Test Report No.: *Prüfbericht-Nr.:*	**JP25EXR1 001**	**Order No.:** *Auftrags-Nr.:*	**150313287**	**Page 1 of 45** *Seite 1 von 45*
Client Reference No.: *Kunden-Referenz-Nr.:*	B-017010	**Order Date:** *Auftragsdatum:*	2025/05/30	
Client: *Auftraggeber:*	Nisshinbo Micro Devices Inc. 1-1, Fukuoka 2-Chome Fujimino City Saitama, 356-8510 Japan			
Test Item: *Prüfgegenstand:*	K-Band Doppler Sensor Module (Movement Sensor)			
Identification / Type No.: *Bezeichnung / Typ-Nr.:*	NJR4266F3C2	**Serial No.:** *Serien-Nr.:*	Y000083AT	
Order Content: *Auftrags-Inhalt:*	Radio Testing			
Test Specification: *Prüfgrundlage:*	FCC 47 CFR Part 15, Subpart C, Section 15.245 RSS-210 (Issue 11): 2024			

Date of Sample Receipt: *Wareneingangsdatum:*	2025-06-05, 2025-06-09
Test Sample No.: *Prüfmuster-Nr.:*	A004012378-001,-002
Testing Period: *Prüfzeitraum:*	2025-06-06 to 2025-06-17
Place of Testing: *Ort der Prüfung:*	Yokohama EMC Laboratory
Testing Laboratory: *Prüflaboratorium:*	TÜV Rheinland Japan Ltd.
Test Result*: *Prüfergebnis*:*	Pass

-/-

compiled by: *zusammengestellt von:*	T. Nagata	**authorized by:** *genehmigt von:*	P. Zhang
Date: 2025-07-09 *Datum:*	Takeshi Nagata	**Issue Date:** 2025-07-09 *Ausstellungsdatum:*	Pin Zhang
Position / *Stellung:*	Test Engineer	**Position** / *Stellung:*	Authorizer

Other / *Sonstiges:*

This test report is prepared for testing to C2PC application due to modification of the original module.

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*

This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
V05

Revisions

Report No.	Issue date	Changes / Remarks
JP25EXR1 001	2025-07-09	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.

Contents

1. General Remarks

1.1 Test Specifications

Table 1: Test Summary

Test	Specifications	Result
Radio: FCC 47 CFR Part 15, Subpart C, Section 15.245 RSS-210 (Issue 11): 2024 RSS-Gen (Issue 5): 2018+Amendment 1:2019+Amendment 2:2021 ANSI C63.10-2020		
Supply Voltage Requirements FCC §15.31(e)	See section 5.1.	Pass
Antenna Requirements FCC §15.203	See section 5.2.	Pass
Restricted Bands of Operation FCC §15.205 RSS-Gen §8.10, §8.11 and RSS-210 §7.3	See section 5.3.	Pass
Field Strength of Fundamental FCC §15.245(b) and RSS-210 §Annex F, Table F1	2500mV/m (127.9dBuV/m) at 3m measurement distance	Pass
20dB Bandwidth §15.215(c)	20dB bandwidth shall be contained within the designated frequency band.	Pass
99% Bandwidth RSS-Gen §6.7 and RSS-210 §7.3	-/-	For. Ref.
Duty Cycle	-/-	For. Ref.
Radiated Spurious Emissions of Transmitter FCC §15.209 and §15.245(b)(1) (i) and (ii) RSS-210 §§Annex F, Table F1 and RSS-Gen §8.9, 8.10	9kHz - 100GHz Harmonics: 7.5mV/m (77.5dBuV/m) at 3m distance	Pass
Conducted Emission on AC Power Ports of Transmitter FCC §15.207(a) RSS-Gen §8.8	150kHz - 30MHz	Pass

Note: Spot-check testing has been conducted as per the test plan.

1.2 Test Report Purpose

The purpose of this test report is to show compliance of the EUT (**E**quipment **U**nder **T**est) with the requirements of the standards listed in section 1.1.

This test report is prepared for C2PC application due to modification of the original module.

For the original test items and their test data, see the test report No. JP21FRBC 001 by TÜV Rheinland Japan Ltd.

There is **no degradation** from the original test data at the test sample.

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

The test facility is accredited by A2LA (member of ILAC) under certificate number 5056.02 according to ISO/IEC 17025:2017 for RSS-210, RSS-Gen and ANSI C63.10 standards.

The test facility is recognized by the Federal Communications Commission (FCC) as Accredited Testing Laboratory under designation number JP0017.

The test facility is recognized by Innovation, Science and Economic Development Canada (ISED) as Wireless Device Testing Laboratory under the Wireless Lab Company Number 3466B and CAB Identifier JP0011.

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 Transmitter Radiated Spurious Emission (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 44	103396	RF-1250	1 year	2025-05-22	2026-05-22
RF Selector (10m Chamber)	Toyo Corporation	NS4900	0703-182	RF-0029	N/A	N/A	N/A
Biconical Antenna, 30-200MHz	Schwarzbeck	BBA9106-VHBB912	00235-00963	RF-0784	1 year	2025-03-10	2026-03-10
5dB Attenuator	Pasternack	PE7047-5	-/-	RF-0732	1 year	2025-03-12	2026-03-12
Log-Periodic Antenna, 300-1000MHz	Schwarzbeck	UHALP 9108 A1	UHALP 9108-A 0845	RF-0287	1 year	2025-03-10	2026-03-10

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equip. ID	Cal. Interval	Cal. Date	Next Cal.
3dB Attenuator	Pasternack	PE7047-3	-/-	RF-0733	1 year	2025-03-12	2026-03-12
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	2025-03-14	2026-03-14
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA9120D	9120D-2280	RF-0845	1 year	2025-03-07	2026-03-07
MMW PreAmp 0-50GHz	NEXTEM	RFA-1050000-40	RFA-1905-01	RF-1140	1 year	2024-12-03	2025-12-03
Horn Antenna, 1-18GHz	Schwarzbeck	BBHA9120D	9120D-2280	RF-0845	1 year	2025-03-07	2026-03-07
Horn Antenna with Preamplifier, 6-18GHz (RX)	Toyo Corporation	HAP06-18W	B1510452210-123	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, 18-26.5GHz (RX)	MI Technologies	12A-18	2774	RF-1308	1 year	2025-05-03	2026-05-03
Pre-amplifier for RF-1308 (18-26.5 GHz)	Toyo Corporation	HAP18-26N	10	RF-1310	1 year	2025-05-08	2026-05-08
Horn Antenna with Preamplifier, 18-26.5GHz (RX)	Toyo Corporation	HAP18-26W	B2010482210-125	RF-1096	1 year	2024-11-08	2025-11-08
10dB Attenuator	ZTS Technologies	ZFA2K-40B-10A	1#	RF-1272	1 year	2024-09-24	2025-09-24
10dB Attenuator	ZTS Technologies	ZFA2K-40B-10A	4#	RF-1275	1 year	2024-09-24	2025-09-24
Horn Antenna, 26.5 -40GHz (RX)	AMETEK	ANT-SGH-26.5-40	11894	RF-1317	1 year	2025-02-21	2026-02-21
Pre-amplifier for RF-1317, 26.5-40GHz	TOYO Corporation	HAP26-40W	B3208602210-126	RF-1320	1 year	2025-03-14	2026-03-14
For Transmitter Radiated Spurious Emission (above 40GHz)							
Spectrum Analyzer	Rohde & Schwarz	FSW85	101545	RF-1039	1 year	2024-11-15	2025-11-15
Horn Antenna 40-60GHz (RX)	Custom Microwave Inc.	HO19R	-/-	BT-8334	1 year	2024-08-01	2025-08-01
Low Noise Ampllifier (40-50GHz)	ERAVANT	SBL-4036033080-1919-E1	20101-01	RF-1061	1 year	2024-08-14	2025-08-14
Horn Antenna 50-75GHz (RX)	Custom Microwave Inc.	HO15R	-/-	BT-8336	1 year	2024-08-02	2025-08-02
Low Noise Ampllifier (50-75GHz)	ERAVANT	SBP-5037533020-1515-E1	27695-01	RF-1169	1 year	2024-08-07	2025-08-07
Harmonic mixer 75GHz-110GHz	Rohde & Schwarz	FS-Z110	101655	RF-1035	1 year	2024-10-09	2025-10-09
Horn Antenna 75-110GHz (RX)	Custom Microwave Inc.	HO10R	-/-	BT-8338	1 year	2024-08-05	2025-08-05
WR-10 84GHz Highpass Filter	SAGE Millimeter, Inc.	SWF-84380340-10-H1	13421-01	RF-1293	1 year	2024-08-07	2025-08-07
Low Noise Ampllifier (75-110GHz)	SAGE Millimeter, Inc.	SBL75311420401010E1	13352-01	G1810348	1 year	2024-08-07	2025-08-07

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equip. ID	Cal. Interval	Cal. Date	Next Cal.
For Power Port Conducted Emission (CE)							
Path Loss Correction Factors for CE	-/-	-/-	-/-	RF-0597	1 year	2025-01-29	2026-01-29
CE Measurement Software	Toyo Corporation	ES10/CE-AJ	0700-0183-35	RF-1262	N/A	N/A	N/A
EMI Receiver ESW 44	Rohde & Schwarz	ESW 44	103396	RF-1250	1 year	2025-05-22	2026-05-22
LISN	Rohde & Schwarz	ENV216	100276	RF-0016	1 year	2025-05-21	2026-05-21
LISN	Rohde & Schwarz	ENV216	101958	RF-0708	1 year	2025-05-21	2026-05-21
AC Extension Cable	Intertek	INTAP-EU-001	001	RF-0608	1 year	2025-05-21	2026-05-21
Constant Voltage Constant Frequency Stabilizers and Power Accessories							
CVCF (10m Chamber)	NF Corporation	ES2000U	9067307	RF-0212	1 year	2025-03-10	2026-03-10
CVCF Booster (10m Chamber)	NF Corporation	ES2000B	9074408	RF-0213	1 year	2025-03-10	2026-03-10
CVCF (Shielded Room)	NF Corporation	ES2000S	9075612	RF-0210	1 year	2025-03-10	2026-03-10
CVCF Booster (Shielded Room)	NF Corporation	ES2000B	9074403	RF-0211	1 year	2025-03-10	2026-03-10
DC Power Supply	Agilent	E3646A	MY50350007	RF-0412	N/A	N/A	N/A
True RMS Multimeter	Fluke	87V	97680450	RF-0282	1 year	2025-04-08	2026-04-08

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 Power Ports	9 - 150kHz	±3.79dB
	150kHz - 30MHz	±3.31dB
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
Radiated Emission above 40GHz	40GHz - 60GHz	±4.73dB
	60GHz - 75GHz	±4.91dB
	75GHz – 110GHz	±6.32dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT is K-band movement sensor module based on the Doppler effect.

The module radiates un-modulated carrier of 24GHz. It has five types of duty cycle (1%, 2%, 3%, 7.7% and 100%) to optimize sensing parameters for a detecting distance and its power consumption.

The module incorporates one MCU that processes a sensing output to improve detection accuracy. It enables wired communication with a host by either one of two types. As the radio portion is fully identical among the types, Type 2 (Digital Output / Analog Range Setting) was selected for the testing.

3.2 Ratings and System Details

24GHz Field Disturbance Sensor

Fundamental Field Strength:	106.49dBµV/m @3m, Average
Antenna gain:	+9.3dBi
Antenna type:	Patch Antenna
Antenna mounting type:	Internal
Frequency range:	24.075 - 24.175GHz
Nominal frequency:	24.125GHz
Modulation type:	No modulation (5 types of duty cycle)
Signal spreading:	-/- (No wireless data transmission capability)
Transmit speed:	-/- (No wireless data transmission capability)
Number of channels:	1
FCC classification:	FDS
ISED classification:	Other
Emission designator:	G0N
System Input Voltage:	DC 3.3/5.0V
Typical Nominal Voltage:	DC 3.3/5.0V
Input Current:	50mA
Protection Class:	III
Test voltage and frequency:	DC 3.3 (For EUT) AC 120V, 60Hz (For AC Adapter) **(*)**

Note: **(*)** A typical rating of off-the-shelf AC Adapters were used for AC Power Line Conducted Emission testing.

3.3 Noise Generating and Noise Suppressing Parts

The highest frequency generated or used by the EUT is 24.175GHz for fundamental component as intentional radiator portion.

3.4 Submitted Documents and Information

Following documents have been submitted by the client:

Instruction for the testing

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 15.245.

The test methodology used is based on the requirements of RSS-Gen, sections 3.2 and RSS-210.

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

4.2 Operation Modes

The operation mode used for testing is:

A. Transmitting and receiving at the nominal center frequency (24.125GHz).

Coupled with the following Duty Cycle:

- 1. Continuous Transmission (Duty Cycle: 100%)
- 2. Intermittent Transmission (Duty Cycle: 7.7%, Burst Period: 143us, On-time: 11us as nominal)

Note: As this test report is prepared for C2PC application due to modification of the original module, spot-check based testing was conducted.

4.3 Physical Configuration for Testing

The EUT was tested on a stand-alone basis.

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 Radiated Emission of Transmitter

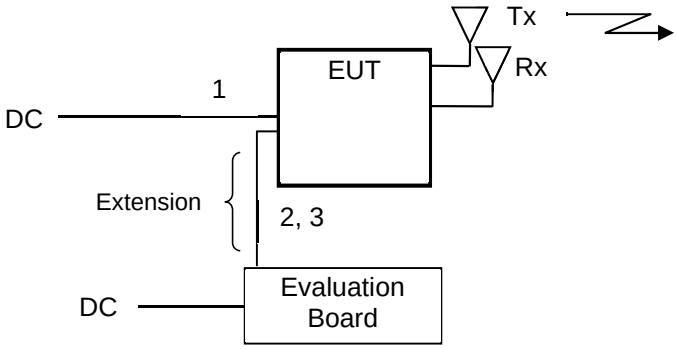
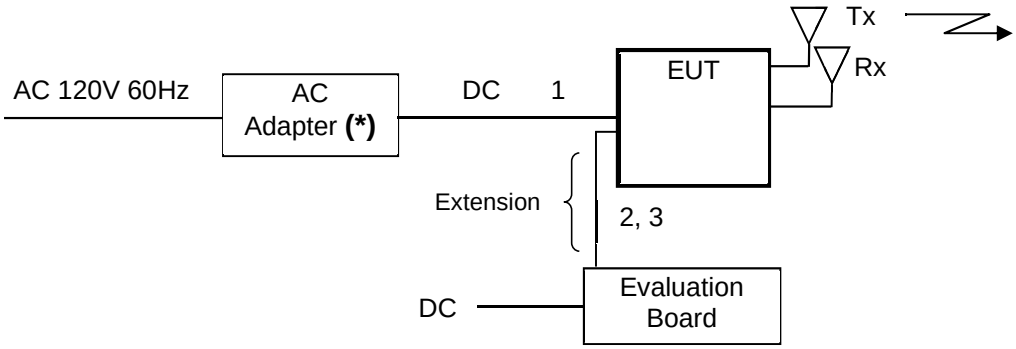


Figure 2: Block Diagram for AC Power Line Conducted Emission of Transmitter



Note: **(*)** Off-the-shelf AC Adapter was used. See the section 4.5 for details.

Table 4: Interfaces present on the EUT

No.	Interface	Cable Length for Testing, Shielding	Interface Classification
1.	DC cable (DC and Gnd.)	2.0m, un-shielded	DC Input Power Port
2.	Analog Range Setting	1.7m, un-shielded	Signal Line
3.	Digital Output (Detect)	1.7m, un-shielded	Signal Line

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

4.4 Test Software

No special test software was used to operate the EUT.

4.5 Special Accessories and Auxiliary Equipment

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

1. Product: AC Adapter for EUT (DC 3.3V)
   Manufacturer: UNIFIVE
   Model: US303320
   Rated Voltage: AC 100-240V
   Input Current: 0.3A
   Frequency: 50/60Hz
   Protection Class: II
   Serial Number: K01-0187443

2. Product: Evaluation Board × 2
   Manufacturer: Nisshinbo Micro Devices Inc.
   Model: NJR4266K-100-1.0
   Rated Voltage: DC 5V
   Input Current: Unspecified
   Protection Class: III
   Serial Number: Unspecified

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.

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 antenna permanently attached on the printed circuit board. Hence it complies with the antenna requirements.

5.3 Restricted Bands of Operation

RESULT: **Pass**

Requirements:

FCC §15.205 and RSS-Gen §8.10 and RSS-210 §7.3

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

RSS-210 §7.3

Only spurious emissions are permitted in any of the TV bands of 54-72MHz, 76-88MHz, 174-216MHz, 470-608MHz and 614-806MHz.

Verdict:

The Operation frequency range of the EUT is 24.075 - 24.175GHz as Field Disturbance Sensor, only spurious emissions may be found in the restricted bands below 100GHz. Hence the EUT complies with the restricted frequency band requirement.

5.4 Field Strength of Fundamental

RESULT: **Pass**

Date of testing:	2025-06-06
Ambient temperature:	23°C
Relative humidity:	57%
Atmospheric pressure:	1008hPa
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber

Requirements:

FCC §15.245(b) and RSS-210 Annex F

The field strength of fundamental shall not exceed the level specified in 15.245(b). The field strength of fundamental shall not exceed the level specified in RSS-210 Annex F, Table F1.

Test procedure:

ANSI C63.10-2020 §6.3 and §6.6

The EUT was placed on a non-conductive table raised 1.5m above the ground plane for the fundamental measurements. Measurements were made at 3m distance. The EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level.

Measurements were taken using both horizontal and vertical antenna polarizations for the worst EUT orientations (Y-axis) as per the original test report.

Measurements were performed using a spectrum analyzer with a suitable span to encompass the maximum point of the fundamental and using the following settings;

- RBW = 1MHz, VBW = 3MHz, peak detector with max hold for Peak;
- RBW = 1MHz, VBW = 3MHz, linear average detector with max hold for Average.

The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

In the taken spectra in this section, the Yellow trace corresponds to the peak measurement. The Green trace corresponds to the average measurement.

Table 5: Field Strength of Fundamental, Average Data

Conf.	Frequency [GHz]	EUT / Ant. Orient.	Reading Level AV [dBµV]	Factor [dB/m]	Average Level [dBµV/m]	Average Limit [dBµV/m]	Margin [dB]
1	24.12659734	Y/V	91.11	14.70	105.81	127.9	22.09
2	24.12696334	Y/V	91.79	14.70	106.49	127.9	21.41

Note: Average limit in dBµV/m is calculated as follows: Average limit = 20 × Log_{10} (2500mV/m).

Average Level was calculated by the following formula;

- Average Level at 3m = Reading Level AV + Factor

Gray shading data shows the highest E-field strength of the fundamental in this test report.

The original highest fundamental field strength was 104.23 dBµV/m. As a range of the fundamental E field strength level is 5 dB on its mass productions, this difference is within the mass production tolerance. Hence, there is no degradation of the fundamental level on this test sample.

Table 6: Field Strength of Fundamental, Peak Data

Conf.	Frequency [GHz]	EUT / Ant. Orient.	Reading Level PK [dBµV]	Factor [dB/m]	Peak Level [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]
1	24.12659734	Y/V	91.14	14.70	105.84	147.9	42.06
2	24.12696334	Y/V	92.10	14.70	106.80	147.9	41.10

Note: Peak limit in dBµV/m is calculated as follows: Peak limit = Average limit + 20dB.

Peak Level was calculated by the following formula;

- Peak Level at 3m = Reading Level PK + Factor

Figure 3: Field Strength of Fundamental, Spectral Diagram, Mode A at Configuration 1

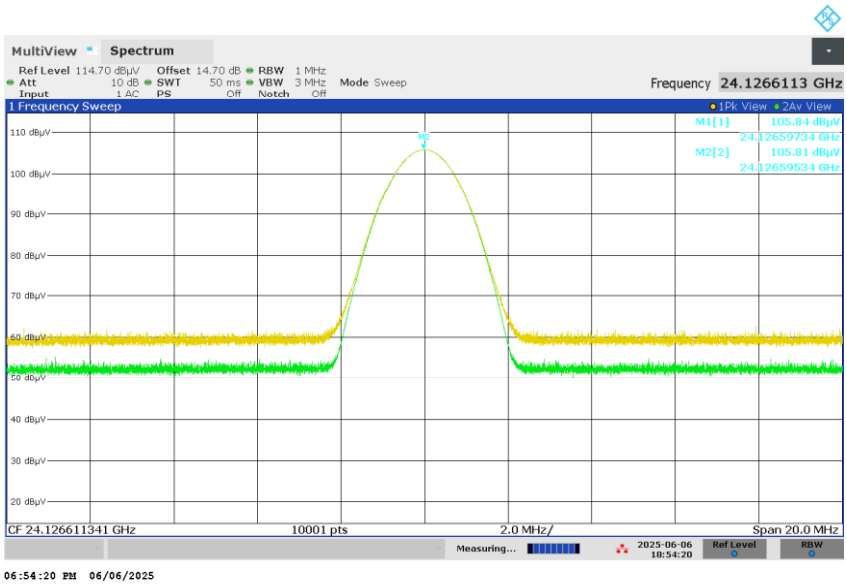
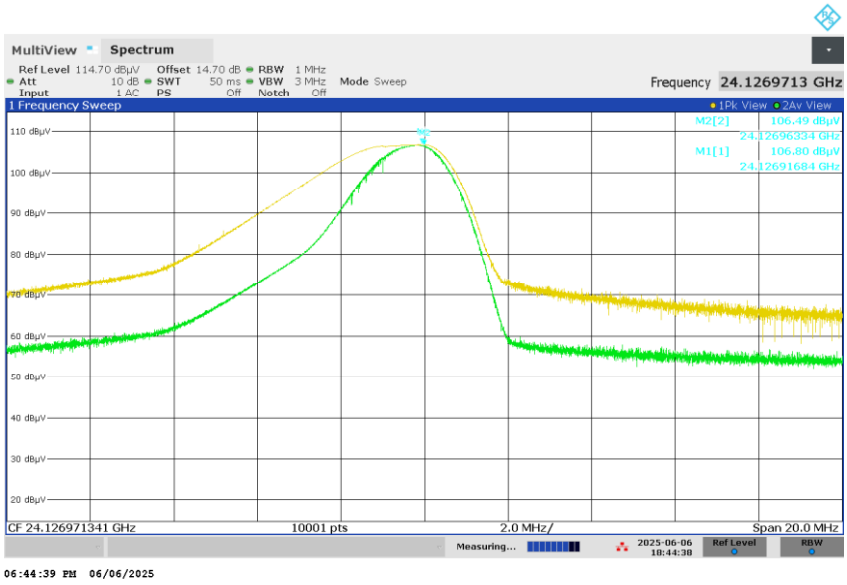


Figure 4: Field Strength of Fundamental, Spectral Diagram, Mode A at Configuration 2



5.5 20dB Bandwidth

RESULT: **Pass**

Date of testing: 2025-06-06

Ambient temperature: 23°C
Relative humidity: 57%
Atmospheric pressure: 1008hPa

Requirements:

FCC §15.215(c) and §15.245

The 20dB bandwidth of the emission shall be contained within the frequency band (24.075 - 24.175GHz) designated in the rule section under which the equipment is operated.

Test procedure:

ANSI C63.10-2020 §6.9.2

The EUT was placed on non-conductive table raised 1.5m above the ground plane in a semi-anechoic chamber.

The 20dB bandwidth was measured with a horn antenna connected to a spectrum analyzer.

Markers were placed at the lowest and highest intersections of the trace with a 20dBc line to obtain the value of the emission bandwidth.

Table 7: 20dB Bandwidth Edge Frequencies

Configuration	20dB Bandwidth Edge Side	Edge Frequency [GHz]	Limit [GHz]	Margin [MHz]
1	Lower side	24.126720682	24.075	51.72068
	Higher side	24.126734491	24.175	48.26551
2	Lower side	24.125418491	24.075	50.41849
	Higher side	24.127255311	24.175	47.74469

Note: Lower side of the Lowest Ch and Higher side of the Highest Ch were measured.

Table 8: 20dB Bandwidth

Configuration	20dB Bandwidth [MHz]	RBW [kHz]	Ratio [%]	Remark
1	0.01381	0.5	3.62	
2	1.83682	50	2.72	

Note: Ratio was calculated in order to confirm its RBW setting at each measurement (i.e. 1% to 5%).

Figure 5: 20dB Bandwidth, Mode A at Configuration 1

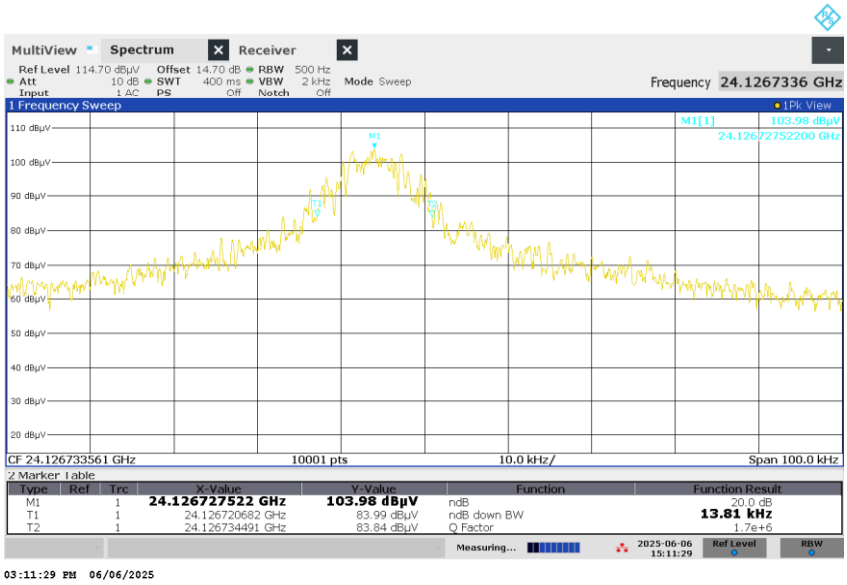
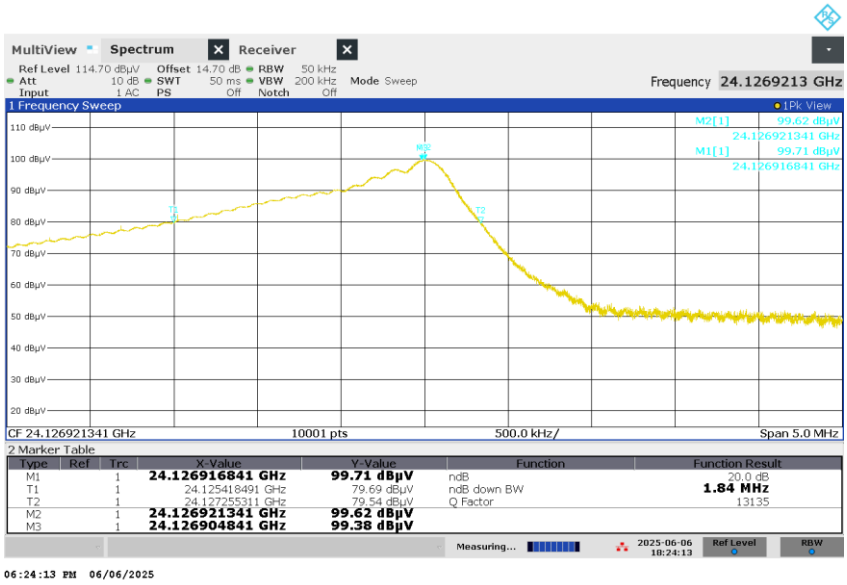


Figure 6: 20dB Bandwidth, Mode A at Configuration 2



5.6 99% Bandwidth

RESULT: **For. Ref.**

Date of testing: 2025-06-06

Ambient temperature: 23°C
Relative humidity: 57%
Atmospheric pressure: 1008hPa

RSS-Gen §6.7 and §8.11 and RSS-210 §7.3

The 99% bandwidth shall be reported and shall lie entirely outside the restricted bands and the prohibited TV bands of 54-72MHz, 76-88MHz, 174-216MHz, 470-608MHz and 614-806MHz, unless otherwise indicated.

Test procedure:

ANSI C63.10-2020 §6.9.3

The EUT was placed on non-conductive table raised 1.5m above the ground plane in a semi-anechoic chamber.

The 99% bandwidth was measured with a horn antenna connected to a spectrum analyzer.

Markers were placed at the lowest and highest intersections of the trace by 99% OBW function to obtain the value of the emission bandwidth.

Table 9: 99% Bandwidth

Configuration	99% Bandwidth [MHz]	RBW [kHz]	Ratio [%]	Remark
1	0.025763739	0.5	1.94	
2	2.191513771	50	2.28	Widest 99 OBW

Note: Ratio was calculated in order to confirm its RBW setting at each measurement (i.e. 1% to 5%). Gray shading data is the widest 99% OBW in this test report.

Figure 7: 99% Bandwidth, Mode A at Configuration 1

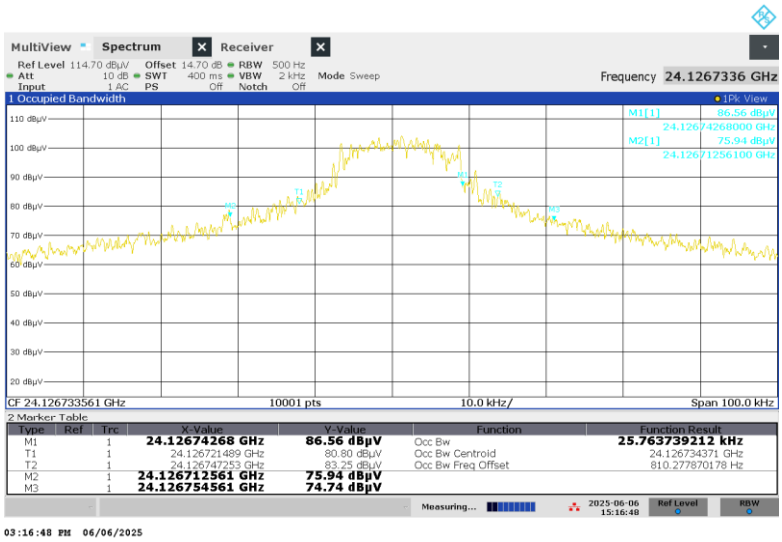
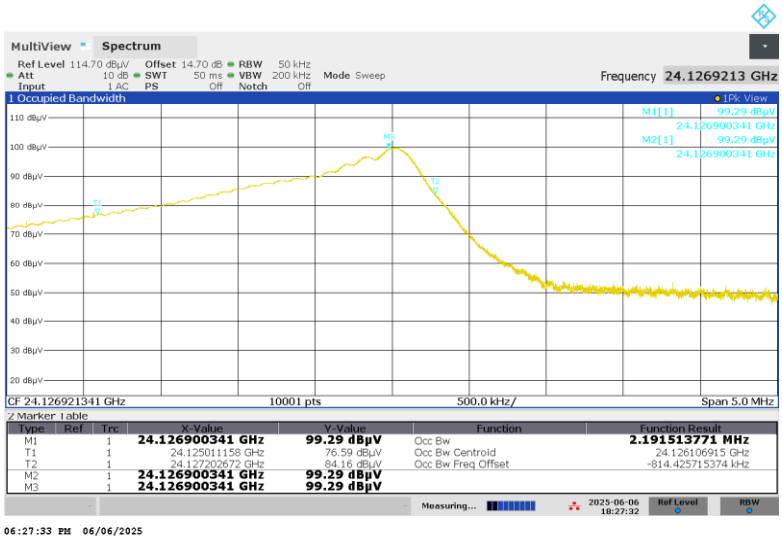


Figure 8: 99% Bandwidth, Mode A at Configuration 2



5.7 Duty Cycle

RESULT: **For. Ref.**

Date of testing:	2025-06-06
Ambient temperature:	23°C
Relative humidity:	57%
Atmospheric pressure:	1008hPa

Requirements:

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

Test procedure:

ANSI C63.10-2020 §7.5 as reference

The EUT was placed on non-conductive table raised 1.5m above the ground plane in a semi-anechoic chamber.

Duty cycle was measured by a radiated manner using with a horn antenna connected to a spectrum analyzer.

RBW was greater than the emission bandwidth of the fundamental.

Sweep time was adjusted to obtain the one period of a pulse train, including blanking intervals.

Note:

Two duty cycle settings (configuration 1, 2) were confirmed at mode A.

Table 10: Duty Cycle

Configuration	Duty Cycle Setting [%]	On-Time [ms]	Period [ms]	Duty Cycle [%]	DCCF [dB]
1	100	50000	50000	100	0
2	7.7	11.3	143.3	7.89	22.05

Note: Duty Cycle Correction Factor (DCCF) is calculated by the following formula.
DCCF = 20 × Log_{10} (1/duty cycle)

Figure 9: Duty Cycle, Mode A at Configuration 1

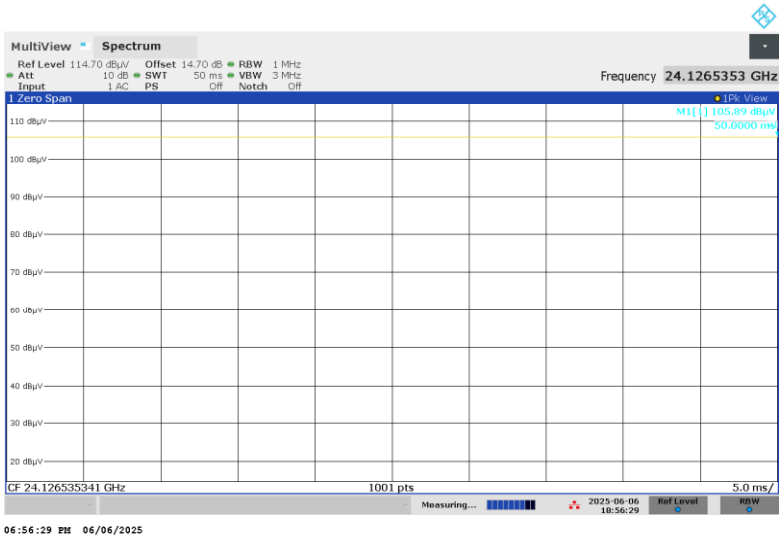


Figure 10: Duty Cycle, Mode A at Configuration 2

5.8 Radiated Spurious Emissions of Transmitter

RESULT: **Pass**

Date of testing:	2025-06-09, 2025-06-10, 2025-06-11 2025-06-13, 2025-06-16, 2025-06-17
Ambient temperature:	23, 23, 23, 25, 25, 24°C
Relative humidity:	55, 58, 51, 52, 56, 54%
Atmospheric pressure:	1012, 1007, 1007, 1014, 1000, 1001hPa
Frequency range:	9kHz - 100GHz
Measurement distance:	3m below 30MHz 3m 30MHz - 1GHz, 1GHz - 40GHz 1.2m/0.3m 40GHz - 100GHz
Kind of test site:	Semi Anechoic Chamber below 40GHz Fully Anechoic Chamber above 40GHz

Requirements:

FCC §15.245, §15.205, §15.209, RSS-210 Annex F, RSS-Gen §8.9 and §8.10

Radiated emissions which fall in the restricted bands, as defined in FCC §15.205(a) and RSS-Gen §8.10 (table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen §8.9 (tables 5 and 6) except for harmonics.

Radiated emission which is outside of the authorized band except for harmonics, shall be attenuated by at least 50dBc or to the general emission, whichever is the lesser attenuation.

Test procedure:

ANSI C63.10-2020 §6.3, 6.4, 6.5, 6.6, 6.10, 9 and RSS-Gen §6.13 and 8.1

ANSI C63.10-2020 § 9.12 for above 40GHz

The EUT was placed on a non-conductive table. The table height was 0.8m 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.

Measurements were taken using both horizontal and vertical antenna polarizations for the worst EUT orientations for each frequency range as per the original test report.

The spectrum was examined from 9kHz to 100GHz.

Final radiated emission measurements were made at 3m distance from 9kHz to 40GHz and 1.2m/0.3m above 40GHz.

At each frequency selected for final measurement, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's

maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

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

For emissions from 1GHz and 40GHz, 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 from 1GHz to 40GHz.

For emissions above 40GHz, measurements were performed with a spectrum analyzer using the following settings: for peak field strength: RBW = 1MHz & VBW = 3MHz by positive peak detector; for average field strength: RBW = 1MHz & VBW = 3MHz by linear voltage average detector.

Absorbers have been placed on the floor and walls between the EUT and the measuring antenna for testing from 40GHz to 100GHz in order to minimize contribution from reflections.

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

As no spurious emission was found in the range from 9kHz to 30MHz at 3m measurement distance, pre-check was only performed.

Table 11: Radiated Emission, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode A Configuration 2

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBµV]	Factor [dB(1/m)]	Level QP [dBµV/m]	Limit QP [dBµV/m]	Margin QP [dB]	Height [cm]	Angle [°]
45.109	Z/V	31.4	-24.0	7.4	40.0	32.6	100	193
47.555	Z/H	29.9	-24.3	5.6	40.0	34.4	400	152
60.036	Z/V	33.9	-25.3	8.6	40.0	31.4	100	109
65.015	Z/V	31.5	-25.3	6.2	40.0	33.8	100	204
130.076	Z/V	41.6	-22.5	19.1	43.5	24.4	100	158
138.234	Z/V	30.2	-22.0	8.2	43.5	35.3	381	32
143.947	Z/V	30.2	-21.7	8.5	43.5	35.0	100	156
148.498	Z/V	38.8	-21.4	17.4	43.5	26.1	108	101
148.498	Z/H	36.0	-21.4	14.6	43.5	28.9	381	116
152.009	Z/H	30.0	-21.2	8.8	43.5	34.7	222	25
153.879	Z/V	30.1	-21.1	9.0	43.5	34.5	400	39
157.334	Z/V	30.0	-21.0	9.0	43.5	34.5	100	87
192.902	Z/H	29.8	-18.9	10.9	43.5	32.6	222	355
455.673	Z/V	29.0	-15.9	13.1	46.0	32.9	157	359
759.982	Z/V	32.3	-12.4	19.9	46.0	26.1	120	243
867.846	Z/H	29.7	-9.8	19.9	46.0	26.1	181	226
994.463	Z/V	29.4	-8.1	21.3	54.0	32.7	108	77

Note: Level QP = Reading QP + Factor, dB(uV/m) = 20 × Log_{10}(uV/m)

Table 12: Radiated Emission, Average Data, 1GHz - 40GHz, Horizontal and Vertical Antenna Orientations, Mode A Configuration 1

Freq. [MHz]	EUT / Antenna Orientation	Reading AV [dBµV]	Factor [dB(1/m)]	Level AV [dBµV/m]	Limit AV [dBµV/m]	Margin AV [dB]	Height [cm]	Angle [°]
1294.572	Y/H	44.3	-19.4	24.9	54.0	29.1	302	193
3084.426	Y/V	41.3	-13.3	28.0	54.0	26.0	110	299
4646.556	Y/H	40.8	-10.4	30.4	54.0	23.6	312	307
7332.210	Y/V	39.0	-3.0	36.0	54.0	18.0	314	52
16908.774	Y/V	29.0	3.1	32.1	54.0	21.9	100	101
17561.702	Y/V	27.8	5.2	33.0	54.0	21.0	100	359
17751.645	Y/H	28.2	5.0	33.2	54.0	20.8	100	175
19711.512	Y/V	34.6	-9.6	25.0	54.0	29.0	211	301
20943.230	Y/V	33.7	-8.1	25.6	54.0	28.4	100	307
22371.034	Y/H	32.8	-6.6	26.2	54.0	27.8	211	87
25331.950	Y/V	32.3	-5.5	26.8	54.0	27.2	211	194
35289.112	Y/V	64.0	-32.5	31.5	54.0	22.5	100	195
38298.878	Y/V	65.4	-33.5	31.9	54.0	22.1	122	122
38972.689	Y/H	65.1	-34.0	31.1	54.0	22.9	216	243

Note: Level AV = Reading AV + Factor, dB(uV/m) = 20 × Log_{10}(uV/m)

Table 13: Radiated Emission, Peak Data, 1GHz - 40GHz, Horizontal and Vertical Antenna Orientations, Mode A Configuration 1

Freq. [MHz]	EUT / Antenna Orientation	Reading PK [dBµV]	Factor [dB(1/m)]	Level PK [dBµV/m]	Limit PK [dBµV/m]	Margin PK [dB]	Height [cm]	Angle [°]
1294.572	Y/H	58.3	-19.4	38.9	74.0	35.1	302	193
3084.426	Y/V	55.3	-13.3	42.0	74.0	32.0	110	299
4646.556	Y/H	54.8	-10.4	44.4	74.0	29.6	312	307
7332.210	Y/V	52.3	-3.0	49.3	74.0	24.7	314	52
16908.774	Y/V	42.7	3.1	45.8	74.0	28.2	100	101
17561.702	Y/V	41.6	5.2	46.8	74.0	27.2	100	359
17751.645	Y/H	41.8	5.0	46.8	74.0	27.2	100	175
19711.512	Y/V	48.4	-9.6	38.8	74.0	35.2	211	301
20943.230	Y/V	47.5	-8.1	39.4	74.0	34.6	100	307
22371.034	Y/H	46.5	-6.6	39.9	74.0	34.1	211	87
25331.950	Y/V	45.9	-5.5	40.4	74.0	33.6	211	194
35289.112	Y/V	77.6	-32.5	45.1	74.0	28.9	100	195
38298.878	Y/V	79.1	-33.5	45.6	74.0	28.4	122	122
38972.689	Y/H	79.0	-34.0	45.0	74.0	29.0	216	243

Note: Level PK = Reading PK + Factor, dB(uV/m) = 20 × Log_{10}(uV/m)

Table 14: Radiated Emission, Average Data, 40GHz - 100GHz, Horizontal and Vertical Antenna Orientations, Mode A Configuration 1

Frequency [GHz]	EUT / Antenna Orientation	Reading AV [dBµV]	D [m]	DCF [dB]	Level AV [dBµV/m]	Limit AV [dBµV/m]	Margin AV [dB]
48.2511173	Y/V	58.90	0.3	-20.00	38.90	77.5	38.60
48.2509973	Y/H	73.09	0.3	-20.00	53.09	77.5	24.41
72.3779000	Y/V	81.87	0.3	-20.00	61.87	77.5	15.63
72.3780000	Y/H	78.14	0.3	-20.00	58.14	77.5	19.36

Note: **D**istance **C**onversion **F**actor (DCF) was applied for each measurement point.
DCF = 20 × Log_{10} (D/3.0) [dB]
Level AV = Reading AV + Factor + DCF, dB(uV/m) = 20 × Log_{10}(uV/m)
The minimum margin at this range was **15.62dB** in the original test report.

Table 15: Radiated Emission, Peak Data, 40GHz - 100GHz, Horizontal and Vertical Antenna Orientations, Mode A Configuration 1

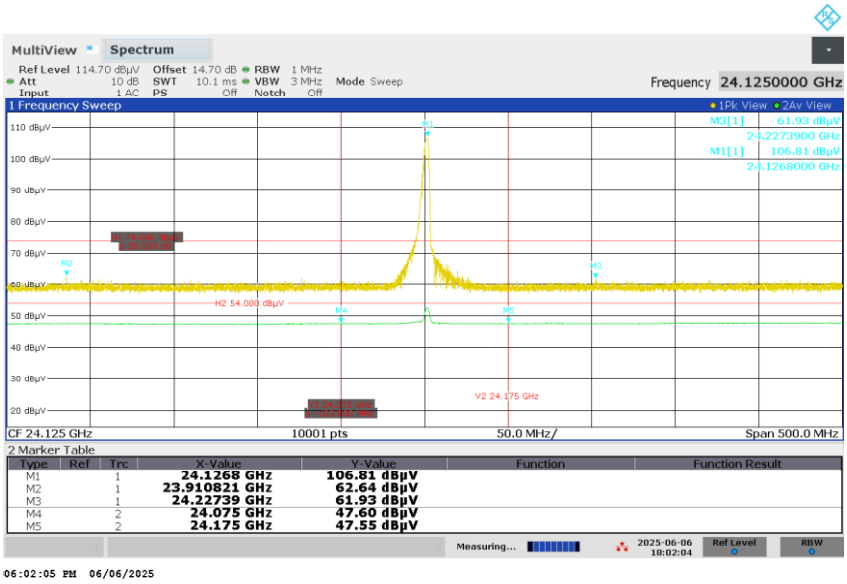
Frequency [GHz]	EUT / Antenna Orientation	Reading PK [dBµV]	D [m]	DCF [dB]	Level PK [dBµV/m]	Limit PK [dBµV/m]	Margin PK [dB]
48.2512873	Y/V	63.95	0.3	-20.00	43.95	97.5	53.55
48.2509823	Y/H	74.40	0.3	-20.00	54.40	97.5	43.10
72.3778000	Y/V	84.70	0.3	-20.00	64.70	97.5	32.80
72.3778000	Y/H	82.51	0.3	-20.00	62.51	97.5	34.99

Note: **D**istance **C**onversion **F**actor (DCF) was applied for each measurement point.
DCF = 20 × Log_{10} (D/3.0) [dB]
Level PK = Reading PK + Factor + DCF, dB(uV/m) = 20 × Log_{10}(uV/m)

Figure 11: Radiated Emissions at Band Edge, Spectral Diagram, Mode A at Configuration 1

Note: The upper trace shows the peak value and the lower trace shows the average value. Radiated emissions which is outside of the authorized band were attenuated below the general emission limits.

Figure 12: Radiated Emissions at Band Edge, Spectral Diagram, Mode A at Configuration 2



Note: The upper trace shows the peak value and the lower trace shows the average value. Radiated emissions which is outside of the authorized band were attenuated below the general emission limits.

5.9 AC Power Line Conducted Emission of Transmitter

RESULT: **Pass**

Date of testing:	2025-06-11
Ambient temperature:	25°C
Relative humidity:	67%
Atmospheric pressure:	1005hPa
Frequency range:	0.15 - 30MHz
Kind of test site:	Shielded Room

Requirements:

FCC §15.207 and RSS-Gen §8.8

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).

Test procedure:

ANSI C63.10-2020 §6.2 and RSS-Gen §8.1

The EUT was placed on an wooden table raised 80cm above the reference ground plane. A vertical conducting plane of the screened room was located 40cm to the rear of the EUT. The AC input port of the EUT was connected to a Line Impedance Stabilization Network (LISN).

The physical arrangement of the test system and associated cabling was varied to determine the effect on the EUT's emissions in amplitude and frequency in order to ensure that maximum emission amplitudes were attained.

The measurements were performed with a measurement receiver operating in the CISPR quasi-peak and average detection modes. The receiver's 6dB bandwidth was set to 9kHz.

Final measurement was performed at the worst case condition on the original test report (mode A, configuration 1, DC 3.3V).

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

Table 16: AC Power Line Conducted Emission, 0.15 - 30MHz, Quasi Peak and Average Data, Phase N (N) and L1 (L), Mode A at Configuration 1

Freq. [MHz]	Phase	Reading QP [dBµV]	Reading AV [dBµV]	Factor [dB]	Level QP [dBµV]	Level AV [dBµV]	Limit QP [dBµV]	Limit AV [dBµV]	Margin QP [dB]	Margin AV [dB]
0.1506	L1	30.1	14.3	10.0	40.1	24.3	66.0	56.0	25.9	31.7
0.4471	L1	20.9	16.7	10.3	31.2	27.0	56.9	46.9	25.7	19.9
0.7163	L1	8.2	2.8	10.2	18.4	13.0	56.0	46.0	37.6	33.0
9.6497	L1	16.7	4.5	10.4	27.1	14.9	60.0	50.0	32.9	35.1
13.5932	L1	13.8	7.8	10.5	24.3	18.3	60.0	50.0	35.7	31.7
0.1506	N	27.6	12.7	10.0	37.6	22.7	66.0	56.0	28.4	33.3
0.2164	N	17.0	4.5	10.0	27.0	14.5	63.0	53.0	36.0	38.5
0.4434	N	18.2	12.7	10.3	28.5	23.0	57.0	47.0	28.5	24.0
0.5788	N	5.0	-0.7	10.2	15.2	9.5	56.0	46.0	40.8	36.5
9.7243	N	17.1	8.0	10.4	27.5	18.4	60.0	50.0	32.5	31.6
13.6734	N	15.6	9.8	10.6	26.2	20.4	60.0	50.0	33.8	29.6

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

7. List of Tables

8. List of Figures

9. List of Photographs

– End of test report –