

Test Report

Product	Collaboration end-point
Name and address of the applicant	Cisco Systems Norway AS Philip Pedersens vei 1 1366 Lysaker, Norway
Name and address of the manufacturer	Cisco Systems, Inc. 170 West Tasman Drive San Jose CA 95134, USA
Model Number	TTC60-31 TTC60-32
Rating	3.5 - 2.5A 100-240V AC 50/60Hz 4.5 - 3.5A 100-240V AC 50/60Hz
Trademark	Cisco
Serial number	WZS2442J006 (for TTC60-31)
Additional information	WiFi, Bluetooth
Tested according to	Parts of FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Parts of ISED Canada RSS-247, Issue 2 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Order number	406072
Tested in period	2020-11-23 to 2020-11-25
Issue date	2021-09-06
Name and address of the testing laboratory	 Institutveien 6 Kjeller, Norway www.nemko.com <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50 </div> <div style="width: 45%;">   NORWEGIAN ACCREDITATION TEST 033 </div> </div> <p style="text-align: center;">An accredited technical test executed under the Norwegian accreditation scheme</p>
	 Prepared by [Frode Sveinsen]
	 Approved by [G. Suhanthakumar]
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1 INFORMATION

1.1 Test Item

Name	Cisco
Marketing Name	Webex Board Pro 55 Webex Board Pro 75
Model Number	TTC60-31 TTC60-32
FCC ID	LDKNVTX21737
ISED ID	2461N-NVTX21737
Serial number	WZS2442J006
Hardware identity and/or version	DV1
Software identity and/or version	S01845-1.23.0
Frequency Range	2402–2480 MHz, 2MHz Channel Separation
Number of Channels	40
Operating Modes	Bluetooth Low Energy, 1Mb Mode
Type of Modulation	GFSK
Conducted Output Power	3.4 mW (Peak)
Antenna Connector	None
Number of Antennas	1
Diversity or Smart Antennas	No
Power Supply	Mains Powered

Description of Test Item

The EUT is a radio module with WiFi and BT/BLE module in a collaboration end-point system.

This Bluetooth Low Energy part has been tested as a DTS system and fulfils all requirements for DTS systems.

The radio is a certified module NVIDIA P3310 (Cisco FCC ID: LDKNVTX21737, Nvidia FCC ID: VOB-P3310).

The module is identical, but the antennas are changed, and power levels are reduced for some channels.

All tests were performed on a TTC60-31.

1.2 Normal test condition

Temperature: 20 - 24 °C
Relative humidity: 20 - 50 %
Normal test voltage: 120V 60Hz

The EUT was powered from a regulated Power Source during all tests.

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen

1.4 Antenna Requirement

Does the EUT have detachable antenna(s)?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
If detachable, is the antenna connector(s) non-standard?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
The tested equipment has only integral antennas. Conducted tests were performed with a temporary antenna connector.		

Requirement: FCC 15.203, 15.204

1.5 EUT Operating Modes

Description of operating modes	Continuous TX
Additional information	The following settings were used for all tests: Power Setting: Default Bit Pattern: PSRB Frame Type: Default Bit rate: 1 Mbit

1.6 Comments

The EUT uses the Bluetooth Low Energy protocol.

The measurements were done with the EUT powered by 115 V AC. It was checked that power variations between 85% and 115% did not have any influence on the measurements.

All ports were populated during spurious emission measurements.

This test report covers only radiated emissions tests. All other tests are covered by UL report no: 11526345-E2V2.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and Industry Canada RSS-247 Issue 2 and RSS-GEN Issue 5.

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 1m, 3m and 10m.

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

<input type="checkbox"/> New Submission	<input checked="" type="checkbox"/> Production Unit
<input checked="" type="checkbox"/> Class II Permissive Change	<input type="checkbox"/> Pre-production Unit
DTS Equipment Code	<input type="checkbox"/> 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 2, RSS-GEN Issue 5 reference	ANSI C63.10-2013 Reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	5.13	Complies
Antenna Requirement	15.203	6.8 (RSS-GEN)	5.8	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	6.2	N/T
Occupied Bandwidth (99% BW)	N/A	6.7 (RSS-GEN)	6.9.3	N/T
DTS Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	11.8 Option 2	N/T
Peak Power Output	15.247(b)	5.4 (RSS-247)	11.9.1.1	Complies
Power Spectral Density	15.247(d)	5.2 (2) (RSS-247)	11.10.2 PKPSD (DTS)	N/T
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	6.7 11.11 (DTS)	N/T
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	5.5 (RSS-247) 7.3 (RSS-GEN) 8.9 (RSS-GEN)	6.3, 6.5, 6.6, 6.10 11.12, 11.13 (DTS)	Complies

Revision history

Revision	Date	Comment	Sign
00	2021-03-26	First edition	FS
01	2021-09-03	Updated model numbers	FS

3 TEST RESULTS

3.1 Peak Power Output

FCC Part 15.247 (b)

ISED Canada RSS-247 Issue 2, Clause 5.4

Measurement procedure: ANSI C63.10-2013 Clause 11.9.1.2

Test Results: Complies

Measurement Data:

Carrier Frequency (MHz)	Bit rate	Field Strength (dB μ V/m)	EIRP (dBm)	EIRP (mW)
2402	1 Mb	99.1	3.9	2.4
2480	1 Mb	99.9	4.7	2.9

Output Power reported is Maximum Peak Power.

Radiated Power was calculated from measured Field Strength using the method described in FCC KDB 412172 D01.

See attached plots.

Requirements:

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

For frequency hopping systems employing at least 75 hopping channels: 1 Watt

For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

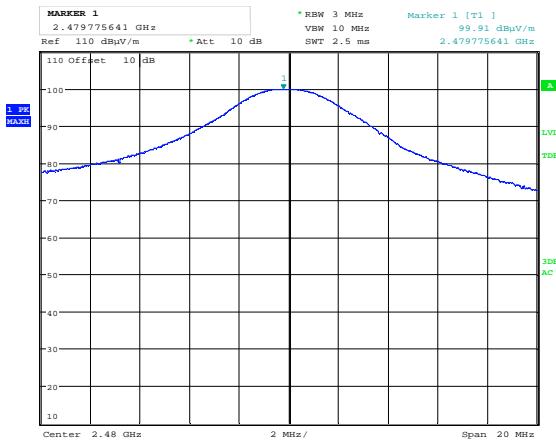
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

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.



Date: 23.NOV.2020 16:35:39

Maximum Field Strength, 2402 MHz, GFSK



Date: 23.NOV.2020 16:42:33

Maximum Field Strength, 2480 MHz, GFSK

3.2 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISED Canada (MHz)	FCC (GHz)	ISED Canada (GHz)
0.090-0.110		0.96-1.24 1.3-1.427	0.96-1.427
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		2.69-2.9	2.655-2.9
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		3.6-4.4	3.5-4.4
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 123-138	108-138	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISED, all other frequencies are common.

3.3 Radiated Emissions, Band Edge

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3 / 8.9

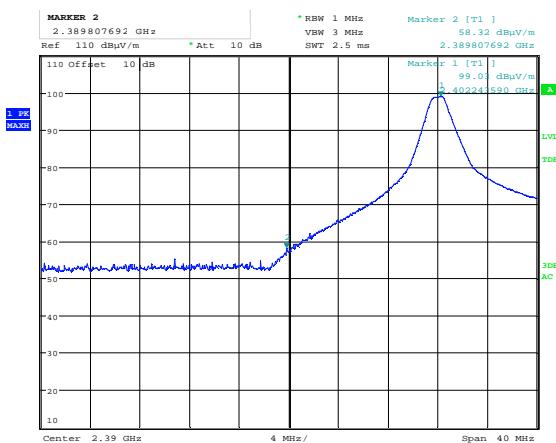
Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

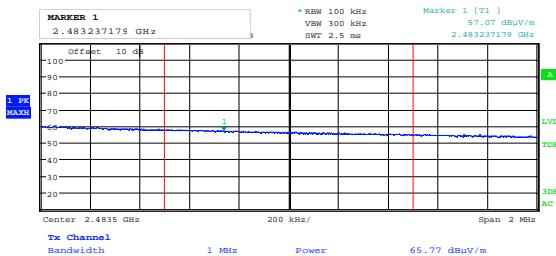
Carrier Frequency and Data Rate	Band Edge Frequency	Measured Field Strength (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)	
		Peak	Av	Peak	Av	Pk	Av
2402 MHz 1Mb	2390 MHz	58.3	/	74	54	15.7	/
2480 MHz 1Mb	2483.5 MHz	65.8	/			8.2	/

See attached plots.



Date: 23.NOV.2020 16:34:48

Lower Band Edge 2402 MHz, GFSK, Peak



Date: 23.NOV.2020 16:50:50

Upper Band Edge 2480 MHz, GFSK, Peak

3.4 Radiated Emission, 30 -1000 MHz

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Detector: Peak (found frequencies were measured with Quasi-Peak Detector)

Measuring distance 3 m

Tested in with BLE Active in Burst Mode

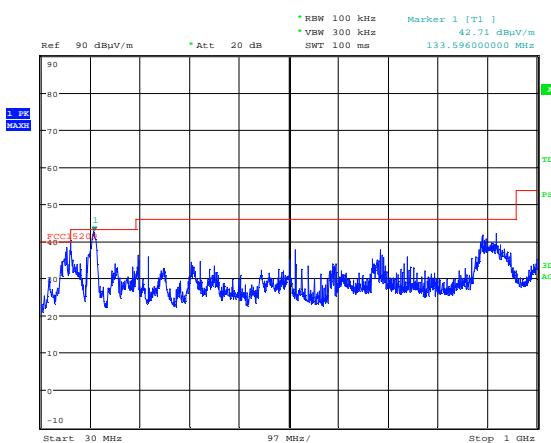
Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
30 – 88	2440	Any	< 40.0	40.0	>0
88 – 216	2440	Any	< 43.5	43.5	>10
216 – 960	2440	Any	< 46.0	46.0	>10
960 – 1000	2440	Any	< 54.0	54.0	>10
47.46	Any	Any	36.2*	40.0	3.8
88.80	Any	Any	42.0*	43.5	1.5
135.50	Any	Any	41.8*	43.5	1.7
528.00	Any	Any	39.2*	46.0	6.8
694.27	Any	Any	38.7*	46.0	7.3
893.17	Any	Any	38.8*	46.0	7.2

* This is a Class A Device, and the measured spurious emissions are not from the radio part.

See attached plots

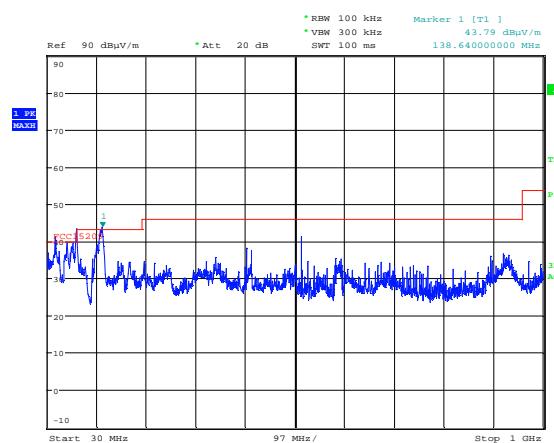
Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
Frequency	Radiated emission limit @3 meters	
30 – 88 MHz	100 μ V/m	40.0 dB μ V/m
88 – 216 MHz	150 μ V/m	43.5 dB μ V/m
216 – 960 MHz	200 μ V/m	46.0 dB μ V/m
960 – 1000 MHz	500 μ V/m	54.0 dB μ V/m
Limits above are with Quasi Peak Detector		



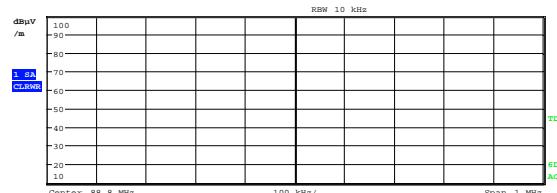
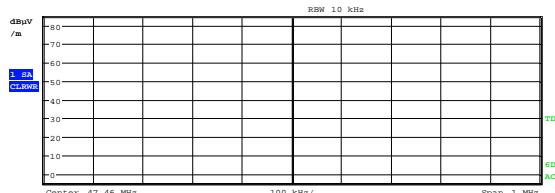
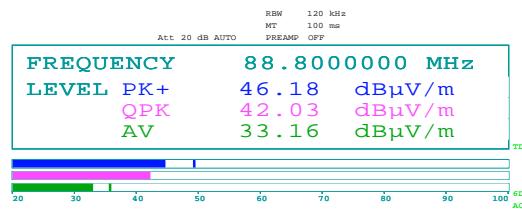
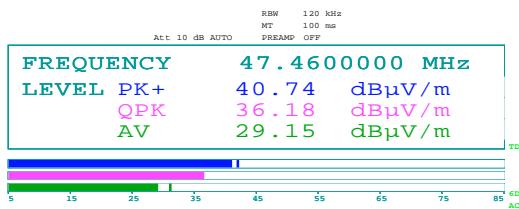
Date: 24.NOV.2020 17:05:15

Radiated Emissions 30 - 1000 MHz, GFSK, HP



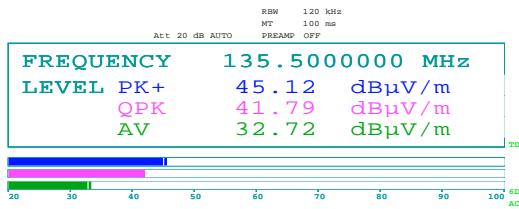
Date: 24.NOV.2020 17:03:15

Radiated Emissions 30 - 1000 MHz, GFSK, VP



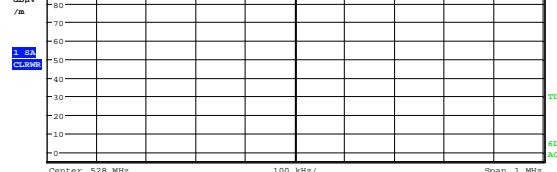
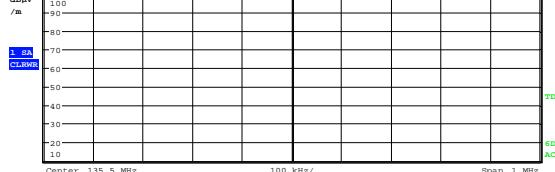
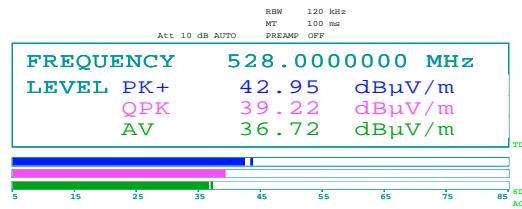
Date: 24.NOV.2020 15:32:50

Radiated Emissions 47.46 MHz (Max: VP)



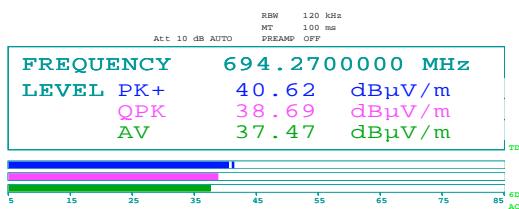
Date: 24.NOV.2020 15:47:57

Radiated Emissions 88.80 MHz (Max: VP)



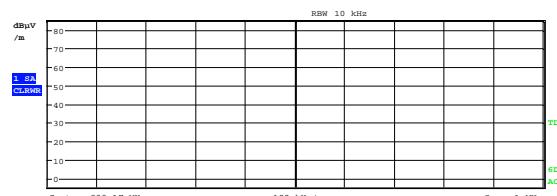
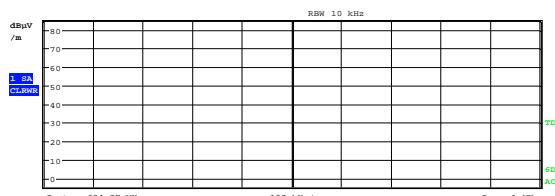
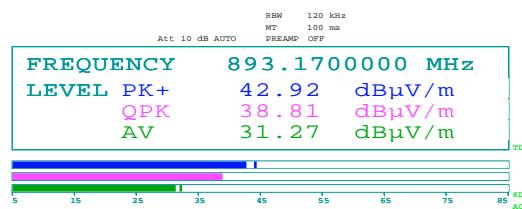
Date: 24.NOV.2020 16:03:44

Radiated Emissions 135.50 MHz (Max: HP)



Date: 24.NOV.2020 16:18:37

Radiated Emissions 528.00 MHz (Max: HP)



Date: 24.NOV.2020 16:29:39

Radiated Emissions 694.27 MHz (Max: HP)

Date: 24.NOV.2020 16:47:02

Radiated Emissions 893.17 MHz (Max: HP)

3.5 Radiated Emissions, 1-26 GHz

FCC Part 15.209 (a)

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 – 18 GHz)
 1m (18 – 26 GHz)

RBW/VBW = 1MHz/3MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Measured Emissions (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)	
		Peak Det.	Average Det.	Peak	Average	Peak	Average
Any	1.350	59.4*	56.3*	74	54	14.6	-2.3*
Any	2.971	65.8*	45.1*	74	54	8.2	8.9
Any	4.050	59.0*	56.8*	74	54	15.0	-2.8*
Any	5.942	66.9*	52.6*	74	54	7.1	1.4
Any	1 - 26	< 64	< 54	74	54	>10	>0

* This is a Class A Device, and the Measured Emissions are not from the radio transmitter.

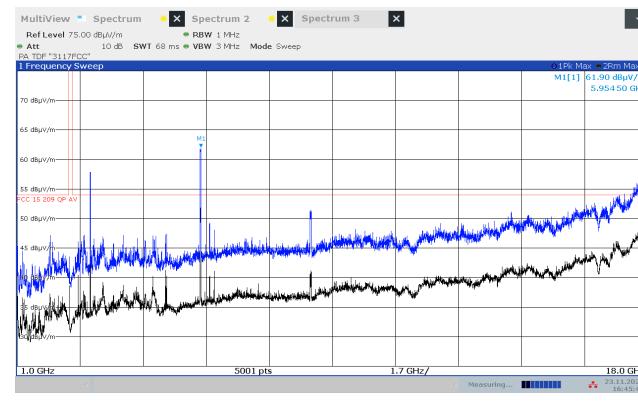
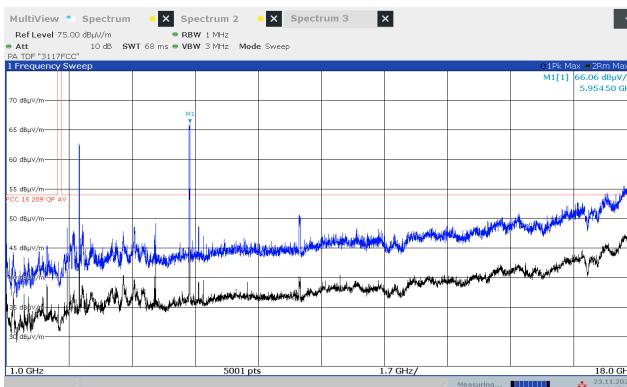
A Band Reject Filter was used for measurements from 1 GHz to 18 GHz.

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

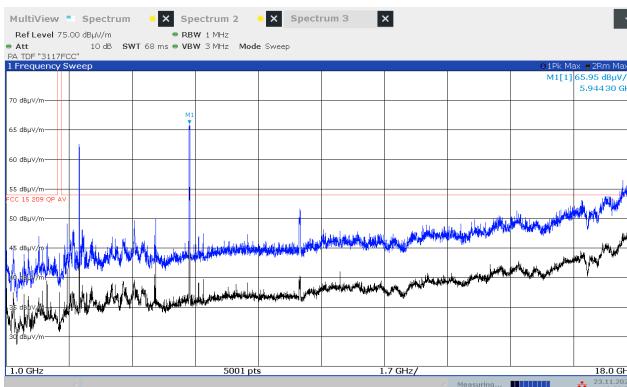
See plots.

Requirements/Limit

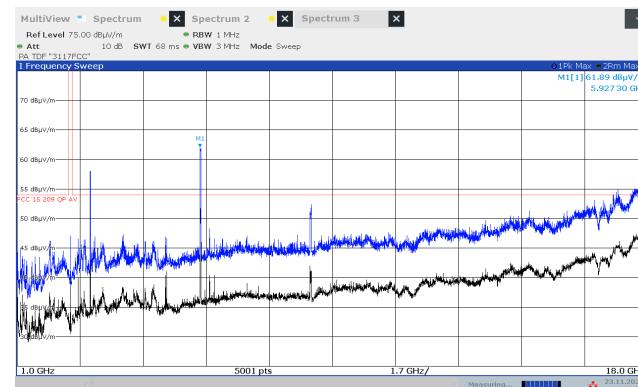
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
Radiated emission limit @3 meters		
Frequency	Average Detector	Peak Detector
1 – 26 GHz	54.0 dB μ V/m	74.0 dB μ V/m



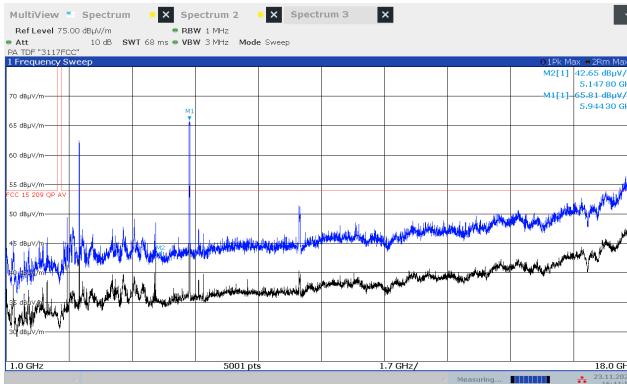
Radiated Emissions 1 - 18 GHz, 2402 MHz, GFSK, HP



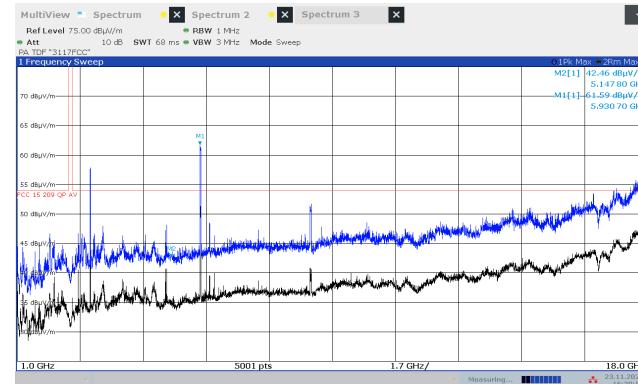
Radiated Emissions 1 - 18 GHz, 2402 MHz, GFSK, VP



Radiated Emissions 1 - 18 GHz, 2440 MHz, GFSK, HP

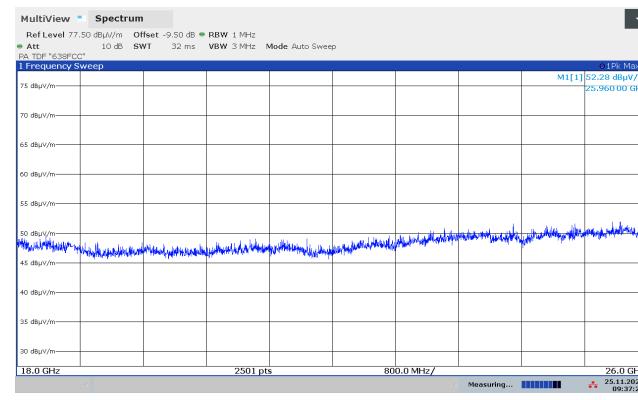
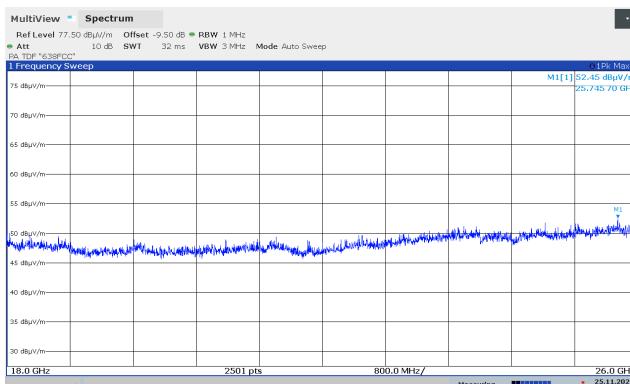


Radiated Emissions 1 - 18 GHz, 2440 MHz, GFSK, VP

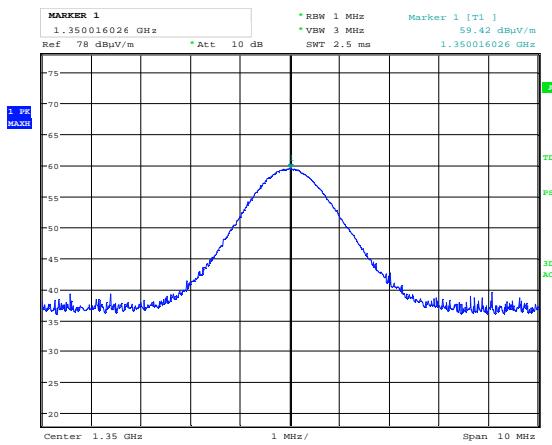


Radiated Emissions 1 - 18 GHz, 2480 MHz, GFSK, HP

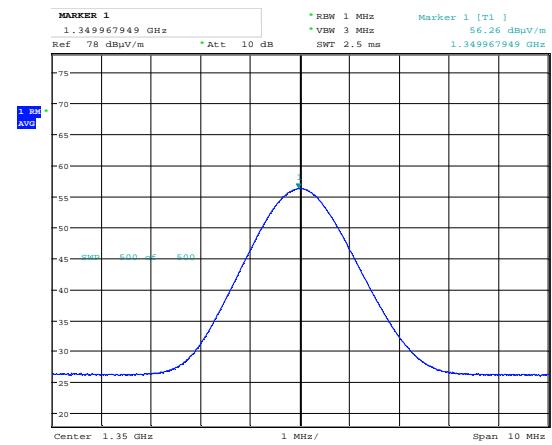
Radiated Emissions 1 - 18 GHz, 2480 MHz, GFSK, VP



Radiated Emissions 18 - 26 GHz, 2440 MHz, GFSK, HP, @1m



Radiated Emissions 18 - 26 GHz, 2440 MHz, GFSK, VP, @1m



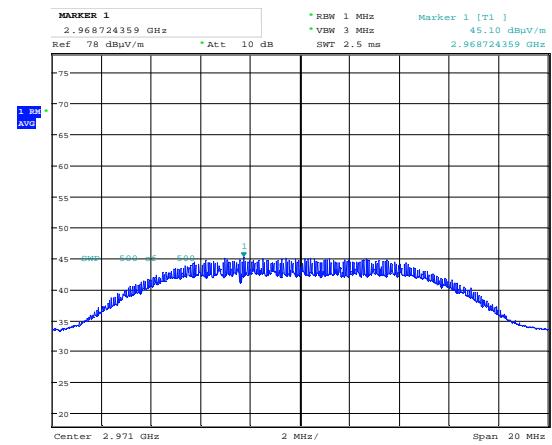
Date: 20.NOV.2020 10:26:54

Radiated Emissions 1350 MHz, Peak (Max: VP)



Date: 20.NOV.2020 10:26:24

Radiated Emissions 1350 MHz, Average (Max: VP)

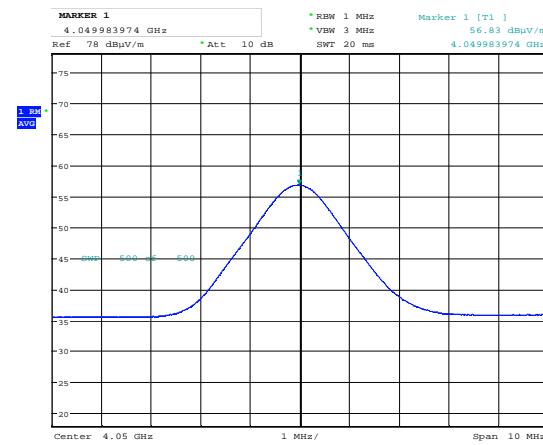
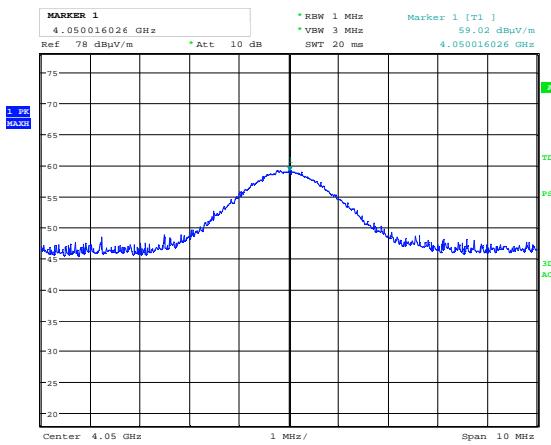


Date: 20.NOV.2020 10:42:02

Radiated Emissions 2971 MHz, Peak (Max: HP)

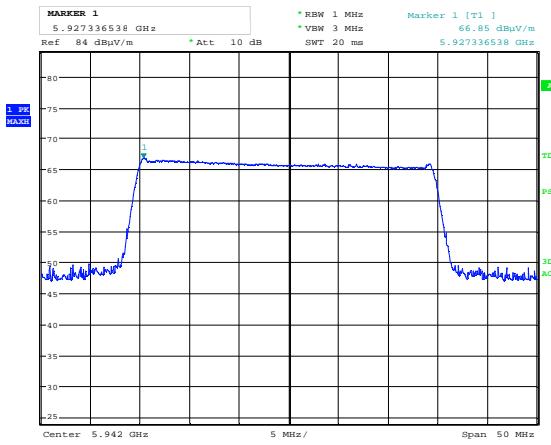
Date: 20.NOV.2020 10:43:12

Radiated Emissions 2971 MHz, Average (Max: HP)



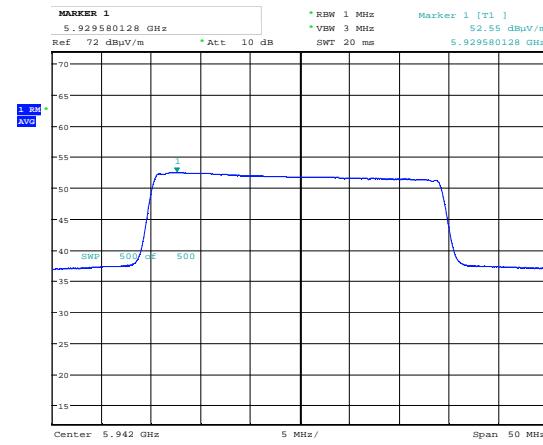
Date: 20.NOV.2020 10:58:26

Radiated Emissions 4050 MHz, Peak (Max: HP)



Date: 20.NOV.2020 10:59:22

Radiated Emissions 4050 MHz, Average (Max: HP)



Date: 20.NOV.2020 11:13:13

Radiated Emissions 5942 MHz, Peak (Max: HP)

Date: 20.NOV.2020 11:14:29

Radiated Emissions 5942 MHz, Average (Max: HP)

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

5 LIST OF TEST EQUIPMENT

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	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2020-10	2021-10
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2020-03	2021-03
3	6810-17B	Attenuator	Suhner	LR 1669	2020-08	2021-08
4	N0324415	BandStop Filter	Microwave Circuits	LR 1760	COU	
5	WLK5-1100-1485-7000-40SS	Low Pass Filter	Wainwright Inst.	LR 1761	COU	
6	VULB 9163	BiLog Antenna	Schwarzbeck	LR 1616	2020-01	2023-01
7	317	Preamplifier	Sonoma Inst.	LR 1687	2020-08	2021-08
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2020-08	2021-08
9	3115	Horn Antenna	EMCO	LR 1330	2016-10	2021-10
10	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2020-08	2021-08
11	Model 638	Antenna Horn	Narda	LR 1480	N/A	
12	Model 87 V	Multimeter	Fluke	LR 1599	2019-02	2021-02
14	6812B	AC Power Source	Agilent	LR 1515	COU	
15	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2019-11	2021-11
16	ESCI3	Measuring Receiver	Rohde & Schwarz	N-4259	2019-10	2021-10
19	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	
20	SF102/1000MM	RF Cable	Suhner	SN 50113/2	COU	
21	SF102/2000MM	RF Cable	Suhner	SN 500100/2	COU	

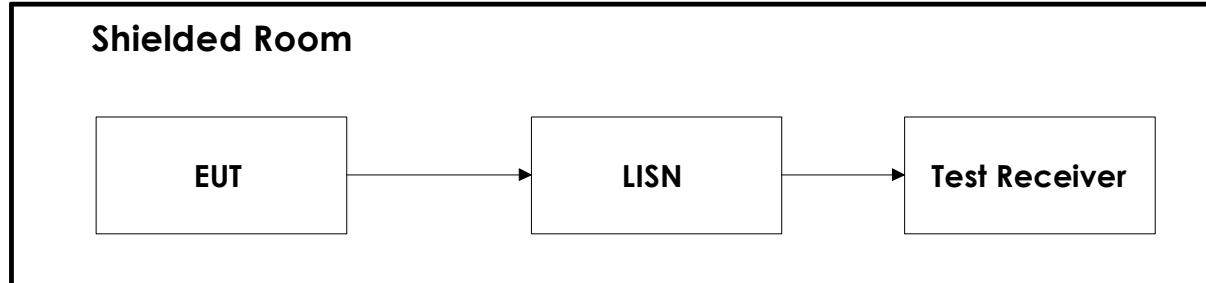
Note: COU – calibrate on use; N/A – Not Applicable

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

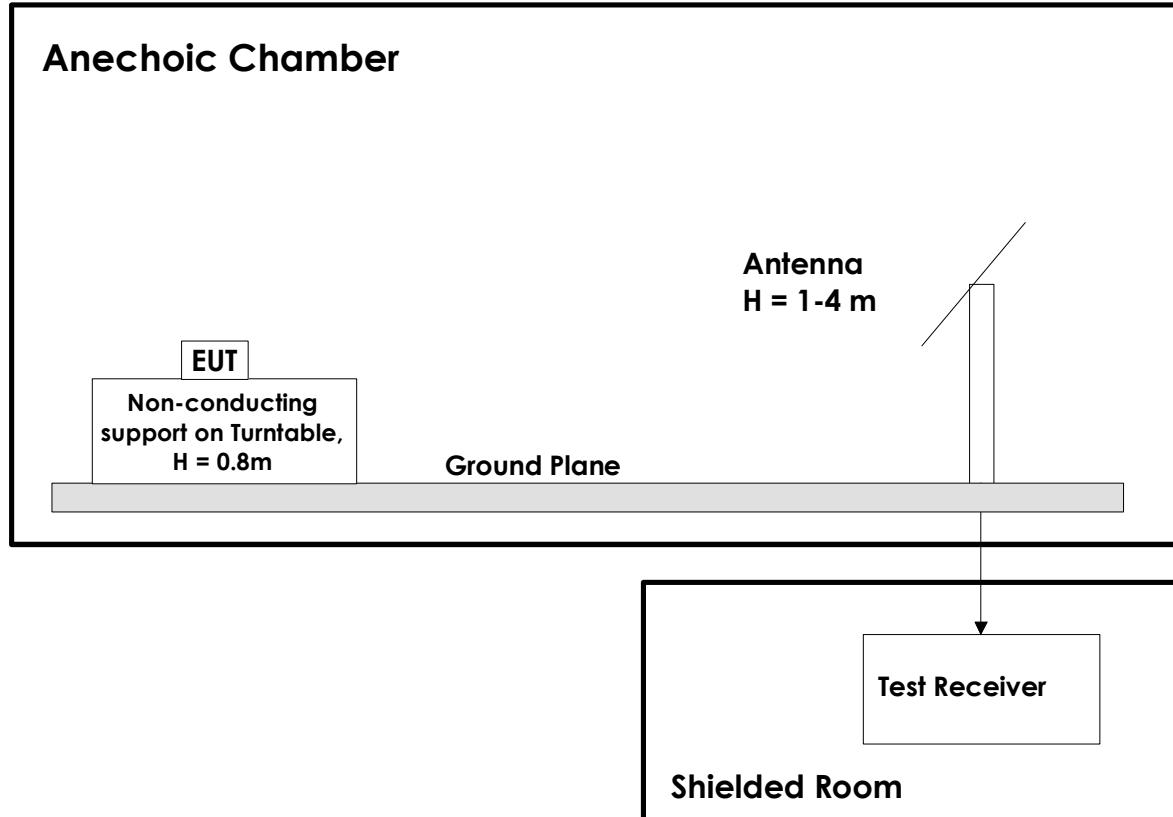
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.40.10	Power Line Conducted test software
2	Nemko AS	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10m, for all other frequencies it is 3m or 1m. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier is used for all measurements above 30 MHz, and High-Pass or Band-Pass filter is used for all harmonics.