



EMI - TEST REPORT

- FCC 15.247 (partly) & RSS 247 Issue 2 (partly) -

Type / Model Name : ARU 2401

Product Description : RFID UHF Reader 902-928 MHz

Applicant : Kathrein Sachsen GmbH

Address : Lindenstrasse 3
09241 Mühlau, Germany

Manufacturer : Kathrein Sachsen GmbH

Address : Lindenstrasse 3
09241 Mühlau, Germany

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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Test Report No. : 80120797-01 Rev_0	24. May 2022 Date of issue
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Deutsche
Akkreditierungsstelle
D-PL-12030-01-03
D-PL-12030-01-04

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results
without the written permission of the test laboratory.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

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ATTACHMENT A and B as separate supplement

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (March, 2022)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart B - Unintentional Radiators (March, 2022)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions,
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (March, 2021)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

ANSI C63.10: 2013 Testing Unlicensed Wireless Devices

ANSI C95.1:2005 IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

CISPR 16-4-2: 2003 Uncertainty in EMC measurement

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RSS-247 Issue 2, February 2017

Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence Exempt Local Area Network (LE-LAN) Devices

RSS-Gen Issue 5, April 2018

General Requirements and Information for the Certification of Radiocommunication Equipment

RSS-102 Issue 5, March 2015

Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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2 SUMMARY

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	Pass
15.247(a)	RSS-247, 5.1(c)	20 dB Bandwidth	Pass
15.247(b)(2)	RSS-247, 5.4(a)	Maximum peak conducted output power	Pass
15.247(d)	RSS-247, 5.5	Spurious RF conducted emissions	Pass
15.247(d)	RSS-247, 5.5	Spurious radiated emissions	Pass
15.247(d)	RSS-Gen, 8.10	Emissions in restricted bands	Pas

The mentioned RSS Rule Parts in the above table are related to:
RSS-Gen, Issue 5 + Amendment 1 + Amendment 2, March 2019
RSS-247, Issue 2, February 2017

2.1 GENERAL REMARKS

Only partial tests according to FCC Part 15.247 and RSS-247 were carried out in this test report.
This test report can only be used in combination with the test report number from CSA Group Bayern GmbH
"80086331-03 Rev_1".

The frequency range was scanned from 9 kHz to 10 GHz.

All emissions not reported in this test report were more than 10 dB below the specified limit.

The EuT is a frequency hopping system using 52 channels in the frequency band from 902 to 928 MHz.

The device transmits to each antenna in turn (not all at the same time). This function is controlled
via software from the manufacturer and can not changed from the user.

The EuT is declared as Class B digital device.

It is not possible to set the EuT only in receiving mode.

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The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 01 March 2022

Testing concluded on : 23 May 2022

Checked by:

Tested by:

Gegenfurtner Klaus
Teamleader Radio

Josef Knab
Radio Team

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see Attachment A

3.2 Power supply system utilised

Power supply voltage: : 120 V / 60 Hz / 1 ϕ

3.3 Short description of the EUT

The device is a UHF RFID reader. The UHF RFID Reader can read active and passive Tags in the frequency range from 902 to 928 MHz.

Number of tested samples: 1
Serial number: G0O3026464

3.4 EUT operation mode

The equipment under test was operated during the measurement under the following conditions:

- TAG reader active (frequency hopping mode from 902.25 to 927.75 MHz)

- Tx mode unmodulated at CH1, CH25, CH52

- Standby mode

EUT configuration:

The following peripheral devices and interface cables were connected during the measurements:

- | | |
|----------------------------|--|
| - <u>Test software</u> | Model : <u>Supplied by manufacturer</u> |
| - <u>Lap Top</u> | Model : <u>Supplied by CSA Group Bayern GmbH</u> |
| - <u>Power supply</u> | Model : <u>Mean Well – GE18I24, S/N OFB9452668</u> |
| - customer specific cables | |

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4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Statement regarding the usage of logos in test reports

The accreditation and notification body logos displayed in this test report are only valid for standards listed in the accreditation or notification scope of CSA Group Bayern GmbH.

4.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

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Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
20 dB Bandwidth	Center frequency of EuT	95%	± 2.5 × 10 ⁻⁷
99% Occupied Bandwidth	Center frequency of EuT	95%	± 2.5 × 10 ⁻⁷
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Radiated power of the fundamental wave	Center frequency of EuT	95%	± 3.71 dB
Peak conducted output power	902 MHz to 928 MHz	95%	± 0.35 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

4.5 Measurement Protocol for FCC, VCCI and AUSTEL

4.5.1 GENERAL INFORMATION

4.5.1.1 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.5.1.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011

ISED: DE0009

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4.6 Determination of worst case measurement conditions

Tests were performed with following antenna type and power supply:

- Power Setting: 30 dBm (Reader output power)
- Antenna Setting: 5.5 dBiC (2.5 dBi)
- Power supply: Mean Well GE18I24
S/N: OFB9452668

READERSTART V3 - ETHERNET FE80::2D0:55FF:FE02:650A KATHREIN Solutions GmbH

Datel Optionen Linux-Modul Info

Experteneinstellungen 1

AKTUELLER PARAMETERSATZ

Parametersatz: Parametersatz 0 Lesen Setzen

SENDELEISTUNG

	Aktiviert	Leistung	ERP	Kabeldämpfung	Antennentyp	Gewinn	Portleistung
Port 1: 1	An		30,25 dBm	0,00 dB	Benutzerantenne	5,50 dBiC	30,00 dBm
Port 2: 1	Aus			0,00 dB	Benutzerantenne	5,50 dBiC	
Port 3: 1	Aus			0,00 dB	Benutzerantenne	5,25 dBiC	
Port 4: 1	Aus			0,00 dB	Benutzerantenne	5,25 dBiC	

PORTMULTIPLEXKONFIGURATION

Port:	Antennenport 1	Antennenport 2	Antennenport 3	Antennenport 4	Aus	Aus	Aus	Aus
Verweildauer:	100 ms	100 ms	100 ms	100 ms	0 ms	0 ms	0 ms	0 ms

HF-EINSTELLUNGEN

Kommunikationsstandard: FCC

Kommunikationsprofil: 4: Tx40kbps/Rx40kbps/Miller4

SELEKTIONSPARAMETER

Initialer Q-Wert: 3

Sel: All

Session: 2

11:08:43: Info: GetSessionAndTarget: Erfolgreich
 11:08:43: Info: GetInitialQ: Erfolgreich
 11:08:43: Info: GetParameterByConfigId(CID_ETSIActiveChannels): Erfolgreich
 11:08:43: Info: GetProfile: Erfolgreich
 11:08:43: Info: GetProfileList: Erfolgreich
 11:08:43: Info: GetCommunicationStandard: Erfolgreich

All radiated measurements were performed with the test sample in vertical orientation. Preliminary measurements showed that this is the worst case.



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4.6.1 Functionality of device

Declared by manufacturer:

Example for a Hopping sequence for Kathrein UHF RFID Devices. The channel spacing is 500 kHz, the center frequency of the first channel is 902.25MHz. The occupancy time is 400ms for each slot, the slot frequency is determined randomly each time before the slot is used.

Slot Number	Channel Number	Frequency (MHz)	Slot Number	Channel Number	frequency (MHz)
1	21	912.25	27	3	903.25
2	44	923.75	28	39	921.25
3	25	914.25	29	24	913.75
4	36	919.75	30	16	909.75
5	27	915.25	31	51	927.25
6	29	916.25	32	26	914.75
7	35	919.25	33	4	903.75
8	49	926.25	34	47	925.25
9	6	904.75	35	18	910.75
10	46	924.75	36	40	921.75
11	19	911.25	37	11	907.25
12	20	911.75	38	48	925.75
13	45	924.25	39	7	905.25
14	22	912.75	40	12	907.75
15	30	916.75	41	23	913.25
16	8	905.75	42	13	908.25
17	42	922.75	43	31	917.25
18	52	927.75	44	2	902.75
19	14	908.75	45	1	902.25
20	37	920.25	46	43	923.25
21	41	922.25	47	50	926.75
22	17	910.25	48	33	918.25
23	5	904.25	49	34	918.75
24	10	906.75	50	32	917.75
25	15	909.25	51	28	915.75
26	38	920.75	52	9	906.25

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5 TEST CONDITIONS AND RESULTS

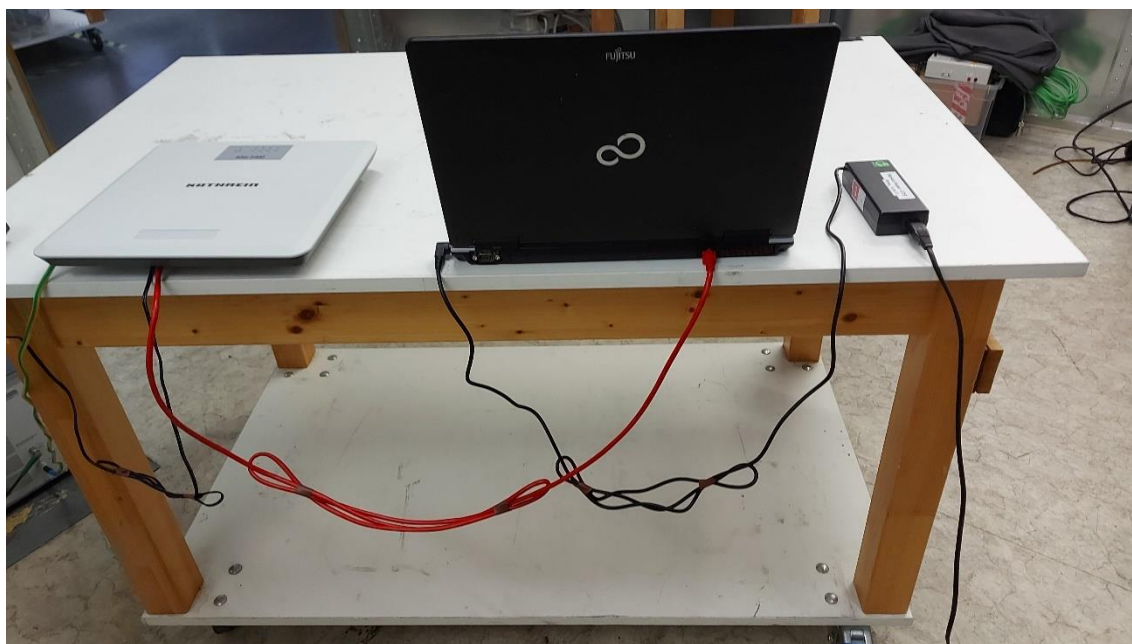
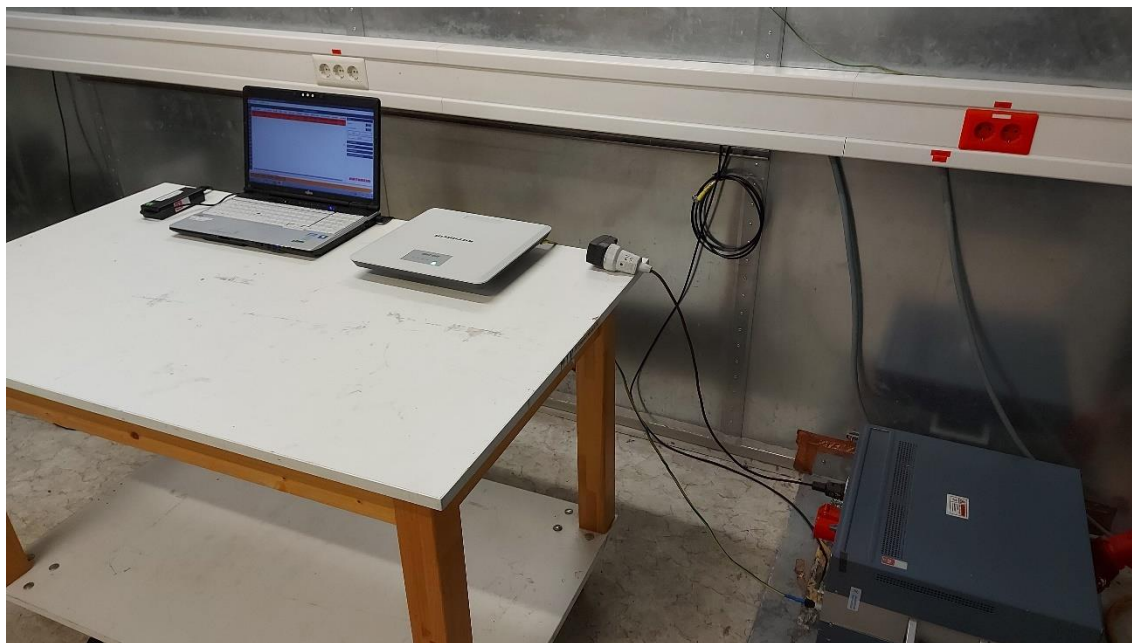
5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



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5.1.3 Applicable standard

According to FCC Part 15C, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

5.1.4 Description of Measurement

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded.

To convert between dBμV and μV, the following conversions apply:

$$\text{dB}\mu\text{V} = 20 \log \mu\text{V}$$

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz
Min. limit margin 10.56 dB at 0.507 MHz (Tag reading mode)

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols.

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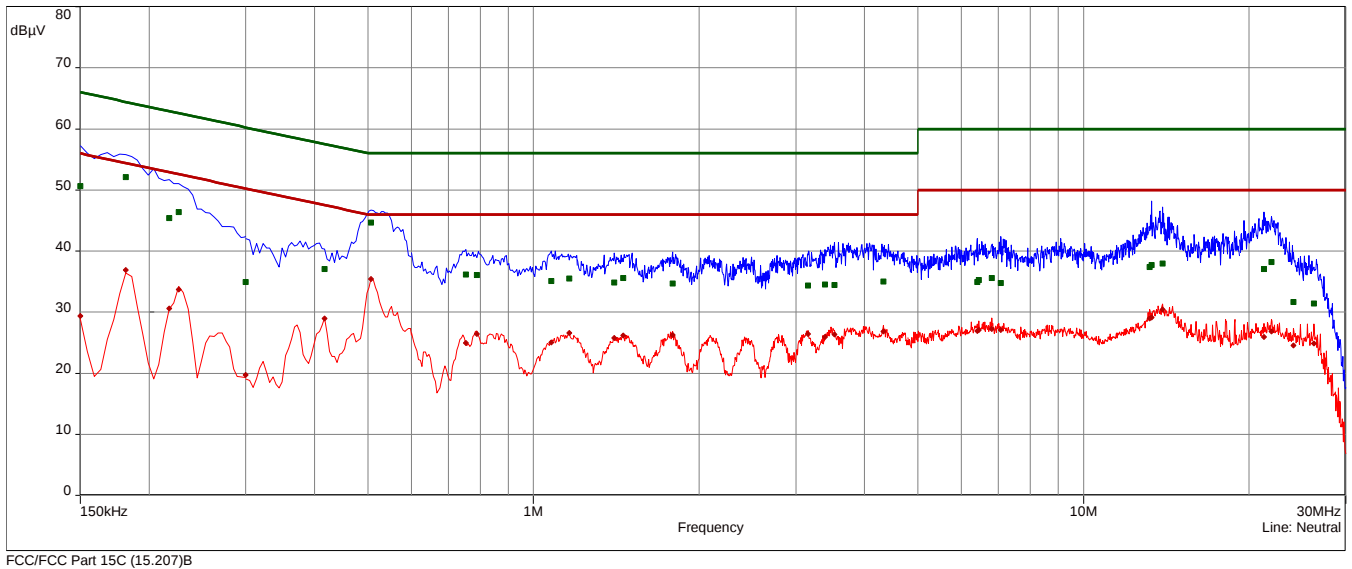
IC: 5530C-RRU1400

5.1.6 Test protocol

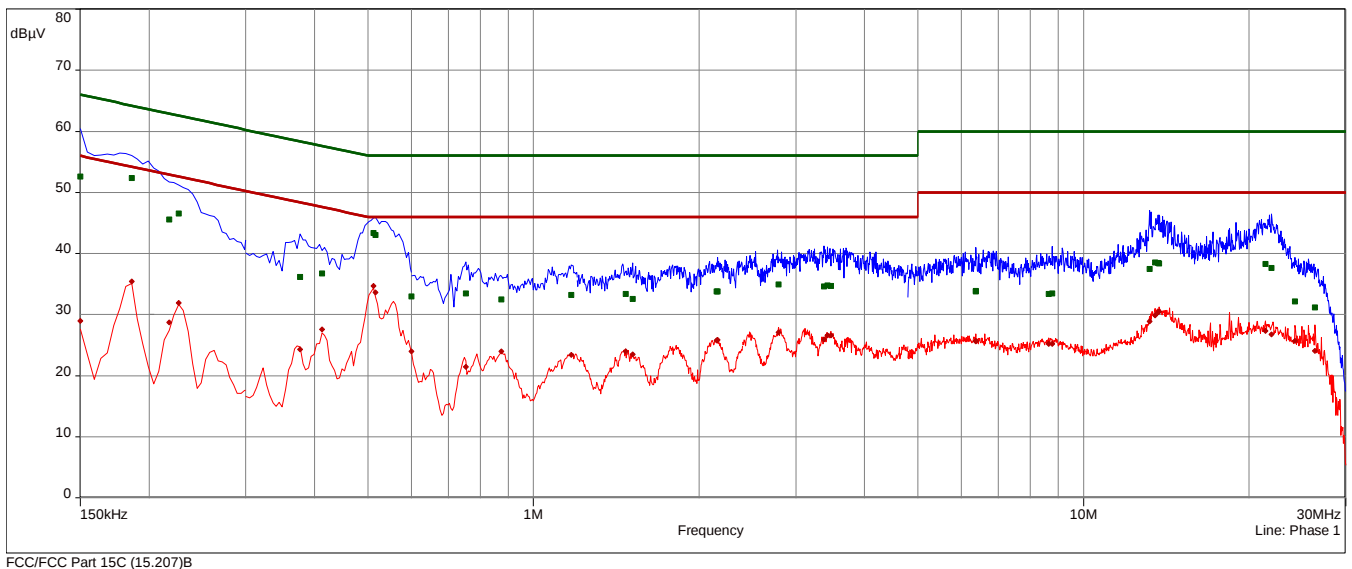
Test point: L1 - N
 Operation mode: TAG reader active (frequency hopping mode from 902.25 to 927.75 MHz)
 Remarks: -
 Date: 04 March 2022
 Tested by: Josef Knab

Result: passed

FCC/FCC Part 15C (15.207) B - Avg/
 FCC/FCC Part 15C (15.207) B - Q-Peak/
 Peak (Neutral)
 CISPR.AVG (Neutral)
 QuasiPeak (Finals) (Neutral)
 CISPR AV (Finals) (Neutral)



FCC/FCC Part 15C (15.207) B - Avg/
 FCC/FCC Part 15C (15.207) B - Q-Peak/
 Peak (Phase 1)
 CISPR.AVG (Phase 1)
 QuasiPeak (Finals) (Phase 1)
 CISPR AV (Finals) (Phase 1)



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freq	SR	QP	margin	limit	AV	margin	limit	line	RBW	Measure time	corr
MHz		dBμV	dB	dBμV	dBμV	dB	dBμV		Hz	sec	dB
0.15	1	52.59	-13.41	66.00	28.93	-27.07	56.00	Phase 1	9k	1.00	10.09
0.186	1	52.32	-11.89	64.21	35.43	-18.78	54.21	Phase 1	9k	1.00	10.10
0.2175	1	45.58	-17.33	62.91	28.74	-24.17	52.91	Phase 1	9k	1.00	10.11
0.2265	1	46.58	-16.00	62.58	31.91	-20.67	52.58	Phase 1	9k	1.00	10.11
0.3765	2	36.15	-22.21	58.36	24.33	-24.02	48.36	Phase 1	9k	1.00	10.15
0.4125	2	36.70	-20.90	57.60	27.61	-19.99	47.60	Phase 1	9k	1.00	10.16
0.5115	2	43.38	-12.62	56.00	34.70	-11.30	46.00	Phase 1	9k	1.00	10.16
0.516	2	43.01	-12.99	56.00	33.65	-12.35	46.00	Phase 1	9k	1.00	10.16
0.6	3	32.94	-23.06	56.00	23.97	-22.03	46.00	Phase 1	9k	1.00	10.17
0.753	3	33.45	-22.55	56.00	21.47	-24.53	46.00	Phase 1	9k	1.00	10.19
0.8745	3	32.48	-23.52	56.00	23.96	-22.04	46.00	Phase 1	9k	1.00	10.19
1.1715	3	33.23	-22.77	56.00	23.44	-22.56	46.00	Phase 1	9k	1.00	10.23
1.47	4	33.40	-22.60	56.00	23.95	-22.05	46.00	Phase 1	9k	1.00	10.26
1.515	4	32.55	-23.45	56.00	23.47	-22.53	46.00	Phase 1	9k	1.00	10.27
2.154	4	33.76	-22.24	56.00	25.80	-20.20	46.00	Phase 1	9k	1.00	10.29
2.163	4	33.77	-22.23	56.00	25.83	-20.17	46.00	Phase 1	9k	1.00	10.29
2.787	5	34.96	-21.04	56.00	27.12	-18.88	46.00	Phase 1	9k	1.00	10.34
3.426	5	34.81	-21.19	56.00	26.56	-19.44	46.00	Phase 1	9k	1.00	10.35
3.4755	5	34.72	-21.28	56.00	26.58	-19.42	46.00	Phase 1	9k	1.00	10.35
6.3705	6	33.75	-26.25	60.00	25.65	-24.35	50.00	Phase 1	9k	1.00	10.55
6.375	6	33.83	-26.17	60.00	25.61	-24.39	50.00	Phase 1	9k	1.00	10.55
8.652	6	33.40	-26.60	60.00	25.23	-24.77	50.00	Phase 1	9k	1.00	10.68
8.778	6	33.45	-26.55	60.00	25.17	-24.83	50.00	Phase 1	9k	1.00	10.69
13.4925	7	38.51	-21.49	60.00	29.86	-20.14	50.00	Phase 1	9k	1.00	11.06
13.6635	7	38.49	-21.51	60.00	30.39	-19.61	50.00	Phase 1	9k	1.00	11.08
13.7265	7	38.36	-21.64	60.00	30.50	-19.50	50.00	Phase 1	9k	1.00	11.08
21.4095	8	38.28	-21.72	60.00	27.34	-22.66	50.00	Phase 1	9k	1.00	11.53
24.249	8	32.19	-27.81	60.00	25.68	-24.32	50.00	Phase 1	9k	1.00	11.65
26.364	8	31.17	-28.83	60.00	24.08	-25.92	50.00	Phase 1	9k	1.00	11.69
0.15	9	50.68	-15.32	66.00	29.40	-26.60	56.00	Neutral	9k	1.00	10.09
0.1815	9	52.08	-12.33	64.42	36.89	-17.53	54.42	Neutral	9k	1.00	10.11
0.2175	9	45.38	-17.54	62.91	30.63	-22.29	52.91	Neutral	9k	1.00	10.13
0.2265	9	46.40	-16.17	62.58	33.68	-18.90	52.58	Neutral	9k	1.00	10.13
0.3	10	34.93	-25.31	60.24	19.74	-30.50	50.24	Neutral	9k	1.00	10.14
0.417	10	37.09	-20.42	57.51	28.96	-18.55	47.51	Neutral	9k	1.00	10.16
0.507	10	44.65	-11.35	56.00	35.44	-10.56	46.00	Neutral	9k	1.00	10.16
0.753	11	36.19	-19.81	56.00	24.98	-21.02	46.00	Neutral	9k	1.00	10.19
0.789	11	36.07	-19.93	56.00	26.45	-19.55	46.00	Neutral	9k	1.00	10.19
1.077	11	35.14	-20.86	56.00	25.00	-21.00	46.00	Neutral	9k	1.00	10.21
1.1625	11	35.52	-20.48	56.00	26.61	-19.39	46.00	Neutral	9k	1.00	10.23
1.4025	12	34.81	-21.19	56.00	25.81	-20.19	46.00	Neutral	9k	1.00	10.26
1.4565	12	35.57	-20.43	56.00	26.15	-19.85	46.00	Neutral	9k	1.00	10.26
1.7895	12	34.66	-21.34	56.00	26.26	-19.74	46.00	Neutral	9k	1.00	10.27
3.156	13	34.36	-21.64	56.00	26.41	-19.59	46.00	Neutral	9k	1.00	10.35
3.5295	13	34.45	-21.55	56.00	26.32	-19.68	46.00	Neutral	9k	1.00	10.35
4.3305	13	34.98	-21.02	56.00	26.84	-19.16	46.00	Neutral	9k	1.00	10.41
6.411	14	34.90	-25.10	60.00	26.94	-23.06	50.00	Neutral	9k	1.00	10.53
6.456	14	35.23	-24.77	60.00	27.10	-22.90	50.00	Neutral	9k	1.00	10.54
6.816	14	35.62	-24.38	60.00	27.23	-22.77	50.00	Neutral	9k	1.00	10.56
7.068	14	34.80	-25.20	60.00	27.07	-22.93	50.00	Neutral	9k	1.00	10.57
13.308	15	37.68	-22.32	60.00	29.16	-20.84	50.00	Neutral	9k	1.00	10.90
13.9155	15	37.97	-22.03	60.00	30.43	-19.57	50.00	Neutral	9k	1.00	10.94
21.288	16	37.05	-22.95	60.00	25.94	-24.06	50.00	Neutral	9k	1.00	11.26
24.105	16	31.65	-28.35	60.00	24.54	-25.46	50.00	Neutral	9k	1.00	11.26
26.238	16	31.42	-28.58	60.00	24.84	-25.16	50.00	Neutral	9k	1.00	11.22

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

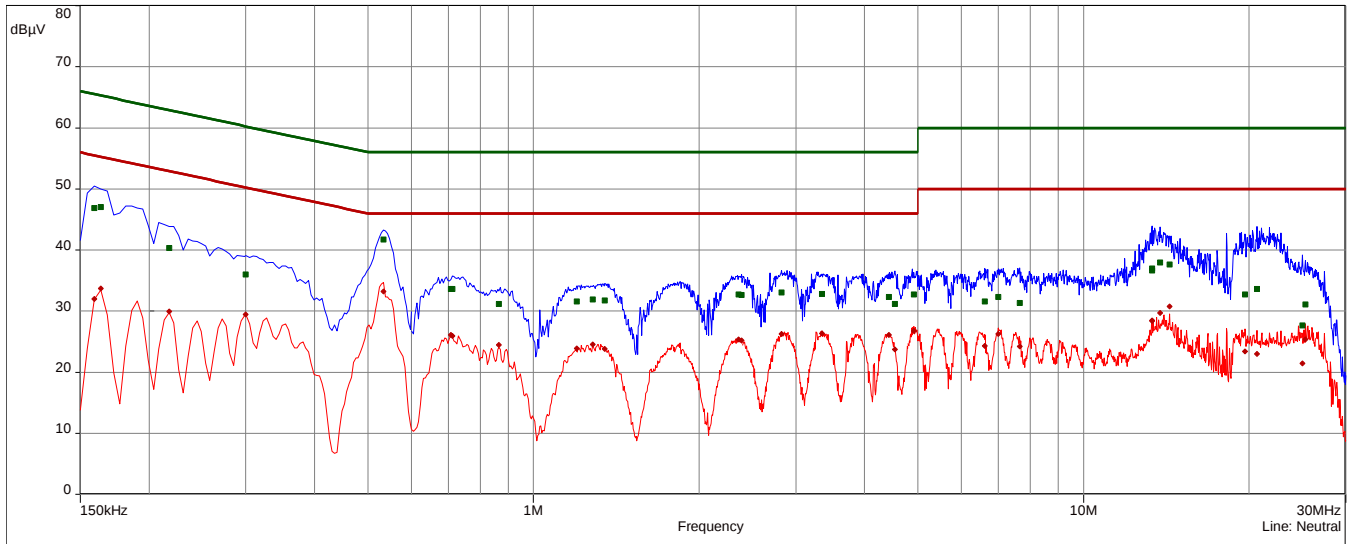
FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Test point: L1 - N
Operation mode: Standby mode
Remarks: -
Date: 04 March 2022
Tested by: Josef Knab

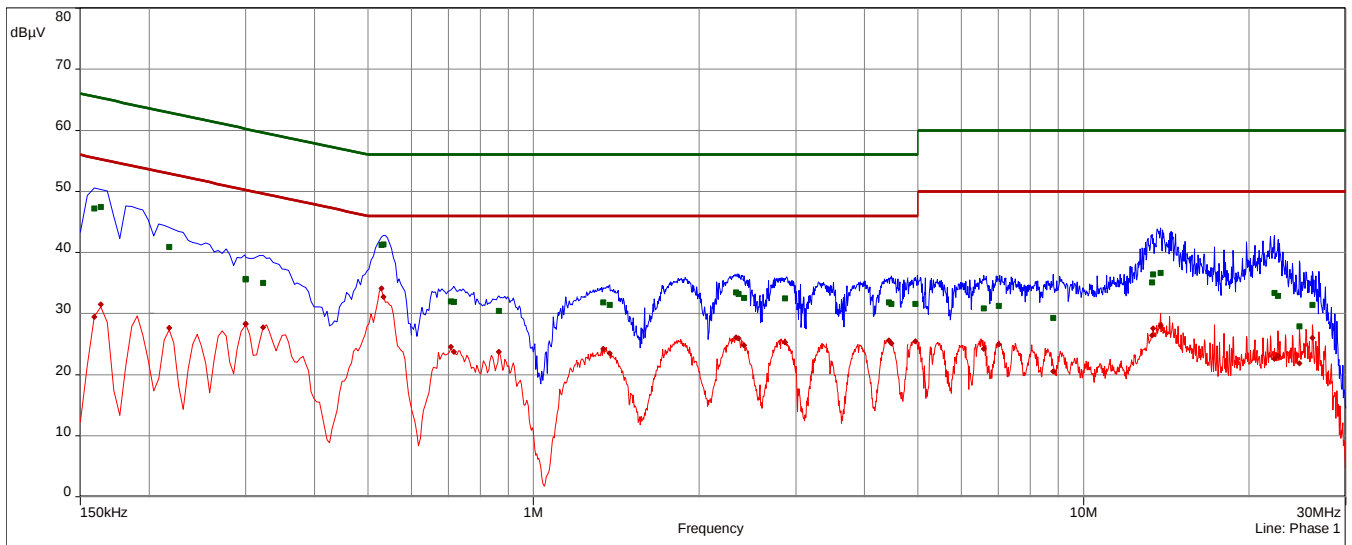
Result: passed

- FCC/FCC Part 15C (15.207) B - Avg/
- FCC/FCC Part 15C (15.207) B - Q-Peak/
- Peak (Neutral)
- CISPR.AVG (Neutral)
- QuasiPeak (Finals) (Neutral)
- CISPR AV (Finals) (Neutral)



FCC/FCC Part 15C (15.207)B

- FCC/FCC Part 15C (15.207) B - Avg/
- FCC/FCC Part 15C (15.207) B - Q-Peak/
- Peak (Phase 1)
- CISPR.AVG (Phase 1)
- QuasiPeak (Finals) (Phase 1)
- CISPR AV (Finals) (Phase 1)



FCC/FCC Part 15C (15.207)B

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

freq	SR	QP	margin	limit	AV	margin	limit	line	RBW	Measure time	corr
MHz		dBμV	dB	dBμV	dBμV	dB	dBμV		Hz	sec	dB
0.159	1	47.18	-18.34	65.52	29.48	-26.04	55.52	Phase 1	9k	1.00	10.10
0.1635	1	47.46	-17.83	65.28	31.47	-23.81	55.28	Phase 1	9k	1.00	10.10
0.2175	1	40.89	-22.02	62.91	27.64	-25.28	52.91	Phase 1	9k	1.00	10.11
0.3	1	35.58	-24.66	60.24	28.33	-21.91	50.24	Phase 1	9k	1.00	10.14
0.3	2	35.67	-24.57	60.24	28.33	-21.91	50.24	Phase 1	9k	1.00	10.14
0.3225	2	35.05	-24.59	59.64	27.77	-21.87	49.64	Phase 1	9k	1.00	10.14
0.5295	2	41.23	-14.77	56.00	34.15	-11.85	46.00	Phase 1	9k	1.00	10.16
0.534	2	41.28	-14.72	56.00	32.71	-13.29	46.00	Phase 1	9k	1.00	10.16
0.708	3	32.00	-24.00	56.00	24.51	-21.49	46.00	Phase 1	9k	1.00	10.19
0.717	3	31.94	-24.06	56.00	23.70	-22.30	46.00	Phase 1	9k	1.00	10.19
0.8655	3	30.42	-25.58	56.00	23.69	-22.31	46.00	Phase 1	9k	1.00	10.19
1.3395	4	31.82	-24.18	56.00	24.19	-21.81	46.00	Phase 1	9k	1.00	10.25
1.3755	4	31.44	-24.56	56.00	23.52	-22.48	46.00	Phase 1	9k	1.00	10.25
2.334	4	33.43	-22.57	56.00	26.10	-19.90	46.00	Phase 1	9k	1.00	10.31
2.4135	5	32.57	-23.43	56.00	24.83	-21.17	46.00	Phase 1	9k	1.00	10.31
2.868	5	32.46	-23.54	56.00	25.32	-20.68	46.00	Phase 1	9k	1.00	10.34
4.425	5	31.84	-24.16	56.00	25.61	-20.39	46.00	Phase 1	9k	1.00	10.42
4.9485	6	31.54	-24.46	56.00	25.41	-20.59	46.00	Phase 1	9k	1.00	10.44
6.5865	6	30.84	-29.16	60.00	24.18	-25.82	50.00	Phase 1	9k	1.00	10.57
7.0095	6	31.23	-28.77	60.00	24.99	-25.01	50.00	Phase 1	9k	1.00	10.60
8.814	6	29.32	-30.68	60.00	20.52	-29.48	50.00	Phase 1	9k	1.00	10.69
13.3305	7	35.13	-24.87	60.00	26.44	-23.56	50.00	Phase 1	9k	1.00	11.05
13.3935	7	36.43	-23.57	60.00	27.55	-22.45	50.00	Phase 1	9k	1.00	11.05
13.8165	7	36.67	-23.33	60.00	27.96	-22.04	50.00	Phase 1	9k	1.00	11.09
22.2465	8	33.35	-26.65	60.00	22.62	-27.38	50.00	Phase 1	9k	1.00	11.57
22.593	8	32.89	-27.11	60.00	23.05	-26.95	50.00	Phase 1	9k	1.00	11.59
24.6945	8	27.91	-32.09	60.00	21.84	-28.16	50.00	Phase 1	9k	1.00	11.67
26.0985	8	31.45	-28.55	60.00	25.99	-24.01	50.00	Phase 1	9k	1.00	11.69
0.159	9	46.86	-18.66	65.52	31.97	-23.55	55.52	Neutral	9k	1.00	10.10
0.1635	9	47.00	-18.28	65.28	33.68	-21.60	55.28	Neutral	9k	1.00	10.10
0.2175	9	40.37	-22.55	62.91	29.97	-22.95	52.91	Neutral	9k	1.00	10.13
0.3	10	36.03	-24.21	60.24	29.43	-20.81	50.24	Neutral	9k	1.00	10.14
0.534	10	41.71	-14.29	56.00	33.18	-12.82	46.00	Neutral	9k	1.00	10.16
0.708	11	33.62	-22.38	56.00	26.13	-19.87	46.00	Neutral	9k	1.00	10.19
0.7125	11	33.62	-22.38	56.00	25.92	-20.08	46.00	Neutral	9k	1.00	10.19
0.8655	11	31.14	-24.86	56.00	24.44	-21.56	46.00	Neutral	9k	1.00	10.19
1.1985	11	31.56	-24.44	56.00	23.92	-22.08	46.00	Neutral	9k	1.00	10.23
1.281	12	31.93	-24.07	56.00	24.53	-21.47	46.00	Neutral	9k	1.00	10.24
1.3485	12	31.74	-24.26	56.00	23.84	-22.16	46.00	Neutral	9k	1.00	10.25
2.361	12	32.70	-23.30	56.00	25.40	-20.60	46.00	Neutral	9k	1.00	10.31
2.8275	13	33.04	-22.96	56.00	26.27	-19.73	46.00	Neutral	9k	1.00	10.34
3.345	13	32.82	-23.18	56.00	26.33	-19.67	46.00	Neutral	9k	1.00	10.35
4.4295	13	32.32	-23.68	56.00	26.11	-19.89	46.00	Neutral	9k	1.00	10.41
4.9215	14	32.72	-23.28	56.00	26.78	-19.22	46.00	Neutral	9k	1.00	10.43
6.6225	14	31.61	-28.39	60.00	24.30	-25.70	50.00	Neutral	9k	1.00	10.55
7.0005	14	32.29	-27.71	60.00	26.22	-23.78	50.00	Neutral	9k	1.00	10.57
7.653	14	31.36	-28.64	60.00	24.20	-25.80	50.00	Neutral	9k	1.00	10.60
13.317	15	36.66	-23.34	60.00	28.46	-21.54	50.00	Neutral	9k	1.00	10.90
13.3215	15	37.01	-22.99	60.00	28.37	-21.63	50.00	Neutral	9k	1.00	10.90
13.7805	15	37.94	-22.06	60.00	29.72	-20.28	50.00	Neutral	9k	1.00	10.93
14.3385	15	37.65	-22.35	60.00	30.74	-19.26	50.00	Neutral	9k	1.00	10.96
19.6815	16	32.74	-27.26	60.00	23.38	-26.62	50.00	Neutral	9k	1.00	11.24
20.6895	16	33.66	-26.34	60.00	22.96	-27.04	50.00	Neutral	9k	1.00	11.25
25.0095	16	27.65	-32.35	60.00	21.42	-28.58	50.00	Neutral	9k	1.00	11.25
25.3425	16	31.06	-28.94	60.00	25.35	-24.65	50.00	Neutral	9k	1.00	11.24

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

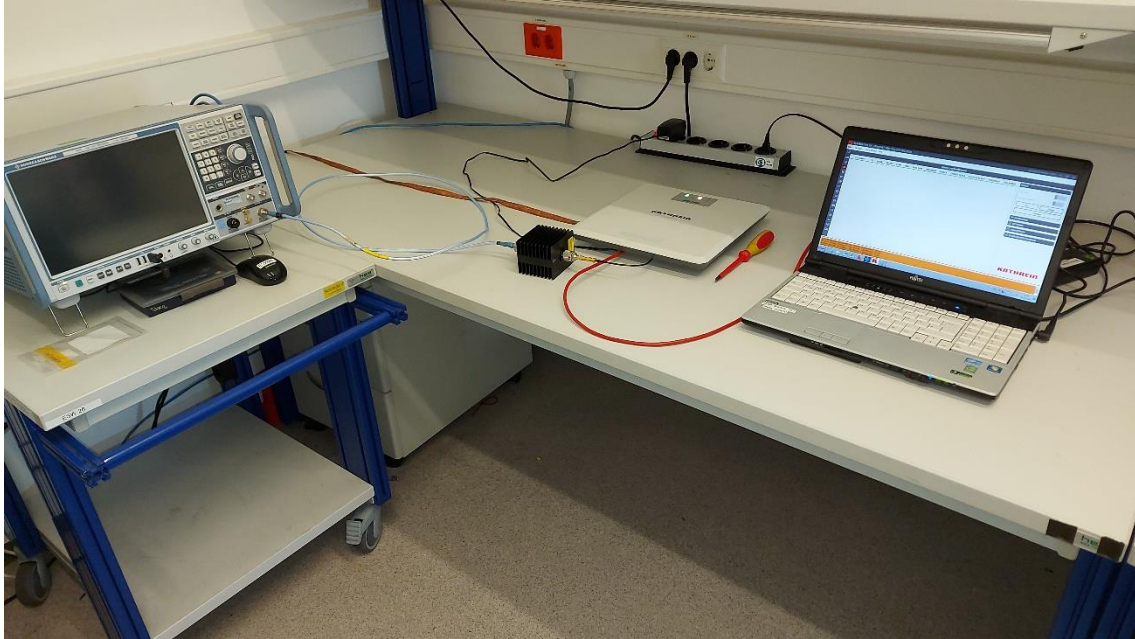
5.2 20 dB bandwidth

For test instruments and accessories used see section 6 Part MB.

5.2.1 Description of the test location

Test location: Shielded room S6

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15C, Section 15.247(a):

Frequency hopping systems shall have hopping carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.2.4 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB. The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or the first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.

FCC ID: WJ9-RRU1400
IC: 5530C-RRU1400
5.2.5 Test result

Power setting 30.0 dBm:

Channel No.	-20 dB Bandwidth below peak (kHz)
CH 1 (902.25 MHz)	52.53
CH 25 (914.75 MHz)	53.50
CH 52 (927.75 MHz)	53.30

Bandwidth limit according to FCC Part15C, Section 15.247(a):

Frequency (MHz)	Hopping channels	Limit -20 dB bandwidth (kHz)
902-928	≥ 50	< 250

The requirements are **FULFILLED**.

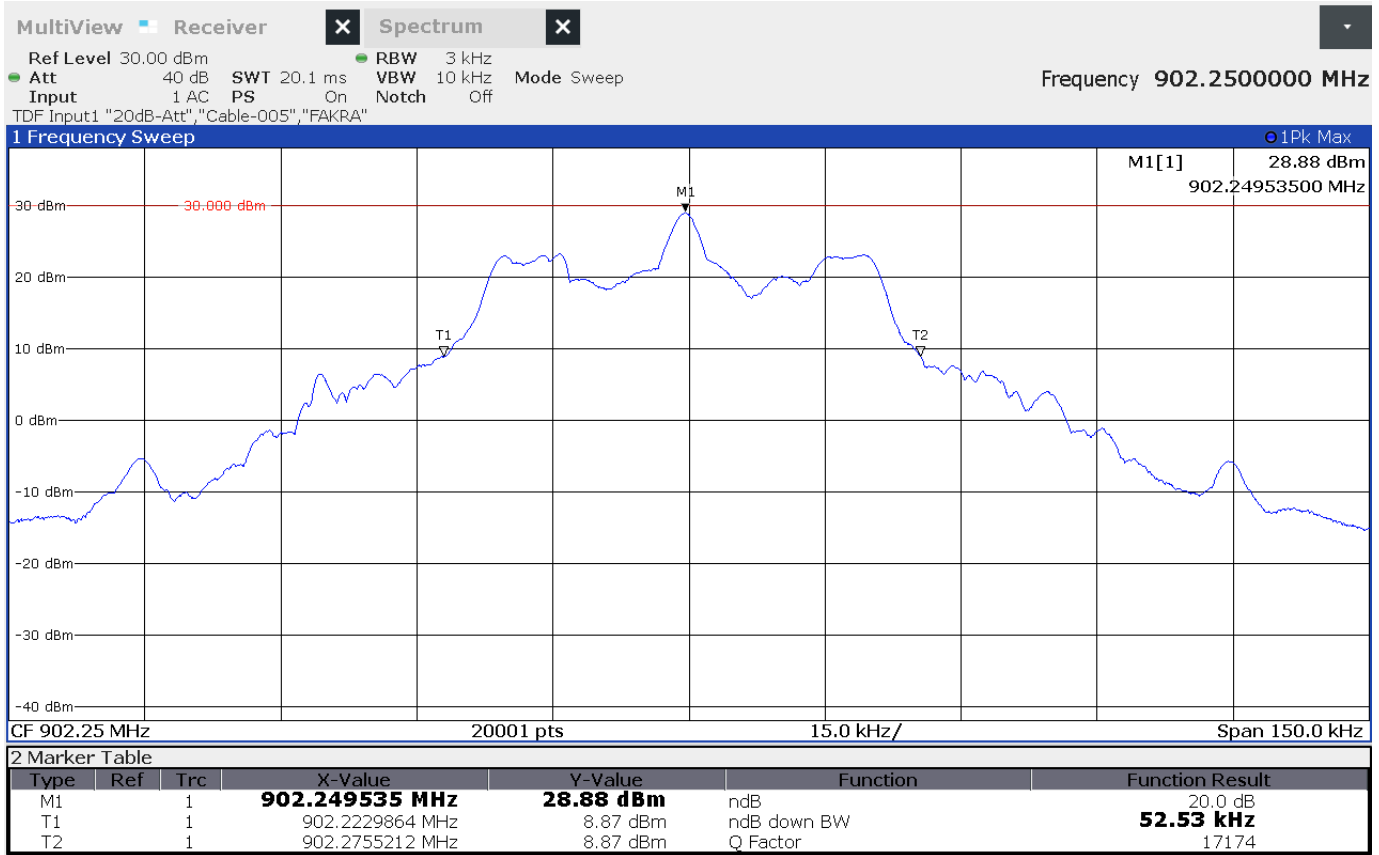
Remarks: For detailed test result please refer to following test protocol.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

5.2.6 Test protocol

Channel 1
902.25 MHz

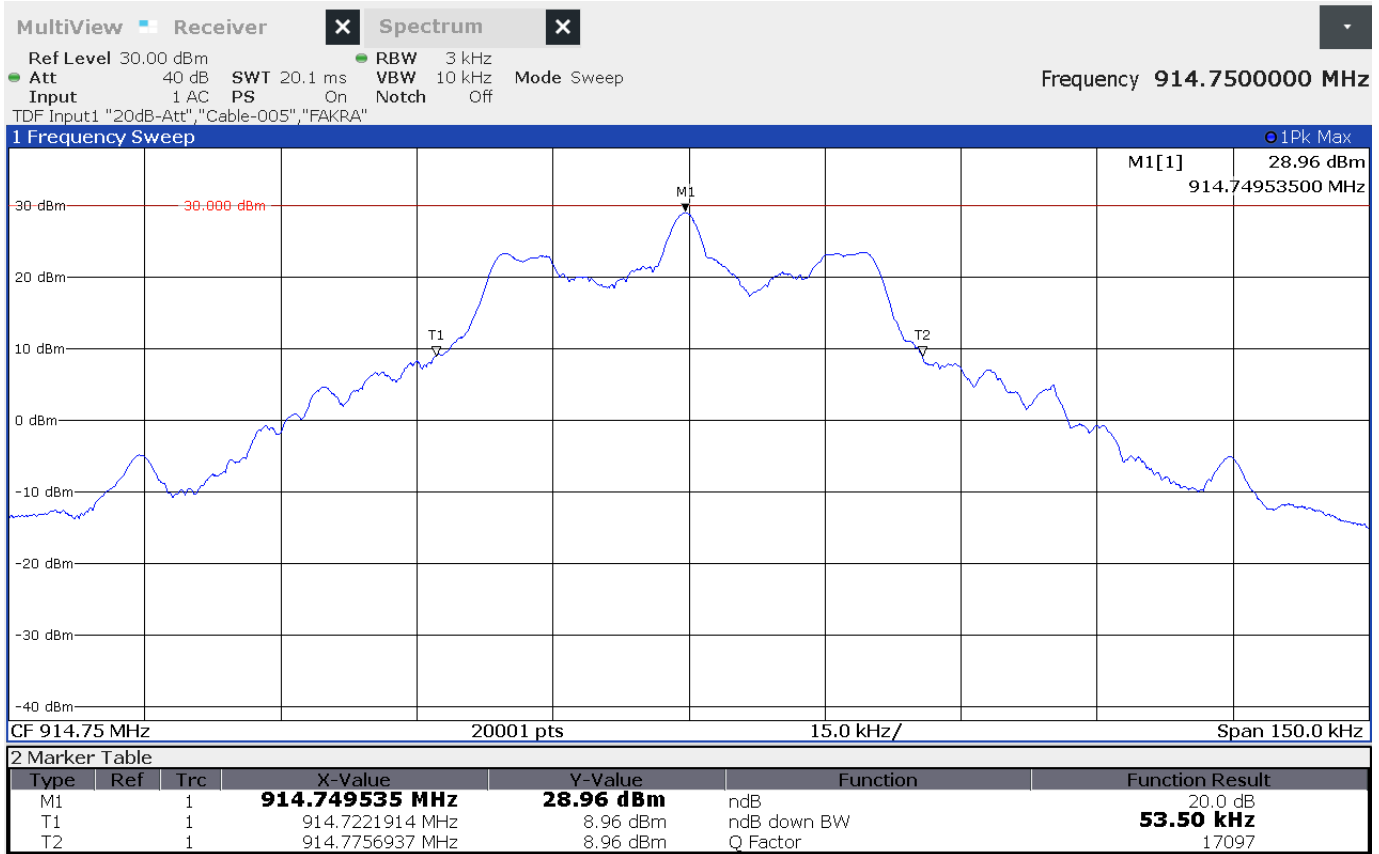


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Channel 25
914.75 MHz

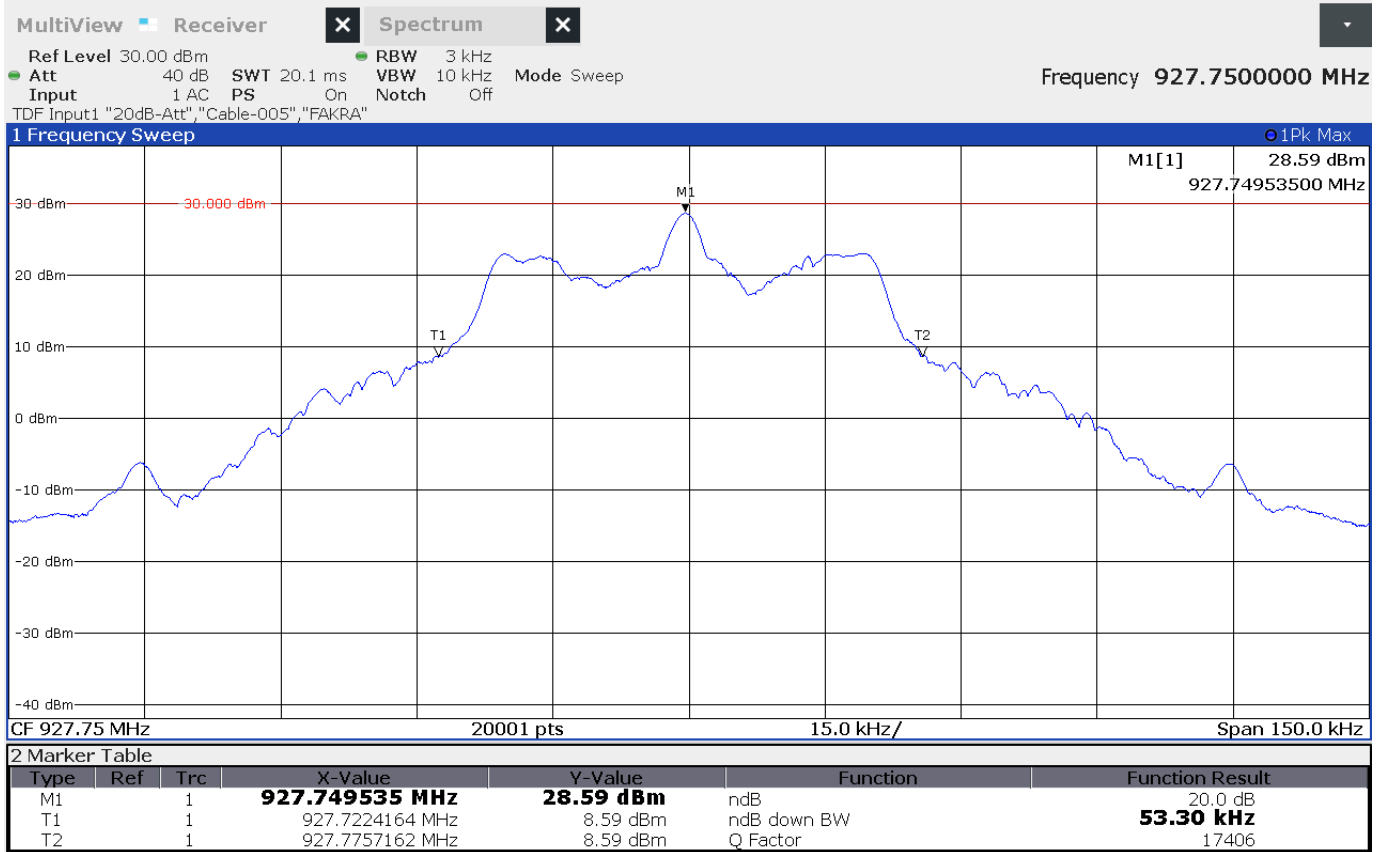


The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Channel 52
927.75 MHz



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: WJ9-RRU1400
IC: 5530C-RRU1400

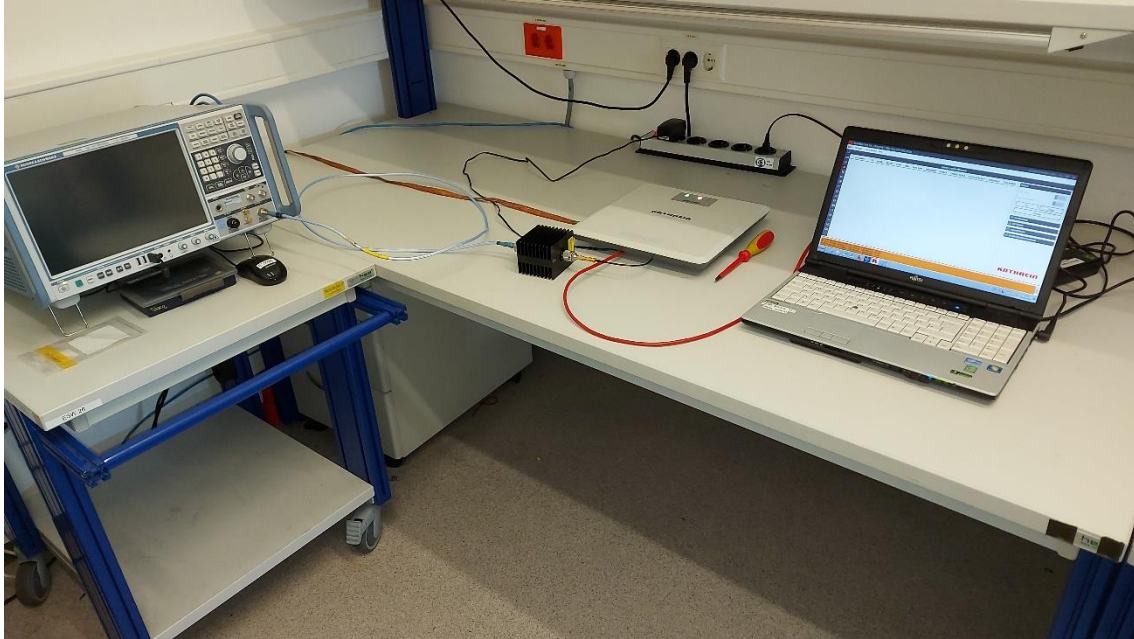
5.3 Maximum peak conducted output power

For test instruments and accessories used see section 6 Part CPC 2.

5.3.1 Description of the test location

Test location: Shielded room S6

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.247(b)(2):

For frequency hopping systems operating in the 902-928 MHz band the maximum peak conducted output power shall not exceed the limit of 1 watt for systems employing at least 50 hopping channels.

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.4 Description of Measurement

A spectrum analyzer is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode using the assigned frequency.

Spectrum analyser settings:

RBW	300 kHz	Sweep time	Auto (5 ms)
VBW	1 MHz	Power Mode	Max. hold
Detector	Peak	Span	25 0 kHz

FCC ID: WJ9-RRU1400
IC: 5530C-RRU1400
5.3.5 Test result

- Power setting 30.0 dBm

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Delta (dB)
1	902.25	28.65	30.0	-1.35
25	914.75	28.80	30.0	-1.20
52	927.75	28.74	30.0	-1.26

Note: Test cable loss and fixed attenuation of 20 dB are included in the analyzer reading (transducer factor).

Peak Power Limit according to FCC Part 15C, Section 15.247(b)(2):

Frequency (MHz)	Hopping channels	Hop. CH carrier frequ. separation	Peak Power Limit (dBm)	Peak Power Limit (W)
902-928	≥ 50	52 CH	30	1.0

The requirements are **FULFILLED**.

Remarks:

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

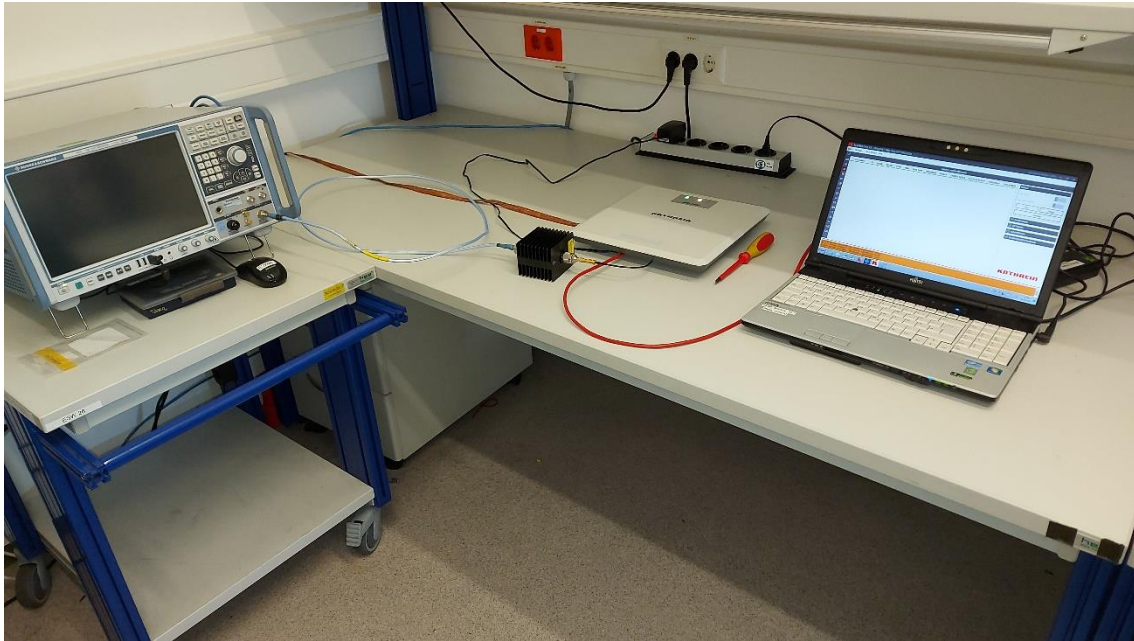
5.4 Spurious RF conducted emissions

For test instruments and accessories used see section 6 Part SEC1, SEC2 and SEC3.

5.4.1 Description of the test location

Test location: Shielded room S6

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15C, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency band 902 to 928 MHz, the digitally modulated 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 an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.4.4 Description of Measurement

A spectrum analyzer is connected to the output of the transmitter via a suitable attenuator while EUT was operating in transmit mode at the assigned frequency.

Spectrum analyzer settings:

RBW	100 kHz
VBW	300 kHz
Detector	Max. peak
Trace:	Max. hold
Sweep time	auto

FCC ID: WJ9-RRU1400
IC: 5530C-RRU1400
5.4.5 Test result

Power setting 30.0 dBm

Hopping frequency from 902.75 to 927.25 MHz (frequencies falling in restricted bands)			
Frequency (MHz)	Peak power * (dBm)	Limit (-20 dB) (dBm)	Delta (dB)
2706.72	-47.51	8.80	-56.31
2781.72	-44.50	8.80	-53.30
4807.78	-50.06	8.80	-58.86

Note: Test cable loss and fixed attenuation of 20 dB are included in the analyzer reading (transducer factor).

The requirements are **FULFILLED**.

Remarks: All spurious emissions falling in restricted bands have been measured radiated.

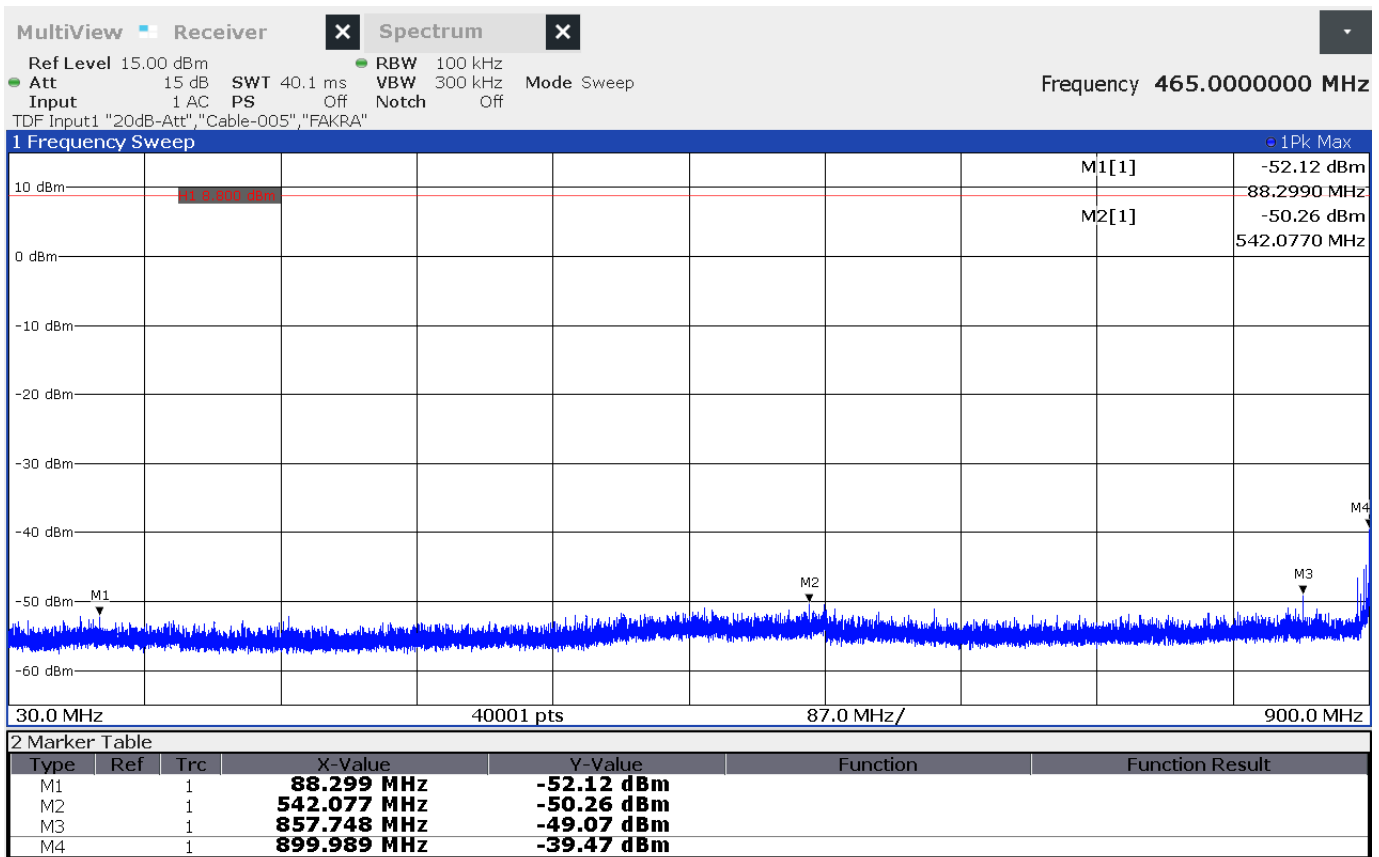
For detailed results please refer to following test protocols.

Test was performed in frequency hopping mode from 902.25 to 927.75 MHz.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

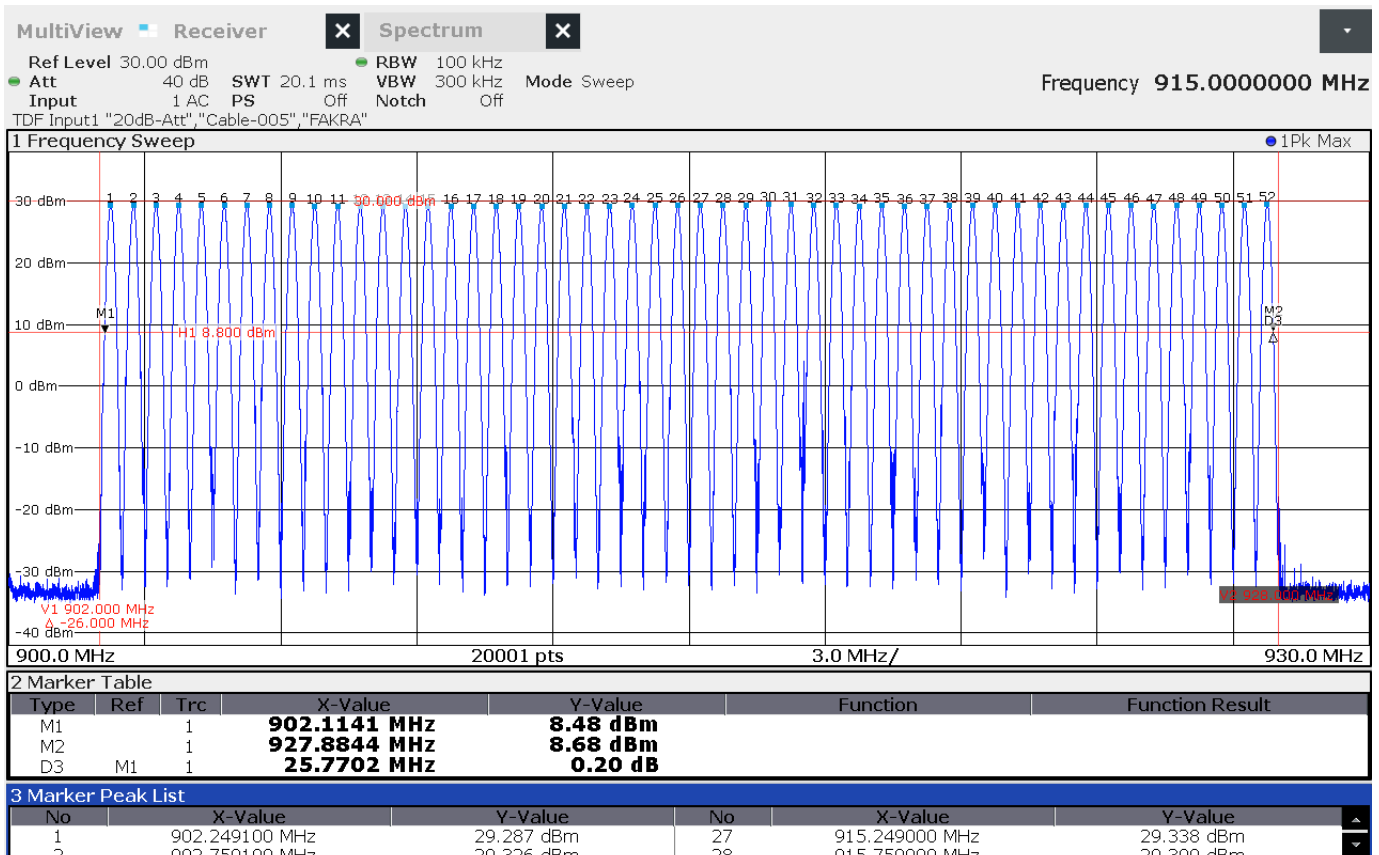
Conducted RF emission from 30 MHz to 900 MHz



Note: No frequencies are located in restricted band.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Conducted RF emission from 900 MHz to 930 MHz
(Band edge)

MultiView ☒ Receiver ☒ Spectrum ☒

Ref Level 30.00 dBm Att 40 dB SWT 20.1 ms RBW 100 kHz VBW 300 kHz Mode Sweep
Input 1 AC PS Off Notch Off

TDF Input1 "20dB-Att", "Cable-005", "FAKRA"

Frequency 915.000000 MHz

3 Marker Peak List

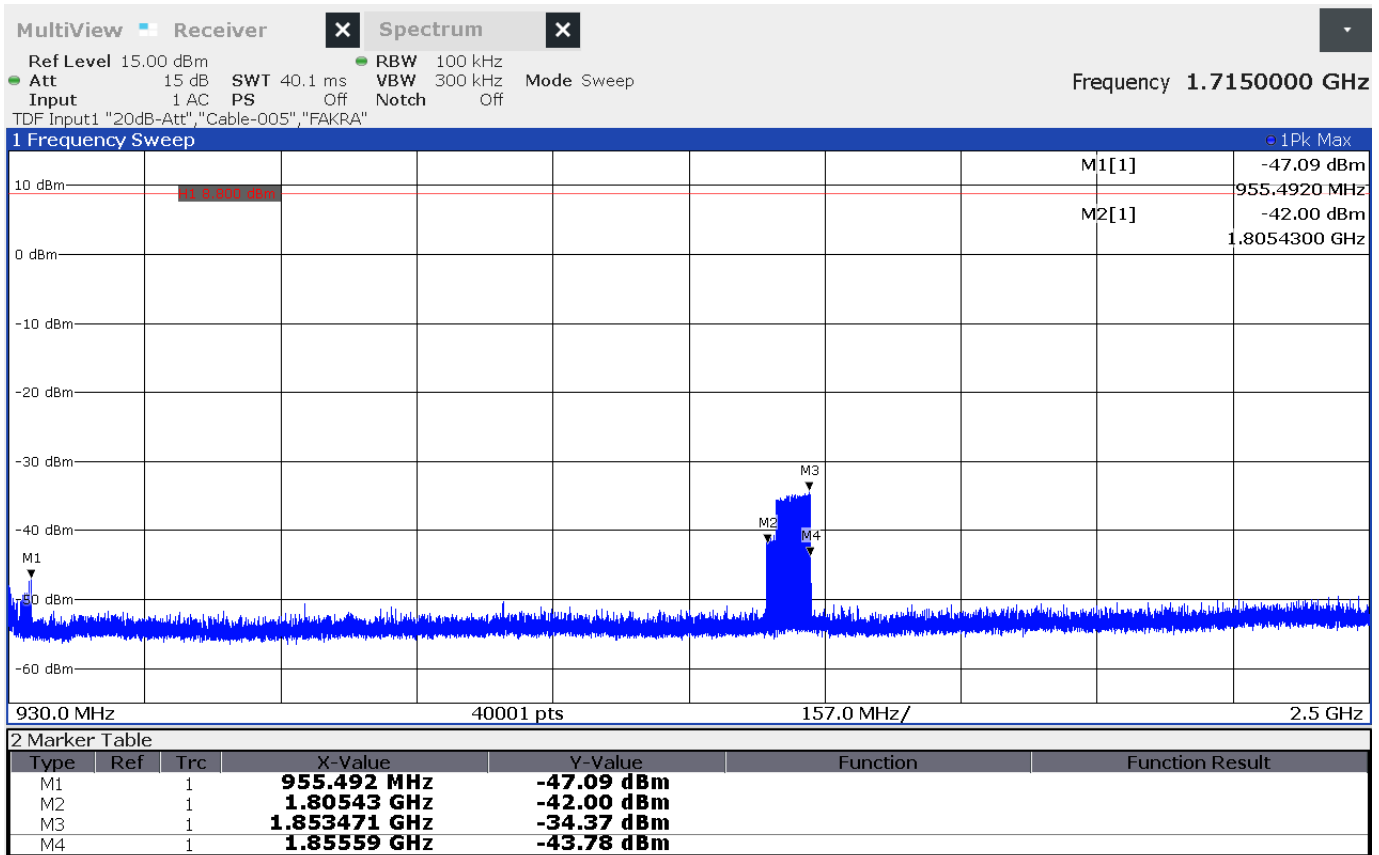
No	X-Value	Y-Value	No	X-Value	Y-Value
1	902.249100 MHz	29.287 dBm	27	915.249000 MHz	29.338 dBm
2	902.750100 MHz	29.326 dBm	28	915.750000 MHz	29.300 dBm
3	903.249600 MHz	29.314 dBm	29	916.249400 MHz	29.283 dBm
4	903.749100 MHz	29.319 dBm	30	916.750400 MHz	29.500 dBm
5	904.250000 MHz	29.323 dBm	31	917.249900 MHz	29.449 dBm
6	904.749500 MHz	29.331 dBm	32	917.749400 MHz	29.405 dBm
7	905.249000 MHz	29.310 dBm	33	918.248800 MHz	29.306 dBm
8	905.750000 MHz	29.296 dBm	34	918.749800 MHz	29.245 dBm
9	906.249400 MHz	29.274 dBm	35	919.249300 MHz	29.280 dBm
10	906.748900 MHz	29.215 dBm	36	919.748800 MHz	29.230 dBm
11	907.248400 MHz	29.200 dBm	37	920.249700 MHz	29.250 dBm
12	907.749400 MHz	29.184 dBm	38	920.749200 MHz	29.410 dBm
13	908.248800 MHz	29.144 dBm	39	921.248700 MHz	29.354 dBm
14	908.751300 MHz	29.133 dBm	40	921.748200 MHz	29.302 dBm
15	909.249300 MHz	29.133 dBm	41	922.252100 MHz	29.278 dBm
16	909.748800 MHz	29.162 dBm	42	922.750100 MHz	29.404 dBm
17	910.249700 MHz	29.193 dBm	43	923.249600 MHz	29.386 dBm
18	910.749200 MHz	29.219 dBm	44	923.749100 MHz	29.370 dBm
19	911.248700 MHz	29.246 dBm	45	924.248500 MHz	29.316 dBm
20	911.748200 MHz	29.156 dBm	46	924.749500 MHz	29.268 dBm
21	912.249100 MHz	29.184 dBm	47	925.249000 MHz	29.221 dBm
22	912.748600 MHz	29.168 dBm	48	925.750000 MHz	29.385 dBm
23	913.249600 MHz	29.219 dBm	49	926.249400 MHz	29.368 dBm
24	913.749100 MHz	29.272 dBm	50	926.748900 MHz	29.334 dBm
25	914.248500 MHz	29.321 dBm	51	927.248400 MHz	29.321 dBm
26	914.749500 MHz	29.333 dBm	52	927.749400 MHz	29.445 dBm

Note: No frequencies are located in restricted band.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Conducted RF emission from 930 MHz to 2.5 GHz

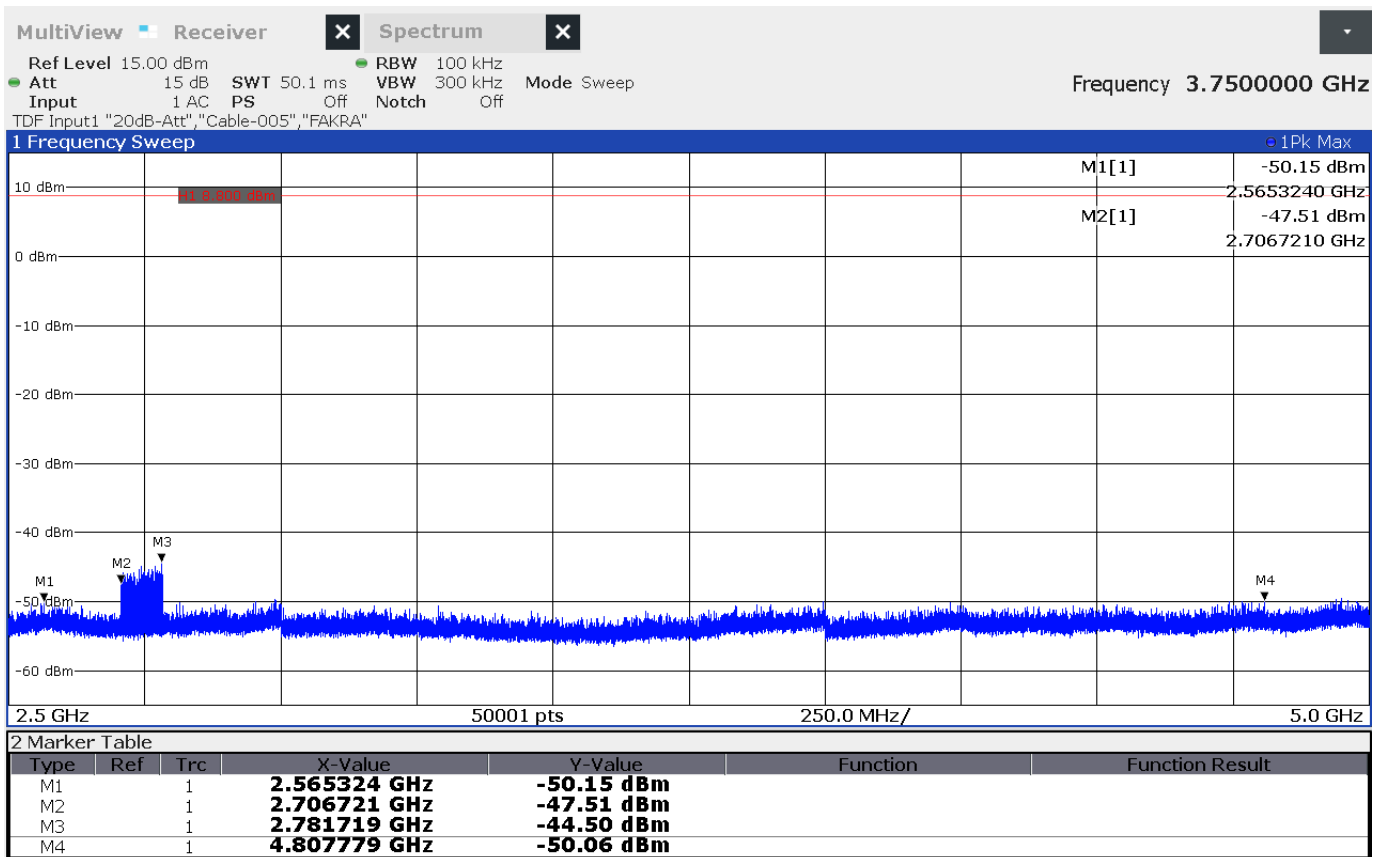


Note: No frequencies are located in restricted band.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Conducted RF emission from 2.5 GHz to 5 GHz

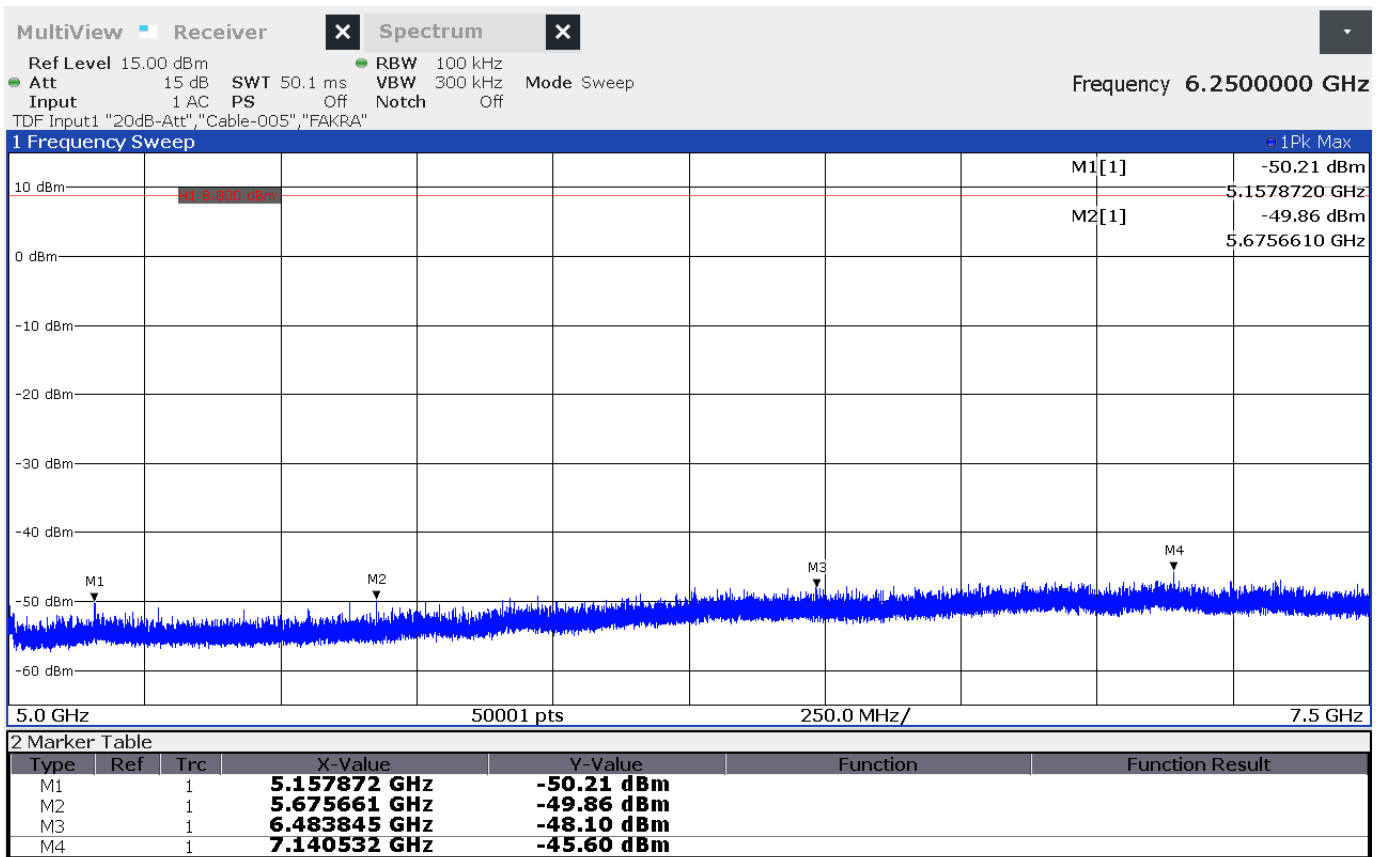


Note: Marker M2 to M4 are located in restricted band.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Conducted RF emission from 5 GHz to 7.5 GHz

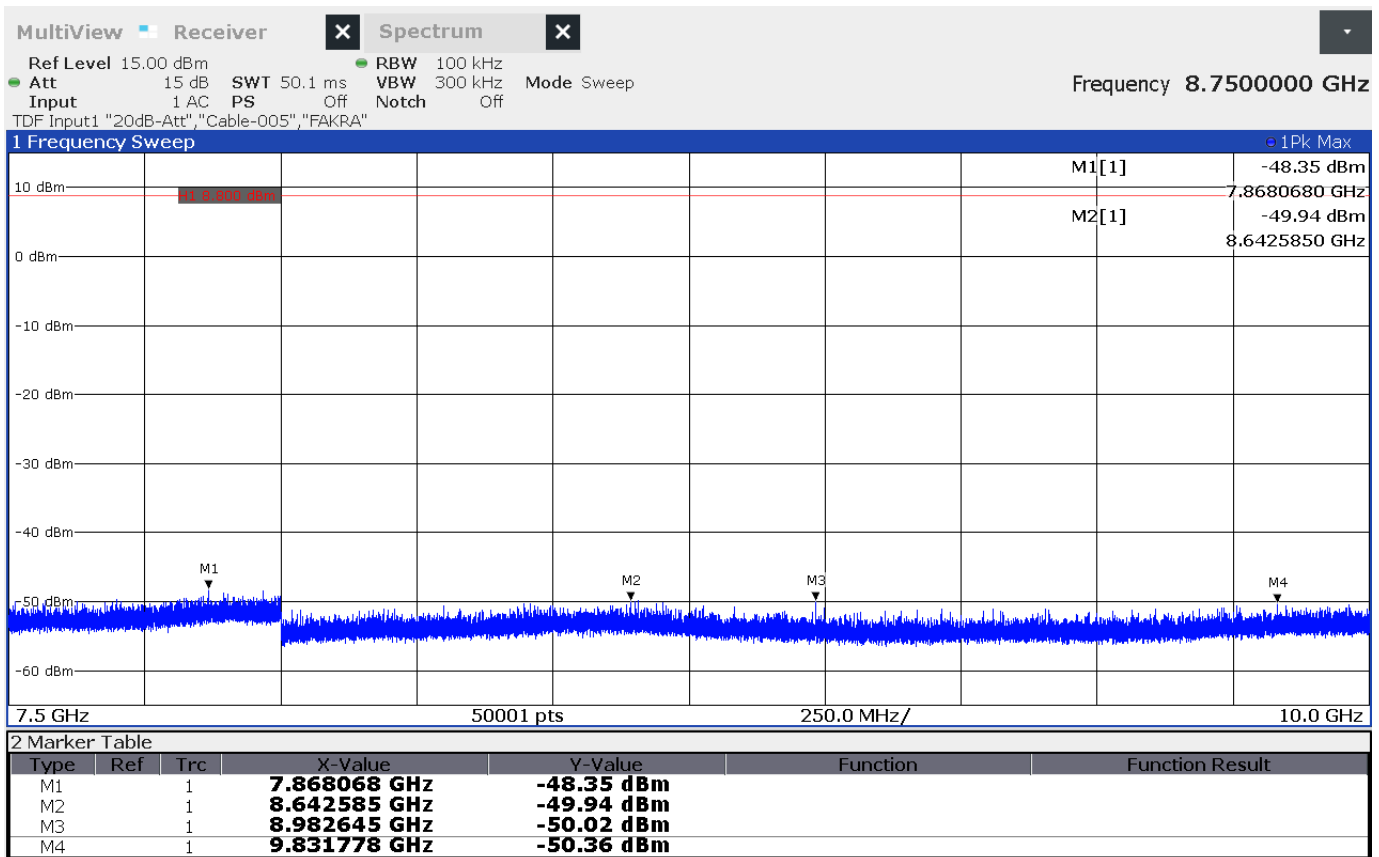


Note: No frequencies are located in restricted band.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

Conducted RF emission from 7.5 GHz to 10 GHz



Note: No frequencies are located in restricted band.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400

5.5 Spurious radiated emissions

For test instruments and accessories used see section 6 Part SER 1, SER 2, SER 3.

5.5.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

Test location: Anechoic Chamber A1
Test distance: 3 metres

5.5.2 Photo documentation of the test set-up



9 kHz to 30 MHz



9 kHz to 30 MHz

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400



30 MHz to 1000 MHz



30 MHz to 1000 MHz

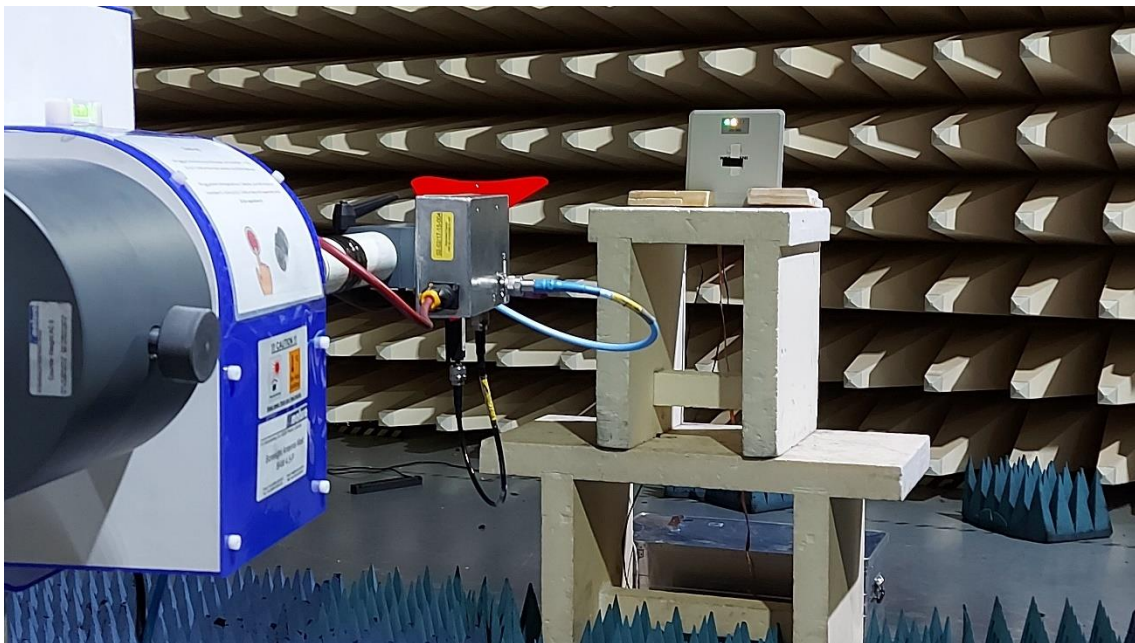
The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: WJ9-RRU1400

IC: 5530C-RRU1400



1 GHz to 10 GHz



1 GHz to 10 GHz

5.5.3 Applicable standard

According to FCC Part 15, Section 15.247(d):

In any 100 kHz bandwidth outside the frequency bands 902 to 928 MHz, the digitally modulated 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 an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

FCC ID: WJ9-RRU1400**IC: 5530C-RRU1400****5.5.4 Description of Measurement**

Radiated spurious emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linear polarized antennas. The measurements are made with 120 kHz bandwidth and quasi-peak detection (200 Hz, 9 kHz up to 30 MHz). The EUT was placed on a 1.0 X 1.5 metres non-conducting table 80 centimetres above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.10. The antenna was positioned 3 metres horizontally from the EUT. To locate maximum emissions from the EUT the antenna is shifted in height from 1 to 4 metres, after the EUT is rotated 360 degrees. The measurement scan is made in horizontal and vertical polarization of the antenna.

For the radiated measurement up from 1 GHz to maximum frequency as specified in Section 15.33, a spectrum analyzer and appropriate linear polarized antennas are used. The EUT is placed on a 1.0 X 1.5 metres non-conducting table 150 centimetres above the ground plane. The set up of the EUT will be in accordance to ANSI C63.10. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions the EUT was rotated 360 degrees in the fully anechoic chamber. The measurement scan is made in horizontal and vertical polarization of the antenna. For testing above 1 GHz, if the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise, the emission will be measured in average mode again and reported.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz:	RBW:	200 Hz
150 kHz – 30 MHz:	RBW:	9 kHz
30 MHz – 1 GHz:	RBW:	120 kHz
1 GHz – 10 GHz:	RBW:	1 MHz

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5.5.5 Test result
5.5.5.1 Radiated emission test 9 kHz to 30 MHz

- Power setting 30.0 dBm
- PK & QP detector was used for this measurement

Frequency (kHz)	PK reading (dBμV)	QP reading (dBμV)	Duty cycle corr. (dB)	Ant. factor (dB)	Distance corr. (dB)	corr. AV level (dBμV/m)	QP level (dBμV/m)	Limit (dBμV/m)	Dlimit (dB)
10.0	47.0	41.2	0.0	20.0	-80.0	-13.0	-18.8	47.6	-60.6
50.0	39.0	37.3	0.0	20.0	-80.0	-21.0	-22.7	33.6	-54.6
200.0	43.0	42.0	0.0	20.0	-80.0	-17.0	-18.0	21.6	-38.6
5000.0	26.3	23.8	0.0	20.0	-40.0	6.3	3.8	29.5	-25.7
20000.0	22.7	21.1	0.0	20.0	-40.0	2.7	1.1	29.5	-28.4

Note: Values in bold are evaluated with AV detector.

Note: No unwanted emissions from the EuT could be measured in the relevant frequency ranges.
Only ambient noises could be detected!

5.5.5.2 Radiated emission test 30 MHz to 1GHz

- Power setting 30.0 dBm
- QP detector was used for this measurement

Restricted band	Frequency (MHz)	Reading Vert. (dBμV)	Reading Hor. (dBμV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBμV/m)	Level Hor. (dBμV/m)	Limit (dBμV/m)	Dlimit (dB)
	42.93	18.5	2.8	17.3	18.3	35.8	21.1	40.0	-4.2
	48.77	17.1	6.8	17.5	18.7	34.6	25.5	40.0	-5.4
	54.12	17.7	7.0	17.3	18.5	35.0	25.5	40.0	-5.0
	56.50	16.1	3.1	17.2	18.3	33.3	21.4	40.0	-6.7
X	75.19	18.9	3.6	15.0	15.5	33.9	19.1	40.0	-6.1
X	108.50	15.6	6.3	16.1	15.1	31.7	21.4	43.5	-11.8
	110.20	13.8	6.7	16.3	15.4	30.1	22.1	43.5	-13.4
	120.00	11.8	4.2	17.4	16.8	29.2	21.0	43.5	-14.3
X	125.00	8.9	1.9	17.9	17.2	26.8	19.1	43.5	-16.7
	208.50	5.1	5.9	17.3	16.7	22.4	22.6	43.5	-20.9
	226.20	8.4	15.0	17.9	17.6	26.3	32.6	46.0	-13.4
X	248.80	4.2	8.0	18.7	18.6	22.9	26.6	46.0	-19.4
	297.40	3.4	4.9	20.1	20.6	23.5	25.5	46.0	-20.5
	321.60	0.2	0.6	20.8	21.3	21.0	21.9	46.0	-24.1
	373.80	0.2	1.4	22.3	22.8	22.5	24.2	46.0	-21.8
X	400.00	7.3	4.2	23.1	23.5	30.4	27.7	46.0	-15.6
	424.98	4.1	2.9	23.7	24.1	27.8	27.0	46.0	-18.2
	439.00	0.7	0.7	24.1	24.5	24.8	25.2	46.0	-20.8
	450.00	7.4	5.6	24.4	24.8	31.8	30.4	46.0	-14.2

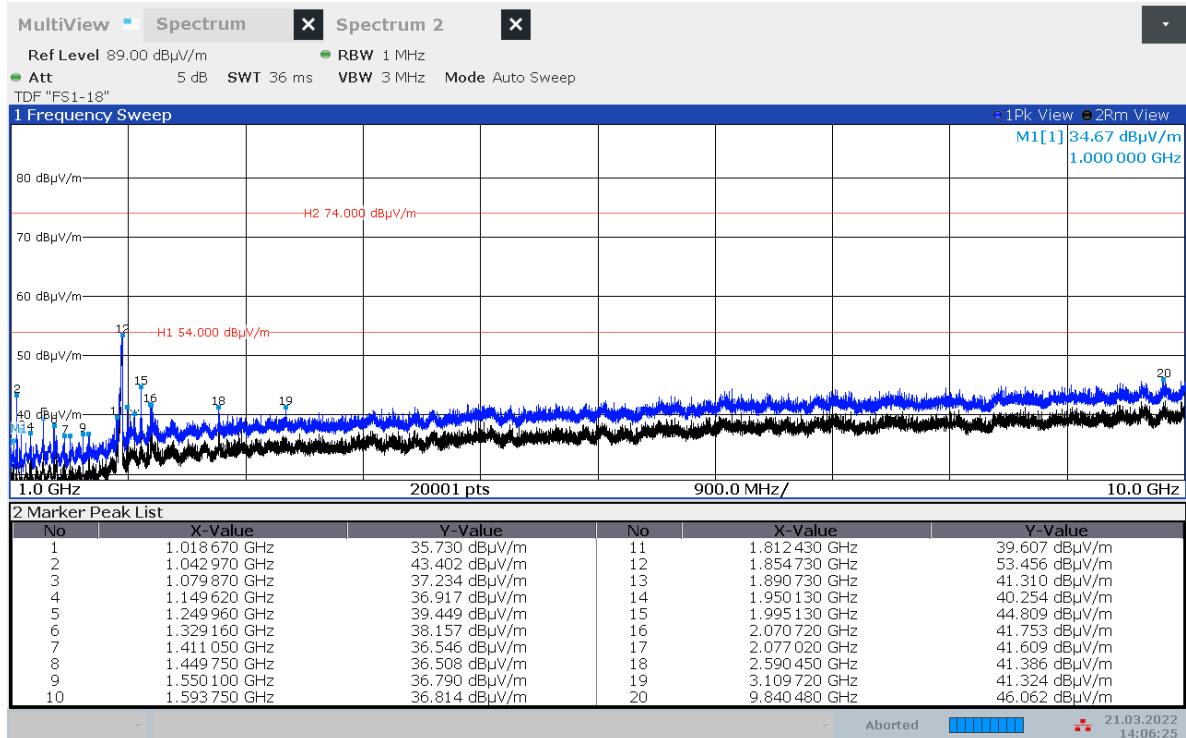
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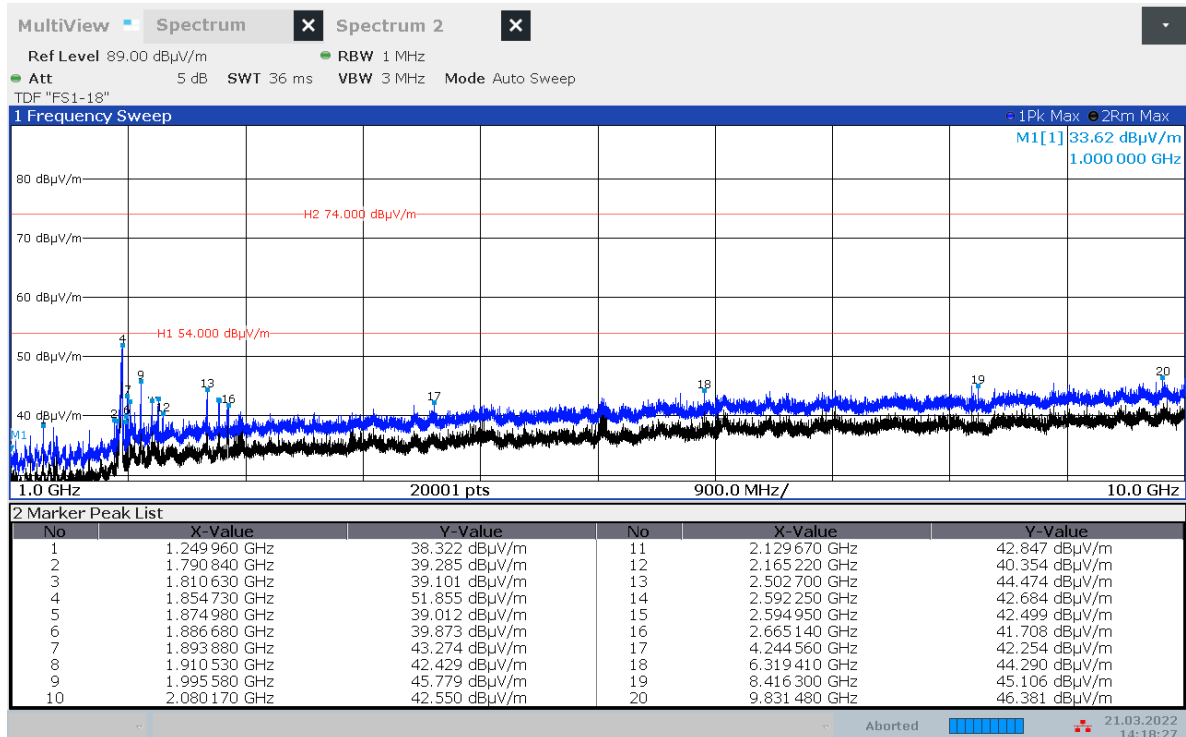
5.5.5.3 Radiated emission test 1GHz to 10 GHz

- Power setting 30.0 dBm
- QP detector was used for this measurement

Horizontal measurement



Vertical measurement



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Radiated limits according to FCC Part 15C, Section 15.209(a) for spurious emissions:

Frequency (MHz)	Field strength of spurious emissions ($\mu\text{V/m}$)		Measurement distance (metres)
	($\mu\text{V/m}$)	dB($\mu\text{V/m}$)	
0.009 - 0.490	2400/F(kHz)		300
0.490 - 1.705	24000/F(kHz)		30
1.705 - 30	30	29.5	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209: (Refer to section 5.5.5.1)

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

The requirements are **FULFILLED**.

Remarks: Test was performed in frequency hopping mode from 902.75 to 927.25 MHz.

The measurement was performed up to the 10th harmonic (10000 MHz).

For measurements >1 GHz the test cable loss and fixed attenuation of 20 dB are included in the analyzer reading (transducer factor).

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5.6 Maximum permissible exposure (MPE) – See Attachment B

For test instruments and accessories used see section 6 Part **CPC 2**.

5.6.1 Description of the test location

Test location: None

5.6.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

5.6.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, the MPE can be calculated in a defined distance away from the product.

Friis transmission formula:
$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

P_d = power density (mW/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

Remarks: For detailed test result please refer Attachment B.

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6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	BAT-EMC 3.21.0.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	21/06/2022	21/06/2021		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2022	31/10/2019	22/09/2022	22/03/2022
	N-4000-BNC	02-02/50-05-138				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	08/09/2022	08/03/2022
	6430	02-02/50-13-014				
CPC 2	ESW26	02-02/03-17-002	10/02/2023	10/02/2022		
	KK-SF104-11SMA-11N-2M	02-02/50-14-005				
	18N50W-20 dB	02-02/50-14-017				
MB	ESW26	02-02/03-17-002	10/02/2023	10/02/2022		
	KK-SF104-11SMA-11N-2M	02-02/50-14-005				
	18N50W-20 dB	02-02/50-14-017				
SEC 1-3	ESW26	02-02/03-17-002	10/02/2023	10/02/2022		
	KK-SF104-11SMA-11N-2M	02-02/50-14-005				
	18N50W-20 dB	02-02/50-14-017				
SER 1	ESR 7	02-02/03-17-001	29/07/2022	29/07/2021		
	HFH 2 - Z 2	02-02/24-15-001	30/03/2022	30/03/2021		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 2	ESR 7	02-02/03-17-001	29/07/2022	29/07/2021		
	VULB 9168	02-02/24-05-005	20/12/2022	20/12/2021	07/07/2022	07/07/2021
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
	50F-003 N 3 dB	02-02/50-21-010				
SER 3	ESW26	02-02/03-17-002	10/02/2023	10/02/2022		
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	3117	02-02/24-05-009	28/06/2022	28/06/2021		
	Sucoflex N-2000-SMA	02-02/50-05-075				
	WHK 3.0/18G-10EF	02-02/50-05-180				
	WHJS 1000-10EF	02-02/50-13-003				

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.