

Test report No:
NIE: 76889RAN.002

Test report

IEEE Std C95.3-2021
FCC 47 CFR Part 2.1093.

(*) Identification of item tested	Key Fob
(*) Trademark	iLOQ
(*) Model and /or type reference tested	K55S.2
(*) Other identification of the product	FCC ID : 2A2HZ-FOB55S2 IC ID : 30160-FOB55S2 HW version : E2196C2 SW Version : 32790
(*) Features	NFC, USB-C
(*) Manufacturer	iLOQ OY Elektroniikkatie 10, 90590 OULU, Finland
Test method requested, standard	IEEE Std C95.3-2021. FCC 47 CFR Part 2.1093.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager
Date of issue	2023-11-29
Report template No	FAN39_02 (*) "Data provided by the client"



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Competences and guarantees

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DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification at the time of performance of the test.

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The results presented in this Test Report apply only to the particular item under test established in this document.

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal documents PODT000 and FAN040.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested", "Other identification of the product", "Features" and "Test sample description").
2. Normal device use conditions and minimum use distance information.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: the client

Samples are composed of the following elements:

Sample	Control Nº	Description	Model	Serial Nº	Date of reception
S/01	76889/010	Key Fob	K55S.2	34800907	02/11/2023

1. Sample S/01 has undergone the test(s) specified in subclause "Test method requested".

Test sample description

Description of product	The iLOQ K55S.2 Key Fob is used for operating digital lock cylinders in the iLOQ 5 Series locking system for users without a compatible NFC-enabled smartphone for unlocking. The Key Fob supplies the required operating power to the lock over the NFC field during opening, thus the locks do not need their own power supply.		
Software version.....	32790		
Hardware version	E2196C2		
Mounting position	<input type="checkbox"/>	Table top equipment	
	<input type="checkbox"/>	Wall/Ceiling mounted equipment	
	<input type="checkbox"/>	Equipment used next to the ear	
	<input checked="" type="checkbox"/>	Hand-held equipment	
	<input type="checkbox"/>	Other:	
Accessories (not part of the test item).....	Description	Type	Manufacturer

Identification of the client

Bittium Wireless

Ritaharjuntie 1, 90590 Oulu, Finland

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2023-11-15
Date (finish)	2023-11-16

Document history

Report number	Date	Description
76889RAN.002	2023-11-29	First release

Environmental conditions

Date	Max. Temp. °C	Min. Temp. °C	Max. Hum. %	Min. Hum. %	Limit
From 2023-11-15 to 2023-11-16	24.77	22.94	47.46	40.47	18-40 °C, 20-80%

Remarks and comments

- The tests have been performed by the technical personnel: Ismael Gamarro.
- The instrumentation utilized to perform the tests covered in this test report is listed in the following table:

DEKRA Control Number	Equipment	S/N
7860	E&H FIELD PROBE - NARDA model EHP200A	170WX91007
5261	LOW DIELECTRIC TRIPOD - MANFROTTO model H-491009-01	--
5780	TEMPERATURE AND HUMIDITY PROBE - HW GROUP model HWg-STE	60038023023

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

FCC 47CFR Part 2.1093	VERDICT			
	N/A	P	F	NM
NFC 13.56 MHz		P		

Appendix A: Test results

NFC Evaluation

Measurements of external E and H field strengths using a sample transmitting in continuous mode provided by the manufacturer have been performed from all sides of the device with a separation distance of 0 cm, according to minimum declared used distance, measured from the center of the probe to the edge of the device (due to the field probe dimensions, 4.5 cm is the closest distance between the device edges and the measurement field probe center).

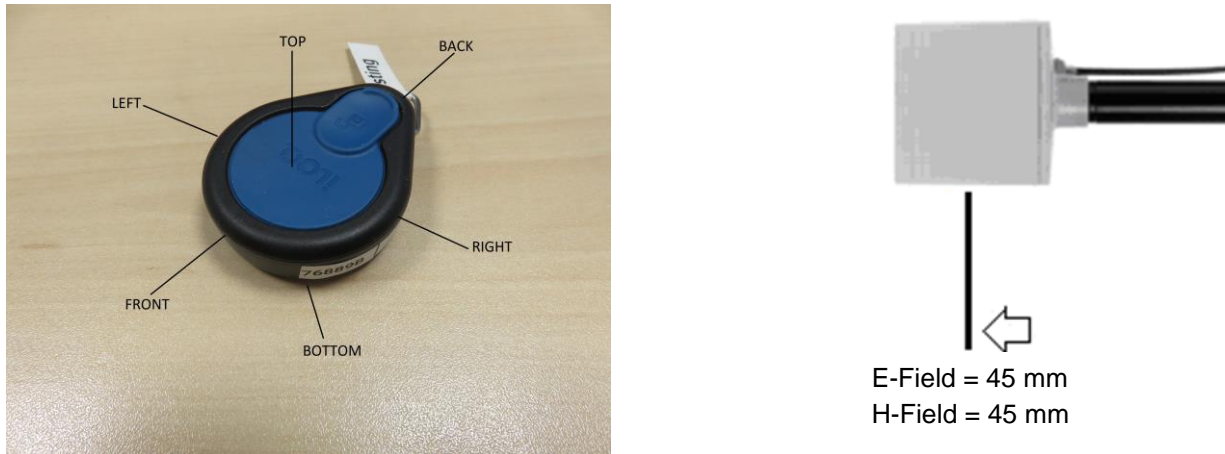


Figure 1: Measurement Setup

The maximum measured values for NFC technology are listed in the following tables:

Technology	Test Side	Distance to DUT (cm)	Freq. (MHz)	E-Field (V/m)	Limit (V/m)	% E-Limit	Verdict
NFC	Front Face	0.0	13.55	3.52	60.81	5.79%	Pass
	Back Face	0.0	13.20	0.88	62.42	1.41%	Pass
	Left Edge	0.0	13.55	3.35	60.81	5.50%	Pass
	Right Edge	0.0	13.55	4.96	60.81	8.15%	Pass
	Top	0.0	13.55	3.52	60.81	5.79%	Pass
	Bottom	0.0	13.55	4.77	60.81	7.84%	Pass

Table 1: E-field measurements values

Technology	Test Side	Distance to DUT (cm)	Freq. (MHz)	H-Field (A/m)	Limit (A/m)	% H-Limit	Verdict
NFC	Front Face	0.0	13.55	0.03	0.16	17.39%	Pass
	Back Face	0.0	13.55	0.03	0.16	21.53%	Pass
	Left Edge	0.0	13.55	0.04	0.16	23.64%	Pass
	Right Edge	0.0	13.55	0.01	0.16	6.99%	Pass
	Top	0.0	13.55	0.43	0.16	266.05%	Fail
	Bottom	0.0	13.20	0.10	0.17	57.98%	Pass

Table 2: H-field measurement values

The measurements were performed in continuous mode for 30 minutes and this is not a real-case scenario of the device use. According to the manufacturer, the device normally will be used to open a door several times in this 30-minute period, so to assess a very conservative worst-case use scenario, for the final calculation it has been supposed that the device will be used to open a door once time per minute, with the button being pushed for 5 seconds in each operation. Therefore, in 30-minute period, the device will transmit for a total time of 150 seconds as a conservative worst-case scenario.

Applying this exposure time to the measured values, the assessment results are listed in the following table:

Technology	Test Side	Distance to DUT (cm)	Freq. (MHz)	E-Field (V/m)	Limit (V/m)	% E-Limit	Verdict
NFC	Front Face	0.0	13.55	0.30	60.81	0.49%	Pass
	Back Face	0.0	13.20	0.07	62.42	0.12%	Pass
	Left Edge	0.0	13.55	0.28	60.81	0.46%	Pass
	Right Edge	0.0	13.55	0.42	60.81	0.68%	Pass
	Top	0.0	13.55	0.30	60.81	0.49%	Pass
	Bottom	0.0	13.55	0.40	60.81	0.66%	Pass

Table 3: Real scenario E-field measurements values

Technology	Test Side	Distance to DUT (cm)	Freq. (MHz)	H-Field (A/m)	Limit (A/m)	% H-Limit	Verdict
NFC	Front Face	0.0	13.55	0.00	0.16	1.46%	Pass
	Back Face	0.0	13.55	0.00	0.16	1.81%	Pass
	Left Edge	0.0	13.55	0.00	0.16	1.99%	Pass
	Right Edge	0.0	13.55	0.00	0.16	0.59%	Pass
	Top	0.0	13.55	0.04	0.16	22.35%	Pass
	Bottom	0.0	13.20	0.01	0.17	4.87%	Pass

Table 4: Real scenario H-field measurement values

All E-Field and H-Field values are in compliance to values shown into §1.1310, paragraph (e), "Table 1: limits for Maximum Permissible Exposure (MPE)".

Appendix B: FCC RF Exposure information

FCC RF Exposure evaluation for portable devices

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.

Evaluation of compliance with the exposure limits in § 1.1310, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or if the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is not exempt by the formulas and tables stated into § 1.1310, paragraphs (3), (i), (B) and (C).

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 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)
(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

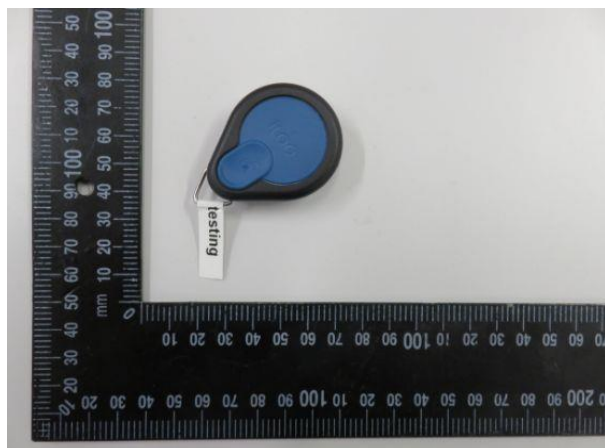
f = frequency in MHz * = Plane-wave equivalent power density

Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m.

According to TCB Workshop For all RF devices operating below 100 kHz, the provision in KDB 680106 apply, i.e. field strengths not to exceed 83 V/m and 90 A/m, for E and H fields, respectively.

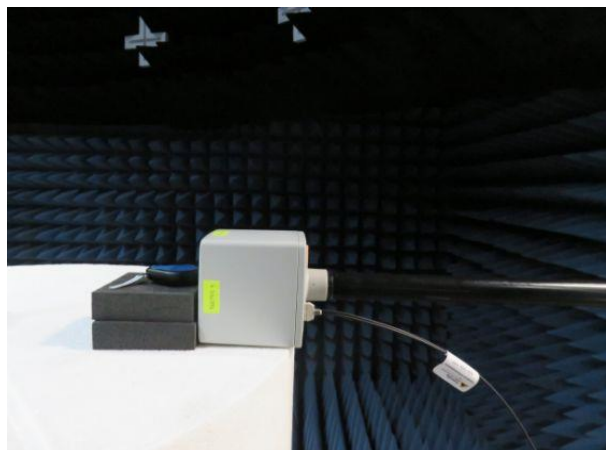
Appendix C: Photographs

Equipment view

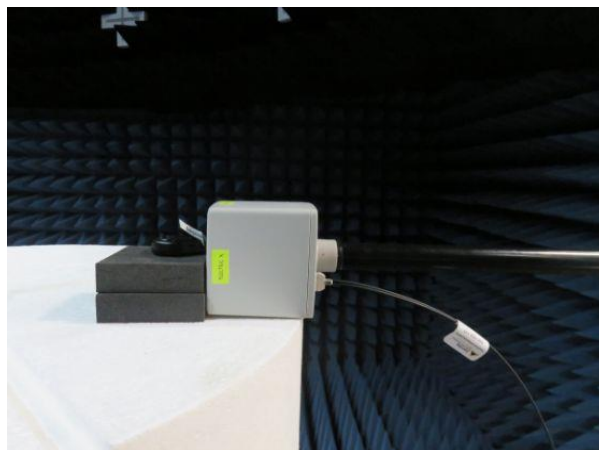


E-Field and H-Field measurement setup views

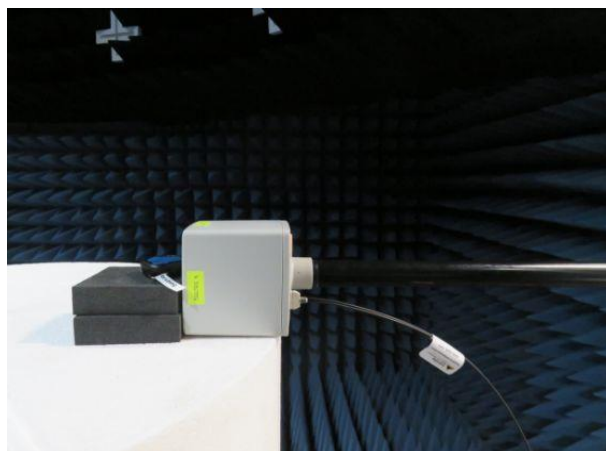
Front Face



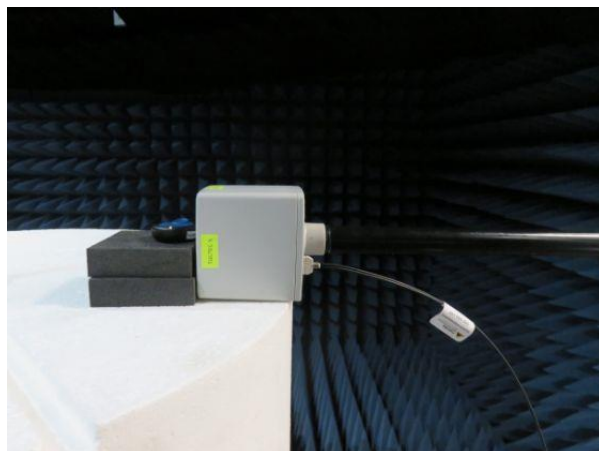
Back Face



Left Edge



Right Edge



Top



Bottom

