

Test report No:
76889REM.002A1

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B
(10-1-21 Edition) & ICES-003 Issue 7 (October 2020)

(*) Identification of item tested	Key Fob
(*) Trademark	iLOQ
(*) Model and /or type reference	K55S.2
Other identification of the product	N/A
(*) Features	Features: NFC, USB-C HW version: E2196C2 SW version: 32790 FCC ID: 2A2HZ-FOB55S2 IC: 30160-FOB55S2
Manufacturer	iLOQ OY Elektroniikkatie 10, 90590 OULU, Finland
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez EMC Consumer & RF Lab. Manager 
Date of issue	2024-02-26
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Acronyms

Acronym ID	Acronym Description
Code	EMC Test Code
Freq Rng	Frequency Range
Line	Conducted Emissions - Tested Line
MP	Measurement Point
OM	Operation Mode
S/	Sample
V	Verdict

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 S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

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

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2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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Uncertainty

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

The total uncertainty of the measurement system for the measured conducted disturbance characteristics of EUT from 150 kHz to 30 MHz is $I = \pm 3,9$ dB for quasi-peak measurements, $I = \pm 3,2$ dB for peak measurements ($k = 2$).

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1000 MHz is $I = \pm 4,9$ dB for quasi-peak measurements, $I = \pm 4,6$ dB for peak measurements ($k = 2$).

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").
2. The sample consists of an iLOQ K55S.2. 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.

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.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	76889B_17.1	Key Fob iLOQ	K55S 2	34800905	2023-11-02	Element Under Test
S/01	76889B_8.1	Lock	C50S	--	2023-11-02	Element Under Test

Notes referenced to samples during the project:

N/A

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	USB service port (USB-C interface for service and charging)	< 3m	[]	[]	[]		
Supplementary information to the ports..... :	Not provided data						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[]	AC:	[]	[]	[]	[]	[]
	[]	AC:	[]	[]	[]	[]	[]
	[X]	DC: Lithium-ion polymer rechargeable battery. DC 3.7V, 220mAh, 0.814Wh					
	[X]	DC: USB -C port, nom. 5 VDC					
Rated Power	USB-C port: max. 0,5 W (5 V/ 0,1 A)						
Clock frequencies.....	27.12MHz, 32.768kHz, 1MHz, 100kHz, 48MHz, 24MHz						
Other parameters	Not provided data						
Software version	32790						
Hardware version	E2196C2						
Dimensions in cm (W x H x D)	41 mm x 50,2 mm x 13,7 mm						
Mounting position	[]	Table top equipment					
	[]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					
	[X]	Hand-held equipment					
	[]	Other:					
Modules/parts..... :	Module/parts of test item			Type	Manufacturer		
	Not provided data						
Accessories (not part of the test item)	Description			Type	Manufacturer		
	Not provided data						
Documents as provided by the applicant..... :	Description			File name	Issue date		
	Not provided data						

⁽³⁾ Only for Medical Equipment

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
76889REM.002	2023-12-21	First release
76889REM.002A1	2024-02-26	Second release: It was included a modification in the description of operation mode. This report cancels and replaces the report: 76889REM.002

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860mbar Max. = 1060mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860mbar Max. = 1060mbar

Remarks and comments

The tests have been performed by the technical personnel: Javier Rodríguez Ruiz and Raul Alfaya Ruiz.

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P
Partial Passed	P*

List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
06666	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2024-03-04
06607	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2024-04-18
05779	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2024-04-18
06815	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2025-03-04
04729	PRE-AMPLIFIER G>30dB 18-40GHz	BLMA 1840-1M	BONN ELEKTRONIK	2024-03-14
07614	SEMIANECHOIC ABSORBER LINED CHAMBER V	FACT 3 200 STP	ETS LINDGREN	--
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	--
06204	THREE-PHASE ARTIFICIAL NETWORK 32A	PMM L3-32	NARDA	2023-11-17
08825	EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2025-08-21
07553	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2024-04-18
05151	TRANSIENT LIMITER 10DB N CONNECTOR	VTSD 9561-F	SCHWARZBECK	2024-05-30

Summary

Test Specification	Requirement – Test case	Verdict	Remark
FCC CFR 47, Part 15, Subpart B (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)	RE Radiated emission. Electromagnetic field measure	P	(1)
FCC CFR 47, Part 15, Subpart B (10-1-21 Edition)	CE Continuous conducted emission	P	(2)
<u>Supplementary information and remarks:</u> (1) Range: $f > 12.75$ GHz. Test required only to the 5th harmonics of the maximum internal work frequency in the EUT. (2) According to Subpart B.			

Appendix A: Test results

Appendix A content

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CE Continuous conducted emission 16

RE Radiated emission. Electromagnetic field measure 16

Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself.
The operation modes used by the samples to which the present report refers, are shown in the following table:

Id	Description
OM/01	EUT ON. EUT without transmitting NFC. Equipment transferring data to an auxiliary laptop via USB. Charging battery. Power supply: 5Vdc. (By USB port). Auxiliary laptop powered 115Vac.

Test standards version applied

The product standards and test standards applied for each test cases are shown in the following table:

Product Test Standard	Test standard	Requirement – Test case
FCC CFR 47, Part 15, Subpart B (10-1-21 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	RE Radiated emission.
FCC CFR 47, Part 15, Subpart B (10-1-21 Edition)	ANSI C63.4 (2014)	CE Continuous conducted emission

Test Cases Details

FCC 47 CFR Part 15B

RE Radiated emission. Electromagnetic field measure

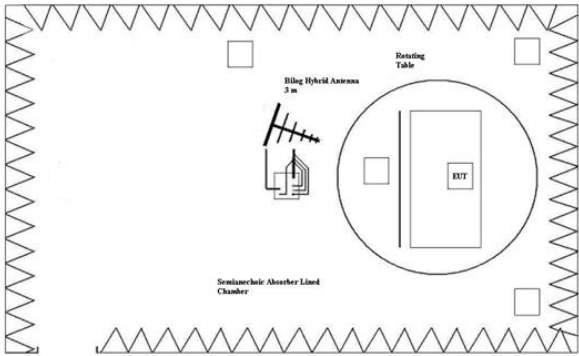
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according to the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-21 Edition), Secs. 15.109 & ICES-003 Issue 7 (October 2020)

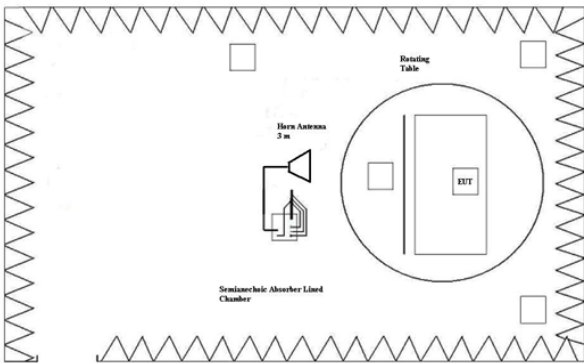
Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	(µV/m)	(dBµV/m)	(µV/m)	(dBµV/m)	(dBµV/m)	(dBµV/m)
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46	---	---
230 to 960	200	46	224	47		
960 to 1000	500	54	500	54	---	---
Above 1000	---	---	---	---	74	54

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

Setup for measurements



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

Results

SI	OM	Code	Freq Rng (MHz)	V
01	OM/01	RE0101LR	[30, 1000]	P

Verdict

Pass

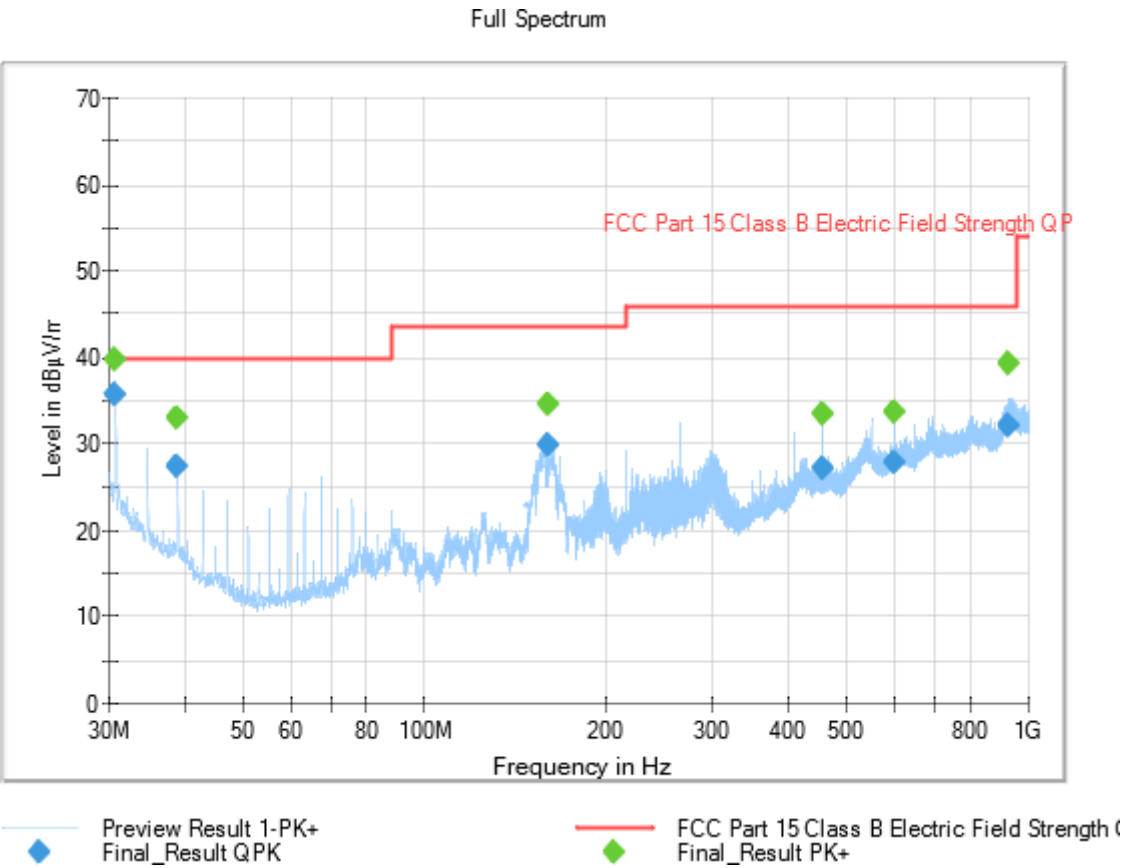
Attachments

EMC Test Code = RE0101LR Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. EUT without transmitting NFC. Equipment transferring data to an auxiliary laptop via USB. Charging battery. Power supply: 5Vdc. (By USB port). Auxiliary laptop powered 115Vac.

Images:



Tables:

Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
30.708000	---	39.73	---	---	106.0	V	358.0
30.708000	35.63	---	40.00	4.37	106.0	V	358.0
38.907000	---	32.97	---	---	107.0	V	141.0
38.907000	27.30	---	40.00	12.70	107.0	V	141.0
159.725000	---	34.44	---	---	202.0	H	80.0
159.725000	29.95	---	43.52	13.57	202.0	H	80.0
455.969000	---	33.54	---	---	180.0	H	91.0
455.969000	27.15	---	46.00	18.85	180.0	H	91.0
600.011000	---	33.73	---	---	180.0	V	215.0
600.011000	27.73	---	46.00	18.27	180.0	V	215.0
931.105000	---	39.17	---	---	168.0	H	252.0
931.105000	32.17	---	46.00	13.83	168.0	H	252.0

CE Continuous conducted emission

Limits of interference Class B

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-21 Edition), Secs. 15.107 & ICES-003 Issue 7 (October 2020), in the frequency range 0,15 to 30 MHz, for Class B equipment was:

Frequency range (MHz)	Limit (dBµV)	
	Quasi-Peak	Average
0,15 to 0,5	66 – 56*	56 – 46*
0,5 to 5	56	46
5 to 30	60	50

*Decreases with the logarithm of the frequency.

Results

SI	OM	Code	Freq Rng (MHz)	Line	V
01	OM/01	CE01010N	[0.15, 30]	N	P
01	OM/01	CE0101L1	[0.15, 30]	L1	P

Verdict

Pass

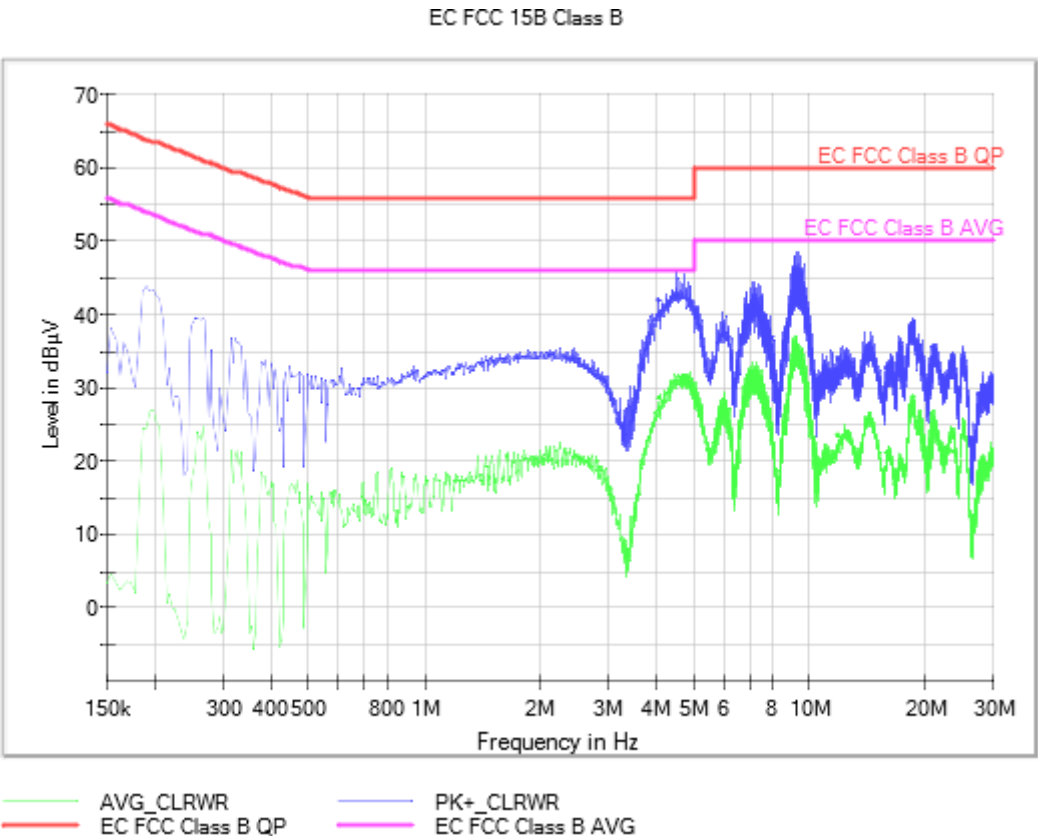
Attachments

EMC Test Code = CE01010N Frequency Range MHz = [0.15, 30]
Conducted Emissions - Tested Line = N

Sample ID: S/01

Operation Mode: OM/01. EUT ON. EUT without transmitting NFC. Equipment transferring data to an auxiliary laptop via USB. Charging battery. Power supply: 5Vdc. (By USB port). Auxiliary laptop powered 115Vac.

Images:



Tables:

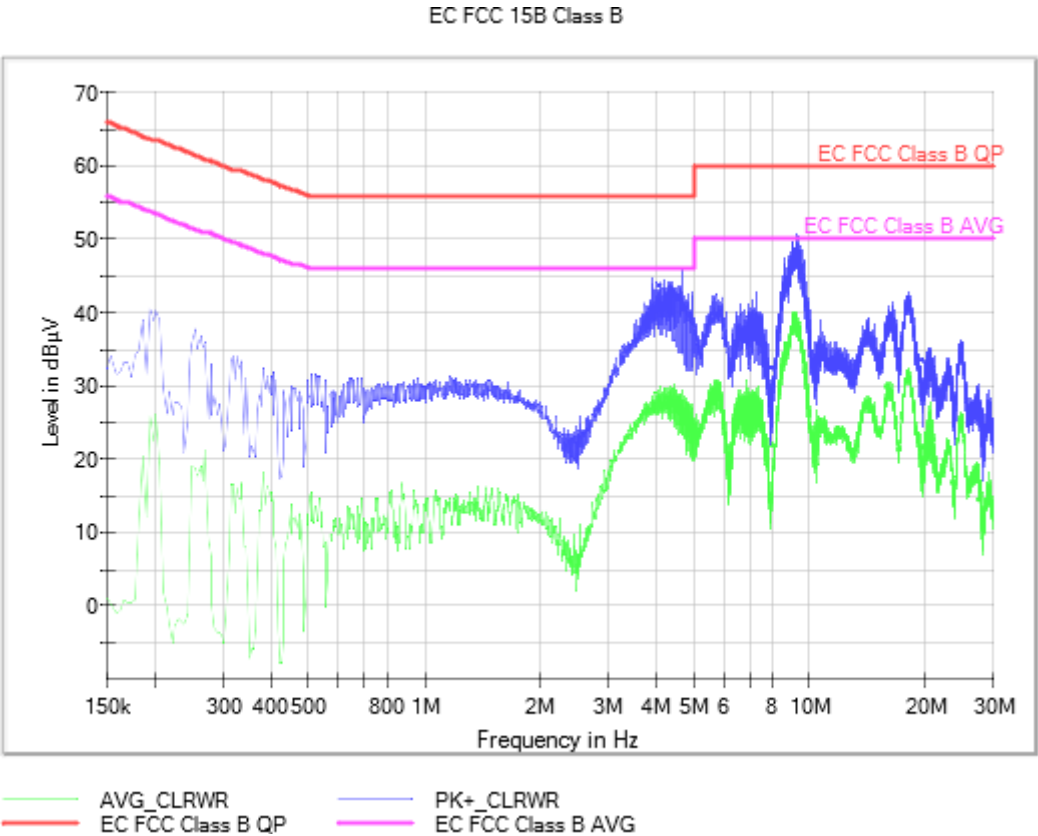
Frequency (MHz)	PK+_CLRWR (dBµV)	AVG_CLRWR (dBµV)	Line
0.190000	43.8	24.4	N
0.258000	39.5	23.8	N
0.446000	32.9	16.4	N
1.226000	33.3	18.0	N
1.854000	35.2	19.5	N
2.266000	35.4	22.1	N
4.534000	45.8	31.1	N
9.346000	48.8	37.1	N
14.010000	37.8	24.6	N
18.414000	39.4	28.8	N

EMC Test Code = CE0101L1 Frequency Range MHz = [0.15, 30]
Conducted Emissions - Tested Line = L1

Sample ID: S/01

Operation Mode: OM/01. EUT ON. EUT without transmitting NFC. Equipment transferring data to an auxiliary laptop via USB. Charging battery. Power supply: 5Vdc. (By USB port). Auxiliary laptop powered 115Vac.

Images:



Tables:

Frequency (MHz)	PK+_CLRWR (dBµV)	AVG_CLRWR (dBµV)	Line
0.194000	40.6	26.0	L1
0.262000	36.6	19.1	L1
0.522000	31.6	13.6	L1
1.166000	31.2	14.2	L1
1.310000	30.8	15.5	L1
3.546000	38.9	25.6	L1
4.670000	46.0	29.4	L1
9.286000	50.9	39.7	L1
16.526000	41.5	29.4	L1
18.050000	42.8	31.1	L1