DAkkS Deutsche Akkreditierungsstelle D-PL-21375-01-03

INGENIEURBÜRO LENHARDT

Bundesnetzagentur

BNetzA-CAB-21/21-21

Assessment Report

Test report no.: 21014965-18645-0
Date of issue: 2021-06-28

Test result: The test item **- passed - and complies** with the listed standards.

Applicant

FEIG ELECTRONIC GmbH

Manufacturer

Same as applicant

Test Item

ID ECCO Smart

MPE Assessment according to:

FCC 47 CFR Part 15
Radio frequency devices
Parts 1.1307, 1.1310, 2.1091, 2.1093

Tested by (name, function, signature)	*Andreas Bender* *Head of Laboratory*	signature
Approved by (name, function, signature)	*Dr.-Ing. Harald Ansorge* *Managing Director*	signature

Applicant and Test item details	
Applicant	FEIG ELECTRONIC GmbH Lange Straße 4 D-35781 , Weilburg , Deutschland) Fon: +49 6471 31 09 0 Fax: +49 6471 31 09 99
Manufacturer	Same as applicant
Test item description	RFID Reader (& Barcode Scanner) with Bluetooth LE
Model/Type reference	ID ECCO Smart
Standard specific information	
Frequency	13.56 MHz / 2.4 GHz ISM band (2400 ± 2483.5 MHz)
Antenna	Integrated loop antenna
Power supply	Lithium Ion Battery: 3.7 VDC (1250 mAh)
Temperature range	-20 °C ~ +55 °C
FCC ID	PJMECCOSMRT

Disclaimer and Notes

The content of this rest report relates to the mentioned test sample(s) only.
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Within this test report, a ☒ point / ☐ comma is used as a decimal separator.
If otherwise, a detailed note is added adjected to its use.

IBL-Lab GmbH does not take samples. The samples used for testing are provided by the applicant.

Decision rule: Binary Statement for Simple Acceptance Rule according ILAC-G8:09/2019

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2 GENERAL INFORMATION

2.1 Administrative details

Testing laboratory	**IBL-Lab GmbH** Heinrich-Hertz-Allee 7 66386 Sankt Ingbert / Germany Fon: +49 6894 38938-0 Fax: +49 6894 38938-99 URL: www.ib-lenhardt.de E-Mail: info@ib-lenhardt.de
Accreditation	The testing laboratory is accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025:2018. Scope of testing and registration number: • Electromagnetic Compatibility and Telecommunication (FCC requirements) D-PL-21375-01-03 Website DAkkS: https://www.dakks.de/ The Deutsche Akkreditierungsstelle GmbH (DAkkS) is also a signatory to the ILAC Mutual Recognition Arrangement.
Testing location	**IBL-Lab GmbH** Heinrich-Hertz-Allee 7 66386 St. Ingbert / Germany
Date of receipt of test samples	-
Start – End of tests	- – -

2.2 Possible test case verdicts

Test sample meets the requirements	P (PASS)
Test sample does not meet the requirements	F (FAIL)
Test case does not apply to the test sample	N/A (Not applicable)
Test case not performed	N/P (Not performed)

2.3 Observations

No additional observations other than the reported observations within this test report have been made.

2.4 Opinions and Interpretations

No appropriate opinions or interpretations according ISO/IEC 17025:2017 clause 7.8.7 are within this test report.

2.5 Revision History

-0 Initial Version

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3 ENVIRONMENTAL & TEST CONDITIONS

3.1 Environmental conditions of test lab

Temperature	25°C ± 5°C
Relative humidity	25-75% r.H.
Barometric Pressure	860-1060 mbar
Power supply	230/400 V AC 50Hz

4 TEST STANDARDS AND REFERENCES

Test standard (accredited)	**Description**
FCC 47 CFR Part 15	*RADIO FREQUENCY DEVICES*

Test standard (not accredited)	**Description**
-	-

Reference	**Description**
FCC KDB 447498 D01 v06	*RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES*
FCC 47 CFR Part 1.1307(b)	*Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.*
FCC 47 CFR Part 1.1310	*Radiofrequency radiation exposure limits.*
FCC 47 CFR Part 2.1091	*Radiofrequency radiation exposure evaluation: mobile devices.*
FCC 47 CFR Part 2.1093	*Radiofrequency radiation exposure evaluation: portable devices.*

5 Device Data

Parameters declared by the manufacturer:
The declared maximum output powers including tune-up tolerances are used with regard to the maximum antenna gains to find the maximum EIRP and ERP values.

Type	Band [MHz]	Max. Conducted Output Power [dBm]	dBµV/m @ 3m	FCC Tune Up Tolerance [dB]	Max. EIRP + Tune Up [dBm]
RFID	13.56	--	71	1.0	-24.23
Bluetooth	2400	2.5	--	1.0	3.5

Measurements of power levels and declared antenna gains detailed in this test report and were taken from the following RF module test report(s). EUT test information such as test equipment used, date of actual test, environmental conditions, measurement uncertainty and the person who performed the original tests are referenced in the listed test report/s.

Test Report	Radio Standard	Issued by
21014965-18641-0 2021-05-28	Title 47 CFR, Chapter I FCC Regulations, Subchapter A Subpart C: §15.247	IBL-Lab GmbH
21014965-18642-0 2021-05-25	FCC 47 CFR Part 15 Radio Frequency Devices, Subpart C - §15.225 Operation within the band 13.110-14.010 MHz	IBL-Lab GmbH

Type	Band [MHz]	Measured EIRP [dBm]	calculated EIRP [dBm]
Bluetooth	2440.0719	3.24	--
RFID	13.56	--	-25.23

6 MPE Assessment Requirements

6.1 FCC 47 CFR Part 1.1310 Radiofrequency radiation exposure limits.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) 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
(B) 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

6.1.1 FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.
(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular §1.1307(b), chapter (6.1).
(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of **at least 20 centimeters** is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term ''fixed location'' means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they **meet the 20 centimeter** separation requirement.
(c)(1) Mobile devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Upper Microwave Flexible Use Service pursuant to part 30 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; the 76–81 GHz Band Radar Service pursuant to part 95 of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if: (i) They operate at frequencies of **1.5 GHz or below** and their effective radiated power **(ERP) is 1.5 watts or more**, or (ii) They operate at frequencies **above 1.5 GHz and their ERP is 3 watts or more.**
(2) Unlicensed personal communications service devices, unlicensed millimeter-wave devices, and unlicensed NII devices authorized under §§15.255(g), 15.257(g), 15.258, 15.319(i), and 15.407(f) of this chapter are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if their **ERP is 3 watts or more** or if they meet the definition of a portable device as specified in §2.1093(b) requiring evaluation under the provisions of that section.
(3) All other mobile and unlicensed transmitting devices are categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in §§1.1307(c) and 1.1307(d) of this chapter.
6.1.2 FCC 47 CFR Part 2.1093 Radiofrequency radiation exposure evaluation: Portable devices.
(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular § 1.1307(b).
(b) For purposes of this section, the definitions in § 1.1307(b)(2) of this chapter shall apply. A portable device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that the RF source's radiating structure(s) is/are within 20 centimeters of the body of the user.
(c) (1) Evaluation of compliance with the exposure limits in § 1.1310 of this chapter, and preparation of an EA if the limits are exceeded, is necessary for portable devices having single RF sources with more than an available maximum time-averaged power of 1 mW, more than the ERP listed in Table 1 to § 1.1307(b)(3)(i)(C), or more than the Pth in the following formula, whichever is greater. The following formula shall only be used in conjunction with portable devices not exempt by § 1.1307(b)(3)(i)(C) at distances from 0.5 centimeters to 20 centimeters and frequencies from 0.3 GHz to 6 GHz. LII note: we have temporarily removed a non-accessible image, originally published by the government at er01ap20.007 d = the minimum separation distance (cm) in any direction from any part of the device antenna(s) or radiating structure(s) to the body of the device user. (2) For multiple mobile or portable RF sources within a device operating in the same time averaging period, evaluation is required if the formula in § 1.1307(b)(3)(ii)(B) of this chapter is applied to determine the exemption ratio and the result is greater than 1.

(3) Unless otherwise specified in this chapter, any other single portable or multiple mobile and portable RF source(s) associated with a device is exempt from routine environmental evaluation for RF exposure prior to equipment authorization or use, except as specified in § 1.1307(c) and (d) of this chapter.

(d) (1) Applications for equipment authorization of portable RF sources subject to routine environmental evaluation must contain a statement confirming compliance with the limits specified in § 1.1310 of this chapter as part of their application. Technical information showing the basis for this statement must be submitted to the Commission upon request. The SAR limits specified in § 1.1310(a) through (c) of this chapter shall be used for evaluation of portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz shall be evaluated in terms of the MPE limits specified in Table 1 to § 1.1310(e)(1) of this chapter. A minimum separation distance applicable to the operating configurations and exposure conditions of the device shall be used for the evaluation. In general, maximum time-averaged power levels must be used for evaluation. All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

(2) Evaluation of compliance with the SAR limits can be demonstrated by either laboratory measurement techniques or by computational modeling. The latter must be supported by adequate documentation showing that the numerical method as implemented in the computational software has been fully validated; in addition, the equipment under test and exposure conditions must be modeled according to protocols established by FCC-accepted numerical computation standards or available FCC procedures for the specific computational method. Guidance regarding SAR measurement techniques can be found in the Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB). The staff guidance provided in the KDB does not necessarily represent the only acceptable methods for measuring RF exposure or RF emissions, and is not binding on the Commission or any interested party.

(3) For purposes of analyzing portable RF sources under the occupational/controlled SAR criteria specified in § 1.1310 of this chapter, time averaging provisions of the limits may be used in conjunction with the maximum duty factor to determine maximum time-averaged exposure levels under normal operating conditions.

(4) The time averaging provisions for occupational/controlled SAR criteria, based on maximum duty factor, may not be used in determining typical exposure levels for portable devices intended for use by consumers, such as cellular telephones, that are considered to operate in general population/uncontrolled environments as defined in § 1.1310 of this chapter. However, “source-based” time averaging based on an inherent property of the RF source is allowed over a time period not to exceed 30 minutes. An example of this would be the determination of exposure from a device that uses digital technology such as a time-division multiple-access (TDMA) scheme for transmission of a signal.

(5) Visual advisories (such as labeling, embossing, or on an equivalent electronic display) on portable devices designed only for occupational use can be used as part of an applicant's evidence of the device user's awareness of occupational/controlled exposure limits. Such visual advisories shall be legible and clearly visible to the user from the exterior of the device. Visual advisories must indicate that the device is for occupational use only, refer the user to specific information on RF exposure, such as that provided in a user manual and note that the advisory and its information is required for FCC RF exposure compliance. Such instructional material must provide users with information on how to use the device and to ensure users are fully aware of and able to exercise control over their exposure to satisfy compliance with the occupational/controlled exposure limits. A sample of the visual advisory, illustrating its location on the device, and any instructional material intended to accompany the device when marketed, shall be filed with the Commission along with the application for equipment authorization. Details of any special training requirements pertinent to mitigating and limiting RF exposure should also be submitted. Holders of grants for portable devices to be used in occupational settings are encouraged, but not required, to coordinate with end-user organizations to ensure appropriate RF safety training.

(6) General population/uncontrolled exposure limits defined in § 1.1310 of this chapter apply to portable devices intended for use by consumers or persons who are exposed as a consequence of their employment and may not be fully aware of the potential for exposure or cannot exercise control over their exposure. No communication with the consumer including either visual advisories or manual instructions will be considered sufficient to allow consumer portable devices to be evaluated subject to limits for occupational/controlled exposure specified in § 1.1310 of this chapter.

7 MPE Calculation Method

Conversion of output power

$$\boldsymbol{P(mW) = 10^{(\frac{Lp(dBm)}{10})} \times 1mW}$$

E:	E-field strength [V/m]
P:	Power input to antenna [W]
G:	Gain of the antenna in the direction of interest relative to an isotropic radiator [dBi]
PG:	EIRP (effective isotropic radiated power) [W]
r:	Distance [m]

$$E = \frac{\sqrt{30PG}}{r}$$

S:	Power density [W/m2]
P:	Power input to antenna [W]
G:	Gain of the antenna in the direction of interest relative to an isotropic radiator [dBi]
PG:	EIRP (effective isotropic radiated power) [W]
r:	Distance [m]

$$S = \frac{PG}{4\pi r^2}$$

The EUT is a wireless device with a distance of at least 5mm from any body part of nearby persons.

Type	Band [MHz]	Max. EIRP [dBm]	Max. EIRP [mW]	Power Density [W/m²]	Power Density [mW/cm²]	FCC Limit [mW/cm²]	FCC Verdict	FCC Exemp. [W]	FCC Exemp. fulfilled	ISED Limit [W/m²]	ISED Verdict	ISED Exemp. [W]	ISED Exemp. fulfilled
Datasheet RFID	13.56	-24.23	0.0038	0.0000079	0.00000075	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RFID	13.56	-25.23	0.0030	0.0000060	0.00000060	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Datasheet Bluetooth	2400	3.5	2.2239	0.0044561	0.00044561	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bluetooth	2440	3.24	2.1086	0.0041971	0.00041971	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

The simple procedure for evaluation cannot be used because of the colocations of the antennas and possible tx on both. Please see SAR test exclusion guidance.

FCC 447498 D01 General SAR test exclusion guidance

a) For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- The values 3.0 and 7.5 are referred to as numeric thresholds in step b) below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in KDB Appendix B):

1. {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·(f(MHz)/150)]} mW, for 100 MHz to 1500 MHz
2. {[Power allowed at numeric threshold for 50 mm in step a)] + [(test separation distance – 50 mm)·10]} mW, for > 1500 MHz and ≤ 6 GHz

c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in KDB Appendix C):

1. For test separation distances > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by [1 + log(100/f(MHz))]
2. For test separation distances ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by ½
3. SAR measurement procedures are not established below 100 MHz.

Type	Band [MHz]	Max. EIRP [dBm]	Max. EIRP [mW]	Exclusion Route	Exclusion Threshold	Calc. Value	FCC Exemp. Fulfilled
Datasheet RFID	13.56	-24.0	0.0040	C	711 mW	0.0038	P
RFID	13.56	-25.23	0.0030	C	711 mW	0.0033	P
Datasheet Bluetooth	2400	3.5	2.2387	A	3	0.5	P
Bluetooth	2440	3.24	2.1086	A	3	0.5	P

The simple procedure for evaluation cannot be used because of the colocations of the antennas and possible TX on both. Please see SAR test exclusion guidance.

FCC 1.1307 / (3) Determination of exemption / (ii) For multiple RF sources:
Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P_{th}, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source *i* at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$ = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source *i.*

ERP_j = the ERP of fixed, mobile, or portable RF source *j.*

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source *j,* at a distance of at least λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source *k* either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit$_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source *k,* as applicable from §1.1310 of this chapter.

	P	ERP	Evaluated
Applicable terms	☐	☐	☒

a	b	c	P_i [mW]	$P_{th,i}$ [mW]	ERP_i [mW]	$ERP_{th,j}$ [mW]	$Evaluated_k$ [mW]	Exposure $Limit_k$	Sum	Thresh.	Verdict
-	-	2	-	-	-	-	0.0038	711			
			-	-	-	-	2.239	1462			
									0.00154	1	Pass

8 MPE Conclusion

FCC: The results do comply with the requirements.

9 List of test equipment used

#	Equipment Class	ID	Calibration due date
--	N/A	--	--

End of Assessment Report