Timco Test Report # TR_3456-20_FCC_15.247_2
Revision: 2
Issue Date: September 24, 2020
Final Test Date: September 23, 2020

A2LA ACCREDITED
CERTIFICATE #0955.01

TIMCO ENGINEERING, Inc.
An IIA Company

Test Report - FCC PART 15.247
Prepared For: Ness Corporation Pty. Ltd.

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager
Date of Signature
(YYYY-MM-DD): 2020-09-24

Table of Contents

1. Customer Information

Applicant: Ness Corporation Pty. Ltd.
Address: 4/167 Prospect Highway
Seven Hills, Sydney NSW 2147

1.1 Test Result Summary

The following test procedure and guidance were used for measuring Digital Transmission System (DTS); FCC KDB 558074 D01 DTS Measurement Guidance 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: O2K-TRM915

Applicable Clauses from Part 2 or KDB		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
KDB 558074 D01	Duty Cycle	Reported
KDB 558074 D01	99 % Bandwidth	Reported
KDB 558074 D01	Band-edge measurements	Pass

Applicable Clauses from Part 15.247		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
15.247 (a) (1) – (1) (iii)	FHSS hopping requirements (1, i,ii,iii)	Pass
15.247 (a) (1)	FHSS 20dB Bandwidth	Pass
15.247 (a) (2)	DTS 6dB Bandwidth	n/a
15.247 (b) (1) – (4)	Conducted output power	Pass
15.247 (c) (1) – (2)	Operation with directional antenna gains > 6 dBi	n/a
15.247 (d), 15.215 (b)	Conducted Emissions in Non-restricted bands	Pass
15.247 (d), 15.215 (b)	Conducted Emissions at the Band-edge	Pass
15.247 (e)	Power Spectral Density (PSD)	n/a
15.247 (f)	Hybrid system hopping requirements	n/a
15.247 (f)	Hybrid system Power Spectral Density	n/a
15.247 (g)	FHSS System requirements	Pass
15.247 (h)	FHSS spectrum sensing	n/a

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 in Restricted bands	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

2. Location of Testing

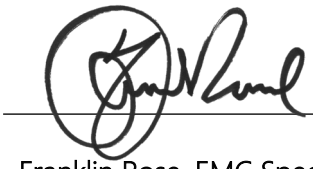
2.1 Test Laboratory

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

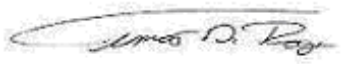
FCC test firm # 578780
FCC Designation # US1070
FCC site registration is under A2LA certificate # 0955.01
ISED Canada test site registration # 2056A
EU Notified Body # 1177
For all designations see A2LA scope # 0955.01

2.2 Testing was performed, reviewed by

Dates of Testing: September 21 - 23, 2020

Signature: 

Name & Title: Franklin Rose, EMC Specialist
Date of Signature
(YYYY-MM-DD): 2020-09-24

Signature: 

Sr. EMC Engineer
EMC-003838-NE

Name & Title: Tim Royer, EMC Engineer
Date of Signature
(YYYY-MM-DD): 2020-09-24

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

The test sample was received: September 16, 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:	O2K-TRM915
Brief Description	Smartfall Blue Pendant
Type of Modular	n/a
Model(s) #	TRMBF915, TRMBV915
Trade name	Smartfall Blue Pendant, Vibrating Blue Pendant
Firmware version	1.0
Software version	n/a
Serial Number	n/a

Technical Characteristics	
Technology	DSS/FHSS
Frequency Range	903 – 927 MHz
RF O/P Power (Max.)	7.89 dBm
Modulation	GFSK
Bandwidth & Emission Class	269.79 kHz, F1D
Number of Channels	25
Duty Cycle	13.54%
Antenna Type	Integrated
Antenna Gain (for each ant.)	0 dBi
Antenna Connector	N/A
Voltage Rating (AC or Batt.)	Battery 3 V

Antenna Characteristics			
Frequency Range	Mode / BW	Ant Gain 1	Ant Gain 2
902-928	n/a	0 dBi	n/a

3.2 Configuration of EUT

Test Modes						
Band	Mode (#)	Mode (Type)	Test Frequencies	BW (nominal)	Modulation	Number of Antennas
902-928	1	GFSK	903 MHz, 915 MHz, 927 MHz	269.79 kHz	GFSK (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 Digital Transmission System (DTS) are provided in the FCC KDB 558074 D01 DTS Measurement Guidance and in Clause 11 of ANSI C63.10-2013.

1) ANSI C63.10-2013
2) FCC KDB 558074 D01

4.2 Applied Limits and Regulatory Limits:

3) FCC CFR 47 Part 15.247

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%
Barametric pressure	30.05 inHg
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
Multimeter	HP	973A	JP37006959	9/9/20	9/9/2023
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
Pre-amp	RF-LAMBDA	RLNA00M45GA	NA	2/27/19	2/26/2022
EMI Test Receiver R&S ESU 40	Rohde & Schwarz	ESU 40	100320	8/28/18	8/27/2021

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.

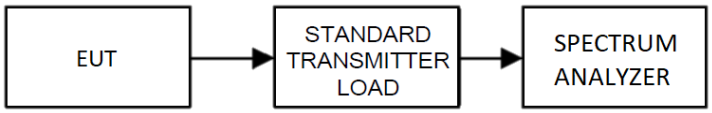
A description and/or a block diagram of the test setup is usually provided.

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 Hopping Characteristics

Limits from FCC 15.247(a)(1)(i) or 15.247 (f) as applicable, and test procedure from ANSI C63.10-2013 section 11.10

Test Setup


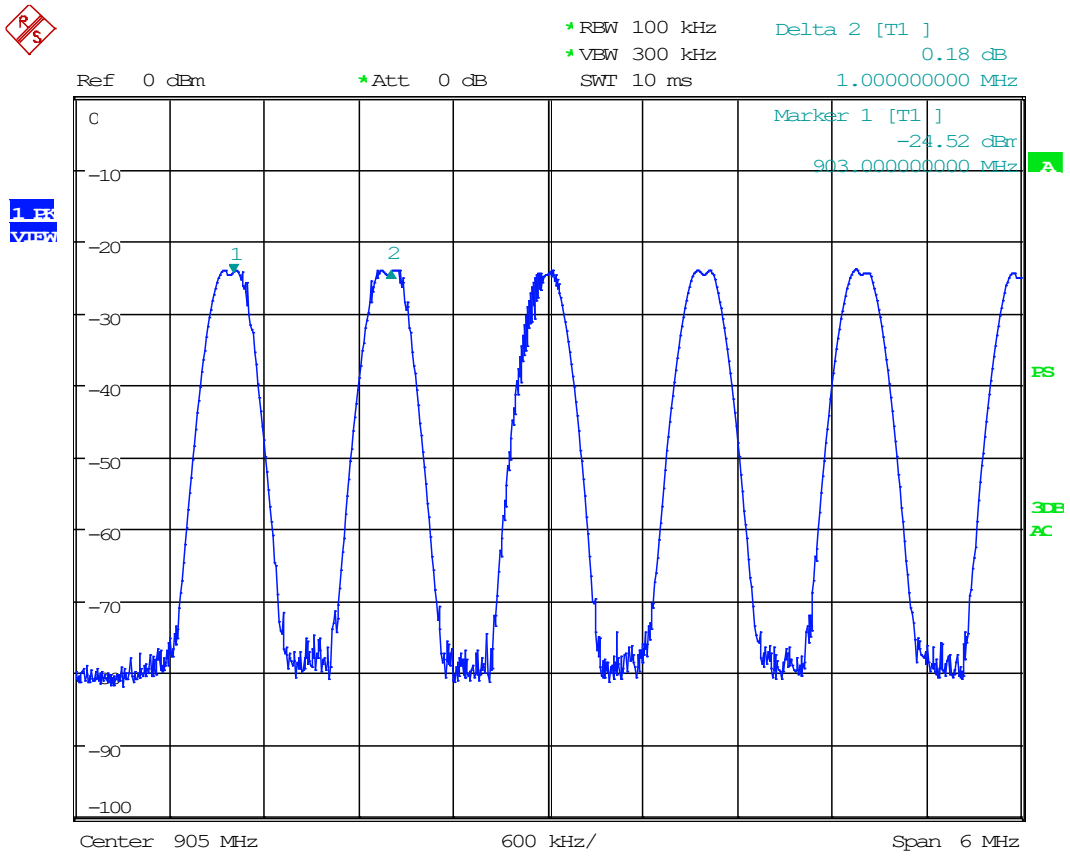
Test Results	
Carrier Frequency Separation	1 MHz
Number of Hopping Frequencies	24
Time of Occupancy	13.47 ms
Dwell Time in 10 s	53.89 ms

8.1.1 Hopping Channel Occupancy Time

Number of hops	Dwell Time (ms)	Total Occupancy Time (ms)	Limit (sec)	Pass / Fail
4	13.47	53.89	≤ 0.4	Pass

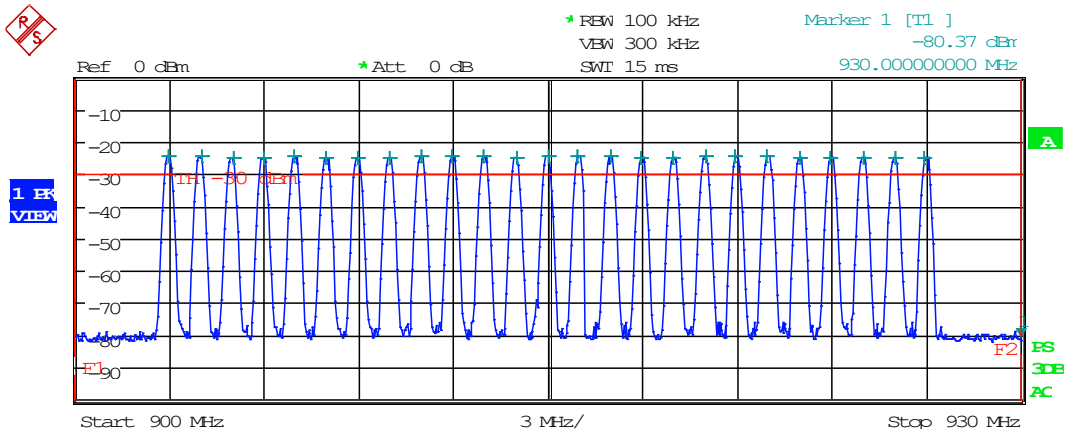
Hopping Characteristics, Spectrum Plots

8.1.2 Carrier Frequency Separation Plot



Date: 21.SEP.2020 18:12:36

8.1.3 Number of Hopping Frequencies Plot



#	Frequency	Level	#	Frequency	Level
1	902.952000 MHz	-24.47 dBm	13	915.024000 MHz	-24.72 dBm
2	904.008000 MHz	-24.78 dBm	14	915.960000 MHz	-24.69 dBm
3	905.016000 MHz	-25.01 dBm	15	917.016000 MHz	-24.57 dBm
4	906.000000 MHz	-25.07 dBm	16	917.976000 MHz	-25.25 dBm
5	906.936000 MHz	-24.78 dBm	17	918.960000 MHz	-24.93 dBm
6	907.944000 MHz	-24.97 dBm	18	920.016000 MHz	-24.69 dBm
7	908.952000 MHz	-25.13 dBm	19	920.952000 MHz	-24.63 dBm
8	909.960000 MHz	-24.97 dBm	20	921.936000 MHz	-24.56 dBm
9	910.992000 MHz	-24.82 dBm	21	923.016000 MHz	-25.34 dBm
10	911.952000 MHz	-24.75 dBm	22	923.952000 MHz	-24.90 dBm
11	912.960000 MHz	-24.60 dBm	23	925.008000 MHz	-25.10 dBm
12	914.016000 MHz	-24.95 dBm	24	926.016000 MHz	-24.98 dBm

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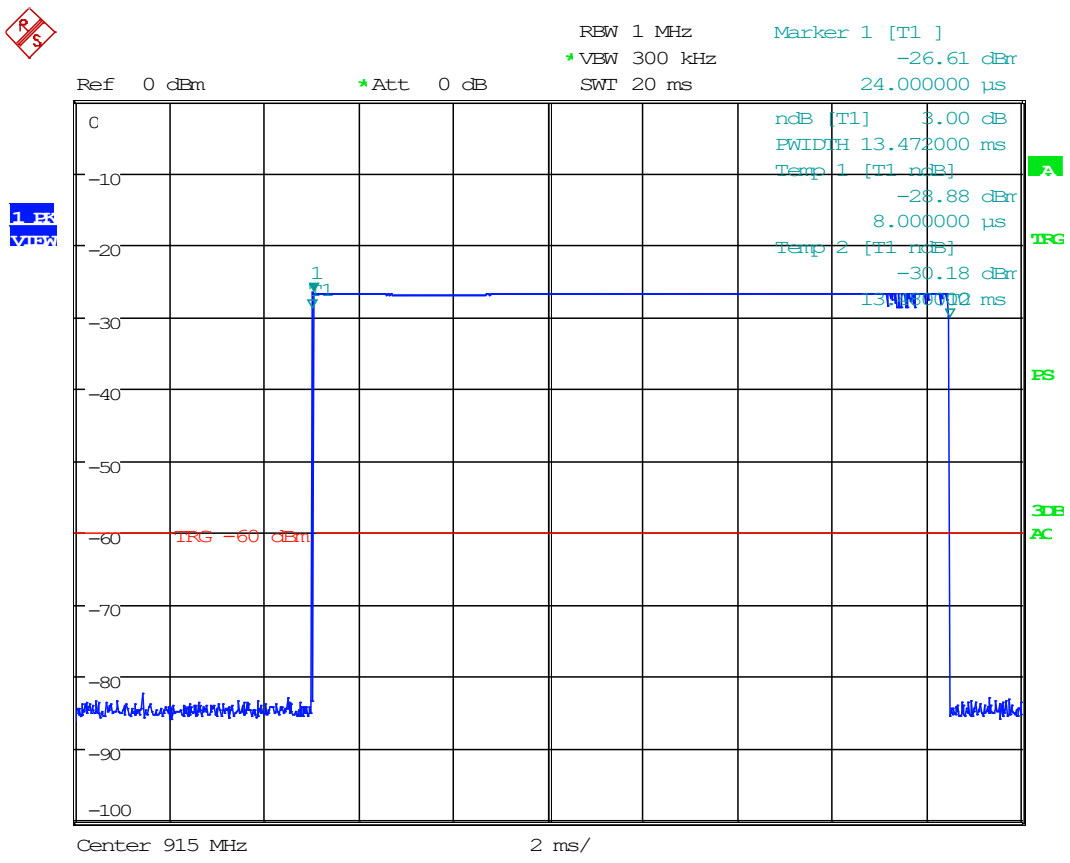
8.1.4 Time of Occupancy Plot



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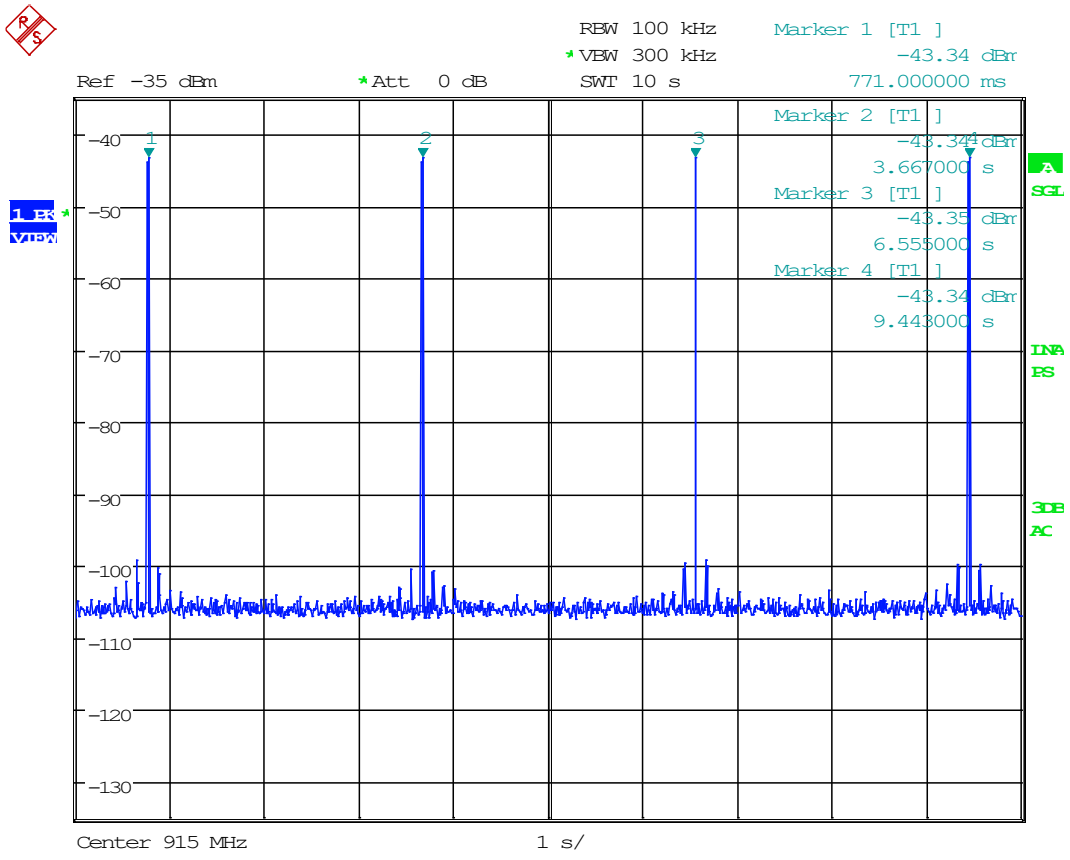
8.1.5 Hops in 10 s Plot



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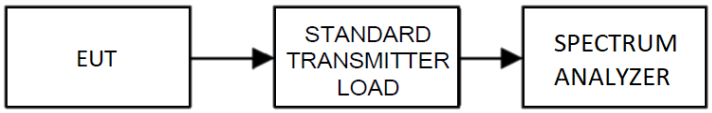
8.2 Occupied Bandwidth

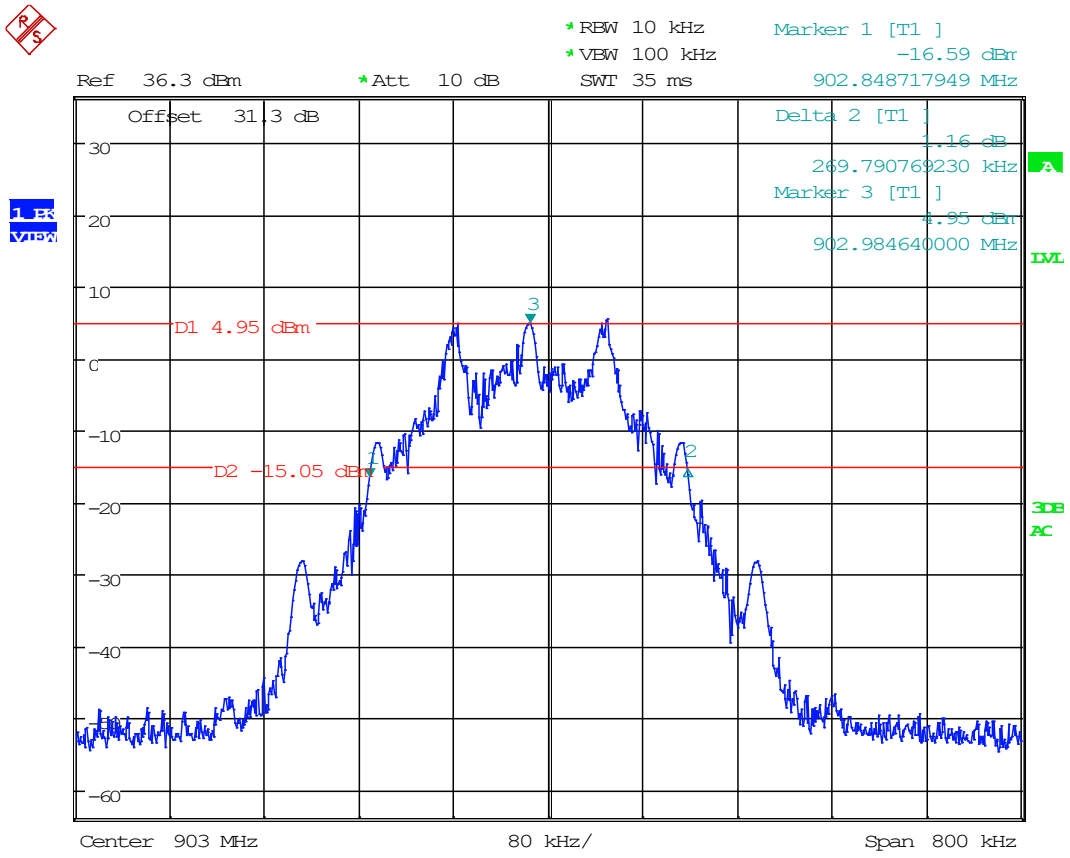
Limits from FCC Part 15.247 (a)(1) – (2) as applicable, and test procedure from ANSI C63.10-2013 section 7.8 or 11.8 as applicable.

Test Setup


Test Results, Mode 1	
Tuned Frequency (MHz)	Bandwidth (kHz)
903	269.79
915	269.23
927	269.23

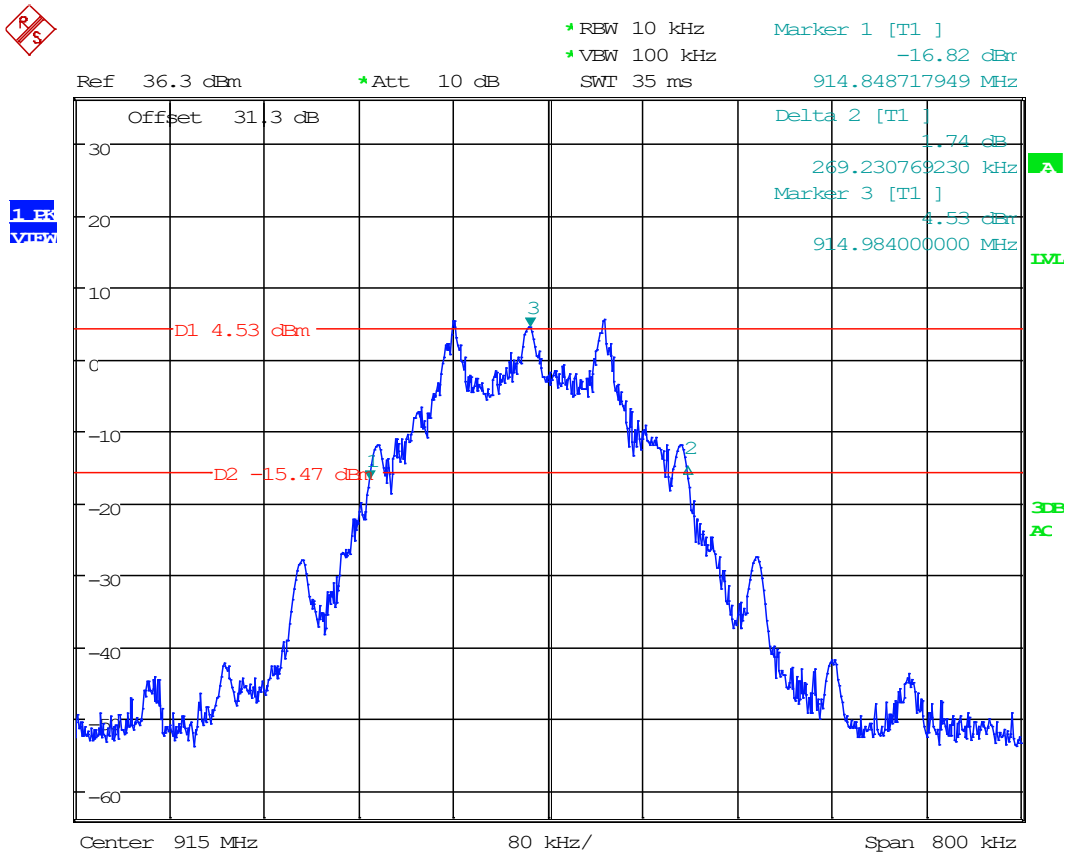
Occupied Bandwidth, Spectrum Plots

8.2.1 20 dB Bandwidth, 903 MHz



Date: 21.SEP.2020 19:47:00

8.2.2 20 dB Bandwidth, 915 MHz



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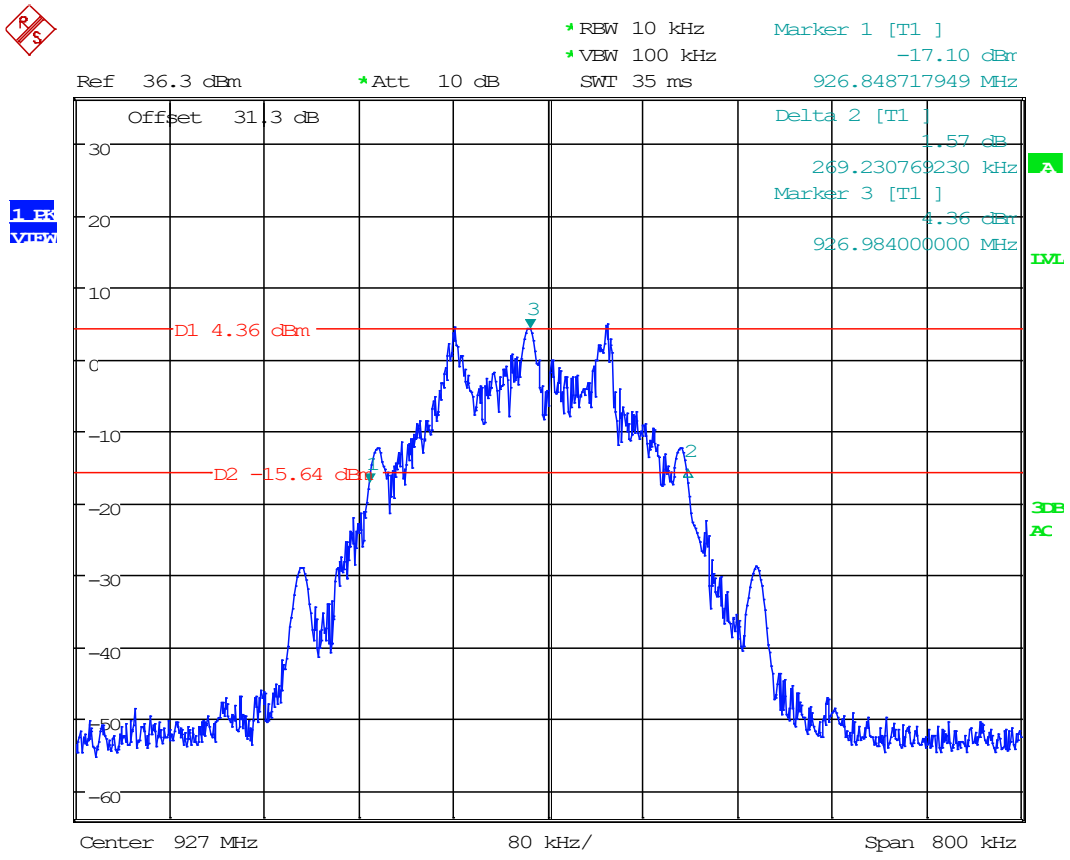
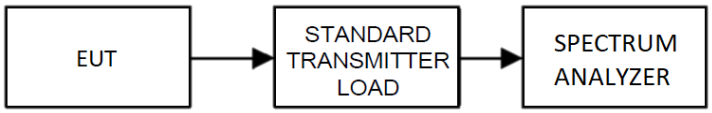
8.2.3 20 dB Bandwidth, 927 MHz



Date: 21.SEP.2020 19:50:43

8.3 Conducted Output Power

Limits from FCC Part 15.247 (b) (1) – (4) as applicable, and test procedure from ANSI C63.10-2013 section 7.8 or 11.9 as applicable.

Test Setup


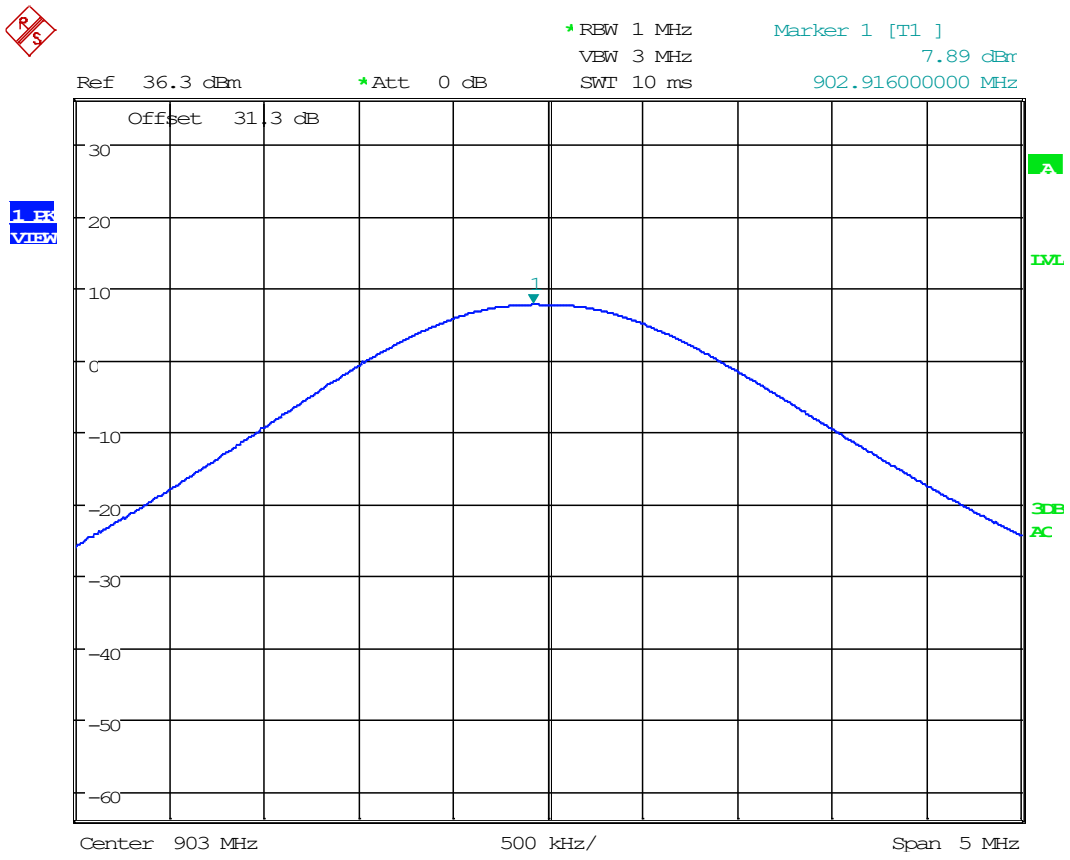
Test Results, Mode 1	
Tuned Frequency (MHz)	Power Output (dBm)
903	7.89
915	7.39
927	7.25

Point-to-Point - N/A. The EUT is not a PtP device.

MIMO - N/A. The EUT is not a MIMO device.

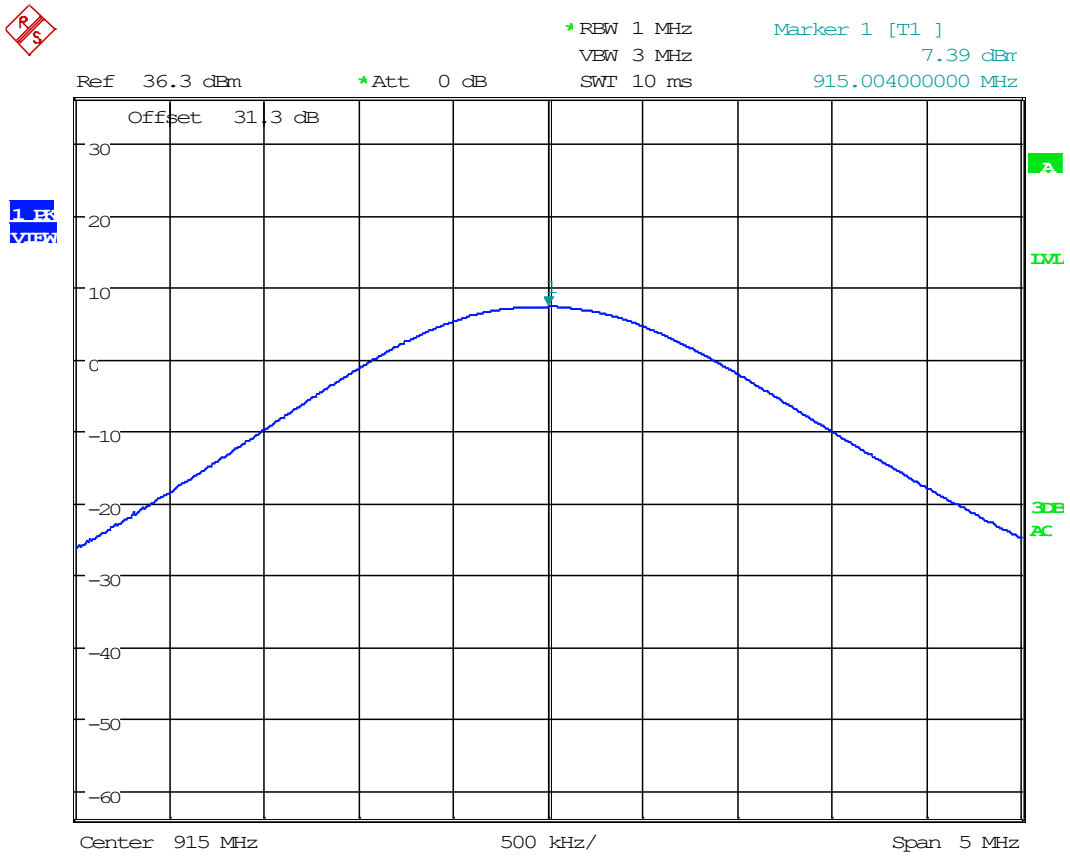
Conducted Output Power, Spectrum Plots

8.3.1 Conducted Output Power, 903 MHz



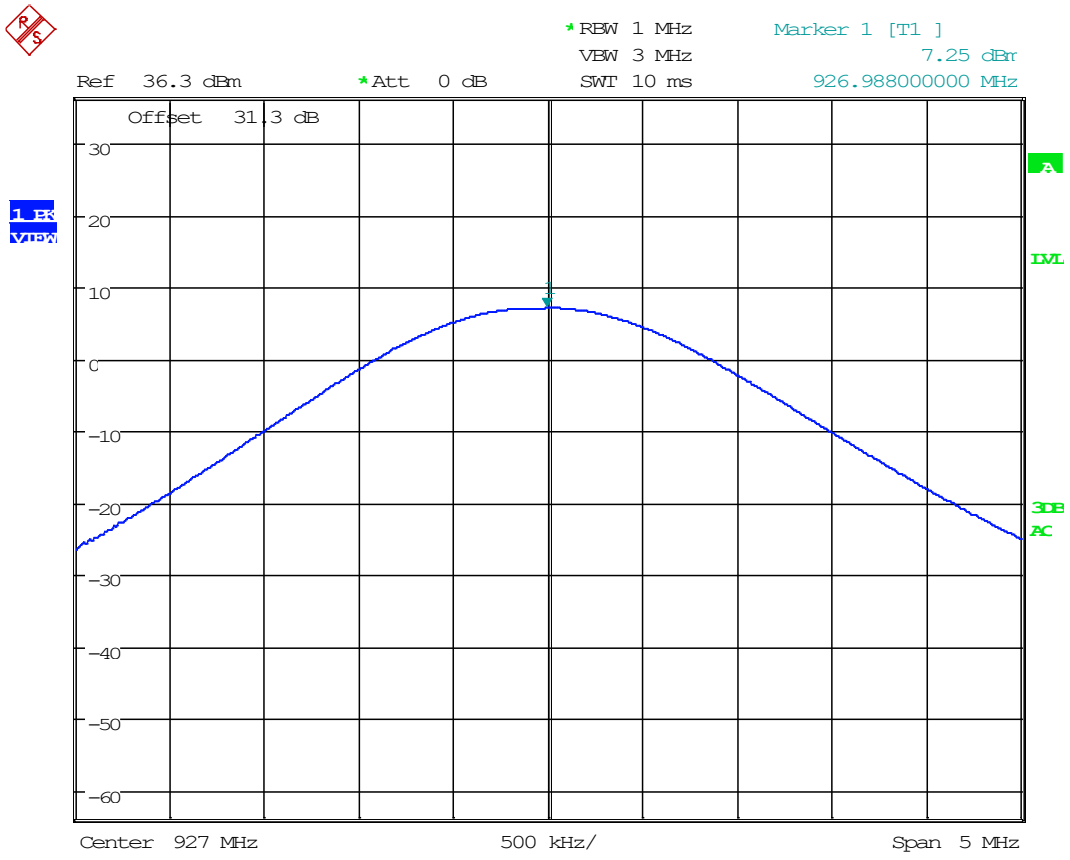
Date: 21.SEP.2020 17:00:28

8.3.2 Conducted Output Power, 915 MHz



Date: 21.SEP.2020 17:01:37

8.3.3 Conducted Output Power, 927 MHz



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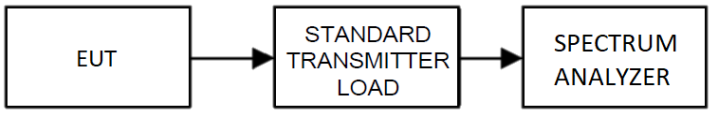
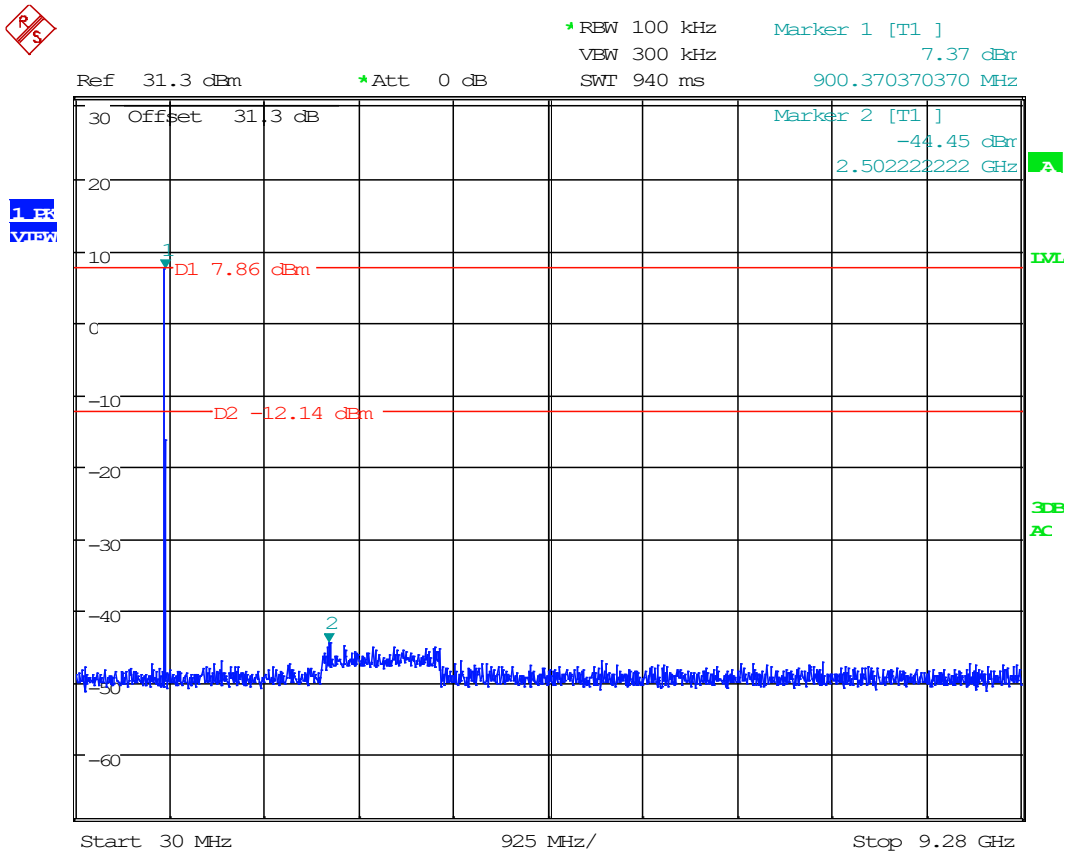
8.4 Emissions in Nonrestricted Frequency Bands (Out of Band)

Limits from FCC Part 15.247 (d) and 15.215 (b) and test procedure from ANSI C63.10-2013 section 7.8 or 11.11 as applicable.

Conducted Test Setup


Conducted Emissions in Non-Restricted Bands, Spectrum Plots

8.4.1 903 MHz



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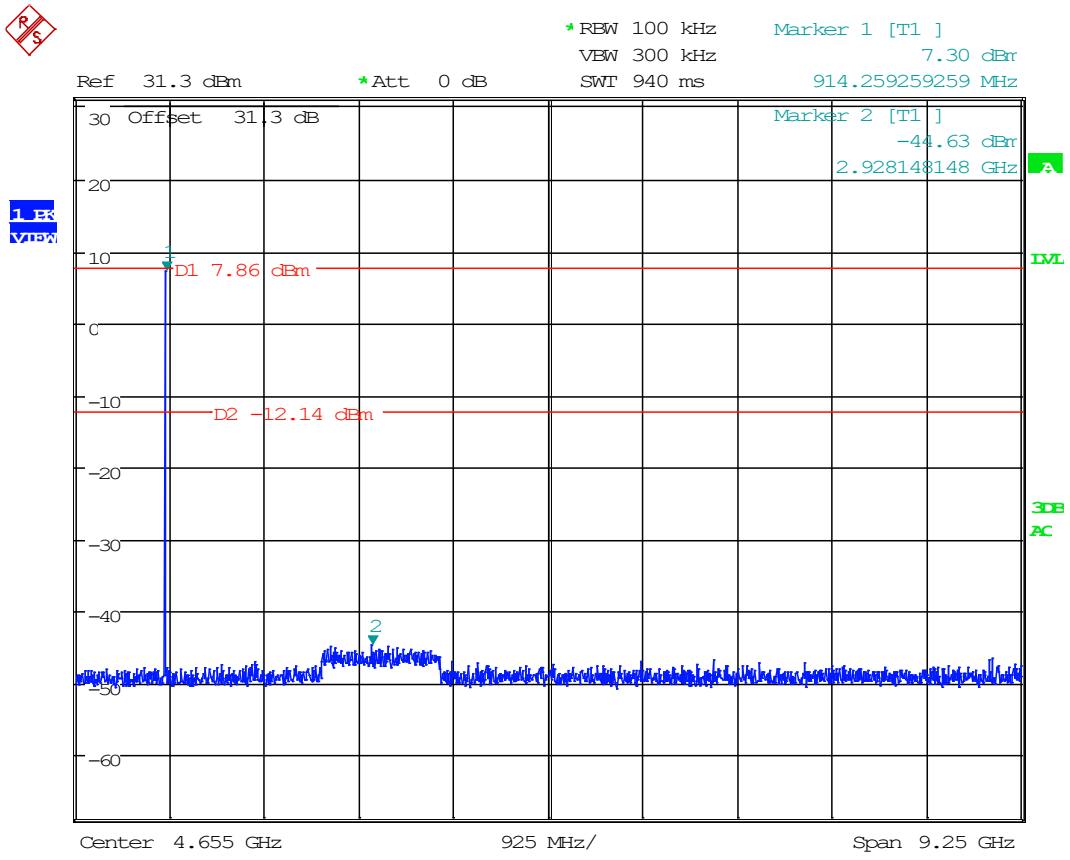
8.4.2 915 MHz



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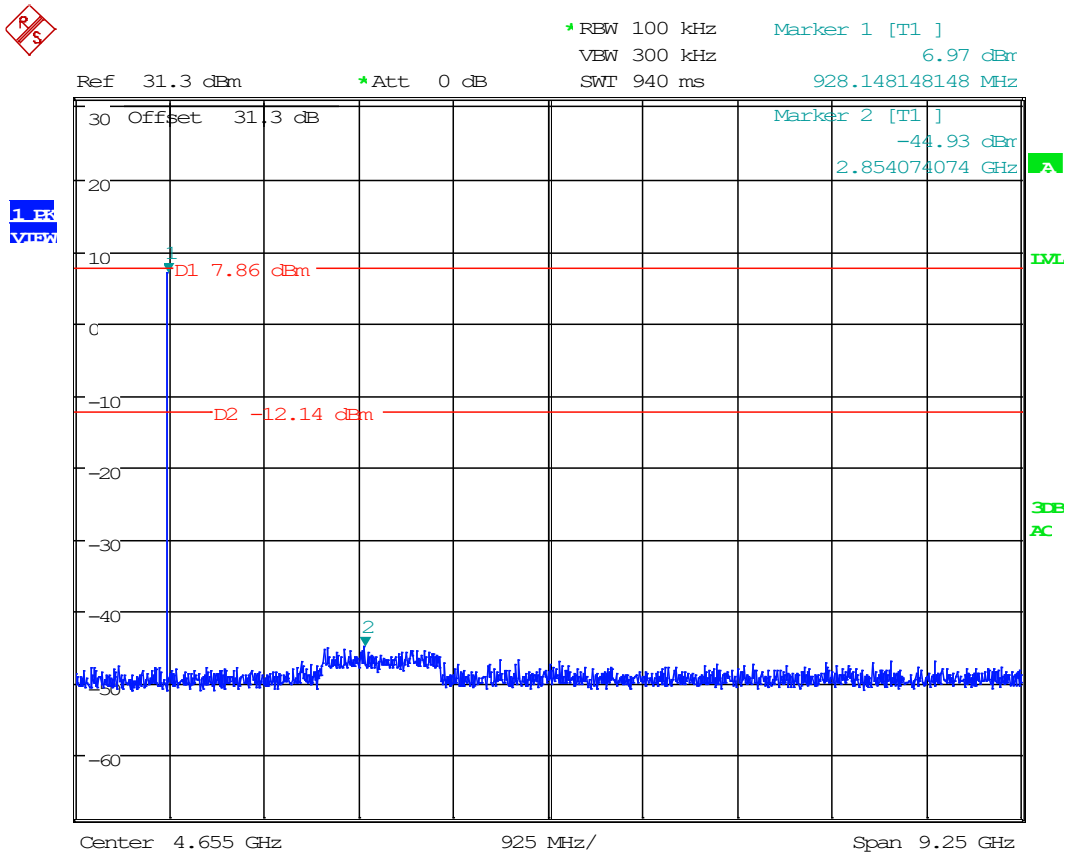
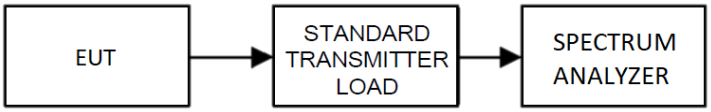
8.4.3 927 MHz



Date: 21.SEP.2020 18:21:21

8.5 Power Spectral Density

Limits from 15.247 (e) as applicable, and test procedure from ANSI C63.10-2013 section 11.10.

Test Setup


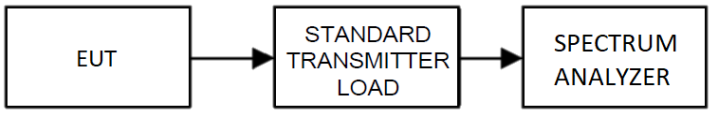
Test Results, Mode 1		
Tuned Frequency (MHz)	Resolution Bandwidth (kHz)	Power Spectral Density (dBm)

N/A. The EUT is not a DTS or Hybrid device.

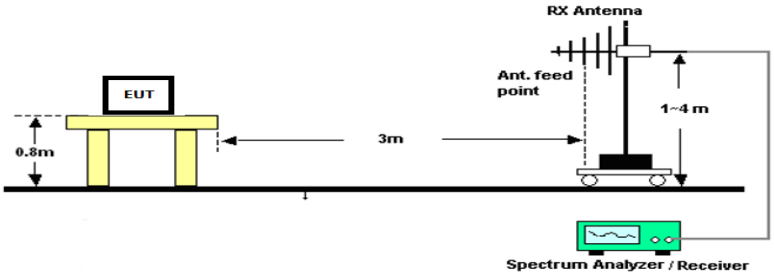
8.6 Band-edge measurements

Requirement from FCC KDB 558074 D01 and test procedure from ANSI C63.10-2013 section 7.8 or 11.13 as applicable.

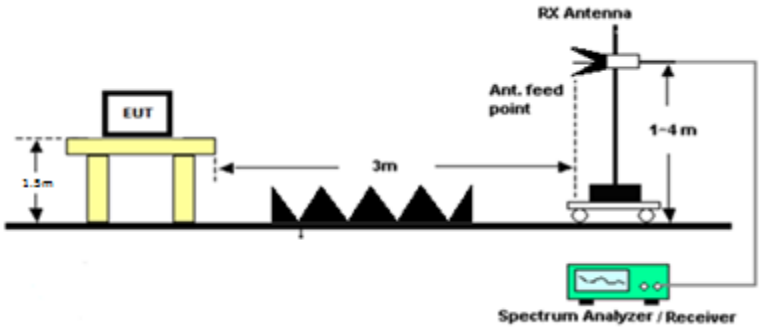
Conducted Test Setup



Radiated Test Setup, 30 – 1000 MHz

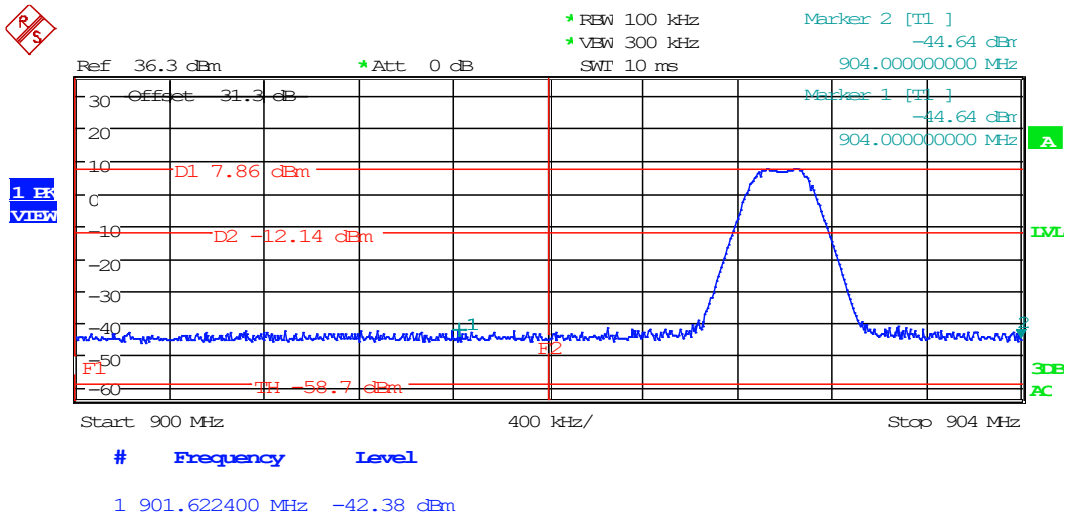


Radiated Test Setup, Above 1000 MHz



Band-edge Spectrum Plots

8.6.1 Lower Band Edge Plot, Stopped



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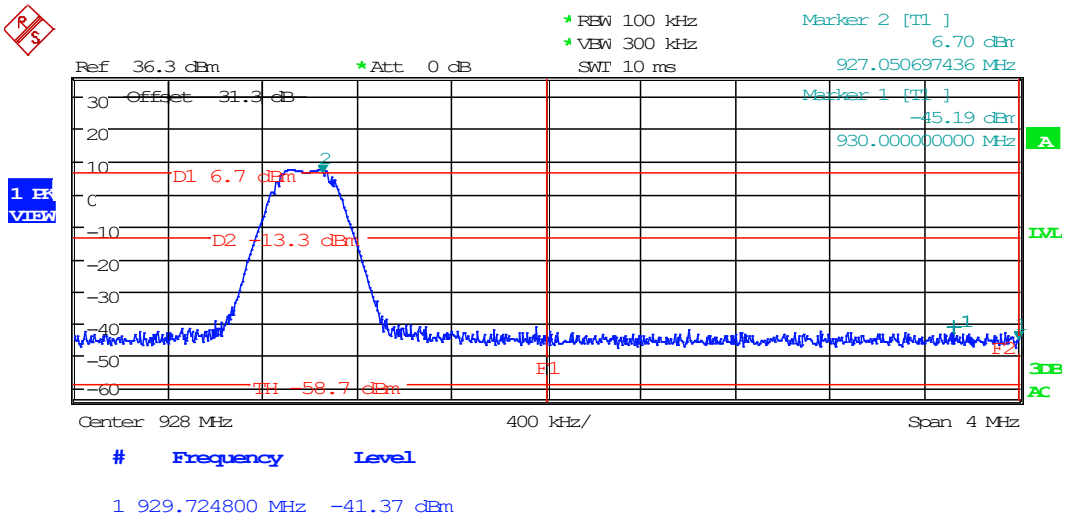
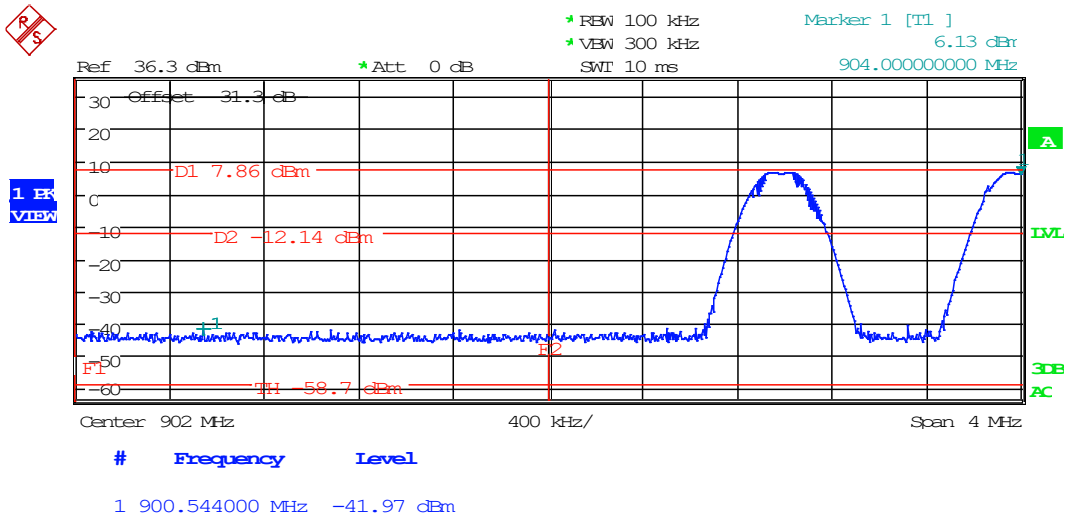
8.6.2 Upper Band Edge Plot, Stopped



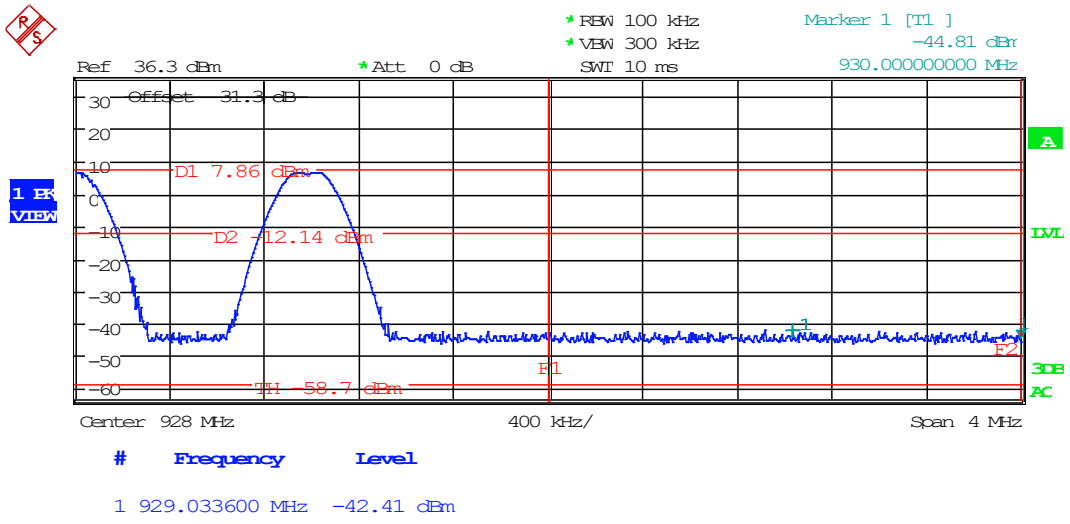
8.6.3 Lower Band Edge Plot, Hopping



#	Frequency	Level
1	900.544000 MHz	-41.97 dBm

Date: 21.SEP.2020 20:01:03

8.6.4 Upper Band Edge Plot, Hopping



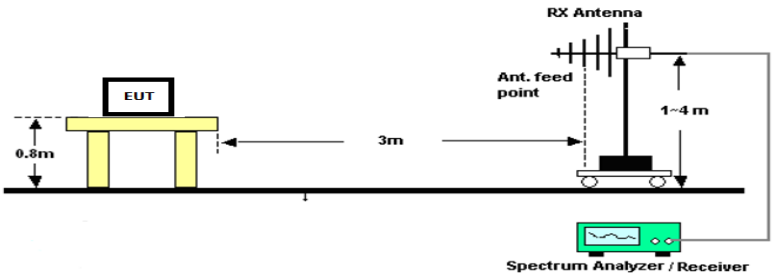
#	Frequency	Level
1	929.033600 MHz	-42.41 dBm

Date: 21.SEP.2020 20:02:29

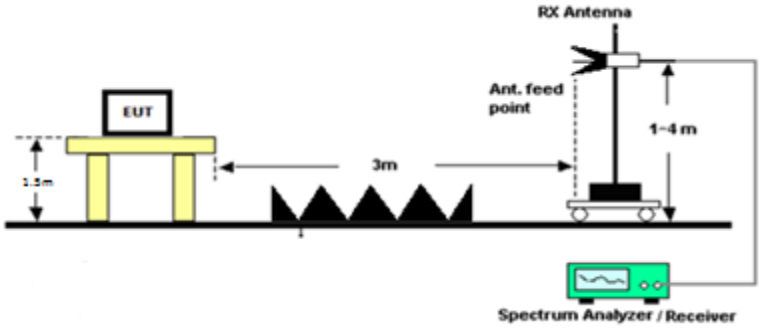
8.7 Radiated Emissions

Restricted Bands from FCC Part 15.205; Limits from FCC Part 15.209

Radiated Test Setup, 30 – 1000 MHz



Radiated Test Setup, Above 1000 MHz



Radiated Emissions in Restricted Bands, Tabular Data

8.7.1 903 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	15.205 Restricted Band	15.205, 15.35, 15.247(d) Detector	Meter Reading (dBµV)	Antenna Polarity	Coax Loss (dB)	Duty Cycle Correction (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	Limit	Margin (dBm)
903.00	2709.00	X	PK	21.80	H	6.00	17.94	32.48	3.00	42.34	73.98	31.64
903.00	2709.00	X	PK	20.00	V	6.00	17.94	32.48	3.00	40.54	73.98	33.44
903.00	2709.00	X	AVG	5.50	H	6.00	17.94	32.48	3.00	26.04	53.98	27.94
903.00	2709.00	X	AVG	4.10	V	6.00	17.94	32.48	3.00	24.64	53.98	29.34
903.00	3612.00	X	PK	11.00	H	6.64	17.94	33.13	3.00	32.83	73.98	41.15
903.00	3612.00	X	PK	10.10	V	6.64	17.94	33.13	3.00	31.93	73.98	42.05
903.00	3612.00	X	AVG	-3.20	H	6.64	17.94	33.13	3.00	18.63	53.98	35.35
903.00	3612.00	X	AVG	-3.60	V	6.64	17.94	33.13	3.00	18.23	53.98	35.75
903.00	4515.00	X	PK	9.80	H	7.37	17.94	33.92	3.00	33.15	73.98	40.83
903.00	4515.00	X	PK	9.40	V	7.37	17.94	33.92	3.00	32.75	73.98	41.23
903.00	4515.00	X	AVG	-4.40	H	7.37	17.94	33.92	3.00	18.95	53.98	35.03
903.00	4515.00	X	AVG	-4.40	V	7.37	17.94	33.92	3.00	18.95	53.98	35.03

8.7.1 915 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	15.205 Restricted Band	15.205, 15.35, 15.247(d) Detector	Meter Reading (dBµV)	Antenna Polarity	Coax Loss (dB)	Duty Cycle Correction (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	Limit	Margin (dBm)
915.00	2745.00	X	PK	21.60	H	6.08	17.94	32.40	3.00	42.14	73.98	31.84
915.00	2745.00	X	PK	18.60	V	6.08	17.94	32.40	3.00	39.14	73.98	34.84
915.00	2745.00	X	AVG	5.60	H	6.08	17.94	32.40	3.00	26.14	53.98	27.84
915.00	2745.00	X	AVG	3.70	V	6.08	17.94	32.40	3.00	24.24	53.98	29.74
915.00	3660.00	X	PK	11.40	H	6.62	17.94	33.20	3.00	33.28	73.98	40.70
915.00	3660.00	X	PK	11.40	V	6.62	17.94	33.20	3.00	33.28	73.98	40.70
915.00	3660.00	X	AVG	-2.40	H	6.62	17.94	33.20	3.00	19.48	53.98	34.50
915.00	3660.00	X	AVG	-2.40	V	6.62	17.94	33.20	3.00	19.48	53.98	34.50
915.00	4575.00	X	PK	8.30	H	7.53	17.94	34.03	3.00	31.91	73.98	42.07
915.00	4575.00	X	PK	8.20	V	7.53	17.94	34.03	3.00	31.81	73.98	42.17
915.00	4575.00	X	AVG	-5.30	H	7.53	17.94	34.03	3.00	18.31	53.98	35.67
915.00	4575.00	X	AVG	-5.30	V	7.53	17.94	34.03	3.00	18.31	53.98	35.67

8.7.1 927 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	15.205 Restricted Band	15.205, 15.35, 15.247(d) Detector	Meter Reading (dBµV)	Antenna Polarity	Coax Loss (dB)	Duty Cycle Correction (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBµV/m)	Limit	Margin (dBm)
927.00	2781.00	X	PK	19.50	H	6.15	17.94	32.46	3.00	40.17	73.98	33.81
927.00	2781.00	X	PK	17.90	V	6.15	17.94	32.46	3.00	38.57	73.98	35.41
927.00	2781.00	X	AVG	3.60	H	6.15	17.94	32.46	3.00	24.27	53.98	29.71
927.00	2781.00	X	AVG	2.30	V	6.15	17.94	32.46	3.00	22.97	53.98	31.01
927.00	3708.00	X	PK	8.50	H	6.57	17.94	33.18	3.00	30.31	73.98	43.67
927.00	3708.00	X	PK	8.60	V	6.57	17.94	33.18	3.00	30.41	73.98	43.57
927.00	3708.00	X	AVG	-5.30	H	6.57	17.94	33.18	3.00	16.51	53.98	37.47
927.00	3708.00	X	AVG	-5.40	V	6.57	17.94	33.18	3.00	16.41	53.98	37.57
927.00	4635.00	X	PK	7.80	H	7.52	17.94	33.95	3.00	31.33	73.98	42.65
927.00	4635.00	X	PK	7.30	V	7.52	17.94	33.95	3.00	30.83	73.98	43.15
927.00	4635.00	X	AVG	-6.70	H	7.52	17.94	33.95	3.00	16.83	53.98	37.15
927.00	4635.00	X	AVG	-6.70	V	7.52	17.94	33.95	3.00	16.83	53.98	37.15

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_3456-20_FCC_15.247_1	1	Initial release	September 24, 2020
	2	Revised pages 6,11 & 31	May 13, 2021

END OF TEST REPORT