

Test report

Number: T251-0732/19
Product: Electronic Lock
Type reference: Electronic Lock RFID ISO SE
Ratings: 12 Vdc (powered via Metra Easy Wire)
Protection class: III
Trademark: METRA EASY WIRE SYSTEM
Applicant: METRA INŽENIRING d.o.o.
Špruha 19, 1236 Trzin, Slovenia
Manufacturer: METRA INŽENIRING d.o.o.
Špruha 19, 1236 Trzin, Slovenia
Place of manufacture: METRA INŽENIRING d.o.o.
Špruha 19, 1236 Trzin, Slovenia

Summary of testing

Testing method: 47 CFR Part 15, Subpart C
Testing location: SIQ Ljubljana, Mašera-Spasičeva ulica 10, SI-1000 Ljubljana, Slovenia
Remarks: Date of receipt of test items: 2019-07-04
Number of items tested: 1
Date of performance of tests: 2019-07-04- 2019-09-12
The test results presented in this report relate only to the items tested.
The product complies with the requirements of the testing methods.
/

Tested by: Luka Cvajnar

Approved by: Marjan Mak

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1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2019-10-15	T251-0732/19	Initial Test Report issued.	--

Environmental conditions:

Ambient temperature: 15°C to 35°C

Relative humidity: 30% to 60%

Atmospheric pressure: 860 mbar to 1060 mbar

1.1 Equipment under test

Electronic Lock

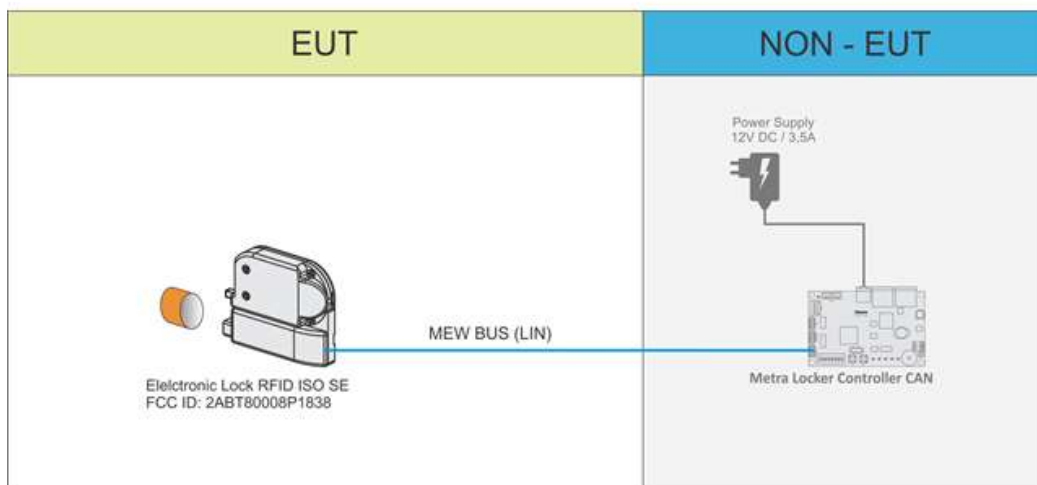
Type: **Electronic Lock RFID ISO SE**

FCC ID: **2ABT80008P1838**



Equipment marking plate

MEW System





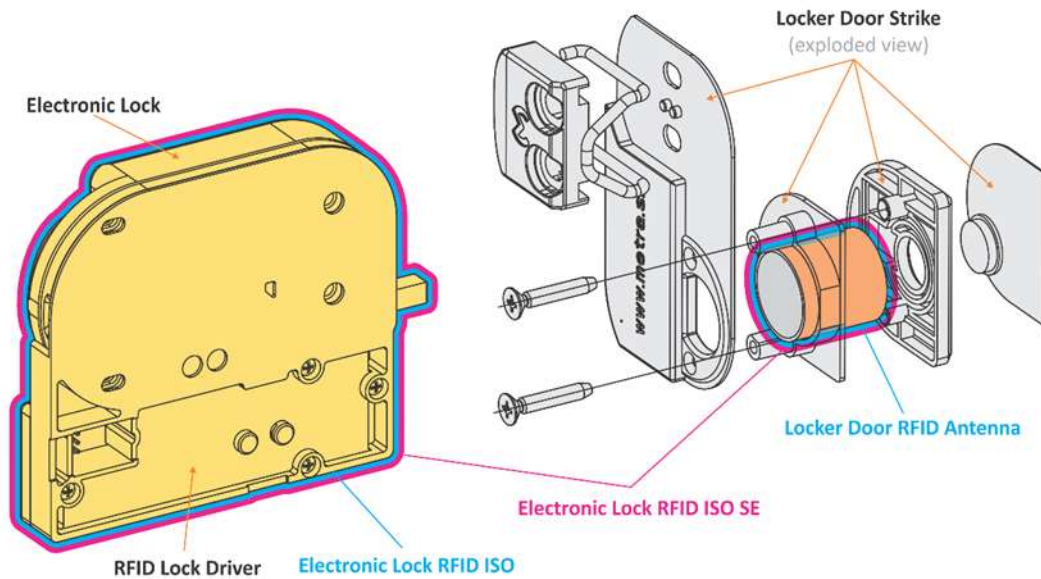
1.1.1 General product information

“Electronic Lock RFID ISO” emits RF field 13.56 MHz that is transmitted through air gap between it and “Locker Door RFID Antenna”. This air gap is well defined by construction of both parts. “Metal Door RFID Antenna” acts as passive antenna booster tuned to operating frequency of 13.56 MHz.

The “Electronic Lock RFID ISO” transmits RF energy only when the Metal Locker Door is closed and “Locker Door RFID Antenna” is in its defined position.

Positioning of the “Metal Door RFID Antenna” in relation to “Electronic Lock RFID ISO” is provided by passive plastic part called “Locker Door Strike”.

Both parts together “Electronic Lock RFID ISO” and “Locker Door RFID Antenna” form complete operational product named “Electronic Lock RFID ISO SE”:



Product group: MEW MODULE
Product Name: Electronic Lock RFID ISO SE
 Part Number: 1838

Hardware Version:
 MEWSLC1_ISO_3.1 (Electronic Lock RFID ISO)

Software Version:
 Test firmware simulating worst case operating conditions with all hardware resources running and scanning for RFID media.

Processor Used:
 NXP1549 Cortex-M3, Internal RC oscillator 12MHz +- 1% internally multiplied by PLL VCO to 192 MHz then divided to operating frequency 48 MHz

LIN communication:
 19200 Baud

RFID Interface:
 NXP Reader chip – PN7150 13,56 MHz
 Quartz oscillator 27,12 MHz used by PN7150

RFID Antenna Name: Locker Door RFID Antenna
Antenna Type: Copper Ring RFID Antenna Tuned to 13.56 MHz used for locker door. Designed also for metal door.

For testing purposes, except for extreme test conditions, the lock was built in the metal locker.





1.2 Antenna requirements (§15.203)

Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

Conclusion:

PASS; See clause 1.1.1 General product information.

1.3 ANSI C63.4 Subpart selection

Subpart C: Intentional Radiators

1.4 Class statement requirements

- The Class B statement offers several suggestions for minimizing interference to radio or TV receivers, including reorienting the receiving antenna and moving the Class B device farther away from the receiver.

1.5 Occupied bandwidth measurement

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

1.6 Quasi-peak detector

Frequency range	Bandwidth (-6dB)
10 Hz to 20 kHz	Full range (wideband)
10 kHz to 150 kHz	200 Hz
150 kHz to 30 MHz	9 kHz
30 MHz to 1 GHz	120 kHz

1.7 Peak, rms, and average detectors

Frequency range	Bandwidth (-6dB)
10 Hz to 20 kHz	10, 100, 1000 Hz
10 kHz to 150 kHz	1 and 10 kHz
150 kHz to 30 MHz	1 and 10 kHz
30 MHz to 1 GHz	10 and 100 kHz
1 GHz to 40 GHz	0.1, 1.0 and 10 MHz

2 LIMITS

2.1 Subpart C: Intentional Radiators

2.1.1 Section 15.207, Conducted emission limits:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.5	66 – 56*	56 – 46*
0.5 to 5.0	56	46
5.0 to 30.0	60	50

* Decreases with the logarithm of the frequency.

The shown limits in table shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
- For all other carrier current systems: 1000 μ V within the frequency band 535-1705 kHz, as measured using a 50 μ H/50 ohms LISN.
- Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as appropriate.

2.1.2 Section 15.209, Radiated emission limits:

Limits:

Frequency Range (MHz)	Limits (dB μ V/m)		Test distance (m)
	VERTICAL	HORIZONTAL	
0,009 to 0,490	$20 \cdot \log(2400/F(\text{kHz}))$	$20 \cdot \log(2400/F(\text{kHz}))$	300
0,490 to 1,705	$20 \cdot \log(24000/F(\text{kHz}))$	$20 \cdot \log(24000/F(\text{kHz}))$	30
1,705 to 30,0	30	30	30
30 to 88	40**	40**	3
88 to 216	43.5**	43.5**	3
216 to 960	46**	46**	3
Above 960	54	54	3

** Except as provided in paragraph below, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

Additional provisions to the general radiated emission limitations – Section 15.215: In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission as per clause 15.209.

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

3 ALL TEST EQUIPMENT AND THEIR DESCRIPTION

3.1 General information

Description	Model No.	SIQ No.	Last calibration	Calibrated until	Calibration period	Used
Rohde-Schwarz, RFI receiver	ESU8	105187	2019-04	2021-04	24 months	X
Rohde-Schwarz, RFI receiver	ESU26	100428	2018-10	2020-10	24 months	X
Rohde & Schwarz, Artificial main network	ESH2-Z5	106899	2019-08	2021-08	24 months	
Rohde & Schwarz, Artificial main network	ENV216	109818	2018-09	2020-09	24 months	
Comtest Engineering, Semi Anechoic Chamber SAC 1	SAC 3m	NPS001	2019-06	2021-06	24 months	X
Comtest Engineering, Semi Anechoic Chamber SAC 2	SAC 3m	NPS002	2019-06	2021-06	24 months	
Rohde & Schwarz, Horn Antenna	HF907 (SN 102508)	102508	2018-05	2020-05	24 months	
Rohde & Schwarz, Ultra Broadband Antenna	HL562E (SN 100842)	100842	2019-08	2021-08	24 months	X
Rohde & Schwarz, Horn Antenna	HF907 (SN 102494)	102494	2018-05	2020-05	24 months	
Rohde & Schwarz, Ultra Broadband Antenna	HL562E (SN 100843)	100843	2019-08	2021-08	24 months	
Maturo, Turn table (2 m diameter)	TT 2.0 SI	/	N/A	N/A	N/A	X
Maturo, Bore-sight antenna mast	BAM-4.0-P	/	N/A	N/A	N/A	X
Maturo, Multi-channel positioning equipment	Maturo NCD	/	N/A	N/A	N/A	X
Schwarzbeck, Biconical antenna	VHBB9124 (SN 9124-317)	105112	2018-11	2020-11	24 months	X
Schwarzbeck, Loop Antenna	FMZB 1519 B	/	2018-09	2020-09	24 months	X
Kambič, Temperature chamber	I-190 CK	107298	N/A	N/A	/	X

3.2 Other instrument information and auxiliary equipment

Description	Model No.	Bandwidth	Detector functions	Antenna factors	Cable loss	Range
Rohde-Schwarz, AMN	ENV216	/	/	/	/	9 kHz – 30 MHz
Rohde & Schwarz, Artificial main network	ESH 2-Z5	/	/	/	/	9 kHz – 30 MHz
Rohde-Schwarz, RFI receiver	ESU8	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	/	/	20 Hz – 8 GHz
Rohde-Schwarz, RFI receiver	ESU26	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	/	/	20 Hz – 26.5 GHz
Hewlett Packard, RF Spectrum Analyzer	8593E	200Hz, 9kHz, 120kHz, 1MHz	Peak, Q-peak, Average	/	/	9 kHz – 26.5 GHz
Comtest Engineering, Semi Anechoic Chamber SAC 1	SAC 3m	/	/	/	/	30 MHz – 18 GHz
Comtest Engineering, Semi Anechoic Chamber SAC 2	SAC 3m	/	/	/	/	30 MHz – 18 GHz
Rohde & Schwarz, Horn Antenna	HF907 (SN 102508)	/	/	See section 3.2.2	/	0.8 GHz – 18 GHz
Rohde & Schwarz, Ultra Broadband Antenna	HL562E (SN 100842)	/	/	See section 3.2.2	/	30 MHz – 6 GHz
Rohde & Schwarz, Horn Antenna	HF907 (SN 102494)	/	/	See section 3.2.2	/	0.8 GHz – 18 GHz
Rohde & Schwarz, Ultra Broadband Antenna	HL562E (SN 100843)	/	/	See section 3.2.2	/	30 MHz – 6 GHz
Schwarzbeck, Biconical antenna	VHBB9124 (SN 9124-317)	/	/	See section 3.2.2	/	30 MHz – 300 MHz
Schwarzbeck, Loop Antenna	FMZB 1519 B	/	/	See section 3.2.2	/	9 kHz – 30 MHz

3.2.1 Cable loss and attenuation of radiated emission

3.2.1.1 Conducted emission cable (SIQ-K024)

Point	Frequency (9kHz-30MHz)	Cable length (meters)	Loss (dB)
1	190 kHz	1	0,4
2	530 kHz	1	0,26
3	2,53 MHz	1	0,16
4	5,19 MHz	1	0,07
5	11,05 MHz	1	0,03
6	22,01 MHz	1	0,06
7	24,03 MHz	1	0,04

3.2.1.2 Radiated emission attenuation

Point	Frequency (30 MHz – 26,5 GHz)	Attenuation (dB)
1	30 MHz	0,501
2	150 MHz	1,174
3	400 MHz	2,034
4	800 MHz	2,995
5	1 GHz	3,416
6	1,363	1,666667
7	2,686	3,583333
8	5,332	5,25
9	7,978	6,25
10	10,624	7,5
11	13,27	8,333333
12	15,916	9,166666
13	18,562	9,833333
14	21,208	10,66667
15	23,854	11,5
16	26,5	12,16667

3.2.2 Antenna factors

3.2.2.1 Antenna VHBB9124

Frequency (MHz)	Antenna factor VHBB9124 (SN 9124-317)
20	15,3
21	15,1
22	14,8
23	14,5
24	14,3
25	14,1
26	13,8
27	13,6
28	13,3
29	13,1
30	12,6
31	12,4
32	12,2
33	12,0
34	11,8
35	11,7
36	11,4
37	11,3
38	11,1
39	11,0
40	10,8
41	10,7
42	10,5
43	10,3
44	10,2
45	10,1
46	9,9
47	9,9
48	9,7
49	9,7
50	9,5
51	9,5
52	9,3
53	9,3
54	9,2
55	9,1
56	9,0
57	9,0
58	9,0
59	9,0
60	9,0
61	9,0
62	8,9
63	8,9
64	8,8
65	8,8
66	8,8
67	8,9
68	8,9

69	8,9
70	8,9
71	8,9
72	8,9
73	8,9
74	8,9
75	8,9
76	8,9
77	8,9
78	8,9
79	9,0
80	9,0
81	9,0
82	9,1
83	9,0
84	9,0
85	9,0
86	9,1
87	9,1
88	9,2
89	9,2
90	9,3
91	9,3
92	9,3
93	9,3
94	9,3
95	9,3
96	9,4
97	9,4
98	9,5
99	9,5
100	9,6
102	9,7
104	9,7
106	9,9
108	10,0
110	10,2
112	10,2
114	10,3
116	10,4
118	10,5
120	10,5
122	10,7
124	10,7
126	10,8
128	10,9
130	11,0
132	11,1
134	11,2
136	11,4
138	11,5
140	11,6
142	11,8
144	11,8
146	12,0
148	11,9
150	12,0



152	12,1
154	12,4
156	12,6
158	12,8
160	12,9
162	12,9
164	13,0
166	13,0
168	12,8
170	12,8
172	12,9
174	13,0
176	13,2
178	13,3
180	13,4
182	13,5
184	13,5
186	13,5
188	13,6
190	13,7
192	13,8
194	13,8
196	13,9
198	14,0
200	14,1
202	14,2
204	14,3
206	14,4
208	14,3
210	14,4
212	14,7
214	14,6
216	14,5
218	14,5
220	14,6
222	14,4
224	14,6
226	14,8
228	14,9
230	15,0
232	15,0
234	15,0
236	15,0
238	15,2
240	15,3
242	15,3
244	15,4
246	15,3
248	15,2
250	15,2
252	15,2
254	15,4
256	15,4
258	15,5
260	15,6
262	15,7
264	15,7

266	15,8
268	15,9
270	15,9
272	16,0
274	16,0
276	16,2
278	16,2
280	16,4
282	16,7
284	16,8
286	17,0
288	16,9
290	16,9
292	17,2
294	17,4
296	17,6
298	17,9
300	18,2

3.2.2.2 Antenna FMZB 1519 B

Frequency (MHz)	Antenna factor (dB)
0,009	-30,60
0,010	-30,80
0,020	-31,80
0,030	-32,00
0,040	-32,10
0,050	-32,20
0,060	-32,20
0,070	-32,20
0,080	-32,20
0,090	-32,30
0,100	-32,30
0,150	-32,30
0,200	-32,40
0,300	-32,40
0,400	-32,40
0,500	-32,40
0,600	-32,40
0,700	-32,50
0,800	-32,50
0,900	-32,50
1,000	-32,50
2,000	-32,50
3,000	-32,50
4,000	-32,50
5,000	-32,50
6,000	-32,50
7,000	-32,50
8,000	-32,50
9,000	-32,50
10,000	-32,50
11,000	-32,50
12,000	-32,50
13,000	-32,50
14,000	-32,40
15,000	-32,40
16,000	-32,40
17,000	-32,40
18,000	-32,30
19,000	-32,30
20,000	-32,20
21,000	-32,10
22,000	-32,10
23,000	-32,00
24,000	-31,90
25,000	-31,80
26,000	-31,70
27,000	-31,60
28,000	-31,50
29,000	-31,40
30,000	-31,30

3.2.2.3 Antenna HL562E

Frequency (MHz)	Antenna factor HL562E (SN 100842)	Antenna factor HL562E (SN 100843)
30	18.12	18.17
32	17.08	17.07
34	16.01	16
36	14.91	14.94
38	13.76	13.75
40	12.64	12.61
42	11.43	11.4
44	10.17	10.15
46	8.86	8.81
48	7.42	7.44
50	6.01	5.96
52	4.59	4.56
54	3.38	3.37
56	2.84	2.85
58	3.06	3.14
60	3.78	3.76
62	4.44	4.4
64	5.36	5.32
66	6.19	6.18
68	6.96	6.92
70	7.56	7.52
72	8.04	8.01
74	8.38	8.35
76	8.67	8.64
78	8.88	8.85
80	9.04	9.03
82	9.14	9.09
84	9.2	9.14
86	9.22	9.16
88	9.22	9.17
90	9.21	9.17
92	9.22	9.15
94	9.22	9.16
96	9.21	9.16
98	9.22	9.17
100	9.33	9.05
105	9.38	9.39
110	9.67	9.74
115	9.55	10.33
120	10.51	9.88
125	10.15	9.87
130	9.23	9.13
135	8.79	8.71
140	8.4	8.4
145	7.93	7.82
150	7.74	7.75
155	7.68	7.76
160	7.86	7.78
165	8.47	8.33
170	9.83	9.66
175	10.29	10.3
180	7.86	7.93



185	7.19	7.27
190	7.54	7.21
195	7.32	7.2
200	7.56	7.49
205	7.56	7.68
210	7.71	7.95
215	8.68	8.29
220	8.43	8.49
225	8.51	8.62
230	8.85	8.82
235	9.1	9.05
240	9.31	9.29
245	9.33	9.33
250	9.5	9.45
255	9.71	9.64
260	9.86	9.81
265	9.95	9.9
270	10	10.02
275	10.15	10.15
280	10.37	10.36
285	10.58	10.61
290	10.76	10.8
295	10.84	10.9
300	10.83	11.12
305	11.38	11.37
310	11.36	11.32
315	11.53	11.48
320	11.7	11.67
325	11.84	11.81
330	11.98	11.94
335	12.32	12.13
340	12.19	12.22
345	12.29	12.35
350	12.43	12.47
355	12.59	12.61
360	12.72	12.73
365	12.83	12.81
370	12.99	12.99
375	13.08	13.1
380	13.12	13.11
385	13.21	13.2
390	13.38	13.33
395	13.54	13.5
400	13.65	13.63
405	13.74	13.73
410	13.84	13.83
415	14.14	13.96
420	14.1	14
425	14.13	14.08
430	14.24	14.2
435	14.4	14.4
440	14.55	14.49
445	14.7	14.65
450	14.82	14.79
455	14.89	14.91
460	14.9	15.09
465	15.16	15.19



470	15.24	15.22
475	15.31	15.25
480	15.38	15.32
485	15.48	15.43
490	15.58	15.52
495	15.66	15.6
500	15.72	15.7
505	15.74	15.75
510	15.83	15.82
515	16.05	15.92
520	15.95	15.93
525	15.97	15.97
530	16.05	16.01
535	16.09	16.07
540	16.16	16.15
545	16.21	16.21
550	16.29	16.3
555	16.38	16.41
560	16.51	16.53
565	16.67	16.68
570	16.78	16.85
575	16.87	17.02
580	17.03	17.11
585	17.06	17.08
590	17.1	17.09
595	17.15	17.13
600	17.22	17.18
605	17.28	17.25
610	17.35	17.33
615	17.42	17.37
620	17.41	17.42
625	17.48	17.48
630	17.56	17.55
635	17.67	17.65
640	17.8	17.79
645	17.94	17.95
650	18.08	18.13
655	18.16	18.12
660	18.18	18.03
665	18.12	17.99
670	18.13	18.01
675	18.19	18.09
680	18.26	18.24
685	18.42	18.41
690	18.56	18.56
695	18.62	18.61
700	18.67	18.67
705	18.7	18.74
710	18.74	18.79
715	18.81	18.86
720	18.89	18.95
725	19.09	19.09
730	19.22	19.26
735	19.17	19.23
740	19.19	19.14
745	19.14	19.1
750	19.13	19.09



755	19.17	19.1
760	19.19	19.15
765	19.24	19.21
770	19.34	19.29
775	19.37	19.36
780	19.36	19.36
785	19.43	19.41
790	19.51	19.48
795	19.59	19.56
800	19.7	19.66
805	19.83	19.79
810	19.98	19.95
815	20.07	20.04
820	20.1	19.96
825	20.11	19.92
830	20.09	19.94
835	20.09	19.96
840	20.14	20.05
845	20.19	20.11
850	20.27	20.2
855	20.36	20.29
860	20.42	20.37
865	20.46	20.44
870	20.5	20.51
875	20.52	20.55
880	20.59	20.61
885	20.7	20.69
890	20.82	20.77
895	20.89	20.83
900	20.88	20.92
905	20.83	21.08
910	20.93	21.21
915	21.19	21.17
920	21.22	21.1
925	21.09	21.03
930	20.98	21
935	20.95	21
940	20.96	21.01
945	21	21.04
950	21.05	21.06
955	21.09	21.07
960	21.15	21.13
965	21.23	21.2
970	21.27	21.26
975	21.31	21.3
980	21.36	21.37
985	21.43	21.44
990	21.52	21.53
995	21.63	21.64
1000	21.73	21.73

3.2.2.4 Antenna HF907

Frequency (GHz)	Antenna factor HF907 (SN 102508)	Antenna factor HF907 (SN 102494)
1	24.36	24.36
1.01	24.34	24.38
1.02	24.53	24.55
1.03	24.6	24.63
1.04	24.46	24.51
1.05	24.35	24.41
1.06	24.48	24.49
1.07	24.51	24.56
1.08	24.32	24.37
1.09	24.26	24.29
1.1	24.33	24.35
1.11	24.38	24.44
1.12	24.23	24.25
1.13	24.18	24.19
1.14	24.23	24.24
1.15	24.35	24.38
1.16	24.3	24.3
1.17	24.23	24.26
1.18	24.37	24.4
1.19	24.56	24.57
1.2	24.52	24.55
1.21	24.39	24.42
1.22	24.51	24.52
1.23	24.66	24.7
1.24	24.64	24.68
1.25	24.51	24.54
1.26	24.53	24.55
1.27	24.69	24.72
1.28	24.65	24.65
1.29	24.46	24.47
1.3	24.48	24.52
1.31	24.66	24.68
1.32	24.64	24.65
1.33	24.49	24.5
1.34	24.53	24.53
1.35	24.75	24.75
1.36	24.73	24.76
1.37	24.62	24.65
1.38	24.74	24.76
1.39	24.96	24.99
1.4	25.02	25.05
1.41	24.94	24.95
1.42	25.02	25.03
1.43	25.31	25.37
1.44	25.39	25.43
1.45	25.27	25.29
1.46	25.37	25.42
1.47	25.7	25.7
1.48	25.77	25.76
1.49	25.66	25.67
1.5	25.76	25.77



1.51	26.04	26.03
1.52	26.12	26.12
1.53	26.01	26.03
1.54	26.06	26.03
1.55	26.29	26.29
1.56	26.35	26.36
1.57	26.25	26.25
1.58	26.27	26.27
1.59	26.41	26.45
1.6	26.51	26.5
1.61	26.37	26.36
1.62	26.33	26.33
1.63	26.48	26.52
1.64	26.58	26.57
1.65	26.42	26.44
1.66	26.35	26.37
1.67	26.51	26.53
1.68	26.64	26.59
1.69	26.46	26.47
1.7	26.36	26.34
1.71	26.52	26.5
1.72	26.7	26.7
1.73	26.54	26.53
1.74	26.4	26.38
1.75	26.62	26.64
1.76	26.85	26.83
1.77	26.72	26.73
1.78	26.59	26.57
1.79	26.75	26.8
1.8	27.08	27.07
1.81	26.92	26.92
1.82	26.77	26.76
1.83	27	27
1.84	27.26	27.23
1.85	27.09	27.06
1.86	26.92	26.88
1.87	27.17	27.14
1.88	27.4	27.35
1.89	27.27	27.22
1.9	27.14	27.12
1.91	27.43	27.38
1.92	27.72	27.71
1.93	27.59	27.56
1.94	27.55	27.52
1.95	27.9	27.9
1.96	28.25	28.24
1.97	28.13	28.1
1.98	28.06	28.04
1.99	28.43	28.44
2	28.67	28.63
2.01	28.5	28.45
2.02	28.37	28.39
2.03	28.67	28.63
2.04	28.76	28.76
2.05	28.48	28.46
2.06	28.37	28.36
2.07	28.49	28.48

2.08	28.52	28.51
2.09	28.31	28.29
2.1	28.16	28.14
2.11	28.24	28.23
2.12	28.28	28.27
2.13	28.15	28.13
2.14	28.01	28
2.15	28.1	28.09
2.16	28.22	28.21
2.17	28.14	28.1
2.18	28.02	28
2.19	28.11	28.08
2.2	28.29	28.28
2.21	28.24	28.21
2.22	28.11	28.08
2.23	28.21	28.18
2.24	28.37	28.36
2.25	28.31	28.28
2.26	28.16	28.13
2.27	28.21	28.19
2.28	28.4	28.38
2.29	28.37	28.35
2.3	28.21	28.19
2.31	28.28	28.25
2.32	28.46	28.43
2.33	28.47	28.44
2.34	28.35	28.33
2.35	28.41	28.38
2.36	28.56	28.54
2.37	28.62	28.59
2.38	28.54	28.49
2.39	28.56	28.55
2.4	28.73	28.71
2.41	28.77	28.74
2.42	28.72	28.69
2.43	28.74	28.72
2.44	28.86	28.85
2.45	28.9	28.89
2.46	28.86	28.84
2.47	28.89	28.88
2.48	29.02	29.01
2.49	29.08	29.07
2.5	29.05	29.03
2.51	29.1	29.09
2.52	29.3	29.29
2.53	29.39	29.39
2.54	29.38	29.35
2.55	29.39	29.38
2.56	29.58	29.57
2.57	29.74	29.73
2.58	29.65	29.62
2.59	29.54	29.52
2.6	29.71	29.68
2.61	29.9	29.87
2.62	29.71	29.68
2.63	29.53	29.5
2.64	29.67	29.65



2.65	29.87	29.84
2.66	29.72	29.66
2.67	29.5	29.48
2.68	29.6	29.58
2.69	29.82	29.79
2.7	29.71	29.69
2.71	29.51	29.48
2.72	29.59	29.55
2.73	29.77	29.76
2.74	29.72	29.68
2.75	29.56	29.51
2.76	29.59	29.56
2.77	29.74	29.71
2.78	29.69	29.63
2.79	29.53	29.48
2.8	29.54	29.51
2.81	29.65	29.61
2.82	29.6	29.55
2.83	29.44	29.42
2.84	29.49	29.47
2.85	29.63	29.6
2.86	29.6	29.56
2.87	29.49	29.47
2.88	29.59	29.57
2.89	29.79	29.78
2.9	29.79	29.77
2.91	29.73	29.71
2.92	29.88	29.86
2.93	30.1	30.09
2.94	30.16	30.14
2.95	30.08	30.06
2.96	30.23	30.21
2.97	30.54	30.52
2.98	30.57	30.55
2.99	30.46	30.43
3	30.58	30.56
3.05	31.17	31.18
3.1	31.68	31.64
3.15	31.58	31.55
3.2	31.75	31.72
3.25	31.89	31.85
3.3	31.71	31.68
3.35	31.64	31.6
3.4	31.7	31.67
3.45	31.84	31.83
3.5	31.95	31.91
3.55	32.01	31.96
3.6	32.09	32.07
3.65	32.32	32.29
3.7	32.52	32.48
3.75	32.62	32.57
3.8	32.85	32.8
3.85	32.93	32.89
3.9	32.94	32.91
3.95	33.02	32.98
4	32.97	32.91
4.05	33.07	33.01

4.1	33.21	33.17
4.15	33.33	33.31
4.2	33.48	33.43
4.25	33.71	33.66
4.3	33.87	33.83
4.35	34.02	33.99
4.4	33.83	33.82
4.45	33.57	33.53
4.5	33.61	33.58
4.55	33.61	33.59
4.6	33.51	33.49
4.65	33.44	33.39
4.7	33.6	33.58
4.75	33.93	33.92
4.8	34.06	34.05
4.85	34.13	34.13
4.9	34.27	34.25
4.95	34.38	34.36
5	34.38	34.34
5.05	34.19	34.17
5.1	33.99	33.97
5.15	33.93	33.93
5.2	33.97	33.96
5.25	33.92	33.91
5.3	33.93	33.93
5.35	34.17	34.18
5.4	34.37	34.38
5.45	34.43	34.44
5.5	34.38	34.38
5.55	34.42	34.42
5.6	34.45	34.45
5.65	34.28	34.28
5.7	34.05	34.04
5.75	34.04	34.05
5.8	34.2	34.2
5.85	34.31	34.31
5.9	34.35	34.35
5.95	34.47	34.49
6	34.69	34.7
6.05	34.87	34.86
6.1	34.82	34.82
6.15	34.75	34.75
6.2	34.78	34.79
6.25	34.77	34.79
6.3	34.68	34.69
6.35	34.66	34.68
6.4	34.84	34.87
6.45	35.03	35.07
6.5	35.13	35.14
6.55	35.13	35.13
6.6	35.26	35.26
6.65	35.36	35.36
6.7	35.29	35.29
6.75	35.17	35.16
6.8	35.16	35.15
6.85	35.26	35.28
6.9	35.37	35.38



6.95	35.35	35.36
7	35.44	35.45
7.05	35.59	35.61
7.1	35.74	35.76
7.15	35.73	35.74
7.2	35.61	35.63
7.25	35.65	35.66
7.3	35.65	35.67
7.35	35.64	35.64
7.4	35.63	35.64
7.45	35.71	35.74
7.5	35.89	35.9
7.55	35.99	36.01
7.6	36.09	36.1
7.65	36.18	36.21
7.7	36.23	36.25
7.75	36.26	36.29
7.8	36.21	36.22
7.85	36.2	36.2
7.9	36.14	36.16
7.95	36.16	36.17
8	36.14	36.15
8.05	36.19	36.19
8.1	36.3	36.32
8.15	36.46	36.47
8.2	36.5	36.5
8.25	36.51	36.53
8.3	36.51	36.5
8.35	36.48	36.48
8.4	36.46	36.45
8.45	36.4	36.39
8.5	36.41	36.4
8.55	36.45	36.45
8.6	36.56	36.58
8.65	36.7	36.71
8.7	36.71	36.7
8.75	36.79	36.83
8.8	36.85	36.88
8.85	36.88	36.85
8.9	36.79	36.75
8.95	36.79	36.81
9	36.87	36.84
9.05	36.82	36.75
9.1	36.85	36.81
9.15	36.9	36.88
9.2	36.89	36.9
9.25	36.92	36.91
9.3	36.97	36.97
9.35	37.07	37.07
9.4	37.11	37.11
9.45	37.14	37.16
9.5	37.2	37.19
9.55	37.1	37.08
9.6	37.06	37.03
9.65	37.04	37.05
9.7	36.96	36.97
9.75	36.93	36.93



9.8	37	37
9.85	37.15	37.16
9.9	37.23	37.24
9.95	37.25	37.22
10	37.31	37.3
10.05	37.31	37.3
10.1	37.23	37.2
10.15	37.15	37.13
10.2	37.11	37.13
10.25	37.11	37.15
10.3	37.11	37.13
10.35	37.15	37.19
10.4	37.21	37.24
10.45	37.25	37.27
10.5	37.27	37.28
10.55	37.24	37.24
10.6	37.18	37.18
10.65	37.17	37.19
10.7	37.19	37.19
10.75	37.16	37.17
10.8	37.16	37.18
10.85	37.26	37.26
10.9	37.32	37.32
10.95	37.33	37.32
11	37.36	37.35
11.05	37.34	37.33
11.1	37.34	37.36
11.15	37.35	37.34
11.2	37.34	37.33
11.25	37.29	37.29
11.3	37.28	37.29
11.35	37.34	37.31
11.4	37.31	37.3
11.45	37.32	37.33
11.5	37.38	37.39
11.55	37.41	37.42
11.6	37.44	37.43
11.65	37.44	37.42
11.7	37.43	37.42
11.75	37.48	37.48
11.8	37.39	37.38
11.85	37.4	37.38
11.9	37.45	37.39
11.95	37.45	37.43
12	37.48	37.47
12.05	37.51	37.5
12.1	37.54	37.51
12.15	37.58	37.58
12.2	37.59	37.6
12.25	37.62	37.6
12.3	37.62	37.6
12.35	37.61	37.62
12.4	37.61	37.65
12.45	37.65	37.63
12.5	37.67	37.66
12.55	37.71	37.71
12.6	37.8	37.76



12.65	37.86	37.82
12.7	37.89	37.86
12.75	37.92	37.9
12.8	38	37.98
12.85	38.05	38.02
12.9	38.06	38.02
12.95	38.09	38.05
13	38.14	38.1
13.05	38.21	38.19
13.1	38.29	38.24
13.15	38.36	38.35
13.2	38.44	38.47
13.25	38.57	38.55
13.3	38.63	38.59
13.35	38.68	38.67
13.4	38.77	38.73
13.45	38.84	38.77
13.5	38.9	38.8
13.55	38.92	38.88
13.6	39.03	39
13.65	39.15	39.11
13.7	39.3	39.23
13.75	39.42	39.33
13.8	39.53	39.49
13.85	39.66	39.59
13.9	39.74	39.65
13.95	39.81	39.7
14	39.89	39.83
14.05	39.96	39.92
14.1	40.02	39.96
14.15	40.08	40.04
14.2	40.16	40.11
14.25	40.25	40.18
14.3	40.33	40.27
14.35	40.37	40.28
14.4	40.44	40.32
14.45	40.5	40.4
14.5	40.62	40.56
14.55	40.7	40.61
14.6	40.77	40.64
14.65	40.83	40.71
14.7	40.86	40.77
14.75	40.83	40.72
14.8	40.79	40.65
14.85	40.76	40.65
14.9	40.84	40.76
14.95	40.87	40.77
15	40.89	40.79
15.05	40.95	40.85
15.1	41.03	40.94
15.15	41.08	40.96
15.2	41.02	40.93
15.25	40.99	40.88
15.3	41.01	40.91
15.35	41.04	40.88
15.4	41.08	40.92
15.45	41.12	40.96

15.5	41.15	40.97
15.55	41.18	41
15.6	41.14	41.01
15.65	41.05	40.99
15.7	40.99	40.95
15.75	40.99	40.92
15.8	41.03	41
15.85	41.14	41.11
15.9	41.18	41.15
15.95	41.27	41.22
16	41.34	41.33
16.05	41.4	41.36
16.1	41.39	41.34
16.15	41.33	41.32
16.2	41.31	41.31
16.25	41.4	41.37
16.3	41.47	41.43
16.35	41.53	41.52
16.4	41.66	41.66
16.45	41.77	41.75
16.5	41.82	41.77
16.55	41.84	41.87
16.6	41.83	41.95
16.65	41.85	41.94
16.7	41.91	42
16.75	42.09	42.2
16.8	42.23	42.35
16.85	42.36	42.39
16.9	42.5	42.49
16.95	42.61	42.59
17	42.63	42.6
17.05	42.63	42.57
17.1	42.64	42.54
17.15	42.76	42.58
17.2	42.82	42.63
17.25	42.86	42.75
17.3	43.02	42.9
17.35	43.15	42.98
17.4	43.28	43.1
17.45	43.3	43.17
17.5	43.32	43.16
17.55	43.37	43.19
17.6	43.39	43.23
17.65	43.5	43.35
17.7	43.52	43.41
17.75	43.62	43.49
17.8	43.74	43.6
17.85	43.89	43.69
17.9	43.92	43.81
17.95	44.02	43.89
18	44.18	43.98



4 TEST SUMMARY

STANDARDS (details on first page)	Tested		Sample	
	yes	no	pass	not pass
ANSI C63.10-2013; 47 CFR Part 15, Subpart C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Test	47 CFR Part 15 section	Section within the report	Conclusion
Restricted bands of operation	15.205	6.1	PASS
Conducted emission	15.207	6.2	PASS
Radiated emission	15.209	6.3	PASS
Bandwidth of the emission	15.215	6.4	PASS
Spectrum mask	15.225	6.5	PASS
Frequency tolerance of the carrier signal	15.225	6.6	PASS

4.1 Operating voltages/frequencies used for testing

Section	Test	Operating conditions
6.1	Restricted bands of operation	120 V; 60 Hz
6.2	Conducted emission	120 V; 60 Hz
6.3	Radiated emission	120 V; 60 Hz
6.4	Bandwidth of the emission	120 V; 60 Hz
6.5	Spectrum mask	120 V; 60 Hz
6.6	Frequency tolerance of the carrier signal	120 V; 60 Hz

5 CONVERSION FACTORS AND ALL OTHER FORMULAS

Unit	Conversion unit	Formula of conversion
$\text{dB}\mu\text{V}$	$\text{dB}\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m} = \text{dB}\mu\text{V} + \text{AF}$
$\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m}$	$\text{dB}\mu\text{V}/\text{m} = 20\log(X(\mu\text{V}/\text{m})/1\mu\text{V})$

Test distance stated in standard	Test distance of measurement	Conversion factor
3 m	3 m	/
10 m	3 m	20dB/decade (over 30 MHz)
		40dB/decade (under 30 MHz)



6 EMISSION TESTS

6.1 Restricted bands of operation (§15.205 of FCC 47 CFR 15)

6.1.1 Requirement

Except as shown in paragraph (d) of §15.205 only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6

6.1.2 Test results

See Radiated emission results under 6.3 Radiated emission and 6.5 Spectrum mask.

6.2 Conducted emission measurement (§15.207 of FCC 47 CFR 15)

6.2.1 Requirement

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.5	66 – 56*	56 – 46*
0.5 to 5.0	56	46
5.0 to 30.0	60	50

* Decreases with the logarithm of the frequency.

The shown limits in table shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

- For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
- For all other carrier current systems: 1000 µV within the frequency band 535-1705 kHz, as measured using a 50 µH/50 ohms LISN.
- Carrier current systems operating below 30 MHz are also subject to the radiated emission limits as appropriate.

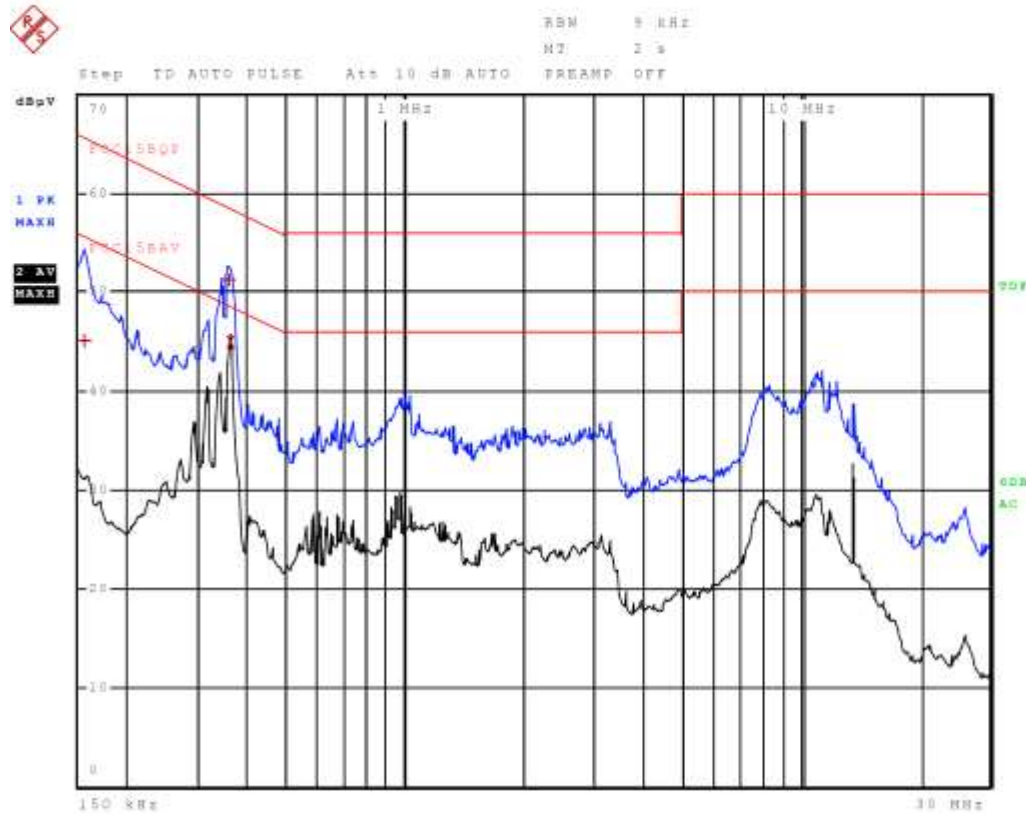
6.2.2 Test procedure

- As per clause 6.2 from ANSI C63.10-2013.
- The EUT is placed on a non-conductive 0.8 meters high table, 0.4 meters from the vertical conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). LISN provide 50 Ohm / 50 µH + 5 Ohm of coupling impedance for the measuring instrument.
- Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
- AC power lines of EUT are checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz is searched using PEAK, QUASI-PEAK and AVERAGE function of the receiver to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band. Bandwidth is set to 9 kHz.
- Measurement repeated with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band.



6.2.3 Test results

Meas Type CONDUCTED EMISSION
Equipment under Test Electronic Lock RFID ISO SE
OP Condition Uin 120 V/ 60 Hz, WAITING
Test Spec
 Phase and Neutral



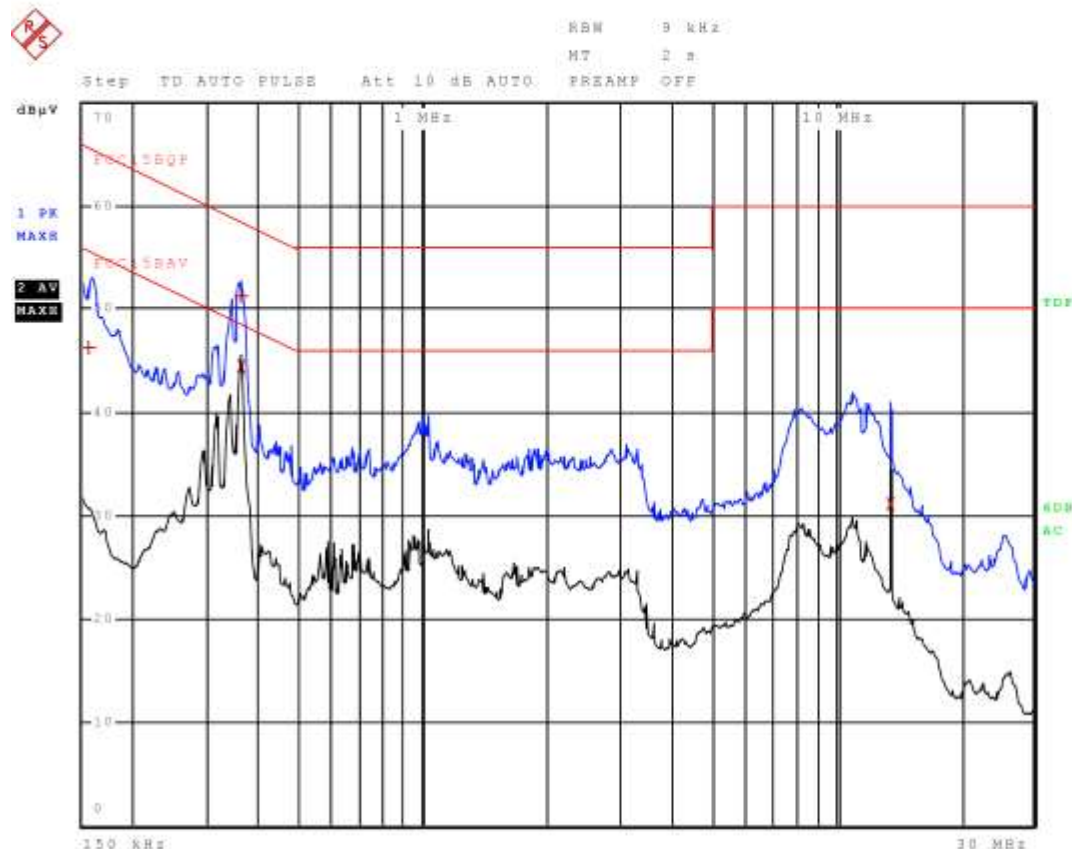
Final Measurement

Meas Time: 2 s
 Margin: 15 dB
 Subranges: 3

Trace	Frequency	Level (dBµV)	Detector	Delta Limit/dB	LISN
2	361.500000000 kHz	44.95	CISPR Averag	-3.74N	
1	357.000000000 kHz	51.23	Quasi Peak	-7.57N	
1	154.500000000 kHz	45.06	Quasi Peak	-20.69N	

Meas Type CONDUCTED EMISSION
 Equipment under Test Electronic Lock RFID ISO SE
 OP Condition Uin 120 V/ 60 Hz, READING

Test Spec
 Phase and Neutral



Final Measurement

Meas Time: 2 s
 Margin: 15 dB
 Subranges: 4

Trace	Frequency	Level (dBμV)	Detector	Delta Limit/dB	LISN
2	361.500000000 kHz	44.56	CISPR Averag	-4.14N	
1	359.250000000 kHz	51.22	Quasi Peak	-7.53N	
2	13.560000000 MHz	31.12	CISPR Averag	-18.88L1	
1	156.750000000 kHz	46.29	Quasi Peak	-19.35N	



6.3 Radiated emission measurement (§15.209 of FCC 47 CRF 15)

6.3.1 Requirement

Frequency Range (MHz)	Limits (dB μ V/m)	Test distance (m)
0.009 to 0.490	$20 \cdot \log(2400/F(\text{kHz}))$	300
0.490 to 1.705	$20 \cdot \log(24000/F(\text{kHz}))$	30
1.705 to 30.0	30	30
30 to 88	40**	3
88 to 216	43.5**	3
216 to 960	46**	3
Above 960	54	3

** Except as provided in paragraph below, fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications

6.3.2 Test procedure

Measurements from 9 kHz to 30 MHz

1. As per clause 6.4 from ANSI C63.10-2013
2. Radiated emission in the frequency range 9 kHz to 30 MHz are measured Active loop Antenna.
3. First preliminary measurements were performed in Semi-anechoic chamber at a distance of 3 m using active loop antenna.
4. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table and antenna was rotated 360 degrees to determine the position of the highest radiation.
5. Final measurements were done at a distance of 10 m at Open Area Test Site due to low emissions measured during preliminary measurements acc. to the clauses from Part 15, Sections 15.31(d) and 15.31(f)(2). Test results were extrapolated by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Measurements from 30 MHz to 1 GHz

6. As per clause 6.5 from ANSI C63.10-2013
7. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
8. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
9. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
10. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
11. The test-receiver system was set to PEAK and QUAS-PEAK Detect Function and Specified Bandwidth with Maximum Hold Mode.
12. The highest points would be re-tested one by one using the quasi-peak method.

Measurements from 1 GHz to 18 GHz

13. As per clause 6.6 from ANSI C63.10-2013
14. The EUT was placed on the top of a rotating table 1.5 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
15. The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of variable-height antenna tower.
16. The antenna is a horn antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
17. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
18. The test-receiver system was set to AVERAGE Detect Function and Specified Bandwidth with Maximum Hold Mode.
19. The highest points would be re-tested one by one using the AVERAGE detector.



6.3.3 Test results

Device passed the requirements stated

Preliminary measurements at 3 m from 9 kHz to 30 MHz:

17.Jul 19 09:44

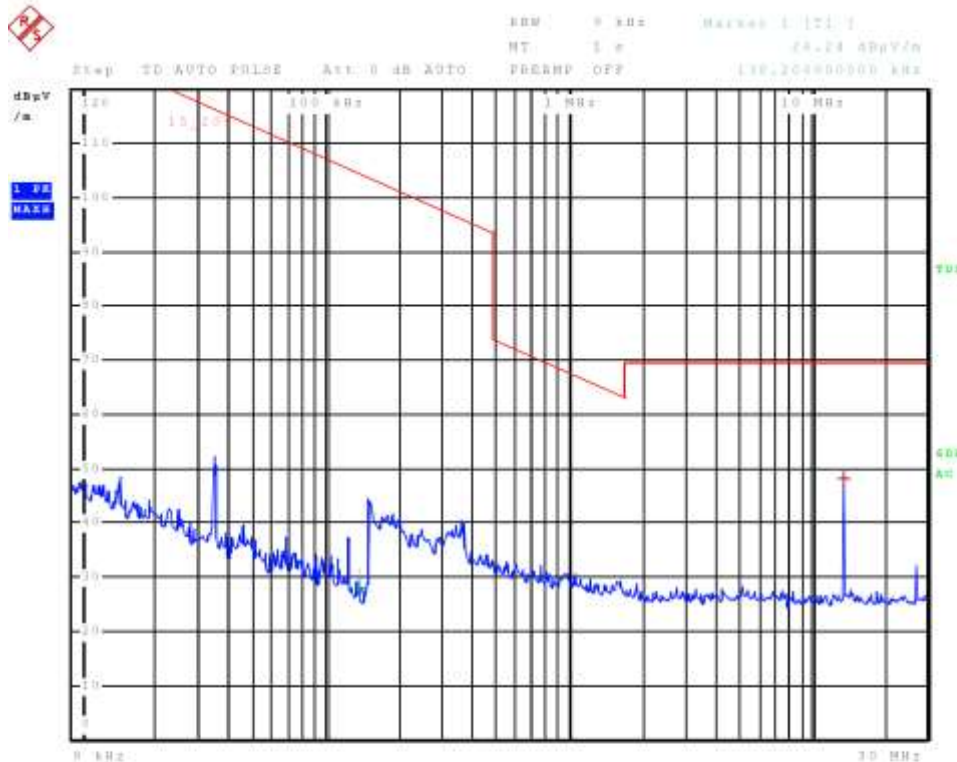
Meas Type RADIATED EMISSION
 Equipment under Test Electronic Lock RFID ISO SE
 OP Condition WAITING

Test Spec
 Antenna: 25 deg, Sample: 68 deg

Time Domain Scan (2 Ranges)

Scan Start: 9 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK
 Transducer: 1519B_V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	2 ms	Auto	0 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	2 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 1 s
 Margin: 30 dB
 Peaks: 1

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	47.94	Quasi Peak	-21.56



17.Jul 19 09:40

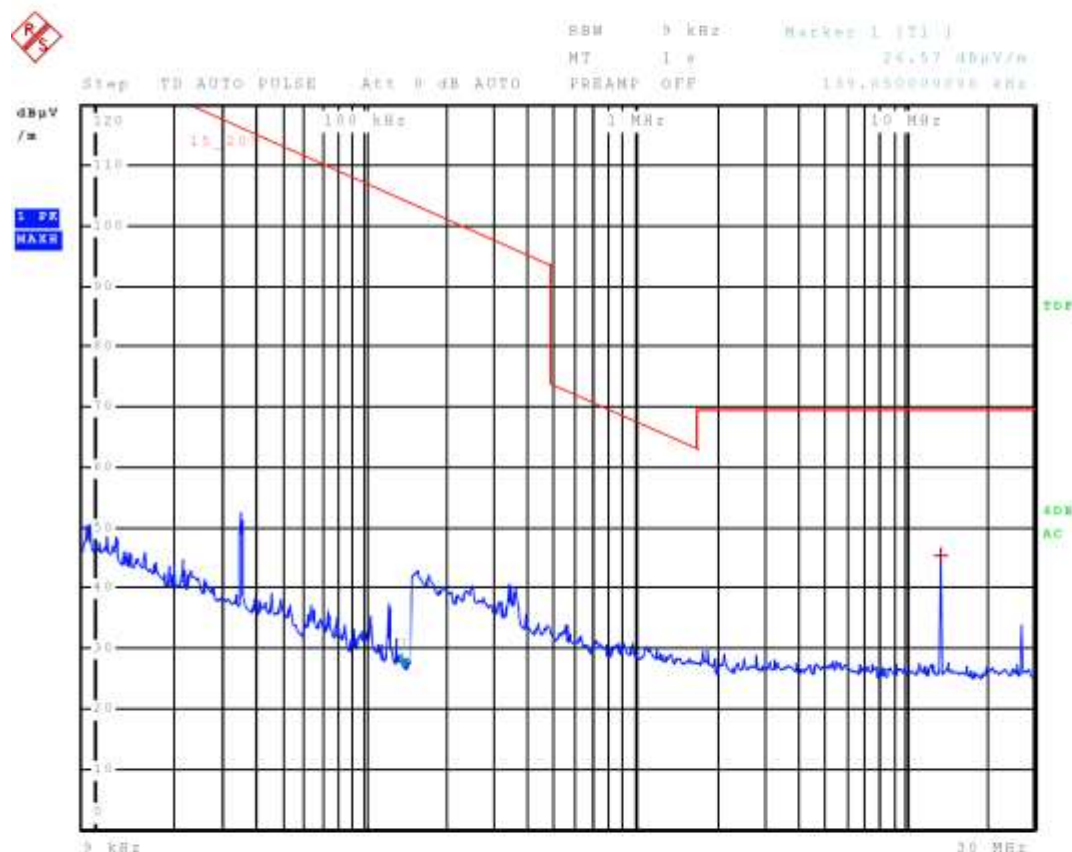
Meas Type RADIATED EMISSION
 Equipment under Test Electronic Lock RFID ISO SE
 OP Condition READING

Test Spec
 Antenna: 25 deg, Sample: 68 deg

Time Domain Scan (2 Ranges)

Scan Start: 9 kHz
 Scan Stop: 30 MHz
 Detector: Trace 1: MAX PEAK
 Transducer: 1519B_V

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
9.000000 kHz	149.950000 kHz	50.00 Hz	200.00 Hz	2 ms	Auto	0 dB	INPUT2
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	2 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 1 s
 Margin: 30 dB
 Peaks: 1

Trace	Frequency	Level (dBµV/m)	Detector	Delta Limit/dB
1	13.560000000 MHz	45.32	Quasi Peak	-24.18



Final measurement at 10 m on OATS

Results with measuring distance of 10 m				
Mode	Frequency (MHz)	Measured value (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Reading	13.56	33,17	103.00	69,83
Waiting	13.56	34,62	103.00	68,38

Calculated value from 10 m to 30 m						
Mode	Frequency (MHz)	Measured value at 10 m (dB μ V/m)	Correction factor from 10 m to 30 m (dB)	Calculated value at 30 m (dB μ V/m)	Limit at 30 m (dB μ V/m)	Margin (dB)
Reading	13.56	33,17	19	14,17	84.00	70,83
Waiting	13.56	34,62	19	15,67	84.00	69,38

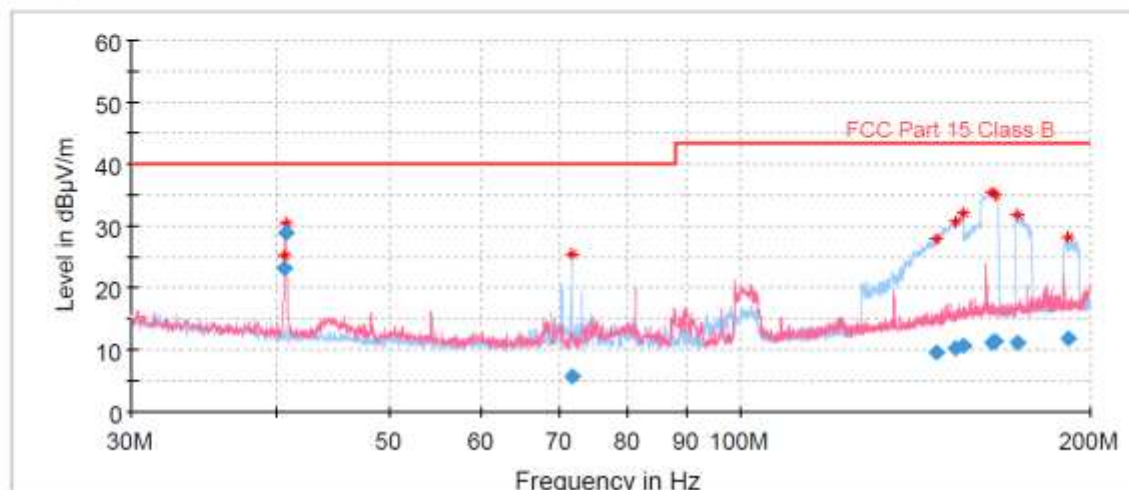
NOTE: Antenna factor and cable loss are included in measurement correction.

Radiated emission

EUT Information

EUT: Electronic Lock RFID ISO SE
 Test condition: WAITING

Full Spectrum



- Preview Result 1H-PK+
- Critical_Freqs PK+
- Final_Result QPK
- Preview Result 1V-PK+
- FCC Part 15 Class B

Final Result

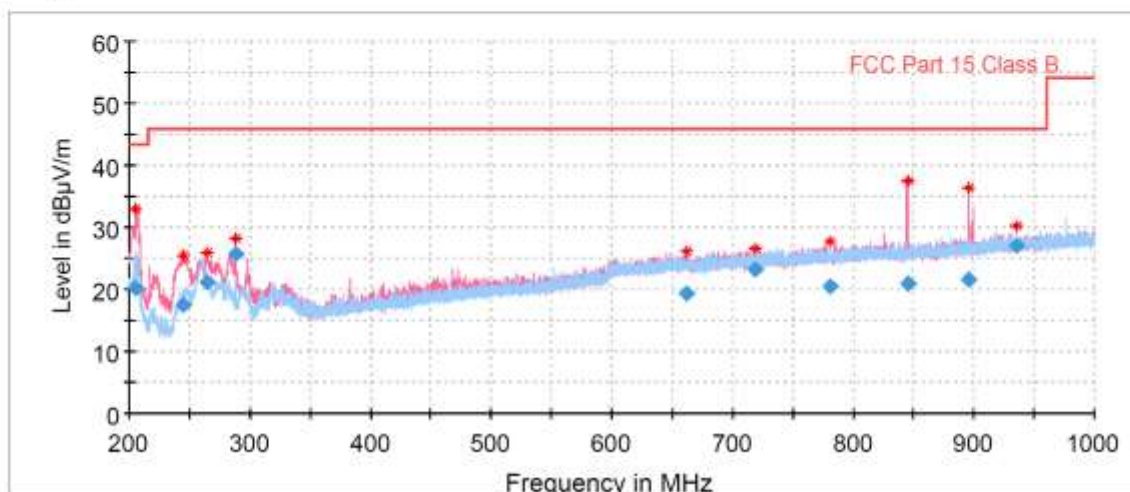
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
40.680000	28.88	40.00	11.12	100.0	V	350.0
40.620000	23.10	40.00	16.90	100.0	V	321.0
191.130000	11.83	43.50	31.67	235.0	H	75.0
165.660000	11.27	43.50	32.23	104.0	H	0.0
172.980000	11.21	43.50	32.29	234.0	H	28.0
164.580000	11.16	43.50	32.34	117.0	H	0.0
155.430000	10.62	43.50	32.88	103.0	H	0.0
153.090000	10.22	43.50	33.28	143.0	H	0.0
147.630000	9.46	43.50	34.04	153.0	H	130.0
71.670000	5.64	40.00	34.36	150.0	H	218.0

Radiated emission

EUT Information

EUT: Electronic Lock RFID ISO SE
 Test condition: WAITING

Full Spectrum



- Preview Result 1V-PK+
- ◆ Critical_Freqs PK+
- Preview Result 1H-PK+
- FCC Part 15 Class B
- ◆ Final_Result QPK

Final Result

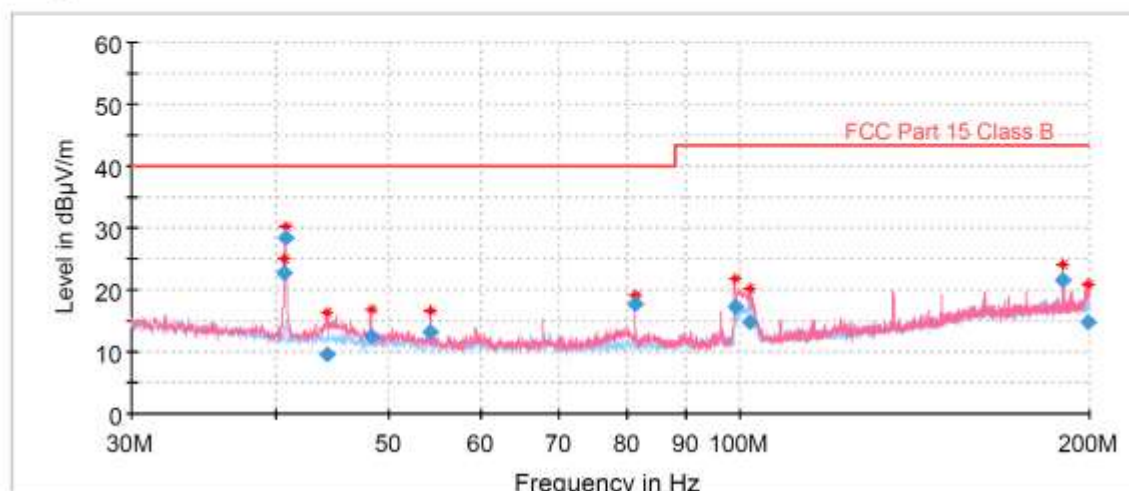
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
935.640000	27.04	46.00	18.96	103.0	H	104.0
288.030000	25.78	46.00	20.22	150.0	V	339.0
718.710000	23.22	46.00	22.78	116.0	H	203.0
204.690000	20.13	43.50	23.37	100.0	V	0.0
896.130000	21.68	46.00	24.32	150.0	V	136.0
264.390000	21.08	46.00	24.92	150.0	V	30.0
845.100000	20.90	46.00	25.10	248.0	V	293.0
780.600000	20.38	46.00	25.62	104.0	V	299.0
661.800000	19.22	46.00	26.78	100.0	V	38.0
244.950000	17.45	46.00	28.55	100.0	V	154.0

Radiated emission

EUT Information

EUT: Electronic Lock RFID ISO SE
 Test condition: READING

Full Spectrum



- Preview Result 1H-PK+
- Preview Result 1V-PK+
- Critical_Freqs PK+
- Final_Result QPK
- FCC Part 15 Class B

Final Result

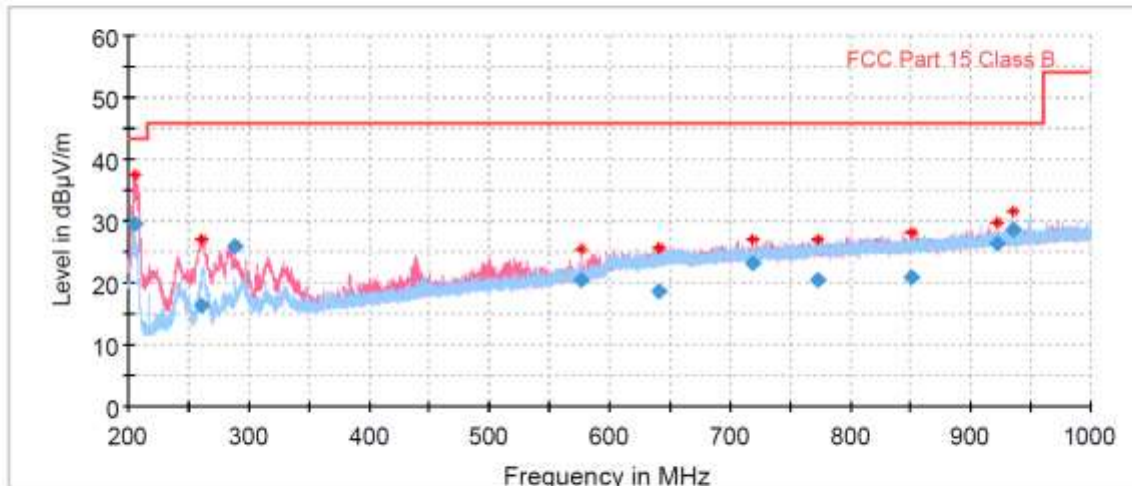
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
40.680000	28.47	40.00	11.53	100.0	V	0.0
40.620000	22.76	40.00	17.24	100.0	V	0.0
189.840000	21.63	43.50	21.87	166.0	V	128.0
81.360000	17.64	40.00	22.36	193.0	V	329.0
99.030000	17.19	43.50	26.31	248.0	V	0.0
54.240000	13.11	40.00	26.89	100.0	V	229.0
48.210000	12.47	40.00	27.53	100.0	V	78.0
199.680000	14.84	43.50	28.66	116.0	V	342.0
101.970000	14.83	43.50	28.67	245.0	V	4.0
44.130000	9.65	40.00	30.35	100.0	V	95.0

Radiated emission

EUT Information

EUT: Electronic Lock RFID ISO SE
 Test condition: READING

Full Spectrum



— Preview Result 1V-PK+ — Preview Result 1H-PK+
★ Critical_Freqs PK+ — FCC Part 15 Class B
◆ Final_Result QPK

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
205.890000	29.47	43.50	14.03	100.0	V	161.0
935.640000	28.71	46.00	17.29	150.0	H	165.0
922.080000	26.45	46.00	19.55	102.0	H	130.0
288.060000	25.97	46.00	20.03	167.0	V	320.0
718.710000	23.19	46.00	22.81	117.0	V	161.0
850.800000	20.96	46.00	25.04	131.0	V	106.0
576.090000	20.38	46.00	25.62	100.0	V	0.0
772.770000	20.34	46.00	25.66	132.0	H	196.0
640.560000	18.65	46.00	27.35	150.0	H	17.0
260.850000	16.33	46.00	29.67	100.0	V	189.0

6.4 Bandwidth of the emission (§15.215)

6.4.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in subpart E of FCC Part 15, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

6.4.2 Test procedure

1. As per Clause 6.9.2 from ANSI C63.10-2013
2. The EUT is placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
3. The EUT is set 3 m away from the interference-receiving antenna.
4. Resolution bandwidth is set to a value greater than 5% of the allowed bandwidth.



6.4.3 Test results

Device passed the requirements stated in FCC Part 15, Subpart C, Section 15.215

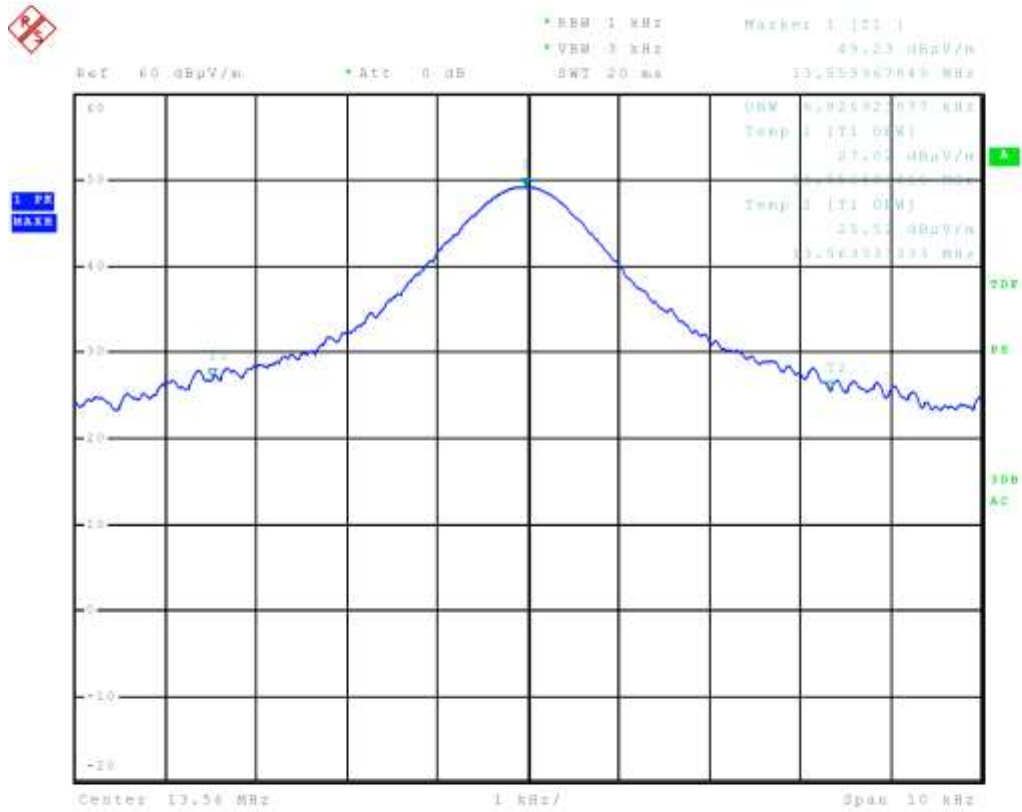
17.Jul 19 11:05

Meas Type OCCUPIED BANDWIDTH
 Equipment under Test Electronic Lock RFID ISO SE
 OP Condition WAITING

Test Spec
 Antenna: 25 deg, Sample: 68 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	60.000 dBµV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	80.000 dB
Stop Frequency	13.565000 MHz	RF Att	0.000 dB
RBW	1.000000 kHz	X-Axis	LIN
VBW	3.000000 kHz	Y-Axis	LOG
Sweep Time	20.00 ms		



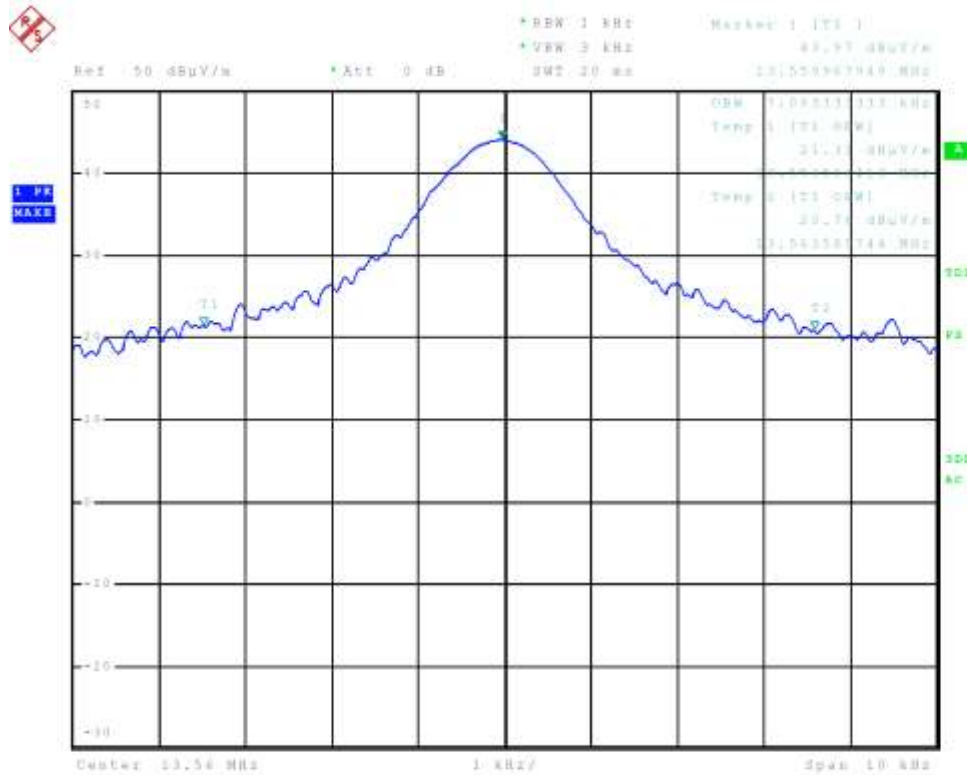
17.Jul 19 11:02

Meas Type OCCUPIED BANDWIDTH
 Equipment under Test Electronic Lock RFID ISO SE
 OP Condition READING

Test Spec
 Antenna: 25 deg, Sample: 68 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	50.000 dBµV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	10.000000 kHz	Ref Position	100.000 %
Start Frequency	13.555000 MHz	Level Range	80.000 dB
Stop Frequency	13.565000 MHz	RF Att	0.000 dB
RBW	1.000000 kHz	X-Axis	LTN
VBW	3.000000 kHz	Y-Axis	LOG
Sweep Time	20.00 ms		



Frequency (MHz)	Permitted frequency band (MHz)	20 dB bandwidth (kHz)	PASS/FAIL
13.56	13.110 – 14.010	7.08	PASS



6.5 Spectrum mask (§15.225 (a)-(d) of FCC 47 CRF 15)

6.5.1 Requirements

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

6.5.2 Test procedure

1. As per clause 6.4 from ANSI C63.10-2013
2. The EUT was placed on the top of a rotating table 0.8 meters above the ground in an Anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
3. The EUT was set 3 m away from the interference-receiving antenna.
4. Frequencies with maximum emission were retested on OATS.
5. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

6.5.3 Test results

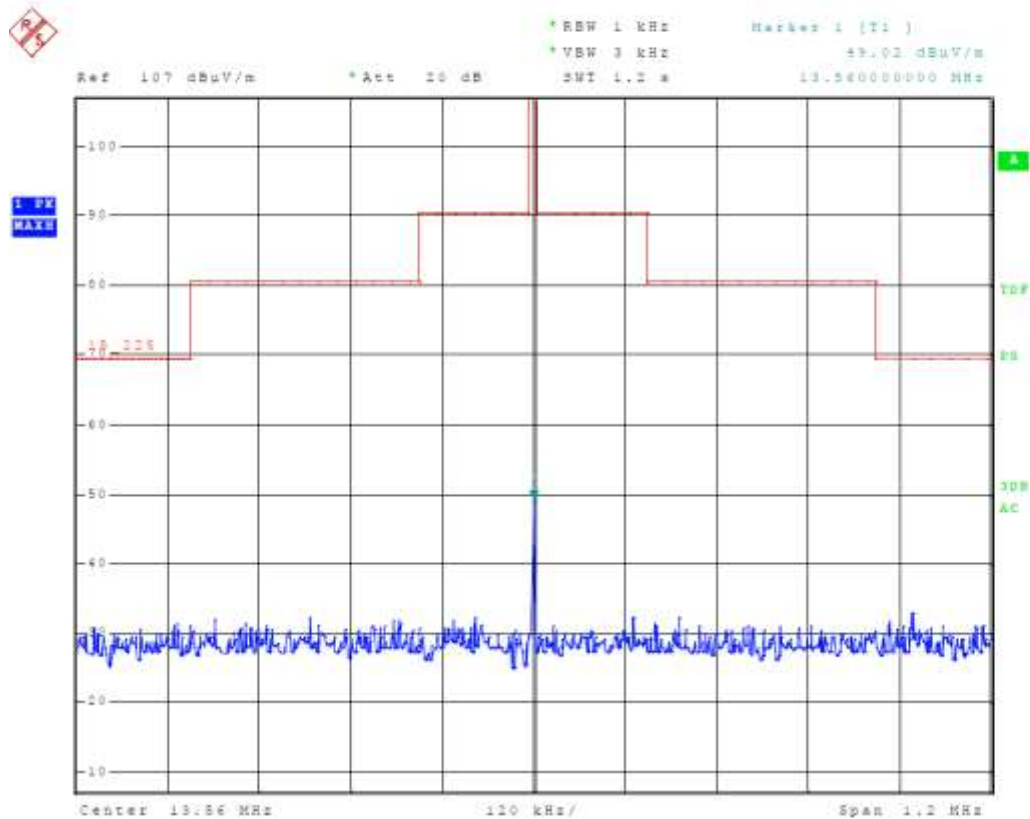
Device passed the requirements stated in FCC Part 15, Subpart C, Section 15.225

17.Jul 19 10:14

Meas Type SPECTRUM MASK
 Equipment under Test Electronic Lock RFID ISO SE
 OP Condition WAITING
 Test Spec
 Antenna: 25 deg, Sample: 68 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	107.000 dBµV/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz	X-Axis	LIN
VBW	3.000000 kHz	Y-Axis	LOG
Sweep Time	1.20 s		





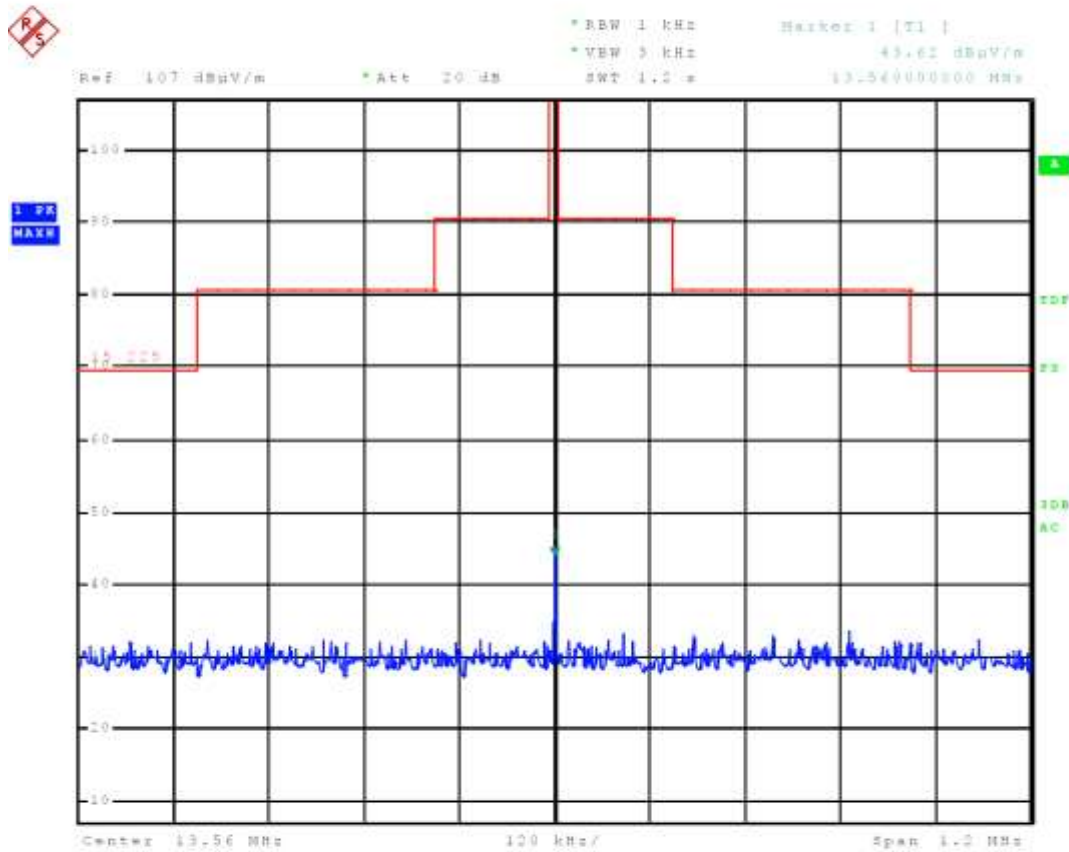
17.Jul 19 10:19

Meas Type SPECTRUM MASK
Equipment under Test Electronic Lock RFID ISO SE
OP Condition READING

Test Spec
Antenna: 25 deg, Sample: 68 deg

Sweep Settings Screen A

Center Frequency	13.560000 MHz	Ref Level	107.000 dB μ V/m
Frequency Offset	0.000000 Hz	Ref Level Offset	0.000 dB
Span	1.200000 MHz	Ref Position	100.000 %
Start Frequency	12.960000 MHz	Level Range	100.000 dB
Stop Frequency	14.160000 MHz	RF Att	20.000 dB
RBW	1.000000 kHz	X-Axis	LIN
VBW	3.000000 kHz	Y-Axis	LOG
Sweep Time	1.20 s		



6.6 Frequency tolerance of the carrier signal (§15.225 (e))

6.6.1 Requirement

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

6.6.2 Test procedure

1. As per clause 6.8 from ANSI C63.10-2013.
2. 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 rated supply voltage at a temperature of 20 °C.
3. If the EUT provides an antenna connector the spectrum analyzer is connected to this port. In cases where the EUT does not provide an antenna connector a test fixture is used.
4. The peak detector of the spectrum analyzer is selected and the resolution bandwidth as well as the video bandwidth is set to values appropriate to the shape of the spectrum of the EUT.
5. While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized.



6.6.3 Test results

Device passed the requirements stated in FCC Part 15, Subpart C, Section 15.225

FREQUENCY STABILITY						
Temperature	Supply voltage (V)	Minutes after switch on	Measured Frequency (MHz)	Allowed tolerance (kHz)	Measured tolerance	RESULT
50	12,00	0	13,559917100	Fref±1.356 kHz	-0,036	PASS
	12,00	2	13,559921100	Fref±1.356 kHz	-0,032	PASS
	12,00	5	13,559920100	Fref±1.356 kHz	-0,033	PASS
	12,00	10	13,559925100	Fref±1.356 kHz	-0,028	PASS
40	12,00	0	13,559931100	Fref±1.356 kHz	-0,022	PASS
	12,00	2	13,559918100	Fref±1.356 kHz	-0,035	PASS
	12,00	5	13,559923100	Fref±1.356 kHz	-0,030	PASS
	12,00	10	13,559922100	Fref±1.356 kHz	-0,031	PASS
30	12,00	0	13,559959000	Fref±1.356 kHz	0,006	PASS
	12,00	2	13,559933100	Fref±1.356 kHz	-0,020	PASS
	12,00	5	13,559936100	Fref±1.356 kHz	-0,017	PASS
	12,00	10	13,559927100	Fref±1.356 kHz	-0,026	PASS
20	13,80	0	13,559993000	Fref±1.356 kHz	0,040	PASS
	13,80	2	13,559967000	Fref±1.356 kHz	0,014	PASS
	13,80	5	13,559952000	Fref±1.356 kHz	-0,001	PASS
	13,80	10	13,559953000	Fref±1.356 kHz	0,000	PASS
20	12,00	0	13,559990000	Fref±1.356 kHz	0,037	PASS
	12,00	2	13,559961000	Fref±1.356 kHz	0,008	PASS
	12,00	5	13,559947100	Fref±1.356 kHz	-0,006	PASS
	12,00	10	13,559953000	Fref	0,000	PASS
20	10,20	0	13,559987000	Fref±1.356 kHz	0,034	PASS
	10,20	2	13,559960000	Fref±1.356 kHz	0,007	PASS
	10,20	5	13,559948100	Fref±1.356 kHz	-0,005	PASS
	10,20	10	13,559953000	Fref±1.356 kHz	0,000	PASS
10	12,00	0	13,560022000	Fref±1.356 kHz	0,069	PASS
	12,00	2	13,560000000	Fref±1.356 kHz	0,047	PASS
	12,00	5	13,559988000	Fref±1.356 kHz	0,035	PASS
	12,00	10	13,559983000	Fref±1.356 kHz	0,030	PASS
0	12,00	0	13,560040000	Fref±1.356 kHz	0,087	PASS
	12,00	2	13,560032000	Fref±1.356 kHz	0,079	PASS
	12,00	5	13,560019000	Fref±1.356 kHz	0,066	PASS
	12,00	10	13,560018000	Fref±1.356 kHz	0,065	PASS
-10	12,00	0	13,560019000	Fref±1.356 kHz	0,066	PASS
	12,00	2	13,560036000	Fref±1.356 kHz	0,083	PASS
	12,00	5	13,560034000	Fref±1.356 kHz	0,081	PASS
	12,00	10	13,560031000	Fref±1.356 kHz	0,078	PASS
-20	12,00	0	13,559999000	Fref±1.356 kHz	0,046	PASS
	12,00	2	13,560026000	Fref±1.356 kHz	0,073	PASS
	12,00	5	13,560023000	Fref±1.356 kHz	0,070	PASS
	12,00	10	13,560026000	Fref±1.356 kHz	0,073	PASS