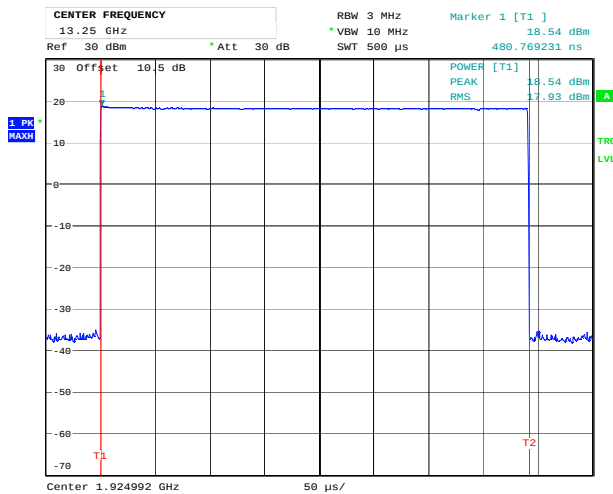
FCC 15.319(c)(e); RSS-213 Issue 3, clause 5.6:

The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.



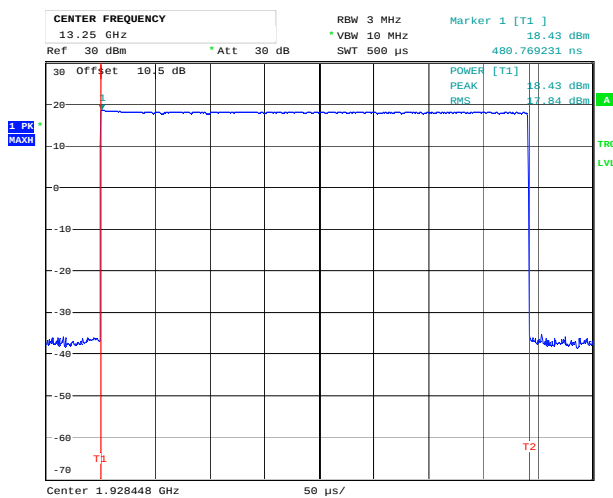
Date: 17.NOV.2020 14:27:24

Conducted Peak Output Power, Lower Channel



Date: 17.NOV.2020 14:50:41

Conducted Peak Output Power, Middle Channel



Date: 17.NOV.2020 14:37:34

Conducted Peak Output Power, Upper Channel

3.4 Emission Bandwidth B

Test Method:

ANSI C63.17, clause 6.1.3.

Test Results: Complies

Measurement Data:

Channel No.	Frequency (MHz)	Emission Bandwidth B (MHz)
4	1921.536	1.39
2	1924.992	1.38
0	1928.448	1.40

Channel No.	Frequency (MHz)	Occupied Bandwidth (MHz)
2	1924.992	1.23

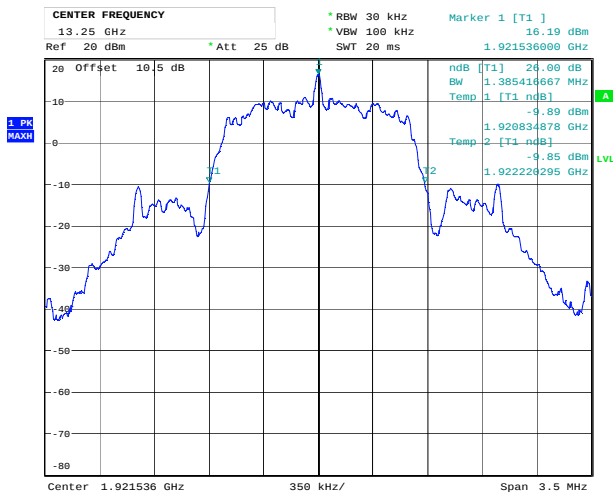
Requirements, FCC 15.323(a), RSS-213 Issue 3, clause 5.5:

The Emission Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz.

No requirements for 6 and 12 dB Bandwidth, these values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4).

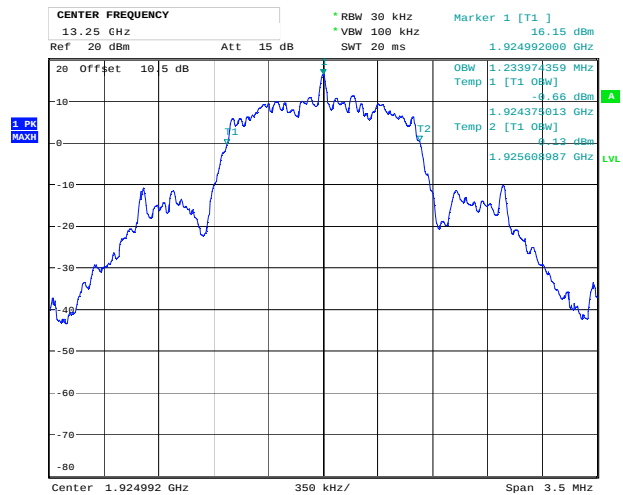
RSS-GEN Issue 5, clause 6.7:

Occupied Bandwidth (99%) is measured according to RSS-GEN Issue 5, clause 6.7. No requirement specified.



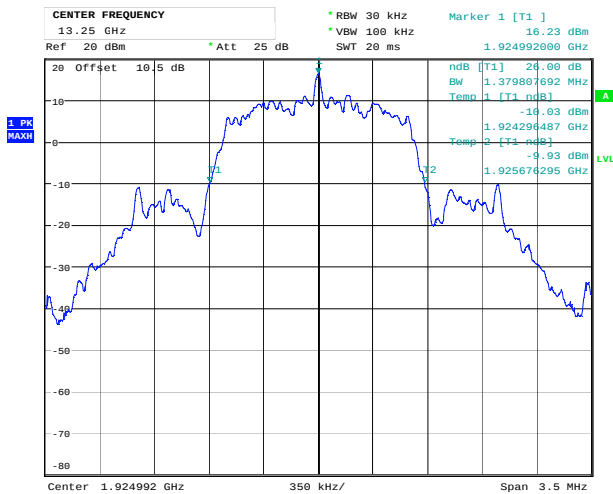
Date: 17.NOV.2020 14:26:29

Emission Bandwidth B, Lower Channel



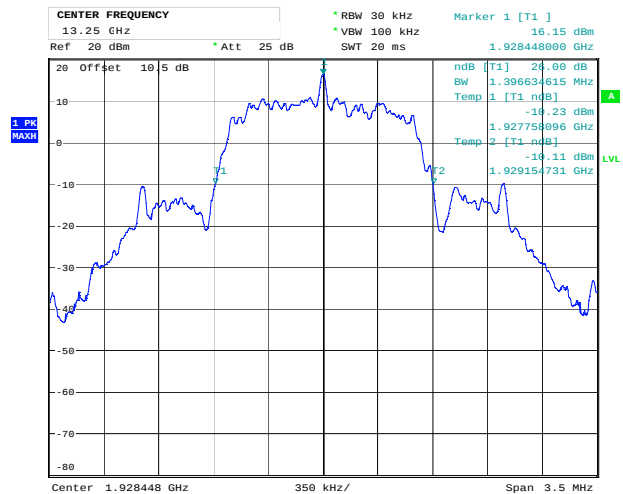
Date: 17.NOV.2020 14:54:06

99% Bandwidth, Middle Channel



Date: 17.NOV.2020 14:52:21

Emission Bandwidth B, Middle Channel



Date: 17.NOV.2020 14:39:15

Emission Bandwidth B, Upper Channel

3.5 Power Spectral Density

Test Method:

ANSI C63.17, clause 6.1.5.

Test Results: Complies

Measurement Data:

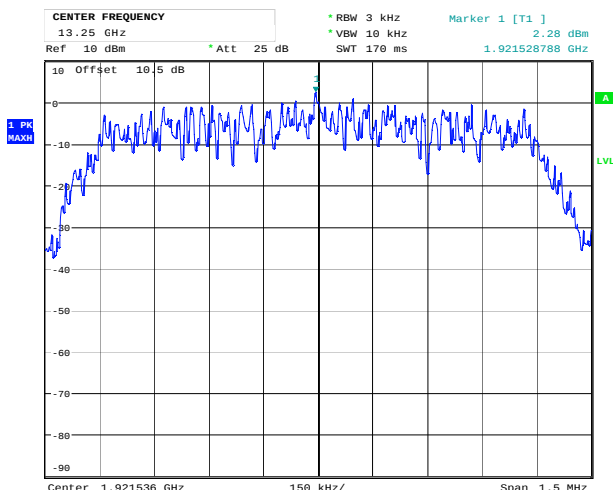
Channel No.	Frequency (MHz)	Power Spectral Density (dBm)
4	1921.536	-3.3
0	1928.448	-4.5

Values above is the RMS value of the sweep that is within 30 dB of the peak.

Measured with Sample Detector and Averaged over 1000 sweeps.

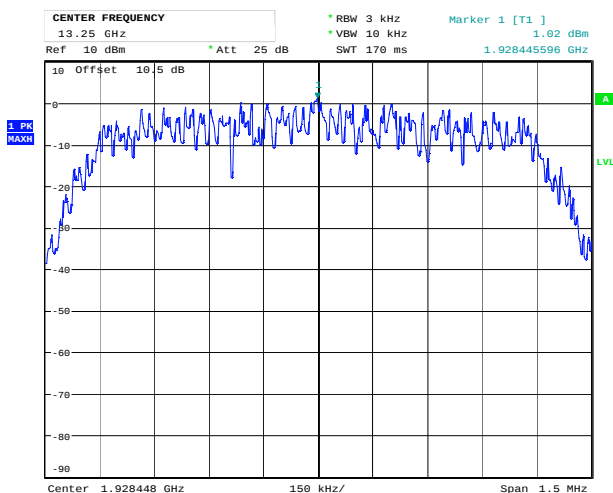
Requirements, FCC 15.319(d), RSS-213 Issue 3, clause 5.7

The Power Spectral Density shall be less than 3 mW (4.77 dBm) when averaged over at least 100 sweeps.



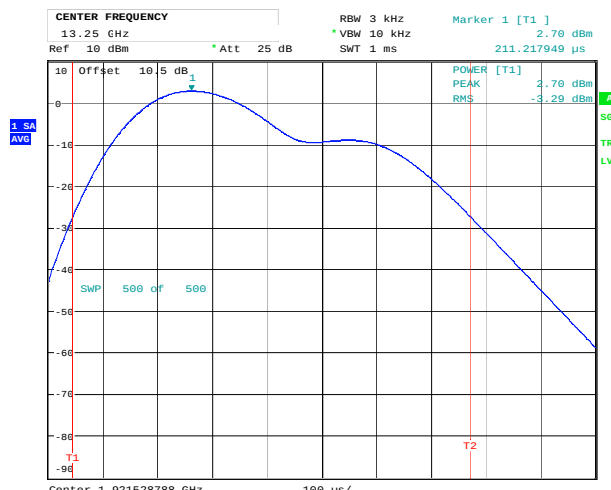
Date: 17.NOV.2020 15:04:47

PSD Overview, Lower Channel



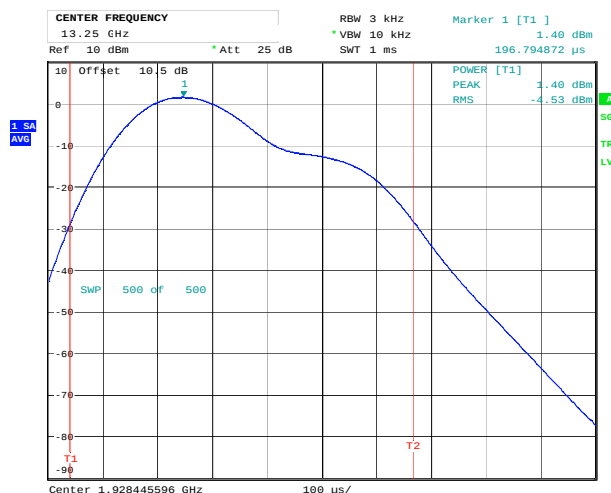
Date: 17.NOV.2020 14:42:24

PSD Overview, Upper Channel



Date: 17.NOV.2020 15:05:19

PSD Averaged, 1000 Sweeps, Lower Channel



Date: 17.NOV.2020 14:42:56

PSD Averaged, 1000 Sweeps, Upper Channel

3.6 In-Band Unwanted Emissions, Conducted

Test Method:

ANSI C63.17, clause 6.1.6.1.

Test Results: Complies

Measurement Data:

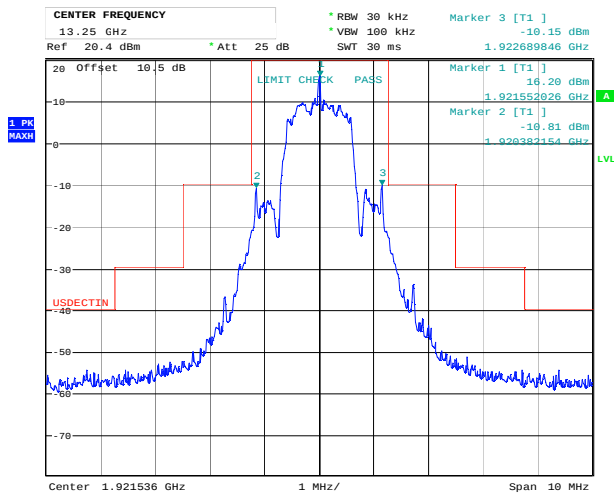
See plots.

Requirements, FCC 15.323(d), RSS-213 Issue 3, clause 5.8.2:

$B < f \leq 2B$: at least 30 dB below max. permitted peak power

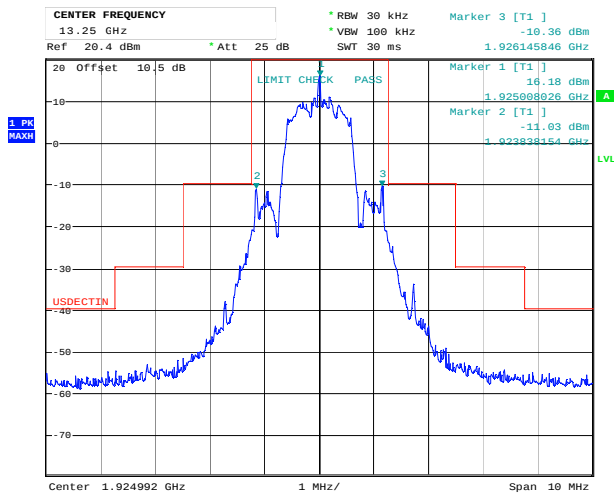
$2B < f \leq 3B$: at least 50 dB below max. permitted peak power

$3B < f \leq$ UPCS Band Edge : at least 60 dB below max. permitted peak power



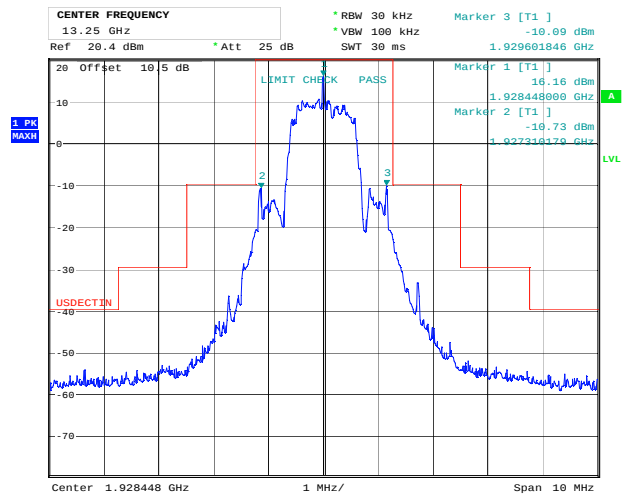
Date: 17.NOV.2020 14:28:22

In-Band Unwanted Emissions, Lower Channel



Date: 17.NOV.2020 14:55:34

In-Band Unwanted Emissions, Middle Channel



Date: 17.NOV.2020 14:40:57

In-Band Unwanted Emissions, Upper Channel

3.7 Out-of-band Emissions, Conducted

Test Method:

ANSI C63.17, clause 6.1.6.2.

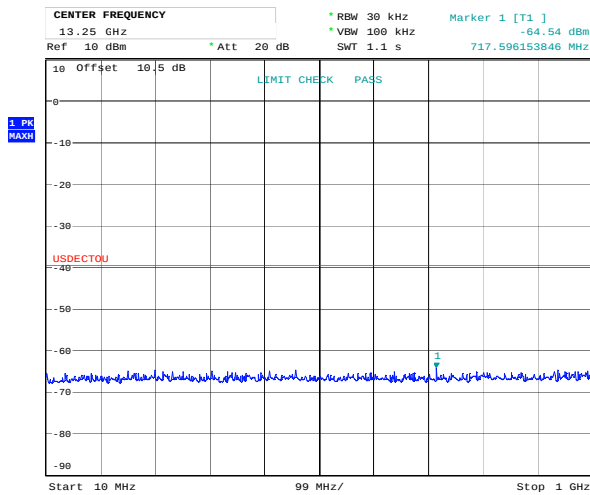
Test Results: Complies

Measurement Data:

All Emissions are below the limit.

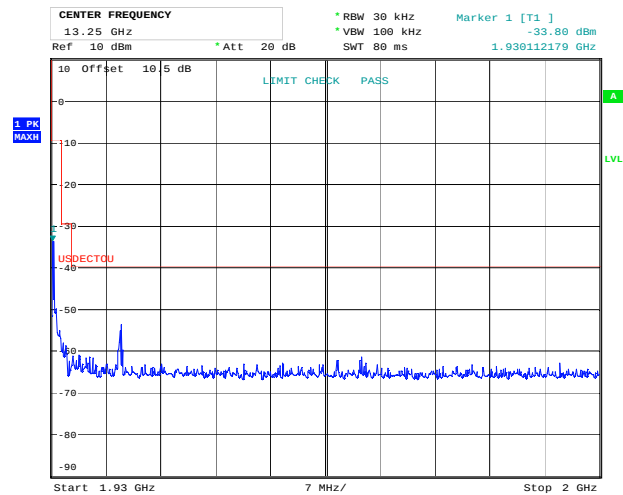
Requirements, FCC 15.323(d), RSS-213 Issue 3, clause 5.8.1:

$f \leq 1.25\text{MHz}$ outside UPCS band :	$\leq -9.5\text{dBm}$
$1.25\text{MHz} \leq f \leq 2.5\text{MHz}$ outside UPCS band :	$\leq -29.5\text{ dBm}$
$f \geq 2.5\text{MHz}$ outside UPCS band :	$\leq -39.5\text{ dBm}$



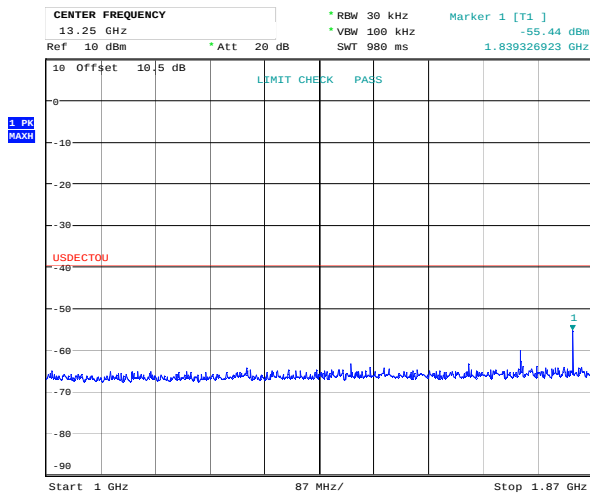
Date: 17.NOV.2020 14:29:27

Out-of-Band Emissions, Lower Channel



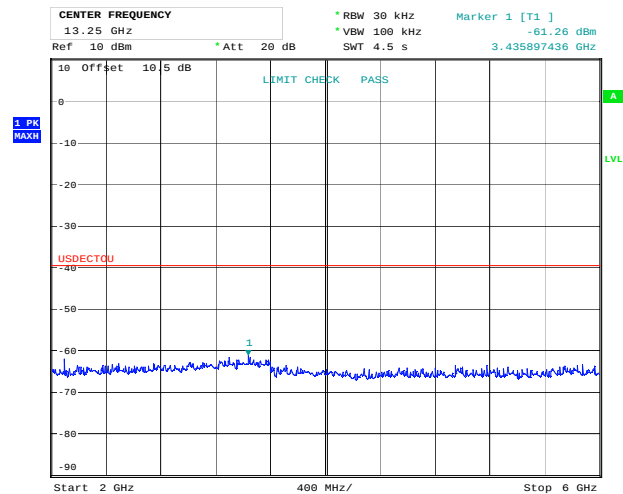
Date: 17.NOV.2020 14:45:41

Out-of-Band Emissions, Upper Channel



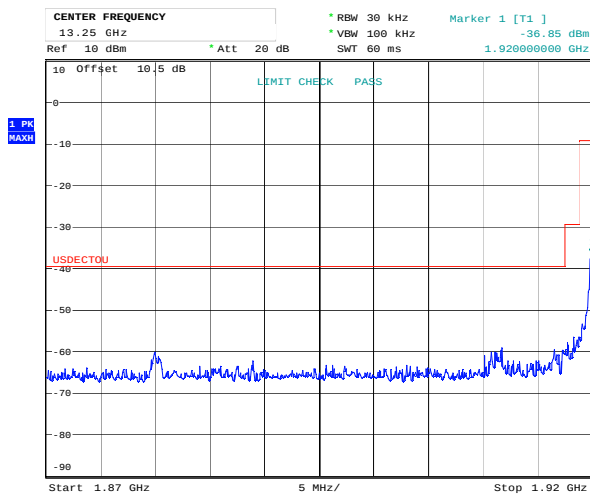
Date: 17.NOV.2020 14:30:04

Out-of-Band Emissions, Lower Channel



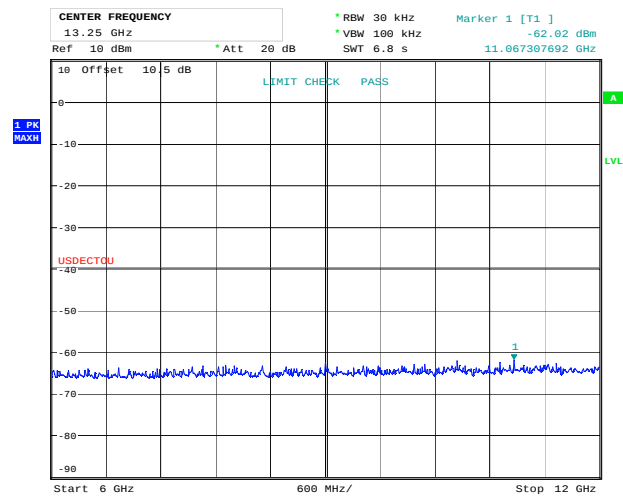
Date: 17.NOV.2020 14:58:47

Out-of-Band Emissions, Middle Channel



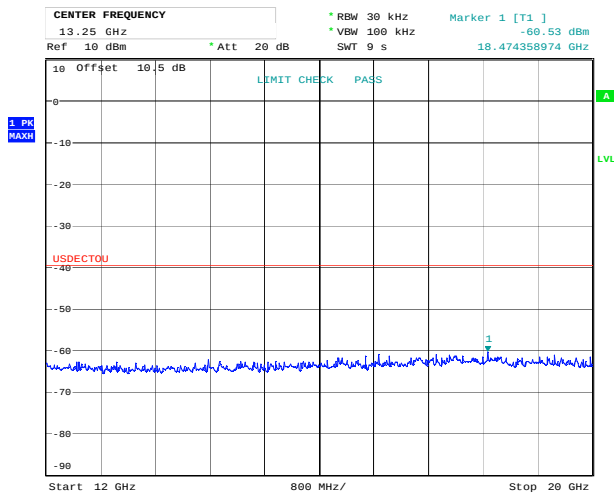
Date: 17.NOV.2020 14:30:32

Out-of-Band Emissions, Lower Channel



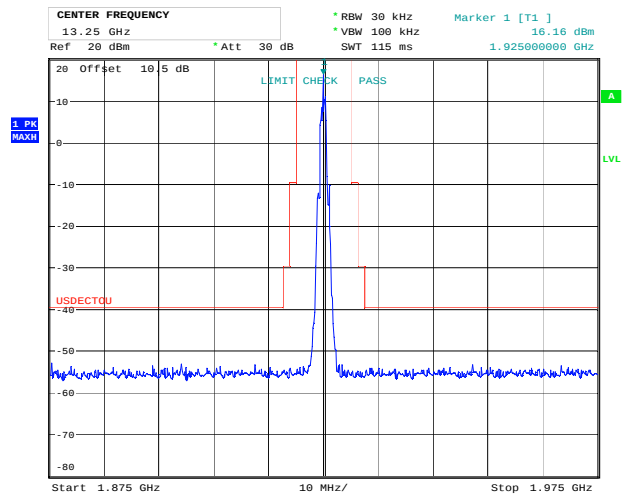
Date: 17.NOV.2020 15:00:11

Out-of-Band Emissions, Middle Channel



Date: 17.NOV.2020 15:00:58

Out-of-Band Emissions, Middle Channel



Date: 17.NOV.2020 14:59:24

Out-of-Band Emissions, Middle Channel

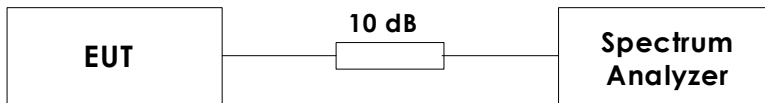
4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted (RBW < 100 kHz)	< 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
Timing and Jitter Measurements		±2.0 ns
Frame Timing Measurements		±1.4 ppm
Receiver Blocking Levels		±1.0 dB
Temperature Uncertainty		±1 °C

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

5 Test Setups

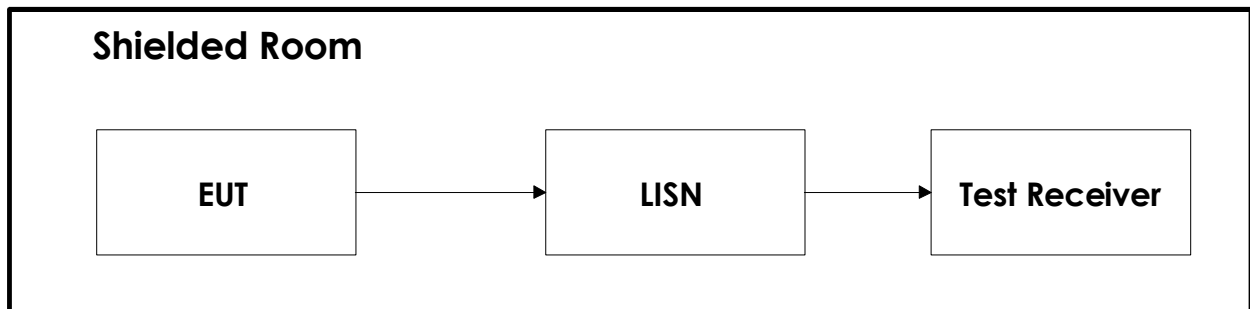
5.1 Conducted Emission Test



Test Set-up 3

This setup is used for all conducted emission tests.

5.2 Power Line Conducted Emissions Test



Test Set-Up 5

6 Test Equipment Used

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 Testhouse.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	2020-01	2022-01
2	6810.17B	Attenuator	Suhner	LR 1669	2020-08	2021-08
3	ESCI3	Measuring Receiver	Rohde & Schwarz	N-4259	2019.10	2021.10
4	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2019-11	2021-11
5	6812B	AC Power Source	Agilent	LR 1515	2020-04	2021-04
6	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	

COU = Cal on use

The software listed below has been used for one or more tests.

No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.10	Power Line Conducted test software
2	Nemko AS	RSPlot	1.0.10.0	Screenshots from R&S Spectrum Analyzers

Revision history

Revision	Date	Comment	Sign
00	2020-12-18	First edition	FS
01	2021-01-11	Deleted reference to incorrect model numbers on page 5.	FS