Timco Test Report # TR_1923-20_FCC_15.236_4
Revision: 4
Issue Date: October 26, 2020
Final Test Date: July 27, 2020

TIMCO ENGINEERING, Inc.

An IIA Company

Test Report - FCC PART 15.236 DWM
Prepared For: KINGDOM INC.

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager
Date of Signature (YYYY-MM-DD): 2020-10-26

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1. Customer Information

Applicant:	KINGDOM INC.
Address:	719 Lambs Creek Road Mansfield, PA 16933 USA
Contact:	Jonathan Berguson
Telephone:	(570) 662-7515 x2930
Fax:	(570) 662-3875
Email address:	jonathan.berguson@kingdom.com

1.1 Test Result Summary

The following test procedure and guidance were used for measuring Unlicensed Wireless Microphones (DWM); FCC KDB 206256 D01 Wireless Microphones, ETSI EN 300 422-1 V1.4.2 (2011-08), and ANSI C63.10-2013. Full test results are available in this report.

No additions to the test methods were needed. There were no deviations, or exclusions from the test methods. No test results are from external providers or from the customer. The test results relate only to the items tested. Timco does not offer opinions and interpretations, only a pass/fail statement.

The Following is for Test item FCC ID: 2AWPDAVTHHT1

Applicable Clauses from Part 15.236		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
15.236 (c) (1) – (6)	Permissible Frequency Bands	Pass
15.236 (d) (1) – (2)	Maximum Power	Pass
15.236 (f) (1) – (2)	Channel Aggregation & Bandwidth	Pass
15.236 (f) (3)	Frequency Tolerance	Pass
15.236 (g)	Conducted Emissions, In-band	Pass

Other Applicable Clauses from Part 2 and Part 15 Subpart C		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
15.203	Antenna requirements	Pass
15.205	Restricted bands of operation	Pass
15.207	AC Power Conducted Emissions	n/a
15.209	Radiated Emissions, Out-of-band	Pass
15.211	Tunnel Radio Systems	n/a
15.212 (a)	Single Modular Transmitter	n/a
15.212 (b)	Limited Modular Transmitter	n/a
15.213	Cable Locating Equipment	n/a
15.214	Cordless Telephones	n/a

2. Location of Testing

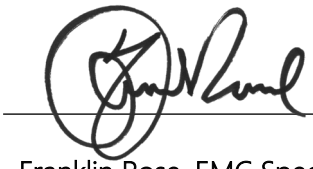
2.1 Test Laboratory

Timco Engineering Inc. is a subsidiary of Industrial Inspection & Analysis, Inc. ("IIA"). Testing was performed at Timco's permanent laboratory located at 849 NW State Road 45, Newberry, Florida 32669

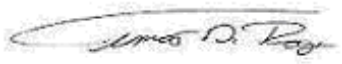
FCC test firm # 578780
FCC Designation # US1070
FCC site registration is under A2LA certificate # 0955.01
ISED Canada test site registration # 2056A
EU Notified Body # 1177
For all designations see A2LA scope # 0955.01

2.2 Testing was performed, reviewed by

Dates of Testing: June 08 – July 27, 2020

Signature: 

Name & Title: Franklin Rose, EMC Specialist
Date of Signature
(YYYY-MM-DD): 2020-10-26

Signature: 


Name & Title: Tim Royer, EMC Engineer
Date of Signature
(YYYY-MM-DD): 2020-10-26

3. Test Sample(s) (EUT/DUT)

The test sample was received: June 08, 2020

3.1 Description of the EUT

A description as well as unambiguous identification of the EUT(s) tested. Where more than one sample is required for technical reasons (such as the use of connected units for the purpose of conducted output power testing where the product units will have integral antennas), each specific test shall identify which unit was tested.

Identification	
FCC ID:	2AWPDAVTHHT1
Brief Description	HANDHELD WIRELESS MICROPHONE
Type of Modular	n/a
Model(s) #	AVTHHT1
Trade name	n/a
Firmware version	n/a
Software version	n/a
Serial Number	n/a

Technical Characteristics	
Technology	Wireless Microphone
Frequency Range	470 – 505 MHz
RF O/P Power (Max.)	50 mW (17 dBm)
Modulation	FM
Bandwidth & Emission Class	200 kHz, F1D
Number of Channels	Variable
Duty Cycle	100%
Antenna Type	Internal
Antenna Gain (for each ant.)	0 dBi
Antenna Connector	N/A
Voltage Rating (AC or Batt.)	Battery 4.3 V

Antenna Characteristics		
Frequency Range	Mode / BW	Antenna Gain
470 – 505 MHz	n/a	0 dBi

3.2 Configuration of EUT

Test Modes						
Band	Mode (#)	Mode (Type)	Test Frequencies	BW (nominal)	Modulation	Number of Antennas
470 – 505 MHz	1	FM	470.125 MHz, 486.425 MHz, 505.000 MHz	200 kHz	FM (F1D)	1

Operating conditions during Testing:

No modifications of the device under test (including firmware, specific software settings, and input/output signal levels to the EUT).

Peripherals used during Testing:

No peripherals used.

3.3 Test Setup of EUT

Equipment, antenna, and cable arrangement. The setup of the equipment and cable or wire placement on the test site that produces the highest radiated and the highest ac power line conducted emissions shall be shown clearly and described. Information on the orientation of portable equipment during testing shall be included. Drawings or photographs may be used for this purpose.

Test Setups are included in the test report.

4. Test methods & Applicable Regulatory Limits

4.1 Test methods/Standards/Guidance:

Test procedures and guidance for measuring Unlicensed Wireless Microphones (DWM) are provided in the FCC KDB 206256 D01 Wireless Microphones, ETSI EN 300 422-1 V1.4.2 (2011-08), and ANSI C63.10-2013.

1) ANSI C63.10-2013
2) FCC KDB 206256 D01
3) ETSI EN 300 422-1 V1.4.2 (2011-08)

4.2 Applied Limits and Regulatory Limits:

1) FCC CFR 47 Part 15.236
2) ETSI EN 300 422-1 V1.4.2 (2011-08)

5. Measurement Uncertainty

Parameter	Uncertainty (dB)
Conducted Emissions	± 3.14 dB
Radiated Emissions (9kHz – 30 MHz)	± 3.08 dB
Radiated Emissions (30 – 200 MHz)	± 2.16 dB
Radiated Emissions (200 – 1000 MHz)	± 2.15 dB
Radiated Emissions (1 GHz – 18 GHz)	± 2.14 dB
Radiated Emissions (18 GHz – 40 GHz)	± 2.31 dB
Note: The uncertainties provided in this table represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of K=2.	

6. Environmental Conditions

6.1 Temperature & Humidity

Measurements performed at the test site did not exceed the following:

Temperature	23 C +/- 5%
Humidity	55% +/- 5%
Note: Specific environmental conditions that are applicable to a specific test are available in the test result section.	

7. List of Test Equipment and Test Facility

The test equipment used identified by type, manufacturer, serial number, or other identification and the date on which the next calibration or service check is due.

Description of the firmware or software used to operate EUT for testing purposes.

A complete list of all test equipment used shall be included with the test report. The manufacturer's model and serial numbers, and date of last calibration, and calibration interval shall be included. Measurement cable loss, measuring instrument bandwidth and detector function, video bandwidth, if appropriate, and antenna factors shall also be included where applicable.

7.1 List of Test Equipment

Device	Manufacturer	Model	SN #	Current Cal	Cal Due
Digital Multimeter	Fluke	77	35053830	11/6/17	11/5/2020
Active Loop	ETS-Lindgren	6502	00062529	12/11/17	12/10/2020
Biconical 1057	Eaton	94455-1	1057	12/13/17	12/12/2020
Log-Periodic 1243	Eaton	96005	1243	4/20/18	4/19/2021
Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	2/25/20	2/24/2023
CHAMBER	Panashield	3M	N/A	3/12/19	3/11/2021
EMI Test Receiver R&S ESU 40	Rohde & Schwarz	ESU 40	100320	8/28/18	8/27/2021
Frequency Counter Small	HP	5385A	3242A07460	9/9/20	9/9/2023
Type K J Thermometer	Martel	303	080504494	11/6/17	11/5/2020

Software	Author	Version	Validation Or
ESU Firmware	Rohde & Schwarz	4.43 SP3; BIOS v5.1-24-3	2018
RSCommander	Rohde & Schwarz	1.6.4	2014

8. Test Results

The results of the test are usually indicated in the form of tables, spectrum analyzer plots, charts, sample calculations, as appropriate for each test procedure.

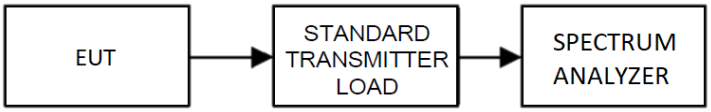
A description and/or a block diagram of the test setup is usually provided.

The measurement results, along with the appropriate limits for comparison, may be presented in tabular or graphical form. In addition, any variation in the measurement environment may be reported if applicable (e.g., a significant change of temperature that could affect the cable loss and amplifier response).

Unless noted otherwise in the referenced standard, the measurements of ac power-line conducted emissions and conducted power output will be reported in units of dBµV. Unless noted otherwise in the referenced standard, the measurements of radiated emissions will be reported in units of decibels, referenced to one microvolt per meter (dBµV/m) for electric fields, or to one ampere per meter (dBA/m) for magnetic fields, at the distance specified in the appropriate standards or requirements. The measurements of antenna-conducted power for receivers may be reported in units of dBµV if the impedance of the measuring instrument is also reported. Otherwise, antenna-conducted power will be reported in units of decibels referenced to one milliwatt (dBm). All formulas for data conversions and conversion factors, if used, will be included in this measurement report.

8.1 Output Power

Limits from FCC Part 15.236 (d) (1) – (2) as applicable, and test procedure from ANSI C63.10-2013.

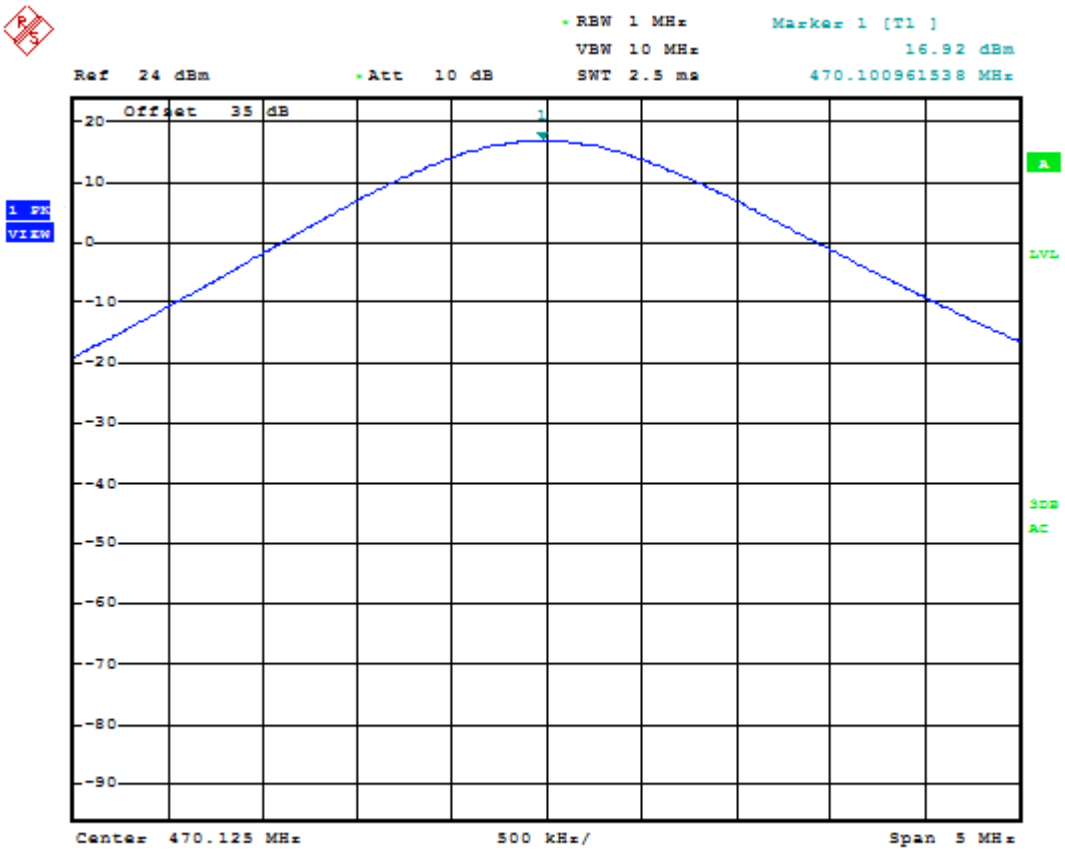
Test Setup


Conducted Output Power, Table

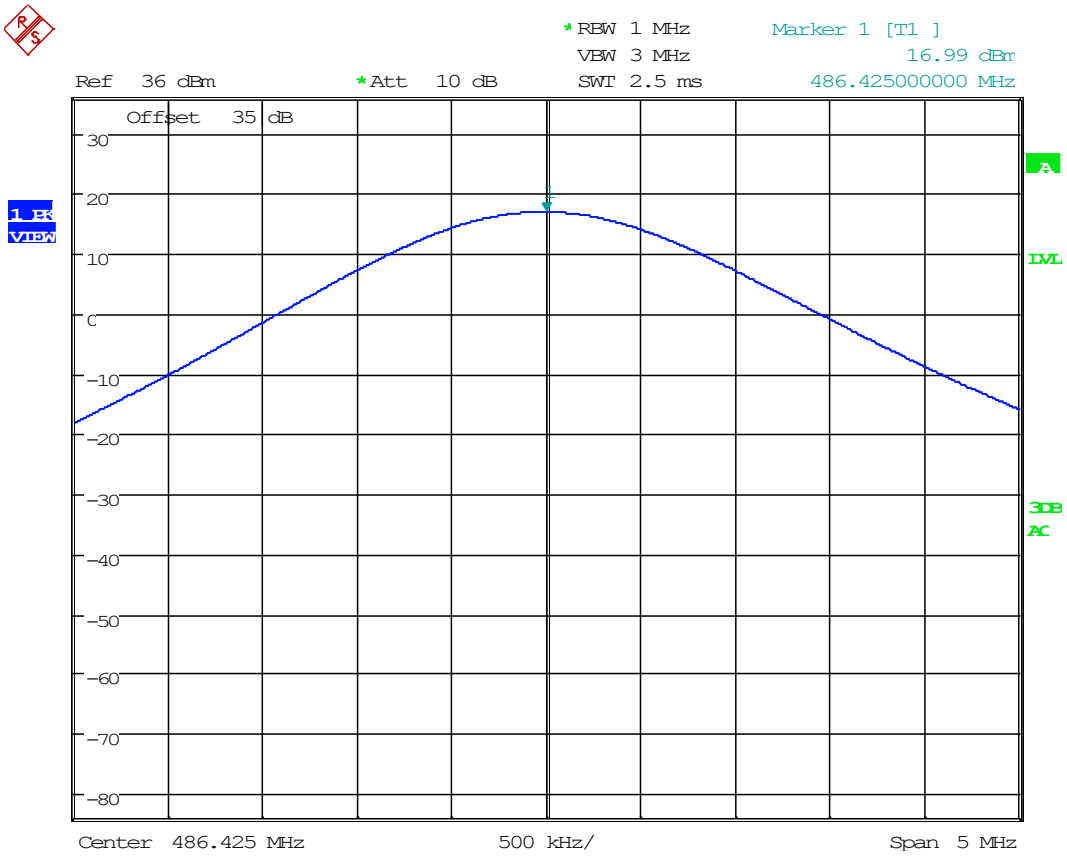
Tuned Frequency (MHz)	Measured Output (dBm)	Measured Output (mW)	Limit (mW)	Margin (mW)
470.125	16.92	49.20	50.0	0.8
486.425	16.99	50.00	50.0	0.0
505.000	16.91	49.10	50.0	0.9

Output Power, Spectrum Plots

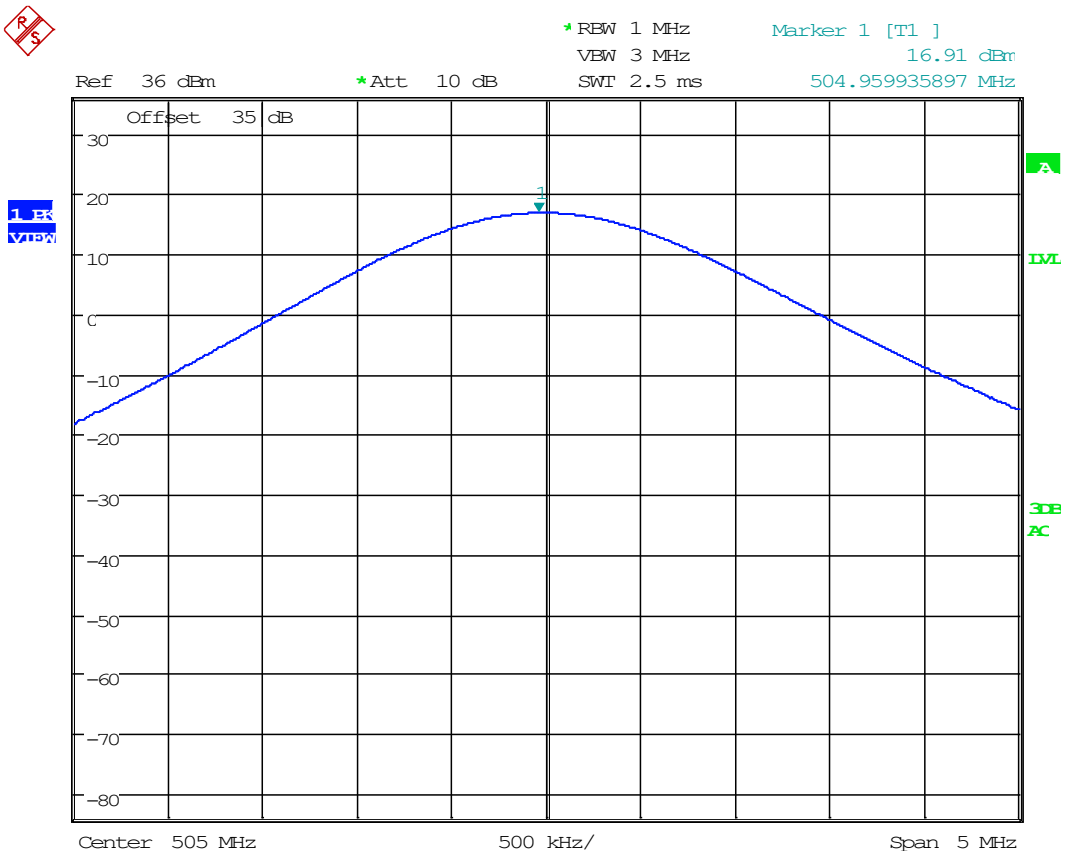
8.1.1 Output Power, 470.125 MHz



8.1.2 Output Power, 486.425 MHz

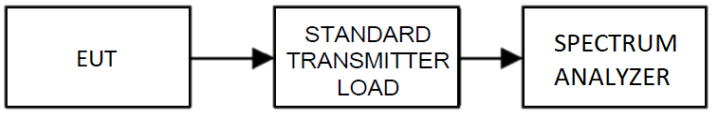


8.1.3 Output Power, 505.000 MHz



8.2 Permissible Band and Bandwidth

Limits from FCC Part 15.236 (c) (1) – (6) & 15.236 (f) (1) – (2), and test procedure from ANSI C63.10-2013.

Test Setup


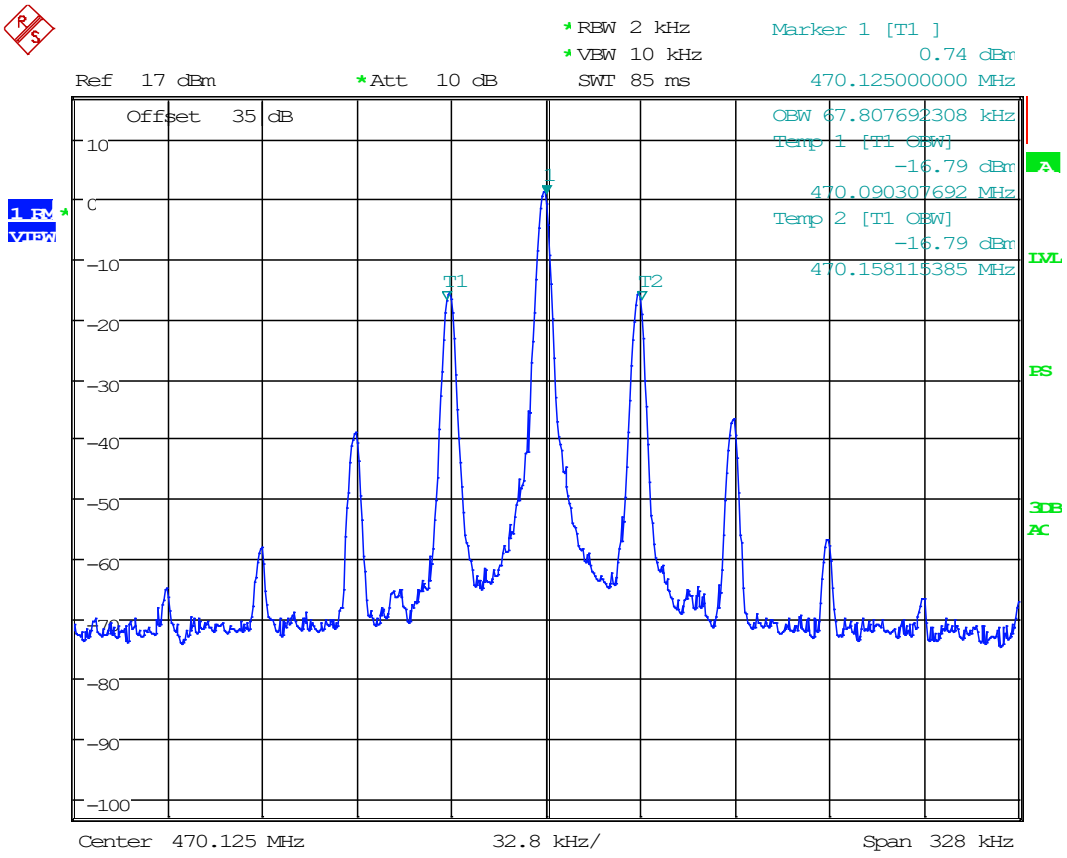
Occupied Bandwidth, Table

Test Results, Mode 1	
Tuned Frequency (MHz)	99% Bandwidth (kHz)
470.125	67.81
486.425	68.33
505.000	68.33

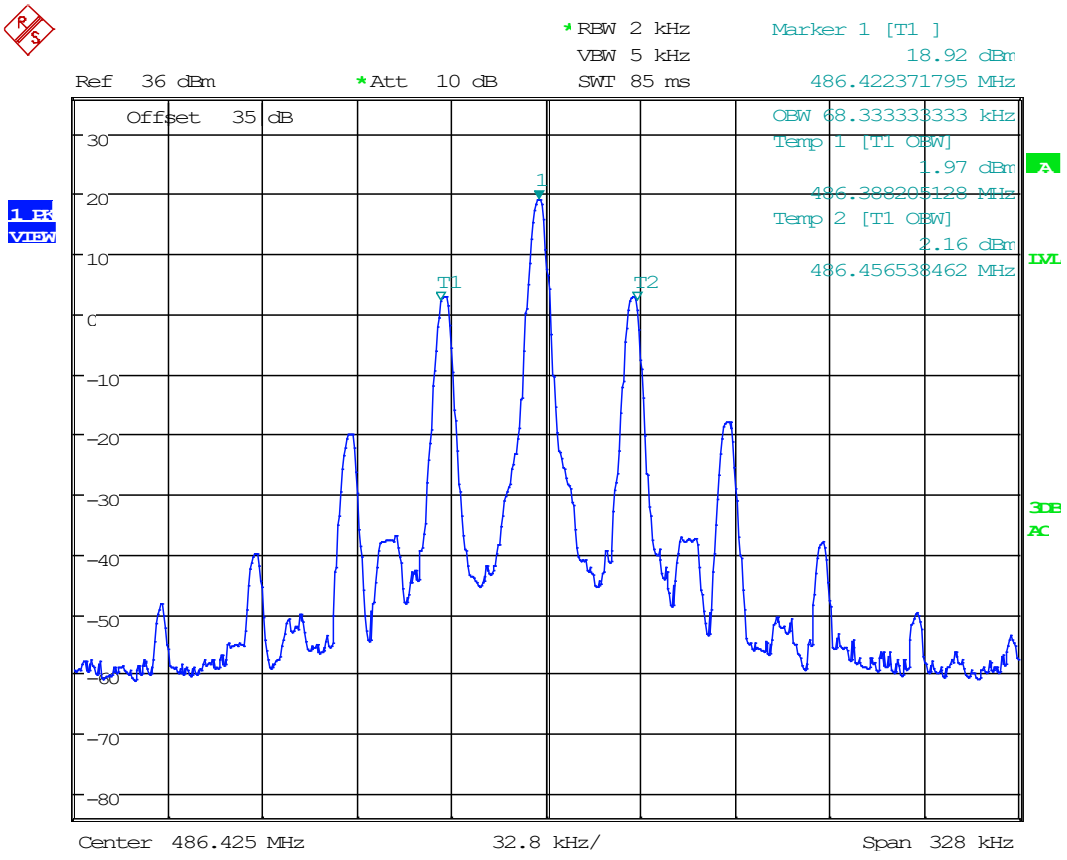
Lowest Frequency Selection	Highest Frequency Selection
≥ 25 kHz above permissible band edge	≥ 25 kHz below permissible band edge

Occupied Bandwidth, Spectrum Plots

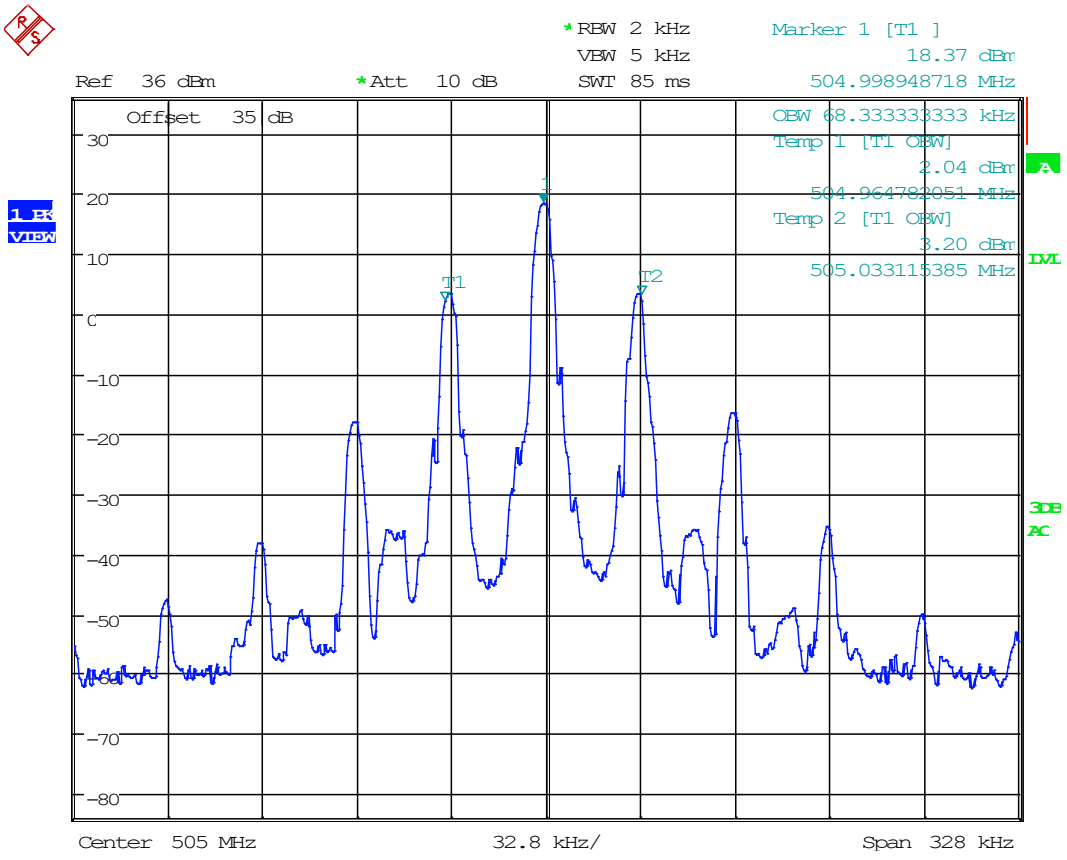
8.2.1 Bandwidth, 470.125 MHz



8.2.2 Bandwidth, 486.425 MHz

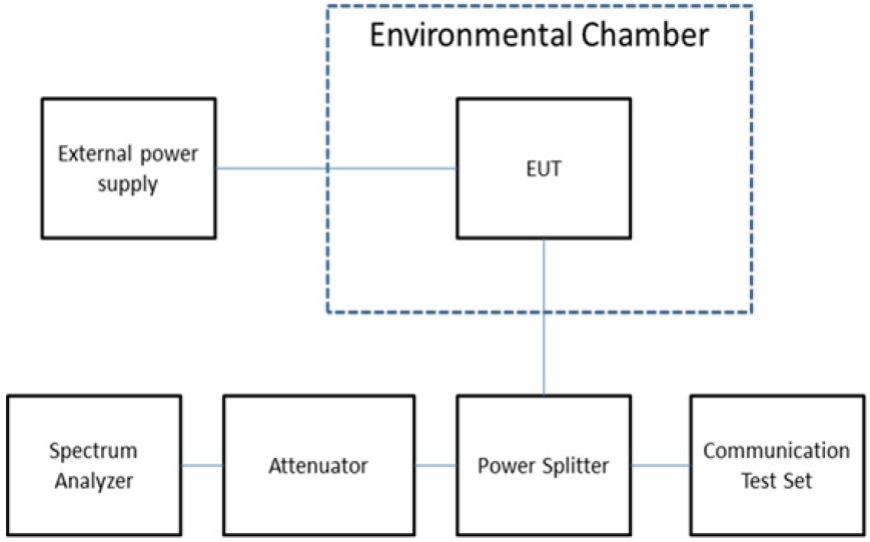


8.2.3 Bandwidth, 505.000 MHz



8.3 Frequency Tolerance

Limits from FCC Part 15.236 (f) (3) as applicable, and test procedure from ANSI C63.10-2013 section 6.8.

Test Setup


Frequency Stability, Tabular Data

8.3.1 Frequency Stability, 486.425 MHz

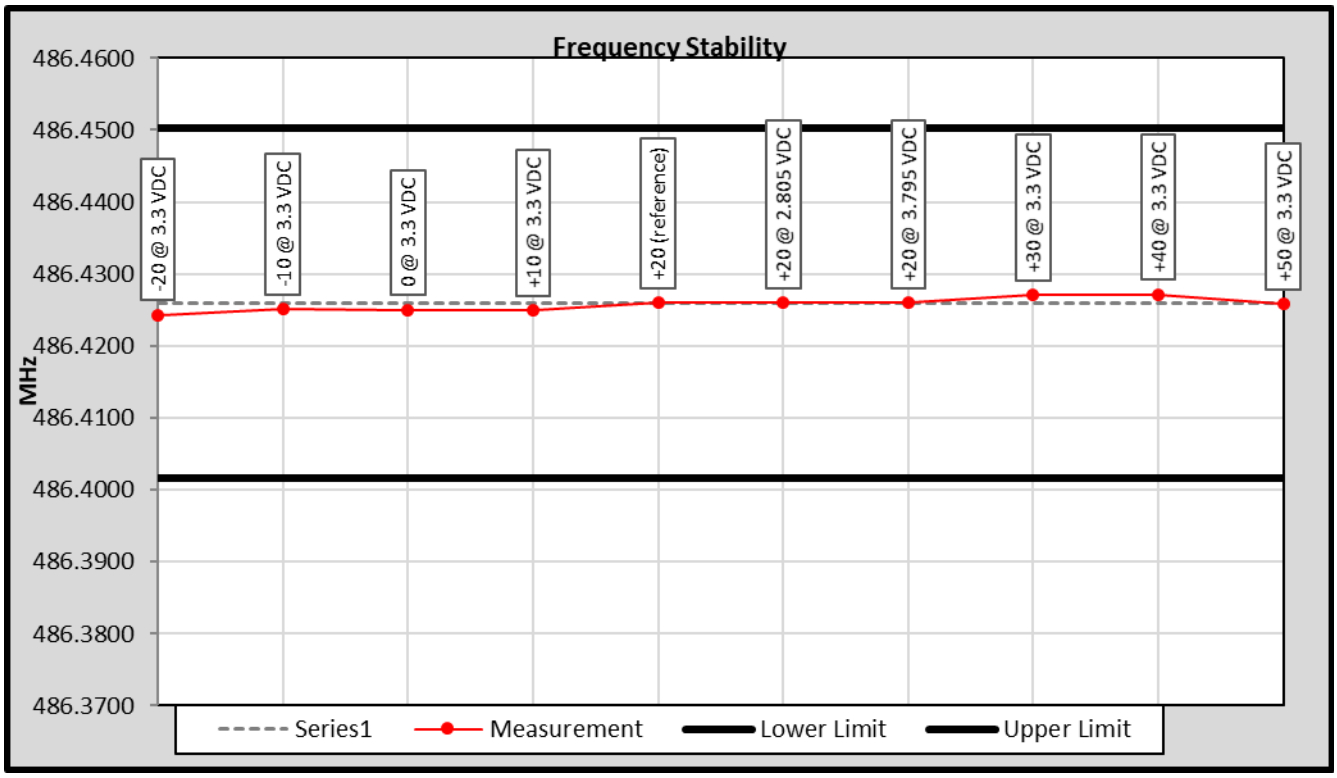
Limit of FCC Pt 15.236(f)(3)	50.0	ppm
Limit, in Hz	24321.299	Hz
Lower Limit	486.401649	MHz
Upper Limit	486.450291	MHz
Rated Supply Voltage	3.3	○ AC ◉ DC

Temperature / Voltage Variation

Temperature (°C)	Supplied Voltage (V)	Frequency (MHz)	Deviation (kHz)
-20	3.3	486.42432	1.650
-10	3.3	486.42505	0.920
0	3.3	486.425	0.970
+10	3.3	486.42490	1.070
+20 (reference)	3.3	486.42597	0.000
+20	2.8	486.42597	0.000
+20	3.8	486.42597	0.000
+30	3.3	486.42702	-1.050
+40	3.3	486.42715	-1.180
+50	3.3	486.42581	0.160

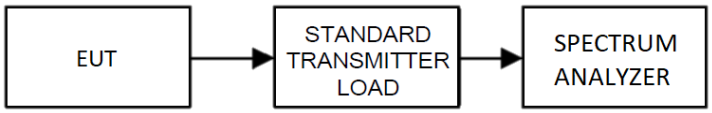
Frequency Stability, Data Plot

8.3.2 Frequency Stability, 486.425 MHz



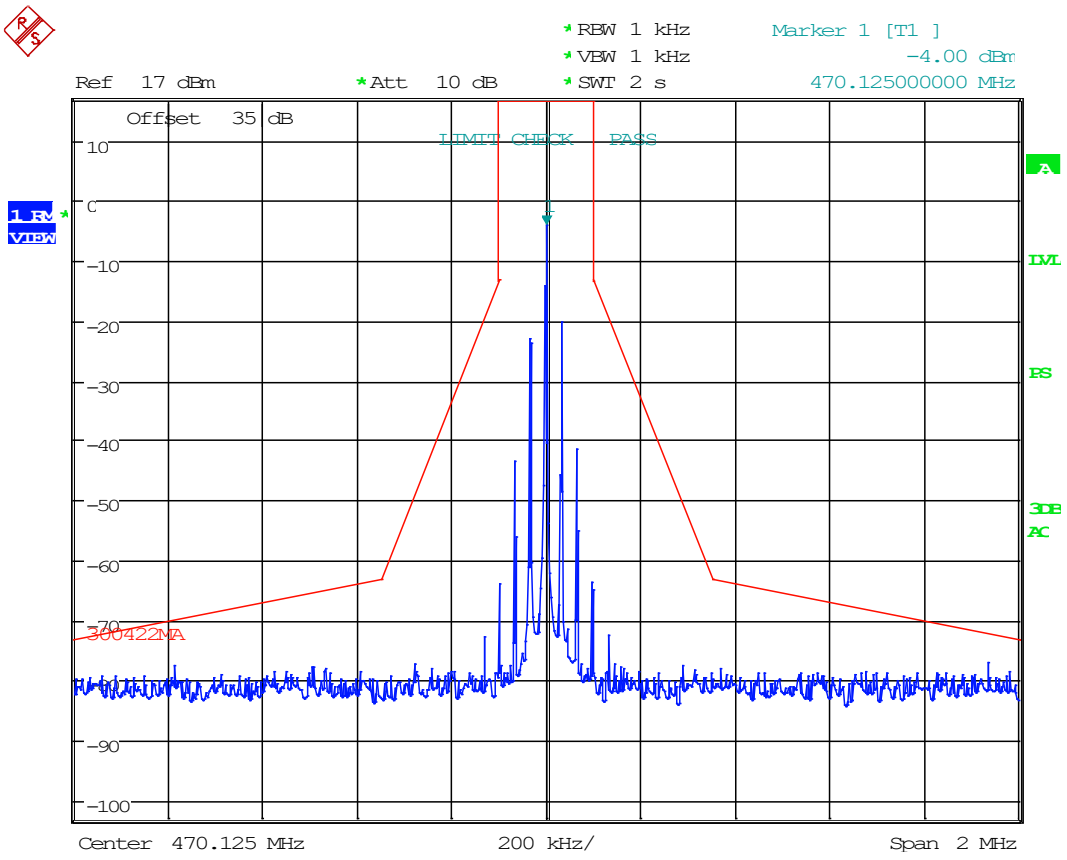
8.4 Conducted Emissions, In-band

Limits from FCC Part 15.236 (g), and test procedure from ETSI EN 300 422-1 V1.4.2 (2011-08).

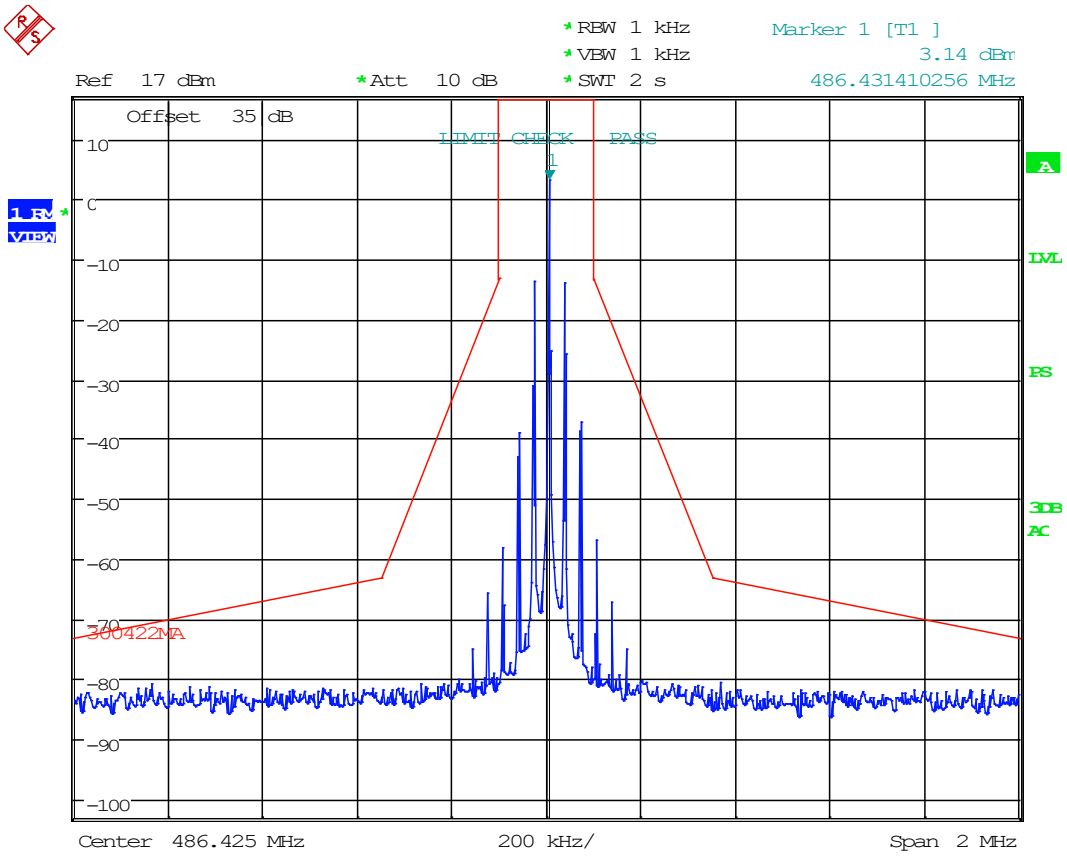
Test Setup


Conducted Emissions In-Band, Spectral Plots

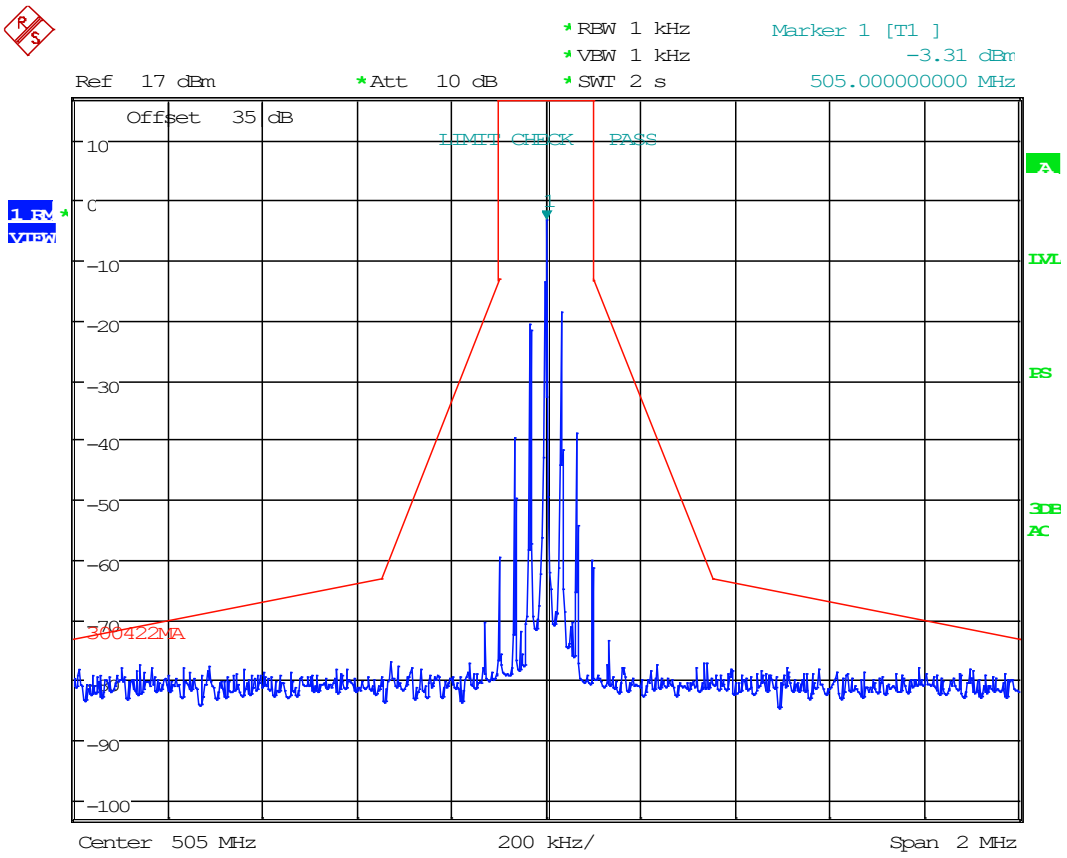
8.4.1 470.125 MHz



8.4.2 486.425 MHz

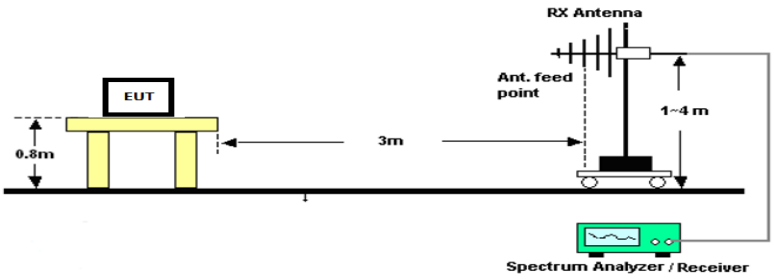


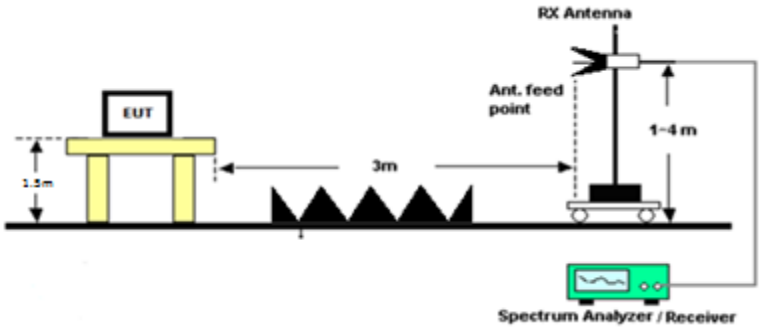
8.4.3 505.000 MHz



8.5 Radiated Emissions, Out-of-band

Limits from EN 300 422-1 V1.4.2, and test procedure from ANSI C63.10-2013.

Radiated Test Setup, 30 – 1000 MHz


Radiated Test Setup, Above 1000 MHz


Radiated Emissions Out-of-Band, Tabular Data

8.5.1 470.125 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBµV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dBm)
470.13	103.64	PK	6.91	H	1.17	10.64	3.00	18.72	-78.66	-36.00	42.66
470.13	103.64	PK	9.20	V	1.17	10.64	3.00	21.01	-76.37	-36.00	40.37
470.13	247.43	PK	7.82	H	1.86	10.99	3.00	20.67	-76.70	-36.00	40.70
470.13	247.43	PK	6.66	V	1.86	10.99	3.00	19.51	-77.86	-36.00	41.86
470.13	940.25	PK	24.73	H	3.59	22.60	3.00	50.92	-46.46	-36.00	10.46
470.13	940.25	PK	18.55	V	3.59	22.60	3.00	44.74	-52.64	-36.00	16.64
470.13	1410.38	PK	19.66	H	4.31	28.39	3.00	52.36	-45.02	-36.00	9.02
470.13	1410.38	PK	17.75	V	4.31	28.39	3.00	50.45	-46.93	-36.00	10.93
470.13	1880.50	PK	17.84	H	5.03	30.95	3.00	53.82	-43.56	-36.00	7.56
470.13	1880.50	PK	12.75	V	5.03	30.95	3.00	48.73	-48.65	-36.00	12.65
470.13	2350.63	PK	31.95	H	5.58	31.93	3.00	69.45	-39.92	-36.00	3.92
470.13	2350.63	PK	25.53	V	5.58	31.93	3.00	63.03	-46.34	-36.00	10.34
470.13	2820.75	PK	22.06	H	6.21	32.43	3.00	60.70	-48.68	-36.00	12.68
470.13	2820.75	PK	22.57	V	6.21	32.43	3.00	61.21	-48.17	-36.00	12.17
470.13	3290.88	PK	29.82	H	6.70	32.63	3.00	69.15	-40.23	-36.00	4.23
470.13	3290.88	PK	21.65	V	6.70	32.63	3.00	60.98	-48.40	-36.00	12.40
470.13	3761.00	PK	21.71	H	6.45	33.13	3.00	61.28	-48.09	-36.00	12.09
470.13	3761.00	PK	17.75	V	6.45	33.13	3.00	57.32	-52.05	-36.00	16.05
470.13	4231.13	PK	24.92	H	7.11	33.33	3.00	65.36	-44.02	-36.00	8.02
470.13	4231.13	PK	20.36	V	7.11	33.33	3.00	60.80	-48.58	-36.00	12.58
470.13	4701.25	PK	25.78	H	7.20	33.88	3.00	66.85	-42.53	-36.00	6.53
470.13	4701.25	PK	19.62	V	7.20	33.88	3.00	60.69	-48.69	-36.00	12.69

8.5.2 486.425 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBm)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dBm)
486.43	247.47	PK	6.45	V	1.86	11.00	3.00	19.31	-78.07	-36.00	42.07
486.43	247.47	PK	9.16	H	1.86	11.00	3.00	22.02	-75.36	-36.00	39.36
486.43	972.85	PK	25.88	H	3.66	22.69	3.00	52.23	-45.15	-36.00	9.15
486.43	972.85	PK	21.30	V	3.66	22.69	3.00	47.65	-49.73	-36.00	13.73
486.43	1459.28	PK	12.49	H	4.38	28.02	3.00	44.89	-52.48	-36.00	16.48
486.43	1459.28	PK	16.76	V	4.38	28.02	3.00	49.16	-48.21	-36.00	12.21
486.43	1945.70	PK	17.20	H	5.12	31.28	3.00	53.61	-43.77	-36.00	7.77
486.43	1945.70	PK	15.10	V	5.12	31.28	3.00	51.51	-45.87	-36.00	9.87
486.43	2432.13	PK	20.13	H	5.61	31.85	3.00	57.59	-39.78	-36.00	3.78
486.43	2432.13	PK	23.91	V	5.61	31.85	3.00	61.37	-36.00	-36.00	0.00
486.43	2918.55	PK	24.69	H	6.26	32.26	3.00	63.20	-39.57	-36.00	3.57
486.43	2918.55	PK	20.36	V	6.26	32.26	3.00	58.87	-43.90	-36.00	7.90
486.43	3404.98	PK	27.24	H	6.80	32.65	3.00	66.69	-36.09	-36.00	0.09
486.43	3404.98	PK	28.04	V	6.80	32.65	3.00	67.49	-36.29	-36.00	0.29
486.43	3891.40	PK	22.74	H	6.87	33.23	3.00	62.84	-39.94	-36.00	3.94
486.43	3891.40	PK	19.44	V	6.87	33.23	3.00	59.54	-43.24	-36.00	7.24
486.43	4377.83	PK	25.05	H	7.31	33.63	3.00	65.99	-36.79	-36.00	0.79
486.43	4377.83	PK	24.91	V	7.31	33.63	3.00	65.85	-36.93	-36.00	0.93
486.43	4864.25	PK	21.52	H	7.26	33.94	3.00	62.72	-40.06	-36.00	4.06
486.43	4864.25	PK	20.94	V	7.26	33.94	3.00	62.14	-40.64	-36.00	4.64

8.5.3 505.000 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBm)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dBm)
505.00	1010.00	PK	20.95	H	3.72	27.04	3.00	51.71	-45.67	-36.00	9.67
505.00	1010.00	PK	15.49	V	3.72	27.04	3.00	46.25	-51.13	-36.00	15.13
505.00	1515.00	PK	20.44	H	4.51	27.76	3.00	52.72	-44.66	-36.00	8.66
505.00	1515.00	PK	15.99	V	4.51	27.76	3.00	48.27	-49.11	-36.00	13.11
505.00	2020.00	PK	16.77	H	5.22	31.18	3.00	53.17	-44.21	-36.00	8.21
505.00	2020.00	PK	16.59	V	5.22	31.18	3.00	52.99	-44.39	-36.00	8.39
505.00	2525.00	PK	21.32	H	5.66	32.44	3.00	59.42	-37.95	-36.00	1.95
505.00	2525.00	PK	20.11	V	5.66	32.44	3.00	58.21	-39.16	-36.00	3.16
505.00	3030.00	PK	27.33	H	6.37	32.59	3.00	66.29	-36.29	-36.00	0.29
505.00	3030.00	PK	23.05	V	6.37	32.59	3.00	62.01	-40.57	-36.00	4.57
505.00	3535.00	PK	27.50	H	6.82	32.88	3.00	67.19	-36.38	-36.00	0.38
505.00	3535.00	PK	23.90	V	6.82	32.88	3.00	63.59	-38.98	-36.00	2.98
505.00	4040.00	PK	22.13	H	7.20	33.38	3.00	62.71	-39.86	-36.00	3.86
505.00	4040.00	PK	19.56	V	7.20	33.38	3.00	60.14	-42.43	-36.00	6.43
505.00	4545.00	PK	18.53	H	7.46	33.99	3.00	59.98	-42.60	-36.00	6.60
505.00	4545.00	PK	16.91	V	7.46	33.99	3.00	58.36	-44.22	-36.00	8.22
505.00	5050.00	PK	23.15	H	7.94	34.07	3.00	65.16	-37.42	-36.00	1.42
505.00	5050.00	PK	21.05	V	7.94	34.07	3.00	63.06	-39.52	-36.00	3.52

9. ANNEX-A - Photographs of the EUT

Photographs of the EUT and any manufacturer supplied accessories to be used with the EUT are in separate supplementary documents labelled EXTERNAL PHOTOS and INTERNAL PHOTOS.

10. ANNEX-B – Test Setup Photographs

Test setup photographs are located in a separate supplementary ANNEX-B document.

11. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_1923-20_FCC_15.236_3	3	Revised Report / New Template	October 26, 2020
	4	Revised Report	January 11, 2021

END OF TEST REPORT