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DATE: 11 November 2019

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Airobotics Inc.

Equipment under test:

FTS Mast

AM05500-R00

Tested by: _____
M. Zohar

Approved by: _____
D. Shidlowsky

ISRAEL TESTING LABORATORIES
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Measurement/Technical Report for

Airobotics Inc.

FTS Mast

AM05500-R00

FCC ID: 2ARRW-AM05500

This report concerns:	Original Grant: X Class I Change: Class II Change:
Equipment type:	Digital Transmission System
Limits used:	47CFR15 Section 15.247

Measurement procedure used is KDB 558074 D01 v05r02 and ANSI C63.10:2013

Application for Certification prepared by:
R. Pinchuck
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Applicant for this device: (different from "prepared by")
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8340 E Raintree Dr, Building E
Scottsdale, Arizona 85260
Phone: 408 620-7857

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1. General Information

1.1 *Administrative Information*

Manufacturer:	Airobotics Inc.
Manufacturer's Address:	8340 E Raintree Dr., Scottsdale, Arizona, 85260 Phone: 408 620 7857
Manufacturer's Representative:	Issac Sela
Equipment Under Test (E.U.T):	FTS Mast
Equipment Model No.:	AM05500-R00
Equipment Serial No.:	6
Date of Receipt of E.U.T:	June 3, 2019
Start of Test:	June 3, 2019
End of Test:	July 2, 2019
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC Part 15, Subpart C

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. Department of Innovation, Science and Economic Development (ISED) Canada, CAB identifier: IL1002

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*

FTS – "Flight Termination System" is a common part of a flying object such as missiles or drones. The FTS allows the remote operator to terminate a mission, usually because of safety issues. Quick response time (few seconds) is the key as it is a safety feature.

Working voltage	48VDC via POE
Mode of operation	Transceiver
Modulations	Lora (DTS SF12)
Assigned Frequency Range	902.0-928.0MHz
Operating Frequency Range	903.0-927.0MHz
Transmit power(conducted)	~16.0dBm
Antenna Gain	8.0 dBi
Modulation BW	~700.0kHz

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in KDB 558074 D01 v05r02 and 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 Number is 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 non identical RF chains) each sub 1GHz transceiver at 915MHz band (Lora technology) (not transmitting continuously): main and secondary.
2. The unit was evaluated while transmitting at the low channel (903.0MHz), the mid channel (915.0MHz) and the high channel (927.0MHz).
3. Conducted emission tests were performed with the E.U.T. antenna terminal connected by a RF cable to the Spectrum Analyzer through a 40dB external attenuator for each transmitter.
4. Final radiated emission for restricted bands test performed with the highest gain antenna type for maximum radiation.
5. Final radiated emission for restricted bands test was performed using installation position orientation as defined by customer.

2.2 *EUT Exercise Software*

No special exercise software was used.

2.3 *Special Accessories*

Equipment	Manufacturer	Part #	Serial #
Laptop	Lenovo	20BT-SOMXOO	R9-OJJN4F
POE	TRIPP-LITE	NPOE-30W-1G	2833AICCN87F000832

2.4 *Equipment Modifications*

No modifications were necessary in order to achieve compliance.

2.5 *Configuration of Tested System*

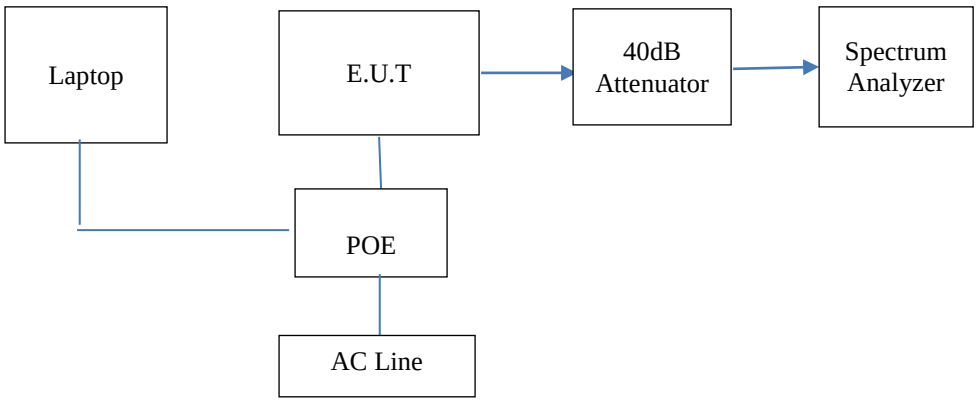

Figure 1. Configuration of Tested System Conducted

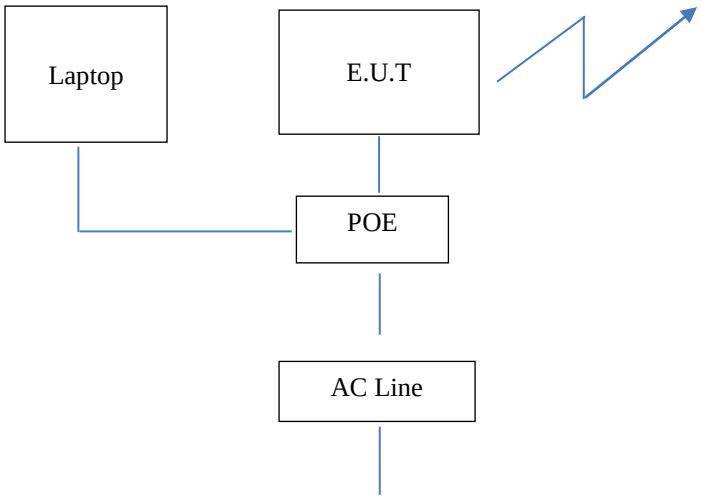

Figure 2. Configuration of Tested System Radiated

3. Conducted & Radiated Measurement Test Set-Up Photos

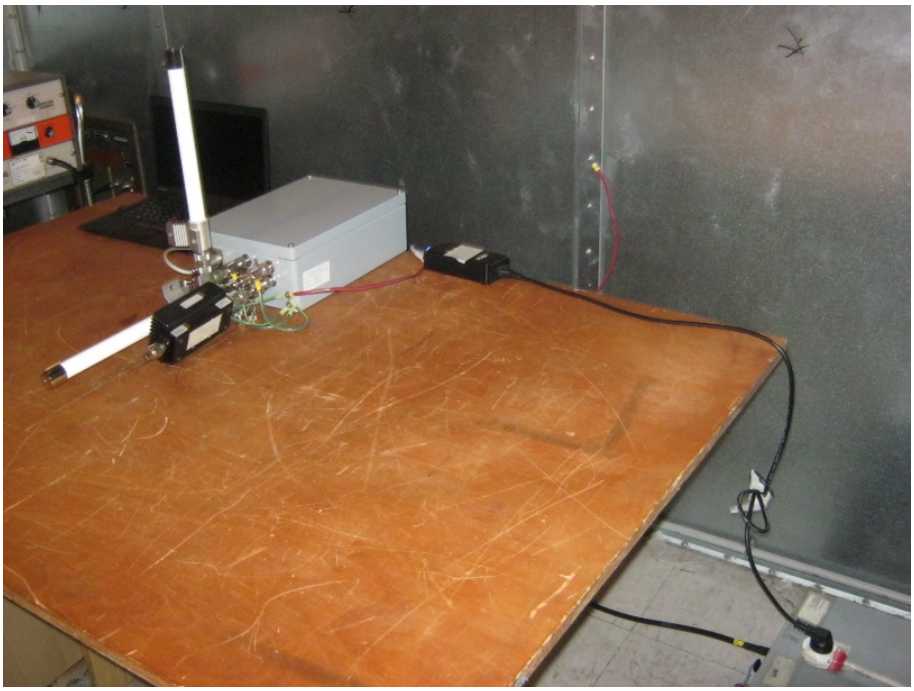

Figure 3. Conducted Emission from AC Mains Line Test

Figure 4. Conducted Emission Test

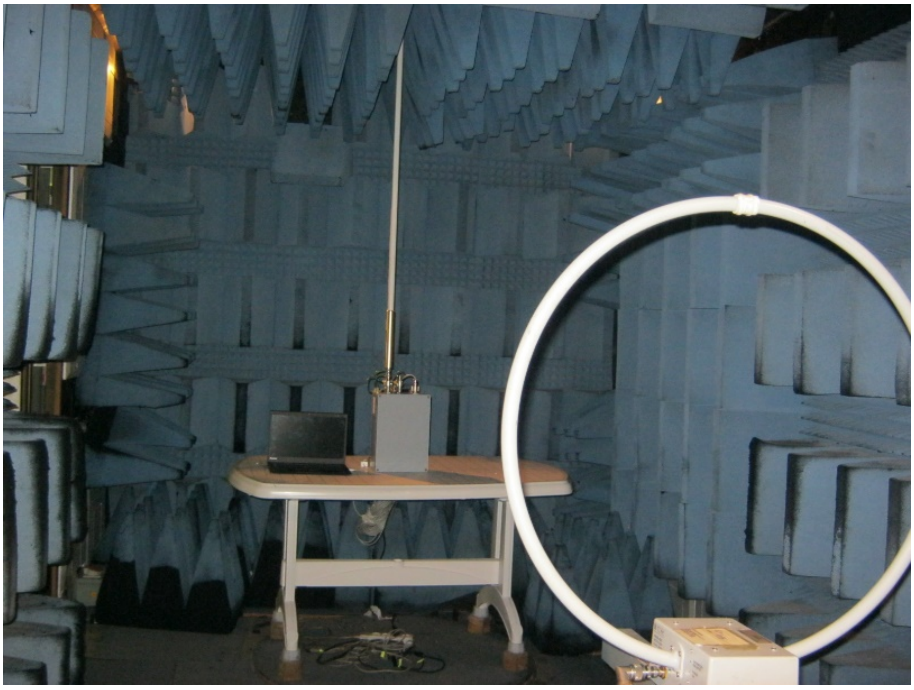

Figure 5. Radiated Emission Test, 0.009-30MHz

Figure 6. Radiated Emission Test, 30-200MHz

Figure 7. Radiated Emission Test, 200-1000MHz

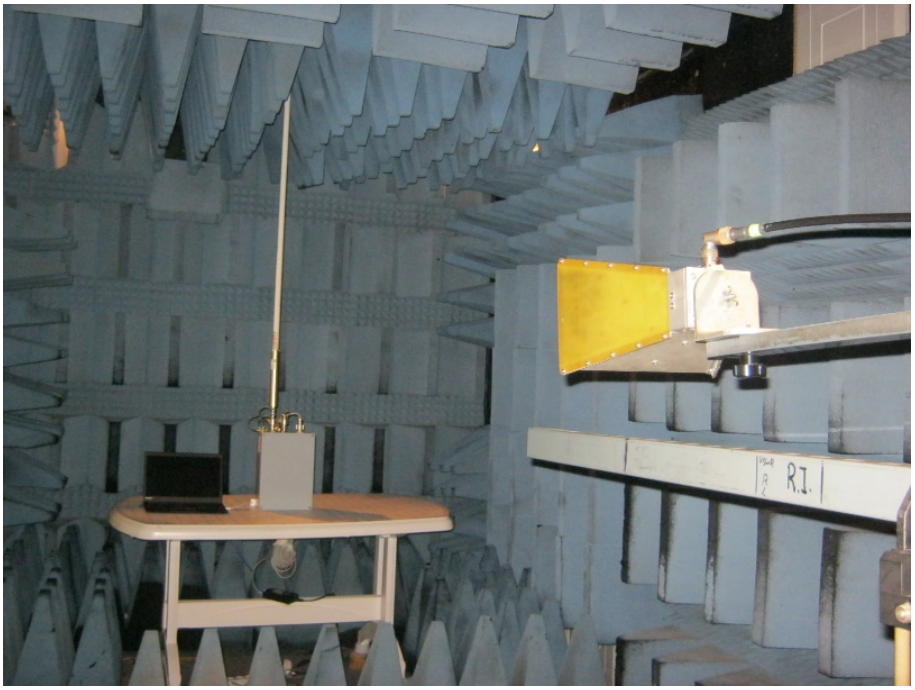

Figure 8. Radiated Emission Test, 1-10GHz

4. Conducted Emission From AC Mains

4.1 *Test Specification*

FCC Part 15, Subpart C, Section 15.207

4.2 *Test Procedure*

(Temperature (22°C)/ Humidity (66%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 µHn 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 evaluated in TX operation mode for Lora and cellular simultaneously.

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 (dBµV)**	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

4.4 *Test Results*

JUDGEMENT: Passed by 1.68 dB

The margin between the emission levels and the specification limit is, in the worst case, 9.92dB for the phase line at 6.218 MHz and 1.68 dB at 6.226 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 9* to *Figure 12*.

Conducted Emission

E.U.T Description	FTS Mast
Type	AM05500-R00
Serial Number:	6

Specification:	FCC Part 15, Subpart C
Lead:	Phase
Detectors: :	Peak, Quasi-peak, Average
Power Operation	POE

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	174 kHz	44.35	-20.41
2	Average	178 kHz	26.82	-27.75
2	Average	282 kHz	26.42	-24.32
1	Quasi Peak	286 kHz	34.03	-26.60
1	Quasi Peak	710 kHz	34.19	-21.80
2	Average	710 kHz	27.66	-18.33
1	Quasi Peak	814 kHz	41.87	-14.12
2	Average	814 kHz	33.40	-12.59
2	Average	1.45 MHz	20.37	-25.62
1	Quasi Peak	1.538 MHz	30.14	-25.85
2	Average	2.618 MHz	19.17	-26.82
1	Quasi Peak	3.226 MHz	30.30	-25.69
1	Quasi Peak	5.934 MHz	41.70	-18.29
2	Average	5.934 MHz	35.85	-14.14
2	Average	6.214 MHz	39.28	-10.71
1	Quasi Peak	6.218 MHz	50.07	-9.92
1	Quasi Peak	16.23 MHz	40.12	-19.87
2	Average	16.23 MHz	35.59	-14.40
2	Average	17.694 MHz	36.17	-13.82
1	Quasi Peak	24.846 MHz	33.54	-26.45

Date: 2.JUL.2019 09:50:24

Figure 9. 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	FTS Mast
Type	AM05500-R00
Serial Number:	6

Specification:	FCC Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average
Power Operation	POE

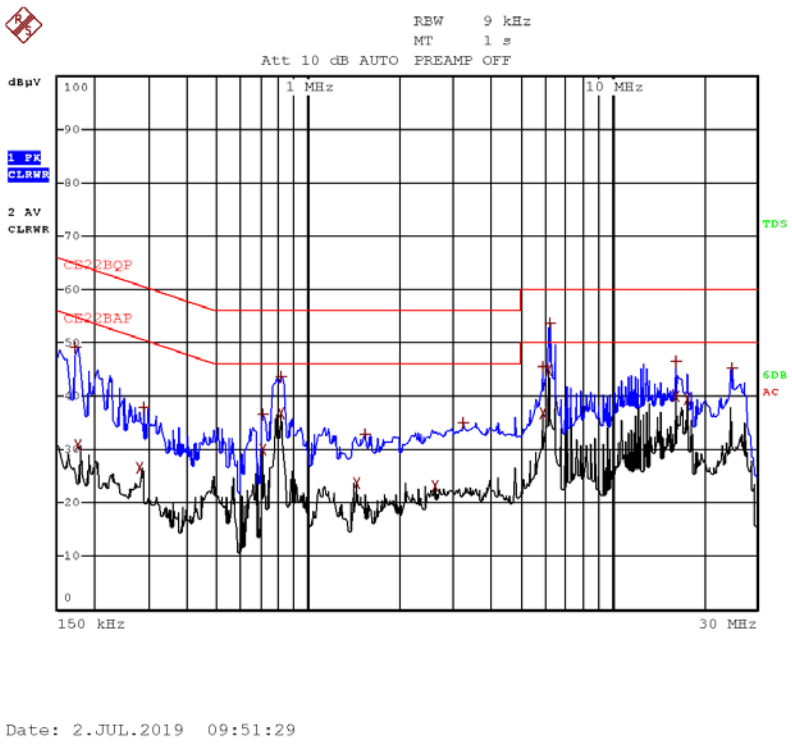

Figure 10. Detectors: Peak, Quasi-peak, Average

Conducted Emission

E.U.T Description	FTS Mast
Type	AM05500-R00
Serial Number:	6

Specification:	FCC Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average
Power Operation	POE

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	150 kHz	45.94	-20.05
2	Average	238 kHz	24.13	-28.02
1	Quasi Peak	262 kHz	33.98	-27.37
2	Average	430 kHz	19.31	-27.94
2	Average	674 kHz	26.27	-19.72
1	Quasi Peak	726 kHz	32.03	-23.96
2	Average	790 kHz	34.36	-11.63
1	Quasi Peak	798 kHz	42.45	-13.54
2	Average	1.486 MHz	21.68	-24.31
1	Quasi Peak	1.526 MHz	30.92	-25.07
1	Quasi Peak	2.286 MHz	29.48	-26.51
2	Average	2.714 MHz	19.79	-26.20
1	Quasi Peak	5.946 MHz	46.36	-13.63
2	Average	5.946 MHz	41.12	-8.87
2	Average	6.226 MHz	48.31	-1.68
1	Quasi Peak	6.23 MHz	52.53	-7.46
1	Quasi Peak	11.894 MHz	41.30	-18.69
2	Average	13.022 MHz	34.34	-15.65
2	Average	24.618 MHz	30.00	-19.99
1	Quasi Peak	24.65 MHz	41.94	-18.05

Date: 2.JUL.2019 09:58:31

Figure 11. 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	FTS Mast
Type	AM05500-R00
Serial Number:	6

Specification:	FCC Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average
Power Operation	POE

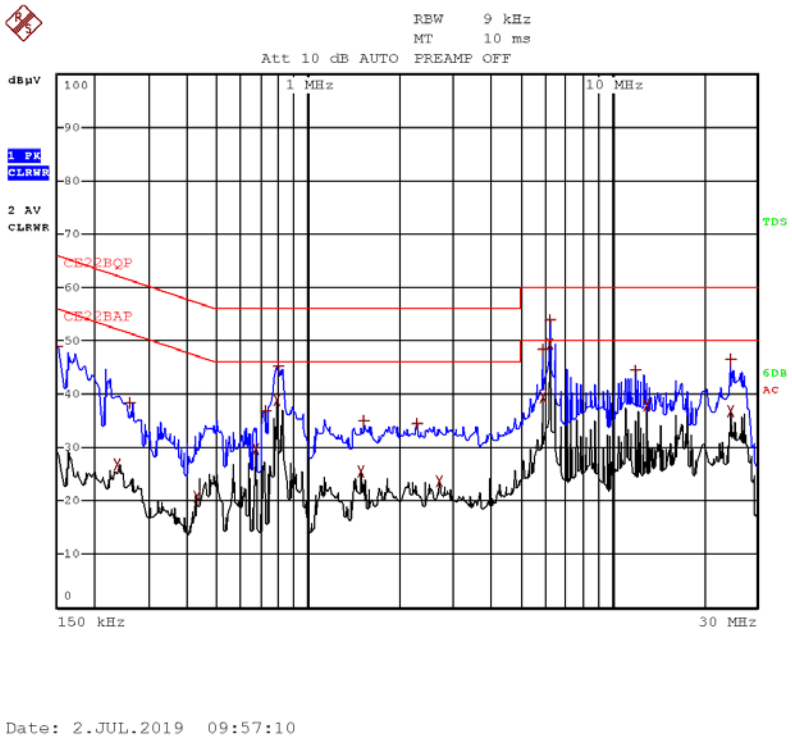

Figure 12 Detectors: Peak, Quasi-peak, Average

4.5 *Test Equipment Used; Conducted Emission*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
LISN	Fischer	FCC-LISN-25A	127	July 20, 2017	July 31, 2019
Transient Limiter	HP	11947A	3107A01308	June 29, 2018	July 31,2019
EMI Receiver	Rohde & Schwarz	ESCI7	100724	February 27, 2019	February 28, 2020
Cable CE Chamber 3M + 3M	Testline 18 + RJ214	11556	-	March 31, 2019	March 31, 2020

Figure 13 Test Equipment Used

5. 6 dB Minimum Bandwidth

5.1 *Test Specification*

FCC Part 15, Subpart C, Section 247(a)(2)

5.2 *Test Procedure*

(Temperature (22°C)/ Humidity (63%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss=40.5 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded.

The RBW was set to 100 kHz.

5.3 *Test Limit*

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.4 *Test Results*

RF Chain	Operation Frequency (MHz)	Reading (kHz)	Limit (kHz)
Main	903.0	750.5	>500.0
	915.0	750.5	>500.0
	927.0	762.5	>500.0
Secondary	903.0	778.6	>500.0
	915.0	737.6	>500.0
	927.0	762.6	>500.0

Figure 14 6 dB Minimum Bandwidth

JUDGEMENT: Passed

For additional information see *Figure 15* to *Figure 20.*

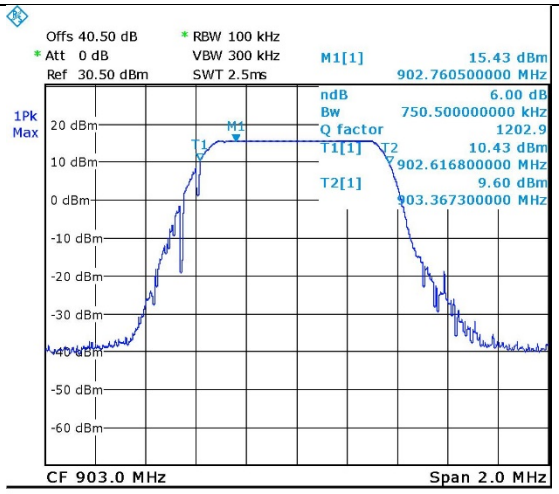

Figure 15. Low Channel, Main

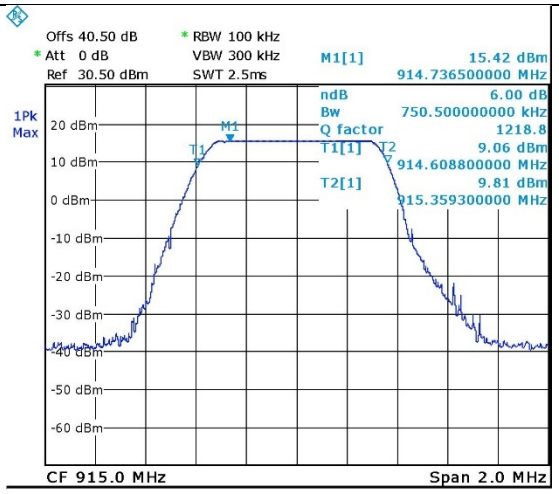

Figure 16. Mid Channel, Main

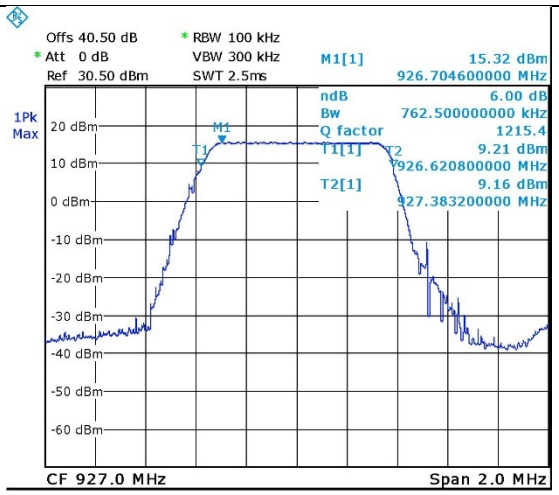

Figure 17. High Channel, Main

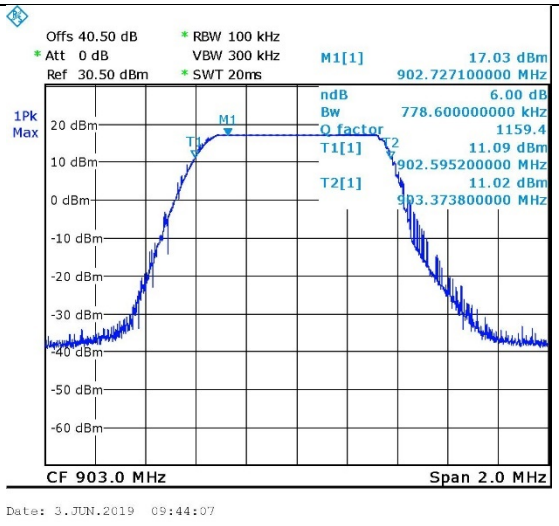

Figure 18. Low Channel, Secondary

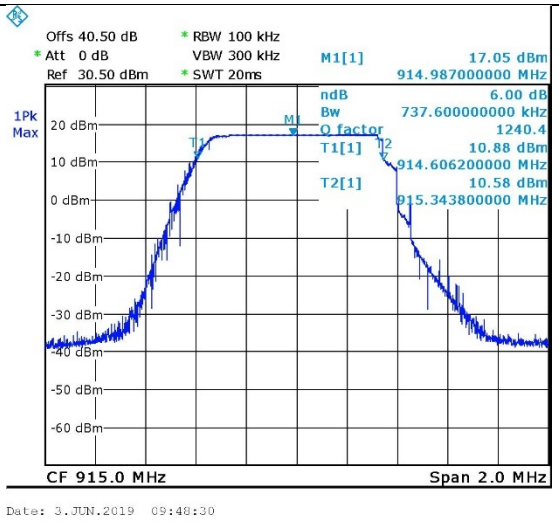

Figure 19. Mid Channel, Secondary

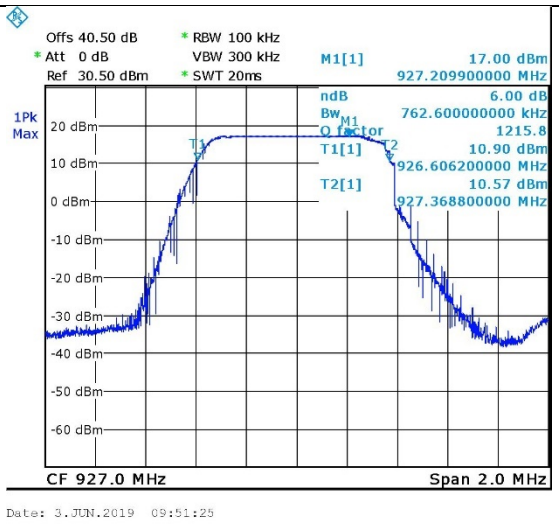

Figure 20. High Channel, Secondary

5.5 *Test Equipment Used; 6dB Bandwidth*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	March 24, 2019	March 31, 2020
40dB Attenuator	Weinschel	WA 39-40-33	A1323	December 24, 2018	December 31, 2019
RF Cable	Huber Suner	Sucofelex	28239/4PEA	December 24, 2018	December 31, 2019

Figure 21 Test Equipment Used

6. Maximum Conducted Output Power

6.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(b)(3)

6.2 *Test Procedure*

(Temperature (22°C)/ Humidity (63%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss=40.5 dB).
Test method: AVGSA-1 as describe in ANSI C63.10 (2013), section 11.9.2.2.2
Special attention was taken to prevent Spectrum Analyzer RF input overload.

6.3 *Test Limit*

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

6.4 *Test Results*

RF Chain	Operation Frequency (MHz)	Power (dBm)	Power (mW)	Limit* (mW)	Margin (mW)
Main	903.0	15.1	32.4	640.0	-607.6
	915.0	15.1	32.4	640.0	-607.6
	927.0	15.1	32.4	640.0	-607.6
Secondary	903.0	16.8	47.9	640.0	-592.1
	915.0	16.9	49.0	640.0	-591.0
	927.0	16.9	49.0	640.0	-591.0

***Note: the E.U.T can transmit with antenna gain of 8dBi (2dBi exceeds) so limit value reduce by 2dB: from 30dBm (1W) to 28dBm (640mW)*

Figure 22 Maximum Peak Power Output

JUDGEMENT: Passed by 591.0mW

For additional information see *Figure 23* to *Figure 28.*

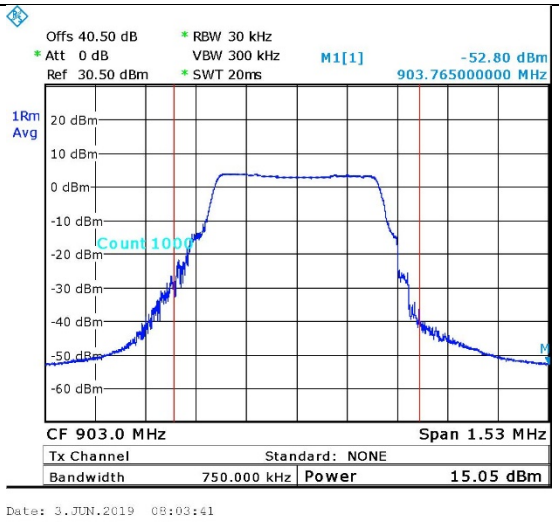

Figure 23. Low Channel, Main

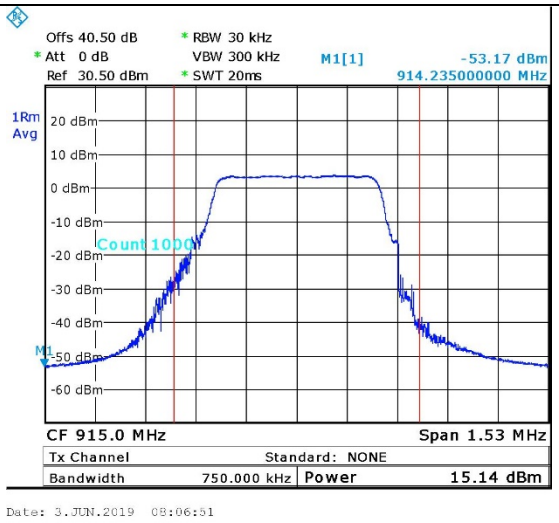

Figure 24. Mid Channel, Main

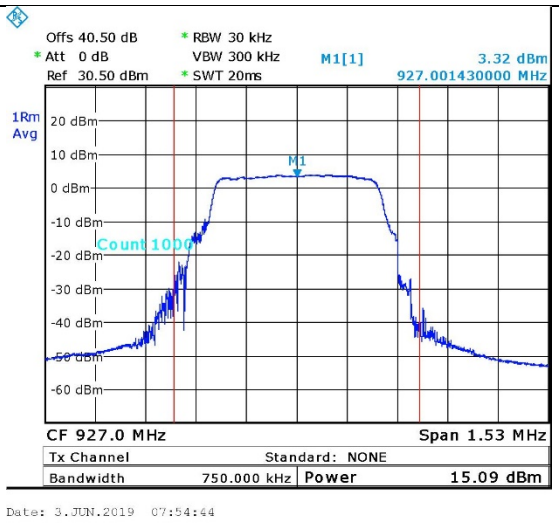

Figure 25. High Channel, Main

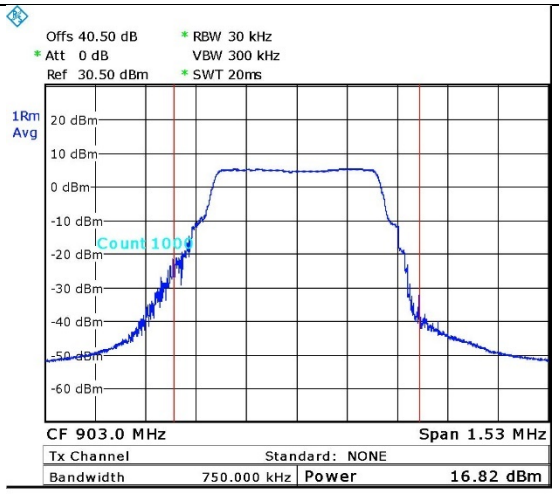

Figure 26. Low Channel, Secondary

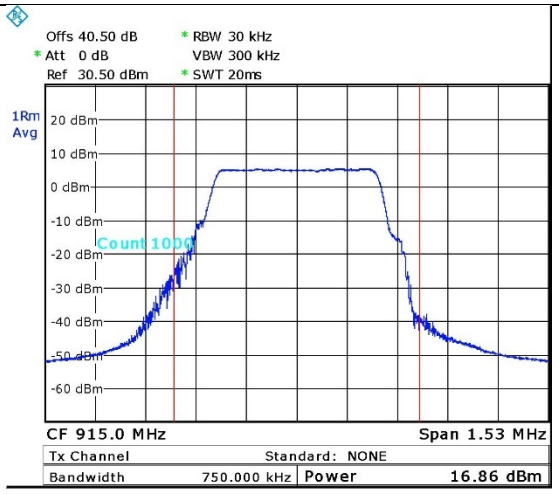

Figure 27. Mid Channel, Secondary

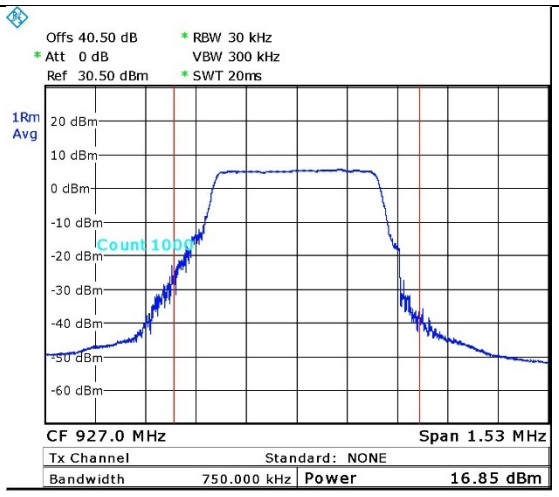

Figure 28. High Channel, Secondary

6.5 *Test Equipment Used; Maximum Peak Power Output*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	March 24, 2019	March 31, 2020
40dB Attenuator	Weinschel	WA 39-40-33	A1323	December 24, 2018	December 31, 2019
RF Cable	Huber Suner	Sucofelex	28239/4PEA	December 24, 2018	December 31, 2019

Figure 29 Test Equipment Used

7. Band Edge Spectrum

7.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(d)

7.2 *Test Procedure*

(Temperature (22°C)/ Humidity (55%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss=30.5 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The RBW was set to 100 kHz.

7.3 *Test Limit*

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

7.4 *Test Results*

RF Chain	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBm)	Limit (dBm)	Margin (dB)
Main	903.0	902.0	-39.4	-4.6	-34.8
	927.0	928.0	-33.1	-4.7	-28.4
Secondary	903.0	902.0	-38.0	-3.0	-35.0
	927.0	928.0	-31.3	-3.0	-28.3

Figure 30 Band Edge Spectrum

JUDGEMENT: Passed by 28.3 dB

For additional information see *Figure 31* to *Figure 34.*

Band Edge Spectrum

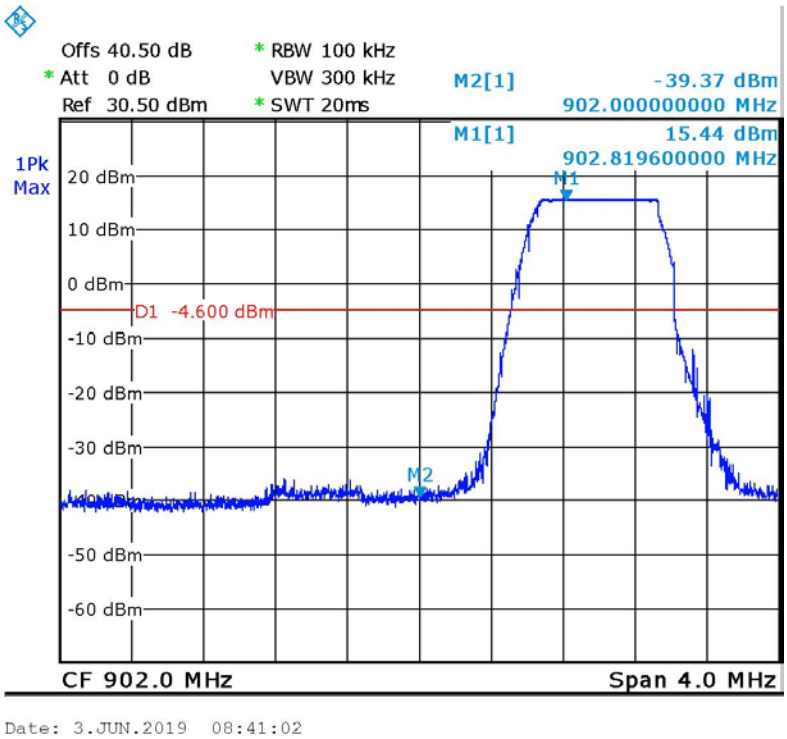

Figure 31 Low Band Edge, Main

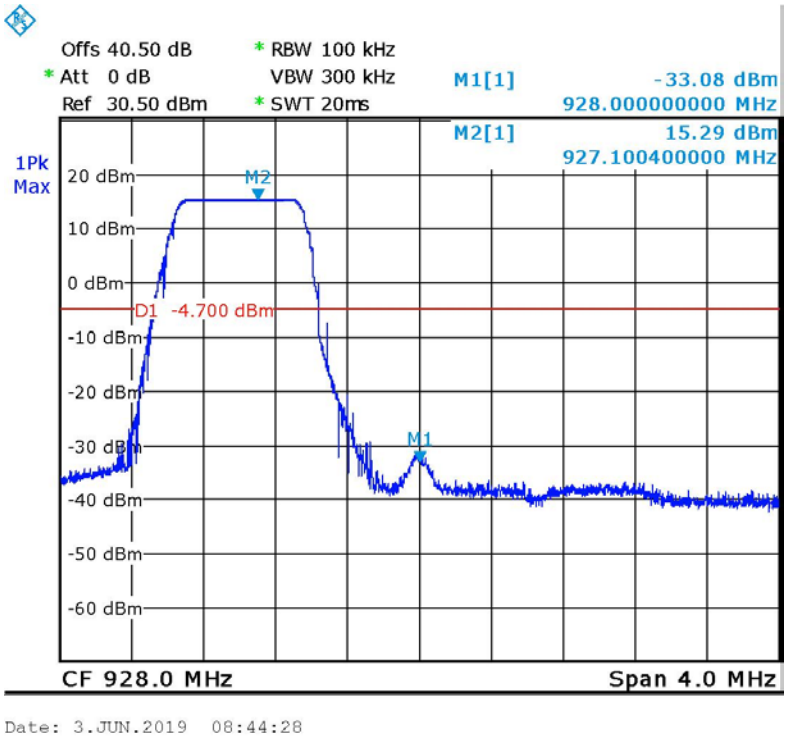

Figure 32 High Band Edge, Main

Band Edge Spectrum

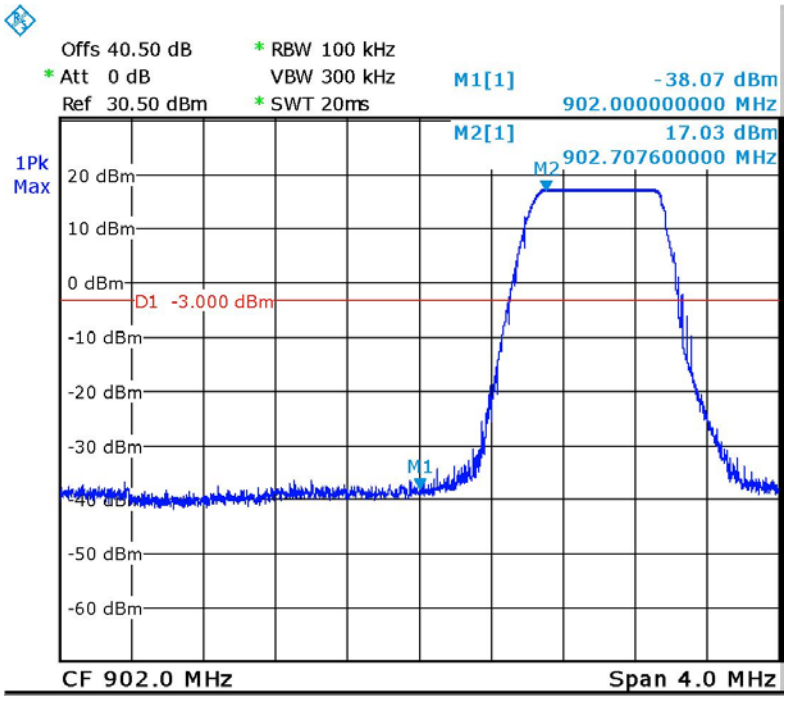

Figure 33 Low Band Edge, Secondary

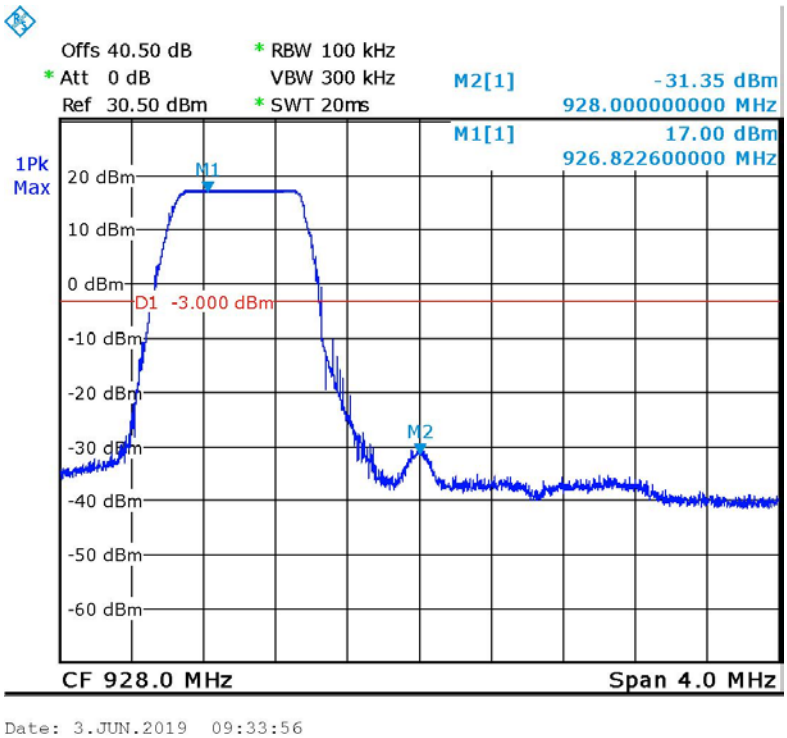

Figure 34 High Band Edge, Secondary

7.5 *Test Equipment Used; Band Edge*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	March 24, 2019	March 31, 2020
40dB Attenuator	Weinschel	WA 39-40-33	A1323	December 24, 2018	December 31, 2019
RF Cable	Huber Suner	Sucofelex	28239/4PEA	December 24, 2018	December 31, 2019

Figure 35 Test Equipment Used

8. Emissions in Non-Restricted Frequency Bands

8.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(d)

8.2 *Test Procedure*

(Temperature (22°C)/ Humidity (55%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (max total loss=34.0 dB).
Special attention was taken to prevent Spectrum Analyzer RF input overload.
RBW was set to 100 kHz, detector set to max peak and trace to "max hold".

8.3 *Test Limit*

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

8.4 *Test Results*

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 247(d) specification.

For additional information see *Figure 36* to *Figure 41*.

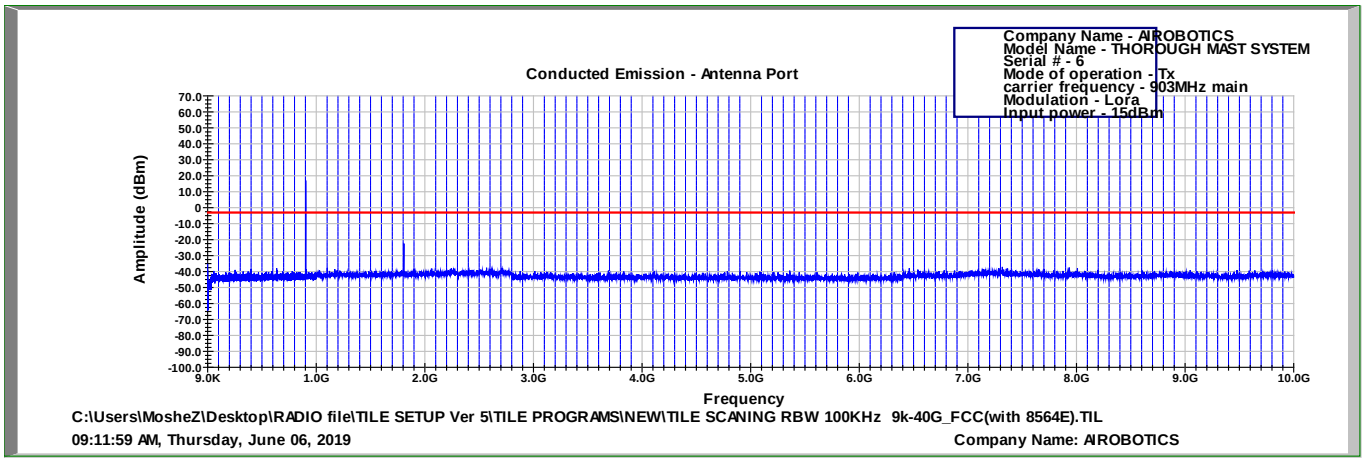

Figure 36 Low Channel, Main

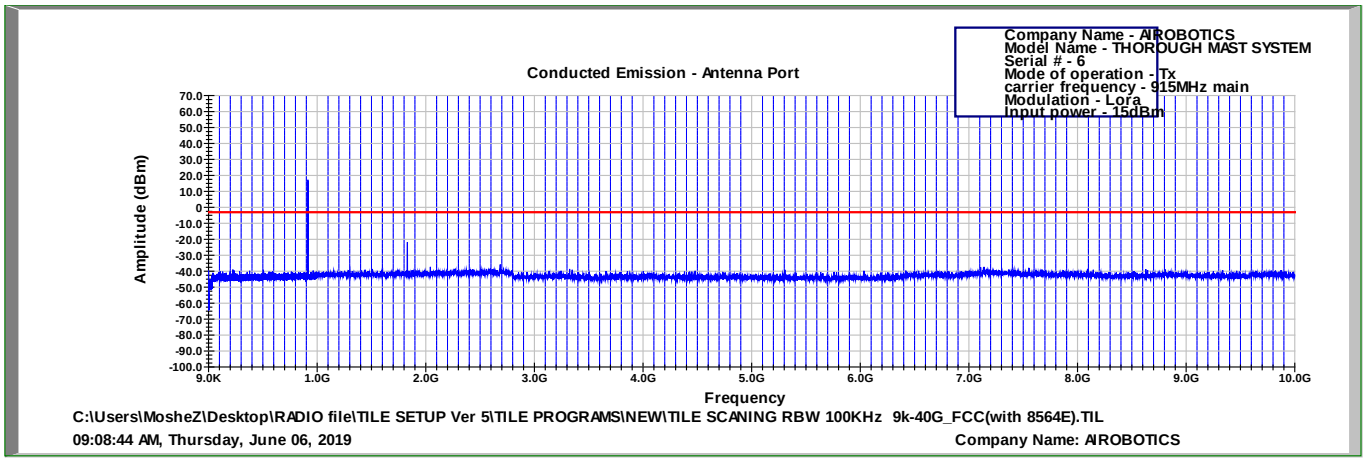

Figure 37 Mid Channel, Main

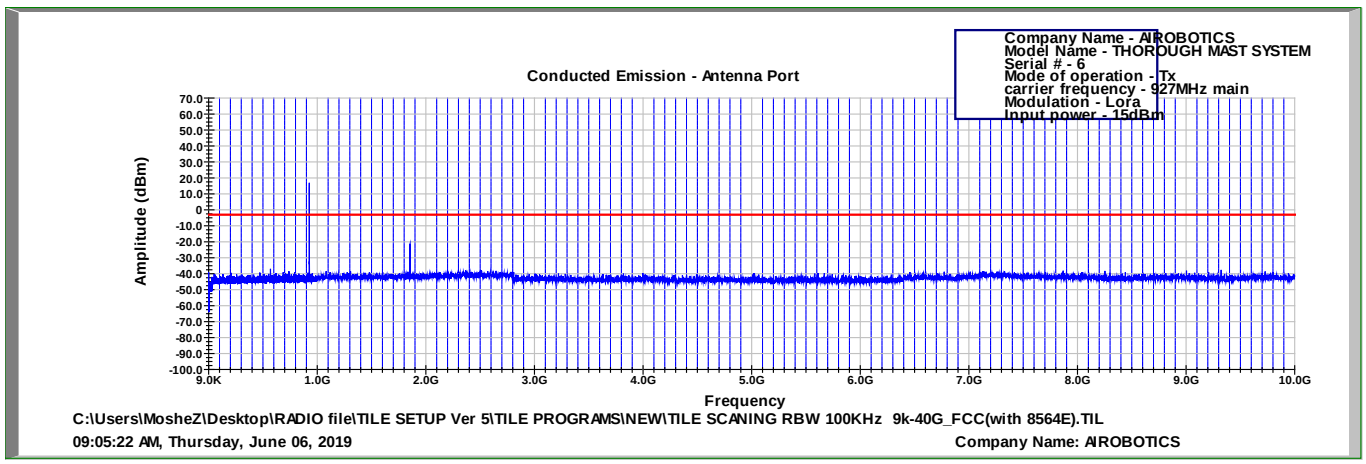

Figure 38 High Channel, Main

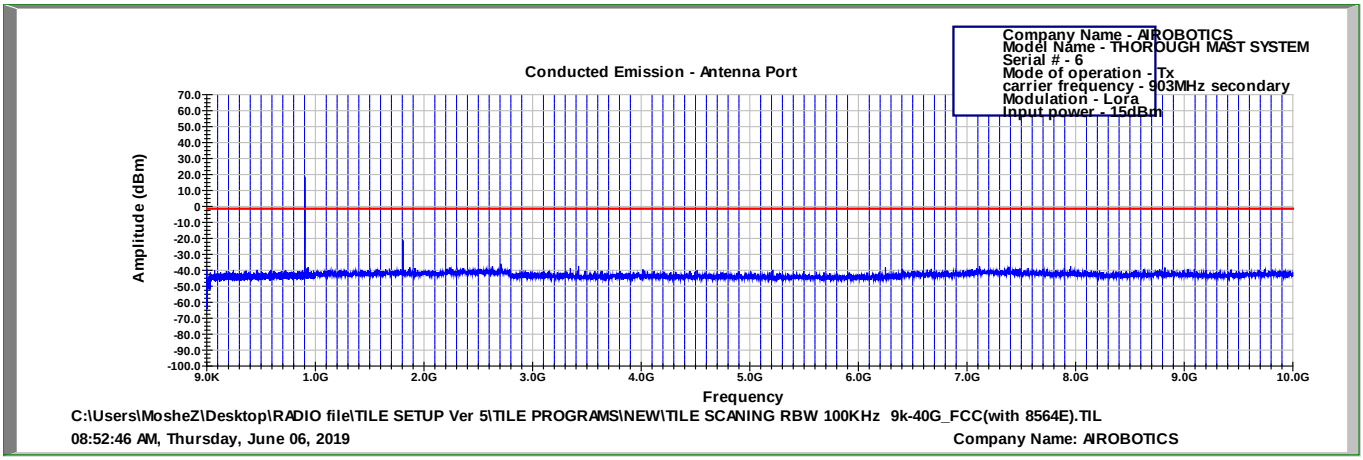

Figure 39 Low Channel, Secondary

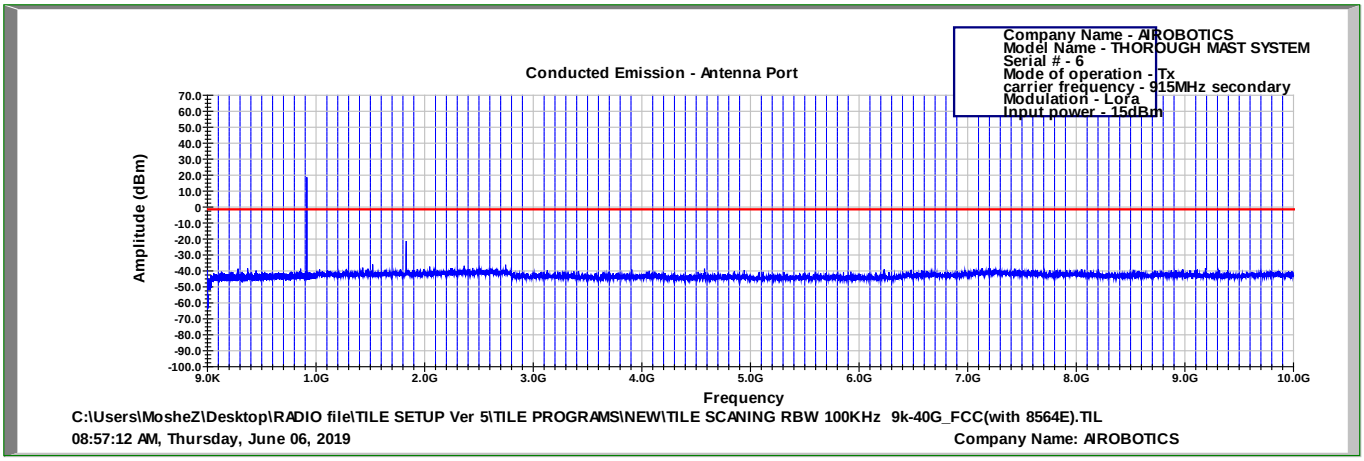

Figure 40 Mid Channel, Secondary

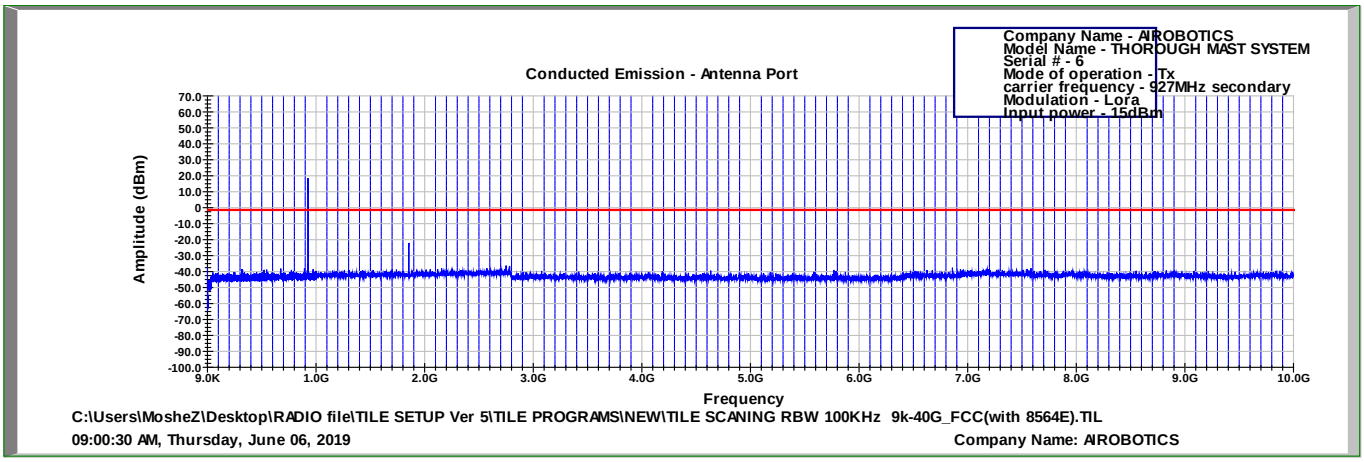

Figure 41 High Channel, Secondary

Note: All peaks in plots are the fundamental transmission frequency.

8.5 *Test Instrumentation Used, Emission in Non Restricted Frequency Bands*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	March 24, 2019	March 31, 2020
40dB Attenuator	Weinschel	WA 39-40-33	A1323	December 24, 2018	December 31, 2019
RF Cable	Huber Suner	Sucofelex	28239/4PEA	December 24, 2018	December 31, 2019

Figure 42 Test Equipment Used

9. Emissions in Restricted Frequency Bands

9.1 *Test Specification*

FCC Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)

9.2 *Test Procedure*

(Temperature (23°C)/ Humidity (55%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

For measurements between 0.009-30MHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 0.009MHz-30MHz was scanned.

For measurements between 30-1000MHz:
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The frequency range 30MHz -1000MHz was scanned and the list of the highest emissions was verified and updated accordingly.

For measurements between 1GHz-10GHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 1GHz -10GHz was scanned.

The highest radiation is described in the tables below.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

9.3 *Test Limit*

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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.

Figure 43 Table of Limits

9.4 *Test Results*

JUDGEMENT: Passed by 6.4 dB

For the operation frequency of 903 MHz, the margin between the emission level and the specification limit is in the worst case 9.6 dB at the frequency of 2709.0 MHz, horizontal polarization.

For the operation frequency of 915 MHz, the margin between the emission level and the specification limit is in the worst case 7.5 dB at the frequency of 3660.0 MHz, vertical polarization.

For the operation frequency of 927 MHz, the margin between the emission level and the specification limit is in the worst case 6.4 dB at the frequency of 2781.0 MHz, vertical polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C Sections 15.209, 15.205, 15.247(d) specifications.

The details of the highest emissions are given in *Figure 44* and *Figure 45.*

Radiated Emission

E.U.T Description FTS Mast
Type AM05500-R00
Serial Number: 6

Specifications: FCC, Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)

Antenna Polarization: Horizontal/Vertical Frequency Range: 9 kHz to 10.0 GHz
Protocol type: Lora (Main) Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
903.0	2709.0	V	52.4	74.0	-21.6	44.0	54.0	-10.0
	2709.0	H	51.9	74.0	-22.1	43.7	54.0	-10.3
	3612.0	V	45.4	74.0	-28.6	38.9	54.0	-15.1
	3612.0	H	45.8	74.0	-28.2	39.6	54.0	-14.4
915.0	2745.0	V	52.6	74.0	-21.4	43.2	54.0	-10.8
	2745.0	H	53.5	74.0	-20.5	44.7	54.0	-9.3
	3660.0	V	48.0	74.0	-26.0	43.1	54.0	-10.9
	3660.0	H	46.6	74.0	-27.4	39.2	54.0	-14.8
927.0	2781.0	V	53.9	74.0	-20.1	45.8	54.0	-8.2
	2781.0	H	52.7	74.0	-21.3	44.1	54.0	-9.9
	3708.0	V	50.0	74.0	-24.0	45.0	54.0	-9.0
	3708.0	H	47.9	74.0	-26.1	39.5	54.0	-14.5

Figure 44. Radiated Emission Results

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.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Radiated Emission

E.U.T Description FTS Mast
Type AM05500-R00
Serial Number: 6

Specifications: FCC, Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)

Antenna Polarization: Horizontal/Vertical Frequency Range: 9 kHz to 10.0 GHz
Protocol type: Lora (Secondary) Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
903.0	2709.0	V	52.1	74.0	-21.9	44.2	54.0	-9.8
	2709.0	H	52.5	74.0	-21.5	44.4	54.0	-9.6
	3612.0	V	45.0	74.0	-29.0	38.1	54.0	-15.9
	3612.0	H	47.0	74.0	-27.0	41.8	54.0	-12.2
915.0	2745.0	V	52.9	74.0	-21.1	45.0	54.0	-9.0
	2745.0	H	53.0	74.0	-21.0	45.1	54.0	-8.9
	3660.0	V	49.9	74.0	-24.1	46.5	54.0	-7.5
	3660.0	H	48.2	74.0	-25.8	41.1	54.0	-12.9
927.0	2781.0	V	55.2	74.0	-18.8	47.6	54.0	-6.4
	2781.0	H	51.9	74.0	-22.1	43.5	54.0	-10.5
	3708.0	V	52.2	74.0	-21.8	47.0	54.0	-7.0
	3708.0	H	48.0	74.0	-26.0	40.2	54.0	-13.8

Figure 45. Radiated Emission Results

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.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

9.5 *Test Instrumentation Used; Emissions in Restricted Frequency Bands*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 27, 2019	February 28, 2020
EMI Receiver	HP	8542E	3906A00276	February 27, 2019	February 28, 2020
RF Filter Section	HP	85420E	3705A00248	February 27, 2019	February 28, 2020
Spectrum Analyzer	HP	8593EM	3536A00120 ADI	February 26, 2019	February 28, 2020
Biconical Antenna	EMCO	3110B	9912-3337	May 21, 2019	May 31, 2020
Log Periodic Antenna	EMCO	3146	9505-4081	May 31, 2018	May 31, 2020
Horn Antenna	ETS	3115	29845	May 31, 2018	May 31 2021
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2017	October 31, 2019
MicroWave System Amplifier	HP	83006A	3104A00589	December 24, 2018	December 31, 2019
Low Noise Amplifier 1GHz-18GHz	Miteq	AFSX4-02001800-50-8P	-	December 24, 2018	December 31, 2019
RF Cable Chamber	Commscope ORS	0623 WBC-400	G020132-	December 24, 2018	December 31, 2019
RF Cable Oats	EIM	RG214-11N(X2)	-	May 26, 2019	May 31, 2020
High Pass Band Filter	Meuro	MFL040120H50	902252	December 24, 2018	December 31, 2019
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
Antenna Mast	ETS	2070-2	9608-1497	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR
Mast & Table Controller	ETS/EMCO	2090	9608-1456	NCR	NCR

Figure 46 Test Equipment Used

10. Transmitted Power Density

10.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(e)

10.2 *Test Procedure*

(Temperature (22°C)/ Humidity (63%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 40.5dB).
Test method: AVGPSD-1 as describe in ANSI C63.10 (2013), section 11.10.3
Special attention was taken to prevent Spectrum Analyzer RF input overload.

The spectrum analyzer was set to 3 kHz RBW.

10.3 *Test Limit*

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.4 *Test Results*

RF Chain	Operation Frequency (MHz)	PSD Reading (dBm)	Limit (dBm)	Margin (dB)
Main	903.0	-2.9	8.0	-10.9
	915.0	-2.4	8.0	-10.4
	927.0	-2.6	8.0	-10.6
Secondary	903.0	-2.5	8.0	-10.5
	915.0	-1.7	8.0	-9.7
	927.0	-1.4	8.0	-9.4

Figure 47 Test Results

JUDGEMENT: Passed by 9.4dB

For additional information see *Figure 48* to *Figure 53.*

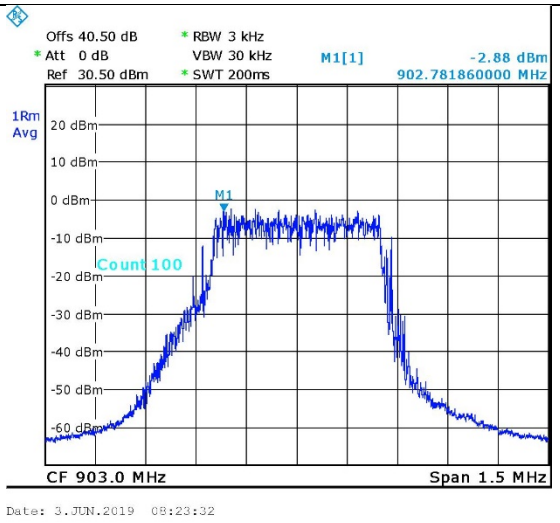

Figure 48. Low Channel, Main

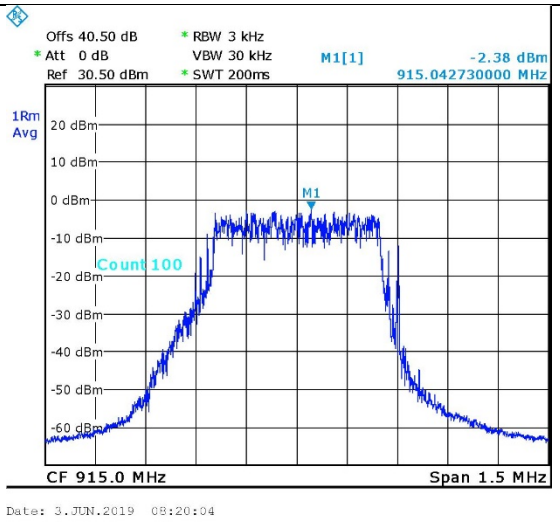

Figure 49. Mid Channel, Main

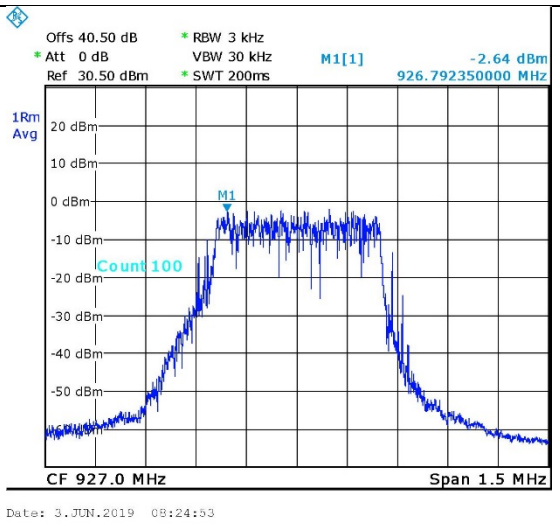

Figure 50. High Channel, Main

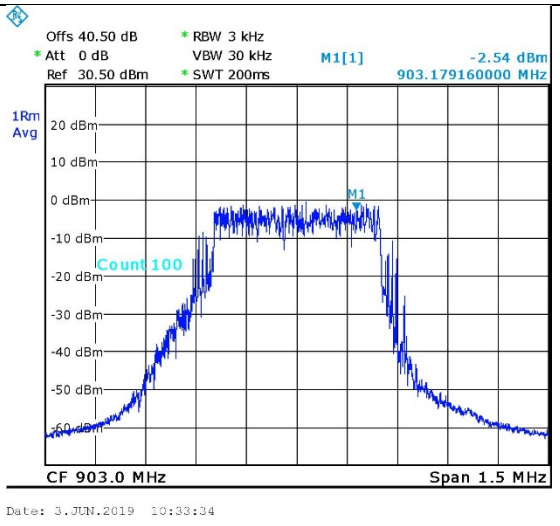

Figure 51. Low Channel, Secondary

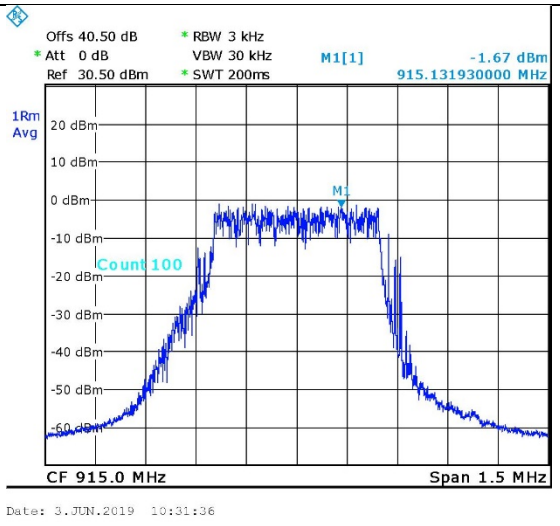

Figure 52. Mid Channel, Secondary

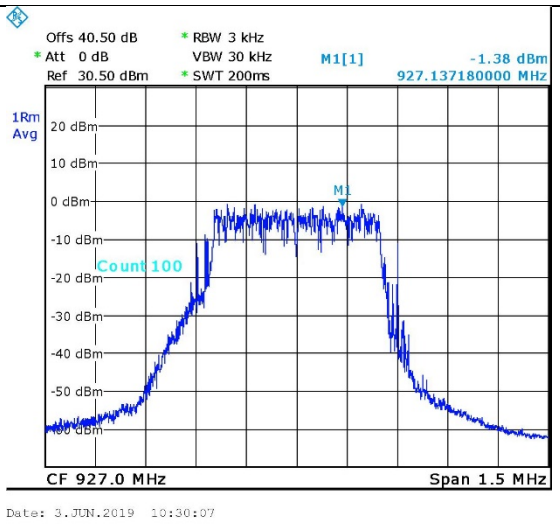

Figure 53. High Channel, Secondary

10.5 *Test Equipment Used; Transmitted Power Density*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	March 24, 2019	March 31, 2020
40dB Attenuator	Weinschel	WA 39-40-33	A1323	December 24, 2018	December 31, 2019
RF Cable	Huber Suner	Sucofelex	28239/4PEA	December 24, 2018	December 31, 2019

Figure 54 Test Equipment Used

11. Antenna Gain/Information

Omnidirectional antenna, 8.0dBi, Peak Gain

12. R.F Exposure/Safety

The typical placement of the E.U.T. is on a torren/mast. The typical distance between the E.U.T. and the user is at least 20cm.

Calculation of Maximum Permissible Exposure (MPE)
Based on 47CFR1 Section 1.1307(b)(1)

(a) FCC Limit at 927 MHz is: f/1500 = 915/1500 = 0.61 mW/cm^2

Using Table 1 of 47CFR1 Section 1.1310 limit for general population/uncontrolled exposures, the above levels are an average over 30 minutes.

(b) The power density produced by the E.U.T. is:

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t = Conducted Transmitted Power 16.9 dBm = 49.0 mW

G_t = Antenna Gain 8dBi= 6.31 numeric

R = Distance From Transmitter 20 cm

(c) The peak power density produced by the E.U.T. is:

$S = 49.0*6.31/4\pi(20)^2 = 0.062$ mW/cm^2

(d) This is below the FCC limit.

13. APPENDIX A - CORRECTION FACTORS

13.1 *Correction factors for RF OATS Cable 35m ITL #1911*

Frequency (MHz)	loss (dB)
30.0	1.3
50.0	1.7
100.0	2.6
200.0	3.7
300.0	4.7
400.0	5.5
500.0	6.3
600.0	7.0
700.0	7.6
800.0	8.4
900.0	9.0
1000.0	9.6

13.2 *Correction factor for RF CABLE for Semi Anechoic Chamber*

ITL # 1840

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*

13.3 *Correction factors for Active Loop Antenna ITL # 1075:*

F(MHz)	AF(dB/m)
0.01	18.4
0.02	14.3
0.03	13.3
0.05	11.7
0.1	11.4
0.2	11.2
0.3	11.2
0.5	11.2
0.7	11.2
1	11.4
2	11.5
3	11.5
4	11.4
5	11.3
6	11.1
7	11.1
8	11.1
9	11
10	11
20	10
30	8

13.4 *Correction factors for biconical antenna ITL # 1356*

Frequency [MHz]	ITL 1356 AF [dB/m]
30	13.00
35	10.89
40	10.59
45	10.63
50	10.12
60	9.26
70	7.74
80	6.63
90	8.23
100	11.12
120	13.16
140	13.07
160	14.80
180	16.95
200	17.17

13.5 *Correction factors for log periodic antenna ITL # 1349*

Frequency [MHz]	ITL 1349 AF [dB/m]
200	11.58
250	12.04
300	14.76
400	15.55
500	17.85
600	18.66
700	20.87
800	21.15
900	22.32
1000	24.22

13.6 *Correction factors for Double –Ridged Waveguide Horn ANTENNA ITL # 1352*

FREQUENCY (GHz)	AFE (dB/m)	FREQUENCY (GHz)	AFE (dB/m)
0.75	25	9.5	38
1.0	23.5	10.0	38.5
1.5	26.0	10.5	38.5
2.0	29.0	11.0	38.5
2.5	27.5	11.5	38.5
3.0	30.0	12.0	38.0
3.5	31.5	12.5	38.5
4.0	32.5	13.0	40.0
4.5	32.5	13.5	41.0
5.0	33.0	14.0	40.0
5.5	35.0	14.5	39.0
6.0	36.5	15.0	38.0
6.5	36.5	15.5	37.5
7.0	37.5	16.0	37.5
7.5	37.5	16.5	39.0
8.0	37.5	17.0	40.0
8.5	38.0	17.5	42.0
9.0	37.5	18.0	42.5