

Test Report

Product	Wireless temperature and humidity sensor		
Name and address of the applicant	Disruptive technologies Research AS Strandveien 17 1366 Lysaker, Norway		
Name and address of the manufacturer	Disruptive technologies Research AS Strandveien 17 1366 Lysaker, Norway		
Model	102895		
Rating	3.0 V DC (Primary Battery, BR1632A Lithium Cell)		
Trademark	Disruptive		
Additional information	None		
Tested according to	FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Industry Canada RSS-247, Issue 3 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices		
Order number	PRJ0065558		
Tested in period	2025-01-16 to 2025-01-17		
Issue date	2025-03-11		
Name and address of the testing laboratory	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: center;">  Nemko Scandinavia AS Instituttveien 6 2007 Kjeller, Norway www.nemko.com </div> <div style="text-align: center;"> CAB Number: FCC: NO0001 ISED: NO0470 ISED No: 2040D-1 </div> <div style="text-align: center;">   </div> </div> <p style="text-align: center; color: red; font-weight: bold;">An accredited technical test executed under the Norwegian accreditation scheme</p>		
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  Prepared by [Frode Sveinsen] </div> <div style="text-align: center;">  Approved by [Roy Uggerud] </div> </div>			
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Revision history

Revision	Date	Comment	Sign
A	2025-03-11	First edition	FS

GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to ensure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is solely responsible for any modifications to the product that could result in non-compliance with the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither are opinions expressed regarding model variants covered by the testing of this report.

CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence, that the instruments remain within the calibrated levels.

MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in a separate clause in this report.

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1 INFORMATION

1.1 Test Item

Product	Wireless temperature and humidity sensor
Manufacturer	Disruptive Technologies Research AS
Model	102895
FCC ID	2AFTX-102895
ISED ID	25087-102895
Serial number	HUMIDITY_US1 HUMIDITY_US2
Hardware version	0.5
Software version	1.8.1
Frequency Range	903.250 – 926.750 MHz
Number of Channels	1 Uplink 8 Downlink
Type of Modulation	GFSK
Conducted Output Power	18.2 mW
Antenna Connector	None
Number of Antennas	1
Diversity or Smart Antennas	No
Power Supply	Primary Battery (BR1632A Lithium Cell)

Description of Test Item

The EUT is a wireless temperature and humidity sensor operating in the 902-928 MHz frequency band.

1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	3.0 V DC (Nominal Battery Voltage)

The values are the limit registered during the test period.

1.3 Test Engineer

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	Radiated Emissions were performed with the EUT set to transmit at a fixed carrier with modulation.
Additional information	EUT was transmitting one burst per second during the radiated tests. During the conducted tests, the EUT was transmitting continuously.

1.6 Comments

All radiated measurements were performed with the EUT powered by a new battery.

Conducted tests were performed with the EUT powered from an external regulated power supply.

2 TEST REPORT SUMMARY

2.1 General

The tests were conducted on a sample of the equipment for demonstrating compliance with one or more of the following standards.

Standard	Description
FCC CFR 47 Part 15.247	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
ISED RSS-247, Issue 3	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
ISED RSS-GEN Issue 5	General Requirements for Compliance of Radio Apparatus

The following standards and documents were used for one or more measurements:

Standard	Description
ANSI C63.4-2014	Unintentional Radiators
ANSI C63.10-2013 / 2020	Intentional Radiators
FCC KDB 558074 D01	15.247 Measurement Guidance for DTS and Frequency Hopping Systems

All measurements are traceable to national standards.

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

<input checked="" type="checkbox"/> New Submission	<input checked="" type="checkbox"/> Production Unit
<input type="checkbox"/> Class II Permissive Change	<input type="checkbox"/> Pre-production Unit
DTS Equipment Class	<input type="checkbox"/> Family Listing

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 3, RSS-GEN Issue 5 reference	ANSI C63.10-2013 Reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	5.13	N/A*
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/A*
Occupied Bandwidth (99% BW)	N/A	6.7 (RSS-GEN)	6.9.3	Complies
DTS Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	11.8 Option 2	Complies
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)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	6.7 11.11 (DTS)	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	3.3 (RSS-247) 7.3 (RSS-GEN) 8.9 (RSS-GEN)	6.3, 6.5, 6.6, 6.10 11.12, 11.13 (DTS)	Complies

*Not applicable for battery powered devices

3 TEST RESULTS

3.1 Occupied Bandwidth (99% BW)

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.2

Test Results: Complies

Measurement Data:

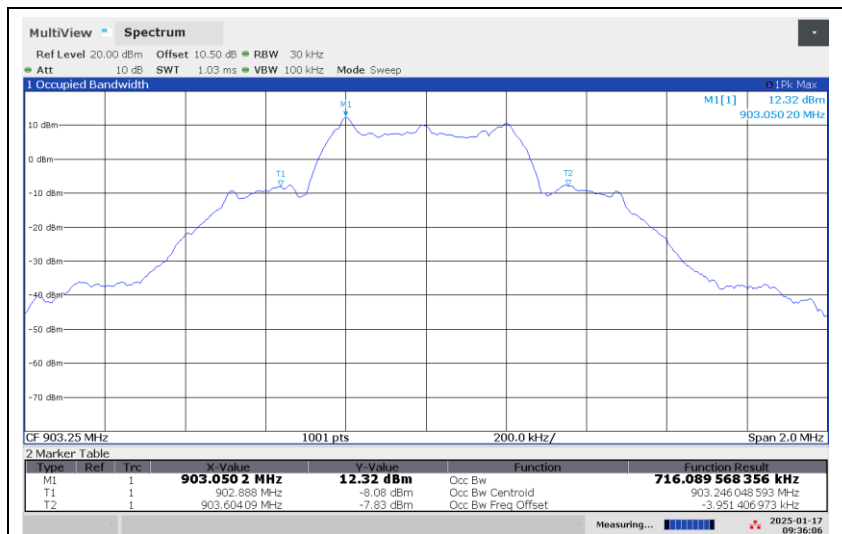
Carrier Frequency, Data Rate	Occupied Bandwidth (99% BW)
903.25 MHz	716 kHz
915.00 MHz	748 kHz
926.75 MHz	738 kHz

Occupied Bandwidth is the same for all channels

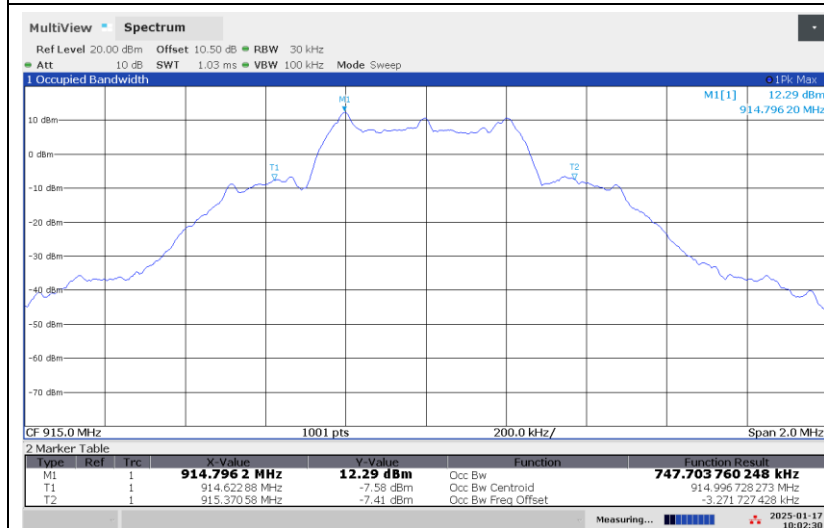
See attached plots

Requirements:

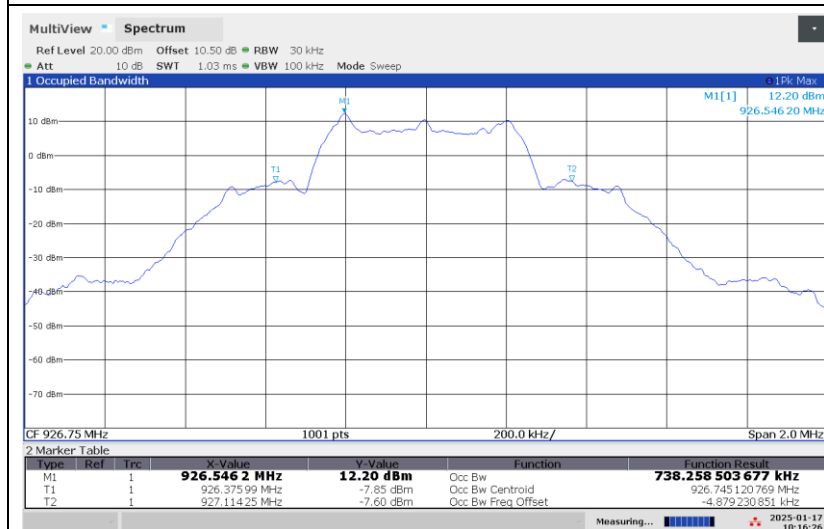
No requirement for 99% BW, reported for information only.



99% Occupied BW, 903.25 MHz



99% Occupied BW, 915.00 MHz



99% Occupied BW, 926.75 MHz

3.2 DTS Bandwidth

FCC Part 15.247 (a)(2)

ISED Canada RSS-247 Issue 3, Clause 5.2 (a)

Measurement procedure: ANSI C63.10-2013 Clause 11.8

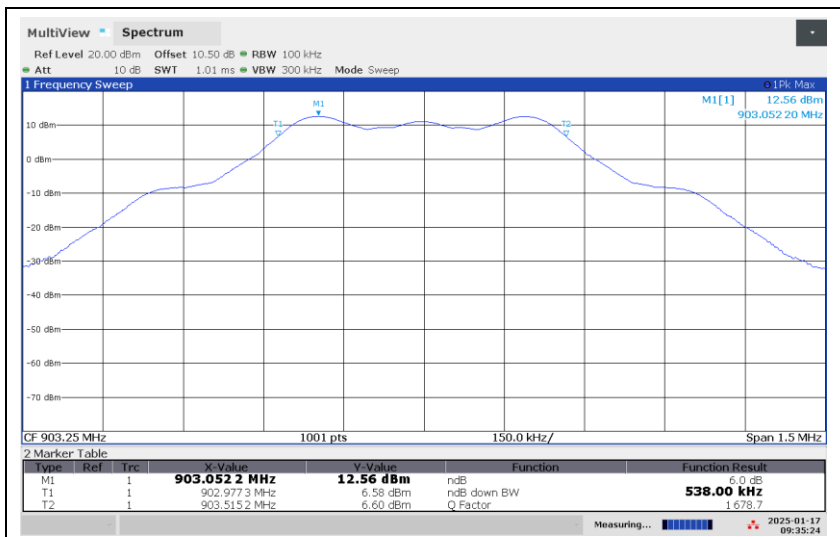
Test Results: Complies

Measurement Data:

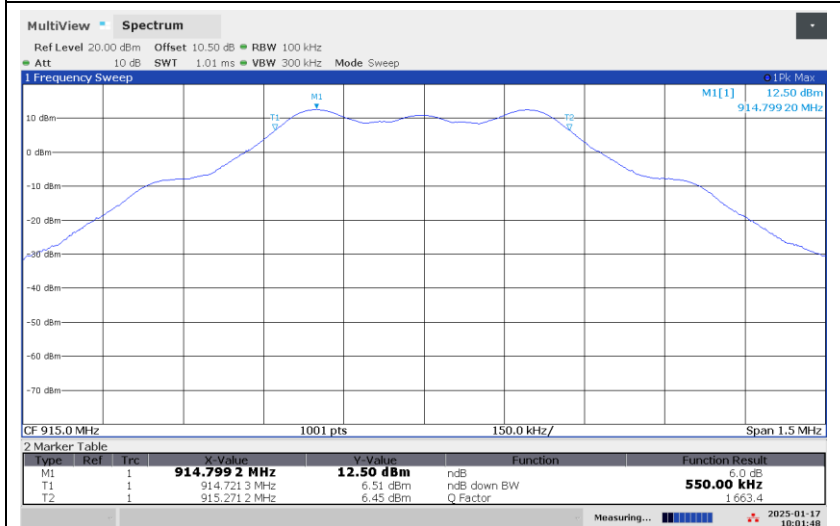
Measured DTS Bandwidth		
903.25 MHz	915.000 MHz	926.75 MHz
538 kHz	550 kHz	546 kHz

Frequency Band	Requirement for systems using Digital Modulation
902-928 MHz	The minimum 6 dB bandwidth shall be at least 500 kHz.
2400-2483.5 MHz	
5725-5850 MHz	

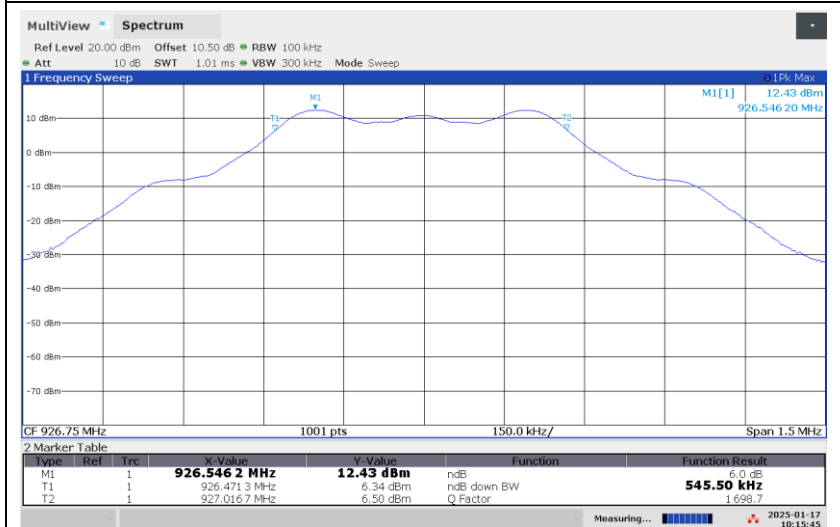
No requirements for Frequency Hopping Systems.



DTS BW, 903.25 MHz



DTS BW, 915.00 MHz



DTS BW, 926.75 MHz

3.3 Peak Power Output

FCC Part 15.247 (b)

ISED Canada RSS-247 Issue 3, Clause 5.4

Measurement procedure: ANSI C63.10-2013 Clause 11.9.1.2

Test Results: Complies

Measurement Data:

Carrier Frequency	Peak Conducted Power (dBm)	Peak EIRP (dBm)	Antenna Gain (dBi)
903.25 MHz	12.6	1.6	-11.1
915.00 MHz	12.5	5.1	-7.4
926.75 MHz	12.5	7.1	-5.4

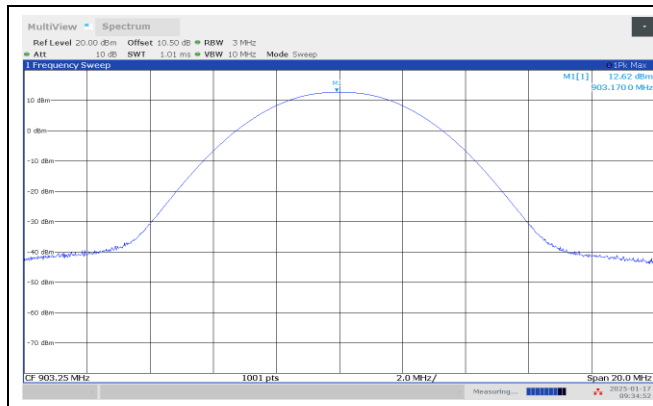
Output Power reported is Maximum Peak Power.

Radiated Power was calculated from measured Field Strength using the method described in ANSI C63.10 Annex G.

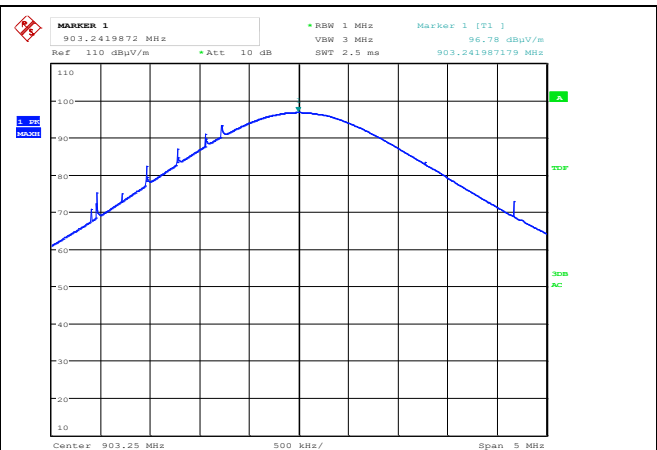
Antenna Gain is less than 6 dBi.

See attached plots.

Frequency Band	Requirements for Frequency Hopping systems
902-928 MHz	For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels
Requirements for Digital Modulation systems	
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the 1 Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the <i>maximum conducted output power</i> is the highest total transmit power occurring in any mode.	
Maximum allowed Antenna Gain	
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.	

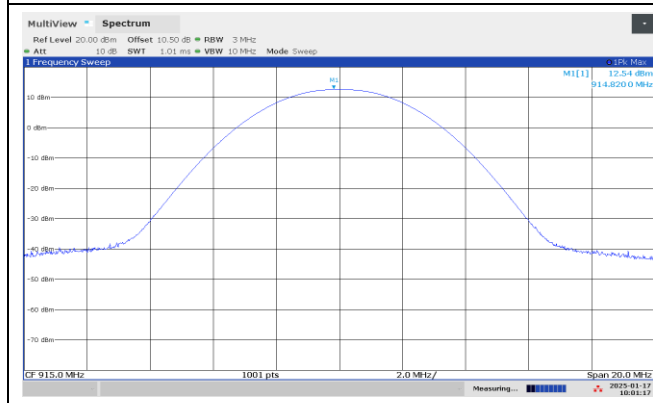


Peak Power, 903.25 MHz

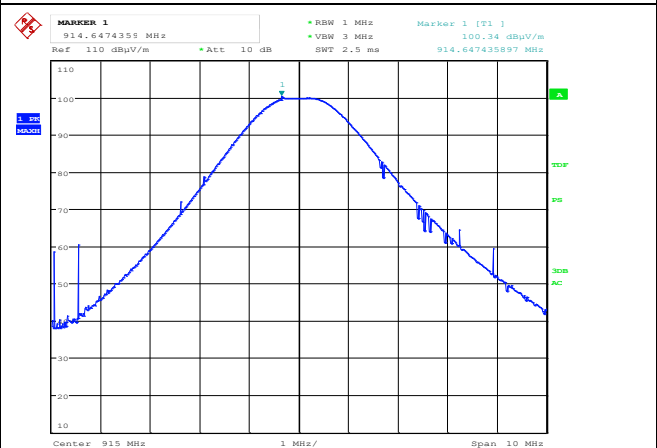


Date: 16.JAN.2025 11:11:06

Peak EIRP, 903.25 MHz

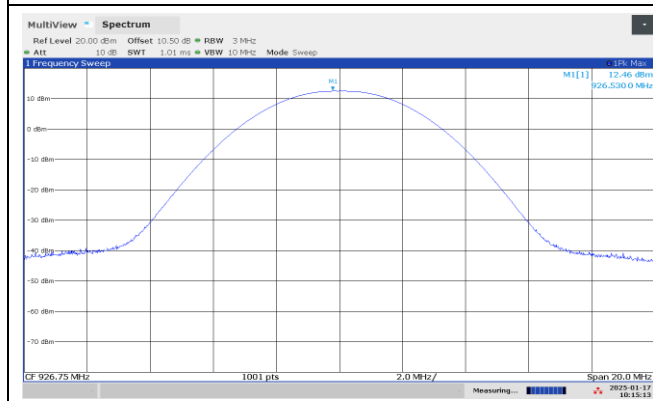


Peak Power, 915.00 MHz

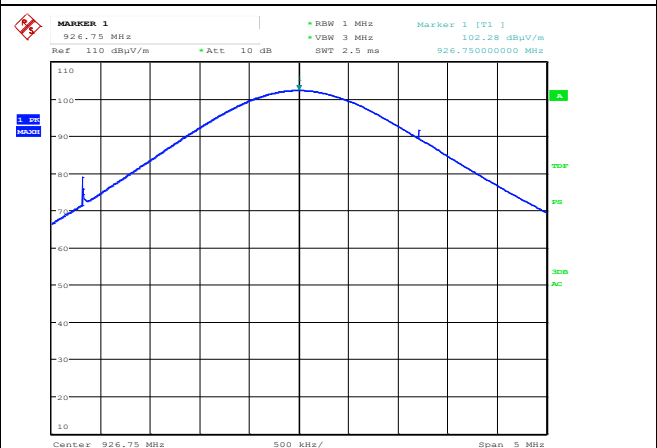


Date: 16.JAN.2025 10:28:58

Peak EIRP, 915.00 MHz



Peak Power, 926.75 MHz



Date: 16.JAN.2025 10:43:47

Peak EIRP, 926.75 MHz

3.4 Conducted Emissions at Antenna Connector

FCC Part 15.247 (d)

ISED Canada RSS-247 Issue 3, Clause 5.5

Measurement procedure: ANSI C63.10-2013 Clause 11.11

Test Results: Complies

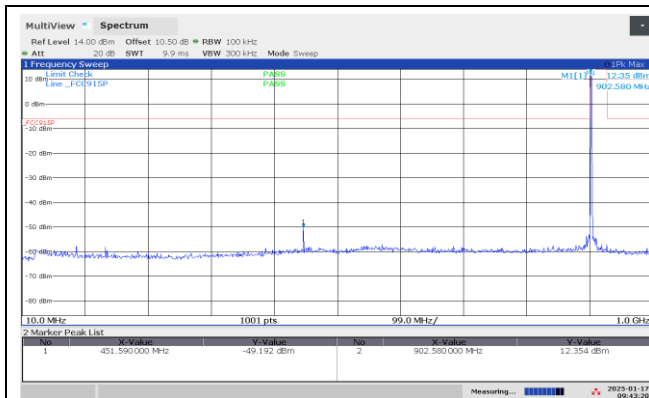
Measurement Data:

Carrier Frequency	Highest Value (dBc)	Margin (dB)	Verdict
903.25 MHz	> 30	> 10	Pass
915.00 MHz	> 30	> 10	Pass
926.75 MHz	> 30	> 10	Pass

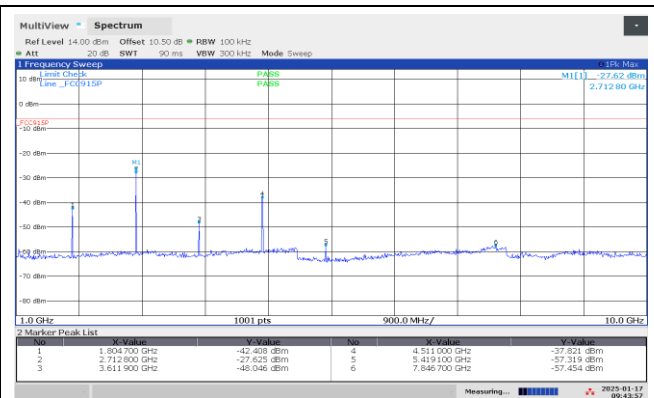
Measured with Peak Detector

RF conducted power to 25 GHz: see attached plots.

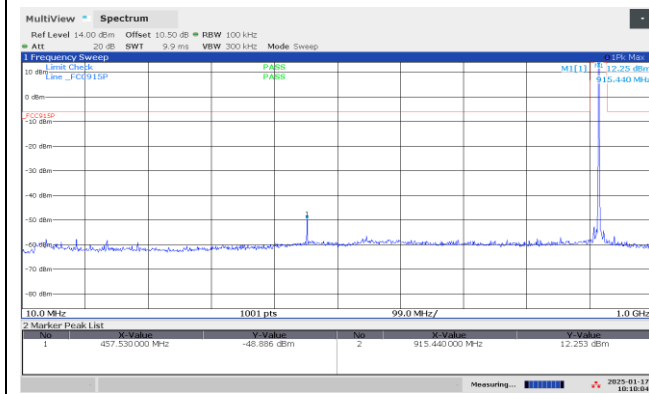
Requirements for all systems	
Peak measurement	RMS averaging (alternative measurement)
20 dB or more below carrier measured in 100 kHz bandwidth	30 dB or more below carrier measured in 100 kHz bandwidth
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.</p> <p>Attenuation below the general limits specified in § 15.209(a) is not required.</p>	



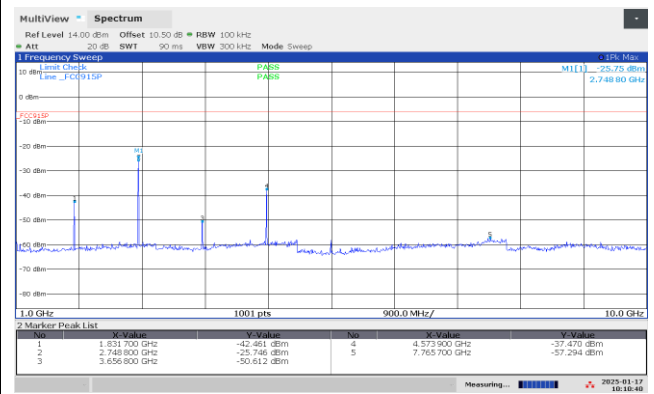
Conducted Emissions 10-1000 MHz, 903.25 MHz



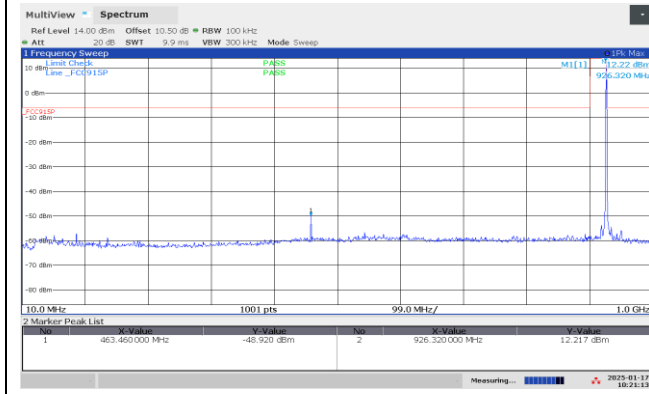
Conducted Emissions 1000-10000 MHz, 903.25 MHz



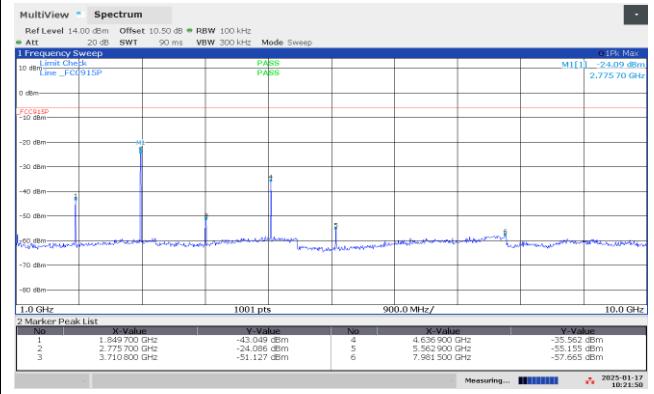
Conducted Emissions 10-1000 MHz, 915.00 MHz



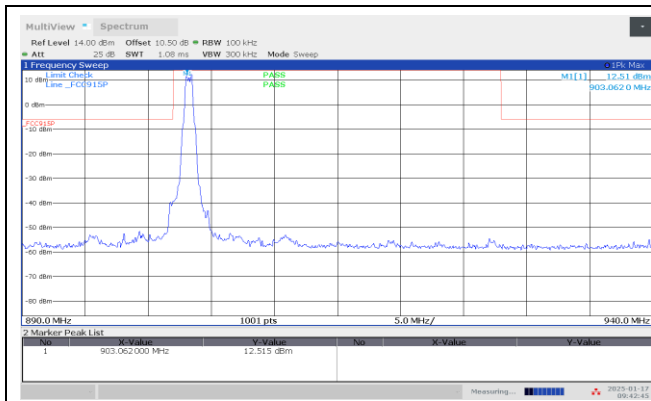
Conducted Emissions 1000-10000 MHz, 915.00 MHz



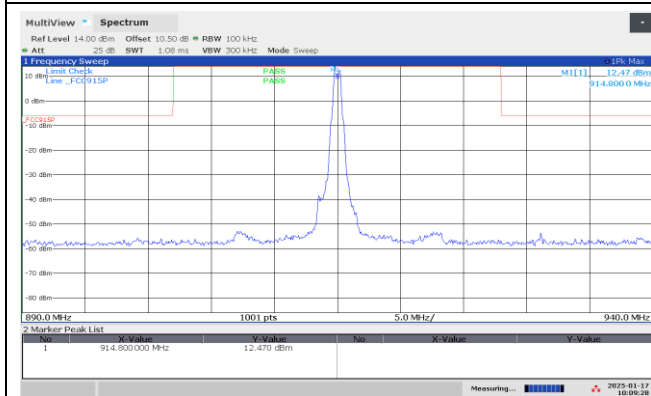
Conducted Emissions 10-1000 MHz, 926.75 MHz



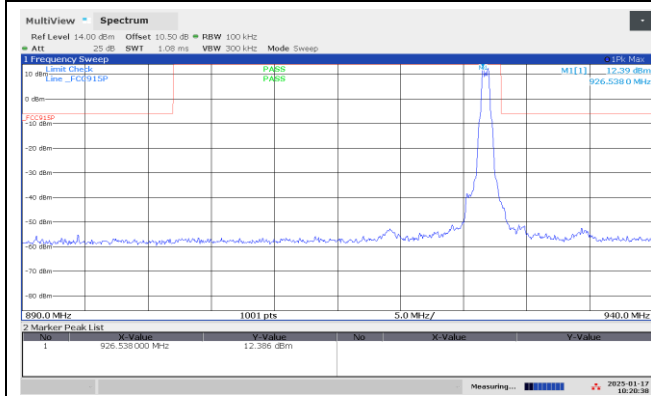
Conducted Emissions 1000-10000 MHz, 926.75 MHz



Conducted Emissions 890-940 MHz, 903.25 MHz



Conducted Emissions 890-940 MHz, 915.00 MHz



Conducted Emissions 890-940 MHz, 926.75 MHz

3.5 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 (MHz)	FCC (GHz)	ISED (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.

3.6 Radiated Emissions, 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: Quasi-Peak

Measuring distance 3 m

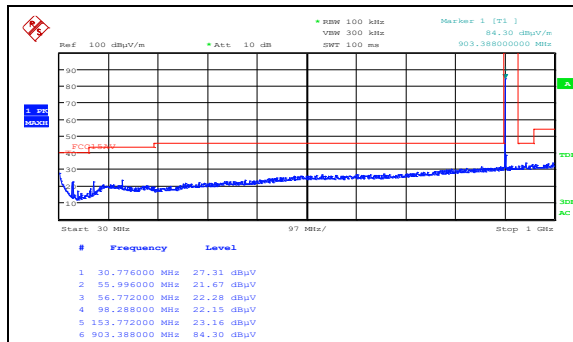
Tested in test mode with EUT transmitting

Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
30 – 88	Any	GFSK	< 30	40.0	> 10
88 – 216	Any	GFSK	< 30	43.5	> 13.5
216 – 960	Any	GFSK	< 36	46.0	> 10
960 – 1000	Any	GFSK	< 34	54.0	> 20

See attached plots

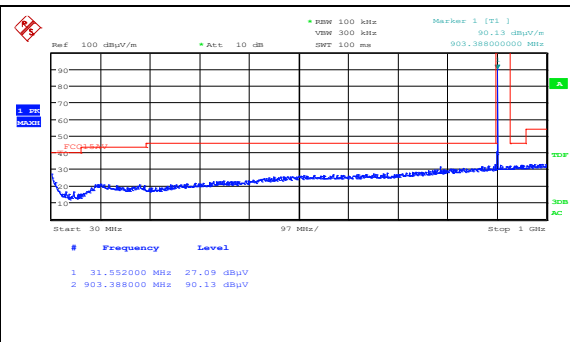
Requirements/Limit

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 μV/m	40.0 dBμV/m
88 – 216 MHz	150 μV/m	43.5 dBμV/m
216 – 960 MHz	200 μV/m	46.0 dBμV/m
960 – 1000 MHz	500 μV/m	54.0 dBμV/m
Limits above are with Quasi Peak Detector		



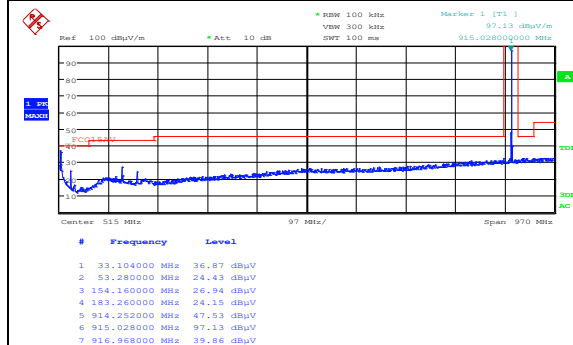
Date: 16.JAN.2025 11:20:54

Radiated Emissions 30 - 1000 MHz, 903.25 MHz, HP



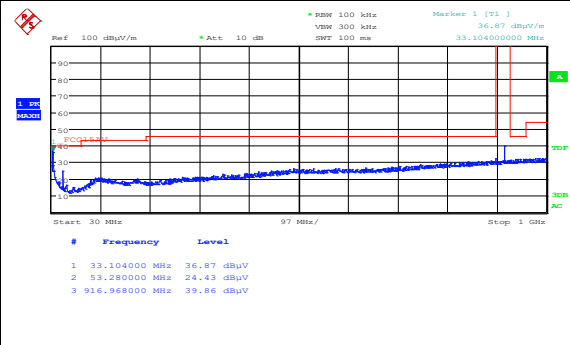
Date: 16.JAN.2025 11:16:55

VP



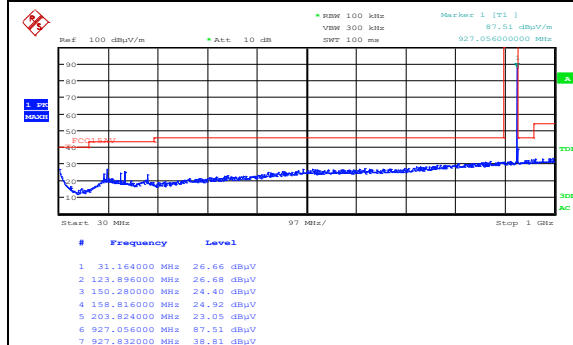
Date: 16.JAN.2025 09:57:08

Radiated Emissions 30 - 1000 MHz, 915.00 MHz, HP



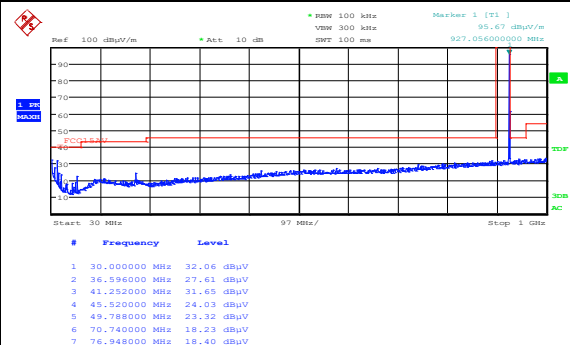
Date: 16.JAN.2025 09:55:13

VP



Date: 16.JAN.2025 10:56:33

Radiated Emissions 30 - 1000 MHz, 926.75 MHz, HP



Date: 16.JAN.2025 10:53:20

VP

3.7 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 – 10 GHz)

RBW=1 MHz

Carrier Frequency (MHz)	Measured Frequency (GHz)	Mode	Measured Emissions (dBµV/m)		Limit (dBµV/m)		Margin (dB)	
			Peak	Average	Pk	Av	Pk	Av
903.25	1 – 10	GFSK	< 56	< 36	74	54	> 18	> 10
915.00	1 – 10	GFSK	< 56	< 36	74	54	> 18	> 10
926.25	1 – 10	GFSK	< 56	< 36	74	54	> 18	> 10
903.25	2710	GFSK	60.0	40.0	74	54	14.0	14.0
915.00	2745	GFSK	61.4	41.4	74	54	12.6	12.6
915.00	4575	GFSK	57.5	37.5	74	54	16.5	16.5
926.25	2780	GFSK	63.2	43.2	74	54	10.8	10.8
926.25	4634	GFSK	57.9	37.5	74	54	16.1	16.1

A Band Reject Filter was used for measurements from 1 GHz to 10 GHz

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

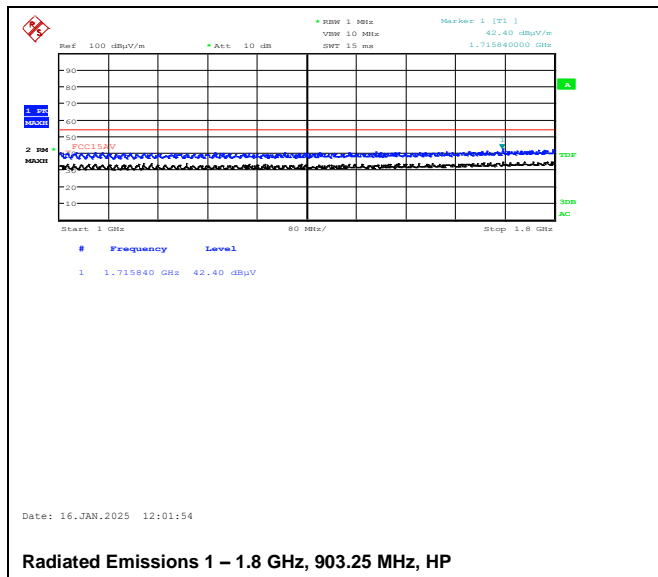
Duty Cycle is less than 2.5% => Duty Cycle Correction Factor = 20 dB

Average Values are calculated from Peak Values using the DC Correction Factor.

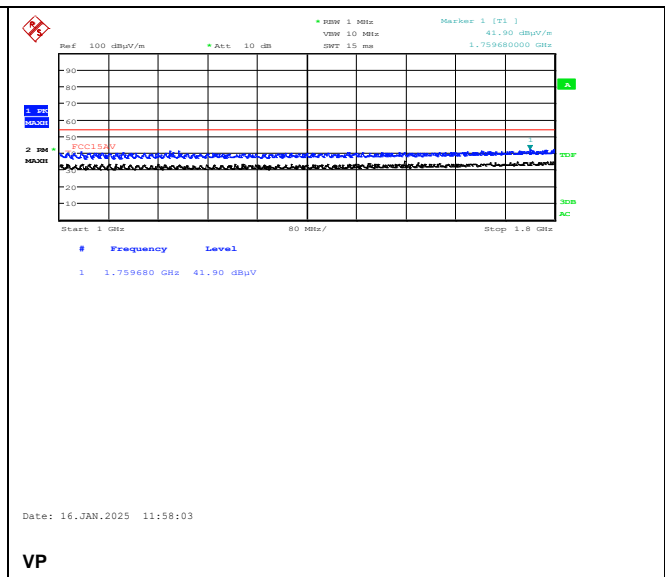
See plots.

Requirements/Limit

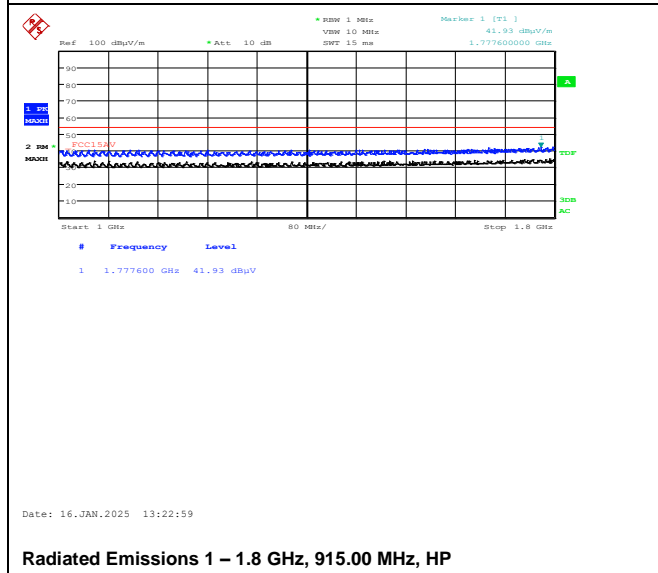
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector	Peak Detector
1 – 26 GHz	54.0 dBµV/m	74.0 dBµV/m



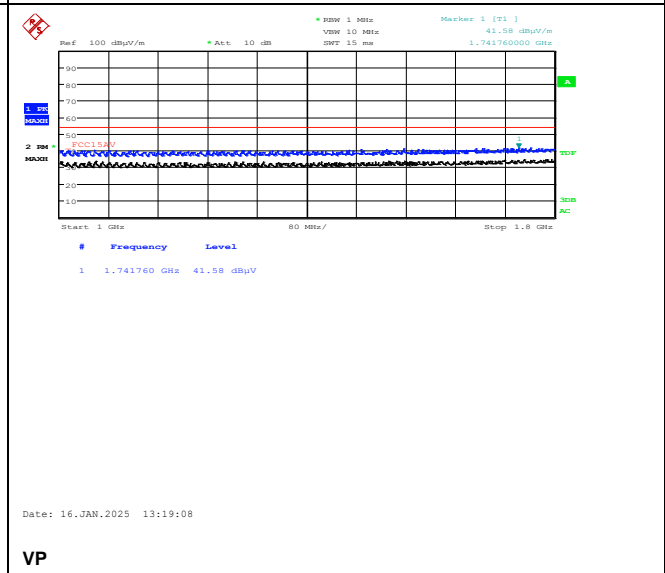
Radiated Emissions 1 – 1.8 GHz, 903.25 MHz, HP



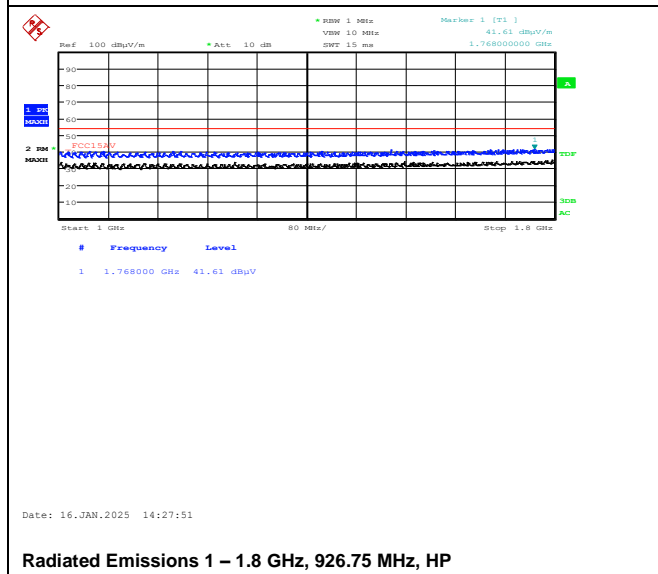
VP



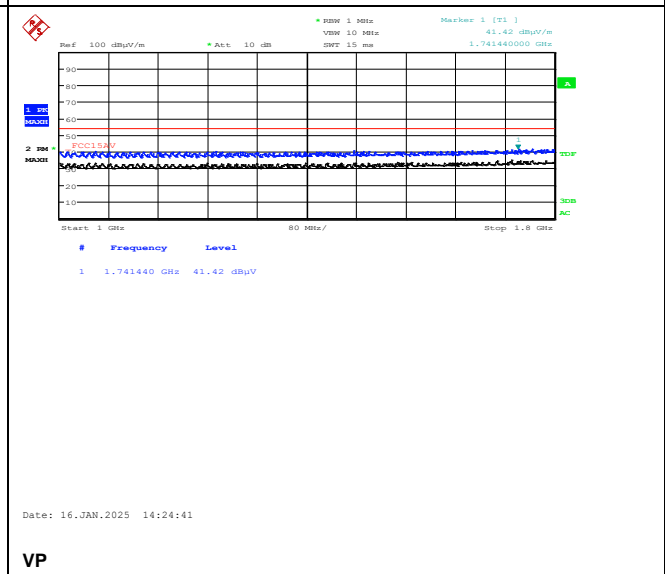
Radiated Emissions 1 – 1.8 GHz, 915.00 MHz, HP



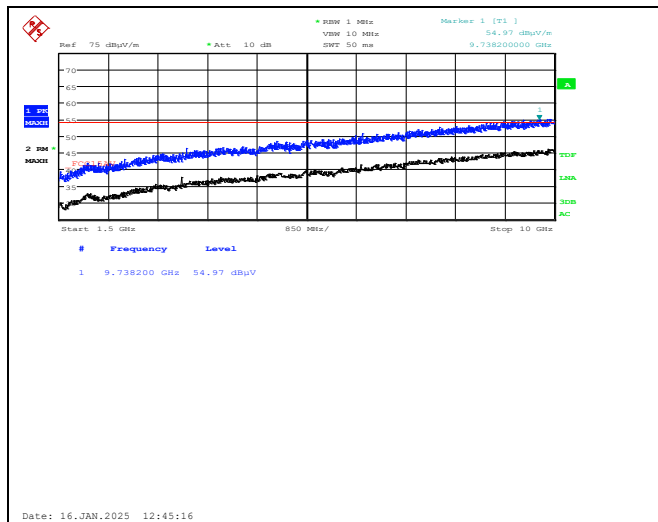
VP



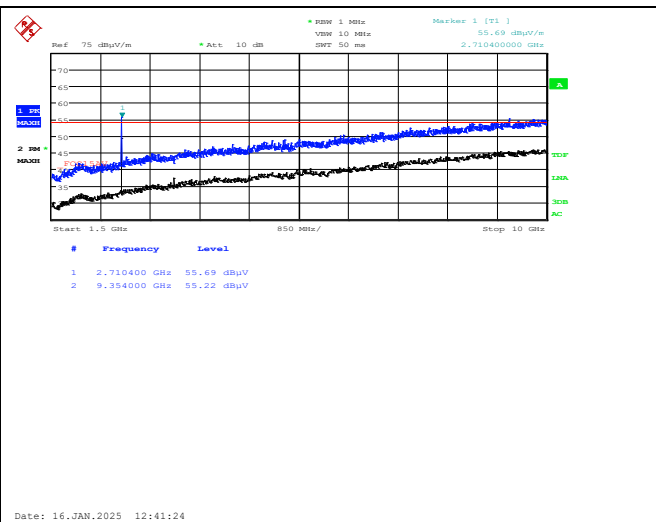
Radiated Emissions 1 – 1.8 GHz, 926.75 MHz, HP



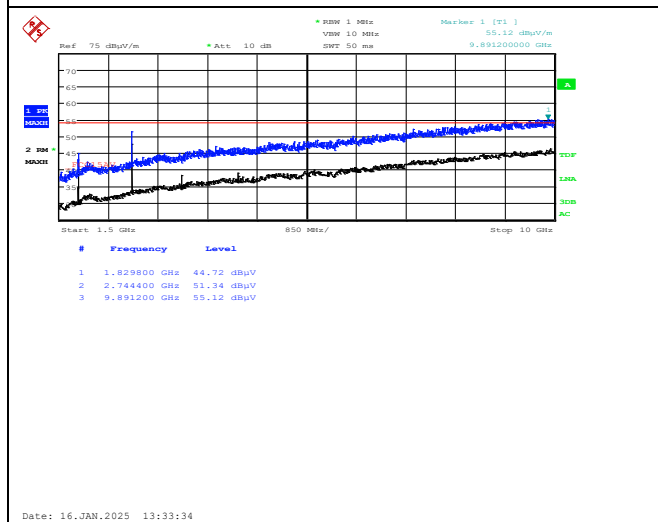
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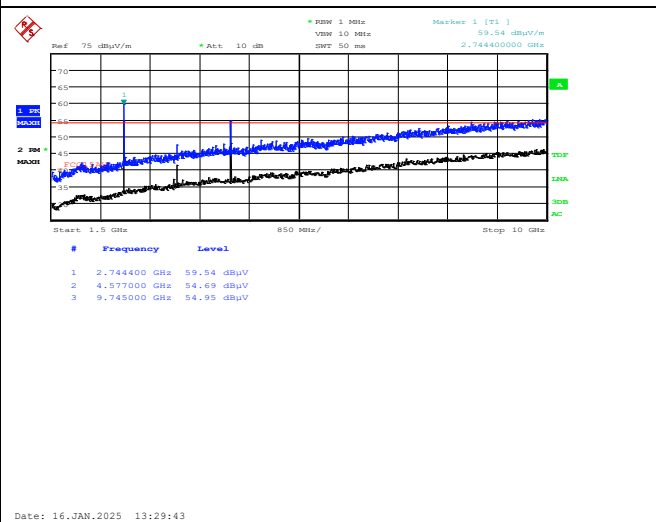
Radiated Emissions 1.5 - 10 GHz, 903.25 MHz, HP



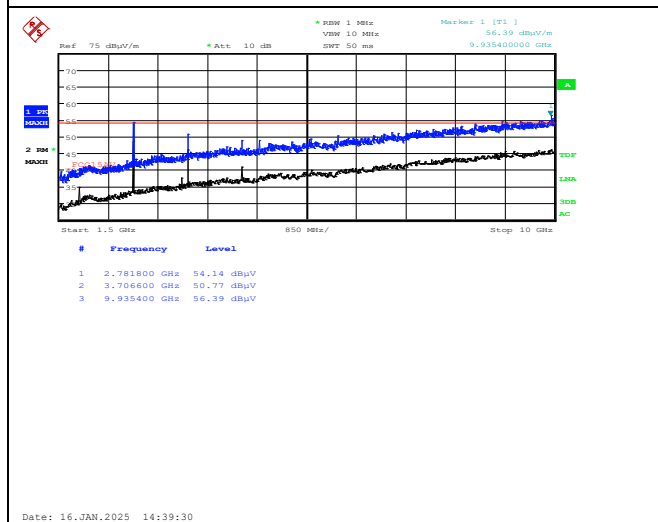
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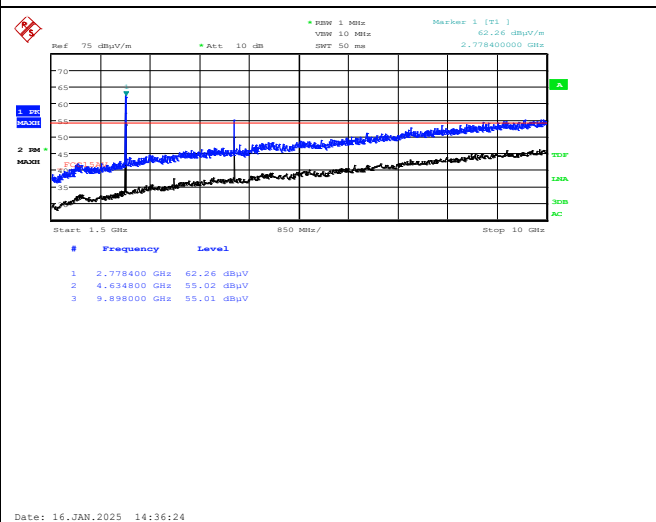
Radiated Emissions 1.5 - 10 GHz, 915.00 MHz, HP



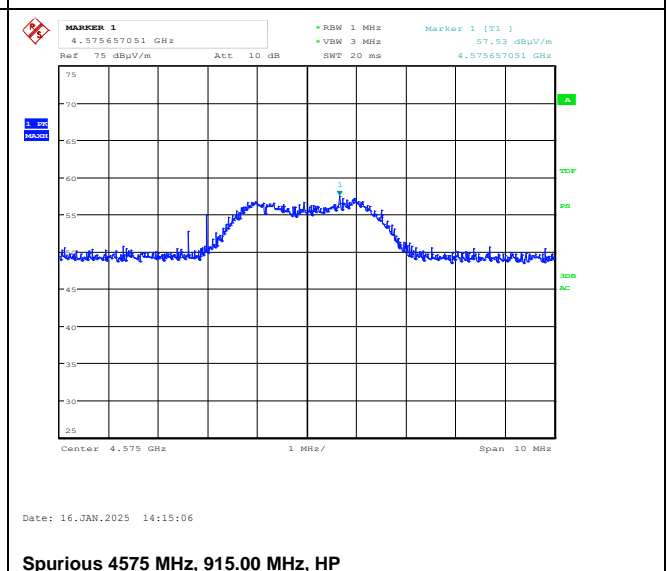
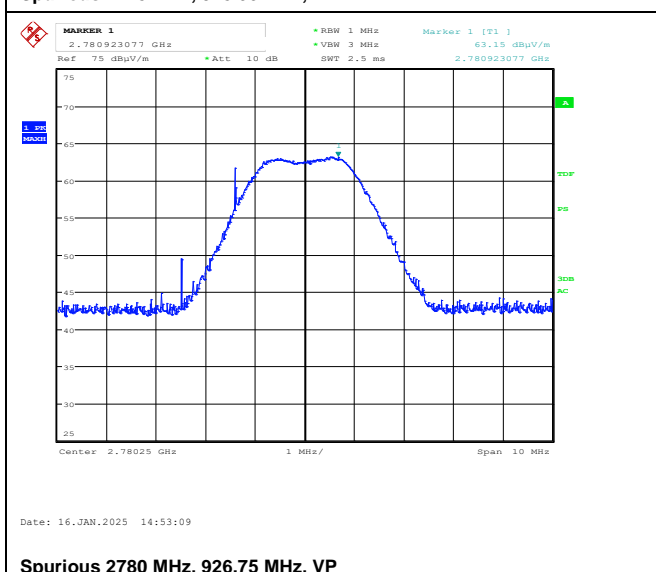
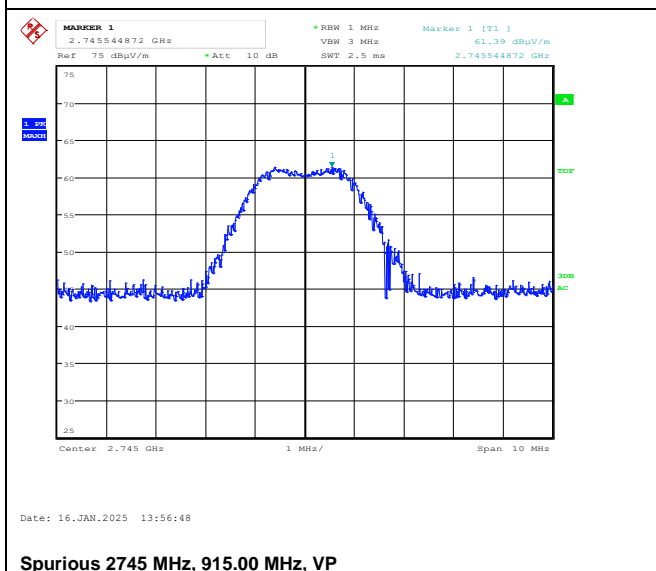
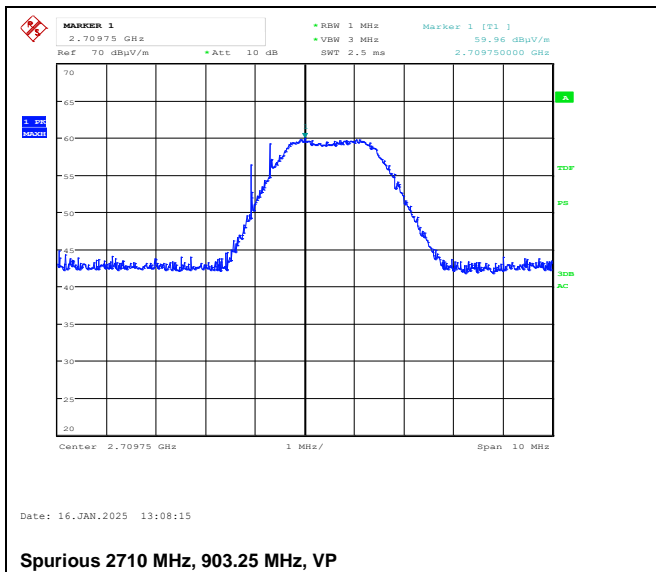
VP

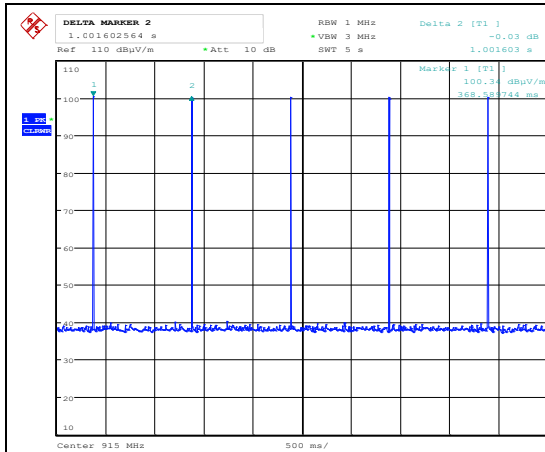


Radiated Emissions 1.5 - 10 GHz, 926.75 MHz, HP



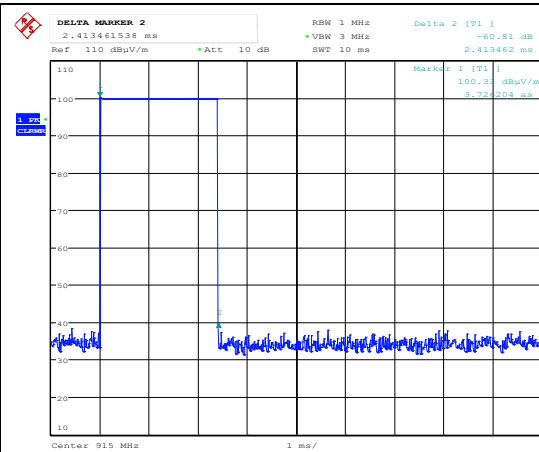
VP





Date: 16.JAN.2025 10:32:34

Duty Cycle, Burst Period (Test Mode, Battery Operated)



Date: 16.JAN.2025 10:30:44

Burst Length

3.8 Power Spectral Density (PSD)

FCC part 15.247(d)

ISED Canada RSS-247 Issue 3, Clause 5.2 (2)

Measurement procedure: ANSI C63.10-2013 Clause 11.10

Test Results: Complies

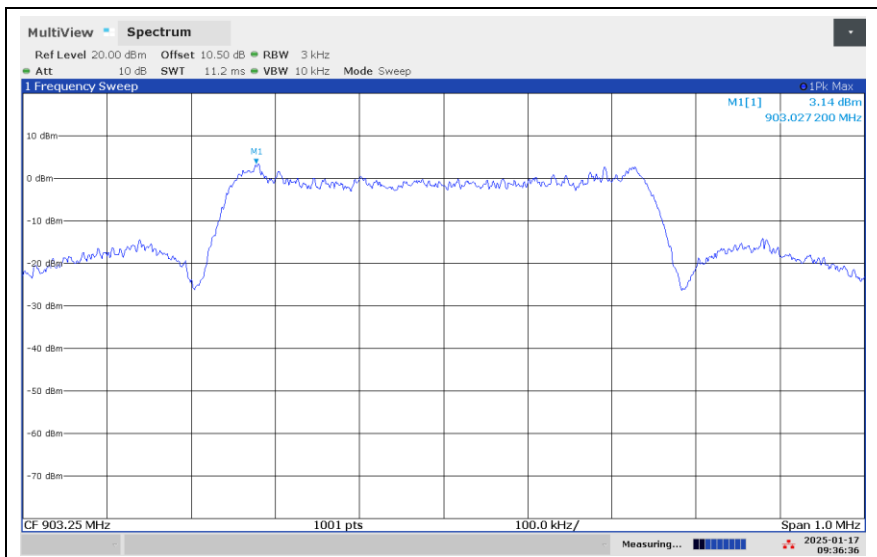
Measurement Data:

The measurement procedure PKPSD described in ANSI C63.10-2013 was used.

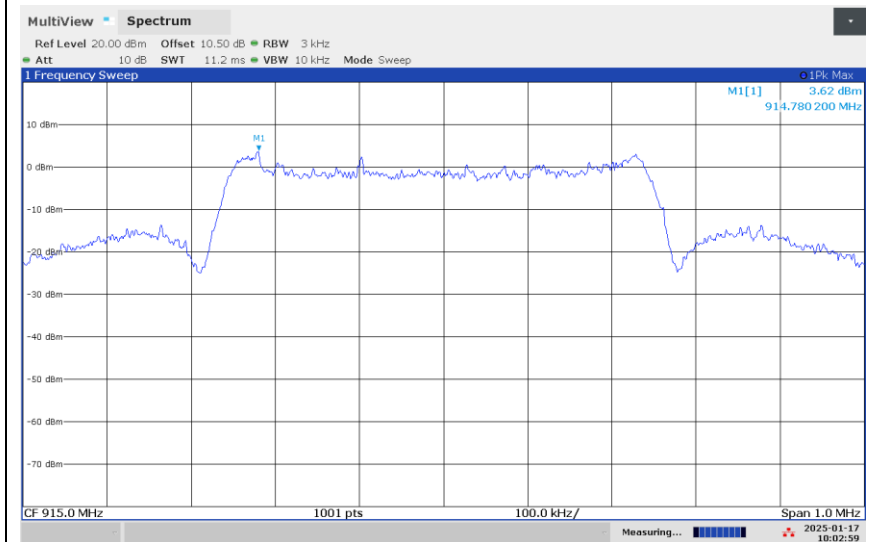
Measured Power Spectral Density (dBm/3kHz)		
903.25 MHz	915.00 MHz	926.75 MHz
3.1	3.6	4.0

Requirement for systems using Digital Modulation

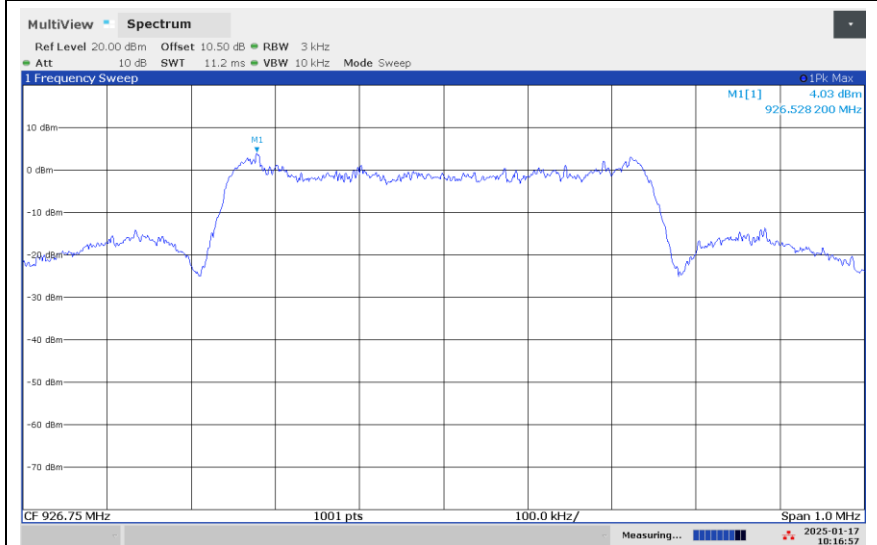
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.



PSD, 903.25 MHz



PSD, 915.00 MHz



PSD, 926.75 MHz

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 testhouse.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2024-01	2025-01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2024-01	2025-01
3	6810.17B	Attenuator	Suhner	LR 1669	COU	
4	NO324415	Band Reject Filter	Microwave Circuits	LR 1760	COU	
5	JB3	BiLog Antenna	Sunol	N-4525	2023-04	2026-04
6	310	Preamplifier	Sonoma Inst.	LR 1686	2024-09	2025-09
7	3115	Horn Antenna	EMCO	LR 1330	2022-11	2027-11
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2024-09	2025-09
9	6HC1500/18000-3-KK	High Pass Filter (1.5 GHz)	Trilithic	LR 1612	COU	
10	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	

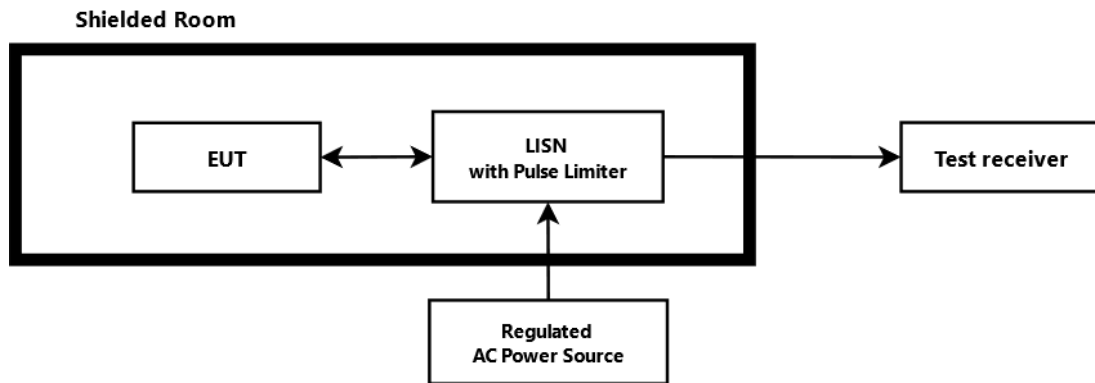
COU = Calibrate on Use

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

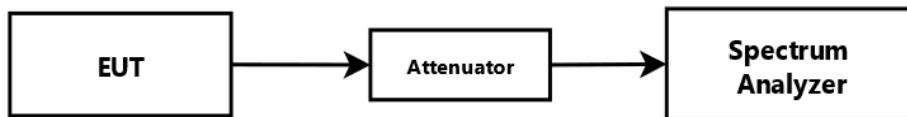
No.	Manufacturer	Name	Version	Comment
1	Nemko Scandinavia	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission

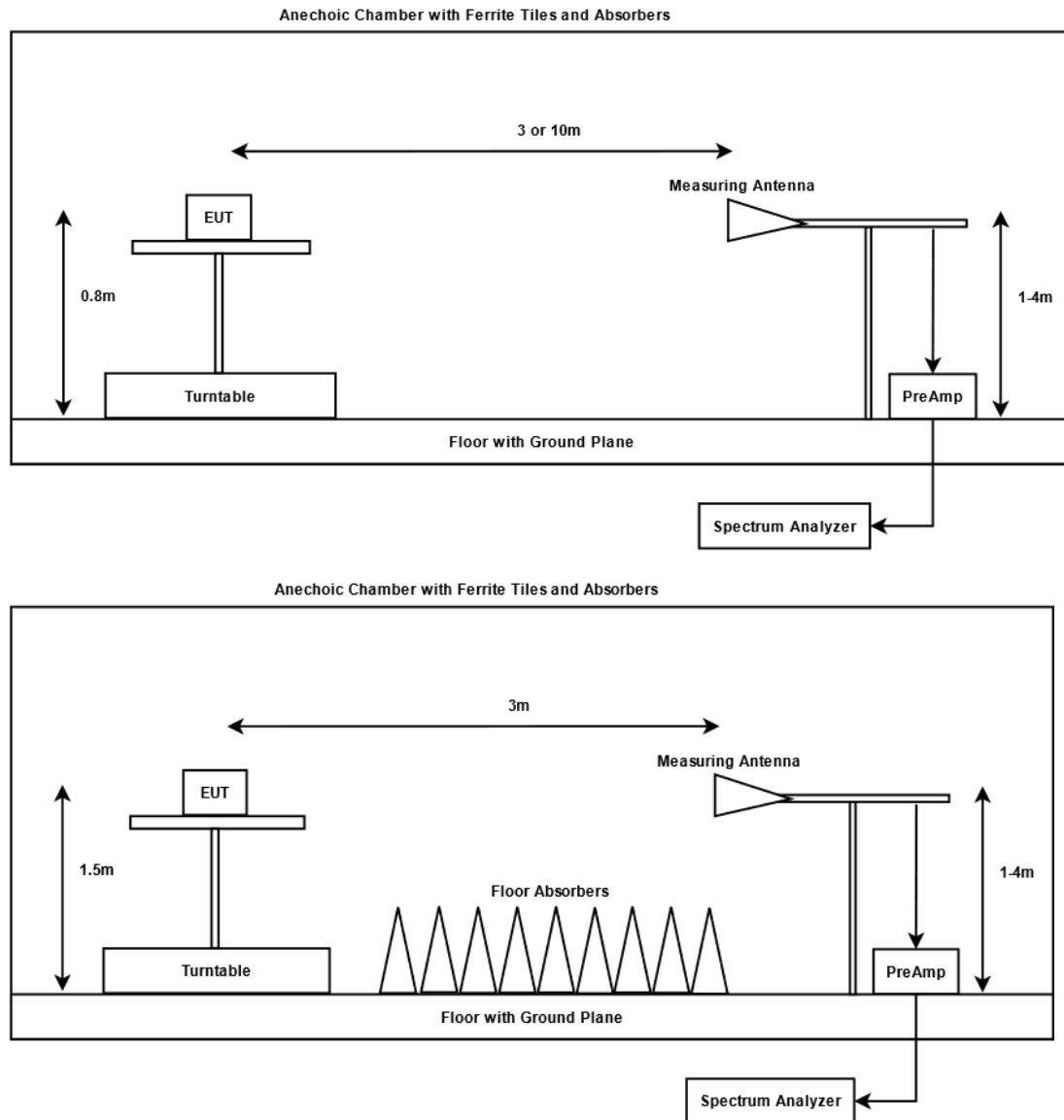


6.2 Conducted Tests



This test set-up is used for all Conducted tests.
For Frequency Stability test the EUT was placed in a climatic chamber.

6.3 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.