



DATE: 3 January 2019

I.T.L. (PRODUCT TESTING) LTD.
FCC/IC Radio Test Report
For

AeroScout

Equipment under test:

Exciter LF 125 kHz Transmitter

Indoor Unit: EX5210
Outdoor Unit: EX5210R*

***see customer declaration on page 5**

Tested by:


M. Zohar

Approved by:


D. Shidlowsky

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This report relates only to items tested.



Measurement/Technical Report for AeroScout

Exciter LF 125 kHz Transmitter

Indoor Unit: EX5210
Outdoor Unit: EX5210R

FCC ID: Q3HEX5210

IC: 5115A-EX5210

This report concerns: Original Grant: X
 Class I Change:
 Class II Change:

Equipment type: Part 15 Low Power Transmitter Below 1705 kHz
 Low Power Transmitter General Field Limits
 (9kHz-30MHz)

Limits used: 47CFR15 Section 15.209
 RSS-Gen, Issue 5, April 2018

Measurement procedure used ANSI C.63.10 2013

Application for Certification	Applicant for this device:
prepared by:	(different from "prepared by")
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1. General Information

1.1 Administrative Information

Manufacturer:	AeroScout
Manufacturer's Address:	2 Ilan Ramon St., Science Park Ness-Ziona, 7403635, Israel Tel: +972-8-936-9393 Fax: +972-8-936-5977
Manufacturer's Representative:	Eli Aharon
Equipment Under Test (E.U.T):	Exciter LF 125 kHz Transmitter
Equipment HVIN:	Indoor Unit: EX5210 Outdoor Unit: EX5210R
Equipment PMN:	Indoor Unit: EX5210 Outdoor Unit: EX5210R
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	July 2, 2018
Start of Test:	July 2, 2018
End of Test:	July 8, 2018
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Bat Sheva St., LOD 7120101 ISRAEL
Test Specifications:	FCC Part 15, Subpart C, Section 15.209 RSS-Gen, Issue 5, April 2018



Date: 4-Oct-18

We hereby declare that both EX5210 and EX5210R share the same electronic module (the same PCBA). The difference between the two is mechanical enclosure, for the EX5210R use an outdoor rugged enclosure and the EX5210 use an indoor enclosure.

Thank you,

Reuven Amsalem

Signature:



1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. Industry Canada (Canada), IC File No.: 46405-4025; Sites No. IC 4025A-1, 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 **Product Description**

The EX5210R/EX5210 AeroScout Exciter is a component of the AeroScout suite of enterprise visibility solutions that enables location-based applications. The Exciter extends the AeroScout suite to provide robust and sophisticated RFID detection capabilities, using the same AeroScout tags that can also be accurately located in real time by the AeroScout system. The Exciter triggers AeroScout's tags as they pass through a choke point, and those transmit a message to AeroScout Location Receivers or compatible Access Points in range.

Working voltage	48.0VDC via 2 optionally types of operation: 1. POE 2. direct 48VDC
Mode of operation	Transmitter
Modulation	ASK (OOK)
Operation Frequency	125.0kHz
Modulation BW	2.73 kHz

1.4 **Test Methodology**

Radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 **Test Facility**

Emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation No. IL1005.



1.6 Measurement Uncertainty

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)
for open site:

30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB

1 GHz to 6 GHz

Expanded Uncertainty (95% Confidence, K=2):

± 5.19 dB

>6 GHz

Expanded Uncertainty (95% Confidence, K=2):

± 5.51 dB

2. System Test Configuration

2.1 Justification

1. The E.U.T contains a LF 125 kHz transmitter transmitting continuously to 2 antennas (at different polarity) via one RF chain.
2. The E.U.T has 2 optional installation positions: wall or ceiling mounted.
3. The E.U.T has 2 optional types: indoor or outdoor. The hardware & software are identical but they have different enclosures.
4. Exploratory radiated emission screening was performed in 2 orthogonal orientations to find the “worst case” type and orientation

Type	Wall Mounted			Ceiling Mounted		
	Fundamental	2 nd Harmonic	3 rd Harmonic	Fundamental	2 nd Harmonic	3 rd Harmonic
	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)
Indoor	100.9	69.9	66.2	102.5	71.9	65.8
Outdoor	102.2	66.9	65.5	103.2	72.0	66.7

Figure 1. Screening Results

According to the above table the “worst case” was the outdoor type and at ceiling mount.

5. Evaluation was performed with POE power supply.

2.2 EUT Exercise Software

No special exercise software was used.

2.3 Accessories

POE injector details:

Manufacturer: CISCO

Model: SB-PWR-INJ1

S/N: C1214657500

2.4 Equipment Modifications

No equipment modifications were required to achieve compliance.

2.5 Configuration of Tested System

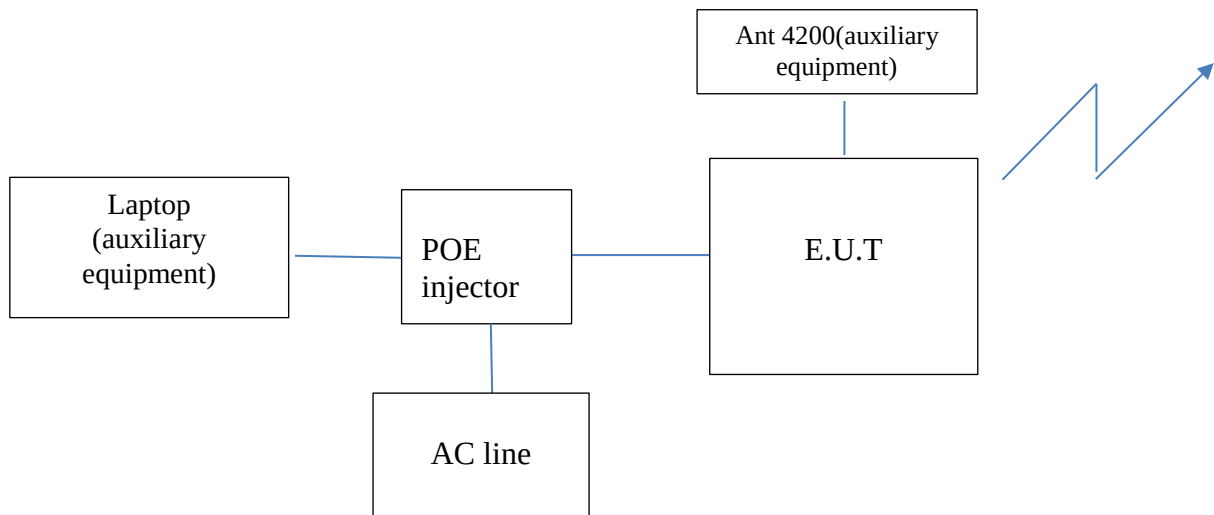


Figure 2. Test Set-Up

3. Conducted & Radiated Measurement Test Setup Photos



Figure 3. Conducted Emission from AC Mains

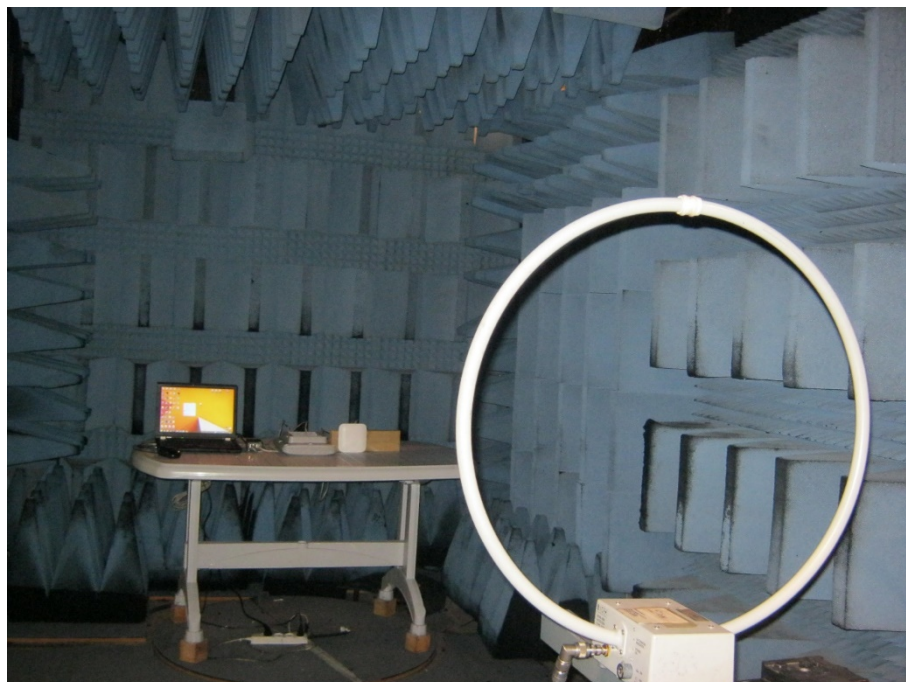


Figure 4. Radiated Emission Test Setup

4. Conducted Emission From AC Mains

4.1 Test Specification

FCC Part 15, Subpart C, Section 15.207

RSS-Gen, Issue 5: 2018, Section 8.8

4.2 Test Procedure

(Temperature (22°C)/ Humidity (57%RH))

The E.U.T operation mode and test setup are as described in Section 2 of this report. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on a 0.8 meter high wooden table, 0.4 meter from the room's vertical wall. In the case of a floor-standing E.U.T., it was placed on the horizontal ground plane.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T.

The center of the E.U.T.'s AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver and are displayed on the receiver's spectrum display.

The E.U.T was tested while transmitting simultaneously 125 kHz.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Test Limit

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66.0 to 56.0*	56.0 to 46.0*
0.5-5.0	56.0	46.0
5.0-30.0	60.0	50.0

* Decreases with the logarithm of the frequency.

4.4 Test Results

JUDGEMENT: Passed by 0.92 dB

The margin between the emission levels and the specification limit is, in the worst case, 1.04 dB for the phase line at 10.25 MHz and 0.92dB at 10.25 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C and RSS-Gen, Issue 5: 2018, Section 8.8 specification requirements.

The details of the highest emissions are given in *Figure 5* to *Figure 8*.

Conducted Emission

E.U.T Description Exciter LF 125 kHz
Transmitter
Type Indoor Unit: EX5210
Outdoor Unit: EX5210R
Serial Number: Not designated

Specification: FCC Part 15, Subpart C, Section 15.207
RSS-Gen, Issue 5: 2018, Section 8.8
Lead: Phase
Detectors: : Quasi-peak, Average
Voltage supply type: POE

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	CE22BQP			
Trace2:	CE22BAP			
Trace3:	---			
	TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
2	Average	178 kHz	31.89	-22.68
1	Quasi Peak	182 kHz	45.46	-18.93
1	Quasi Peak	278 kHz	32.65	-28.21
2	Average	414 kHz	21.37	-26.19
1	Quasi Peak	506 kHz	33.54	-22.45
2	Average	534 kHz	29.97	-16.02
2	Average	970 kHz	26.55	-19.44
1	Quasi Peak	1.21 MHz	29.82	-26.17
1	Quasi Peak	1.698 MHz	26.72	-29.27
2	Average	1.938 MHz	22.17	-23.82
2	Average	2.906 MHz	24.38	-21.61
1	Quasi Peak	3.39 MHz	27.56	-28.43
1	Quasi Peak	4.842 MHz	32.88	-23.11
2	Average	4.842 MHz	24.92	-21.07
1	Quasi Peak	10.25 MHz	58.95	-1.04
2	Average	10.25 MHz	47.03	-2.97
2	Average	11.374 MHz	42.23	-7.76
1	Quasi Peak	11.378 MHz	53.56	-6.44
1	Quasi Peak	20.75 MHz	51.99	-8.00
2	Average	20.75 MHz	37.52	-12.47

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Figure 5. Detectors: Peak, Quasi-peak, Average

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

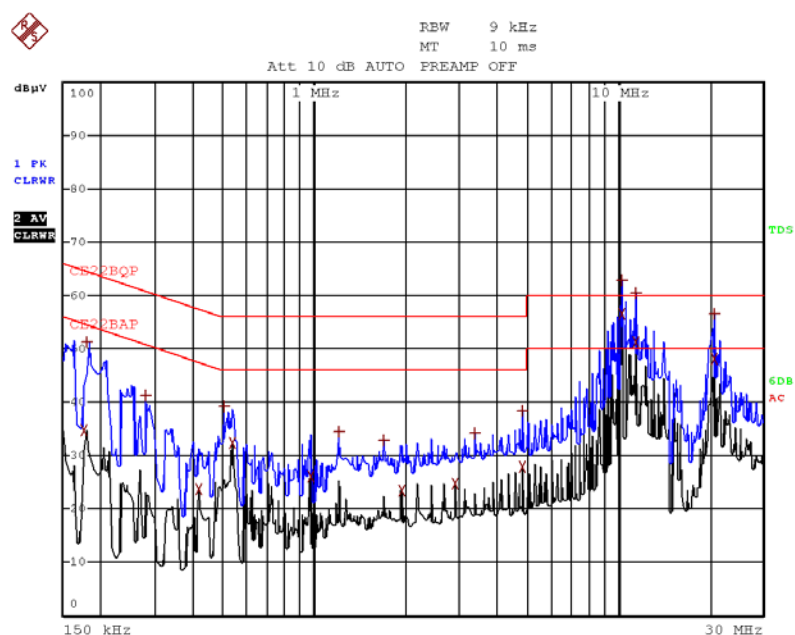
E.U.T Description	Exciter LF 125 kHz Transmitter
Type	Indoor Unit: EX5210 Outdoor Unit: EX5210R
Serial Number:	Not designated

Specification: FCC Part 15, Subpart C, Section 15.207
RSS-Gen, Issue 5: 2018, Section 8.8

Lead: Phase

Detectors: Peak, Average

Voltage supply type: POE



Date: 8.JUL.2018 17:02:18

Figure 6. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description: Exciter LF 125 kHz Transmitter
Type: Indoor Unit: EX5210
Outdoor Unit: EX5210R
Serial Number: Not designated

Specification: FCC Part 15, Subpart C, Section 15.207
RSS-Gen, Issue 5: 2018, Section 8.8

Lead: Neutral

Detectors: Quasi-peak, Average

Voltage supply type: POE

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	CE22BQP		
Trace2:	CE22BAP		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	170 kHz	46.16	-18.79
2 Average	206 kHz	29.23	-24.13
1 Quasi Peak	258 kHz	34.47	-27.02
2 Average	386 kHz	17.60	-30.54
2 Average	502 kHz	28.01	-17.98
1 Quasi Peak	530 kHz	34.60	-21.39
1 Quasi Peak	970 kHz	28.88	-27.11
2 Average	970 kHz	25.83	-20.16
1 Quasi Peak	1.694 MHz	25.12	-30.87
2 Average	1.694 MHz	19.30	-26.69
2 Average	2.422 MHz	24.97	-21.02
1 Quasi Peak	3.386 MHz	26.28	-29.71
1 Quasi Peak	3.63 MHz	28.78	-27.21
2 Average	3.874 MHz	26.98	-19.01
1 Quasi Peak	10.25 MHz	59.07	-0.92
2 Average	10.25 MHz	45.54	-4.45
1 Quasi Peak	10.878 MHz	53.80	-6.20
2 Average	11.25 MHz	41.05	-8.94
1 Quasi Peak	20.814 MHz	48.26	-11.74
2 Average	21.626 MHz	34.48	-15.51

Date: 8.JUL.2018 17:08:45

Figure 7. Detectors: Peak, Quasi-peak, Average

Note: QP Delta/Av Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

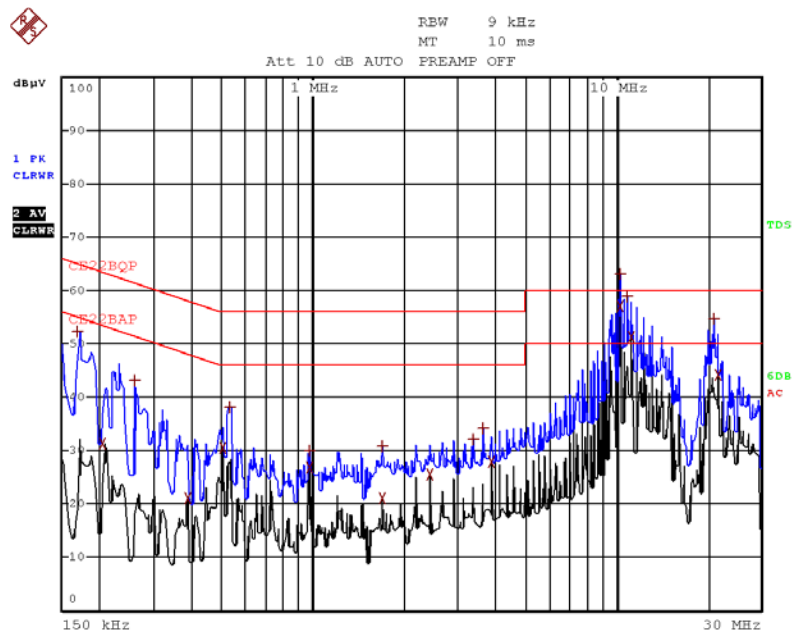
E.U.T Description Exciter LF 125 kHz
Transmitter
Type Indoor Unit: EX5210
Outdoor Unit: EX5210R
Serial Number: Not designated

Specification: FCC Part 15, Subpart C, Section 15.207
RSS-Gen, Issue 5: 2018, Section 8.8

Lead: Neutral

Detectors: Peak, Average

Voltage supply type: POE



Date: 8.JUL.2018 17:07:35

Figure 8 Detectors: Peak, Quasi-peak, Average



4.5 Test Equipment Used; Conducted Emission from AC Mains

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
LISN	Fischer	FCC-LISN-25A	127	July 20, 2017	July 20, 2018
Transient Limiter	HP	11947A	3107A03041	June 29, 2018	June 29, 2019
EMI Receiver	Rohde & Schwarz	ESCI7	100724	February 19, 2018	February 19, 2019
Cable CE Chamber 3M + 3M	Testline 18 + RJ214	11556	-	March 31, 2018	March 31, 2019

Figure 9 Test Equipment Used

5. Field Strength of Fundamental

5.1 Test Specification

Part 15, Subpart C, Section 15.209(a)

RSS-Gen, Issue 5: 2018, Section 8.9

5.2 Test Procedure

(Temperature (20°C)/ Humidity (58%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 0.8 meters above the ground.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna polarity were adjusted for maximum level reading on the EMI receiver.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

5.3 Test Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBμV/m)	Field strength* (dBμV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

5.4 Test Results

Frequency	Peak Reading	Avg. Limit	Margin
(kHz)	(dB μ V/m)	(dB μ V/m)	(dB)
125.0	97.1	105.7	-8.6

Figure 10. Field Strength of Fundamental Test Results

JUDGEMENT: Passed by 8.6 dB

The EUT met the FCC Part 15, Subpart C, Section 15.209 and RSS-Gen, Issue 5: 2018, Section 8.9 requirements.

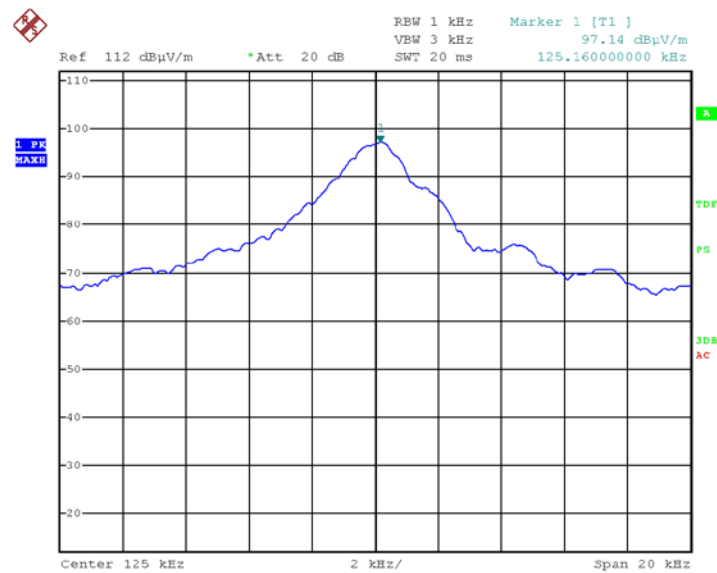
The details of the highest emissions are given in *Figure 11*.

Field Strength of Fundamental

E.U.T Description Exciter LF 125 kHz
Transmitter

Model Number Indoor Unit: EX5210
Outdoor Unit: EX5210R

Part Number: Not designated



Date: 2.JUL.2018 11:33:55

Figure 11. Field Strength of Fundamental



5.5 Test Instrumentation Used; Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 19, 2019
Loop Antenna	EMCO	6502	2950	October 19, 2017	October 19, 2018
RF Cable	Commscope ORS	0623 WBC- 400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 12. Test Equipment Used

6. Radiated Emission, 9 kHz – 30 MHz

6.1 Test Specification

FCC, Part 15, Subpart C, Section 209(c)

RSS-Gen, Issue 5: 2018, Section 8.9

6.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 0.8 meters above the ground.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna polarity were adjusted for maximum level reading on the EMI receiver.

The EMI receiver was set to the E.U.T. Fundamental Frequency and Peak Detection.

The frequency range 9 kHz-30 MHz was scanned.

6.3 Test Limit

The level of any unwanted emissions from an intentional radiator shall not exceed the level of the fundamental emission .in addition the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength (dBμV/m)	Field strength* (dBμV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

6.4 Test Results

JUDGEMENT: Passed by 16.1 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 and RSS-Gen, Issue 5: 2018, Section 8.9 specification.

See additional information in *Figure 13*.

Radiated Emission 9 kHz – 30 MHz

E.U.T Description Exciter LF 125 kHz
Transmitter
Model Number Indoor Unit: EX5210
Outdoor Unit: EX5210R
Part Number: Not designated

Specifications: FCC, Part 15, Subpart C, RSS-Gen, Issue 5: 2018, Section 8.9

Antenna Polarization: Horizontal/Vertical Frequency range: 9 kHz to 30.0 MHz
Test Distance: 3 meters Detector: Peak
Operation Frequency: 125kHz

Frequency	Peak Reading	Limit	Margin
(kHz)	(dB μ V/m)	(dB μ V/m)	(dB)
250.0	67.7	99.6	-31.9
375.0	61.8	96.1	-34.3
500.0	57.5	73.6	-16.1
625.0	52.8	71.7	-18.9

Figure 13. Radiated Emission

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

6.5 Test Instrumentation Used; Radiated Emission

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 19, 2019
Loop Antenna	EMCO	6502	2950	October 19, 2017	October 19, 2018
RF Cable	Commscope ORS	0623 WBC- 400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 14. Test Equipment Used

6.6 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ V/m]

RA: Receiver Amplitude [dB μ V]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

Example: $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB/m (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

7. Occupied Bandwidth

7.1 Test Specification

FCC, Part 2, Sub part J, Section 2.1049

RSS-Gen, Issue 5: 2018, Section 6.6

7.2 Test Procedure

(Temperature (22°C)/ Humidity (56%RH))

The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. was placed in the chamber on a non-conductive table, 0.8 meters above the ground.

The distance between the E.U.T. and test antenna was 3 meters.

The transmitter unit was operated with normal modulation. The RBW set to the range of 1% to 5% of the OBW. The span was set to ~ 3 times the OBW.

99% occupied bandwidth function was set on

7.3 Test Limit

N/A

7.4 Test Results

FREQUENCY	READING
(kHz)	(kHz)
125.0	17.0

Figure 15. Bandwidth Test Results

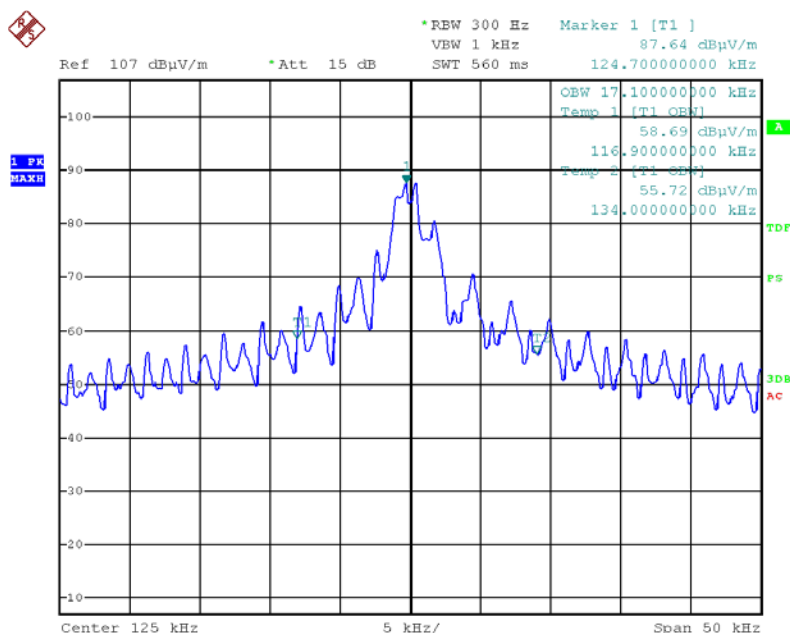
JUDGEMENT: N/A

See additional information in *Figure 16*.



Occupied Bandwidth

E.U.T Description Exciter LF 125 kHz
Transmitter
Model Number Indoor Unit: EX5210
Outdoor Unit: EX5210R
Part Number: Not designated



Date: 2.JUL.2018 11:49:33

Figure 16 Bandwidth Test Results

7.5 Test Equipment Used; Occupied Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 19, 2019
Loop Antenna	EMCO	6502	2950	October 19, 2017	October 19, 2018
RF Cable	Commscope ORS	0623 WBC- 400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 17 Test Equipment Used

8. APPENDIX A - CORRECTION FACTORS

8.1 Correction factors for RF CABLE for Semi Anechoic Chamber

ITL # 1841

FREQ (MHz)	LOSS (dB)
1000.0	1.5
2000.0	2.1
3000.0	2.7
4000.0	3.1
5000.0	3.5
6000.0	4.1
7000.0	4.6
8000.0	4.9
9000.0	5.7
10000.0	5.7
11000.0	6.1
12000.0	6.1
13000.0	6.2
14000.0	6.7
15000.0	7.4
16000.0	7.5
17000.0	7.9
18000.0	8.1
19000.0	8.8
20000.0	9.1

NOTES:

1. The cable is manufactured by Commscope
2. The cable type is 0623 WBC-400, serial # G020132 and 10m long
3. For testing frequencies below 1000MHz, the cable loss for 1000MHz as listed above was used.



8.2 Correction factors for Active Loop Antenna

Model 6502 S/N 9506-2950

ITL # 1075:

f(MHz)	MAF(dBs/m)	AF(dB/m)
0.01	-33.1	18.4
0.02	-37.2	14.3
0.03	-38.2	13.3
0.05	-39.8	11.7
0.1	-40.1	11.4
0.2	-40.3	11.2
0.3	-40.3	11.2
0.5	-40.3	11.2
0.7	-40.3	11.2
1	-40.1	11.4
2	-40	11.5
3	-40	11.5
4	-40.1	11.4
5	-40.2	11.3
6	-40.4	11.1
7	-40.4	11.1
8	-40.4	11.1
9	-40.5	11
10	-40.5	11
20	-41.5	10
30	-43.5	8