



**Date: 1 February 2023**

**I.T.L. Product Testing Ltd.  
FCC Radio Partial Testing Report**

for


**Maytronics Ltd.**


Equipment under test:

**Digital Transmission System**

**RCU Dynamic 2010**

FCC ID: WCH99954226-7

Tested by:   
M. Zohar

Approved by:   
I. Mansky

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This report concerns: Class II Permissive Change

Equipment type: FCC: (DTS) Digital Transmission System

Limits used: 47CFR15 Section 15.247

Measurement procedure used: KDB 558074 D01 v03r05, ANSI C63.10:2013

**Prepared by:**

R. Ezra

I.T.L. Product Testing Ltd.

1 Bat Sheva St., Lod 7116002, Israel

Email: [rame@itlglobal.org](mailto:rame@itlglobal.org)

**Applicant:**

Yair Hadari

Maytronics Ltd.

Kibbutz Yizreel, Kibbutz Yizreel 19350, Israel

Email: [yair.hadari@maytronics.com](mailto:yair.hadari@maytronics.com)



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# 1. General Information

## 1.1 Administrative Information

Manufacturer:	Maytronics Ltd.
Manufacturer's Address:	Kibbutz Yizreel, Kibbutz Yizreel 19350, Israel
Equipment Under Test (E.U.T):	Digital Transmission System
Equipment Model number:	RCU Dynamic 2010
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	December 13, 2022
Start of Test:	December 13, 2022
End of Test:	December 13, 2022
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Bat dheva St., Lod 7120101, Israel
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. 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

The E.U.T. is a wireless remote-control unit, which enables automatic and manual operation of the Dolphin Supreme M5. The easily set parameters include cycle time, regular and ultraclean, climbing, and non-climbing.

## 1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in KDB 558074 D01 v03r05, 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



Date: 16 January 2023

To whom it may concern

RCU Dynamic 2010 Model Changes

The following change/s was/were made to the device:

1. Chrystal oscillator Y1 p/n 9C-26.000MEEJT manufactured by TXC, was replaced with p/n NX2520SA-26.000M-STD-CSX-1, manufactured by NDK. Reason for change – E.O.L. of the original component. As a result of change, local adjustment was made on the PCBA to accommodate new component. The new component provides the same clock frequency with better accuracy.
2. LCD driver IC p/n PCF8562TT manufactured by NXP Semiconductors was replaced with p/n TM1621 manufactured by Titan Microelectronics. Reason for change – E.O.L. of the original component. As a result of change, local adjustment was made on the PCBA to accommodate new component. The new component has no effect on the transmitter performance.

Sincerely,

Yair Hadari

CTO

Maytronics Ltd.

## 2. System Test Configuration

### 2.1 Justification

1. The E.U.T contains an FCC certified transceiver (FCC ID: WCH99954226-7), that transmits at 2433 MHz.
2. The customer made some changes to the EUT as listed in the declaration on the previous page.
3. This report subject is to check compliance with C2PC process requirements.
4. Exploratory tests were performed at three orthogonal polarities, to find the “worst case” radiation, which was found to be at the Y axis.

### 2.2 EUT Exercise Software

No special exercise software was used.

### 2.3 Special Accessories

No special accessory was used.

### 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

### 3. Test Setup Photos



Figure 2. Radiated Emission Test



## 4. Maximum Conducted Output Power

### 4.1 Test Specification

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

### 4.2 Test Procedure

(Temperature (20°C)/ Humidity (57%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 tested in the chamber and placed on a remote-controlled turntable.

The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.

The emissions were measured at a distance of 3 meters.

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{v/m} \times d)^2}{(30 \times G)} \quad [W]$$

*E* - Field Strength (V/m)

*d* - Distance from transmitter (m)

*G* - Antenna gain

*P* - Peak power (W)

### 4.3 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.

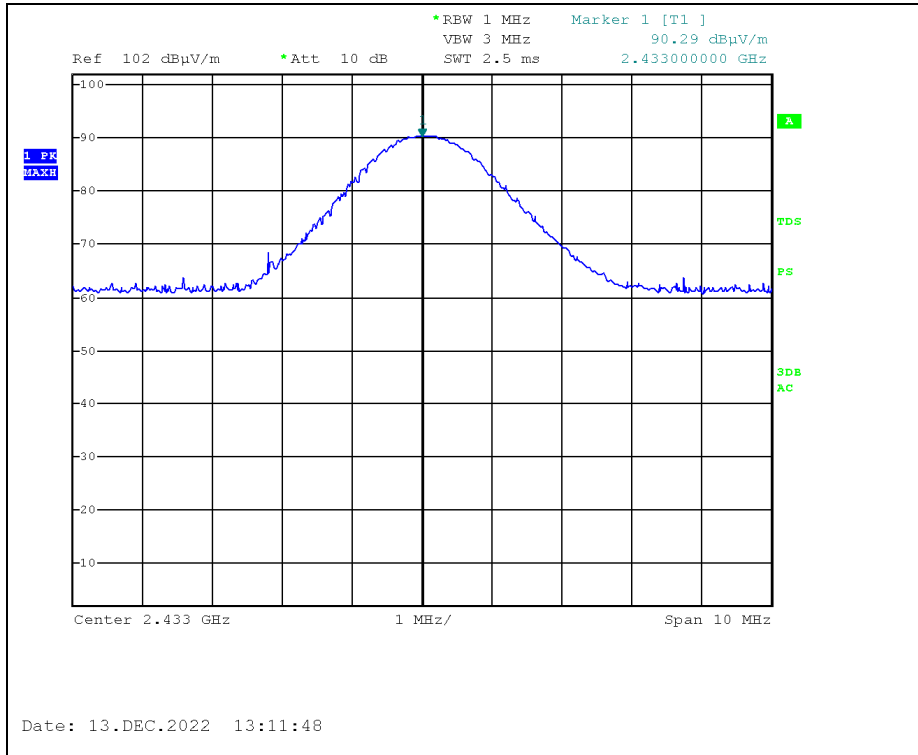
### 4.4 Test Results

Product	Operation Frequency	Pol.	Field Strength	EIRP	Ant. Gain	Power	Power	Limit	Margin
	(MHz)								
Original	2443.0	V	76.5	-18.7	1.0	-19.7	0.01	1000.0	-999.99
		H	90.3	-4.9	1.0	-5.9	0.20	1000.0	-999.80
Modified	2443.0	V	74.8	-20.4	1.0	-21.4	0.01	1000.0	-999.99
		H	88.6	-6.6	1.0	-7.6	0.20	1000.0	-999.80

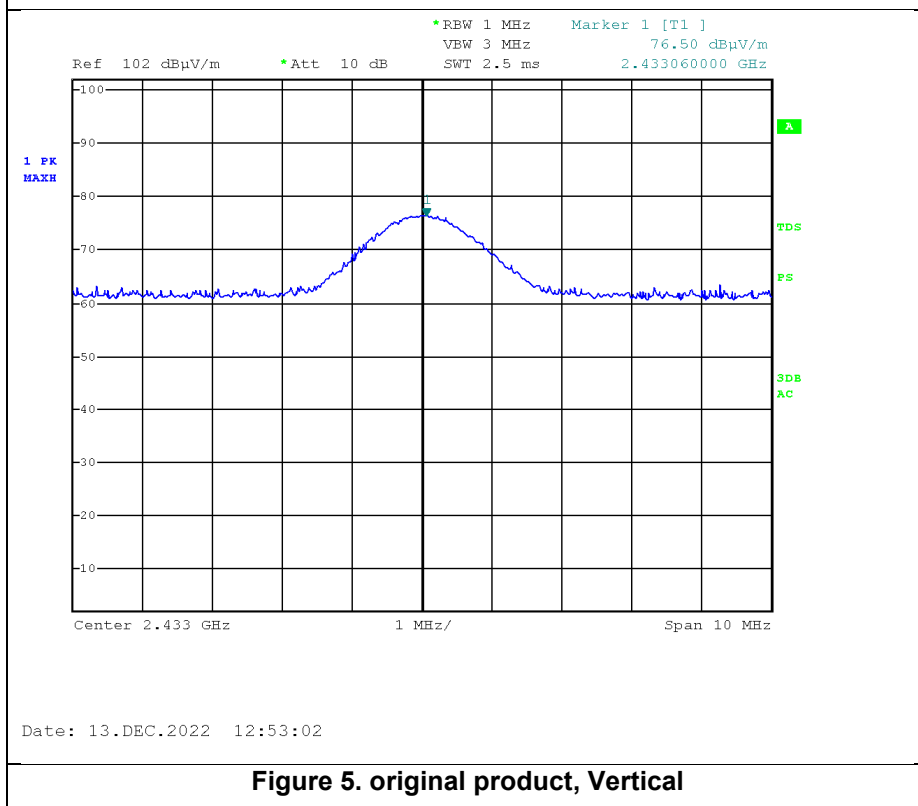
Figure 3 Maximum Peak Power Output

JUDGEMENT: Passed by \_\_\_-999.80\_\_ mW

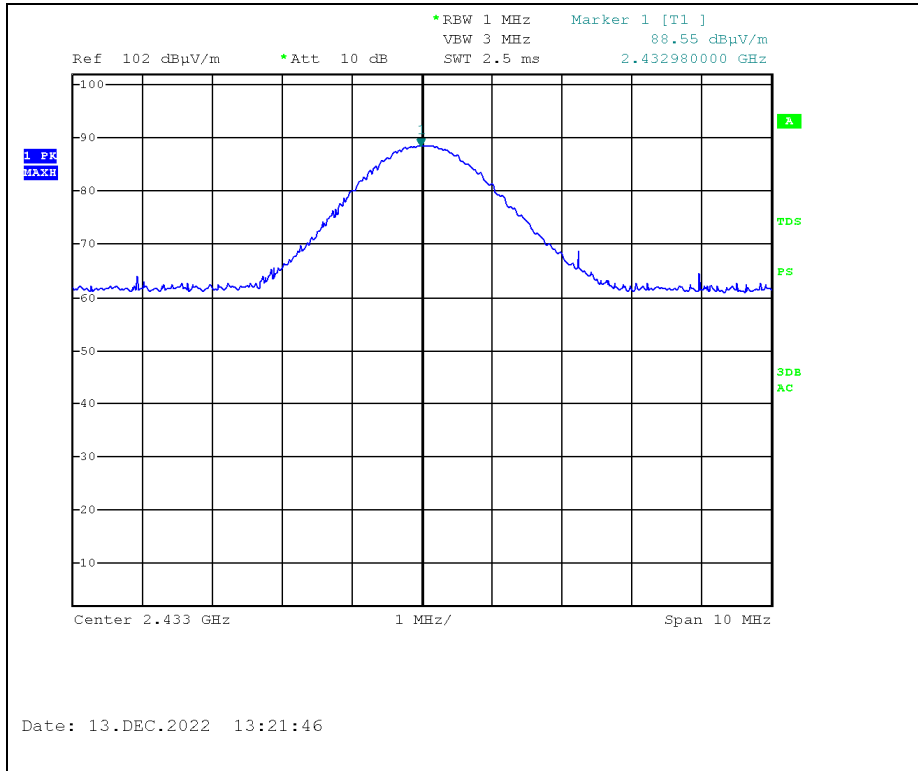
For additional information see *Figure 4* to *Figure 7*.



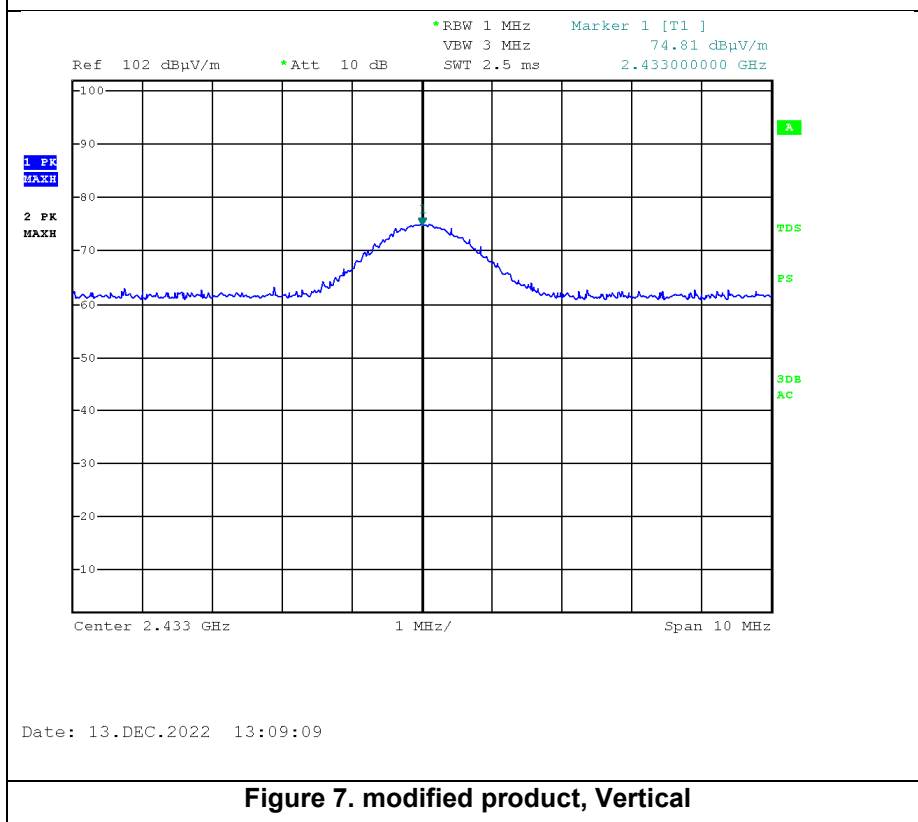
**Figure 4. original product, Horizontal**



**Figure 5. original product, Vertical**



**Figure 6. modified product, Horizontal**



**Figure 7. modified product, Vertical**



#### 4.5 Test Equipment Used; Maximum Conducted Output Power

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 20, 2022	February 20, 2023
Horn Antenna	ETS	3115	6142	May 25, 2021	May 25, 2024
10 m RF cable	Commscope ORS (Serge)	0623 WBC-400	G020133	May 16, 2022	May 16, 2023
Full Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 8 Test Equipment Used



## 5. Occupied Bandwidth

### 5.1 Test Specification

FCC, Part 2, Sub part J, Section 2.1049

### 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 transmitter unit was operated with normal modulation. The RBW set to the range of 1% to 5% of the OBW.

The span was set between 1.5 to 5 times of the OBW.

99% occupied bandwidth function was set on.

### 5.3 Test Limit

N/A

### 5.4 Test Results

Product	Operation Frequency	Reading
	(MHz)	(kHz)
Modified	2443.0	476.0

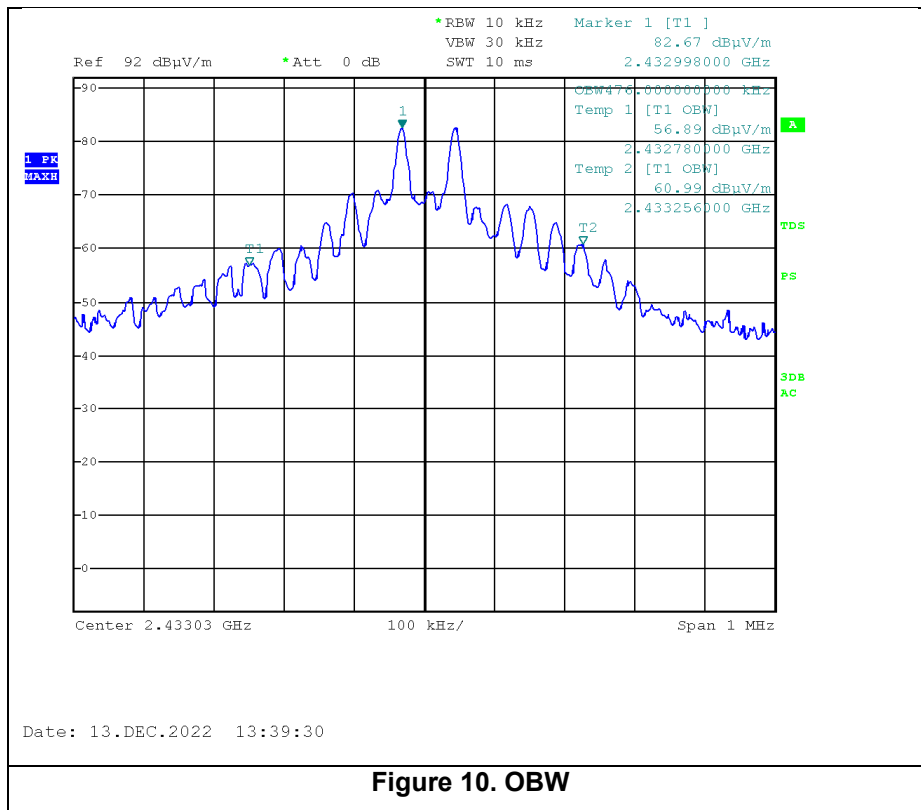
Figure 9. Bandwidth Test Results

JUDGEMENT: N/A

See additional information in *Figure 10*.

## Occupied Bandwidth

E.U.T Description    Digital Transmission System  
 Model Number        RCU Dynamic 2010  
 Part Number:        Not designated



### 5.5 Test Equipment Used; Occupied Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 20, 2022	February 20, 2023
Horn Antenna	ETS	3115	6142	May 25, 2021	May 25, 2024
10 m RF cable	Commscope ORS (Serge)	0623 WBC-400	G020133	May 16, 2022	May 16, 2023
Full Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

**Figure 11 Test Equipment Used**



## 6. Radiated Spurious Emissions

### 6.1 Test Specification

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

### 6.2 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.

#### **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-25GHz:**

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 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 -25GHz was scanned.

The highest radiations are described in the tables below.

### 6.3 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 12 Table of Limits

### 6.4 Test Results

JUDGEMENT: Passed by \_\_-4.5 dB

For the operation frequency of 2433.0 MHz, the margin between the emission level and the specification limit is in the worst case -4.5 dB at the frequency of 4866.0 MHz, horizontal 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 13*.





## Radiated Emission

E.U.T Description Digital Transmission System  
Type RCU Dynamic 2010  
Serial Number: Not designated

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

Antenna Polarization: Horizontal/Vertical Frequency Range: 9kHz to 25.0 GHz  
Frequency operate : 2433MHz Detector: Peak, Average

Product	Freq.	Pol.	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
	(MHz)	(H/V)	(dBμV/m)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
Original	4866.0	V	56.5	74.0	-17.5	43.6	54.0	-10.4
	4866.0	H	60.1	74.0	-13.9	47.5	54.0	-6.5
	7299.0	V	57.6	74.0	-16.4	44.3	54.0	-9.7
	7299.0	H	59.0	74.0	-15.0	46.3	54.0	-7.7
Modified	4866.0	V	56.1	74.0	-17.9	43.2	54.0	-10.8
	4866.0	H	62.5	74.0	-11.5	49.5	54.0	-4.5
	7299.0	V	58.0	74.0	-16.0	45.4	54.0	-8.6
	7299.0	H	58.9	74.0	-15.1	45.6	54.0	-8.4

**Figure 13. 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



### 6.5 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 20, 2022	February 20, 2023
EMI Receiver	HP	8542E	3906A00276	February 22, 2022	February 22, 2023
RF Filter Section	HP	85420E	3705A00248	February 22, 2022	February 22, 2023
Spectrum Analyzer	HP	8593EM	3536A00120 ADI	February 26, 2019	February 26, 2020
Active Loop Antenna	EMCO	6502	9506-2950	July 5, 2022	July 5, 2023
Biconical Antenna	EMCO	3110B	9912-3337	January 18, 2022	January 18, 2024
Log Periodic Antenna	EMCO	3146	9505-4081	April 27, 2021	April 27, 2024
Horn Antenna	ETS	3115	29845	May 25, 2021	May 25, 2024
Horn Antenna	ARA	SWH-28	1007	November 2, 2021	November 2, 2024
MicroWave System Amplifier	HP	83006A	3104A00589	August 23, 2020	August 23, 2021
Pass Band Filter	Meuro	MFL040120H5 0	902252	May 16, 2022	May 16, 2023
10 m RF cable	Commscope ORS (Serge)	0623 WBC- 400	G020133	May 16, 2022	May 16, 2023
RF Cable Oats	EIM	RG214- 11N(X2)	-	February 20, 2022	February 20, 2023
Pass Band Filter	Meuro	MFL040120H5 0	902252	May 16, 2022	May 16, 2023
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 14 Test Equipment Used

## 7. Appendix A - Correction Factors

### 7.1 ITL #1911: OATS RF Cable

Frequency (MHz)	Cable Loss (dB)	Frequency (MHz)	Cable Loss (dB)
1.00	0.50	450.00	5.83
10.00	1.00	500.00	6.33
20.00	1.34	550.00	6.67
30.00	1.50	600.00	6.83
50.00	1.83	650.00	7.17
100.00	2.67	700.00	7.66
150.00	3.17	750.00	7.83
200.00	3.83	800.00	8.16
250.00	4.17	850.00	8.50
300.00	4.50	900.00	8.83
350.00	5.17	950.00	8.84
400.00	5.50	1000.00	9.00

### 7.2 ITL #1840: Semi-Anechoic Chamber RF Cable

Frequency (MHz)	Cable Loss (dB)	Frequency (MHz)	Cable Loss (dB)
1,000.0	-1.40	10,000.0	-6.00
1,500.0	-1.70	10,500.0	-6.20
2,000.0	-2.00	11,000.0	-6.20
2,500.0	-2.30	11,500.0	-6.00
3,000.0	-2.60	12,000.0	-6.00
3,500.0	-2.80	12,500.0	-6.10
4,000.0	-3.10	13,000.0	-6.30
4,500.0	-3.30	13,500.0	-6.50
5,000.0	-3.60	14,000.0	-6.70
5,500.0	-3.70	14,500.0	-7.00
6,000.0	-4.00	15,000.0	-7.30
6,500.0	-4.40	15,500.0	-7.50
7,000.0	-4.7	16,000.0	-7.60
7,500.0	-4.80	16,500.0	-8.00
8,000.0	-5.00	17,000.0	-8.00
8,500.0	-5.10	17,500.0	-8.10
9,000.0	-5.60	18,000.0	-8.20
9,500.0	-5.80		

### 7.3 ITL # 1075: Active Loop Antenna

Frequency (MHz)	MAF (dBs/m)	AF (dB/m)	Frequency (MHz)	MAF (dBs/m)	AF (dB/m)
0.01	-33.10	18.40	3.00	-40.00	11.50
0.02	-37.20	14.30	4.00	-40.10	11.40
0.03	-38.20	13.30	5.00	-40.20	11.30
0.05	-39.80	11.70	6.00	-40.40	11.10
0.10	-40.10	11.40	7.00	-40.40	11.10



0.20	-40.30	11.20
0.30	-40.30	11.20
0.50	-40.30	11.20
0.70	-40.30	11.20
1.00	-40.10	11.40
2.00	-40.00	11.50

8.00	-40.40	11.10
9.00	-40.50	11.00
10.00	-40.50	11.00
20.00	-41.50	10.00
30.00	-43.50	8.00

**7.4 ITL #1356: Biconical Antenna**

Frequency (MHz)	AF (dB/m)	Frequency (MHz)	AF (dB/m)
30.00	13.00	90.00	8.23
35.00	10.89	100.00	11.12
40.00	10.59	120.00	13.16
45.00	10.63	140.00	13.07
50.00	10.12	160.00	14.80
60.00	9.26	180.00	16.95
70.00	7.74	200.00	17.17
80.00	6.63		

**7.5 ITL # 1349: Log Periodic Antenna**

Frequency (MHz)	AF (dB/m)
200.00	11.58
250.00	12.04
300.00	14.76
400.00	15.55
500.00	17.85
600.00	18.66
700.00	20.87
800.00	21.15
900.00	22.32
1000.00	24.22



**7.6 ITL # 1352: 1-18 GHz Horn Antenna**

Frequency (GHz)	AF (dB/m)		Frequency (GHz)	AF (dB/m)
0.75	25.00		9.50	38.00
1.00	23.50		10.00	38.50
1.50	26.00		10.50	38.50
2.00	29.00		11.00	38.50
2.50	27.50		11.50	38.50
3.00	30.00		12.00	38.00
3.50	31.50		12.50	38.50
4.00	32.50		13.00	40.00
4.50	32.50		13.50	41.00
5.00	33.00		14.00	40.00
5.50	35.00		14.50	39.00
6.00	36.50		15.00	38.00
6.50	36.50		15.50	37.50
7.00	37.50		16.00	37.50
7.50	37.50		16.50	39.00
8.00	37.50		17.00	40.00
8.50	38.00		17.50	42.00
9.00	37.50		18.00	42.50

**End of Test Report**