Test Report – Products
Prüfbericht – Produkte

VLAC Lab Accreditation VLAC-017

TÜVRheinland®

Test Report No.: *Prüfbericht-Nr.:*	**JP25KRGU 001**	**Order No.:** *Auftrags-Nr.:*	**150302505**	**Page 1 of 66** *Seite 1 von 66*
Client Reference No.: *Kunden-Referenz-Nr.:*	N/A	**Order Date:** *Auftragsdatum:*	2024-12-18	
Client: *Auftraggeber:*	MinebeaMitsumi Inc. 1-9-3, Higashi-shimbashi, Minato-ku, Tokyo, 105-0021, Japan			
Test Item: *Prüfgegenstand:*	Parking Sensor			
Identification / Type No.: *Bezeichnung / Typ-Nr.:*	NDPM006US	**Serial No.:** *Serien-Nr.:*	E 2411270005	
Order Content: *Auftrags-Inhalt:*	Radio Testing			
Test Specification: *Prüfgrundlage:*	FCC 47 CFR Part 15, Subpart C, Section 15.247			

Date of Sample Receipt: *Wareneingangsdatum:*	2024-12-20, 2024-12-27
Test Sample No.: *Prüfmuster-Nr.:*	A003894557-001, A003898564-001
Testing Period: *Prüfzeitraum:*	2025-01-28 to 2025-02-06
Place of Testing: *Ort der Prüfung:*	Yokohama EMC Laboratory
Testing Laboratory: *Prüflaboratorium:*	TÜV Rheinland Japan Ltd.
Test Result*: *Prüfergebnis*:*	Pass

-/-

compiled by: *zusammengestellt von:*	Hidetoshi Sasaki	**authorized by:** *genehmigt von:*	P. Zhang
Date: 2025-02-17 *Datum:*	Hidetoshi Sasaki	**Issue Date:** 2025-02-17 *Ausstellungsdatum:*	Pin Zhang
Position / *Stellung:*	Project Engineer	**Position** / *Stellung:*	Authorizer

Other / *Sonstiges:*

This test report covers DSS (FHSS) transmitter portions of the EUT for the application.

Condition of the test item at delivery: *Zustand des Prüfgegenstandes bei Anlieferung:*	Test item complete and undamaged *Prüfmuster vollständig und unbeschädigt*

* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
** Legende:*	*P(ass) = entspricht o.g. Prüfgrundlage(n)*	*F(ail) = entspricht nicht o.g. Prüfgrundlage(n)*	*N/A = nicht anwendbar*	*N/T = nicht getestet*

Revisions

Report No.	Issue date	Changes / Remarks
JP25KRGU 001	2025-02-17	Original document

Remarks

1	The equipment used during the specified testing period was calibrated according to the test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of the laboratory's management system.
2	Unless otherwise specified by the applied standard(s), the decision rule used in this test report for statements of conformity based on numerical measurement results is the "Zero Guard Band"/"Simple Acceptance" rule in accordance with ILAC G8:2019 and IEC Guide 115:2021. When the "Zero Guard Band" rule is applied, measurement uncertainty is not taken in account. For additional information on the risk resulting from the application of the "Zero Guard Band" decision rule, refer to ILAC G8:2019.

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1. General Remarks

1.1 Test Specifications

Table 1: Test Summary

Test	Specifications	Result
Radio: FCC 47 CFR Part 15, Subpart C, Section 15.247 ANSI C63.10-2020 KDB Publication No. 558074 D01 (v05r02): Guidance for Compliance Measurement on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operation under Section 15.247 of the FCC Rules		
Supply Voltage Requirements FCC §15.31(e)	See the section 5.1.	Pass
Antenna Requirements FCC §15.203	See the section 5.2.	Pass
Restricted Bands of Operation FCC §15.205	See the section 5.3.	Pass
Maximum Peak Output Power FCC §15.247(b)(3)	1W (30dBm) (Peak Conducted)	Pass
Carrier Frequency Separation FCC §15.247(a)(1)(i) and §15.215(c)	≥20dB EBW(Carrier Frequency Separation) Maximum 500kHz (20dB EBW)	Pass
Number of Hopping Frequency FCC §15.247(a)(1)(i)	≥50 channels (20dB EBW < 250kHz)	Pass
Average Time of Occupancy (Dwell Time) FCC §15.247(a)(1)(i)	0.4 seconds Maximum within a 20 seconds period	Pass
99% Bandwidth	-/-	For. Ref.
Duty Cycle	-/-	For. Ref.
Conducted Spurious Emissions of Transmitter FCC §15.247(d)	20dBc (Peak) 30MHz - 10GHz (10^{th} Harmonics)	Pass

Test	Specifications	Result
Radiated Spurious Emissions of Transmitter FCC §15.247(d), §15.205 and §15.209	9kHz - 10GHz	Pass
Conducted Emission on AC Power Ports of Transmitter FCC §15.207(a)	150kHz - 30MHz This test is not applicable, since the equipment is not intended to be connected to the AC mains network. (The equipment is battery operated only.)	N/A

1.2 Test Report Purpose

The purpose of this test report is to show compliance of the EUT (Equipment Under Test) with the requirements of the standards listed in section 1.1.

1.3 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The test facility is recognized by the Federal Communications Commission (FCC) as Accredited Testing Laboratory under Designation Number JP0017 and test firm registration number 386498.

The test facility is accredited by VLAC (member of ILAC) under number VLAC-017-1 according to ISO/IEC 17025:2017.

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equip. ID	Cal. Interval	Cal. Date	Next Cal.
For Antenna Port Conducted Emission							
EMI Receiver	Rohde & Schwarz	ESW 26	101316	RF-0812	1 year	2024-05-29	2025-05-29
RF Power Meter	Agilent	N1911A	MY45101737	RF-0393	1 year	2025-01-17	2026-01-17
RF Peak Power Sensor	Agilent	N1921A	MY45242228	RF-0394	1 year	2025-01-17	2026-01-17
For Radiated Emission (RE below 40GHz)							
Path Loss Correction Factors for RE below 1GHz	-	-	-	RF-0596	1 year	2025-01-29	2026-01-29
Path Loss Correction Factors for RE above 1GHz	-	-	-	RF-0995	1 year	2024-12-03	2025-12-03
RE Meas. Software	Toyo Corporation	ES10/RE-AJ	0600-0179-80	RF-1263	N/A	N/A	N/A
EMI Receiver	Rohde & Schwarz	ESW 26	101316	RF-0812	1 year	2024-05-29	2025-05-29
EMI Receiver	Rohde & Schwarz	ESW 44	101751	RF-0809	1 year	2024-09-27	2025-09-27
RF Selector (10m Chamber)	Toyo Corporation	NS4900	0703-182	RF-0029	N/A	N/A	N/A

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equip. ID	Cal. Interval	Cal. Date	Next Cal.
Trilog Antenna No. 2, 30-1000MHz	Schwarzbeck	VULB 9168	9168-475	RF-0462	1 year	2024-05-09	2025-05-09
5dB Attenuator	Pasternack	PE7047-5	-	RF-0731	1 year	2024-05-22	2025-05-22
20dB Attenuator	Aeroflex/Weinschel	1	BV2948	RF-0200	1 year	2024-04-03	2025-04-30
Low Noise Preamplifier, 9kHz-1GHz	TSJ	MLA-10K01-B01-35	1370750	RF-0253	1 year	2024-12-24	2025-12-24
Band Pass Filter	Microwave Factory	MBP301	224969	RF-1015	1 year	2024-03-19	2025-03-19
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA9120 D	9120D-2280	RF-0845	1 year	2024-03-08	2025-03-08
PreAmp 0-50GHz	NEXTEM	RFA-1050000-40	RFA-1905-01	RF-1140	1 year	2024-12-03	2025-12-03
High Pass Filter (1GHz)	Wainwright Instruments	WHK1000-14SS-10W	1	RF-0550	1 year	2024-07-09	2025-07-09
Horn Antenna, 1-18GHz	Schwarzbeck	BBHA9120 D	9120D-2280	RF-0845	1 year	2024-03-08	2025-03-08
Horn Antenna with Preamplifier, 6-18GHz (RX)	Toyo Corporation	HAP06-18W	B1510452 210-123	RF-1095	N/A	N/A	N/A
High Pass Filter, 8-18GHz	Micro-Tronics	HPM50107	G089	RF-1094	1 year	2024-11-14	2025-11-14
Horn Antenna with Preamplifier, 18-26.5GHz (RX)	Toyo Corporation	HAP18-26N	00000010	RF-0070	1 year	2024-05-01	2025-05-01
Horn Antenna with Preamplifier, 18-26.5GHz (RX)	Toyo Corporation	HAP18-26W	B2010482 210-125	RF-1096	1 year	2024-11-08	2025-11-08
10dB Attenuator	ZTS Technologies Co., Ltd	ZFA2K-40B-10A	1#	RF-1272	1 year	2024-09-24	2025-09-24
20dB Attenuator	ZTS Technologies Co., Ltd	ZFA2K-40B-10A	2#	RF-1273	1 year	2024-09-24	2025-09-24
Horn Antenna with Preamplifier, 26.5 -40GHz (RX)	Toyo Corporation	HAP26-40N	00000007	RF-0069	1 year	2024-05-01	2025-05-01
Horn Antenna with Preamplifier, 26.5 -40GHz (RX)	Toyo Corporation	HAP26-40W	B3208602 210-126	RF-1097	1 year	2024-11-08	2025-11-08
Preamplifier, 18-40GHz	Toyo Corporation	TPA1840-60	B3208602 009-053	RF-0861	1 year	2024-03-19	2025-03-19
Constant Voltage Constant Frequency Stabilizers and Power Accessories							
DC Power Supply	Hewlett Packard	6653A	3640A031 02	RF-0004	N/A	N/A	N/A
True RMS Multimeter	Fluke	87V	97680445	RF-0281	1 year	2024-12-23	2025-12-23

Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 3: Measurement Uncertainty

Measurement Type	Frequency Range	Uncertainty (k=2)
Conducted Emission on RF Ports	30MHz-40GHz	±2.47dB
Magnetic Field Strength	9kHz - 30MHz	±4.79dB
Radiated Emission up to 1GHz	30MHz - 1GHz (3m Distance)	±6.01dB (Vertical) ±4.91dB (Horizontal)
Radiated Emission above 1GHz	1 - 6GHz	±5.15dB
	6 - 18GHz	±5.09dB
	18 - 40GHz	±5.18dB
	40 – 60GHz	±4.73dB
	60 – 75GHz	±4.91dB
	75 – 110GHz	±6.32dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (**E**quipment **U**nder **T**est) is a parking sensor utilizing 24.15GHz radio to detect parked car and communicate via Sub-GHz Radio Interface.

3.2 Ratings and System Details

Rated voltage and frequency:	DC 3.0-3.6V (8500mAh batteries)
Input power:	0.05W
Protection class:	III
Radio standard:	Sub-GHz Transmitter
Peak conducted power:	+12.9dBm
Antenna gain:	-5.0dBi
Antenna type:	Reverse F Antenna
Antenna mounting type:	PCB Pattern
Frequency range:	902-928MHz
Nominal frequency:	902.42 – 927.58MHz
Modulation type:	GFSK
Signal spreading:	FHSS (coupled with modulation type above)
Transmit speed:	100kbps
Number of channels:	75
Channel spacing:	340kHz
FCC equipment class:	DSS
Simultaneous transmission:	Implemented (See below Note.)

Note: One 24GHz transmitter is co-located in the EUT, see the test report JP25E48F 001 for more details.

3.3 Noise Generating and Noise Suppressing Parts

The highest frequency generated or used by the EUT is 927.58MHz for radio portion and unspecified for digital interface.

3.4 Submitted Documents and Information

Following documents have been submitted by the client:

Following information provided in this test report has been submitted by the client:

- client name and address;
- EUT identification, ratings, system details, and description of product function and intended use;
- information related to noise generating and noise suppressing parts (if any).

4. Test Setup and Operation Modes

4.1 Principle of Test Configuration Selection

Radio: The test methodology used is based on the requirements of 47 CFR Part 15, sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209 and 15.247.

The test methods, which have been used, are based on ANSI C63.10 and KDB 558074 D01. For details, see under each test item.

4.2 Operation Modes

The operation modes used for testing are:

A. Transmitting at the lowest frequency Channel with 100% Duty Cycle.

B. Transmitting at the middle frequency Channel with 100% Duty Cycle.

C. Transmitting at the highest frequency Channel with 100% Duty Cycle.

H. Transmitting at pseudo randomly hopping (Hopping Enable).

Above modes are coupled with the following Configurations:

Table 4: Setting of Test Frequencies

Radio	Mode A	Mode B	Mode C	Remark
Sub-GHz Transmitter	902.42MHz	915.00MHz	927.58MHz	

Table 5: Setting of Radio Parameters

Radio	Power Setting	Data Rate	Remark
Sub-GHz Transmitter	13dBm	100kbps	

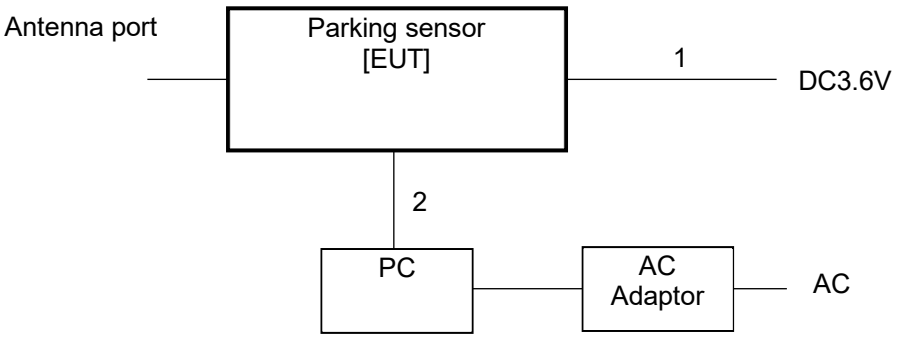
4.3 Physical Configuration for Testing

The EUT was tested on a stand-alone basis and the test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.10.

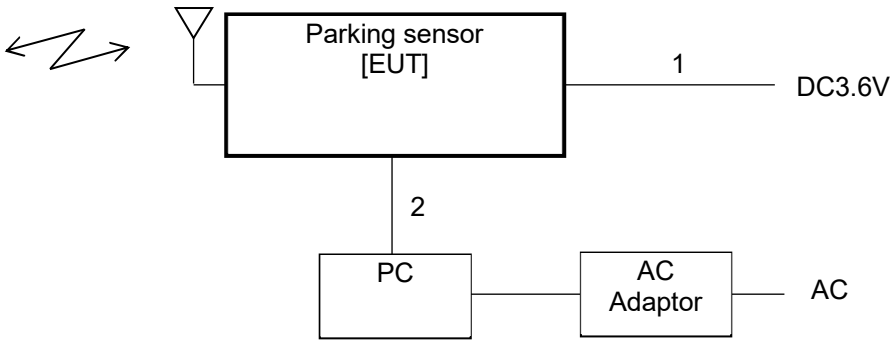
Figure 1: Block Diagram

For Conducted testing



Note:
- DC power was supplied instead of batteries to maintain the constant output power.

For Radiated testing



Note:
- DC power was supplied instead of batteries to maintain the constant output power.
- PC was disconnected from USB cable during the test.

Table 6: Interfaces present on the EUT

No.	Interface	Cable Length for Testing, Shielding	Interface Classification
1.	DC Input	0.7m, un-shielded	DC input power port
2.	USB	1.6m, shielded	Signal port

For more details, refer to section 6 “Photographs of the Test Setup”.

4.4 Test Software

The EUT was provided by the manufacturer with suitable internal software to allow operation in all the required modes.

Software used for testing: PE.STONE.RADIO.TESTER version 1.14.1 by MinebeaMitsumi.

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 4.2 as appropriate.

4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

1. Product: PC (Notebook)
   Manufacturer: Lenovo
   Model: L590
   Rated Voltage: DC20V
   Input Current: 2.25A
   Protection Class: III
   Serial Number: PF-141MAG 19/09

2. Product: AC Adapter
   Manufacturer: Lenovo
   Model: ADLX45YCC2D
   Rated Voltage: 100–240V
   Input Current: 1.3A
   Frequency: 50–60Hz
   Protection Class: II
   Serial Number: 8SSA10R16869C1SG97CH5Y0

4.6 Countermeasures to achieve Compliance

No additional measures were employed to achieve compliance.

5. Test Results RADIO

5.1 Supply Voltage Requirements

RESULT: **Pass**

Requirements:

FCC §15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the supply voltage requirements.

5.2 Antenna Requirements

RESULT: **Pass**

Requirements:

FCC §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
All antennas for use with the EUT must be listed in the application, including a test report.

Verdict:

As per the guidance by KDB Publication No. 353028 D01, three ways can be used for a Part 15 Intentional radiator. a) Antenna permanently addached is applicable to the EUT.

The EUT has an internal antenna permanently attached on the printed circuit board which is not user accessible. Hence it complies with the antenna requirements.

5.3 Restricted Bands of Operation

RESULT: **Pass**

Requirements:

FCC §15.205

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

The Operation frequency range of the EUT is 902-928MHz as Sub-GHz Transmitter, only spurious emissions may be found in the restricted bands below 10GHz. Hence the EUT complies with the restricted frequency band requirement.

5.4 Maximum Peak Output Power

RESULT: **Pass**

Date of testing: 2025-02-07

Ambient temperature: 23°C
Relative humidity: 52%
Atmospheric pressure: 1002hPa

Test mode applied: A, B, C

Requirements:

FCC §15.247(b)(2)

For systems using frequency hopping systems operating in the 902-928MHz band, the maximum peak output power is 1W (30dBm) at least 50 hopping channels.

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

Test procedure:

ANSI C63.10-2020 §11.9, KDB 558074 D01.

The EUT had its hopping function disabled. The maximum peak output power was measured at the antenna port with a peak power meter.

The readings of the measurements took into account the loss generated by all the involved cables.

Maximum average output power was measured as reference for RF Exposure Evaluation.

Table 7: Maximum Peak Output Power

Freq. [MHz]	Peak Output Power [dBm]	Peak Output Power Limit [dBm]	Peak Output Power Margin [dB]
902.42	12.9	30.0	17.1
915.00	12.9	30.0	17.1
927.58	12.7	30.0	17.3

Note:
Cable (including temporary RF cable) and attenuator loss has been compensated for Peak Output Power
e.i.r.p. [dBm] = Peak Output Power [dBm] + Antenna Gain [dBi]

Table 8: Maximum Average Output Power (Reference)

Freq. [MHz]	Average Output Power [dBm]	Antenna Gain [dBi]	Average e.i.r.p. [dBm]
902.42	12.68	-5.0	7.7
915.00	12.58	-5.0	7.6
927.58	12.47	-5.0	7.5

Note:
Reference measurement data for RF Exposure Evaluation.
Cable (including temporary RF cable) and attenuator loss has been compensated for Conducted Reading

5.5 Carrier Frequency Separation

RESULT: **Pass**

Date of testing:	2025-02-07
Ambient temperature:	23°C
Relative humidity:	52%
Atmospheric pressure:	1002hPa
Test mode applied:	H

Requirements:

FCC §15.215(c), §15.247(a)(1)(i)

For system using frequency hopping systems, a carrier frequency must be separated by a minimum 25kHz or the 20dB bandwidth, whichever is greater.

For the system operating in the 902-928MHz band, if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 0.4 seconds period.

The maximum allowed 20dB bandwidth is 500kHz.

Additionally, for FCC, the 20dB bandwidth shall be contained within the frequency band designated in the rule section under which the equipment is operated.

Test procedure:

ANSI C63.10-2020 §6.9.2, §7.8.2 and KDB 558074 D01.

The EUT had its hopping function disabled for 20dB bandwidth measurement. The 20dB bandwidth was measured at the antenna port with a spectrum analyzer at the following settings:

- RBW = 5kHz, VBW = 20kHz, Peak detector with Max-hold

The RBW was set in the range from 1% to 5% of the observed OBW, VBW was set to at least three times of RBW. Markers were placed at the lowest and highest intersections of the trace by 20dB OBW function to obtain the value of the emission bandwidth.

Then, the EUT had its hopping function enabled. The carrier frequency separation was measured at the antenna port with a spectrum analyzer at the following settings:

- RBW = 10kHz, VBW = 30kHz, Peak detector with Max-hold

The RBW was set to best value to identify each individual channel and the VBW was set to at least three times of RBW. Markers placed between the peaks of the adjacent channels, manually.

Table 9: 20dB Bandwidth

Operating Frequency [MHz]	20dB Bandwidth [kHz]	Limit [kHz]
902.42	177.90	≤500
915.00	177.63	≤500
927.58	178.00	≤500

Figure 2: 20dB Bandwidth, Mode A (902.42MHz)

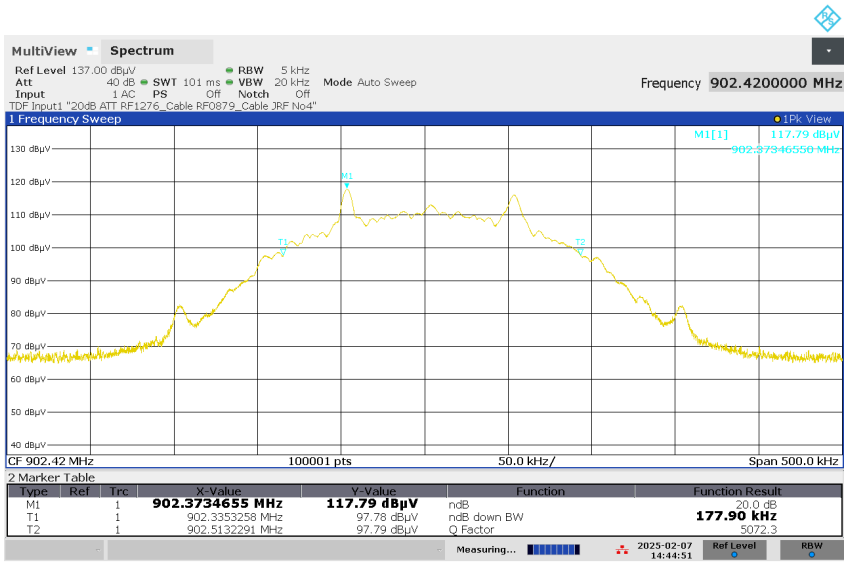


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Figure 3: 20dB Bandwidth, Mode B (915.00MHz)

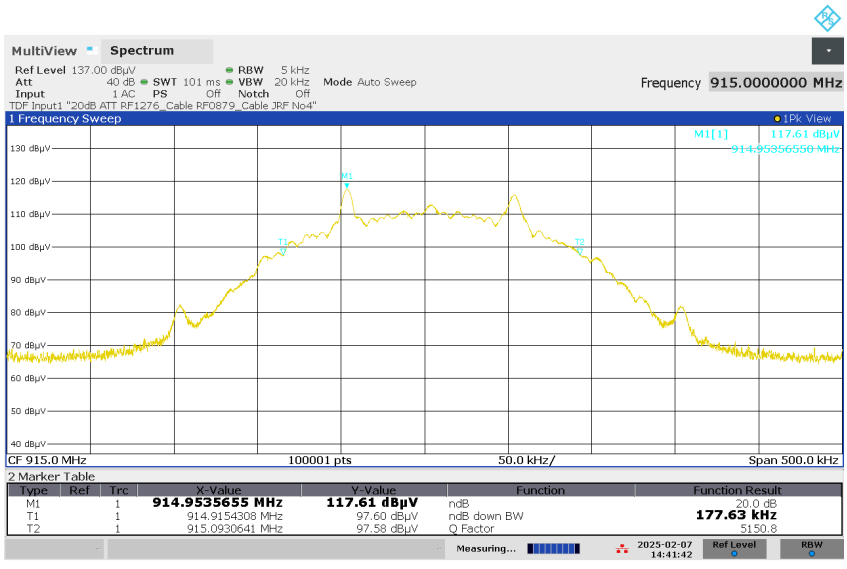

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Figure 4: 20dB Bandwidth, Mode C (927.58MHz)

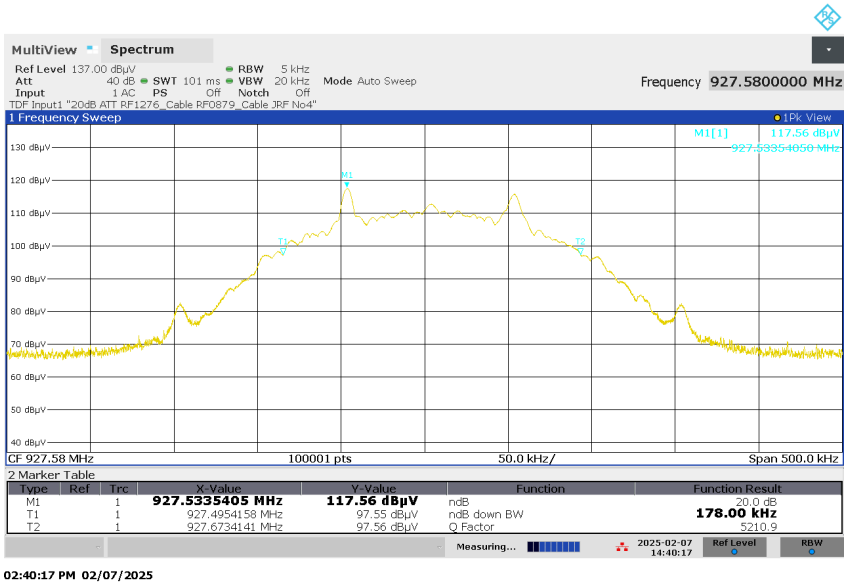

Table 10: Carrier Frequency Separation

Operating Frequency [MHz]	Carrier Frequency Separation [kHz]	Limit [kHz]
902.42	341.950	≥ 177.90
915.00	340.637	≥ 177.63
927.58	340.437	≥ 178.00

Note: For each limit of the Carrier Frequency Separation, see the previous Table 20dB Bandwidth.

Figure 5: Carrier Frequency Separation, Mode A (902.42MHz)

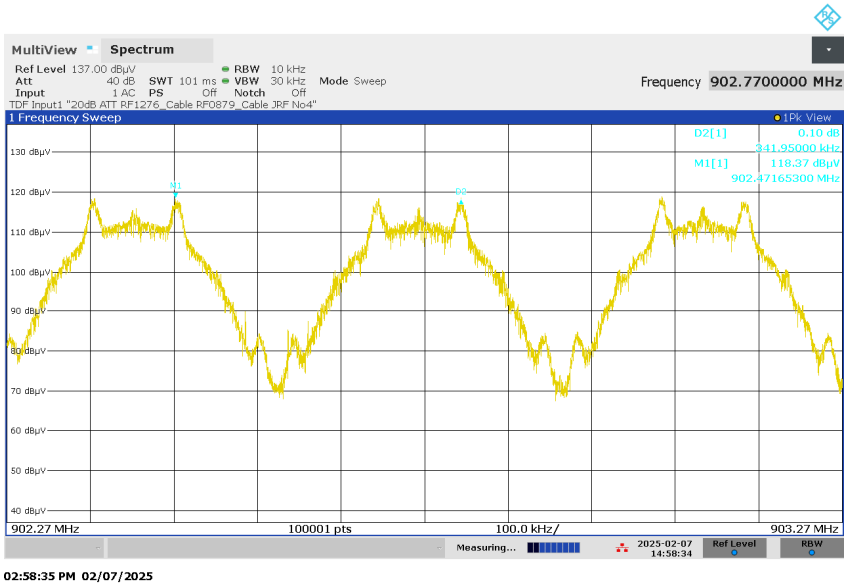

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Figure 6: Carrier Frequency Separation, Mode B (915.00MHz)

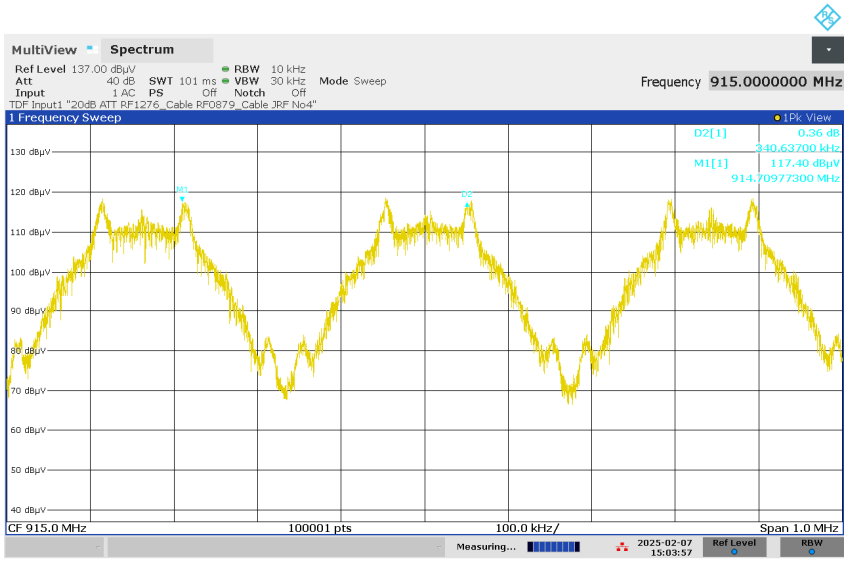

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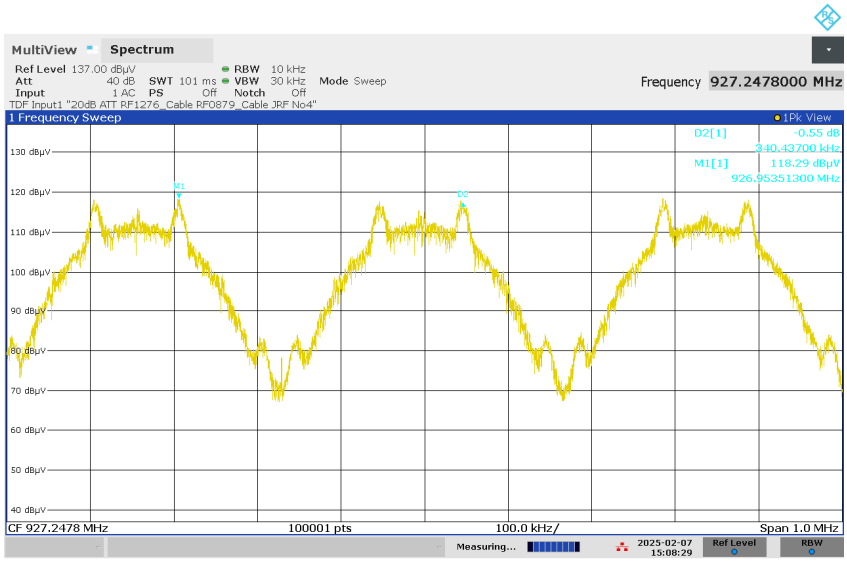
Figure 7: Carrier Frequency Separation, Mode C (927.58MHz)



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5.6 Number of Hopping Frequency

RESULT: **Pass**

Date of testing:	2025-02-07
Ambient temperature:	23°C
Relative humidity:	52%
Atmospheric pressure:	1002hPa
Test mode applied:	H

Requirements:

FCC §15.215(c), §15.247(a)(1)(i)

For the system operating in the 902-928MHz band, if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

Test procedure:

ANSI C63.10-2020 §7.8.3 and KDB 558074 D01.

The EUT had its hopping function enabled. The number of hopping frequencies was measured at the antenna port with a spectrum analyzer at the following settings:

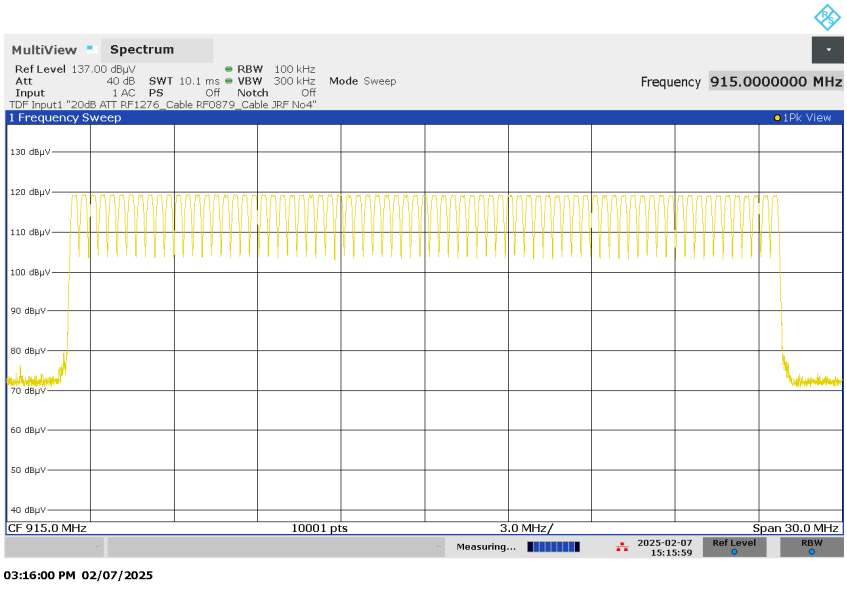
- RBW = 100kHz, VBW = 300kHz, Peak detector with Max-hold

The RBW was set to less than 30% of the channel spacing or the 20dB bandwidth, whichever is smaller and the VBW was set to at least three times of RBW.

Table 11: Number of Hopping Frequency

Operating Mode	Number of Hopping Frequency [channels]	Limit [channels]
Mode H (Hopping Enable)	75	≥50

Figure 8: Number of Hopping Frequency (Mode H)



5.7 Average Time of Occupancy (Dwell Time)

RESULT: **Pass**

Date of testing:	2025-02-07
Ambient temperature:	23°C
Relative humidity:	52%
Atmospheric pressure:	1002hPa
Test mode applied:	H

Requirements:

FCC §15.215(c), §15.247(a)(1)(i)

For the system operating in the 902-928MHz band, if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 seconds period.

Test procedure:

ANSI C63.10-2020 §7.8.4 and KDB 558074 D01.

The EUT had its hopping function enabled. The time of occupancy was measured at the antenna port with a spectrum analyzer at the following settings:

- RBW = 100kHz, VBW = 300kHz, Peak detector with Single trace

In order to determine the number of hops on a channel in the observation period, the measurement was repeated using a longer sweep time on the spectrum analyzer.

The number of hops was counted on the channel across the sweep time.

The average number of hops on the same channel within the observation period (20 seconds) was calculated from the number of hops on the channel divided by the sweep time multiplied by the observation period.

Then, the average time of occupancy was calculated by multiplying the dwell time per hop by the number of hops in the observation period (20 seconds).

Note: The maximum and minimum available payload length settings were configured at Mode H.

Table 12: Number of Hops on a Channel in the Regulatory Observation Period

Payload Length Setting	Frequency of Zero span [MHz]	Sweep time [sec]	Number across the sweep [times]	Average Number within the period [times]
106	915.00	60	3	1
100	915.00	60	3	1

Note: Average Number within the Regulatory observation period (20 seconds) is calculated by the following formula: Average Number within the period = Number across the sweep × (Regulatory observation period/ Sweep time)

Table 13: Average Number of Transmission across the Sweep

Payload Length Setting	Trial 1 [times]	Trial 2 [times]	Trial 3 [times]	Trial 4 [times]	Trial 5 [times]	Average [times]
106	3	3	3	3	3	3
100	3	3	3	3	3	3

Note: Averaged by the five trials of sweep for the Average Time of Occupancy.

Table 14: Average Number of Burst per one Transmission

Payload Length Setting	Trial 1 [times]	Trial 2 [times]	Trial 3 [times]	Trial 4 [times]	Trial 5 [times]	Average [times]
106	17	17	17	17	17	17
100	17	17	17	17	17	17

Note: Averaged by the five trials of sweep for the Average Time of Occupancy.

Table 15: Average Time of Occupancy

Payload Length Setting	Average Number within the period (20 seconds) [times]	Number of Burst in one transmission [times]	Time of One Burst [ms]	Average Time of Occupancy in 20 seconds [sec]	Limit [sec]
106	1	17	9.39	0.16	0.400
100	1	17	8.91	0.15	0.400

Note: Average Time of Occupancy is calculated by the following formula:
Average Time of Occupancy = Number of Tx × Number of Burst × (Time of One Burst / 1000)

Figure 9: Time of One Burst, Mode H (Payload length setting 106)

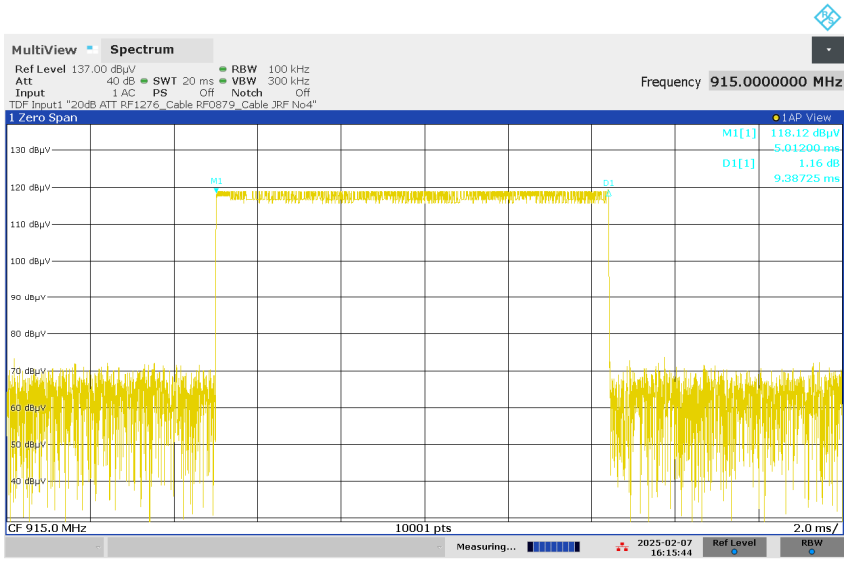


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Figure 10: Number of Burst in one transmission, Mode H (Payload length setting 106)

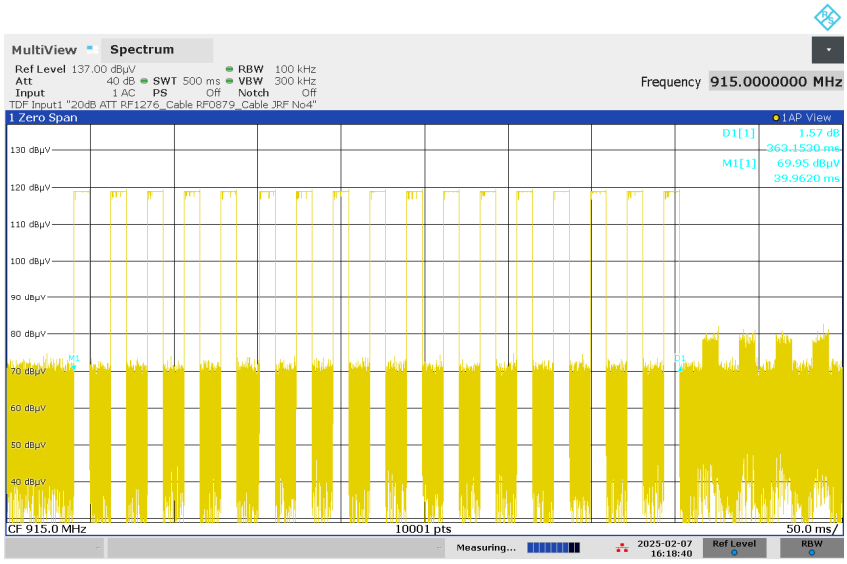

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Figure 11: Numbers across the Sweep, Mode H (Payload length setting 106)

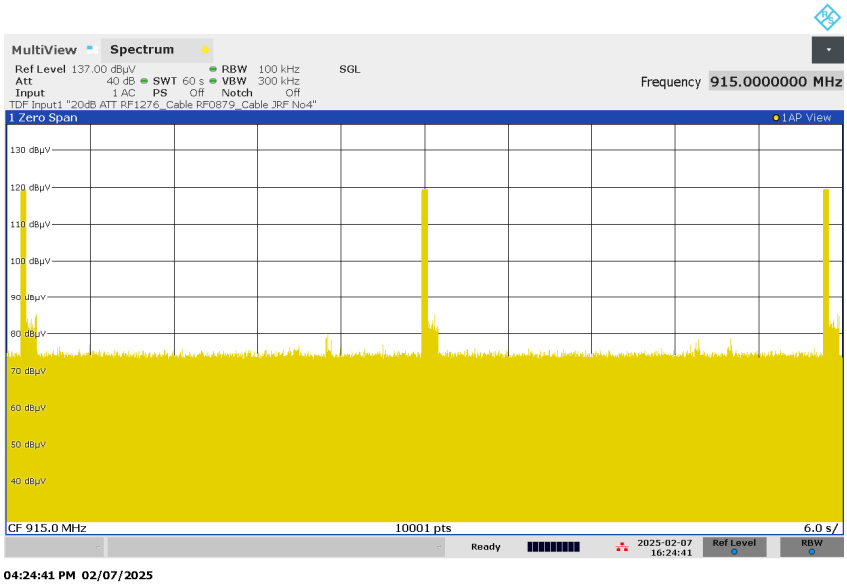

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Figure 12: Time of One Burst, Mode H (Payload length setting 100)

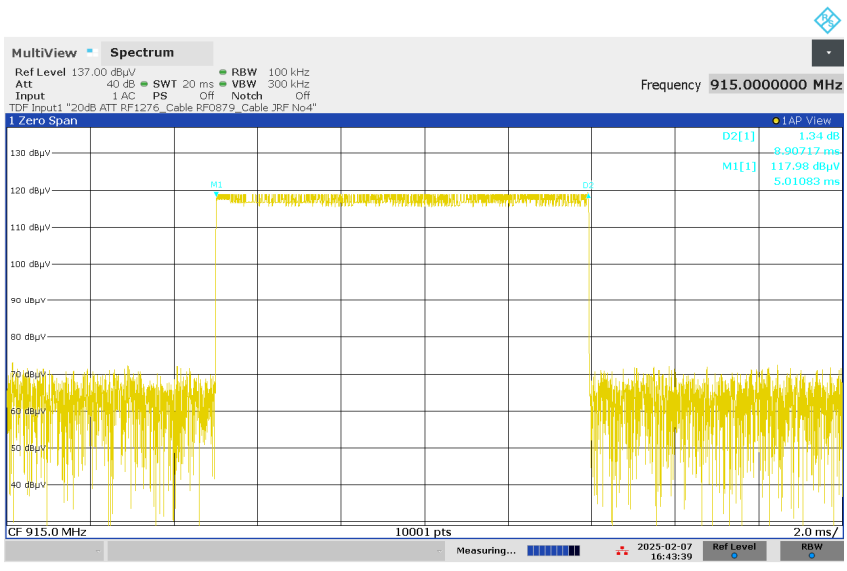

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Figure 13: Number of Burst in one transmission, Mode H (Payload length setting 100)

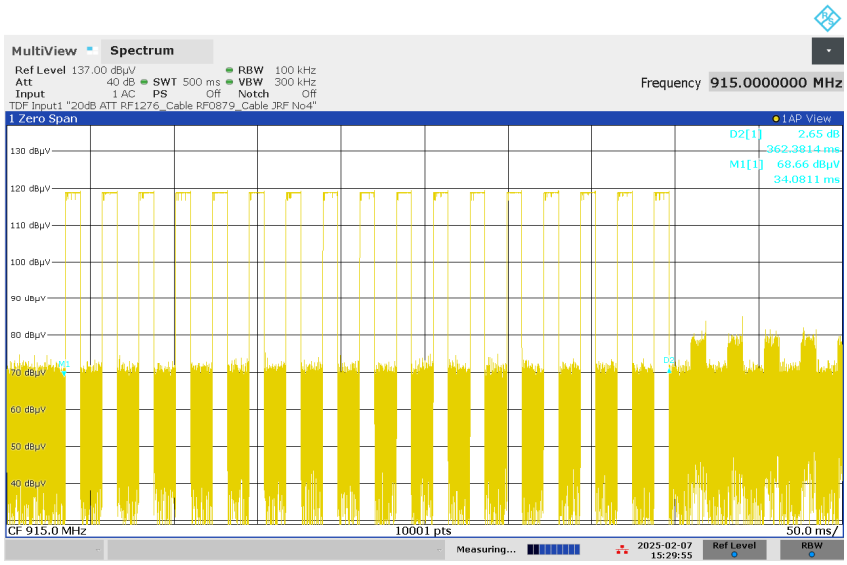

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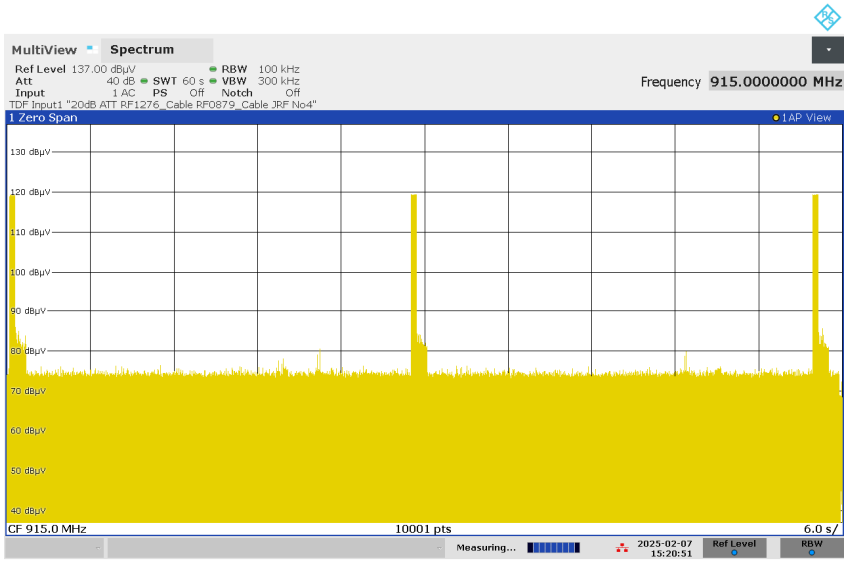
Figure 14: Numbers across the Sweep, Mode H (Payload length setting 100)



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5.8 99% Bandwidth

RESULT: **For. Ref.**

Date of testing:	2025-02-07
Ambient temperature:	23°C
Relative humidity:	52%
Atmospheric pressure:	1002hPa
Test mode applied:	A, B, C

Test procedure:

ANSI C63.10-2020 §6.9.3

The 99% bandwidth was measured at the antenna port with a spectrum analyzer at the following settings:

- RBW = 5kHz, VBW = 20kHz, Peak detector with Max-hold

The RBW was set in the range from 1% to 5% of the observed OBW, VBW was set to at least three times of RBW. Markers were placed at the lowest and highest intersections of the trace by 99% OBW function to obtain the value of the 99% emission bandwidth.

Table 16: 99% Bandwidth

Operating Frequency [MHz]	99% Bandwidth [MHz]	Remarks
902.42	183.010	Widest OBW
915.00	182.344	
927.58	182.414	

Figure 15: 99% Bandwidth, Mode A (902.42MHz)

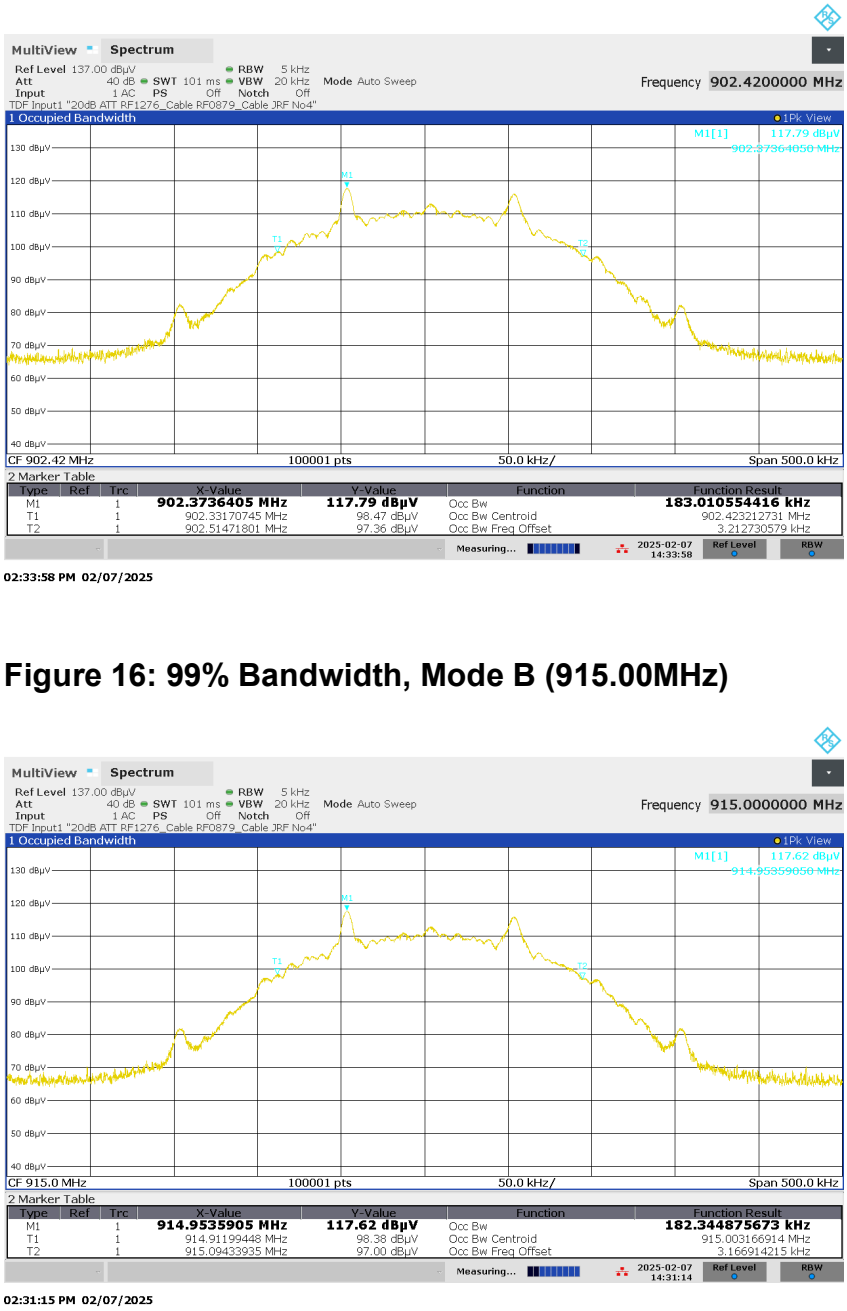

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Figure 16: 99% Bandwidth, Mode B (915.00MHz)

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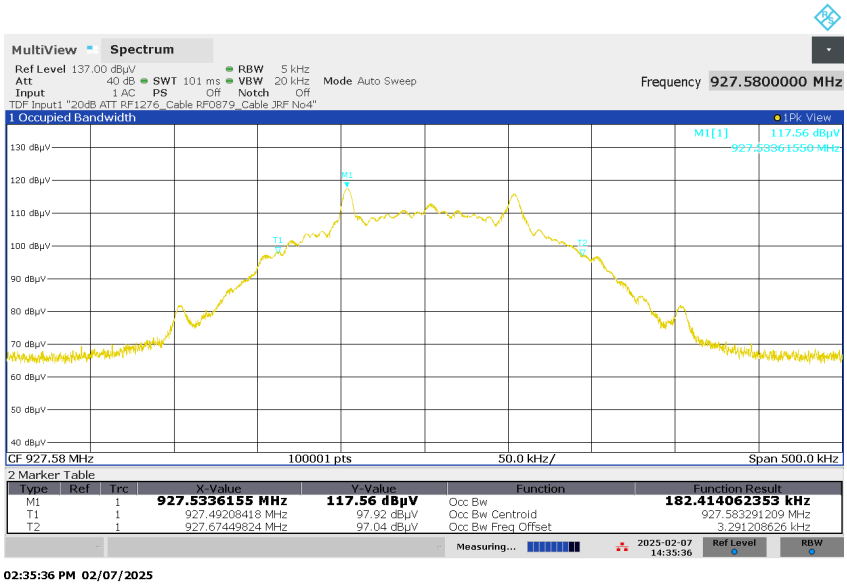
Figure 17: 99% Bandwidth, Mode C (927.58MHz)



5.9 Duty Cycle

RESULT: **For. Ref.**

Date of testing: 2025-02-07

Ambient temperature: 23°C
Relative humidity: 52%
Atmospheric pressure: 1002hPa

Test mode applied: A, B, C

Requirements:

N/A, this test item was performed as reference.

Test procedure:

ANSI C63.10-2020 §7.5 and KDB 558074 D01.

Note:

As the observed duty cycle achieved by the test modes was 100% for mode A, B and C, no duty cycle correction was made on this test report, unless otherwise indicated.

However, as this Sub-GHz Transmitter is FHSS device, particular average emission levels could be applied a **D**uty **C**ycle **C**orrection **F**actor (DCCF) at radiated spurious emission measurements in the section 5.11 of this test report.

The following guidance of the section 9 b) of KDB 558074 D01 was applied.

This DCCF can be applied when the unwanted emission limit is subject to an average field strength limit and the conditions specified in §15.35(c) can be satisfied.

The average radiated field strength is calculated by subtracting the DCCF from the maximum radiated field strength level as determined through measurement. The maximum radiated field strength level represents the worst-case (maximum amplitude) average measurement of the emission(s) during continuous transmission.

As per the Equation (10) at section 7.5 of ANSI C63.10-2020, DCCF was calculated by the following formula.

$$DCCF = 20 \times \mathrm{Log}_{10} \text{ (maximum dwell time in 100ms/100ms)}$$

The maximum dwell time in any 100ms window was identified by Mode H.

Table 17: Duty Cycle for Mode A to C

Operating Frequency [MHz]	On-Time [ms]	Period [ms]	Duty Cycle [%]
902.42	100	100	100
915.00	100	100	100
927.58	100	100	100

Note: These duty cycles show the continuous transmission during measurements at Mode A, B and C.

Figure 18: Duty Cycle, Mode A (902.42MHz)

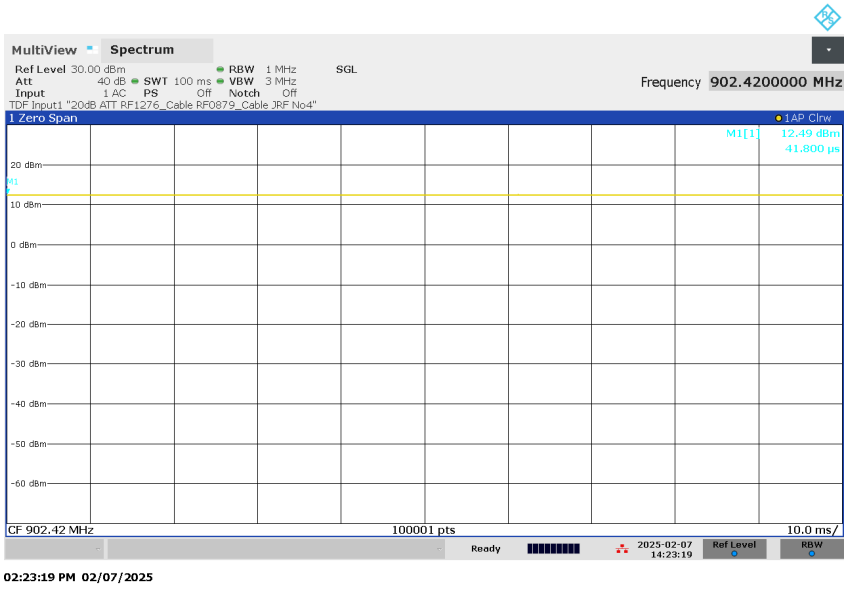


Figure 19: Duty Cycle, Mode B (915.00MHz)

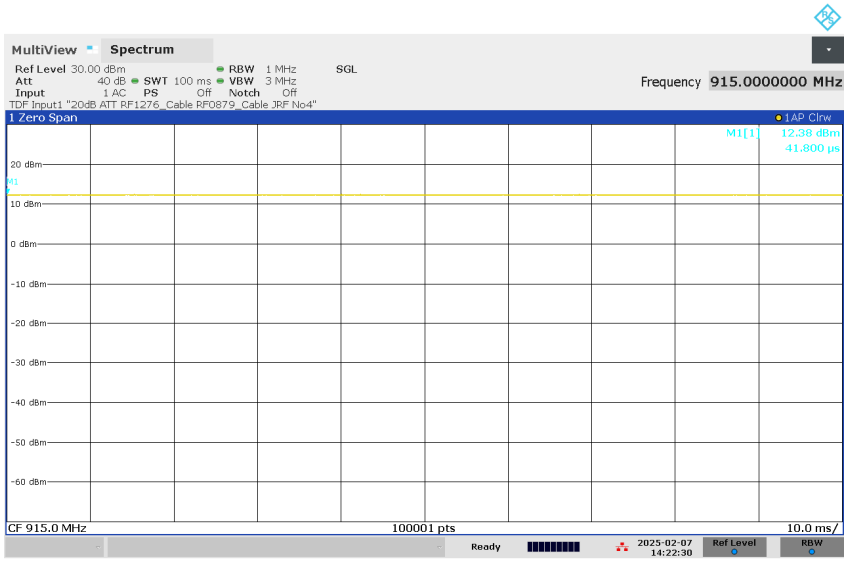


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Figure 20: Duty Cycle, Mode C (927.58MHz)

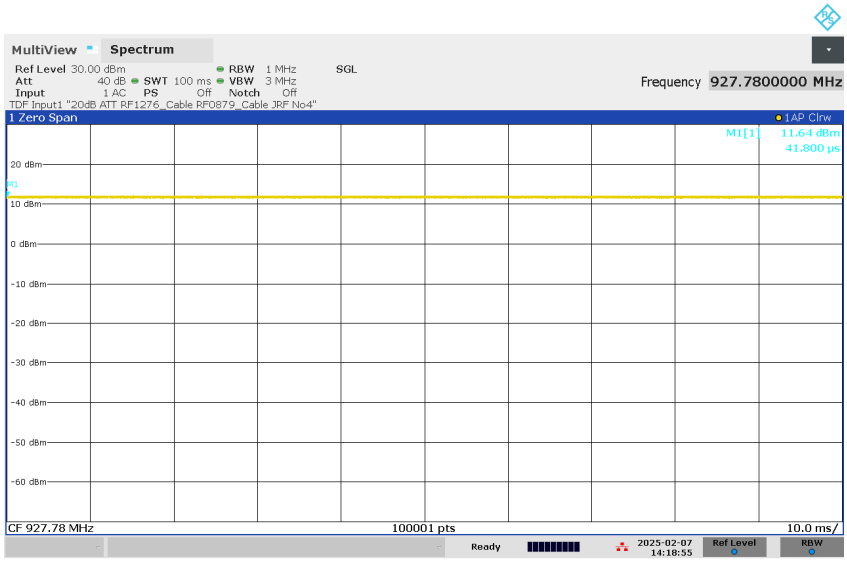

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Table 18: DCCF Calculation

Operating Frequency [MHz]	1 burst duration [ms]	Number of burst	Maximum dwell time [ms]	15.35(c) time-window [ms]	Duty Cycle [%]	DCCF [dB]
902.42	9.36	5	46.80	100	46.80	-6.60
915.00	9.37	5	46.85	100	46.85	-6.59
927.58	9.36	5	46.80	100	46.80	-6.60

Note:
Maximum dwell time = 1 burst duration × Number of burst
DCCF was calculated by the formula: DCCF = 20 × Log_{10} (Maximum dwell time/100)

Figure 21: Maximum dwell time in 100ms window, Mode A (902.42MHz)

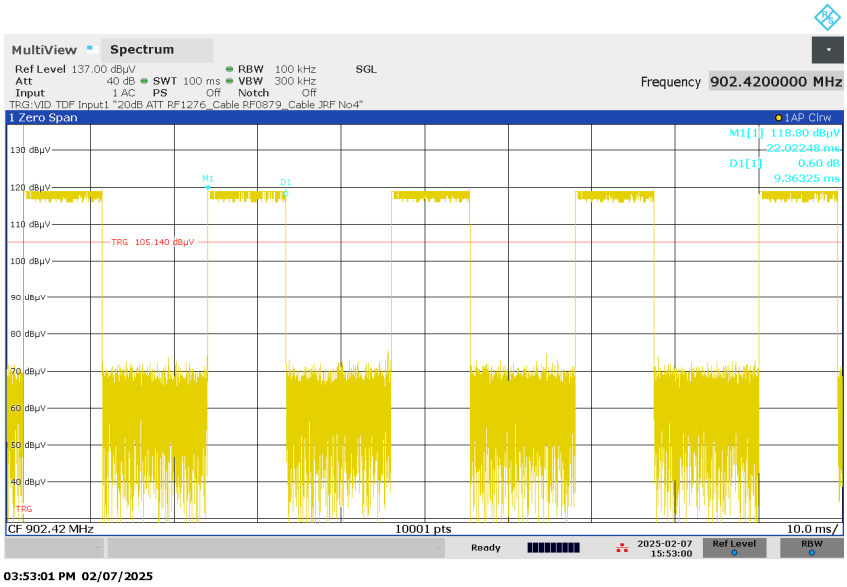

Figure 22: Maximum dwell time in 100ms window, Mode B (915.00MHz)

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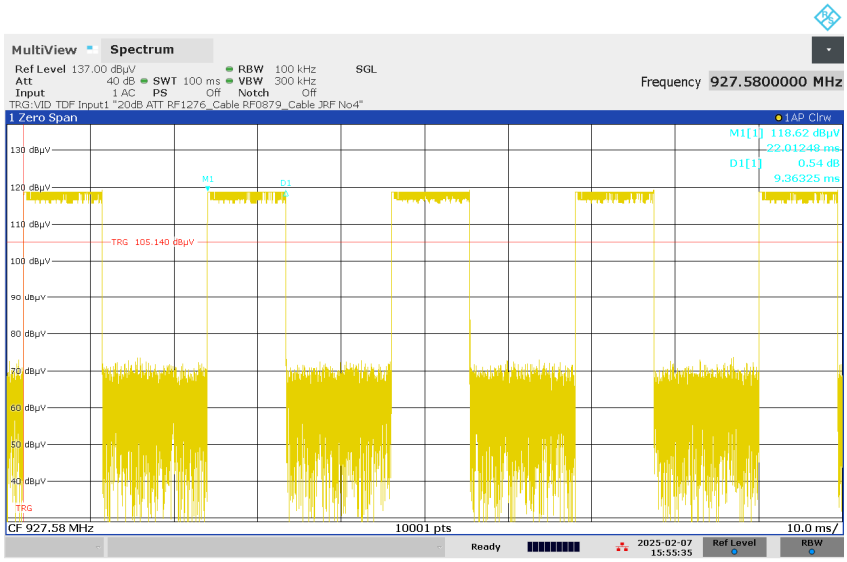
Figure 23: Maximum dwell time in 100ms window, Mode C (927.58MHz)



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5.10 Conducted Spurious Emissions

RESULT: **Pass**

Date of testing: 2025-02-07

Ambient temperature: 23°C
Relative humidity: 52%
Atmospheric pressure: 1002hPa

Test mode applied: A, B, C

Requirements:

FCC §15.247(d)

In any 100kHz bandwidth outside the frequency band in which the intentional radiator is operating, the RF power shall be at least 20dBc (Peak) below that of the maximum in-band 100kHz emission.

Test procedure:

ANSI C63.10-2020 §6.7, §6.10 and KDB 558074 D01.

The conducted spurious emissions were measured at the antenna port with a spectrum analyzer using a peak detector. The RBW was set to 100kHz and the VBW was set to 300kHz. Measurements were performed from 30MHz to 10GHz (10^{th} harmonics).

The readings of the measurements took into account the loss generated by all the involved cables.

Authorized-band band-edge measurements (relative method) were performed by conducted, as per §6.10.4 of ANSI C63.10-2020.

Figure 24: Conducted Spurious Emissions, 30MHz - 10GHz, Mode A (902.42MHz)

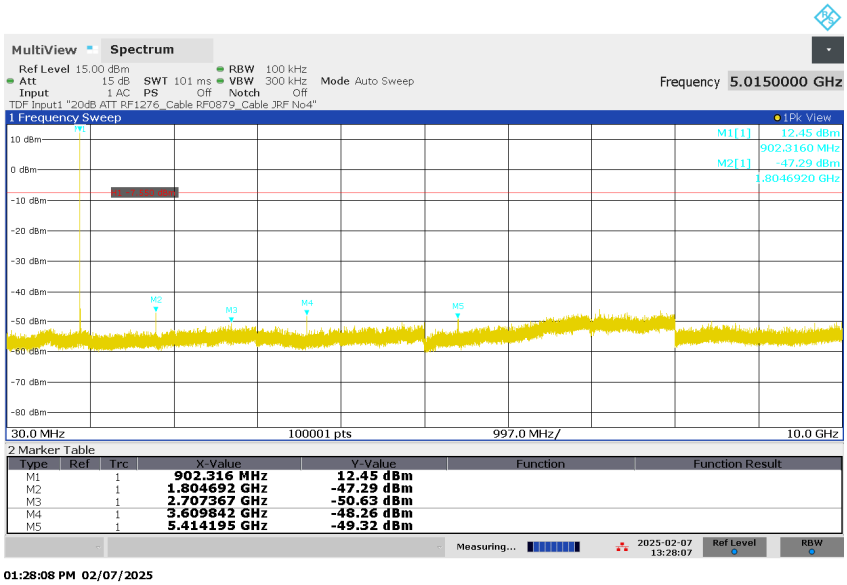

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Figure 25: Conducted Spurious Emissions, 30MHz - 10GHz, Mode B (915.00MHz)

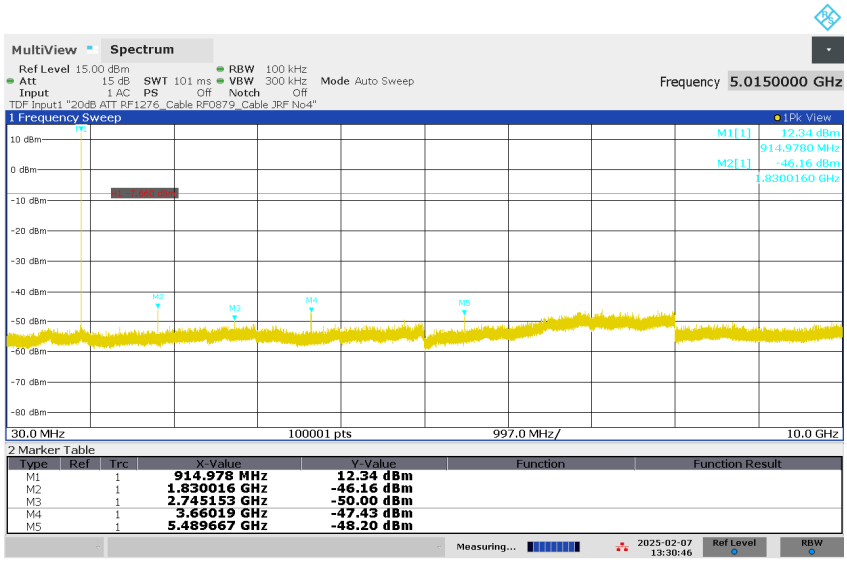

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Figure 26: Conducted Spurious Emissions, 30MHz - 10GHz, Mode C (927.58MHz)

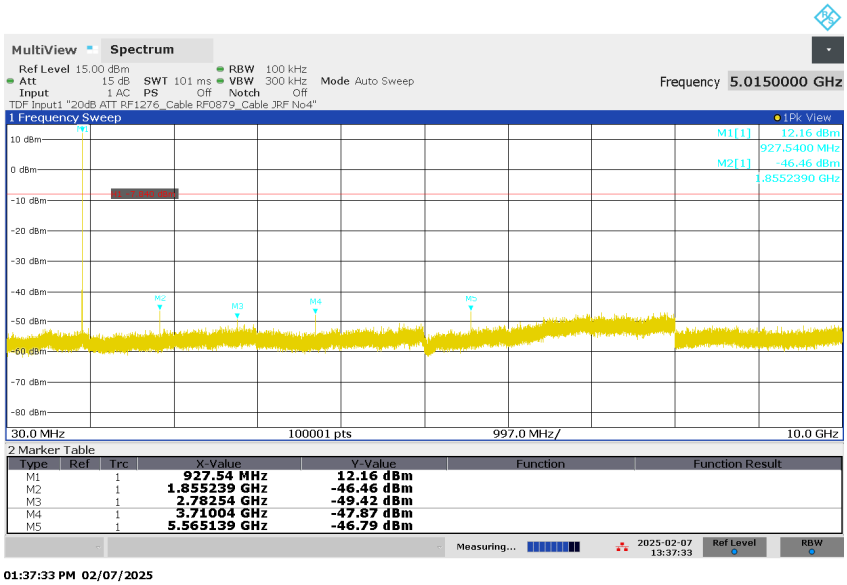

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Figure 27: Conducted Spurious Emissions, 30MHz - 10GHz, Mode H

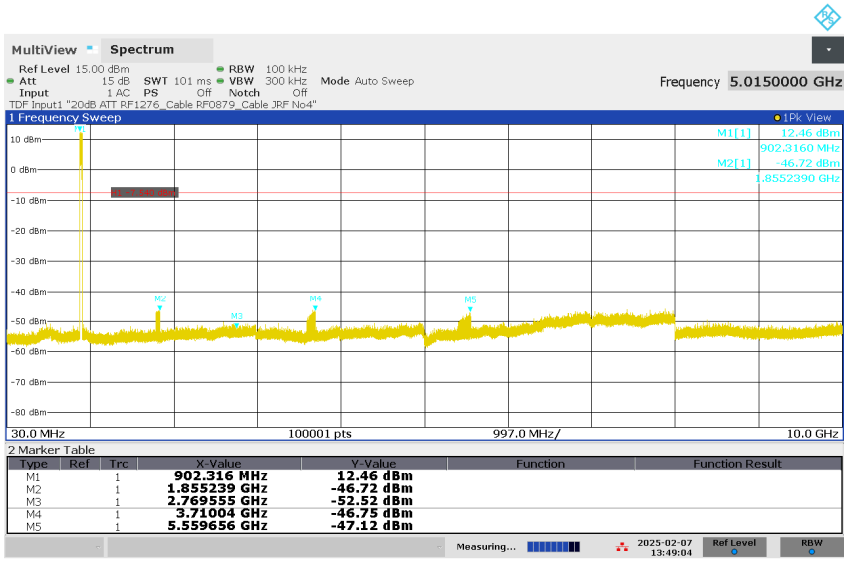

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Figure 28: Authorized-band band-edge, Mode A, Hopping Disable (902.42MHz)

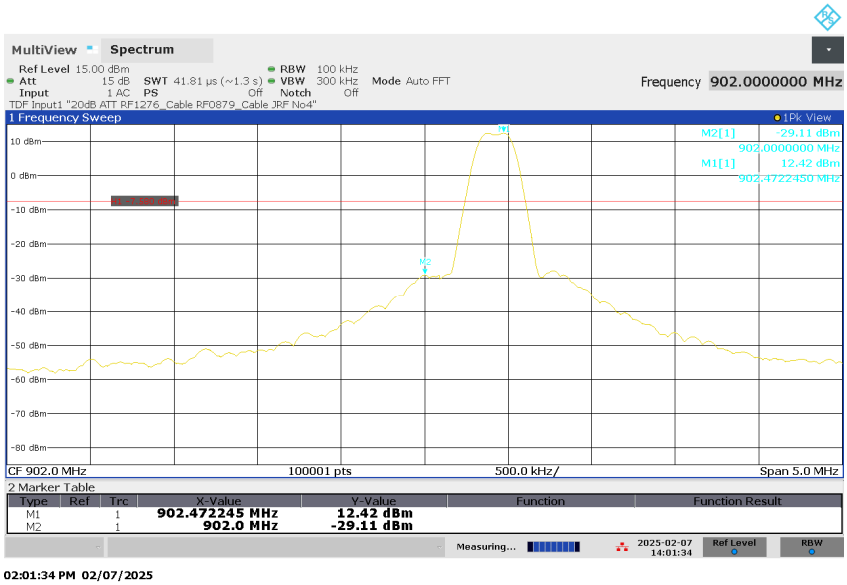

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Figure 29: Authorized-band Band-edge, Mode C, Hopping Disable (927.58MHz)

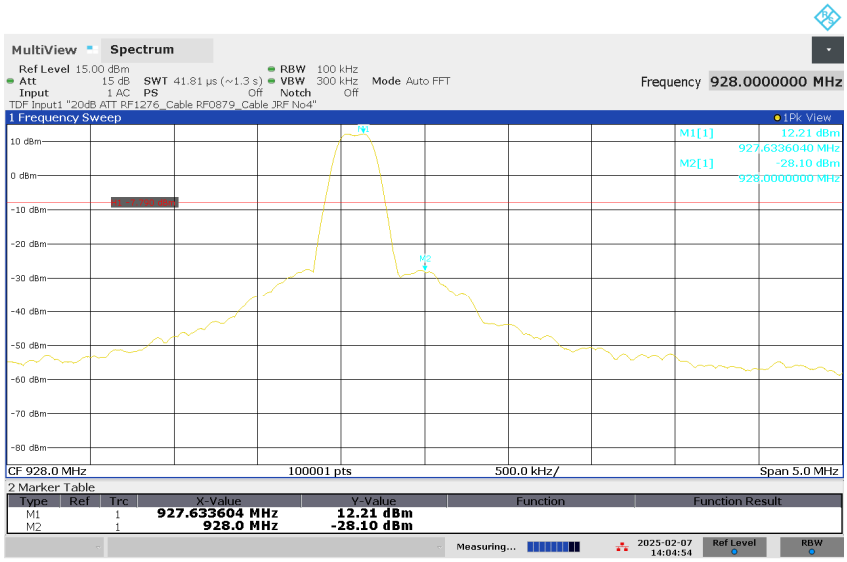

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Figure 30: Authorized-band Band-edge, Mode H, Hopping Enable (902.42MHz)

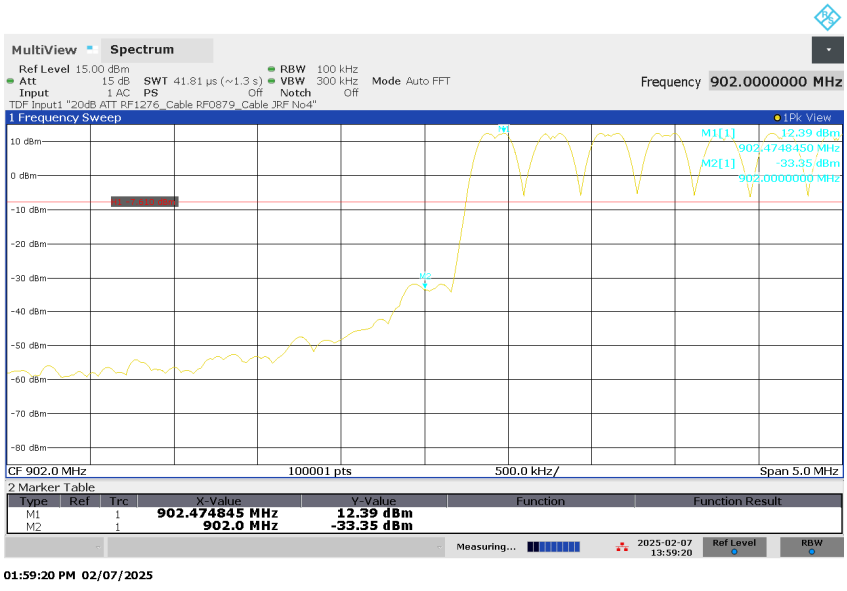

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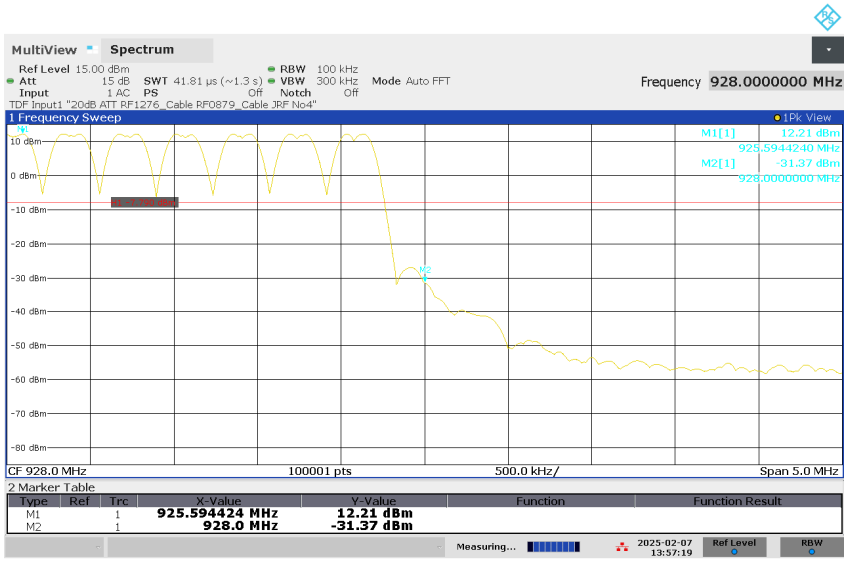
Figure 31: Authorized-band Band-edge, Mode H, Hopping Enable (927.58MHz)



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5.11 Radiated Spurious Emissions of Transmitter

RESULT: **Pass**

Date of testing:	2025-01-28, 2025-01-30, 2025-01-31 2025-02-04
Ambient temperature:	24, 24, 22, 24°C
Relative humidity:	27, 34, 47, 30%
Atmospheric pressure:	1003, 1009, 1015, 1006hPa
Frequency range:	9kHz - 10GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber
Test mode applied:	A, B, C

Requirements:

FCC §15.205, §15.209, §15.247(d)

Radiated emissions which fall in the restricted bands, as defined in FCC §15.205(a) must comply with the radiated emission limits specified in FCC §15.209(a).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC §15.209(a) or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Test procedure:

ANSI C63.10-2020 §6.3, §6.4, §6.5, §6.6, §6.10 and KDB 558074 D01

The EUT was placed on a nonconductive turntable. The table height was 80cm for measurements below 1GHz and 1.5m for measurements above 1GHz. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 9kHz to the 10th harmonic of the highest fundamental transmitter frequency (10GHz). Final radiated emission measurements were made at 3m distance.

At each frequency where a spurious emission was found, the EUT was rotated 360° in order to determine the emission’s maximum level. For frequencies above 30MHz, the antenna was raised and lowered from 1 to 4m and measurements were taken using both horizontal and vertical antenna polarizations.

For emissions between 30MHz and 1GHz, measurements were performed with a test receiver operating in the CISPR quasi-peak detection mode with a 6dB bandwidth set to 120kHz.

For emissions above 1GHz, measurements were performed with a spectrum analyzer using the following settings: for peak field strength: RBW = 1MHz & VBW = 3MHz; for average field strength: RBW = 1MHz & VBW = 10Hz. Positive peak detector was applied.

Absorbers have been placed on the floor between the EUT and the measuring antenna for testing above 1GHz.

As this Sub-GHz Transmitter is FHSS device, particular average emission levels were applied a DCCF. The maximum dwell time in any 100ms were identified and caldulated. Refer to the section 5.9 in this test report for details.

In additions, for emission above 1GHz in non-restricted bands, measurement were performed to the requirements of 20dBc, as per §11.11 of ANSI C63.10-2020.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

Table 19: Radiated Emissions, Quasi Peak Data, 9kHz - 30MHz, Mode A (902.42MHz)

Freq. [MHz]	EUT / Antenna Orient.	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Angle [°]
0.0153	X/H	14.3	19.7	34.0	123.9	89.9	353
0.0456	X/H	4.5	19.6	24.1	114.4	90.3	7
0.3559	X/H	7.0	19.5	26.5	96.6	70.1	352
1.3626	X/H	5.6	19.5	25.1	64.9	39.8	342
11.0899	X/H	5.9	19.8	25.7	69.5	43.8	70
0.0117	X/V	16.3	19.8	36.1	126.3	90.2	51
0.0381	X/V	5.7	19.6	25.3	116.0	90.7	359
0.2092	X/V	10.1	19.5	29.6	101.2	71.6	339
0.5504	X/V	6.6	19.4	26.0	72.8	46.8	119
27.1307	X/V	6.8	20.1	26.9	69.5	42.6	46

Note: Level QP = Reading QP + Factor

Table 20: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode A, 902.42MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
214.663	X/H	48.2	-22.7	25.5	43.5	18.0	144	224
332.117	X/H	45.4	-18.0	27.4	46.0	18.6	100	225
192.929	X/V	45.0	-22.1	22.9	43.5	20.6	100	348
711.438	X/V	36.5	-10.2	26.3	46.0	19.7	100	359

Note: Level QP = Reading QP + Factor

Table 21: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode B, 915.00MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
332.426	X/H	45.8	-18.0	27.8	46.0	18.2	100	215
214.889	X/H	48.7	-22.7	26.0	43.5	17.5	143	225
721.779	X/V	31.1	-10.0	21.1	46.0	24.9	400	349
193.550	X/V	45.0	-22.1	22.9	43.5	20.6	100	343

Note: Level QP = Reading QP + Factor

Table 22: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode C, 927.58MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
334.568	Z/H	44.4	-18.0	26.4	46.0	19.6	100	126
755.689	Z/H	37.0	-9.2	27.8	46.0	18.2	106	15
191.450	Z/V	44.3	-22.0	22.3	43.5	21.2	100	346
763.844	Z/V	32.9	-9.2	23.7	46.0	22.3	158	359

Note: Level QP = Reading QP + Factor

Table 23: Radiated Emissions in the restricted bands, Peak Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, Mode A, 902.42MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1804.84	X/H	72.7	-18.5	54.2	74.0	19.8	157	204
2707.28	X/H	66.6	-14.4	52.2	74.0	21.8	121	320
3609.67	X/H	65.8	-12.4	53.4	74.0	20.6	136	74
5414.55	X/H	65.6	-7.7	57.9	74.0	16.1	148	43
7219.39	X/H	58.1	-1.8	56.3	74.0	17.7	397	66
8121.85	X/H	50.5	-3.7	46.8	74.0	27.2	210	29
1804.87	X/V	73.1	-18.5	54.6	74.0	19.4	142	45
2707.26	X/V	64.4	-14.4	50.0	74.0	24.0	148	24
3609.72	X/V	66.9	-12.4	54.5	74.0	19.5	153	35
5414.55	X/V	64.9	-7.7	57.2	74.0	16.8	148	154
8121.80	X/V	50.6	-3.7	46.9	74.0	27.1	100	137
9024.20	X/V	48.2	-4.0	44.2	74.0	29.8	100	302
1804.72	Y/H	70.8	-18.5	52.3	74.0	21.7	166	129
2707.26	Y/H	68.2	-14.4	53.8	74.0	20.2	103	32
3609.70	Y/H	63.8	-12.4	51.4	74.0	22.6	100	71
5414.55	Y/H	66.6	-7.7	58.9	74.0	15.1	145	295
1804.77	Y/V	72.0	-18.5	53.5	74.0	20.5	224	84
2707.28	Y/V	65.8	-14.4	51.4	74.0	22.6	400	294
3609.67	Y/V	64.7	-12.4	52.3	74.0	21.7	167	118
5414.53	Y/V	65.7	-7.7	58.0	74.0	16.0	166	225
2707.28	Z/H	65.7	-14.4	51.3	74.0	22.7	100	108
3609.67	Z/H	64.5	-12.4	52.1	74.0	21.9	400	83
5414.56	Z/H	67.7	-7.7	60.0	74.0	14.0	225	133
1804.89	Z/V	73.6	-18.5	55.1	74.0	18.9	100	280
2707.26	Z/V	68.6	-14.4	54.2	74.0	19.8	186	17
3609.70	Z/V	64.0	-12.4	51.6	74.0	22.4	145	175
5414.53	Z/V	63.6	-7.7	55.9	74.0	18.1	145	345

Note: Level PK = Reading PK + Factor

Table 24: Radiated Emissions in the restricted bands, Average Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, Mode A, 902.42MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading AV [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1804.84	X/H	71.3	-18.5	-6.60	46.2	54.0	7.8	157	204
2707.28	X/H	63.5	-14.4	-6.60	42.5	54.0	11.5	121	320
3609.67	X/H	62.7	-12.4	-6.60	43.7	54.0	10.3	136	74
7219.39	X/H	51.1	-1.8	-6.60	42.7	54.0	11.3	397	66
8121.85	X/H	41.9	-3.7	-6.60	31.6	54.0	22.4	210	29
1804.87	X/V	71.9	-18.5	-6.60	46.8	54.0	7.2	142	45
2707.26	X/V	60.3	-14.4	-6.60	39.3	54.0	14.7	148	24
3609.72	X/V	64.1	-12.4	-6.60	45.1	54.0	8.9	153	35
5414.55	X/V	61.4	-7.7	-6.60	47.1	54.0	6.9	148	154
8121.80	X/V	43.1	-3.7	-6.60	32.8	54.0	21.2	100	137
9024.20	X/V	37.5	-4.0	-6.60	26.9	54.0	27.1	100	302
1804.72	Y/H	69.2	-18.5	-6.60	44.1	54.0	9.9	166	129
2707.26	Y/H	65.8	-14.4	-6.60	44.8	54.0	9.2	103	32
3609.70	Y/H	59.4	-12.4	-6.60	40.4	54.0	13.6	100	71
1804.77	Y/V	70.6	-18.5	-6.60	45.5	54.0	8.5	224	84
2707.28	Y/V	62.4	-14.4	-6.60	41.4	54.0	12.6	400	294
3609.67	Y/V	61.0	-12.4	-6.60	42.0	54.0	12.0	167	118
2707.28	Z/H	62.6	-14.4	-6.60	41.6	54.0	12.4	100	108
3609.67	Z/H	60.8	-12.4	-6.60	41.8	54.0	12.2	400	83
1804.89	Z/V	72.3	-18.5	-6.60	47.2	54.0	6.8	100	280
2707.26	Z/V	66.6	-14.4	-6.60	45.6	54.0	8.4	186	17
3609.70	Z/V	60.2	-12.4	-6.60	41.2	54.0	12.8	145	175
5414.53	Z/V	59.8	-7.7	-6.60	45.5	54.0	8.5	145	345
5414.55	X/H	62.5	-7.7	-6.60	48.2	54.0	5.8	148	43
5414.55	Y/H	63.8	-7.7	-6.60	49.5	54.0	4.5 (*)	145	295
5414.53	Y/V	62.4	-7.7	-6.60	48.1	54.0	5.9	166	225
5414.56	Z/H	65.3	-7.7	-6.60	51.0	54.0	3.0 (*)	225	133

Note: Level AV = Reading AV + Factor + DCCF

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Table 25: Radiated Emissions in the restricted bands, Peak Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, Mode B, 915.00MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
2745.03	X/H	68.7	-14.2	54.5	74.0	19.5	122	314
3660.02	X/H	64.1	-12.2	51.9	74.0	22.1	103	72
4575.04	X/H	59.1	-9.6	49.5	74.0	24.5	146	45
7320.02	X/H	59.3	-1.8	57.5	74.0	16.5	100	318
8235.00	X/H	50.2	-3.5	46.7	74.0	27.3	145	59
2745.03	X/V	65.2	-14.2	51.0	74.0	23.0	100	217
3660.03	X/V	64.7	-12.2	52.5	74.0	21.5	100	40
4575.02	X/V	60.7	-9.6	51.1	74.0	22.9	245	37
5489.69	X/V	64.2	-7.6	56.6	74.0	17.4	110	49
7320.04	X/V	58.4	-1.8	56.6	74.0	17.4	100	43
8235.00	X/V	51.3	-3.5	47.8	74.0	26.2	166	86
2745.01	Y/H	69.4	-14.2	55.2	74.0	18.8	100	18
3660.02	Y/H	63.3	-12.2	51.1	74.0	22.9	100	80
4575.01	Y/H	61.1	-9.6	51.5	74.0	22.5	100	336
5490.08	Y/H	64.3	-7.6	56.7	74.0	17.3	146	300
7320.00	Y/H	59.9	-1.8	58.1	74.0	15.9	166	230
1830.04	Y/V	72.3	-18.3	54.0	74.0	20.0	110	103
2745.03	Y/V	65.6	-14.2	51.4	74.0	22.6	100	0
3660.02	Y/V	63.8	-12.2	51.6	74.0	22.4	226	299
4575.01	Y/V	60.7	-9.6	51.1	74.0	22.9	146	355
7320.01	Y/V	59.9	-1.8	58.1	74.0	15.9	400	190
2745.03	Z/H	66.5	-14.2	52.3	74.0	21.7	145	125
3660.05	Z/H	63.8	-12.2	51.6	74.0	22.4	121	267
4574.99	Z/H	60.9	-9.6	51.3	74.0	22.7	100	1
7320.01	Z/H	60.4	-1.8	58.6	74.0	15.4	100	51
2745.01	Z/V	69.9	-14.2	55.7	74.0	18.3	167	17
3660.02	Z/V	62.7	-12.2	50.5	74.0	23.5	186	171
4575.01	Z/V	58.9	-9.6	49.3	74.0	24.7	100	50
5489.87	Z/V	64.4	-7.6	56.8	74.0	17.2	206	271
7320.05	Z/V	59.7	-1.8	57.9	74.0	16.1	100	19

Note: Level PK = Reading PK + Factor

Table 26: Radiated Emissions in the restricted bands, Average Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, Mode B, 915.00MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading AV [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
2745.03	X/H	66.8	-14.2	-6.59	46.0	54.0	8.0	122	314
3660.02	X/H	60.3	-12.2	-6.59	41.5	54.0	12.5	103	72
4575.04	X/H	51.9	-9.6	-6.59	35.7	54.0	18.3	146	45
7320.02	X/H	53.2	-1.8	-6.59	44.8	54.0	9.2	100	318
8235.00	X/H	42.4	-3.5	-6.59	32.3	54.0	21.7	145	59
2745.03	X/V	61.9	-14.2	-6.59	41.1	54.0	12.9	100	217
3660.03	X/V	61.3	-12.2	-6.59	42.5	54.0	11.5	100	40
4575.02	X/V	54.9	-9.6	-6.59	38.7	54.0	15.3	245	37
5489.69	X/V	60.7	-7.6	-6.59	46.5	54.0	7.5	110	49
7320.04	X/V	51.9	-1.8	-6.59	43.5	54.0	10.5	100	43
8235.00	X/V	44.2	-3.5	-6.59	34.1	54.0	19.9	166	86
2745.01	Y/H	67.7	-14.2	-6.59	46.9	54.0	7.1	100	18
3660.02	Y/H	59.2	-12.2	-6.59	40.4	54.0	13.6	100	80
4575.01	Y/H	55.5	-9.6	-6.59	39.3	54.0	14.7	100	336
5490.08	Y/H	60.8	-7.6	-6.59	46.6	54.0	7.4	146	300
7320.00	Y/H	53.8	-1.8	-6.59	45.4	54.0	8.6	166	230
1830.04	Y/V	71.0	-18.3	-6.59	46.1	54.0	7.9	110	103
2745.03	Y/V	62.5	-14.2	-6.59	41.7	54.0	12.3	100	0
3660.02	Y/V	59.7	-12.2	-6.59	40.9	54.0	13.1	226	299
4575.01	Y/V	53.7	-9.6	-6.59	37.5	54.0	16.5	146	355
7320.01	Y/V	54.3	-1.8	-6.59	45.9	54.0	8.1	400	190
2745.03	Z/H	63.6	-14.2	-6.59	42.8	54.0	11.2	145	125
3660.05	Z/H	60.0	-12.2	-6.59	41.2	54.0	12.8	121	267
4574.99	Z/H	53.5	-9.6	-6.59	37.3	54.0	16.7	100	1
7320.01	Z/H	55.3	-1.8	-6.59	46.9	54.0	7.1	100	51
3660.02	Z/V	58.2	-12.2	-6.59	39.4	54.0	14.6	186	171
4575.01	Z/V	50.8	-9.6	-6.59	34.6	54.0	19.4	100	50
5489.87	Z/V	60.9	-7.6	-6.59	46.7	54.0	7.3	206	271
7320.05	Z/V	52.7	-1.8	-6.59	44.3	54.0	9.7	100	19
2745.01	Z/V	68.3	-14.2	-6.59	47.5	54.0	6.5	167	17

Note: Level AV = Reading AV + Factor + DCCF

Table 27: Radiated Emissions in the restricted bands, Peak Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, Mode C, 927.58MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
2782.76	X/H	63.7	-14.1	49.6	74.0	24.4	145	311
3710.30	X/H	65.0	-12.0	53.0	74.0	21.0	166	76
4637.89	X/H	61.9	-9.4	52.5	74.0	21.5	100	60
7420.65	X/H	60.0	-2.1	57.9	74.0	16.1	100	327
2782.76	X/V	62.8	-14.1	48.7	74.0	25.3	145	210
3710.37	X/V	66.4	-12.0	54.4	74.0	19.6	110	37
4637.93	X/V	61.8	-9.4	52.4	74.0	21.6	109	136
7420.68	X/V	62.3	-2.1	60.2	74.0	13.8	205	142
2782.73	Y/H	63.7	-14.1	49.6	74.0	24.4	166	23
3710.35	Y/H	64.4	-12.0	52.4	74.0	21.6	103	89
4637.94	Y/H	63.4	-9.4	54.0	74.0	20.0	225	139
7420.65	Y/H	60.6	-2.1	58.5	74.0	15.5	400	216
8348.25	Y/H	53.3	-3.7	49.6	74.0	24.4	145	70
2782.71	Y/V	61.8	-14.1	47.7	74.0	26.3	166	1
3710.33	Y/V	64.7	-12.0	52.7	74.0	21.3	145	97
4637.96	Y/V	62.6	-9.4	53.2	74.0	20.8	145	355
7420.66	Y/V	61.1	-2.1	59.0	74.0	15.0	186	126
2782.76	Z/H	62.2	-14.1	48.1	74.0	25.9	100	356
3710.30	Z/H	65.4	-12.0	53.4	74.0	20.6	103	261
4637.89	Z/H	62.1	-9.4	52.7	74.0	21.3	100	1
7420.65	Z/H	62.0	-2.1	59.9	74.0	14.1	100	49
8348.25	Z/H	53.2	-3.7	49.5	74.0	24.5	145	3
9275.50	Z/H	49.0	-4.0	45.0	74.0	29.0	154	360
2782.73	Z/V	65.7	-14.1	51.6	74.0	22.4	166	19
3710.32	Z/V	64.3	-12.0	52.3	74.0	21.7	100	21
4637.89	Z/V	59.6	-9.4	50.2	74.0	23.8	100	359
7420.70	Z/V	60.3	-2.1	58.2	74.0	15.8	166	35
8348.25	Z/V	52.3	-3.7	48.6	74.0	25.4	210	34
9275.50	Z/V	49.6	-4.0	45.6	74.0	28.4	100	351

Note: Level PK = Reading PK + Factor

Table 28: Radiated Emissions in the restricted bands, Average Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, Mode C, 927.58MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading AV [dBµV]	Factor [dB(1/m)]	DCCF [dB]	Level AV [dBµV/m]	Limit [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
2782.76	X/H	60.1	-14.1	-6.60	39.4	54.0	14.6	145	311
3710.30	X/H	61.7	-12.0	-6.60	43.1	54.0	10.9	166	76
4637.89	X/H	57.5	-9.4	-6.60	41.5	54.0	12.5	100	60
7420.65	X/H	54.8	-2.1	-6.60	46.1	54.0	7.9	100	327
2782.76	X/V	58.8	-14.1	-6.60	38.1	54.0	15.9	145	210
3710.37	X/V	63.4	-12.0	-6.60	44.8	54.0	9.2	110	37
4637.93	X/V	57.3	-9.4	-6.60	41.3	54.0	12.7	109	136
2782.73	Y/H	60.0	-14.1	-6.60	39.3	54.0	14.7	166	23
3710.35	Y/H	61.3	-12.0	-6.60	42.7	54.0	11.3	103	89
4637.94	Y/H	59.0	-9.4	-6.60	43.0	54.0	11.0	225	139
7420.65	Y/H	55.6	-2.1	-6.60	46.9	54.0	7.1	400	216
8348.25	Y/H	47.1	-3.7	-6.60	36.8	54.0	17.2	145	70
2782.71	Y/V	56.1	-14.1	-6.60	35.4	54.0	18.6	166	1
3710.33	Y/V	61.3	-12.0	-6.60	42.7	54.0	11.3	145	97
4637.96	Y/V	58.9	-9.4	-6.60	42.9	54.0	11.1	145	355
2782.76	Z/H	57.0	-14.1	-6.60	36.3	54.0	17.7	100	356
3710.30	Z/H	62.2	-12.0	-6.60	43.6	54.0	10.4	103	261
4637.89	Z/H	57.4	-9.4	-6.60	41.4	54.0	12.6	100	1
8348.25	Z/H	46.9	-3.7	-6.60	36.6	54.0	17.4	145	3
9275.50	Z/H	37.7	-4.0	-6.60	27.1	54.0	26.9	154	360
2782.73	Z/V	62.8	-14.1	-6.60	42.1	54.0	11.9	166	19
3710.32	Z/V	60.8	-12.0	-6.60	42.2	54.0	11.8	100	21
4637.89	Z/V	53.2	-9.4	-6.60	37.2	54.0	16.8	100	359
7420.70	Z/V	54.7	-2.1	-6.60	46.0	54.0	8.0	166	35
8348.25	Z/V	45.5	-3.7	-6.60	35.2	54.0	18.8	210	34
9275.50	Z/V	38.6	-4.0	-6.60	28.0	54.0	26.0	100	351
7420.68	X/V	58.0	-2.1	-6.60	49.3	54.0	4.7 (*)	205	142
7420.66	Y/V	56.5	-2.1	-6.60	47.8	54.0	6.2	186	126
7420.65	Z/H	57.6	-2.1	-6.60	48.9	54.0	5.1	100	49

Note: Level AV = Reading AV + Factor + DCCF

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Table 29: Reference Level Measurement for Radiated Emissions in non-restricted bands

Mode	Freq. [MHz]	Antenna Orient.	Reading PK at 100kHz BW [dBµV]	Factor [dB(1/m)]	Reference Level [dBµV/m]	20dBc Limit [dBµV/m]	Remark
Mode A	902.474	H	97.8	13.1	110.9	90.9	20dBc limit
	902.474	V	89.3	13.1	102.4		
Mode B	915.054	H	98.2	13.2	111.4	91.4	20dBc limit
	915.054	V	91.6	13.2	104.8		
Mode C	927.636	H	96.7	13.3	110.0	90.0	20dBc limit
	927.636	V	89.6	13.3	102.9		

Note: Level PK = Reading PK + Factor

Gray-shading data was applied as 20dBc Peak Limit for both horizontal and vertical antenna orientations.

Table 30: Radiated Emissions non-restricted bands, Peak Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, 902.42MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	20dBc Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
7219.39	X/V	61.3	-1.8	59.5	90.9	31.5	207	145
7219.41	Y/H	59.6	-1.8	57.8	90.9	33.1	145	228
7219.38	Y/V	60.1	-1.8	58.3	90.9	32.6	401	193
1804.92	Z/H	71.8	-18.5	53.3	90.9	37.6	185	70
7219.00	Z/H	59.1	-1.8	57.3	90.9	33.6	100	226
7219.73	Z/V	55.7	-1.8	53.9	90.9	37.0	100	27

Note: Level PK = Reading PK + Factor

Table 31: Radiated Emissions non-restricted bands, Peak Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, 915.00MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	20dBc Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1829.87	X/H	71.2	-18.3	52.9	91.4	38.5	110	208
5490.30	X/H	65.6	-7.6	58.0	91.4	33.4	100	51
1830.09	X/V	70.3	-18.3	52.0	91.4	39.4	100	72
1830.04	Y/H	64.7	-18.3	46.4	91.4	45.0	146	61
5490.25	Y/V	60.0	-7.6	52.4	91.4	39.0	186	209
1830.07	Z/H	75.4	-18.3	57.1	91.4	34.3	146	64
5490.21	Z/H	64.4	-7.6	56.8	91.4	34.6	167	130
1830.02	Z/V	68.8	-18.3	50.5	91.4	40.9	122	77

Note: Level PK = Reading PK + Factor

Table 32: Radiated Emissions non-restricted bands, Peak Data, 1 - 10GHz, Horizontal and Vertical Antenna Orientations, 927.58MHz

Freq. [MHz]	EUT / Antenna Orient.	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	20dBc Limit [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1855.29	X/H	73.9	-18.1	55.8	90.0	34.2	145	193
5565.73	X/H	68.0	-7.5	60.5	90.0	29.6	100	58
1855.07	X/V	74.1	-18.1	56.0	90.0	34.0	205	74
5565.13	X/V	67.8	-7.5	60.3	90.0	29.7	110	4
1855.04	Y/H	66.5	-18.1	48.4	90.0	41.6	145	130
5565.53	Y/H	67.4	-7.5	59.9	90.0	30.1	145	298
1855.14	Y/V	71.8	-18.1	53.7	90.0	36.3	166	140
5565.78	Y/V	67.9	-7.5	60.4	90.0	29.6	166	41
1855.04	Z/H	76.1	-18.1	58.0	90.0	32.0	205	81
5565.85	Z/H	69.7	-7.5	62.2	90.0	27.8	167	131
1855.34	Z/V	73.3	-18.1	55.2	90.0	34.8	145	79
5565.53	Z/V	65.6	-7.5	58.1	90.0	31.9	166	273

Note: Level PK = Reading PK + Factor

Figure 32: Authorized-band Band-edge, Spectral Diagram, 902.42MHz, Horizontal Antenna Orientation, for Reference

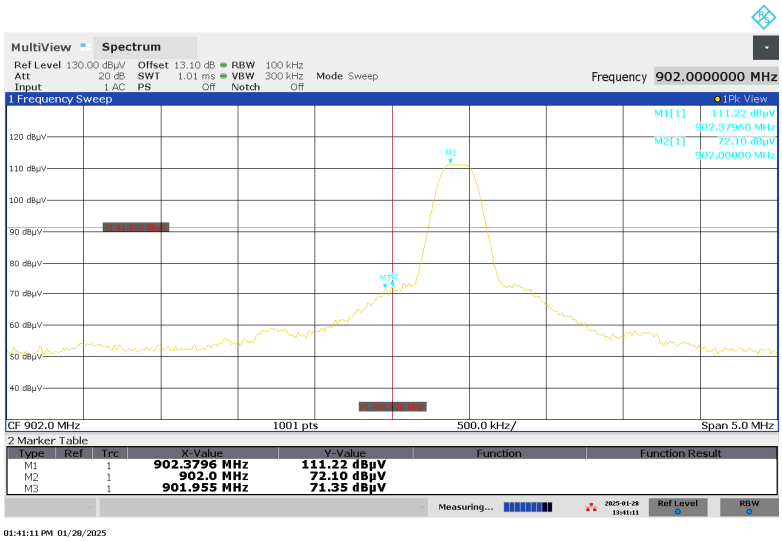
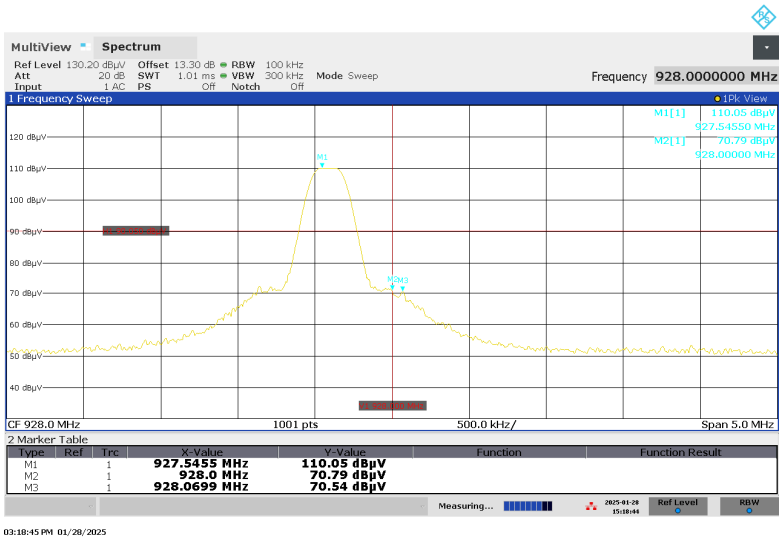


Figure 33: Authorized-band Band-edge, Spectral Diagram, 927.58MHz, Vertical Antenna Orientation, for Reference



5.12 AC Power Line Conducted Emission of Transmitter

RESULT: **N/A**

Frequency range: 0.15 - 30MHz

Requirements:

FCC §15.207

The AC power line conducted emission on any frequency within the band 150kHz to 30MHz shall not exceed the limits specified in FCC §15.207(a) and RSS-Gen §8.8 (table 4).

Note:

This test item is not applicable for the EUT which only employes battery power for operation and which does not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

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