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

Model: IoTgo® Track-Solar rail

In accordance with FCC 47 CFR Part 1.1310, Part 2.1093 and RSS-102

Product Service

Choose certainty.
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Prepared for: Giesecke+Devrient GmbH
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FCC ID:	2BP32-GDTSR2501
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Contains IC:	10224A-BG95M5

COMMERCIAL-IN-CONFIDENCE

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Alexander Deese	2025-07-23	SIGN-ID 1061342
Authorised Signatory	Alex Fink	2025-07-24	SIGN-ID 1061448

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 reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 1.1310, Part 2.1093 and RSS 102 Issue 6 (December 2023). The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	
Testing	Alexander Deese	2025-07-23	SIGN-ID 1061342

Laboratory Accreditation	Laboratory recognition	ISED 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 SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 1.1310 : 2020 Part 2.1093 : 2021 and RSS 102 Issue 6 (December 2023)

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Product Service

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1 Report Summary

1.1 Report Modification Record

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

Revision	Description of Change	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. Chapter 1.6 and 2.1, mode for GSM corrected to band 850. Exemption calculation at 20cm and ERP for part 47CFR.	2025-07-17
3	MPE calculation according to 47 CFR, Part 1, § 1.1310(e)(1) and RSS-102, section 5.3.2.	2025-07-23

Table 1

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/Issue/Date	FCC 47 CFR Part 1.1310 : 2020 and Part 2.1093 : 2021 RSS 102 Issue 6 (December 2023)
Test Plan/Issue/Date	---
Order Number Date	8185527-a 2025-04-29
Date of Receipt of EUT	2025-04-08
Start of Test	2025-05-08
Finish of Test	2025-06-12
Name of Engineer(s)	Alexander Deese
Related Document(s)	447498 D04 Interim General RF Exposure Guidance v01 ANSI C63.10 (2013)

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1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 1.1310, Part 2.1093 and RSS-102 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Continuously Transmitting with modulation				
2.1	1.1310 5.3.2	RF Exposure Evaluation	Pass	KDB 447498 D01 v07

Table 2

Product Service

1.4 Product Information

Solar-based IoT Tracking Devices with Bluetooth and LTE-M / GSM.

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:	Bluetooth: Chip Antenna ACA-5036-A2-CC-S, Peak Gain 3 dBi Cellular: Quectel YYW00A2BA

Product Service

1.5 Test Configuration

The EUT was 3.7 V / DC battery supplied. The radio modules were transmitting continuously. Radio frequency of Bluetooth was configured via serial commands provided by the customer. Radio Bands and Channels of the Cellular were configured via test base station (CMW500).

1.6 Modes of Operation

Mode 1:
Ch 37; 2402 MHz; BW 2 MHz; Power setting “7”; Continuously modulated carrier
LTE-M, Band 2, 1880 MHz, BW 1.4 MHz

Mode 2:
Ch 17; 2440 MHz; BW 2 MHz; Power setting “7”; Continuously modulated carrier
LTE-M, Band 5, 836.5 MHz, BW 1.4 MHz

Mode 3:
BLE, Ch 37; 2402 MHz; BW 2 MHz; Power setting “7”; Continuously modulated carrier
GSM, Band 850, 837 MHz

Product Service

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
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 (S/N: ---)	Not Applicable	Not Applicable

Table 3

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

Test Name	Name of Engineer(s)
Configuration and Mode: Continuously Transmitting with modulation	
RF Exposure Evaluation	Alexander Deese

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany

Product Service

2 Test Details

1.1 RF Exposure Exemption

1.1.1 Specification Reference

47 CFR, Part 1, § 1.1310 : 2020
RSS-102, Issue 6 (2023)

1.1.2 Equipment under Test and Modification State

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

1.1.3 Date of Test

2025-05-08 to 2025-06-12

1.1.4 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	39 %

Product Service

1.1.5 Specification Limits

47 CFR, Part 1, § 1.1310(e)(1)

Table 1 to § 1.1310(e)(1) — Limits for Maximum Permissible Exposure (MPE)				
Frequency range (MHz)	**Electric field strength (V/m)**	**Magnetic field strength (A/m)**	**Power density (mW/cm^2)**	**Averaging time (minutes)**
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*($900/f^2$)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*($180/f^2$)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30
f = frequency in MHz. * = Plane-wave equivalent power density.				

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RSS-102, section 5.3.2

Table 7: RF field strength and power density limits for devices used by the general public (uncontrolled environment)

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	27.46	0.0728	2	6
20-48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/ f^{1.2}$
150000-300000	$0.158\ f^{0.5}$	$4.21\times10^{-4}\ f^{0.5}$	$6.67\times10^{-5}\ f$	$616000/ f^{1.2}$

Note: f is frequency in MHz.

Product Service

1.1.6 Test Method

MPE calculation for a test separation distance of 20 cm. The calculations are based on values taken form test reports TR-713356368-00 and R2005A0283-M1.

1.1.7 Test Results

47 CFR

Evaluation according to 47 CFR, Part 1, § 1.1310(e)(1)

Bluetooth:

Frequency [MHz]	*EIRP [dBm]*	*EIRP [mW]*	*Power Spectral Density at 20 cm [mW/cm²]*	*Limit [mW/cm²]*	*Ratio*
2402	4.604	2.887	0.0005744	1.0	0.0005744
2440	4.666	2.928	0.0005825	1.0	0.0005825
2480	4.735	2.975	0.0005919	1.0	0.0005919

Cellular:

Band	*Frequency [MHz]*	*Conducted Output Power [dBm]*	*Antenna Gain [dBi]*	*EIRP [dBm]*	*EIRP [mW]*	*Power Spectral Density at 20 cm [mW/cm²]*	*Limit [mW/cm²]*	*Ratio*
GSM850	836.6	25.970	1.71	27.68	586.1	0.1166	2.788	0.04181
GSM1900	1879.8	22.970	3.74	26.71	468.8	0.09327	1.0	0.09326
NB-IOT Band 2	1880	25.000	3.74	28.74	748.2	0.1488	1.0	0.1488
NB-IOT Band 4	1732.5	25.000	3.74	28.74	748.2	0.1488	1.0	0.1488
NB-IOT Band 5	836.5	25.000	1.71	26.71	468.8	0.09327	2.788	0.03344
NB-IOT Band 12	707.5	25.000	1.71	26.71	468.8	0.09327	2.358	0.03954
NB-IOT Band 13	782	25.000	1.71	26.71	468.8	0.09327	2.606	0.03578
NB-IOT Band 25	1882.5	25.000	3.74	28.74	748.2	0.1488	1.0	0.1488
NB-IOT Band 66	1745	25.000	3.74	28.74	748.2	0.1488	1.0	0.1488
NB-IOT Band 71	680.5	25.000	1.71	26.71	468.8	0.09327	2.268	0.04111
NB-IOT Band 85	707	25.000	1.71	26.71	468.8	0.09327	2.356	0.03957

Evaluation of multiple frequency sources:

$$0.0005919 + 0.1488 = 0.1494 < 1$$

No further evaluation necessary.

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RSS-102

Evaluation according to RSS 102 section 5.3.2

Bluetooth:

Frequency [MHz]	*EIRP [dBm]*	*EIRP [mW]*	*Power Spectral Density at 20 cm [mW/cm²]*	*Limit [mW/cm²]*	*Ratio*
2402	4,604	2,887	0,0005744	0.5350	0.001073
2440	4,666	2,928	0,0005825	0.5408	0.001077
2480	4,735	2,975	0,0005919	0.5468	0.001082

Cellular:

Band	*Frequency [MHz]*	*Conducted Output Power [dBm]*	*Antenna Gain [dBi]*	*EIRP [dBm]*	*EIRP [mW]*	*Power Spectral Density at 20 cm [mW/cm²]*	*Limit [mW/cm²]*	*Ratio*
GSM850	836.6	25.970	1.71	27.68	586.1	0.1166	0.2602	0.4480
GSM1900	1879.8	22.970	3.74	26.71	468.8	0.09327	0.4525	0.2060
NB-IOT Band 2	1880	25.000	3.74	28.74	748.2	0.1488	0.4525	0.3288
NB-IOT Band 4	1732.5	25.000	3.74	28.74	748.2	0.1488	0.4280	0.3477
NB-IOT Band 5	836.5	25.000	1.71	26.71	468.8	0.09327	0.2602	0.3584
NB-IOT Band 12	707.5	25.000	1.71	26.71	468.8	0.09327	0.2320	0.4018
NB-IOT Band 13	782	25.000	1.71	26.71	468.8	0.09327	0.2485	0.3752
NB-IOT Band 25	1882.5	25.000	3.74	28.74	748.2	0.1488	0.4529	0.3285
NB-IOT Band 66	1745	25.000	3.74	28.74	748.2	0.1488	0.4301	0.3460
NB-IOT Band 71	680.5	25.000	1.71	26.71	468.8	0.09327	0.2259	0.4127
NB-IOT Band 85	707	25.000	1.71	26.71	468.8	0.09327	0.2319	0.4020

Evaluation of multiple frequency sources:

$$0.001082 + 0.4480 = 0.4491 < 1$$

No further evaluation necessary.

Product Service

1.1.8 Test Location and Test Equipment

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

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
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 Horna Antenna	Rohde & Schwarz	HF907	64145	24	2025-06-30

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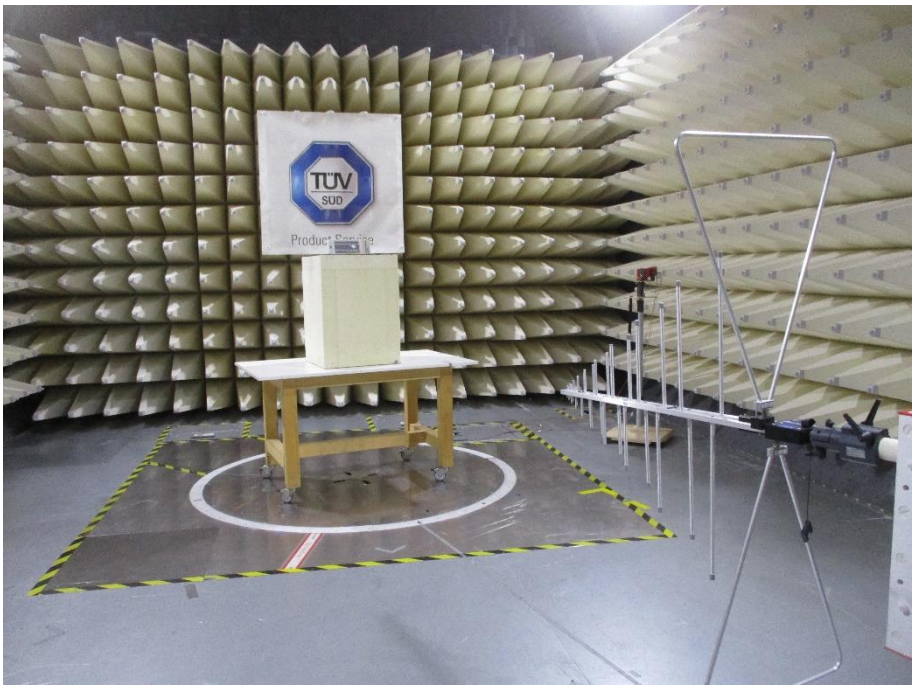
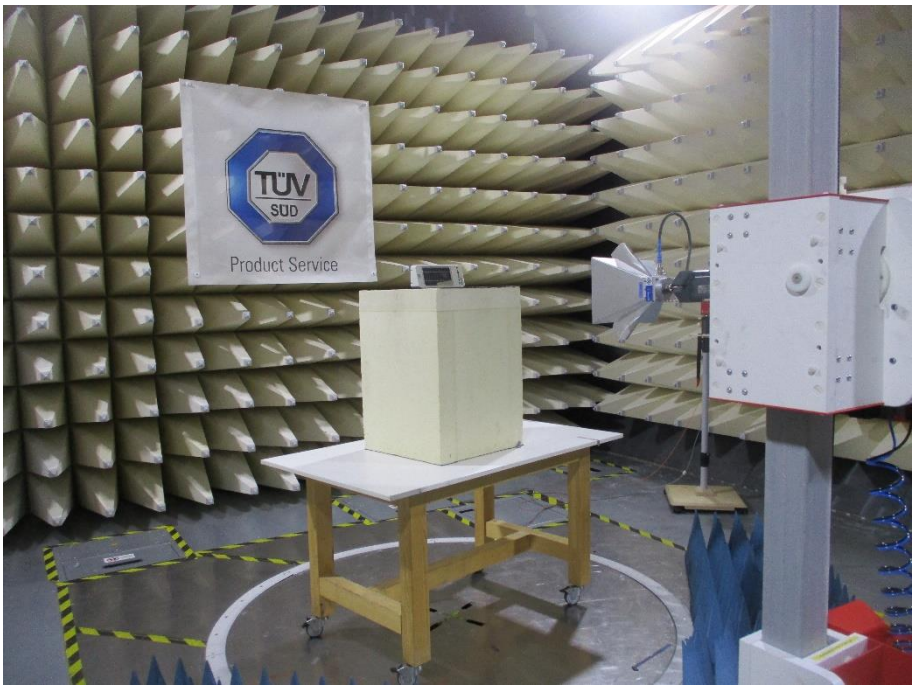
3 Photographs of Test Setups





Product Service

4 Measurement Uncertainty

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

Radio Testing			
Test Name	kp	Expanded Uncertainty	Note
Occupied Bandwidth	2.0	±1.14 %	2
RF-Frequency error	1.96	±1 · 10-7	7
RF-Power. conducted carrier	2	±0.079 dB	2
RF-Power uncertainty for given BER	1.96	+0.94 dB / -1.05	7
RF power. conducted. spurious emissions	1.96	+1.4 dB / -1.6 dB	7
RF power. radiated			
25 MHz – 4 GHz	1.96	+3.6 dB / -5.2 dB	8
1 GHz – 18 GHz	1.96	+3.8 dB / -5.6 dB	8
18 GHz – 26.5 GHz	1.96	+3.4 dB / -4.5 dB	8
40 GHz – 170 GHz	1.96	+4.2 dB / -7.1 dB	8
Spectral Power Density. conducted	2.0	±0.53 dB	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	±2.89 %	2
6 kHz – 25 kHz	2	±0.2 dB	2
Maximum frequency deviation for FM	2	±2.89 %	2
Adjacent channel power 25 MHz – 1 GHz	2	±2.31 %	2
Temperature	2	±0.39 K	4
(Relative) Humidity	2	±2.28 %	2
DC- and low frequency AC voltage			
DC voltage	2	±0.01 %	2
AC voltage up to 1 kHz	2	±1.2 %	2
Time	2	±0.6 %	2

Table 5

Product Service

Radio Interference Emission Testing			
Test Name	kp	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5µH AMN)	2	± 3.6 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50µH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50µH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 200 MHz	2	± 3.5 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.5 dB	1
Harmonic Current Emissions			4
Voltage Changes. Voltage Fluctuations and Flicker			4

Table 6

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Immunity Testing			
Test Name	kp	Expanded Uncertainty	Note
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances. induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips. Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Table 7

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Note 1:
The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%
Note 2:
The expanded uncertainty reported according to UKAS Lab 34 (Edition 1. 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%
Note 3:
The expanded uncertainty reported according to UKAS Lab 34 (Edition 1. 2002-08) is based on a standard uncertainty multiplied by a coverage factor of kp = 2.05. providing a level of confidence of p = 95.45%
Note 4:
It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95%confidence.
Note 5:
The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%
Note 6:
The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of kp = 2. providing a level of confidence of p = 95.45%
Note 7:
The expanded uncertainty reported according ETSI TR 100 028 V1.4.1 (all parts) to is based on a standard uncertainty multiplied by a coverage factor of kp = 1.96. providing a level of confidence of p = 95.45%
Note 8:
The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of kp = 1.96. providing a level of confidence of p = 95.45%