Report on the FCC and IC Testing of the Giesecke+Devrient GmbH

Model: IoTgo® Track-Solar rail

In accordance with FCC 47 CFR Part 15 C and ISED RSS-247 and ISED RSS-GEN

Product Service

Add value.
Inspire trust.

Prepared for: Giesecke+Devrient GmbH
Prinzregentenstr. 161
81677 München
Germany

FCC ID: 2BP32-GDTSR2501
Contains FCC ID: XMR202005BG95M5
IC: 34086-GDTSR2501
Contains IC: 10224A-BG95M5

COMMERCIAL-IN-CONFIDENCE

Date: 2025-07-17
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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Alexander Deese	2025-07-17	SIGN-ID 1059955
Authorised Signatory	Martin Steindl	2025-07-21	SIGN-ID 1060597

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures described on test pages. All reporded testing was carried out on a sample equipment to demonstrate limited compilance with FCC 47 CFR Part 15 C and ISED RSS-247 and RSS-GEN.

The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Alexander Deese	2025-07-17	SIGN-ID 1059955

Laboratory Accreditation	Laboratory recognition	Industry Canada test site registration
DAkkS Reg. No. D-PL-11321-11-03 DAkkS Reg. No. D-PL-11321-11-04	Registration No. BNetzA-CAB-16/21-15	3050A-2

Executive Statement:

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15 C:2023 and ISED RSS247 Issue 3, 2023 and ISED RSS-Gen Issue 5, 2018 + A1:2019 + A2:2021

Trade Register Munich
HRB 85742
VAT ID No. DE129484267
Information pursuant to Section 2(1)
DL-InfoV (Germany) at
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Product Service

Content

Product Service

1 Report Summary

1.1 Modification Report

Alternations and additions of this report will be issued to the holders of each copy in the form of a complete document.

Revision	*Description of changes*	*Date of Issue*
0	First Issue	2025-06-26
1	Type designation changed to “IoTgo® Track-Solar rail” Hardware and Software Version added	2025-06-27
2	Antenna type and gain added to info in 1.4.1. RBW, VBW and detector added to plots of sections 2.1, 2.3, 2.4 and 2.5. Statement in section 2.2.6 and 2.3.6 removed and corrected. EIRP values and detector in section 2.2.7 corrected. Page 35, values for average limit and margin corrected.	2025-07-17

Table 1: Report of Modifications

1.2 Introduction

Applicant	Giesecke+Devrient GmbH
Manufacturer	Giesecke+Devrient GmbH
Model Number(s)	IoTgo® Track-Solar rail
Serial Number(s)	---
Hardware Version(s)	HWR: 101 (V1.01)
Software Version(s)	APP Firmware Version: R00A03V04
Number of Samples Tested	1
Test Specification(s) / Issue / Date	FCC 47 CFR Part 15 C : 2023 ISED RSS-247, Issue 3 : 2023 ISED RSS-Gen Issue 5, 2018 + A1:2019 + A2:2021
Test Plan/Issue/Date	---
Order Number	8185527-a
Date	2025-04-29
Date of Receipt of EUT	2025-04-08
Start of Test	2025-05-08
Finish of Test	2025-05-14
Name of Engineer(s)	Alexander Deese
Related Document(s)	ANSI C63.4: 2014 ANSI C63.10: 2020 FCC 47 CFR Part 2 J : 2023 KDB 558074 D01 V05R02 ISED RSS-102, Issue 6, 2023

Product Service

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15 C, ISED RSS-247 and ISED RSS-GEN is shown below.

Section	*Specification Clause*	*Test Description*	*Result*
---	15.203, 15.247(b)	Antenna requirement	N/T
2.1	15.247(a)(2)	Emission Bandwidth	Pass
2.2	15.247(b)(3)	Output Power	Pass
2.3	15.247(e)	Power Spectral Density	Pass
2.4	15.247(d)	Frequency Band Edge	Pass
2.5	15.247(d), 15.205, 15.209	Spurious Emissions	Pass
---	15.207	Conducted Emissions on Mains Terminals	N/T

Table 2: Results according to FCC 47 CFR Part 15 C

Section	*Specification Clause*	*Test Description*	*Result*
2.1	5.2 a	Emission Bandwidth	Pass
2.2	5.4 d	Output Power	Pass
2.3	5.2 b	Power Spectral Density	Pass
2.4	5.5	Frequency Band Edge	Pass
2.5	5.5	Spurious Emissions	Pass

Table 3: Results according to ISED RSS-247

Section	*Specification Clause*	*Test Description*	*Result*
2.1	6.7	Emission Bandwidth	Pass
2.5	8.9, 8.10	Spurious Emissions	Pass
2.6	8.11	Frequency Stability	Pass
---	8.8	Conducted Emissions on Mains Terminals	N/T

Table 4: Results according to RSS-Gen

N/T = not tested

Product Service

1.4 Product Information

1.4.1 Technical Description

Solar-based IoT Tracking Devices with Bluetooth.

Frequency Band:	2400.0 MHz – 2483.5 MHz
Supply Voltage:	3.7 V, Battery supplied
Supply Frequency:	DC
Highest clock frequency (radio part):	2480 MHz
Highest clock frequency (non-radio part):	---
Antenna Gain:	Chip Antenna ACA-5036-A2-CC-S, Peak Gain 3 dBi

Product Service

1.5 Test Configuration

The EUT was 3.7 V / DC battery supplied. The radio module was transmitting continuously. Radio frequency and power were configured via serial commands provided by the customer.

1.6 Modes of Operation

Mode 1:
Ch 37; 2402 MHz; BW 2 MHz; Power setting “7”; Continuously modulated carrier

Mode 2:
Ch 17; 2440 MHz; BW 2 MHz; Power setting “7”; Continuously modulated carrier

Mode 3:
Ch 39; 2480 MHz; BW 2 MHz; Power setting “7”; Continuously modulated carrier

1.7 Deviations from Standard

Product Service

1.8 EUT Modifications Record

The table below details modifications made to the EUT during the test program.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	Not Applicable	Not Applicable

Table 5

1.9 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

Test Name	Name of Engineer(s)
Configuration according to 1.5 and 1.6	
Emission Bandwidth	Alexander Deese
Output Power	Alexander Deese
Power Spectral Density	Alexander Deese
Frequency Band Edge	Alexander Deese
Spurious Emissions	Alexander Deese
Temperature Stability	Alexander Deese

Office Address:
Äußere Frühlingstraße 45
94315 Straubing
Germany

Product Service

2 Test Details

2.1 Emission Bandwidth

2.1.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(a)(2)
ISED RSS-247, Clause 5.2 a
ISED RSS-Gen, Clause 6.7

2.1.2 Equipment under Test and Modification State

IoTgo® Track-Solar rail; S/N ---; Modification state 0

2.1.3 Date of Test

2025-05-08

2.1.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	39 %

2.1.5 Specification Limits

For systems using digital modulation techniques, operating in the 902 MHz – 928 MHz, 2400 MHz – 2483.5 MHz and/or 5725 MHz – 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz

ISED RSS-GEN:
The occupied (99 %) bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSS.

2.1.6 Test Method

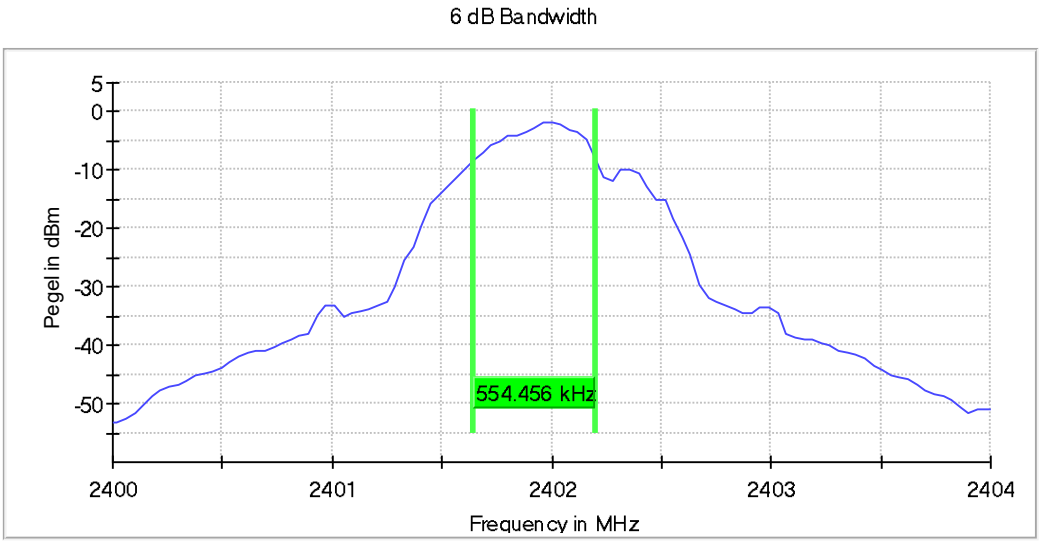
The test was performed according to ANSI C63.10, clauses 6.9.3 and 11.8.1

Product Service

2.1.7 Test Results

Frequency Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
37	0.554456	0.500	2401.643564	2402.198020
17	0.554456	0.500	2439.643564	2440.198020
39	0.554456	0.500	2479.643564	2480.198020

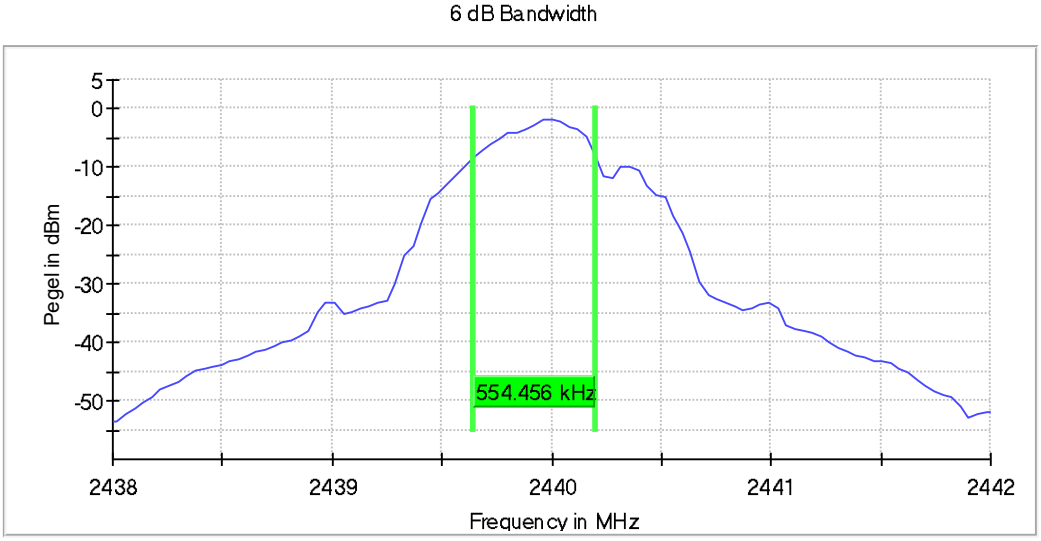
Table 6: 6 dB bandwidth



6 dB Bandwidth, Ch 37

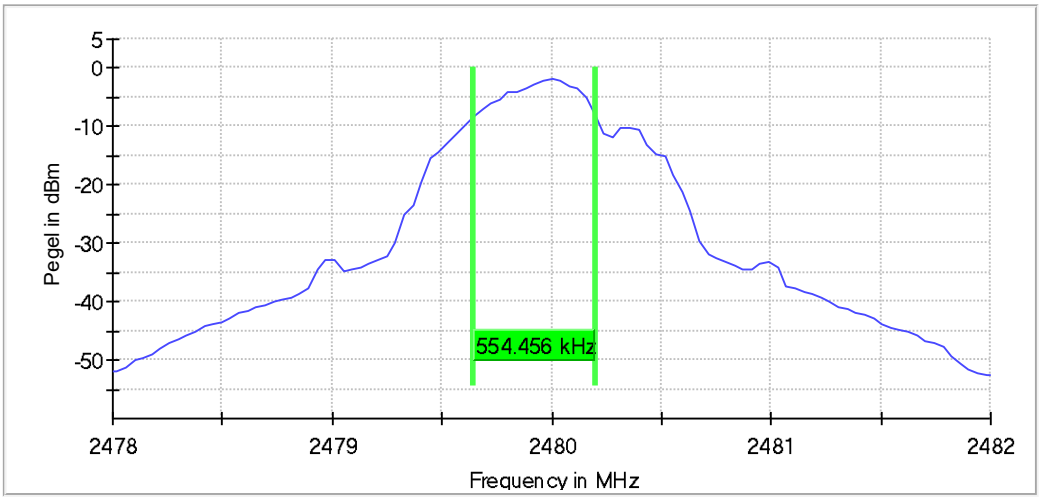
DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Bandwidth (MHz)	Limit Min (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	100	300	0.554456	0.500000	2401.643564	2402.198020

Product Service



6 dB Bandwidth, Ch 17

DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Bandwidth (MHz)	Limit Min (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2440.000000	100	300	0.554456	0.500000	2439.643564	2440.198020



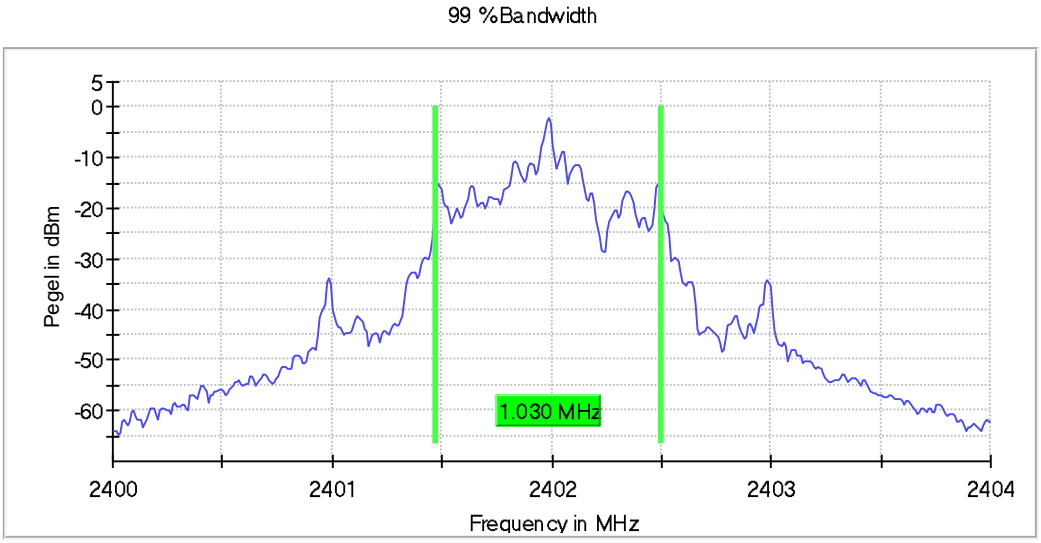
6 dB Bandwidth, Ch 39

DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Bandwidth (MHz)	Limit Min (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	100	300	0.554456	0.500000	2479.643564	2480.198020

Product Service

Frequency Channel	99% Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
37	1.030	2401.475	2402.505
17	1.030	2439.475	2440.505
39	1.030	2479.475	2480.505

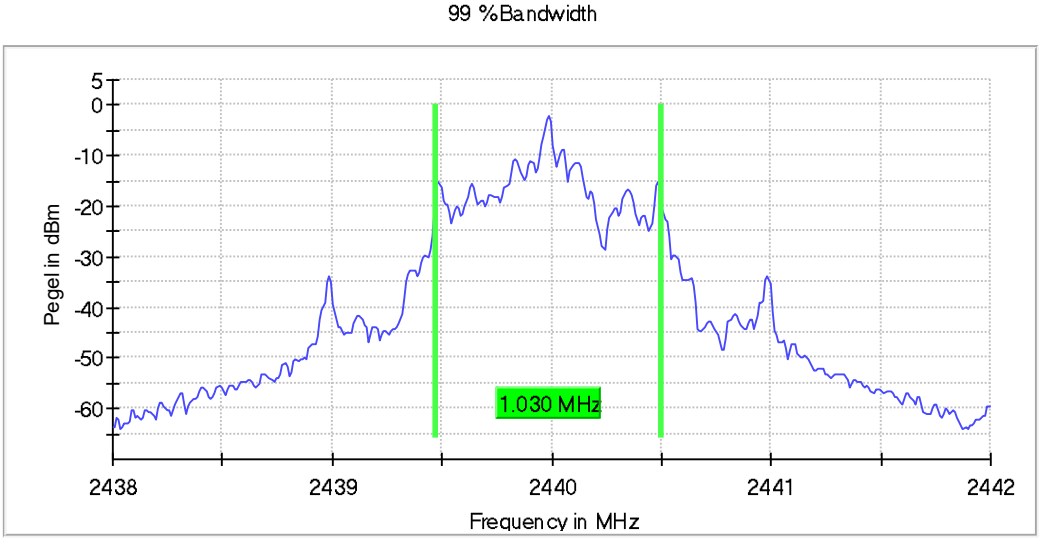
Table 7: 99% bandwidth



99% Bandwidth, Ch 37

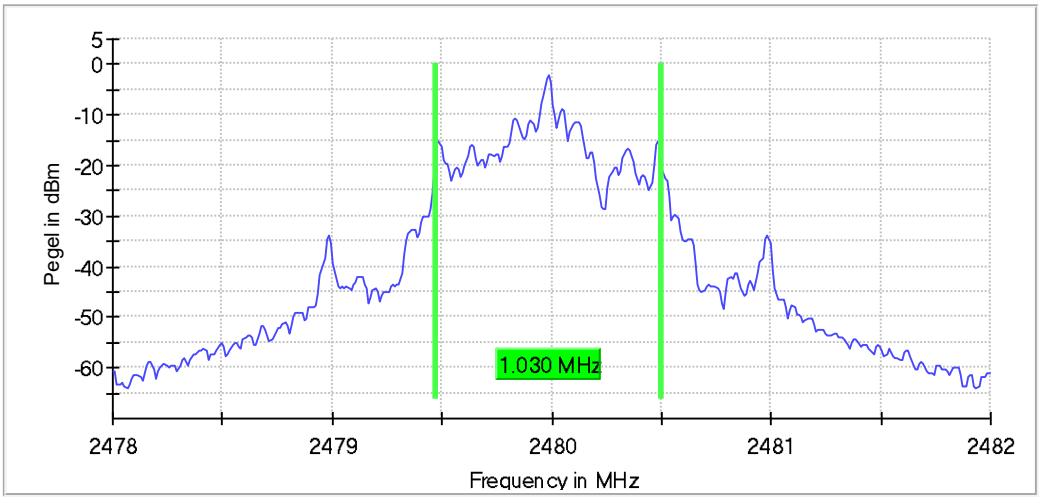
DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402.000000	20	100	1.030000	2401.475000	2402.505000

Product Service



99% Bandwidth, Ch 17

DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2440.000000	20	100	1.030000	2439.475000	2440.505000



99% Bandwidth, Ch 39

DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2480.000000	20	100	1.030000	2479.475000	2480.505000

Product Service

2.1.8 Test Location and Test Equipment

The test was carried out in a non-shielded room:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2026-03-31
Switching device	Rohde & Schwarz	OSP120	20248	36	2026-07-31
Switching device	Rohde & Schwarz	OSP120	38807	36	2026-08-31
Climatic test chamber	ESPEC	PL-4 J	38958	18	2026-09-06

Table 8

Product Service

2.2 Output Power

2.2.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(b)(3)
ISED RSS-247, Clause 5.4 d

2.2.2 Equipment under Test and Modification State

IoTgo® Track-Solar rail; S/N ---; Modification state 0

2.2.3 Date of Test

2025-05-08

2.2.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	39 %

2.2.5 Specification Limits

The maximum conducted output power shall not exceed 1 W (30 dBm).
The e.i.r.p. shall not exceed 4 W (36 dBm).

2.2.6 Test Method

The test was performed according to ANSI C63.10, section 11.9. The conducted output power was measured with a Power Meter of the OSP120.

Product Service

2.2.7 Test Results

Frequency Channel	*Detector*	*Output Power (dBm)*	*Limit (dBm)*
37	RMS	1.604	30.0
17	RMS	1.666	30.0
39	RMS	1.735	30.0

Table 9: Conducted Output Power

Frequency Channel	*Detector*	*EIRP (dBm)*	*Limit (dBm)*
37	RMS	4.604*	36.0
17	RMS	4.666*	36.0
39	RMS	4.735*	36.0

Table 10: EIRP

*: Value derived from conducted output power plus Antenna Gain of 3 dBi.

Product Service

2.2.8 Test Location and Test Equipment

The test was carried out in a non-shielded room:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2026-03-31
Switching device	Rohde & Schwarz	OSP120	20248	36	2026-07-31
Switching device	Rohde & Schwarz	OSP120	38807	36	2026-08-31
Climatic test chamber	ESPEC	PL-4 J	38958	18	2026-09-06

Table 11

Product Service

2.3 Power Spectral Density

2.3.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(e)
ISED RSS-247, Clause 5.2 b

2.3.2 Equipment under Test and Modification State

IoTgo® Track-Solar rail; S/N ---; Modification state 0

2.3.3 Date of Test

2025-05-08

2.3.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	39 %

2.3.5 Specification Limits

FCC 47 CFR, section 15.257(e)
ISED RSS-247, Clause 5.2.(b)
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
The same method (detector) of determining the conducted output power shall be used to determine the power spectral density.

2.3.6 Test Method

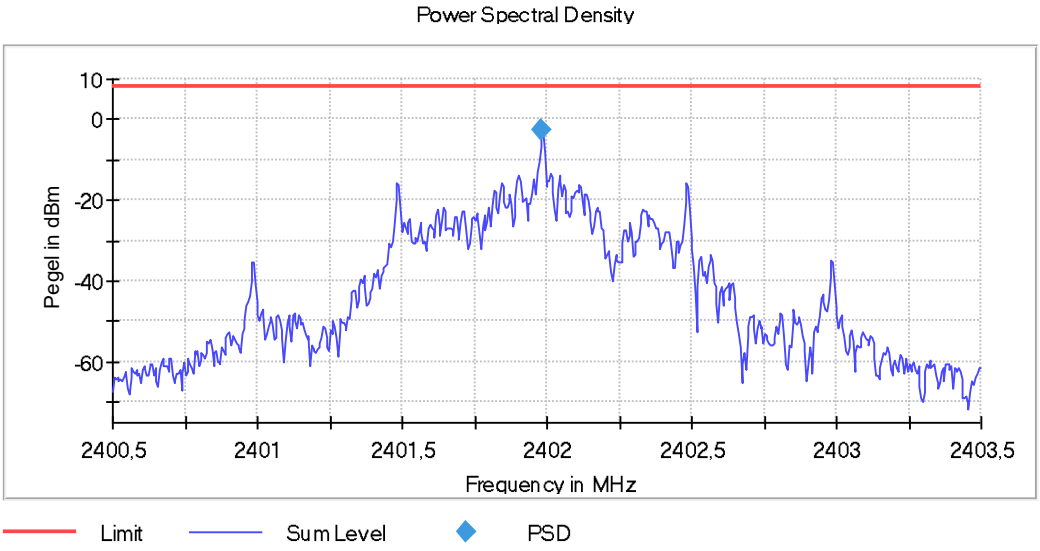
The test was performed according to ANSI C63.10, section 11.10

Product Service

2.3.7 Test Results

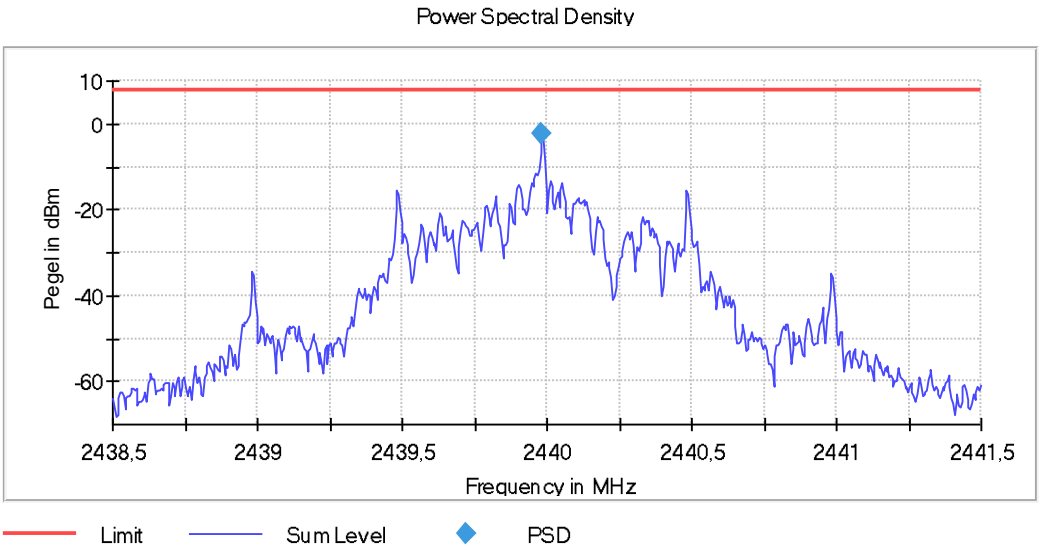
Frequency Channel	Detector	Spectral Power Density (dBm)	Limit (dBm)
37	RMS	-2.509	8.0
17	RMS	-2.417	8.0
39	RMS	-2.395	8.0

Table 12: Power Spectral Density



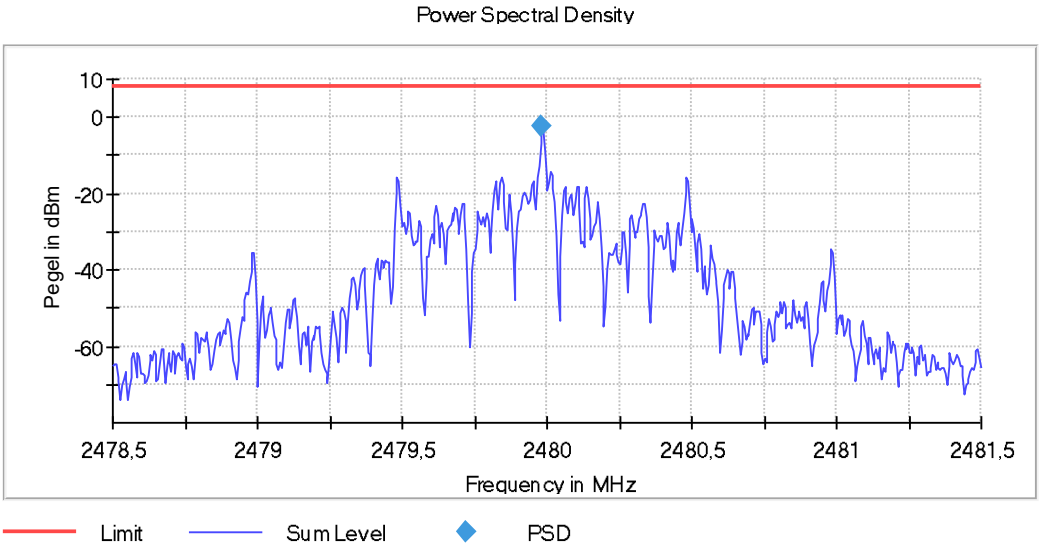
Power Spectral Density, Ch 37

DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	10	30	2401.982500	-2.509	8.0	PASS



Power Spectral Density, Ch 17

DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2440.000000	10	30	2439.982500	-2.417	8.0	PASS



Power Spectral Density, Ch 26

DUT Frequency (MHz)	RBW (kHz)	VBW (kHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2480.000000	10	30	2479.982500	-2.395	8.0	PASS

Product Service

2.3.8 Test Location and Test Equipment

The test was carried out in a non-shielded room:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2026-03-31
Switching device	Rohde & Schwarz	OSP120	20248	36	2026-07-31
Switching device	Rohde & Schwarz	OSP120	38807	36	2026-08-31
Climatic test chamber	ESPEC	PL-4 J	38958	18	2026-09-06

Table 13

Product Service

2.4 Frequency Band Edge

2.4.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(d)
ISED RSS-247, Clause 5.5

2.4.2 Equipment under Test and Modification State

IoTgo® Track-Solar rail; S/N ---; Modification state 0

2.4.3 Date of Test

2025-05-08

2.4.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	39 %

2.4.5 Specification Limits

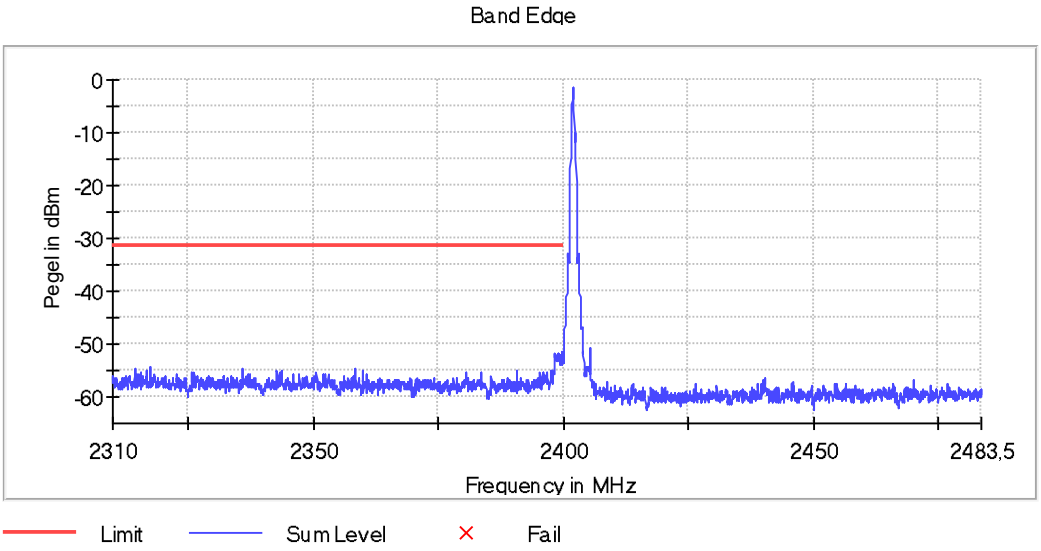
In any 100 kHz bandwidth outside the frequency band in which the device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either conducted or radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits is not required.
In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

2.4.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11

Product Service

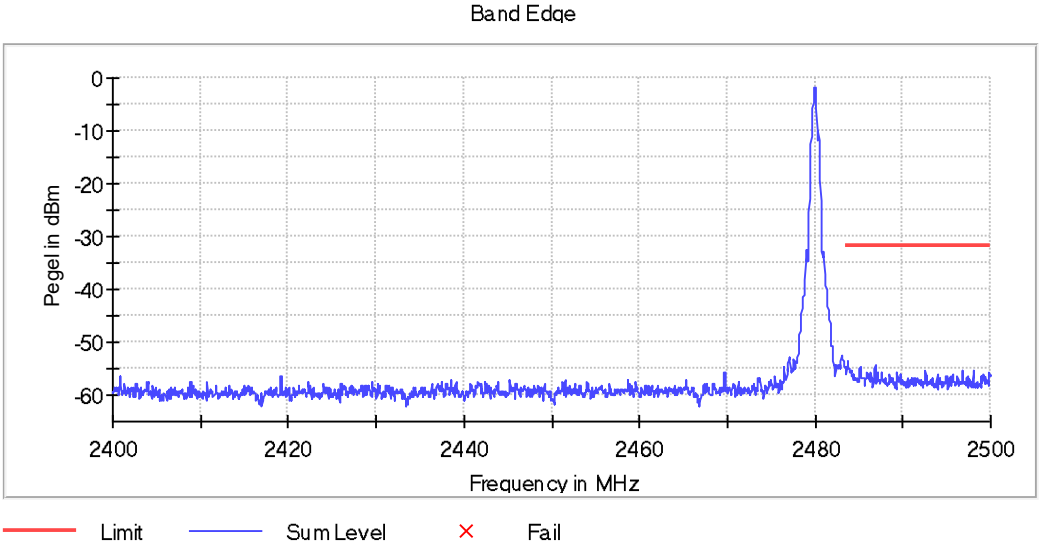
2.4.7 Test Results



Band Edge Low

Frequency (MHz)	RBW (kHz)	VBW (kHz)	Detec-tor	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.625000	100	300	Peak	-51.6	20.0	-31.5	PASS
2399.675000	100	300	Peak	-51.6	20.1	-31.5	PASS
2399.125000	100	300	Peak	-51.7	20.2	-31.5	PASS
2399.175000	100	300	Peak	-51.8	20.3	-31.5	PASS
2399.875000	100	300	Peak	-51.8	20.3	-31.5	PASS
2398.325000	100	300	Peak	-51.9	20.3	-31.5	PASS
2399.925000	100	300	Peak	-51.9	20.4	-31.5	PASS
2398.925000	100	300	Peak	-51.9	20.4	-31.5	PASS
2398.275000	100	300	Peak	-52.0	20.4	-31.5	PASS
2399.025000	100	300	Peak	-52.1	20.5	-31.5	PASS
2398.375000	100	300	Peak	-52.1	20.6	-31.5	PASS
2398.525000	100	300	Peak	-52.2	20.6	-31.5	PASS
2399.575000	100	300	Peak	-52.2	20.6	-31.5	PASS
2399.525000	100	300	Peak	-52.2	20.7	-31.5	PASS
2399.275000	100	300	Peak	-52.2	20.7	-31.5	PASS

Product Service



Band Edge High

Frequency (MHz)	RBW (kHz)	VBW (kHz)	Detec-tor	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.675000	100	300	Peak	-53.4	21.8	-31.6	PASS
2483.725000	100	300	Peak	-53.7	22.1	-31.6	PASS
2483.625000	100	300	Peak	-54.3	22.6	-31.6	PASS
2486.875000	100	300	Peak	-54.3	22.7	-31.6	PASS
2483.525000	100	300	Peak	-54.5	22.9	-31.6	PASS
2485.125000	100	300	Peak	-54.6	22.9	-31.6	PASS
2486.925000	100	300	Peak	-54.8	23.1	-31.6	PASS
2483.825000	100	300	Peak	-54.8	23.2	-31.6	PASS
2485.075000	100	300	Peak	-54.9	23.3	-31.6	PASS
2483.875000	100	300	Peak	-55.0	23.3	-31.6	PASS
2486.825000	100	300	Peak	-55.1	23.5	-31.6	PASS
2485.175000	100	300	Peak	-55.1	23.5	-31.6	PASS
2483.775000	100	300	Peak	-55.1	23.5	-31.6	PASS
2492.575000	100	300	Peak	-55.3	23.7	-31.6	PASS
2484.175000	100	300	Peak	-55.3	23.7	-31.6	PASS

Product Service

2.4.8 Test Location and Test Equipment

The test was carried out in a non-shielded room:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2026-03-31
Switching device	Rohde & Schwarz	OSP120	20248	36	2026-07-31
Switching device	Rohde & Schwarz	OSP120	38807	36	2026-08-31
Climatic test chamber	ESPEC	PL-4 J	38958	18	2026-09-06

Table 14

Product Service

2.5 Spurious emissions

2.5.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.205, 15.209, 15.247(d)
ISED RSS-247, Clause 5.5
ISED RSS-Gen, Clauses 8.9 and 8.10

2.5.2 Equipment under Test and Modification State

IoTgo® Track-Solar rail; S/N ---; Modification state 0

2.5.3 Date of Test

2025-05-08 to 2025-05-09

2.5.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	42 %

2.5.5 Specification Limits

In any 100 kHz bandwidth outside the frequency band in which the device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either conducted or radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits is not required.
In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

Product Service

General radiated emission limits:					
Frequency Range	*Test distance*	*Field strength*		*Field strength*	
(MHz)	*(m)*	*(µA/m)*	*(dBµA/m)*	*(µV/m)*	*(dBµV/m)*
0.009 – 0.49	300	6.37 / *f*	20*lg(6.37 / *f*)	2400 / *f*	20*lg(2400 / *f*)
0.49 – 1.705	30	63.7 / *f*	20*lg(63.7 / *f*)	24000 / *f*	20*lg(24000 / *f*)
1.705 - 30	30	0.08	20*lg(0.08 / *f*)	30	20*lg(30 / *f*)
30 – 88	3	---	--	100	40
88 – 216	3	--	--	150	43.5
126 – 960	3	--	--	200	46
above 960	3	--	--	500	54
Note 1: *f* in kHz					

Table 15 General radiated emission limits

At frequencies at or above 30 MHz, measurements may be performed at distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements.

At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempts should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

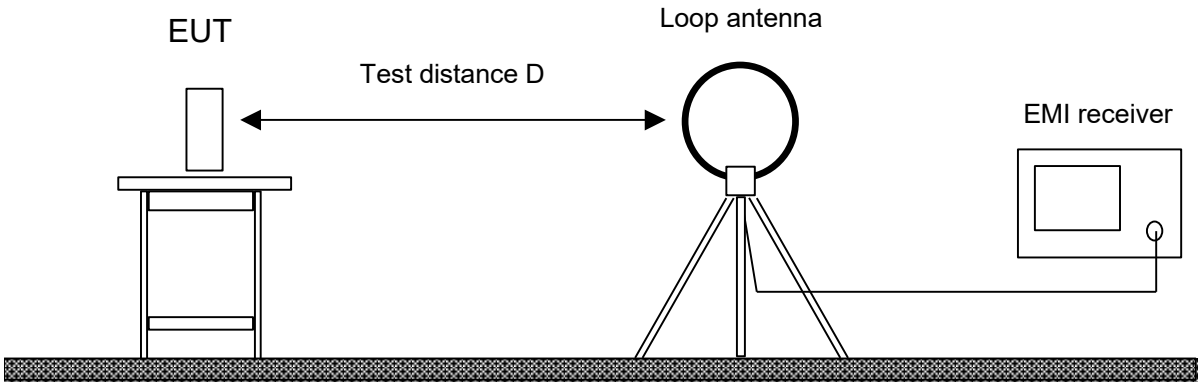
Product Service

2.5.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11 and 11.12

Prescans are performed in six positions of the EUT to get the full spectrum of emission caused by the EUT with the measuring antenna raised and lowered from 1 m to 4 m with vertical and horizontal polarisation to find the combination of table position, antenna height and antenna polarisation for the maximum emission levels.
Data reduction is applied to these results to select those levels having less margin than 10 dB or exceeding the limit using subranges and limited number of maximums.
Further maximisation for adjusting the maximum position is following.
Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

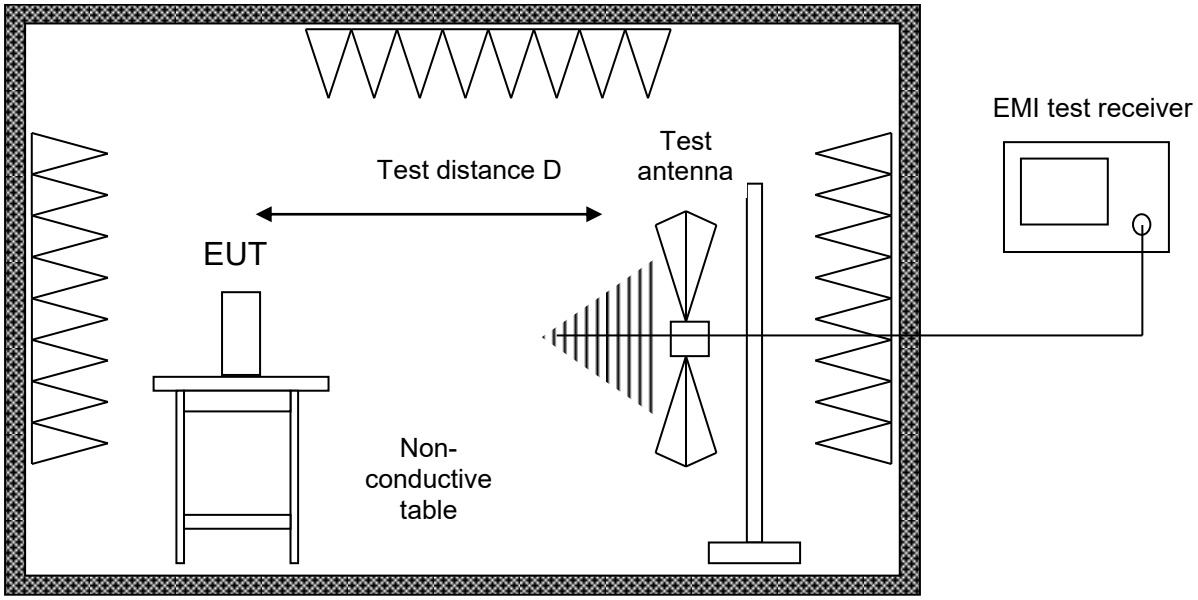
2.5.6.1 Frequency range 9 kHz – 30 MHz



The EUT was placed on a non-conductive table, 0.8 m above the ground.
Radiated emissions in the frequency 9 kHz – 30 MHz is measured within a semi-anechoic room with an active loop antenna with the measurement detector set to peak. In addition in the frequency range 9 kHz to 490 kHz also an average detector was used. The measurement bandwidth of the receiver was set to 300 Hz in the frequency range 9 kHz to 150 kHz and 10 kHz in the frequency range 150 kHz to 30 MHz. Prescans were performed in six positions of the EUT.
For final measurements the detector was set to CISPR quasi-peak and in addition to CISPR average in the frequency range 9 kHz to 490 kHz with a resolution bandwidth 200 Hz in the frequency range 9 kHz to 150 kHz and 9 kHz in the frequency range 150 kHz to 30 MHz. Final tests were performed immediately after a final frequency and zoom (for drifting disturbances) and maximum adjustment.

Product Service

2.5.6.2 Frequency range 30 MHz – 1 GHz

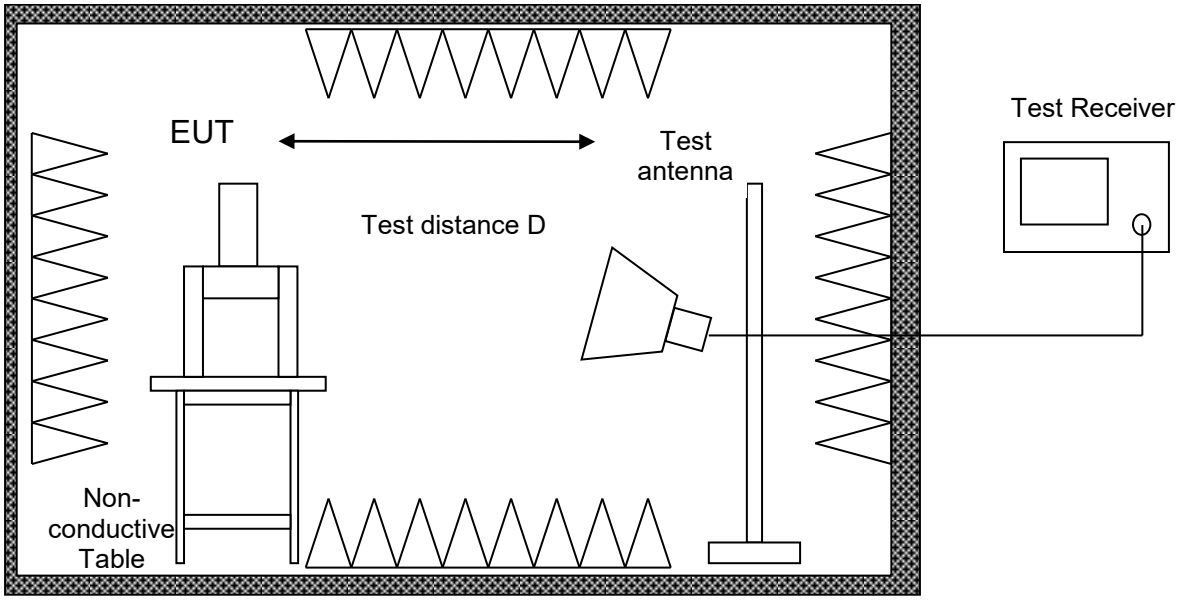


Alternate test site (semi anechoic room)

The EUT was placed on a non-conductive table, 0.8 m above the ground plane
Radiated emissions in the frequency range 30 MHz – 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4. for alternative test sites. A linear polarised logarithmic periodic antenna combined with a 4:1 broadband dipole (“Trilog broadband antenna”) is used.
For prescan tests the test receiver is set to peak-detector with a bandwidth of 120 kHz.
With the measurement bandwidth of the test receiver set to 120 kHz CISPR quasi-peak detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.

Product Service

2.5.6.3 Frequency range above 1 GHz



Fully anechoic room

The EUT was placed on a non-conductive table, 1.5 m above the ground plane
Radiated emission tests above 1 GHz are performed in a fully anechoic room with the S_{VSWR} requirements of ANSI C63.4. Measurements are performed both in the horizontal and vertical planes of polarisation using a test receiver with the detector function set to peak and average and the resolution bandwidth set to 1 MHz. Testing above 1 GHz is performed with horn antennas with the EUT in boresight of the antenna.
For prescan tests the test receiver is set to peak- and average-detector with a bandwidth of 1 MHz. With the measurement bandwidth of the test receiver set to 1 MHz and peak- and CISPR average-detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.

Product Service

2.5.7 Test Results

Frequency range	*Limit applied*	*Test distance*
9 kHz – 30 MHz	15.209; RSS-Gen	3 m
30 MHz – 1 GHz	15.209; RSS-Gen	3 m
1 GHz – 18 GHz	15.209; RSS-Gen	1 m
18 GHz – 25 GHz	15.209; RSS-Gen	3 m

Table 16

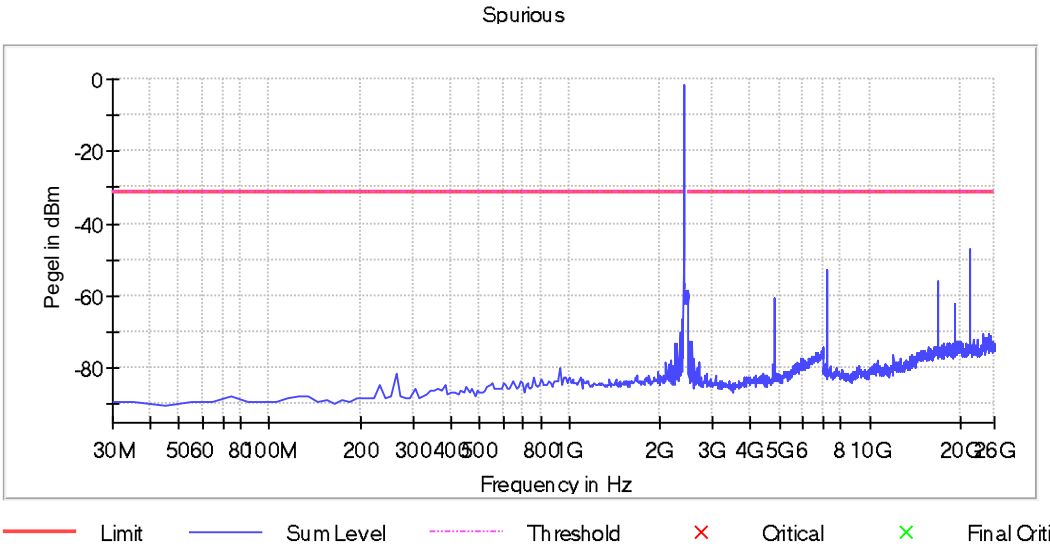
Sample calculation:

Final Value (dBµV/m) = Reading Value (dBµV) + (Cable attenuation (dB) + Antenna Transducer (dB(1/m)))

Additional correction of limit in the frequency range 9 – 490 kHz (300 m to 3 m): +80.0 dB
Additional correction of limit in the frequency range 490 kHz – 30 MHz (30 m to 3 m): +40.0 dB
Additional correction of limit in the frequency ranges above 1 GHz (3 m to 1 m): +9.54 dB

Product Service

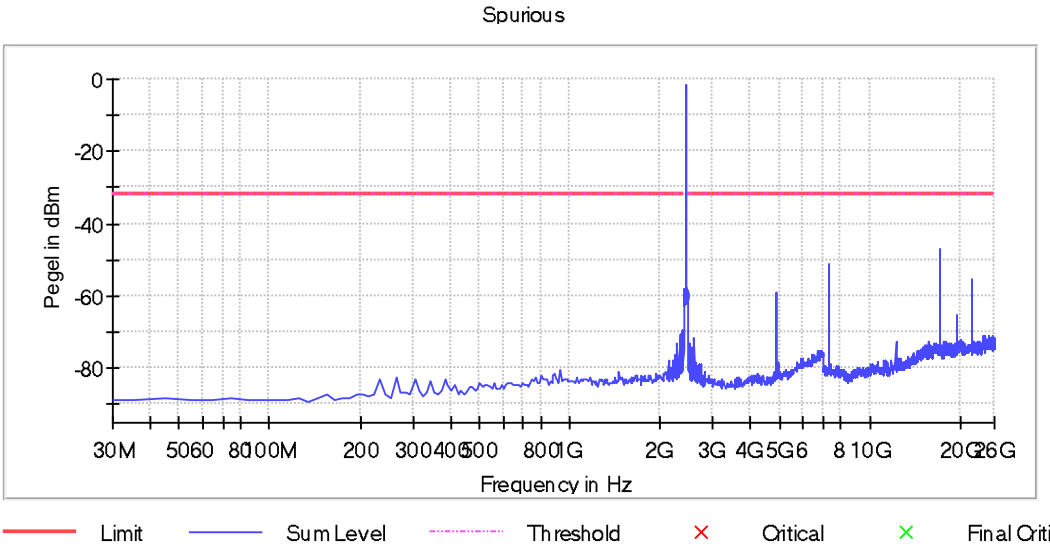
Conducted Spurious Emissions Ch 37:



Frequency (MHz)	RBW (kHz)	VBW (kHz)	Detector	Level (dBm)	Margin (dB)	Limit (dBm)
21617.515831	100	300	Peak	-47.2	15.7	-31.6
2395.021008	100	300	Peak	-48.0	16.4	-31.6
7205.789099	100	300	Peak	-52.7	21.1	-31.6
16810.275499	100	300	Peak	-56.0	24.4	-31.6
16820.269762	100	300	Peak	-60.3	28.7	-31.6
4807.166065	100	300	Peak	-60.4	28.9	-31.6
19218.892796	100	300	Peak	-62.1	30.6	-31.6
2365.147059	100	300	Peak	-66.1	34.5	-31.6
19208.898534	100	300	Peak	-69.5	38.0	-31.6
2325.315126	100	300	Peak	-69.7	38.1	-31.6
24785.697089	100	300	Peak	-70.5	38.9	-31.6
23986.156077	100	300	Peak	-70.7	39.2	-31.6
24865.651190	100	300	Peak	-71.1	39.5	-31.6
25295.404484	100	300	Peak	-71.2	39.6	-31.6
24056.115916	100	300	Peak	-71.4	39.8	-31.6

Product Service

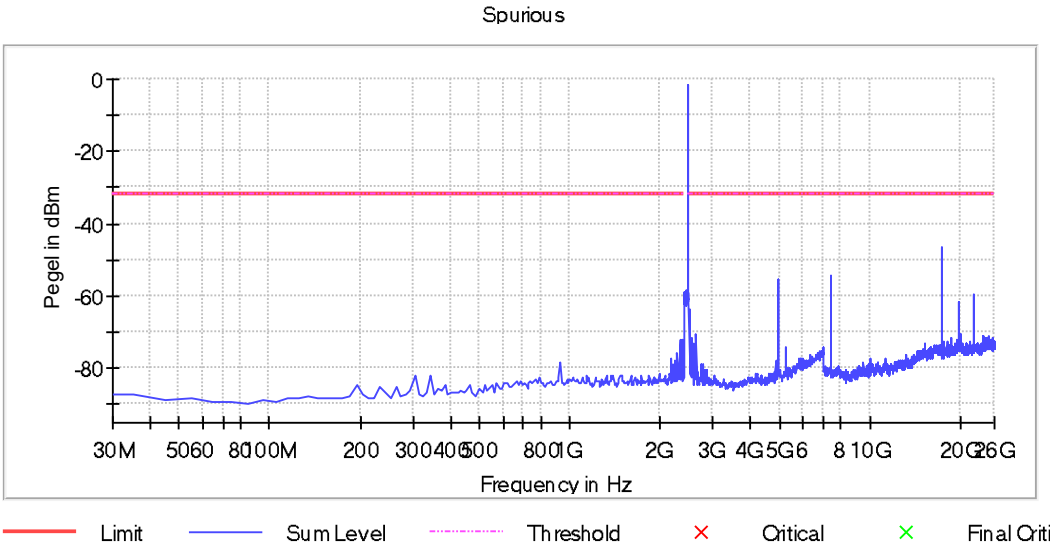
Conducted Spurious Emissions Ch 17:



Frequency (MHz)	RBW (kHz)	VBW (kHz)	Detector	Level (dBm)	Margin (dB)	Limit (dBm)
17080.120591	100	300	Peak	-47.0	15.4	-31.7
7315.725988	100	300	Peak	-50.9	19.3	-31.7
21957.320761	100	300	Peak	-55.5	23.9	-31.7
7325.720251	100	300	Peak	-58.0	26.4	-31.7
4877.125903	100	300	Peak	-58.7	27.1	-31.7
19518.720676	100	300	Peak	-65.1	33.5	-31.7
21967.315023	100	300	Peak	-68.1	36.4	-31.7
2365.147059	100	300	Peak	-69.2	37.5	-31.7
2325.315126	100	300	Peak	-70.6	38.9	-31.7
24735.725776	100	300	Peak	-70.8	39.1	-31.7
24076.104441	100	300	Peak	-71.0	39.3	-31.7
25565.249575	100	300	Peak	-71.2	39.6	-31.7
23986.156077	100	300	Peak	-71.2	39.6	-31.7
23996.150340	100	300	Peak	-71.4	39.7	-31.7
2598.434020	100	300	Peak	-71.4	39.7	-31.7

Product Service

Conducted Spurious Emissions Ch 39:

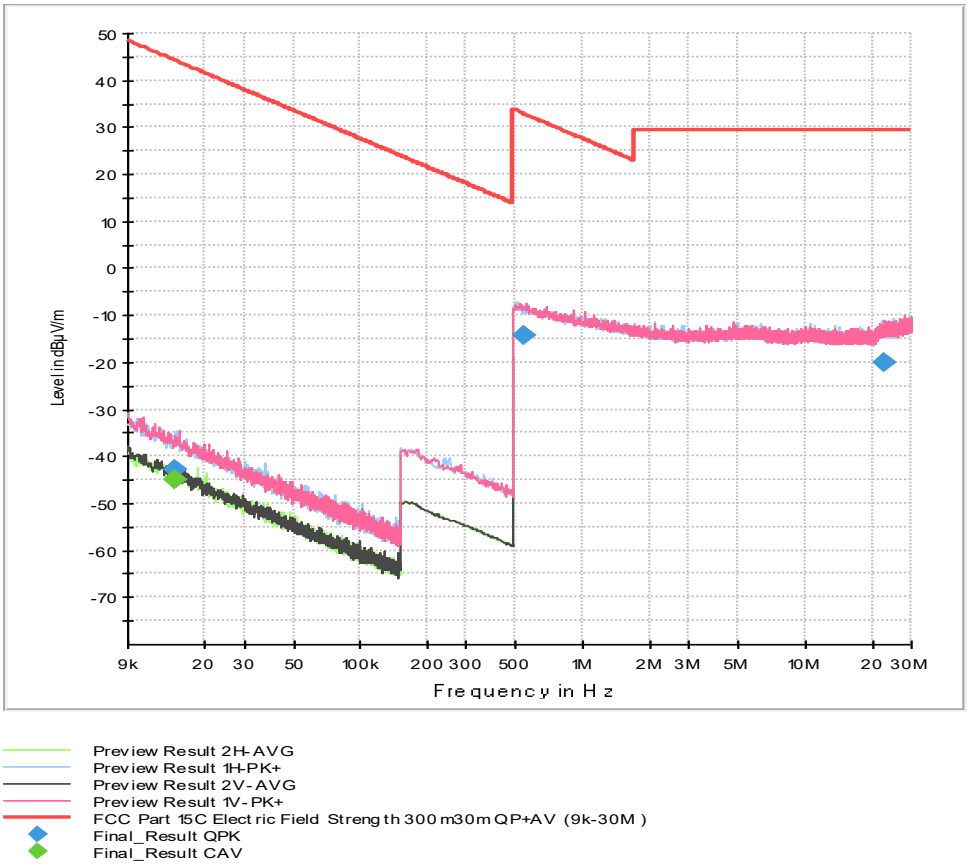


Frequency (MHz)	RBW (kHz)	VBW (kHz)	Detector	Level (dBm)	Margin (dB)	Limit (dBm)
17359.959945	100	300	Peak	-46.2	14.5	-31.8
7435.657140	100	300	Peak	-54.5	22.7	-31.8
4957.080004	100	300	Peak	-55.1	23.4	-31.8
2488.497131	100	300	Peak	-58.8	27.1	-31.8
22317.114216	100	300	Peak	-59.6	27.8	-31.8
19838.537080	100	300	Peak	-61.6	29.8	-31.8
2518.479919	100	300	Peak	-63.9	32.1	-31.8
22327.108479	100	300	Peak	-64.2	32.5	-31.8
7445.651402	100	300	Peak	-65.7	33.9	-31.8
20098.387909	100	300	Peak	-70.4	38.7	-31.8
2638.411071	100	300	Peak	-70.7	38.9	-31.8
23886.213451	100	300	Peak	-71.0	39.2	-31.8
24006.144603	100	300	Peak	-71.0	39.3	-31.8
24725.731513	100	300	Peak	-71.2	39.5	-31.8
2558.456970	100	300	Peak	-71.3	39.5	-31.8

Product Service

Premeasurements were performed for worst case evaluation. Final testing was performed in the chosen worst-case Mode, see section 2.2. Channel 39 was found to be the most critical configuration. Following radiated Tx spurious emissions were captured with Channel 39 active.

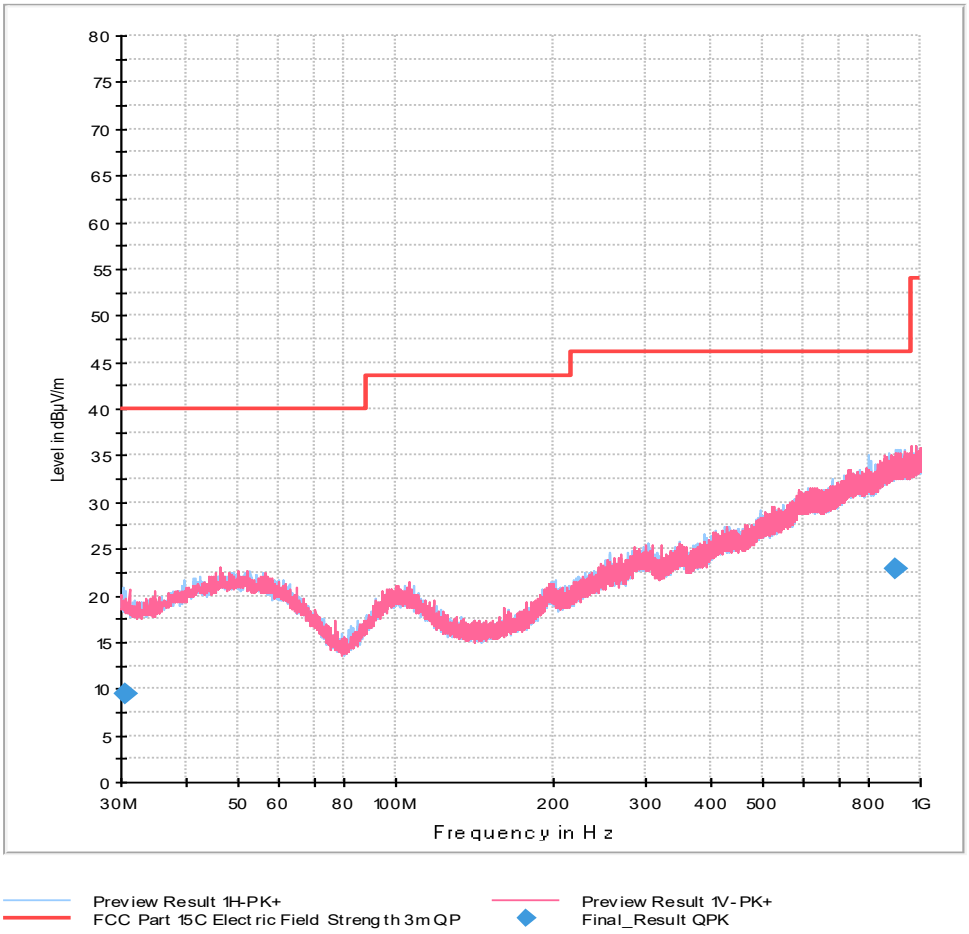
Radiated Spurious Emissions Ch 39:



Final Results:

Frequency MHz	*QuasiPeak dBµV/m*	*CAverage dBµV/m*	*Limit dBµV/m*	*Margin dB*	*Meas. Time ms*	*Bandwidth kHz*	*Height cm*	*Pol*	*Azimuth deg*	*Corr. dB/m*
0.014850	-42.67	---	44.17	86.84	1000.0	0.200	100.0	V	-53.0	-59.9
0.014850	---	-45.13	44.17	89.30	1000.0	0.200	100.0	V	-53.0	-59.9
0.544000	-14.25	---	32.89	47.14	1000.0	9.000	100.0	H	-65.0	-20.6
22.434250	-20.07	---	29.54	49.61	1000.0	9.000	100.0	V	-102.0	-19.3

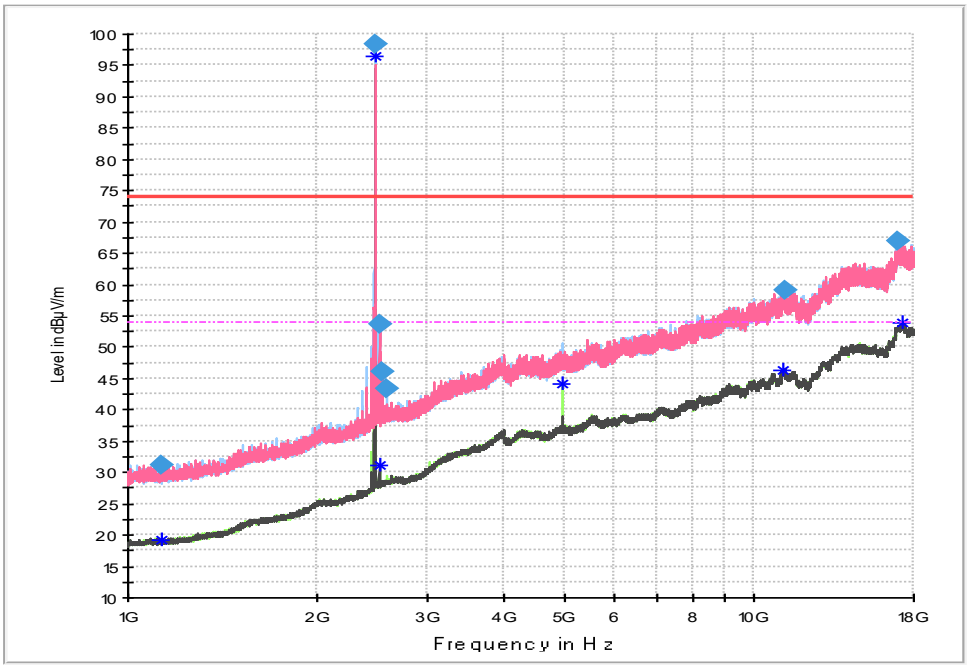
Product Service



Final Results:

Frequency *MHz*	*Qua-siPeak* *dBµV/m*	*Limit* *dBµV/m*	*Margin* *dB*	*Meas. Time* *ms*	*Band-width* *kHz*	*Height* *cm*	*Pol*	*Azi-muth* *deg*	*Corr.* *dB/m*
30.540000	9.48	40.00	30.52	1000.0	120.000	124.0	V	75.0	18.1
898.830000	22.84	46.02	23.18	1000.0	120.000	350.0	H	-2.0	32.7

Product Service

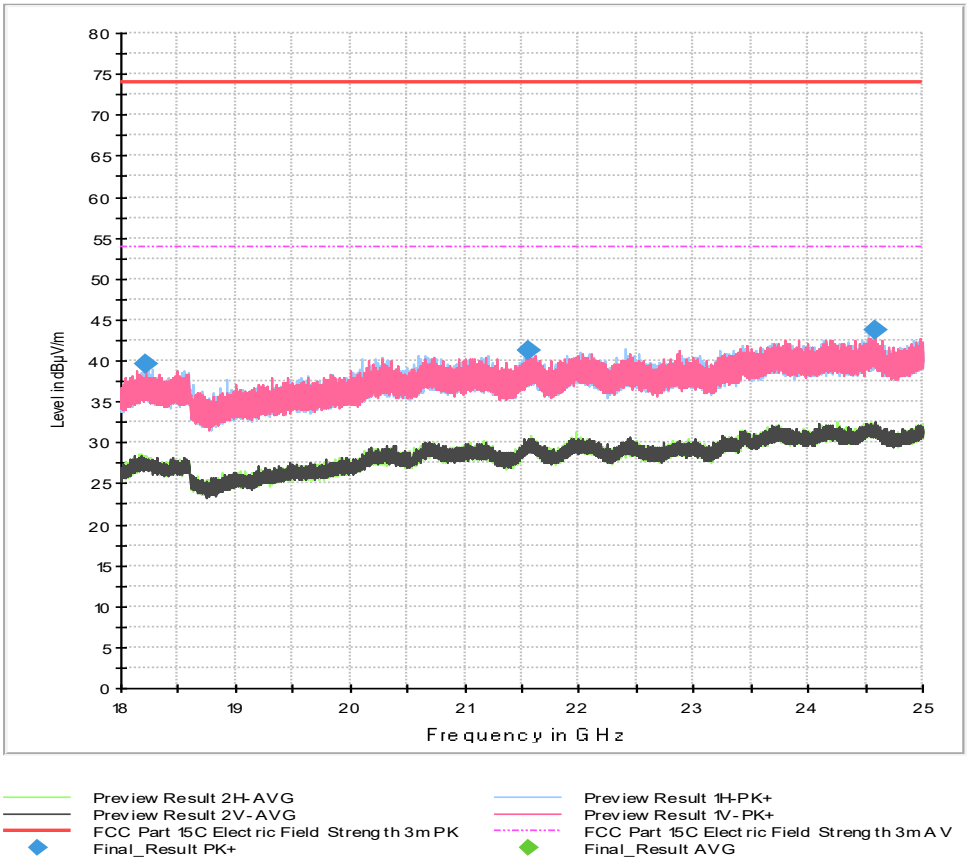


Final Results:

Frequency MHz	*Max-Peak dBµV/m*	*Aver-age dBµV/m*	*Limit dBµV/m*	*Mar-gin dB*	*Meas. Time ms*	*Band-width kHz*	*Height cm*	*Pol*	*Azi-muth deg*	*Corr. dB/m*
1129.500000	---	19.33	53.98	34.65	1000.0	1000.000	250.0	V	15.0	20.0
1130.500000	31.21	---	73.98	42.77	1000.0	1000.000	300.0	V	-45.0	20.0
2479.500000	---	96.44	*	*	1000.0	1000.000	200.0	H	15.0	26.6
2480.000000	98.51	---	*	*	1000.0	1000.000	200.0	H	15.0	26.6
2518.000000	---	31.04	53.98	22.94	1000.0	1000.000	200.0	V	-75.0	26.8
2518.500000	53.57	---	73.98	20.41	1000.0	1000.000	200.0	H	15.0	26.8
2556.000000	46.07	---	73.98	27.91	1000.0	1000.000	200.0	H	15.0	27.0
2595.500000	43.47	---	73.98	30.51	1000.0	1000.000	200.0	H	15.0	27.2
4960.000000	---	44.13	53.98	9.85	1000.0	1000.000	200.0	H	15.0	34.6
11118.500000	---	46.27	53.98	7.71	7000.0	1000.000	250.0	H	105.0	43.3
11212.000000	59.18	---	73.98	14.80	7000.0	1000.000	250.0	H	-135.0	43.1
16982.000000	66.81	---	73.98	7.17	7000.0	1000.000	150.0	V	165.0	50.2
17303.000000	---	53.86	53.98	0.12	7000.0	1000.000	300.0	H	-15.0	50.5

*: Intentional radiation not evaluated.

Product Service



Final Results:

Frequency MHz	*Max-Peak dBµV/m*	*Aver-age dBµV/m*	*Limit dBµV/m*	*Mar-gin dB*	*Meas. Time ms*	*Band-width kHz*	*Height cm*	*Pol*	*Azi-muth deg*	*Corr. dB/m*
18162.750000	---	28.54	53.98	25.44	1000.0	1000.000	100.0	H	-90.0	11.7
18217.437500	39.49	---	73.98	34.49	1000.0	1000.000	200.0	V	-150.0	11.8
21559.500000	41.26	---	73.98	32.72	1000.0	1000.000	200.0	V	90.0	12.7
21575.250000	---	30.80	53.98	23.18	1000.0	1000.000	300.0	H	-90.0	12.7
24580.000000	---	32.53	53.98	21.45	1000.0	1000.000	100.0	V	150.0	14.3
24580.000000	43.76	---	73.98	30.22	1000.0	1000.000	300.0	V	30.0	14.3

Product Service

2.5.8 Test Location and Test Equipment

The test was carried out in a non-shielded room and in semi anechoic chamber no. 3:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
EMI test receiver	Rohde & Schwarz	ESR7	61814	12	2025-06-30
Signal and Spectrum Analyser	Rohde & Schwarz	FSW43	53496	12	2026-04-30
Loop antenna	Schwarzbeck	FMZB 1519 C	72526	36	2028-01-31
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	19691	36	2027-04-30
Double ridged horn antenna	Rohde & Schwarz	HF907	40089	24	2026-11-30
Horn Antenna with preamplifier	Rohde & Schwarz	A-INFOMW LB-180400H-KF + TS-LNA 1840	43661	24	2027-01-31
Semi anechoic room	Frankonia	Cabin no. 3	56331	35	2025-06-07
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	20219	24	2026-03-31
Switching device	Rohde & Schwarz	OSP120	20248	36	2026-07-31
Switching device	Rohde & Schwarz	OSP120	38807	36	2026-08-31
Climatic test chamber	ESPEC	PL-4 J	38958	18	2026-09-06

Table 17

Product Service

2.6 Temperature Stability

2.6.1 Specification Reference

ISED RSS-Gen, Clause 6.11, 8.11

2.6.2 Equipment under Test and Modification State

IoTgo® Track-Solar rail; S/N ---; Modification state 0

2.6.3 Date of Test

2025-05-14

2.6.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	42 %

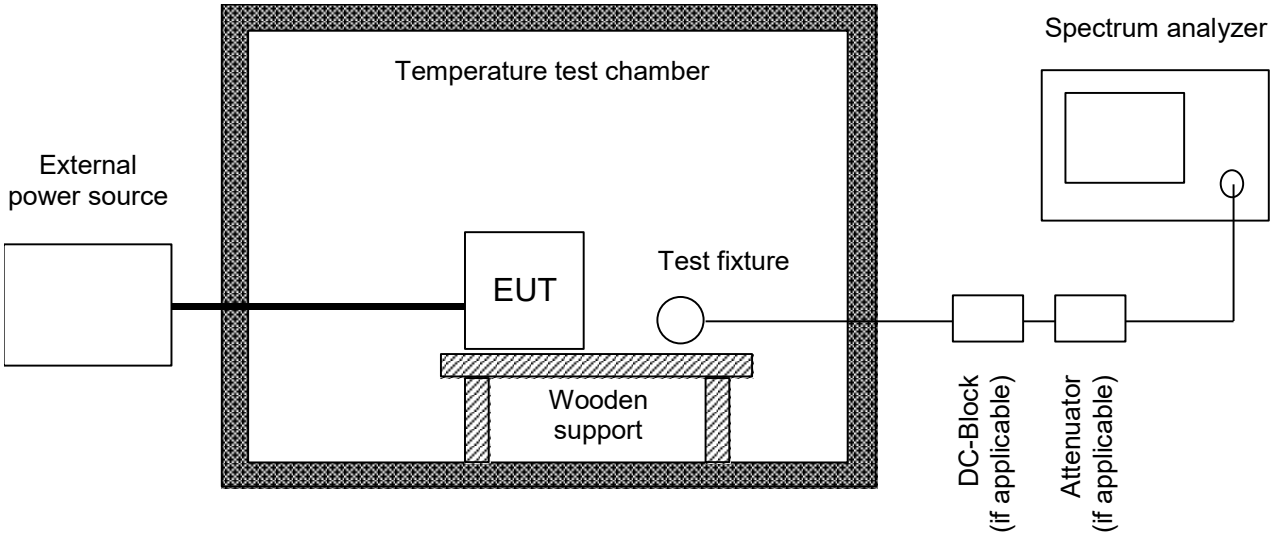
2.6.5 Specification Limits

If the stability of the license-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80 % of its permitted operating frequency band in order to minimize the possibility of out-of-band operation. In additions, its occupied bandwidth shall be entirely outside the restricted bands and the prohibited TV bands of 85 MHz – 72 MHz, 76 MHz – 88 MHz, 174 MHz – 216 MHz, and 470 MHz – 602 MHz, unless otherwise indicated.

Product Service

2.6.6 Test Method

The test was performed according to ANSI C63.10, section 6.8.



The frequency tolerance of the carrier signal is measured over a temperature variation of -20 °C to +50 °C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rates supply voltage at a temperature of 20 °C. Temperature and voltage range may vary if the manufacturer states another temperature or voltage range.
If the EUT provides an antenna connector the spectrum analyzer is connected to this port. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as a DC block and appropriate (50 Ω) attenuators. In case where the EUT does not provide an antenna connector or a test fixture is used.
For battery operated equipment, the test is performed using a new battery. Alternatively, an external supply voltage can be used and is at least set to:

- The maximum battery voltage as delivered by a new battery or 115 % of the battery nominal voltage;
- The battery nominal voltage
- 85 % of the battery nominal voltage
- The battery operating end point voltage which shall be specified by the equipment manufacturer.

The EUT is operating providing an unmodulated carrier for frequency error tests. The peak detector of the spectrum analyzer is selected and resolution as well as video bandwidth are set to values appropriate to shape of the spectrum of the EUT. The frequency counter mode of the spectrum analyzer is used to maximize the accuracy of the measured frequency tolerance.
If an unmodulated carrier is not available a significant and stable point of the spectrum is selected and the span is reduced to a value that delivers an accuracy which shall be better than 1 % of the maximum frequency tolerance allowed for the carrier signal. This method may be performed as long as the margin to the frequency tolerance is larger than the uncertainty of the measured frequency tolerance.

Product Service

2.6.7 Test Results

Temperature	*Channel*	*Supply Voltage*	*Band Edge Left (MHz)*	*Band Edge Right (MHz)*	*Center Frequency (MHz)*	*Frequency drift (‰)*
20 °C	37	3.7 V	2401.475	2402.505	2401.990	-0.0042
20 °C	17	3.7 V	2439.475	2440.505	2439.990	-0.0041
20 °C	39	3.7 V	2479.475	2480.505	2479.990	-0.0040
- 40 °C	37	3.7 V	2401.455	2402.485	2401.970	-0.0125
- 40 °C	17	3.7 V	2439.455	2440.485	2439.970	-0.0123
- 40 °C	39	3.7 V	2479.455	2480.485	2479.970	-0.0121
80 °C	37	3.7 V	2401.475	2402.505	2401.990	-0.0042
80 °C	17	3.7 V	2439.475	2440.505	2439.990	-0.0041
80 °C	39	3.7 V	2479.475	2480.505	2479.990	-0.0040

Table 18

Product Service

2.6.8 Test Location and Test Equipment

The test was carried out in a non-shielded room:

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Climatic test chamber	ESPEC	PL-4 J	38958	18	2026-09-06
Switching device	Rohde & Schwarz	OSP120	20248	36	2026-07-31
Switching device	Rohde & Schwarz	OSP120	38807	36	2026-08-31
Signal and Spectrum Analysator	Rohde & Schwarz	FSV40	20219	24	2026-03-31

Table 19

Product Service

3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
Conducted Voltage Emission		
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB
100 kHz to 200 MHz (50Ω/5µH AMN)	2	± 3.6 dB
Discontinuous Conducted Emission		
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB
Conducted Current Emission		
9 kHz to 200 MHz	2	± 3.5 dB
Magnetic Fieldstrength		
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB
Radiated Emission		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 5.0 dB
1 GHz to 6 GHz	2	± 4.6 dB
Test distance 10 m		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 4.9 dB
The expanded uncertainty reported according to to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 20 Measurement uncertainty based on CISPR 16-4-2

Product Service

Radio Interference Emission Testing		
Test Name	*kp*	*Expanded Uncertainty*
Occupied Bandwdith	2	± 5 %
Conducted Power		
9 kHz ≤ f < 30 MHz	2	± 1.0 dB
30 MHz ≤ f < 1 GHz	2	± 1.5 dB
1 GHz ≤ f ≤ 40 GHz	2	± 2.5 dB
1 MS/s power sensor (TS8997)	2	± 1.5 dB
Occupied Bandwidth	2	± 5 %
Power Spectral Density	2	± 3.0 dB
Radiated Power		
25 MHz – 6 GHz	1.96	±4.4 dB
1 GHz – 18 GHz	1.96	±4.7 dB
18 GHz – 40 GHz	1.96	±4.9 dB
40 GHz – 325 GHz	1.96	±6.1 dB
Conducted Spurious Emissions	2	± 3.0 dB
Radiated Spurious Emissions	2	± 6.0 dB
Voltage		
DC	2	± 1.0 %
AC	2	± 2.0 %
Time (automatic)	2	± 5 %
Frequency	2	± 10^{-7}
The expanded uncertainty reported according to to ETSI TR 100 028:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 21 Measurement uncertainty based on ETSI TR 100 028

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 (U_{CISPR}) and as specified in the test report below. This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

Test Name	*Expanded Uncertainty*
Occupied Bandwidth	±5 %
Conducted Power	
9 kHz ≤ f < 30 MHz	±1.0 dB
30 MHz ≤ f < 1 GHz	±1.5 dB
1 GHz ≤ f ≤ 40 GHz	±2.5 dB
1 MS/s power sensor (2.4 / 5 GHz band)	±1.5 dB
Power Spectral Density	±3.0 dB
Radiated Power	
25 MHz – 26.5 GHz	±6.0 dB
26.5 GHz – 66 GHz	±8.0 dB
40 GHz – 325 GHz	±10.0 dB
Conducted Spurious Emissions	±3.0 dB
Radiated Field Strength 9 kHz – 40 GHz	±6.0 dB
Voltage	
DC	± 1.0 %
AC	± 2.0 %
Time (automatic)	± 5 %
Frequency	± 10^{-7}

Table 22 Decision Rule: Maximum allowed measurement uncertainty