TIMCO ENGINEERING, Inc.

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FCC PART 15.247 & IC RSS-247

900 MHz DTS

TEST REPORT

Applicant	**AIRNETIX, LLC**
Address	**2218 EDGARTOWN LANE**
	SMYRNA GA 30080 USA
FCC ID	**2AB8BSTS170RADIO**
IC Certification Number	**11944A-STS170RADIO**
Model Number	STS-170-RADIO
Product Description	RADIO MODULE
Date Sample Received	2/13/2018
Final Test Date	2/14/2018
Tested By	Tim Royer
Approved By	Franklin Rose

Report Number	Version Number	Description	Issue Date
240AUT18TestReport	Rev1	Initial Issue	02/27/2018
	Rev2	Revised Report	04/11/2018
	Rev3	Revised Report	04/20/2018
	Rev4	Revised Report	04/23/2018

TIMCO ENGINEERING, Inc.

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GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

Summary

The device under test does:

☒ Fulfill the general approval requirements as identified in this test report and was selected by the customer.

☐ Not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Sr. EMC Engineer
EMC-003838-NE

Tested by:
Name and Title: Tim Royer, Project Manager/Testing Engineer

Date: 02/26/2018

Reviewed and approved by: Franklin Rose, Program Manager/EMC Technician

Date: 02/27/2018

GENERAL INFORMATION

EUT Specification

Regulatory Standards	FCC Title 47 CFR Part 15.247 IC RSS-247 Issue 1 IC RSS-GEN Issue 4		
FCC ID	2AB8BSTS170RADIO		
IC Certification Number	11944A-STS170RADIO		
Model	STS-170-RADIO		
EUT Description	RADIO MODULE		
Operating Frequency	TX: 906 – 924 MHz	RX: 906 – 924 MHz	
EUT Power Source	☐ 110–120Vac/50– 60Hz		
	☒ DC Power		
	☐ Battery Operated Exclusively		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☒ Fixed	☐ Mobile	☐ Portable
Antenna Connector	Reverse SMA		
Antenna	2dBi whip, 2dBi omni, 8dBi patch, 14dBi yagi		
Test Facility	**Timco Engineering Inc. located at 849 NW State Road 45 Newberry, FL 32669 USA. Designation #: US1070**		
Test Conditions	Temperature: 24-26ºC Relative humidity: 50-65%		
Measurement Standard	ANSI C63.10-2013 (Measurement Procedures) ANSI C63.4-2014 (Radiated Site Validation)		
Test Exercise	The EUT was operated in a normal operational mode		

Test Supporting Equipment

Device	Manufacturer	Model	S/N	Supplied By	Used For
n/a	n/a	n/a	n/a	n/a	n/a

RESULTS SUMMARY

FCC Rule Part No.	IC Standard Ref.	Requirement	Test Item	Result
---	RSS-GEN 6.6	Occupied Bandwidth	99% Bandwidth	Pass
15.247(a)(e)	RSS-247 § 5.2	Digital Transmission Systems	6 dB Bandwidth	Pass
			Power Spectral Density	Pass
15.247(b)	RSS-247 § 5.4	Transmitter Output Power and Equivalent Isotropically Radiated Power	Peak Power Output (ERP)	Pass
			Antenna Gain (EIRP)	Pass
15.247(d)	RSS-247 § 5.5	Unwanted Emissions	Bandedge	Pass
			Radiated Spurious	Pass
FCC 15.207(a)	---	AC Power Line Conducted Emissions	---	Pass

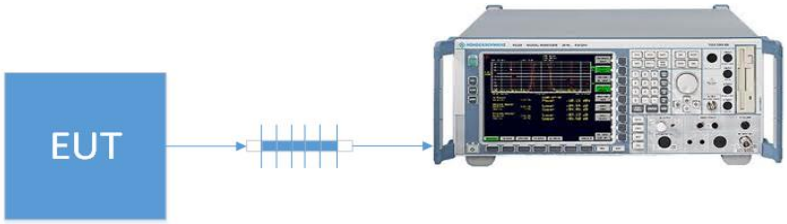
OCCUPIED BANDWIDTH

Rules Part No.: IC RSS 247 § 5.1.1

IC Requirements: 99% emission bandwidth reporting only

Test Method: RSS-GEN 6.6 Occupied bandwidth

Setup:



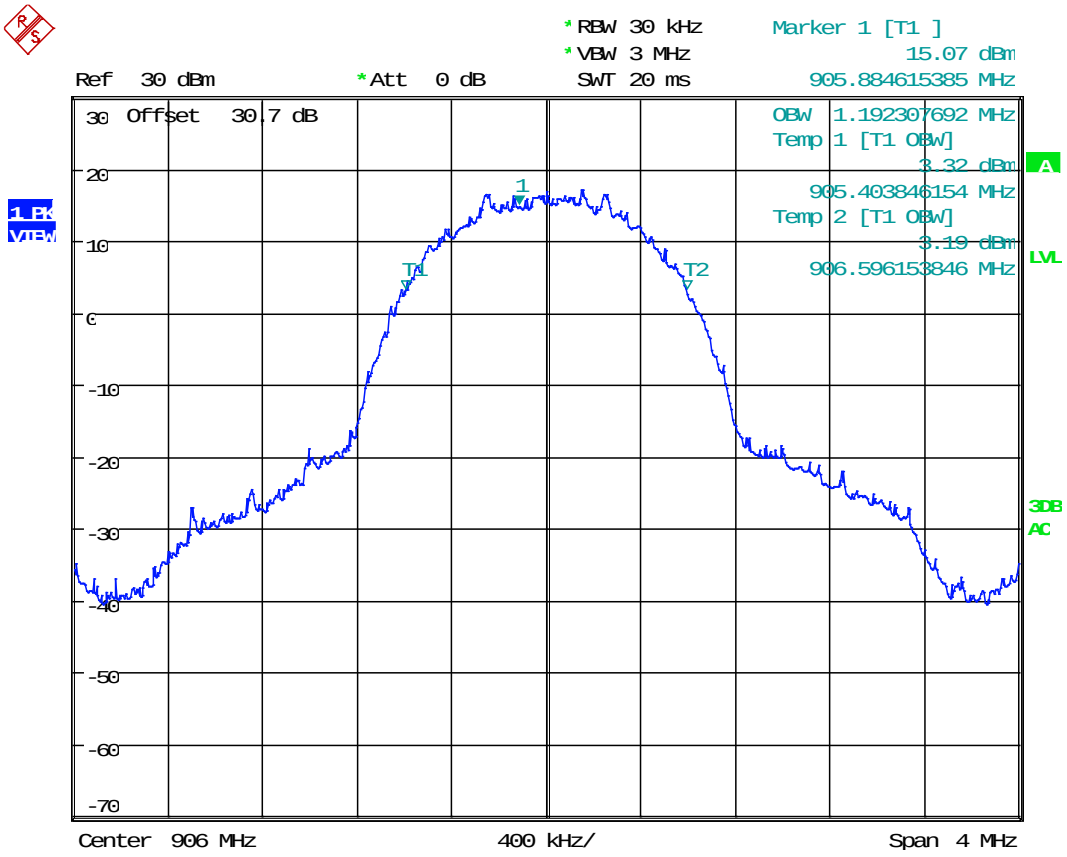
Test Data: **99% Measurement Table**

Tuned Frequency (MHz)	Mode 1 99% dB BW (MHz)
906	1.19
914	1.19
924	1.19

RESULT: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: **99% dB OBW Low End of Band Plot**

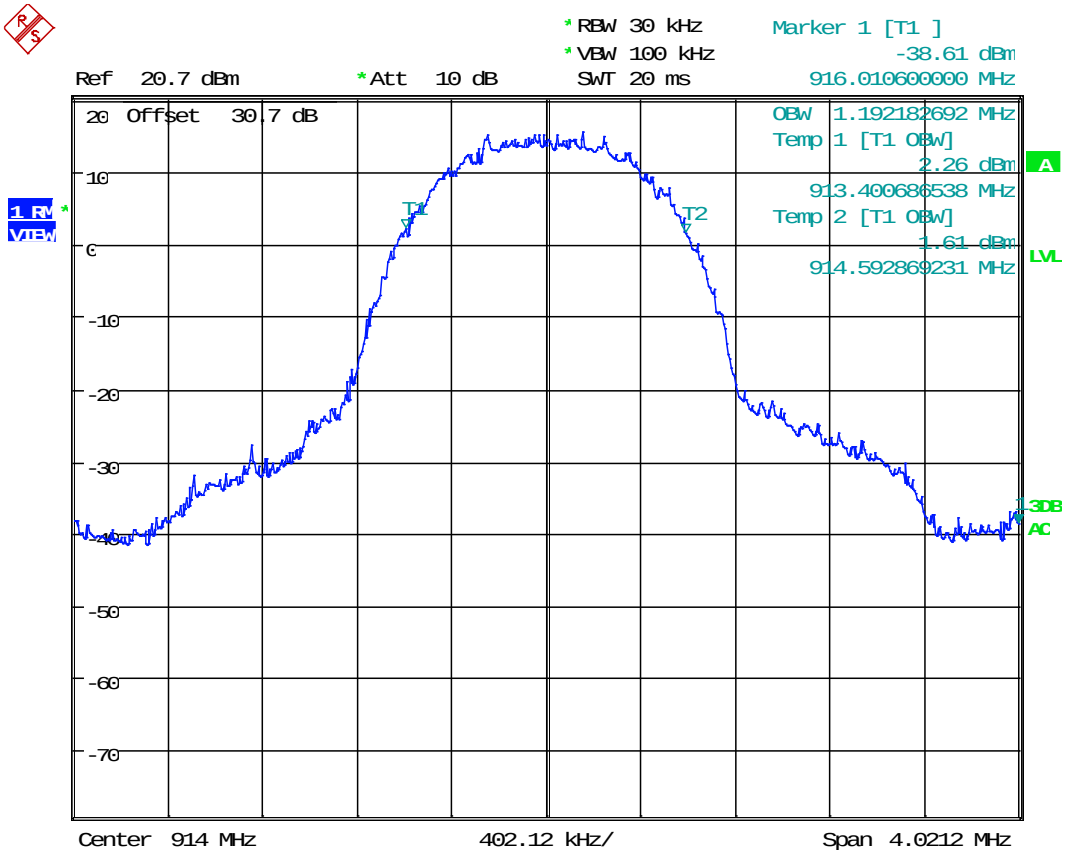


Date: 14.FEB.2018 08:59:39

RESULT: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: **99% dB OBW Middle of Band Plot**

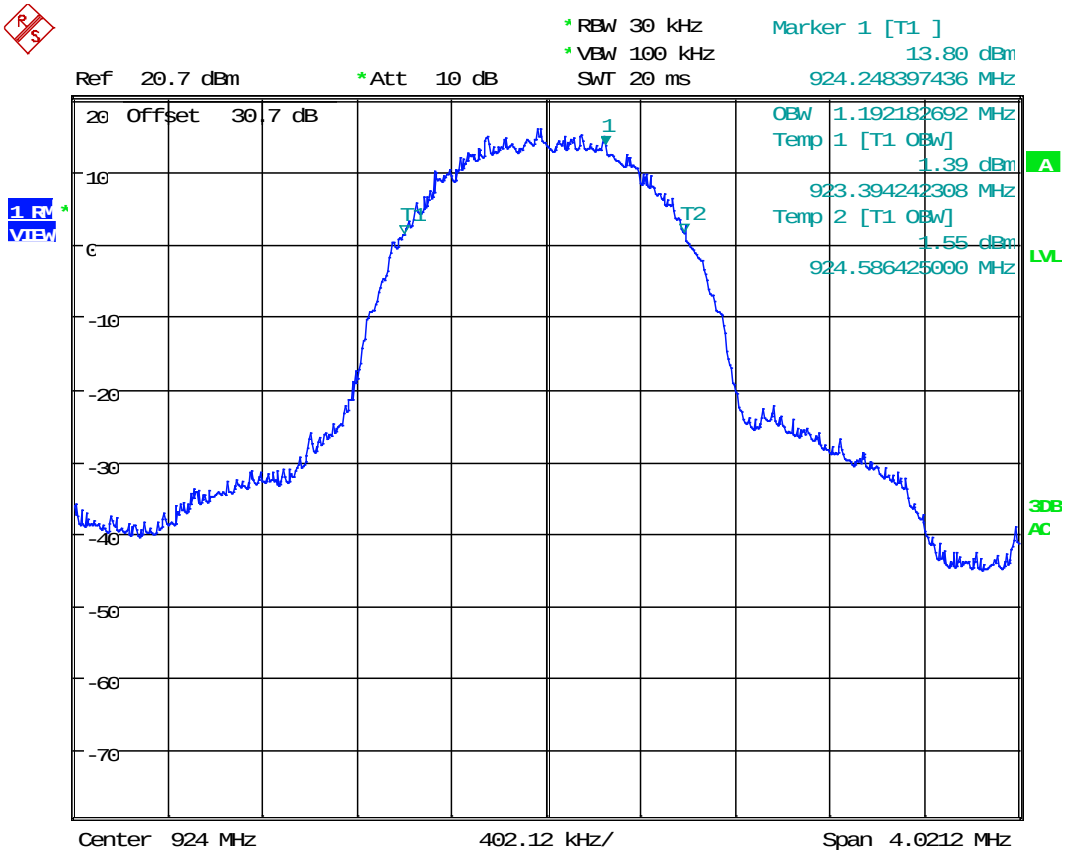


Date: 13.FEB.2018 09:44:16

RESULT: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: **99% dB OBW High End of Band Plot**



Date: 13.FEB.2018 09:42:58

RESULT: Meets Requirements

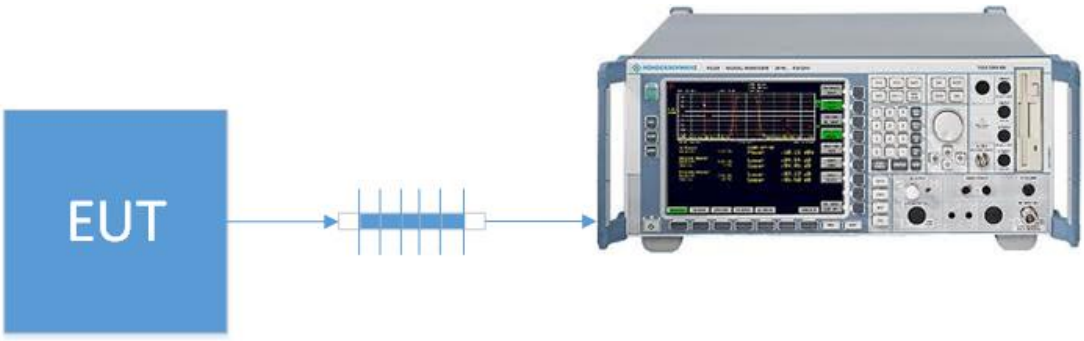
DTS BANDWIDTH

Rules Part No.: FCC 15.247 (a)(2) , IC RSS 247 § 5.2.1

Requirements: The minimum 6 dB bandwidth shall be 500 kHz.

Test Method: ANSI C63.10 § 11.8.1 DTS Bandwidth Option 1

Setup:



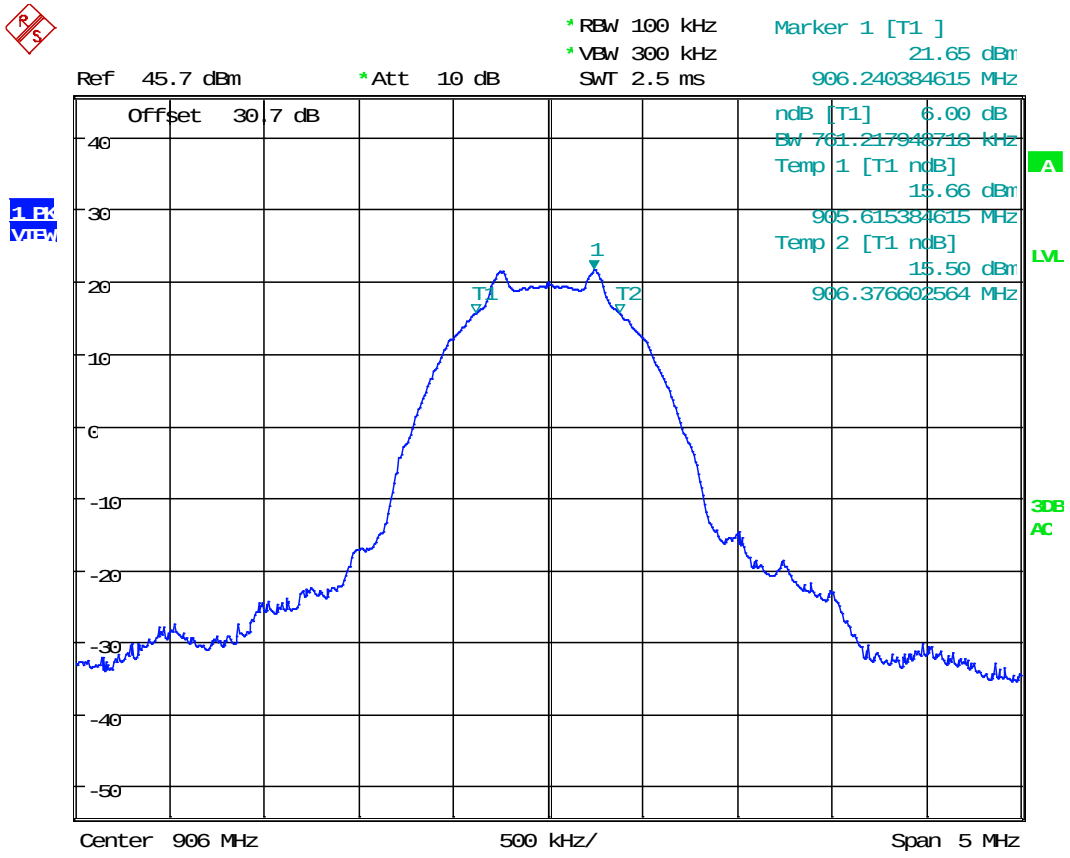
Test Data: 6 dB Occupied Bandwidth Measurement Table

Tuned Frequency (MHz)	6 dB BW (KHz)	Limit (KHz)	Margin (KHz)
906	761.21	≥ 500	261.21
914	739.16	≥ 500	239.16
924	761.21	≥ 500	261.21

RESULT: Meets Requirements

DTS BANDWIDTH

Test Data: **6dB Bandwidth Plot Low End of Band**

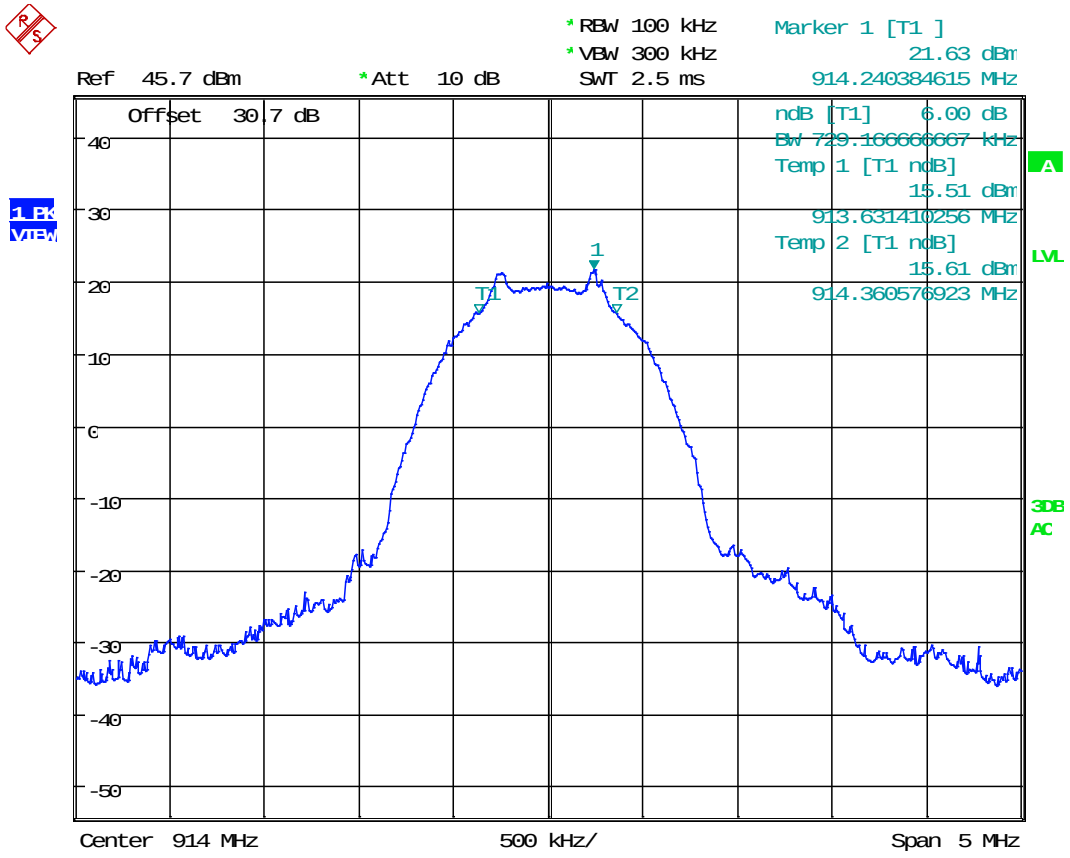


Date: 13.FEB.2018 09:38:50

RESULT: Meets Requirements

DTS BANDWIDTH

Test Data: **6dB Bandwidth Plot Middle of Band**

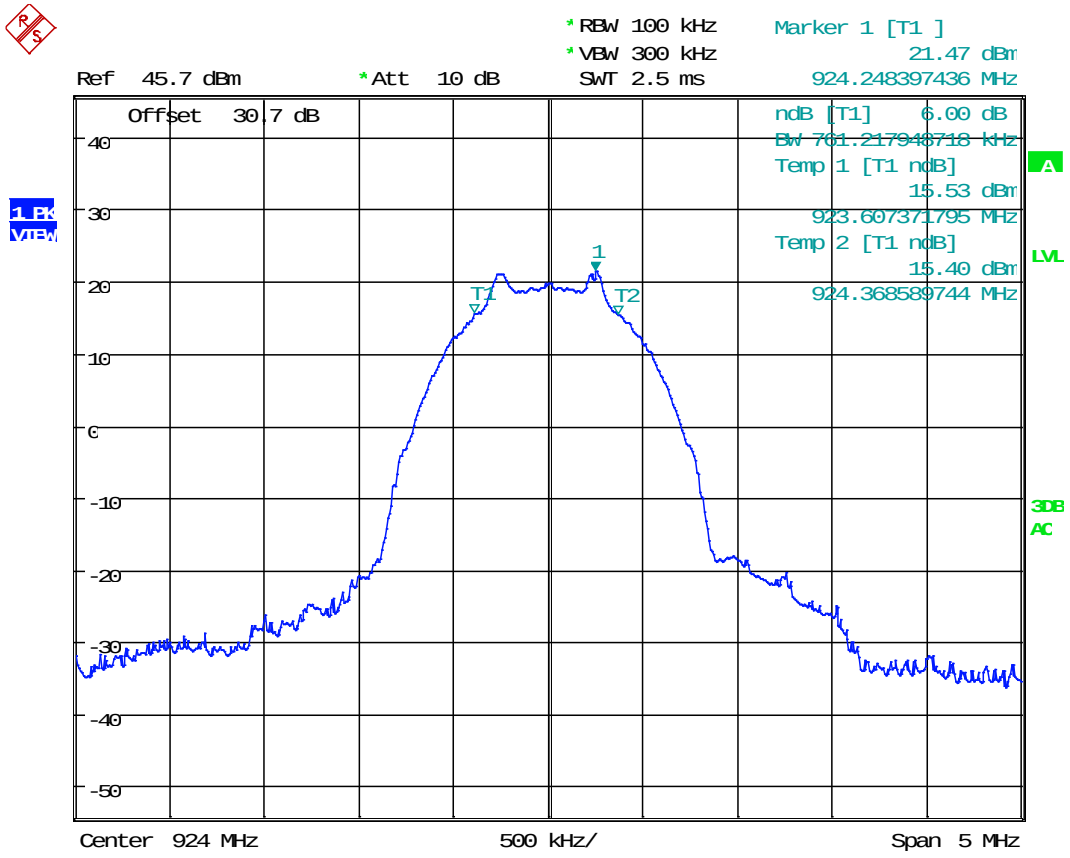


Date: 13.FEB.2018 09:40:06

RESULT: Meets Requirements

DTS BANDWIDTH

Test Data: **6dB Bandwidth Plot High end of Band**



Date: 13.FEB.2018 09:40:59

RESULT: Meets Requirements

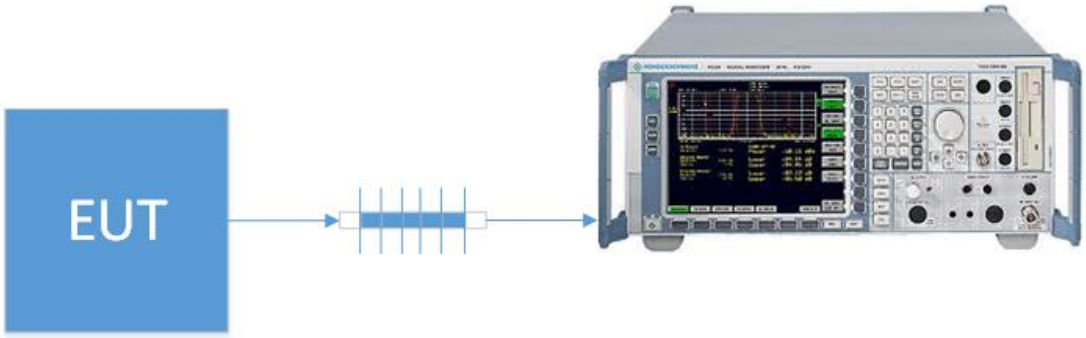
PEAK POWER OUTPUT

Rules Part No.: FCC 15.247(b) (3) (4), IC RSS 247 § 5.4.4

Requirements: Maximum Conducted Peak Power Output shall not exceed 1 Watt
Also the Peak Power Output shall not exceed 4 Watts EIRP

Test Method: ANSI C63.10 § 11.2 Power Limits, definitions, and device configuration
ANSI C63.10 § 11.9.1.1 Fundamental Output Power RBW ≥ DTS Bandwidth
ANSI C63.10 § Annex G Relationship among Field Strength and ERP/EIRP

Setup:



PEAK POWER OUTPUT

Test Data: **Peak Conducted Power Output Measurement Table**

Peak Conducted Power Output Measurement				
Tuned Frequency (MHz)	$P_{Conducted}$ (dBm)	$P_{Conducted}$ (W)	Limit (W)	Margin (W)
906	21.92	0.15560	1.00	0.84440
914	21.93	0.15596	1.00	0.84404
924	21.86	0.15346	1.00	0.84654

EIRP formula: EIRP = Pconducted + 14 dBi		

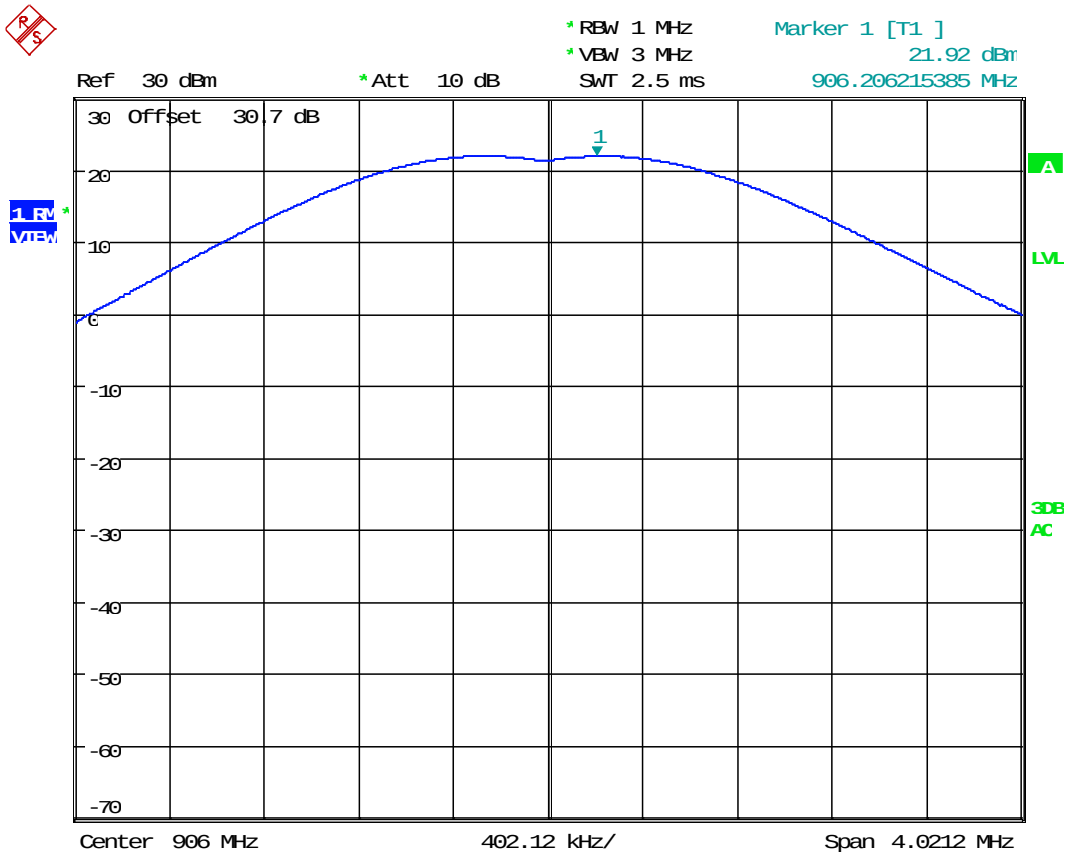
Peak EIRP Power Output Calculation				
Tuned Frequency (MHz)	$P_{Conducted}$ (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
2402	21.92	35.92000	36.00	0.08000
2442	21.93	35.93000	36.00	0.07000
2480	21.86	35.86000	36.00	0.14000

Note: Maximum antenna gain of 14dBi was used

RESULT: Meets Requirements

PEAK POWER OUTPUT

Test Data: **Peak Power Output Plot Low End of Band**

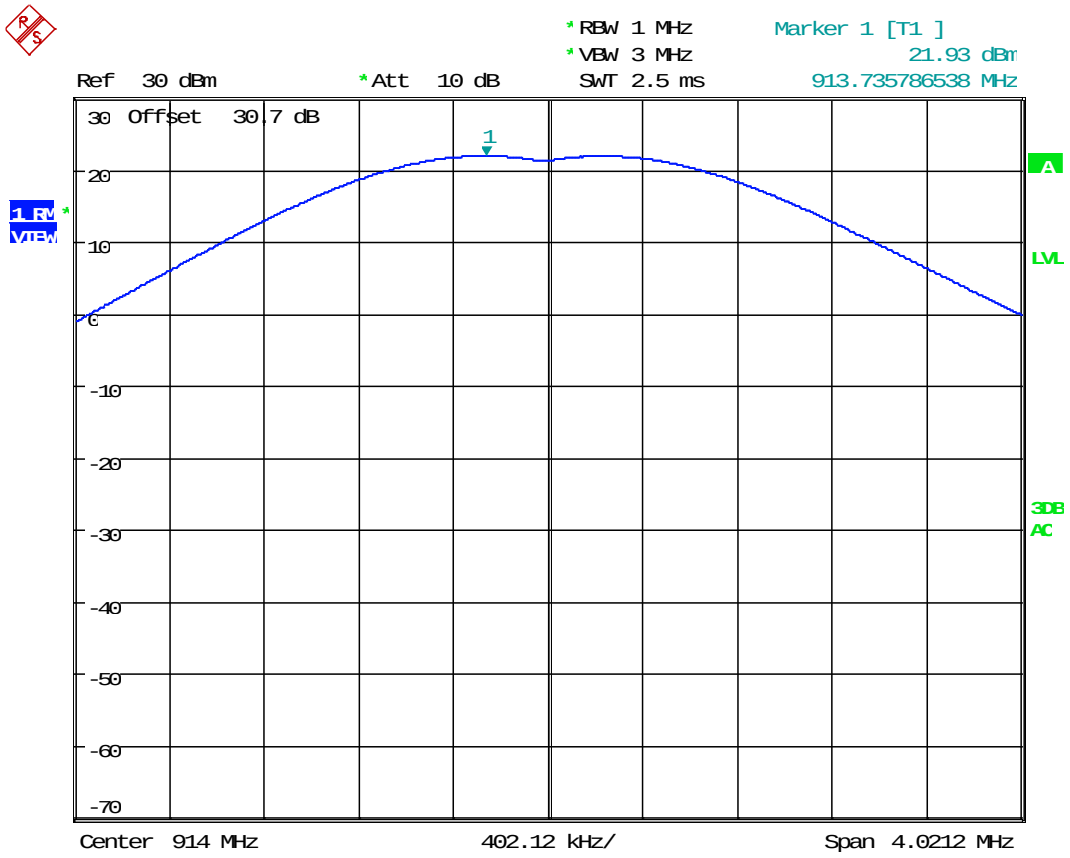


Date: 13.FEB.2018 09:48:45

RESULT: Meets Requirements

PEAK POWER OUTPUT

Test Data: **Peak Power Output Plot Middle of Band**

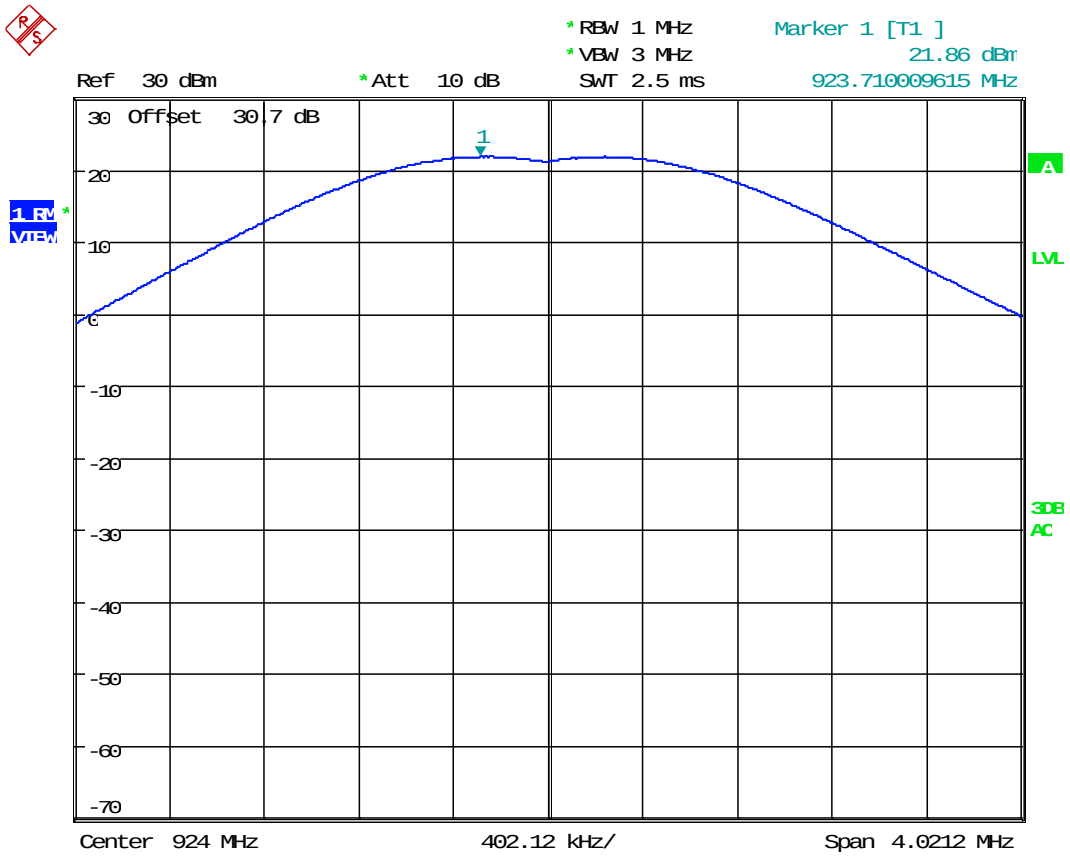


Date: 13.FEB.2018 09:50:20

RESULT: Meets Requirements

PEAK POWER OUTPUT

Test Data: **Peak Power Output High End of Band**



Date: 13.FEB.2018 09:51:00

RESULT: Meets Requirements

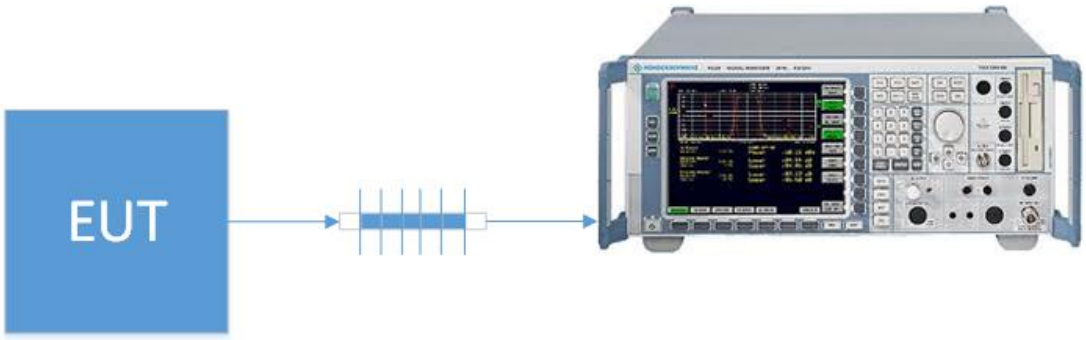
POWER SPECTRAL DENSITY

Rules Part No.: FCC 15.247(e), IC RSS 247 § 5.2.2

Requirements: The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Method: ANSI C63.10 § 11.2 Power Limits, definitions, and device configuration
ANSI C63.10 § 11.10.2 Maximum PSD in the fundamental- Method PKPSD

Setup:



POWER SPECTRAL DENSITY

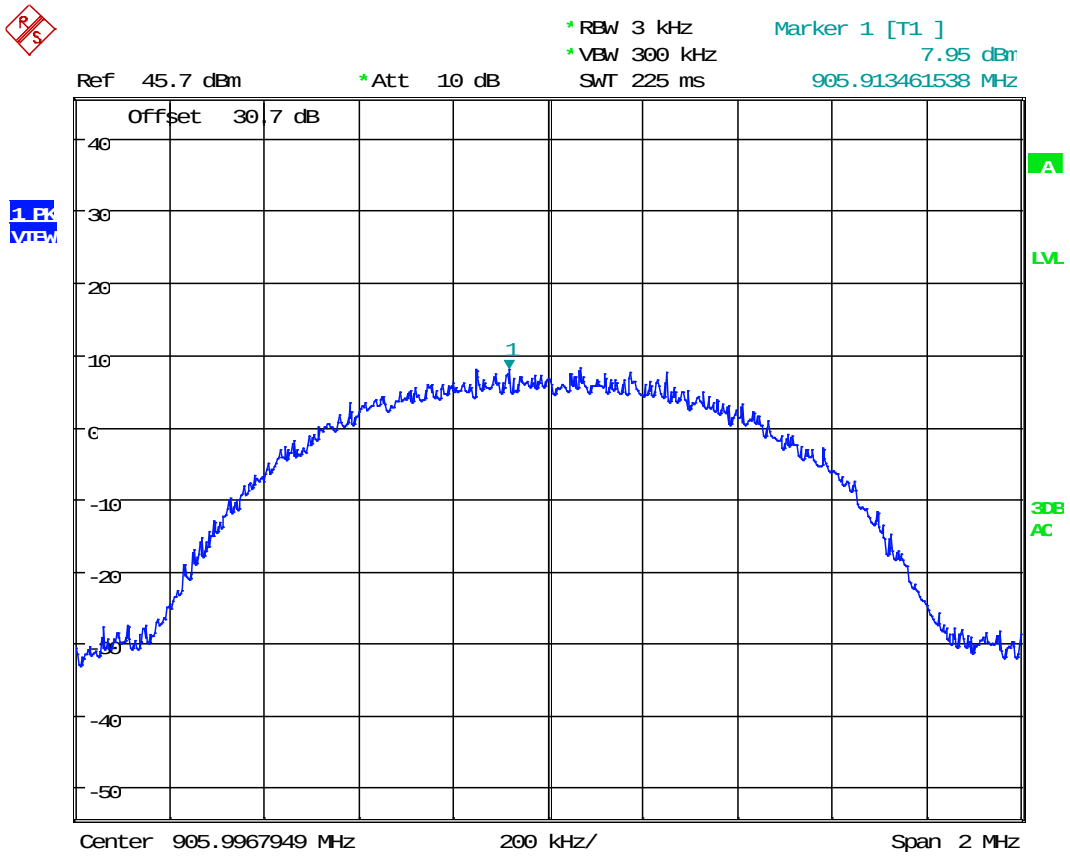
Test Data: **Power Spectral Density Measurement Table**

Peak Conducted Power Spectral Density			
Tuned Frequency (MHz)	Level (dBm/3KHz)	Limit (dBm/3KHz)	Margin (dB)
906	7.95	8.00	0.05
914	7.57	8.00	0.43
924	7.44	8.00	0.56

RESULT: Meets Requirements

POWER SPECTRAL DENSITY

Test Data: **Power Spectral Density Plot Low End of Band**

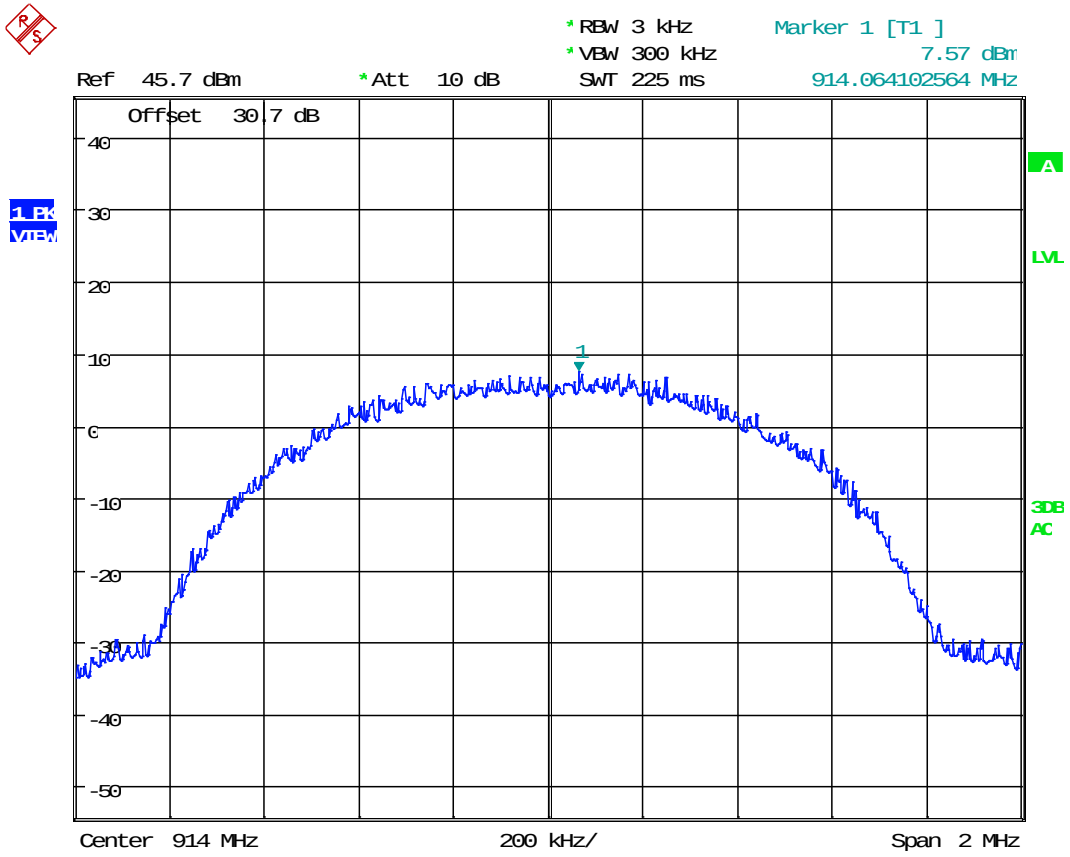


Date: 13.FEB.2018 09:25:54

RESULT: Meets Requirements

POWER SPECTRAL DENSITY

Test Data: **Power Spectral Density Plot Middle of Band**

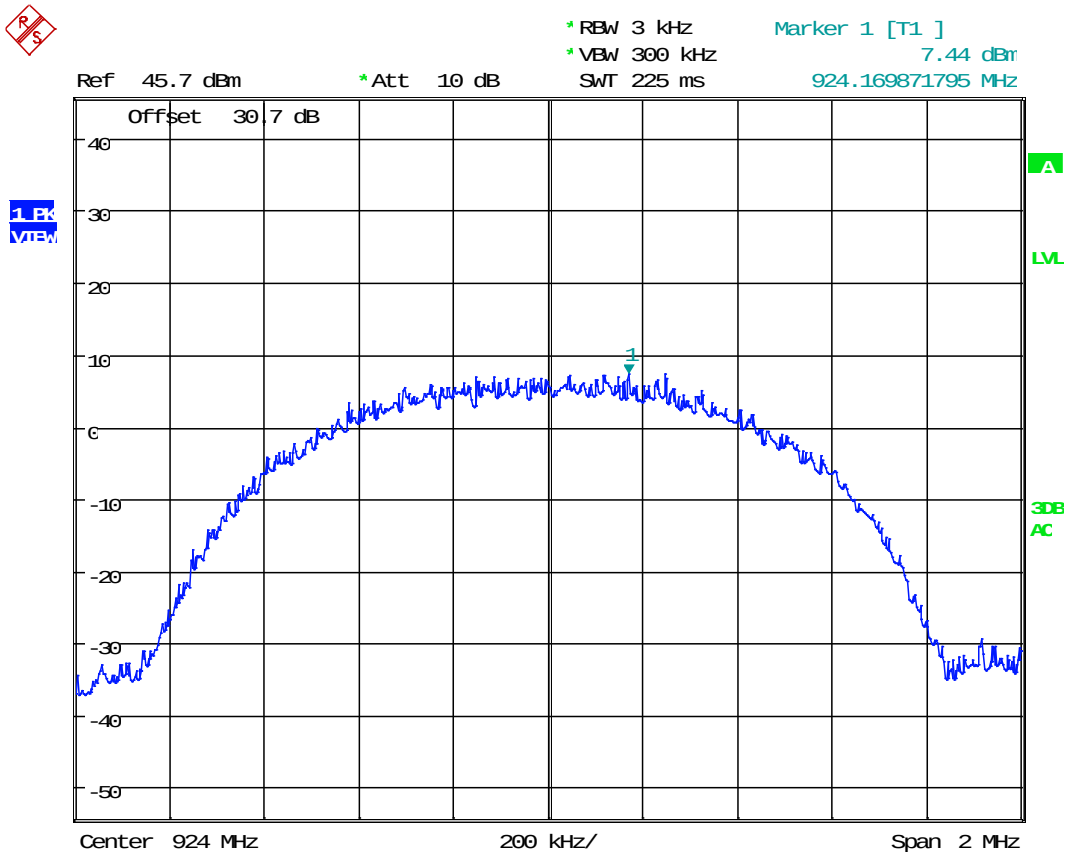


Date: 13.FEB.2018 09:27:14

RESULT: Meets Requirements

POWER SPECTRAL DENSITY

Test Data: **Power Spectral Density Plot High End of Band**



Date: 13.FEB.2018 09:28:12

RESULT: Meets Requirements

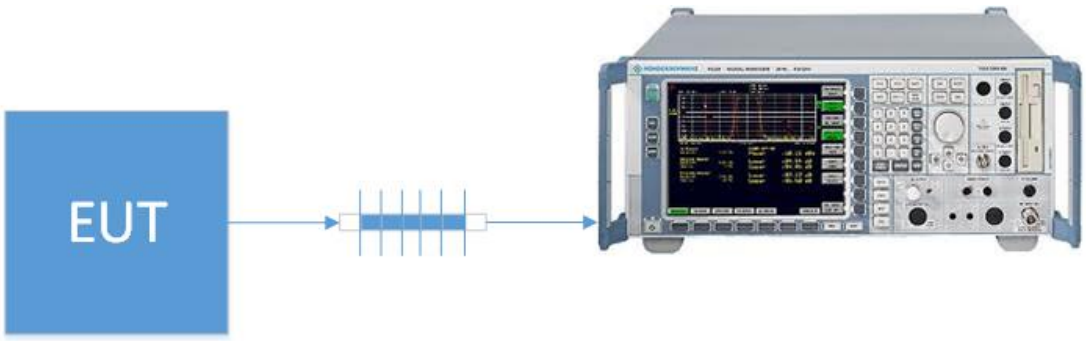
OCCUPIED BANDWIDTH

Rules Part No.: FCC 15.215 (c), IC RSS GEN § 6.6

Requirements: The 99% Bandwidth is for reporting only.

Test Method: ANSI C63.10 § 6.9.3 Occupied Bandwidth- 99% Power Bandwidth procedure

Setup:



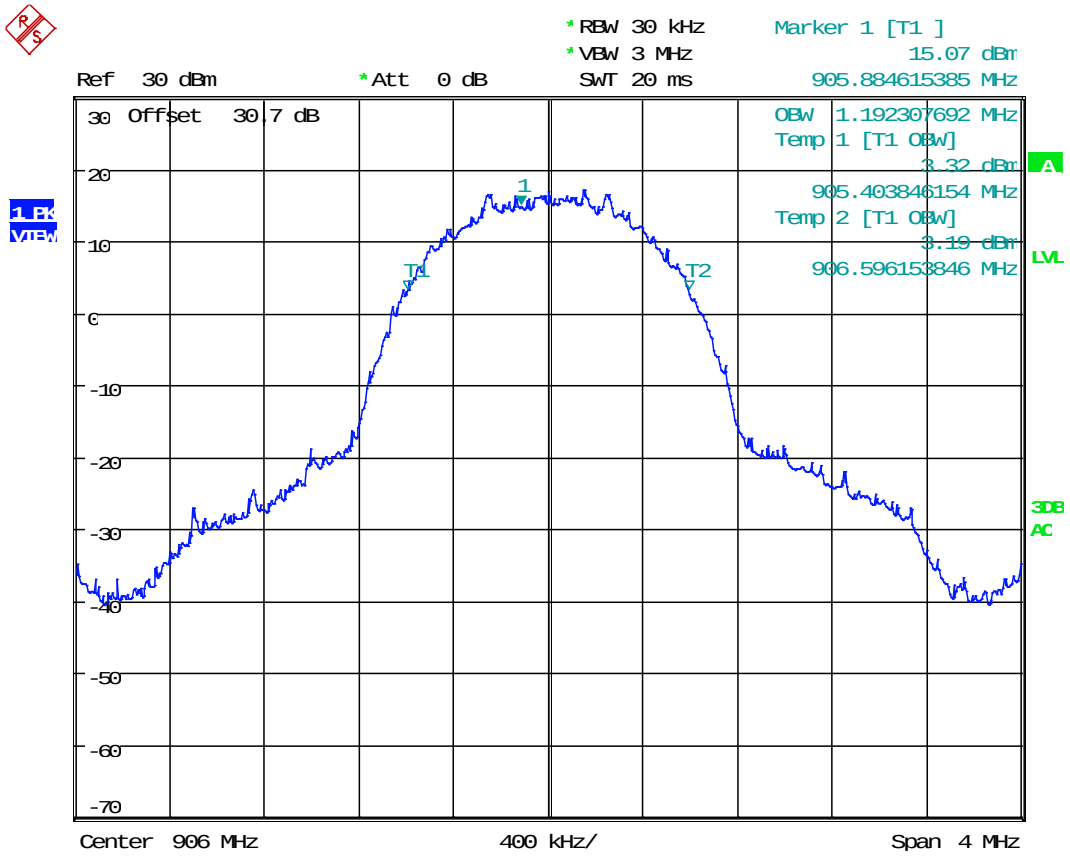
Test Data: **Occupied Bandwidth Measurement Table**

Tuned Frequency (MHz)	99% BW (MHz)
906	1.19
914	1.19
924	1.19

RESULT: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: **99% Bandwidth Low End of Band**

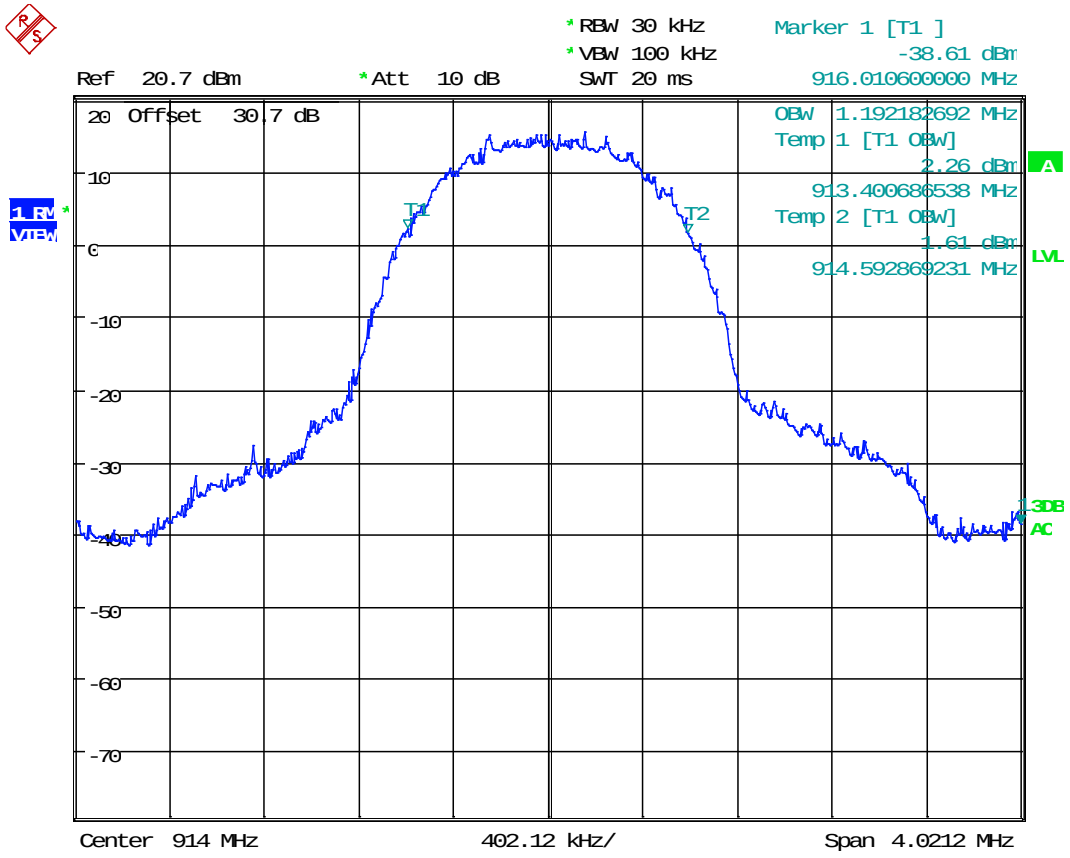


Date: 14.FEB.2018 08:59:39

RESULT: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: **99% Bandwidth Middle of Band**

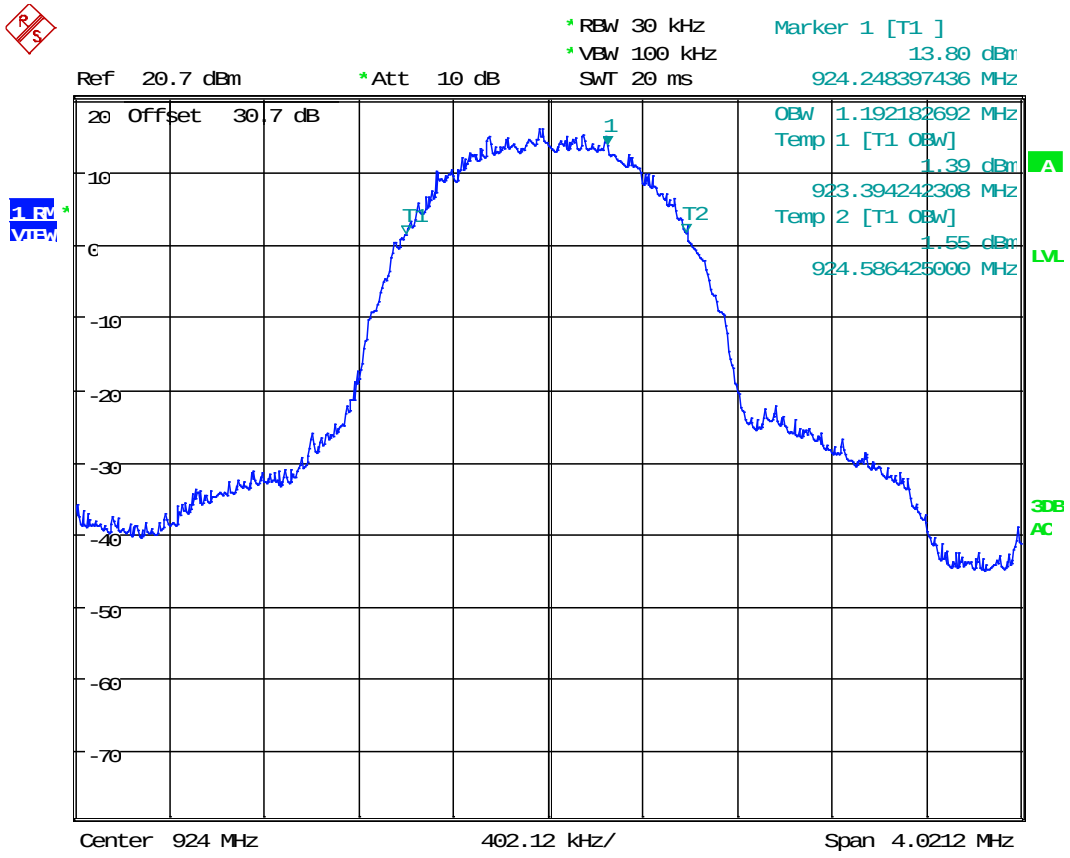


Date: 13.FEB.2018 09:44:16

RESULT: Meets Requirements

OCCUPIED BANDWIDTH

Test Data: **99% Bandwidth High end of Band**



Date: 13.FEB.2018 09:42:58

RESULT: Meets Requirements

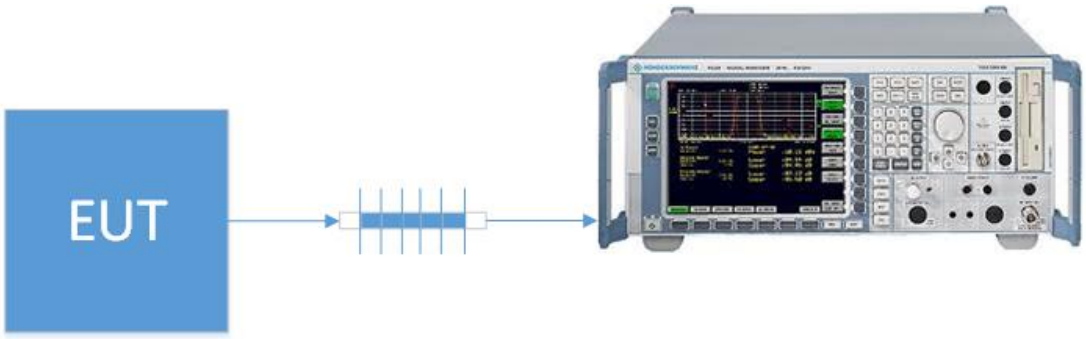
BANDEDGE

Rule Part No.: FCC 15.247(d), IC RSS 247 § 5.5

Requirements: Emissions must be at least 20dB down from the highest emission level Within the authorized band as measured with a 100 kHz RBW.

Test Method: ANSI C63.10 § 6.10.4 Authorized band-edge relative method

Setup:

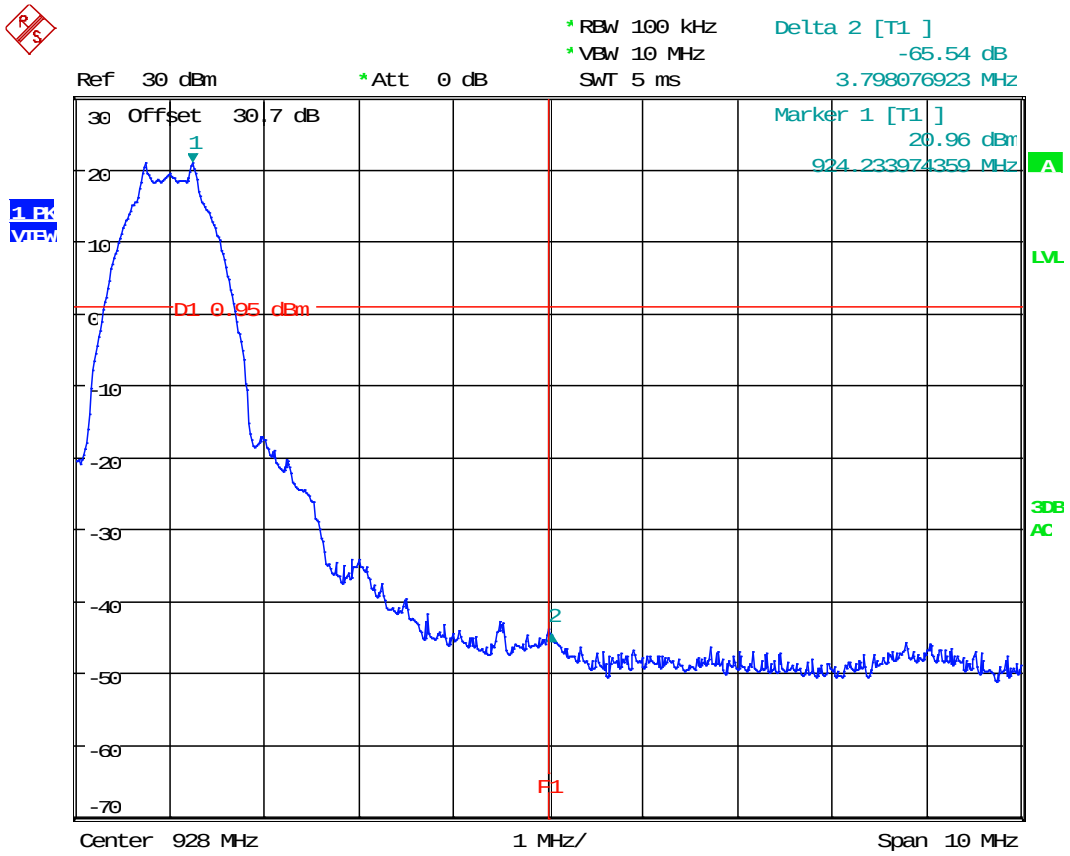


Test Data: **Authorized Bandedge measurement table**

Tuned Frequency (MHz)	Lowwer Bandedge (dBc)	Upper Bandedge (dBc)	Margin (dB)
906	65.54	-	45.54
924	-	63.32	43.32

BANDEDGE

Test Data: **Upper Band Edge Plot**

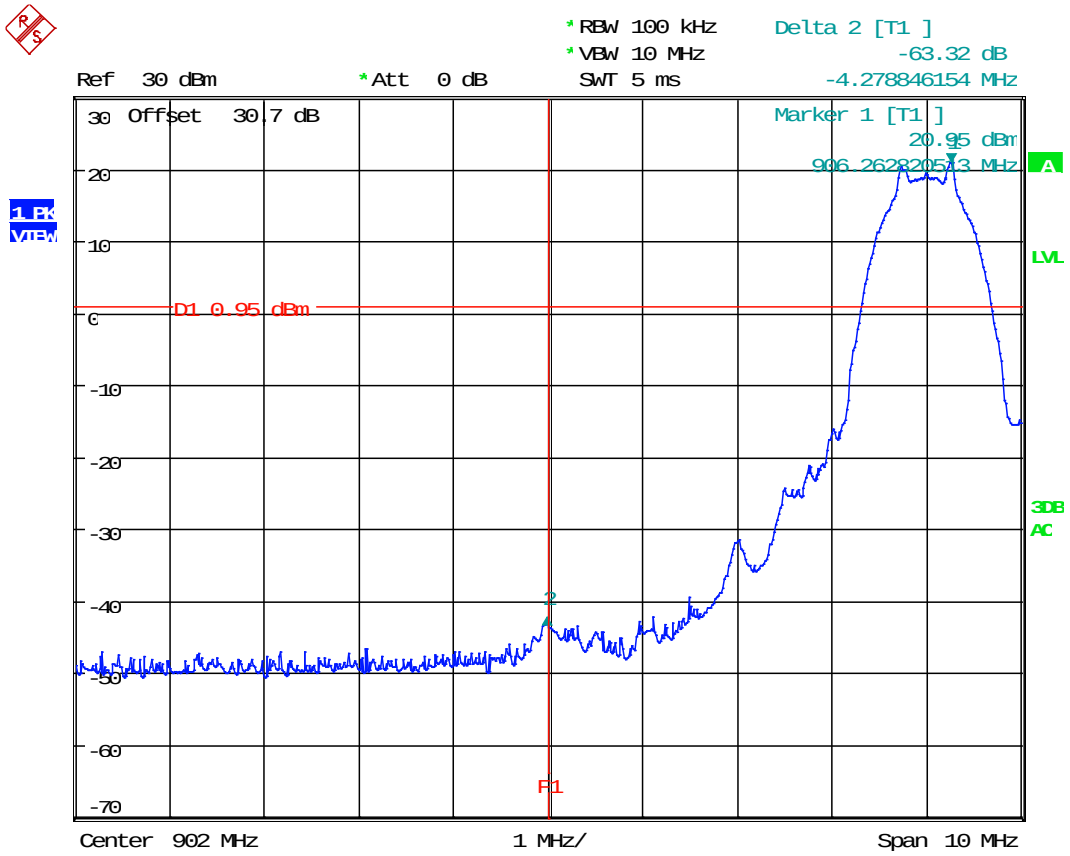


Date: 14.FEB.2018 09:04:42

RESULT: Meets Requirements

BANDEDGE

Test Data: **Lower Band Edge**



Date: 14.FEB.2018 09:01:36

RESULT: Meets Requirements

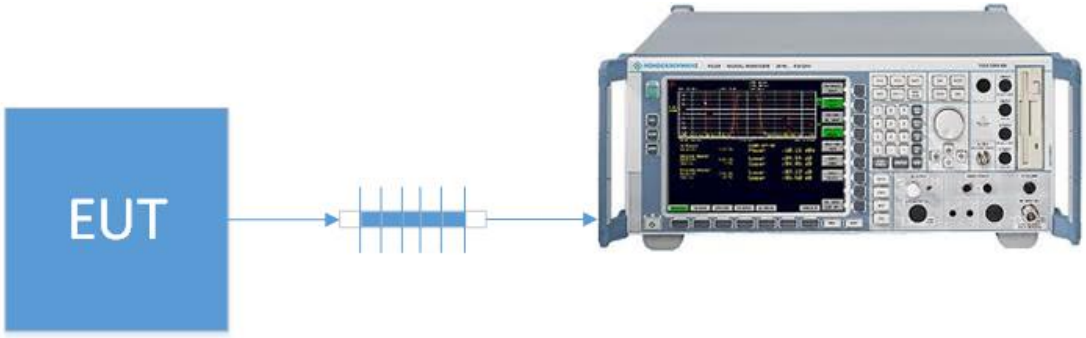
ANTENNA CONDUCTED SPURIOUS EMISSIONS

Rules Part No.: FCC part 15.247 (d) & 15.209, IC RSS 247 § 5.5 & RSS GEN § 8.9

Requirements: 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

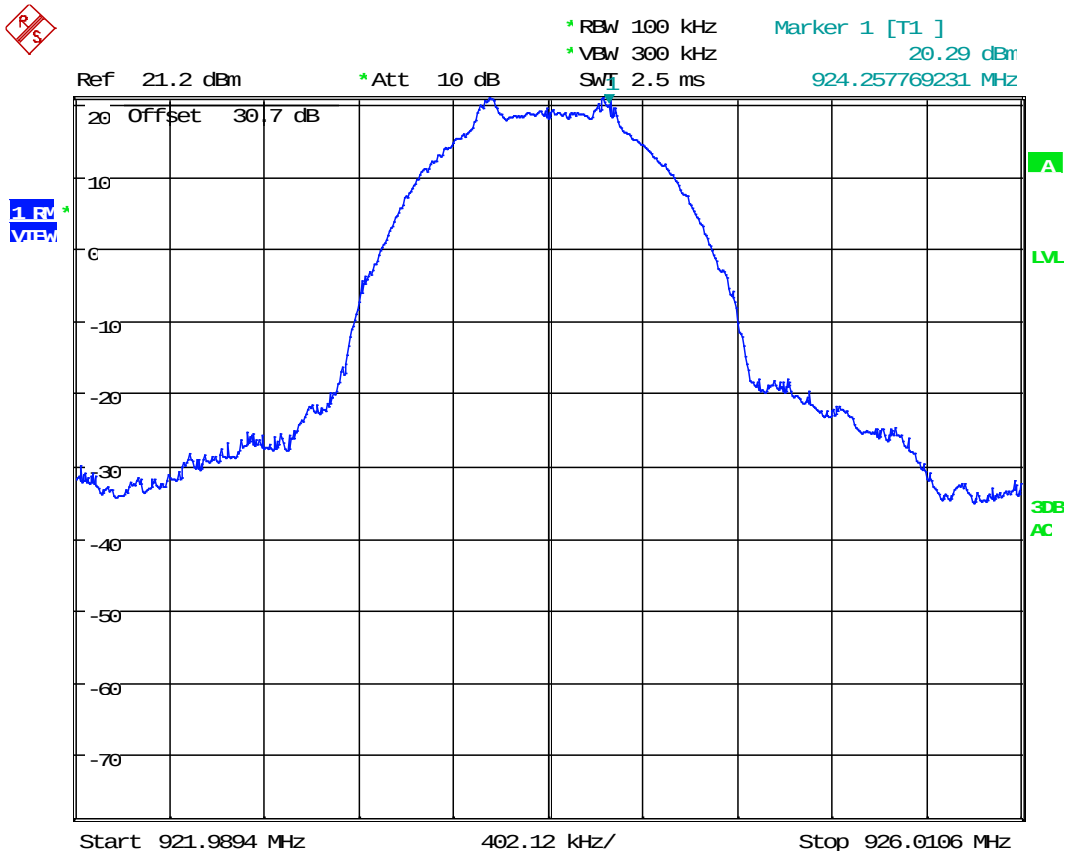
Test Method: ANSI C63.10 § 11.11.1 General Information
ANSI C63.10 § 11.11.2 Reference level measurement
ANSI C63.10 § 11.11.3 Emission level measurement

Setup:



ANTENNA CONDUCTED SPURIOUS EMISSIONS

Test Data: **100 KHz Reference Level Plot**

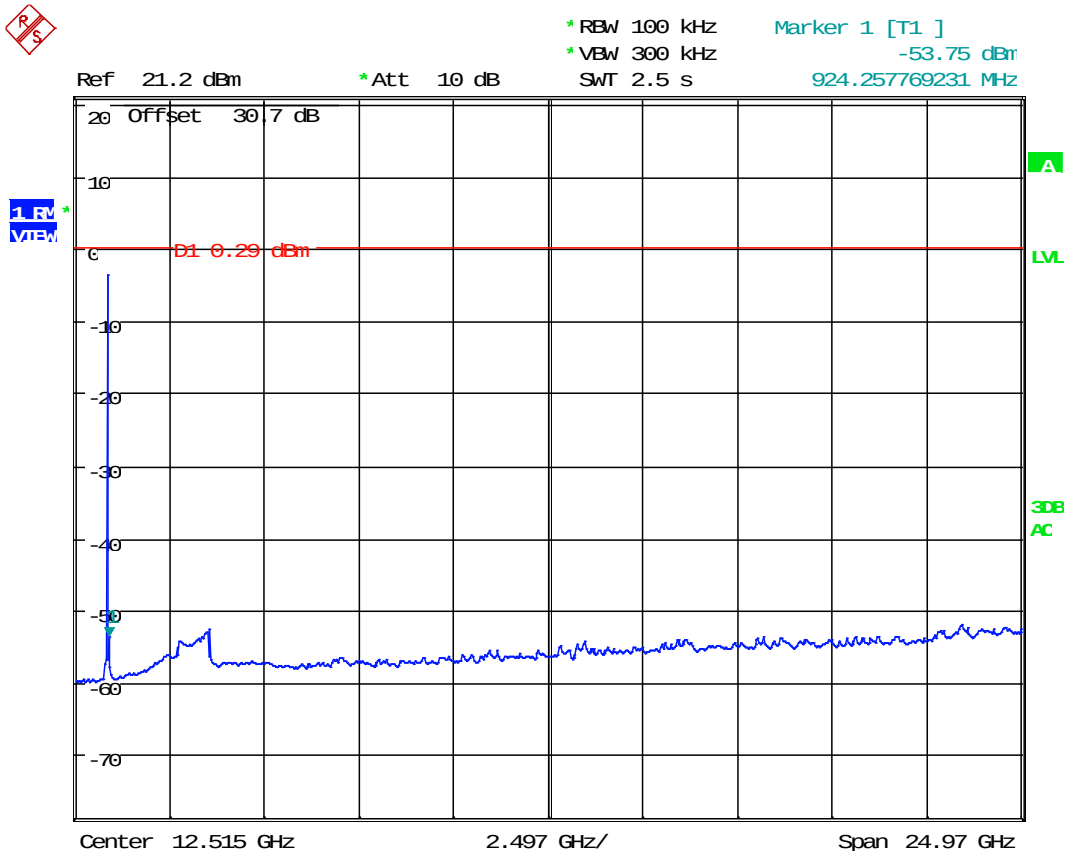


Date: 13.FEB.2018 09:54:04

RESULT: Meets Requirements

ANTENNA CONDUCTED SPURIOUS EMISSIONS

Test Data: **Low End of Band 30 MHz – 25 GHz Plot**

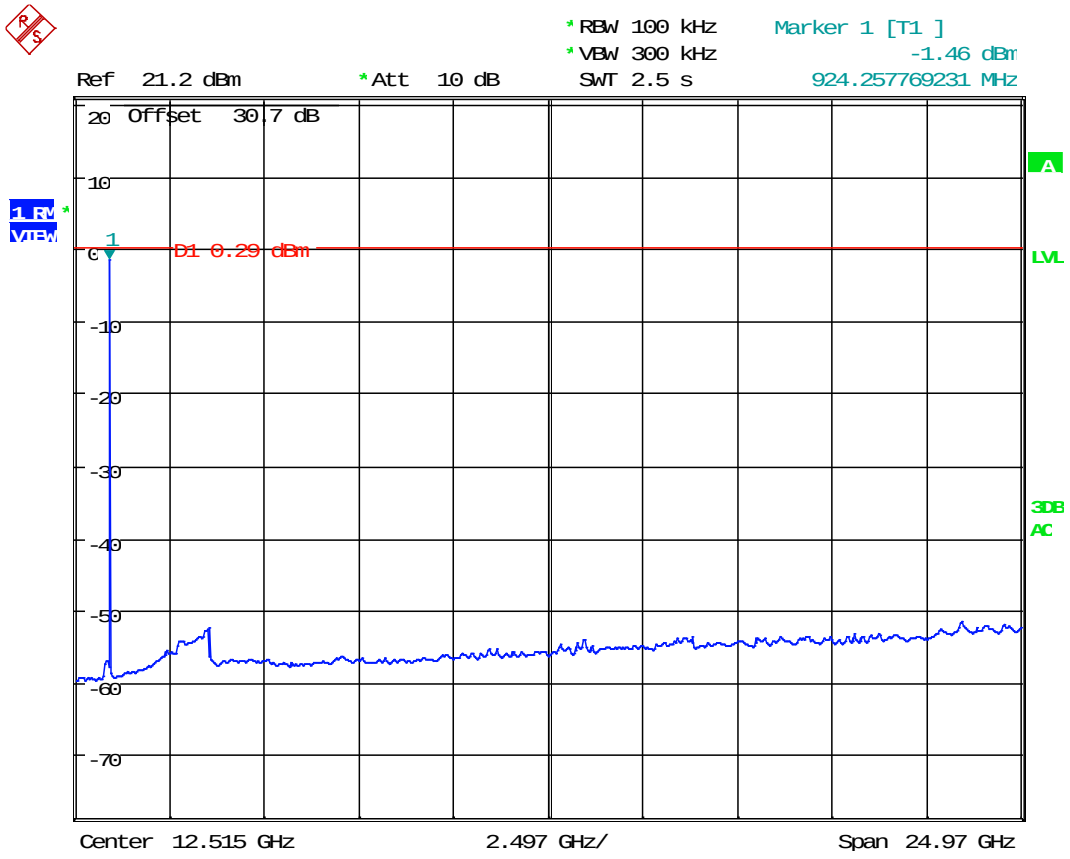


Date: 13.FEB.2018 09:59:30

RESULT: Meets Requirements

ANTENNA CONDUCTED SPURIOUS EMISSIONS

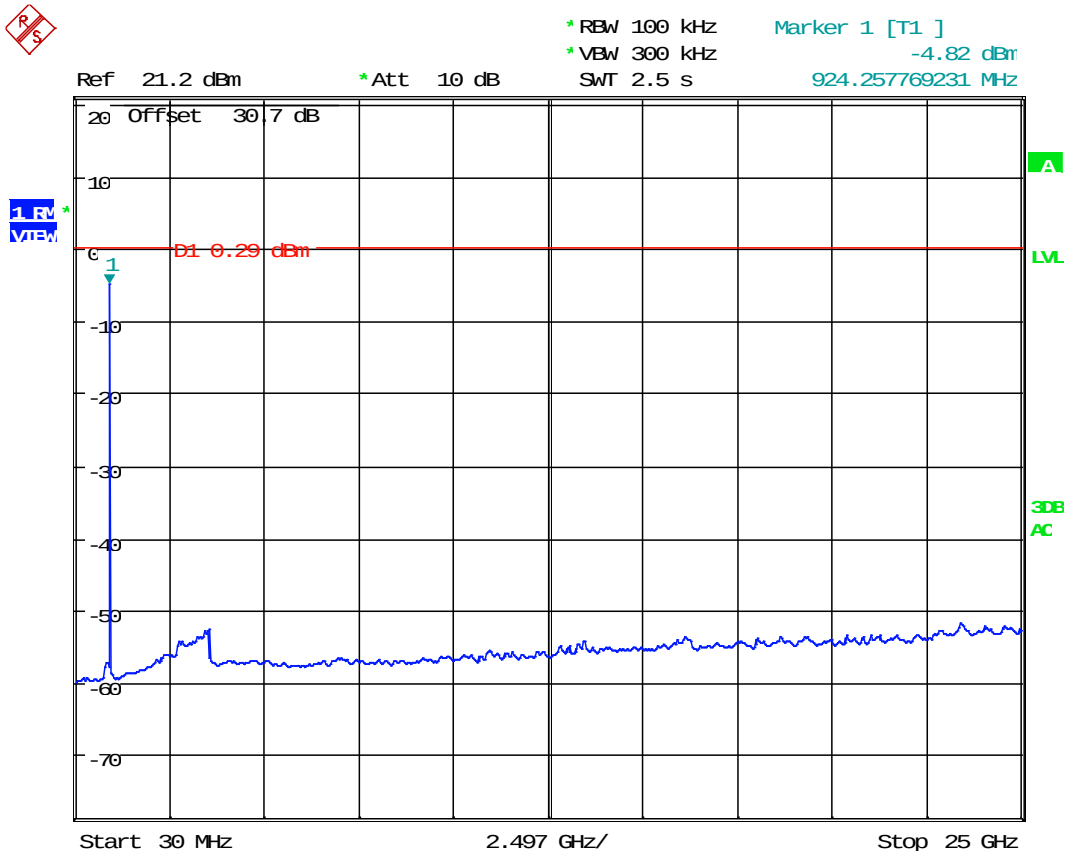
Test Data: **Middle of Band 30 MHz – 25 GHz Plot**



RESULT: Meets Requirements

ANTENNA CONDUCTED SPURIOUS EMISSIONS

Test Data: **High End of Band 30 MHz – 25 GHz Plot**



Date: 13.FEB.2018 09:55:32

RESULT: Meets Requirements

RADIATED SPURIOUS EMISSIONS

Rules Part No.: FCC part 15.247 (d) & 15.209, RSS GEN § 8.9

Requirements: Spurious Emissions found in restricted bands the levels must comply with the general limits found in FCC part 15.209

Frequency	Limits
FCC Part 15.209, IC RSS-GEN 8.9	
9 to 490 kHz	2400/F (kHz) µV/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) µV/m @ 30 meters
1705 kHz to 30 MHz	29.54 dBµV/m @ 30 meters
30 – 88	40.0 dBµV/m @ 3 meters
80 – 216	43.5 dBµV/m @ 3 meters
216 – 960	46.0 dBµV/m @ 3 meters
Above 960	54.0 dBµV/m @ 3 meters

Test Method: ANSI C63.4 § Annex D Validation of radiated emissions standard test sites
ANSI C63.10 § 6.3 Common requirements radiated emissions
ANSI C63.10 § 6.4 Emissions below 30 MHz
ANSI C63.10 § 6.5 Emissions between 30 & 1000 MHz
ANSI C63.10 § 6.6 Emissions above 1 GHz
ANSI C63.10 § 7.5 Procedure for determining the average value of pulsed emissions

Notes: Only emissions found within 20dB of the limit are reported from 9 KHz to 25 GHz for any spurious emission found inside restricted bands of operation as found in FCC Rule Part 15.205, all other spurious emissions not within restricted bands including harmonics were measured during the antenna conducted emissions test.

Where average limits are specified above 1 GHz a duty cycle correction was applied the peak level to determine the average level of the emission

Field Strength Calculation:

The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBµV) to the antenna correction factor supplied by the antenna manufacturer plus the coax loss. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

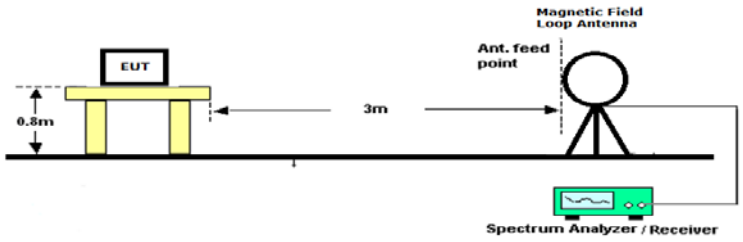
Example:

Freq. (MHz)	Meter Reading	+ ACF	+ CL = FS
33	20 dBµV	+ 10.36 dB	+ 0.5 = 30.86 dBµV/m @ 3m

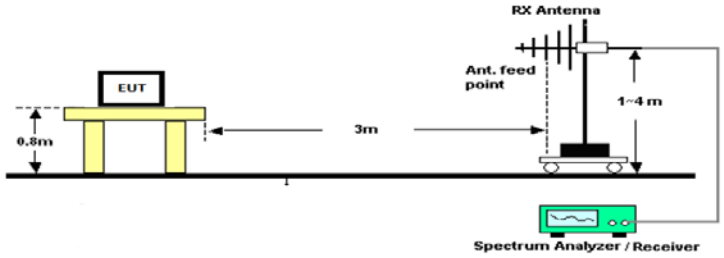
RADIATED SPURIOUS EMISSIONS

Setup:

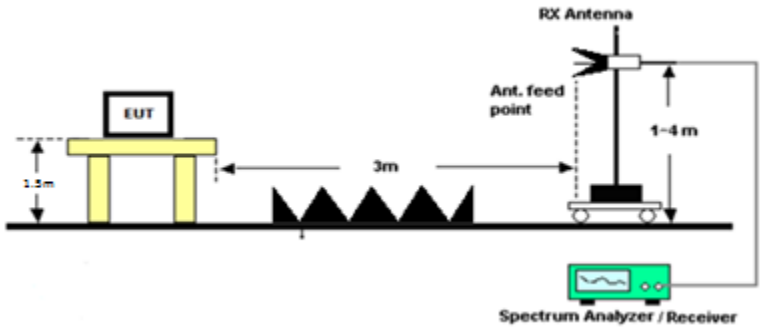
Emissions below 30 MHz



Emissions 30 – 1000 MHz



Emissions above 1 GHz



RADIATED SPURIOUS EMISSIONS

Notes: The EUT was checked in three orthogonal planes as required, a setup photo is provided to show the orientation of the worst case position.

Only the worst case data rate and Output Power which produced emissions within 20dB of the limit are reported.

The spectrum was measured from 9 KHz to 9.28 GHz

Test Data: **2dBi whip antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
906	61.88	PK	2.32	H	0.93	7.03	10.28	29.72	40.00
906	65.59	PK	8.59	V	0.95	6.24	15.78	24.22	40.00
906	149.59	PK	0.88	H	1.40	16.70	18.98	25.02	44.00
906	161.50	PK	1.90	V	1.46	16.85	20.21	23.79	44.00
906	237.18	PK	10.89	V	1.76	11.10	23.75	22.25	46.00
906	239.74	PK	2.74	H	1.77	11.17	15.68	30.32	46.00
906	651.28	PK	2.33	V	2.97	19.80	25.10	20.90	46.00
906	706.41	PK	2.84	H	3.12	21.06	27.02	18.98	46.00
906	2445.50	AV	-9.44	H	5.92	32.58	29.06	24.94	54.00
906	2445.50	PK	1.27	H	5.92	32.58	39.77	14.23	54.00
906	2991.90	AV	-8.89	V	6.51	33.12	30.74	23.26	54.00
906	2991.90	PK	0.08	V	6.51	33.12	39.71	14.29	54.00
906	6887.80	AV	-2.40	V	9.96	35.74	43.30	10.70	54.00
906	6887.80	PK	-13.60	V	9.96	35.74	32.10	21.90	54.00
906	7469.50	AV	-0.40	H	10.33	35.70	45.63	8.37	54.00
906	7469.50	PK	-12.72	H	10.33	35.70	33.31	20.69	54.00
906	10642.60	PK	-13.11	V	12.33	37.63	36.85	17.15	54.00
906	10642.60	AV	-3.29	V	12.33	37.63	46.67	7.33	54.00
906	11048.00	AV	-2.68	H	12.58	37.99	47.89	6.11	54.00
906	11048.00	PK	-13.11	H	12.58	37.99	37.46	16.54	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **2dBi whip antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/m	Margin dB	Limit dBuV/m
914	76.04	PK	2.37	V	1.04	7.51	10.92	29.08	40.00
914	103.55	PK	3.04	H	1.17	10.80	15.01	28.99	44.00
914	157.22	PK	1.29	V	1.44	17.10	19.83	24.17	44.00
914	176.84	PK	0.37	H	1.55	14.53	16.45	27.55	44.00
914	235.89	PK	3.33	H	1.76	10.99	16.08	29.92	46.00
914	237.17	PK	5.63	V	1.76	11.10	18.49	27.51	46.00
914	673.07	PK	3.44	V	3.04	21.01	27.49	18.51	46.00
914	702.53	PK	6.61	H	3.11	21.45	31.17	14.83	46.00
914	737.17	PK	2.29	H	3.17	20.73	26.19	19.81	46.00
914	3961.50	PK	3.27	H	7.53	33.41	44.21	9.79	54.00
914	3961.50	AV	-9.94	H	7.53	33.41	31.00	23.00	54.00
914	4366.98	PK	1.04	V	7.91	33.65	42.60	11.40	54.00
914	4366.98	AV	-10.00	V	7.91	33.65	31.56	22.44	54.00
914	6588.13	AV	-10.91	H	9.78	35.77	34.64	19.36	54.00
914	6588.13	PK	-2.00	H	9.78	35.77	43.55	10.45	54.00
914	7504.80	PK	1.24	V	10.36	35.75	47.35	6.65	54.00
914	7504.80	AV	-11.41	V	10.36	35.75	34.70	19.30	54.00
914	10501.59	AV	-12.89	V	12.29	37.64	37.04	16.96	54.00
914	10501.59	PK	-2.43	V	12.29	37.64	47.50	6.50	54.00
914	11488.70	PK	-3.40	H	12.85	38.25	47.70	6.30	54.00
914	11488.70	AV	-14.65	H	12.85	38.25	36.45	17.55	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **2dBi whip antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
924	32.99	PK	4.14	V	0.65	13.50	18.29	21.71	40.00
924	103.55	PK	3.57	H	1.17	10.80	15.54	28.46	44.00
924	127.50	PK	2.32	V	1.28	12.45	16.05	27.95	44.00
924	176.02	PK	1.88	H	1.54	14.70	18.12	25.88	44.00
924	298.70	PK	3.35	H	2.08	13.70	19.13	26.87	46.00
924	400.00	PK	2.72	V	2.29	15.40	20.41	25.59	46.00
924	683.33	PK	3.48	H	3.06	20.97	27.51	18.49	46.00
924	735.89	PK	3.11	V	3.17	20.49	26.77	19.23	46.00
924	3080.10	PK	2.39	V	6.62	33.41	42.42	11.58	54.00
924	3080.10	AV	-9.23	V	6.62	33.41	30.80	23.20	54.00
924	3274.00	PK	1.41	H	6.82	33.09	41.32	12.68	54.00
924	3274.00	AV	-9.39	H	6.82	33.09	30.52	23.48	54.00
924	5918.26	PK	0.95	H	9.21	35.15	45.31	8.69	54.00
924	5918.26	AV	-11.52	H	9.21	35.15	32.84	21.16	54.00
924	7681.00	AV	-10.90	V	10.47	35.80	35.37	18.63	54.00
924	7681.00	PK	-1.97	V	10.47	35.80	44.30	9.70	54.00
924	10519.00	AV	-13.22	H	12.29	37.65	36.72	17.28	54.00
924	10519.00	PK	-4.20	H	12.29	37.65	45.74	8.26	54.00
924	11153.80	PK	-2.41	V	12.67	38.03	48.29	5.71	54.00
924	11153.80	AV	-13.34	V	12.67	38.03	37.36	16.64	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **8dBi omni antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
906	38.14	PK	2.83	H	0.69	13.60	17.12	22.88	40.00
906	66.50	PK	5.16	V	0.96	6.15	12.27	27.73	40.00
906	103.55	PK	3.92	V	1.17	10.80	15.89	27.61	44.00
906	103.85	PK	3.57	H	1.18	10.80	15.55	27.95	44.00
906	237.18	PK	4.75	H	1.76	11.10	17.61	109.77	46.00
906	378.20	PK	2.74	H	2.23	14.90	19.87	107.51	46.00
906	575.64	PK	2.48	V	2.86	18.90	24.24	103.14	46.00
906	2745.10	AV	-9.06	H	6.24	32.50	29.68	24.32	54.00
906	2745.10	PK	0.52	H	6.24	32.50	39.26	14.74	54.00
906	3097.75	PK	1.35	V	6.65	33.42	41.42	12.58	54.00
906	3097.75	AV	-9.06	V	6.65	33.42	31.01	22.99	54.00
906	6147.40	PK	0.63	H	9.48	35.55	45.66	8.34	54.00
906	6147.40	AV	-11.54	H	9.48	35.55	33.49	20.51	54.00
906	7046.50	AV	-10.19	V	10.05	35.75	35.61	18.39	54.00
906	7046.50	PK	-0.93	V	10.05	35.75	44.87	9.13	54.00
906	9285.20	AV	-11.82	H	11.46	36.27	35.91	18.09	54.00
906	9285.20	PK	-2.13	H	11.46	36.27	45.60	8.40	54.00
906	10360.50	AV	-0.35	V	12.20	37.65	49.50	4.50	54.00
906	10360.50	PK	-12.84	V	12.20	37.65	37.01	16.99	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **8dBi omni antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
914	43.34	PK	2.96	V	0.74	12.97	16.67	23.33	40.00
914	103.83	PK	3.87	H	1.18	10.80	15.85	27.65	44.00
914	107.64	PK	4.63	V	1.19	10.54	16.36	27.14	44.00
914	185.83	PK	2.69	H	1.58	13.50	17.77	25.73	44.00
914	553.85	PK	1.70	V	2.84	18.59	23.13	104.25	46.00
914	655.12	PK	2.53	H	2.98	19.60	25.11	102.27	46.00
914	1299.60	PK	3.00	H	4.28	29.52	36.80	90.58	54.00
914	1299.60	AV	-8.37	H	4.28	29.52	25.43	101.95	54.00
914	3097.70	AV	-8.87	V	6.65	33.42	31.20	22.80	54.00
914	3097.70	PK	-1.46	V	6.65	33.42	38.61	15.39	54.00
914	6235.57	AV	-11.34	V	9.56	35.53	33.75	20.25	54.00
914	6235.57	PK	-0.13	V	9.56	35.53	44.96	9.04	54.00
914	7116.98	AV	-12.60	H	10.09	35.76	33.25	20.75	54.00
914	7116.98	PK	-2.95	H	10.09	35.76	42.90	11.10	54.00
914	10589.70	PK	-4.37	V	12.30	37.61	45.54	8.46	54.00
914	10589.70	AV	-13.69	V	12.30	37.61	36.22	17.78	54.00
914	10959.95	PK	-3.45	H	12.54	37.88	46.97	7.03	54.00
914	10959.95	AV	-13.44	H	12.54	37.88	36.98	17.02	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **8dBi omni antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
924	103.83	PK	2.86	H	1.18	10.80	14.84	28.66	44.00
924	107.90	PK	3.94	H	1.19	10.51	15.64	27.86	44.00
924	353.84	PK	1.72	H	2.13	14.98	18.83	108.55	46.00
924	483.33	PK	3.16	V	2.60	17.43	23.19	104.19	46.00
924	2727.56	PK	0.99	V	6.22	32.55	39.76	14.24	54.00
924	2727.56	AV	-10.16	V	6.22	32.55	28.61	25.39	54.00
924	3203.50	AV	-8.99	H	6.78	33.32	31.11	22.89	54.00
924	3203.50	PK	0.63	H	6.78	33.32	40.73	13.27	54.00
924	6852.50	PK	-0.64	H	9.94	35.69	44.99	9.01	54.00
924	6852.50	AV	-11.43	H	9.94	35.69	34.20	19.80	54.00
924	7363.70	AV	-10.78	V	10.23	35.67	35.12	18.88	54.00
924	7363.70	PK	-2.16	V	10.23	35.67	43.74	10.26	54.00
924	10325.30	PK	-3.73	V	12.15	37.64	46.06	7.94	54.00
924	10325.30	AV	-14.96	V	12.15	37.64	34.83	19.17	54.00
924	10660.20	AV	-13.92	H	12.35	37.64	36.07	17.93	54.00
924	10660.20	PK	-5.02	H	12.35	37.64	44.97	9.03	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **8dBi patch antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
906	66.50	PK	3.42	V	0.96	6.15	10.53	29.47	40.00
906	100.01	PK	3.70	V	1.16	10.90	15.76	28.24	44.00
906	102.19	PK	6.50	H	1.17	10.88	18.55	25.45	44.00
906	112.54	PK	6.72	V	1.21	10.30	18.23	25.77	44.00
906	113.36	PK	11.49	H	1.22	10.30	23.01	20.99	44.00
906	330.76	PK	1.47	V	2.09	13.80	17.36	28.64	46.00
906	501.28	PK	1.32	H	2.65	17.40	21.37	24.63	46.00
906	1810.89	AV	-4.27	V	5.11	30.92	31.76	22.24	54.00
906	1810.89	PK	13.00	V	5.11	30.92	49.03	4.97	54.00
906	1810.89	AV	-8.91	H	5.11	30.92	27.12	26.88	54.00
906	1810.89	PK	9.46	H	5.11	30.92	45.49	8.51	54.00
906	6993.50	PK	-5.29	H	10.01	35.74	40.46	13.54	54.00
906	6993.50	AV	-13.53	H	10.01	35.74	32.22	21.78	54.00
906	9658.35	PK	0.44	V	11.65	37.08	49.17	4.83	54.00
906	9658.35	AV	-11.20	V	11.65	37.08	37.53	16.47	54.00
906	10766.01	AV	-12.93	V	12.43	37.67	37.17	16.83	54.00
906	10766.01	PK	-4.70	V	12.43	37.67	45.40	8.60	54.00
906	11083.30	PK	-3.34	V	12.61	38.00	47.27	6.73	54.00
906	11083.30	AV	-13.82	H	12.61	38.00	36.79	17.21	54.00
906	11083.30	PK	-3.34	H	12.61	38.00	47.27	6.73	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **8dBi patch antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
914	101.65	PK	7.21	V	1.17	10.90	19.28	24.72	44.00
914	101.65	PK	14.24	H	1.17	10.90	26.31	17.69	44.00
914	113.09	PK	17.14	H	1.22	10.30	28.66	15.34	44.00
914	113.63	PK	8.89	V	1.22	10.30	20.41	23.59	44.00
914	333.33	PK	0.58	H	2.10	13.80	16.48	29.52	46.00
914	365.38	PK	-0.07	V	2.19	14.70	16.82	29.18	46.00
914	1828.52	PK	12.48	V	5.11	31.22	48.81	5.19	54.00
914	1828.52	AV	-5.00	V	5.11	31.22	31.33	22.67	54.00
914	5107.36	PK	-0.57	V	8.56	34.14	42.13	11.87	54.00
914	5107.36	AV	-11.28	V	8.56	34.14	31.42	22.58	54.00
914	5213.30	AV	-9.17	H	8.64	34.28	33.75	20.25	54.00
914	5213.30	PK	-0.76	H	8.64	34.28	42.16	11.84	54.00
914	9937.40	PK	-0.40	H	11.86	37.51	48.97	5.03	54.00
914	9937.40	AV	-12.40	H	11.86	37.51	36.97	17.03	54.00
914	10551.80	AV	-12.91	V	12.30	37.66	37.05	16.95	54.00
914	10551.80	PK	-2.71	V	12.30	37.66	47.25	6.75	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **8dBi patch antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
924	102.19	PK	15.42	H	1.17	10.88	27.47	16.53	44.00
924	102.19	PK	8.23	V	1.17	10.88	20.28	23.72	44.00
924	112.00	PK	21.24	H	1.21	10.30	32.75	11.25	44.00
924	113.00	PK	16.22	V	1.22	10.30	27.74	16.26	44.00
924	375.64	PK	1.01	V	2.23	15.00	18.24	27.76	46.00
924	396.16	PK	-0.24	V	2.28	15.30	17.34	28.66	46.00
924	1846.15	PK	4.55	V	5.11	31.51	41.17	12.83	54.00
924	1846.15	AV	-8.82	V	5.11	31.51	27.80	26.20	54.00
924	2568.90	AV	-9.75	H	6.05	32.59	28.89	25.11	54.00
924	2568.90	PK	0.19	H	6.05	32.59	38.83	15.17	54.00
924	6411.85	PK	-1.17	H	9.63	35.63	44.09	9.91	54.00
924	6411.85	AV	-12.89	H	9.63	35.63	32.37	21.63	54.00
924	7963.10	AV	-11.52	V	10.69	35.85	35.02	18.98	54.00
924	7963.10	PK	-3.43	V	10.69	35.85	43.11	10.89	54.00
924	10625.00	AV	-13.34	H	12.32	37.61	36.59	17.41	54.00
924	10625.00	PK	-5.20	H	12.32	37.61	44.73	9.27	54.00
924	11365.38	PK	-3.46	V	12.80	38.18	47.52	6.48	54.00
924	11365.38	AV	-13.42	V	12.80	38.18	37.56	16.44	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **14dBi yagi antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
906	40.35	PK	3.15	V	0.70	13.43	17.28	22.72	40.00
906	65.68	PK	5.34	H	0.96	6.23	12.53	27.47	40.00
906	100.56	PK	3.62	V	1.16	10.90	15.68	28.32	44.00
906	103.83	PK	3.50	H	1.18	10.80	15.48	28.52	44.00
906	241.00	PK	6.01	V	1.78	11.30	19.09	26.91	46.00
906	337.17	PK	2.01	H	2.11	13.90	18.02	27.98	46.00
906	730.76	PK	4.05	H	3.16	20.20	27.41	18.59	46.00
906	736.46	PK	3.26	V	3.17	20.59	27.02	18.98	46.00
906	1810.89	PK	8.92	H	5.11	30.92	44.95	9.05	54.00
906	1810.89	AV	-8.94	H	5.11	30.92	27.09	26.91	54.00
906	1810.89	AV	-8.55	V	5.11	30.92	27.48	26.52	54.00
906	1810.89	PK	6.18	V	5.11	30.92	42.21	11.79	54.00
906	6323.70	PK	0.79	H	9.59	35.61	45.99	8.01	54.00
906	6323.70	AV	-12.15	H	9.59	35.61	33.05	20.95	54.00
906	6676.28	PK	-1.34	V	9.84	35.75	44.25	9.75	54.00
906	6676.28	AV	-11.11	V	9.84	35.75	34.48	19.52	54.00
906	10783.60	AV	-13.57	H	12.44	37.69	36.56	17.44	54.00
906	10783.60	PK	-4.39	H	12.44	37.69	45.74	8.26	54.00
906	11594.50	AV	-13.40	V	12.91	38.39	37.90	16.10	54.00
906	11594.50	PK	-1.04	V	12.91	38.39	50.26	3.74	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **14dBi yagi antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
914	59.80	PK	3.82	H	0.91	7.66	12.39	27.61	40.00
914	103.67	PK	3.70	V	1.17	10.80	15.67	28.33	44.00
914	103.67	PK	2.86	H	1.17	10.80	14.83	29.17	44.00
914	150.69	PK	2.59	V	1.40	16.77	20.76	23.24	44.00
914	238.46	PK	7.12	V	1.77	11.10	19.99	26.01	46.00
914	242.30	PK	0.90	H	1.80	11.33	14.03	31.97	46.00
914	630.76	PK	2.72	H	2.92	19.50	25.14	20.86	46.00
914	714.10	PK	2.90	V	3.14	20.29	26.33	19.67	46.00
914	3097.75	PK	3.04	H	6.65	33.42	43.11	10.89	54.00
914	3097.75	AV	-9.62	H	6.65	33.42	30.45	23.55	54.00
914	3309.29	PK	0.04	V	6.85	33.07	39.96	14.04	54.00
914	3309.29	AV	-10.72	V	6.85	33.07	29.20	24.80	54.00
914	6041.60	PK	1.01	H	9.36	35.38	45.75	8.25	54.00
914	6041.60	PK	-10.80	H	9.36	35.38	33.94	20.06	54.00
914	7346.15	AV	-11.04	V	10.22	35.66	34.84	19.16	54.00
914	7346.15	PK	-2.33	V	10.22	35.66	43.55	10.45	54.00
914	10907.50	AV	-13.31	H	12.54	37.81	37.04	16.96	54.00
914	10907.50	PK	-3.89	H	12.54	37.81	46.46	7.54	54.00
914	11576.90	PK	-2.03	V	12.90	38.37	49.24	4.76	54.00
914	11576.90	AV	-13.76	V	12.90	38.37	37.51	16.49	54.00

Results Meet Requirements

RADIATED SPURIOUS EMISSIONS

Test Data: **14dBi yagi antenna Emissions measurement table**

Tuned Freq MHz	Emission Frequency MHz	Detector	Meter Reading dBu V	Antenna Polarity	Coax Loss Db	Correction Factor dB/M	Field Strength dBu V/M	Margin dB	Limit dBuV/m
924	68.79	PK	3.19	H	0.98	6.18	10.35	29.65	40.00
924	84.87	PK	2.66	V	1.11	9.89	13.66	26.34	40.00
924	103.94	PK	3.84	H	1.18	10.80	15.82	28.18	44.00
924	103.94	PK	3.48	V	1.18	10.80	15.46	28.54	44.00
924	315.38	PK	2.92	H	2.09	13.80	18.81	27.19	46.00
924	385.89	PK	3.12	V	2.25	14.89	20.26	25.74	46.00
924	652.56	PK	1.16	H	2.97	19.74	23.87	22.13	46.00
924	735.89	PK	3.12	V	3.17	20.49	26.78	19.22	46.00
924	1828.50	PK	3.04	V	5.11	31.21	39.36	14.64	54.00
924	1828.50	AV	-9.45	V	5.11	31.21	26.87	27.13	54.00
924	4578.50	AV	-10.24	H	8.10	34.13	31.99	22.01	54.00
924	4578.50	PK	-1.73	H	8.10	34.13	40.50	13.50	54.00
924	5107.37	AV	-10.67	V	8.56	34.14	32.03	21.97	54.00
924	5107.37	PK	-0.69	V	8.56	34.14	42.01	11.99	54.00
924	8086.50	PK	-1.21	H	10.78	35.80	45.37	8.63	54.00
924	8086.50	AV	-12.09	H	10.78	35.80	34.49	19.51	54.00
924	10448.71	PK	-2.35	V	12.27	37.63	47.55	6.45	54.00
924	10448.71	AV	-13.01	V	12.27	37.63	36.89	17.11	54.00
924	11136.21	AV	-12.26	H	12.66	38.02	38.42	15.58	54.00
924	11136.21	PK	-3.34	H	12.66	38.02	47.34	6.66	54.00

Results Meet Requirements

AC POWER LINE CONDUCTED EMISSIONS

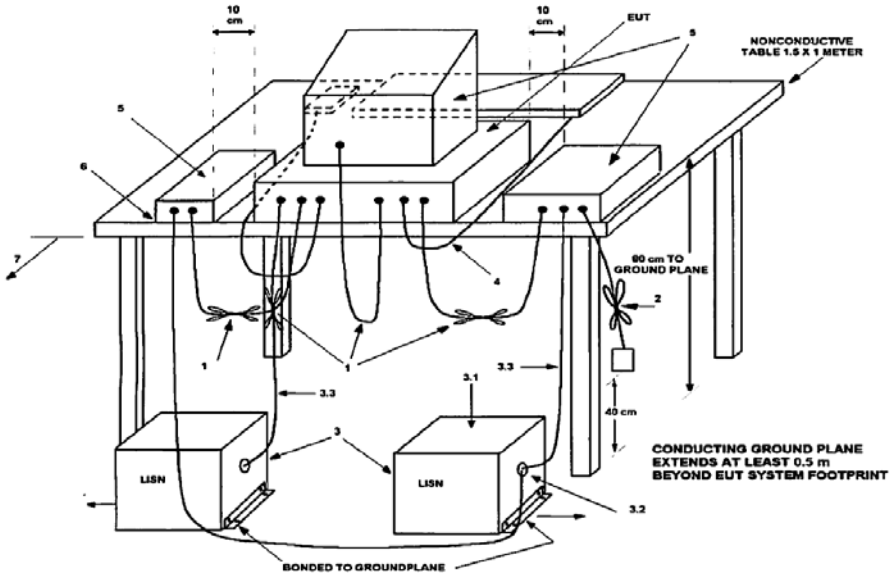
Rules Part No.: FCC 15.207(a)

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBµV)	Average Limits (dBµV)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decrease with logarithm of frequency		

Test Method: ANSI C63.10 § 6.2 Test Method for AC power-line conducted emissions

Setup:



AC POWER LINE CONDUCTED EMISSIONS

Test Data: **906MHz Powerline 1 Peak Plot**

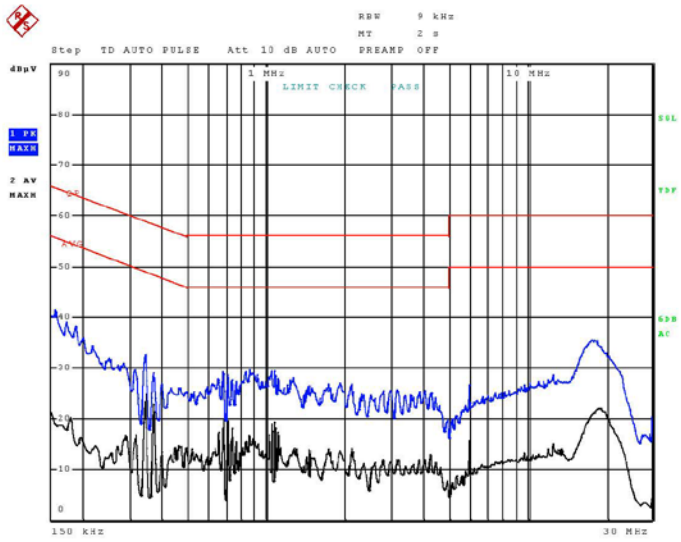
The following plots represent the emissions read for power line Conducted. Both lines were observed.

14.Feb 18 09:51

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: tdf_20

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	500 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 2 s
Margin: 20 dB
Subranges: 0

RESULT: Meets Requirements

POWER LINE CONDUCTED INTERFERENCE

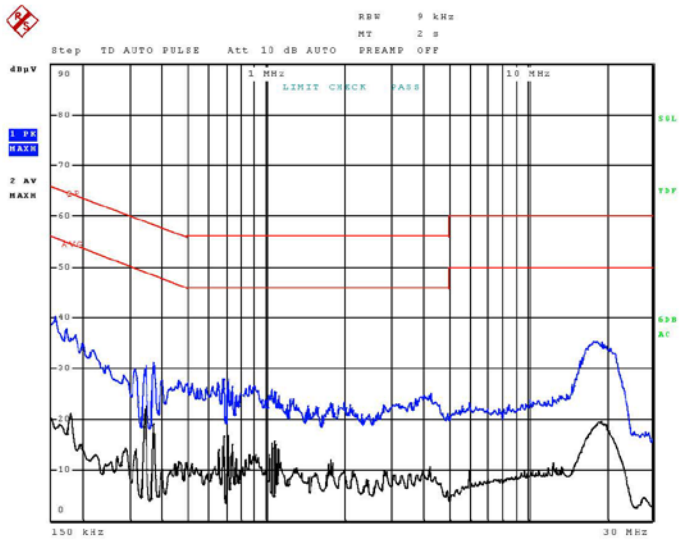
Test Data: **906MHz Power Line 2 Peak Plot**

14.Feb 18 09:53

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: tdf_20

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	500 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 2 s
Margin: 20 dB
Subranges: 0

Page 1 of 2

RESULT: Meets Requirements

AC POWER LINE CONDUCTED EMISSIONS

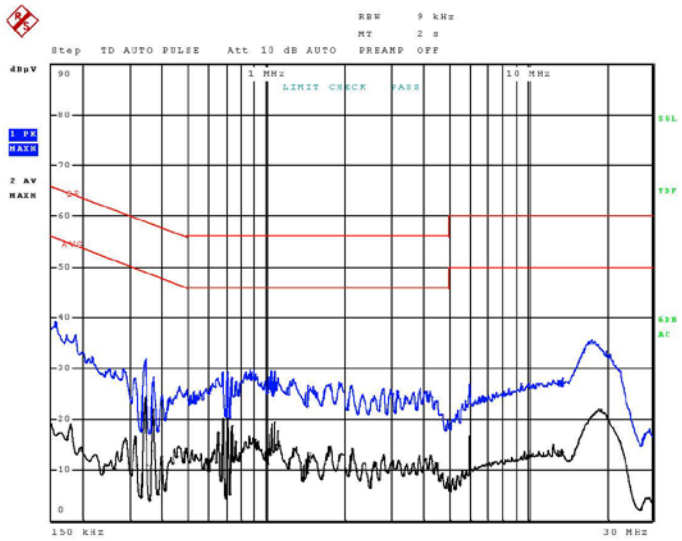
Test Data: **914MHz Powerline 1 Peak Plot**

14.Feb 18 09:58

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: tdf_20

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	500 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 2 s
Margin: 20 dB
Subranges: 0

Page 1 of 2

RESULT: Meets Requirements

POWER LINE CONDUCTED INTERFERENCE

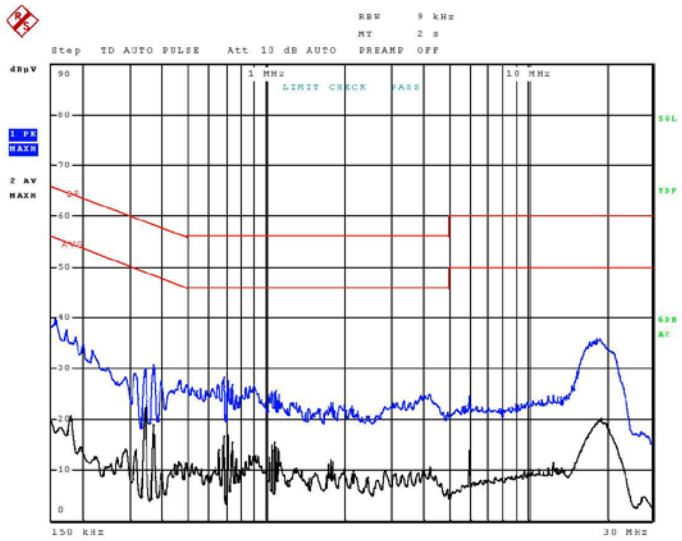
Test Data: **914MHz Power Line 2 Peak Plot**

14.Feb 18 09:56

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: tdf_20

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	500 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 2 s
Margin: 20 dB
Subranges: 0

Page 1 of 2

RESULT: Meets Requirements

AC POWER LINE CONDUCTED EMISSIONS

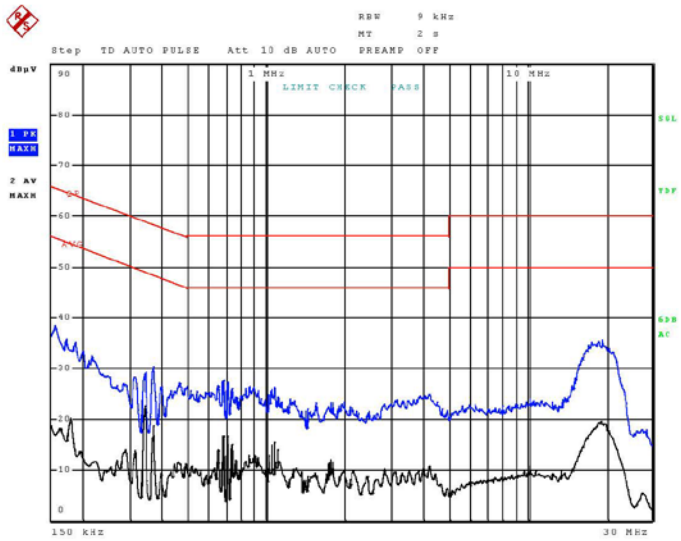
Test Data: **924MHz Powerline 1 Peak Plot**

14.Feb 18 10:03

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: tdf_20

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	500 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 2 s
Margin: 20 dB
Subranges: 0

Page 1 of 2

RESULT: Meets Requirements

POWER LINE CONDUCTED INTERFERENCE

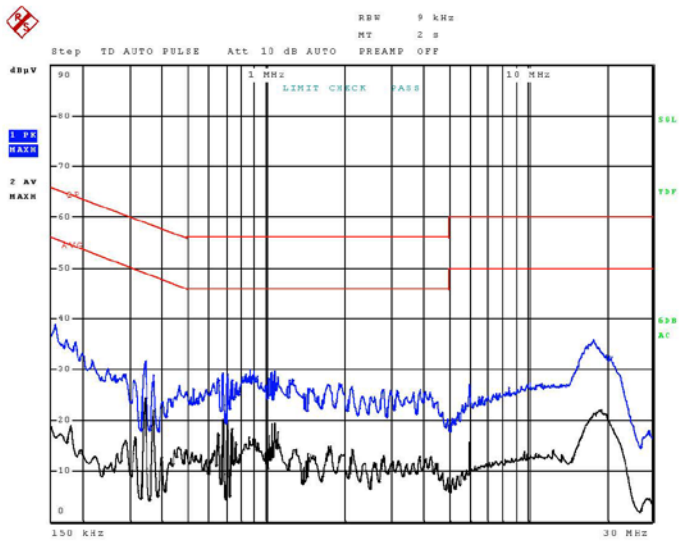
Test Data: **924MHz Power Line 2 Peak Plot**

14.Feb 18 10:01

Time Domain Scan (1 Range)

Scan Start: 150 kHz
Scan Stop: 30 MHz
Detector: Trace 1: MAX PEAK Trace 2: Average
Transducer: tdf_20

Start Frequency	Stop Frequency	Step Size	Res BW	Meas Time	RF Atten	Preamp	Input
150.000000 kHz	30.000000 MHz	2.25 kHz	9.00 kHz	500 ms	Auto	0 dB	INPUT2



Final Measurement

Meas Time: 2 s
Margin: 20 dB
Subranges: 0

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RESULT: Meets Requirements

EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconical 1096	Eaton	94455-1	1096	08/01/17	08/01/19
Antenna: Log-Periodic 1122	Electro-Metrics	LPA-25	1122	07/26/17	07/26/19
LISN (Primary)	Electro-Metrics	ANS-25/2	225363	08/26/17	08/26/19
CHAMBER	Panashield	3M	N/A	04/25/16	03/31/18
Antenna: Double-Ridged Horn/ETS Horn 2	ETS-Lindgren	3117	00041534	03/01/17	03/01/19
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/16/16	08/16/18
Software: Field Strength Program	Timco	N/A	Version 4.10.7.0	N/A	N/A
Antenna: Active Loop	ETS-Lindgren	6502	00062529	12/11/17	12/11/19
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	04/01/16	04/01/18
Coaxial Cable - BMBM-1000-00 Silver	Semflex	LISN Cable	BMBM-1000-00	01/05/17	01/05/19
Coaxial Cable - Chamber 3 cable set (Primary)	Micro-Coax	Chamber 3 cable set (Primary)	KMKM-0244-01; KMKM-0670-00; KFKF-0198-01	08/09/16	08/09/18
Band Reject Filter 2.4 GHz	Micro-Tronics	BRM50702-02	-G042	09/27/16	09/27/18
Pre-amp	RF-LAMBDA	RLNA00M45GA	NA	01/04/16	01/04/18

***EMI RECEIVER SOFTWARE VERSION**

The receiver firmware used was version 4.43 Service Pack 3

STATE OF THE MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty was calculated for all measurements listed in this test report according To CISPR 16–4 or ENTR 100-028 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: "Uncertainty in EMC Measurements" and is documented in the Timco Engineering, Inc. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Timco Engineering, Inc. is reported:

Test Items	Measurement Uncertainty	Notes
RF Frequency Accuracy	± 49.5 Hz	(1)
RF Conducted Power	±0.93dB	(1)
Conducted spurious emission of transmitter valid up to 40GHz	±1.86dB	
Occupied Bandwidth	±2.65%	
Audio Frequency Response	±1.86dB	
Modulation limiting	±1.88%	
Radiated RF Power	±1.4dB	
Maximum frequency deviation: Within 300 Hz and 6kHz of audio freq. Within 6kHz and 25kHz of audio Freq.	 ±1.88% ±2.04%	
Rad Emissions Sub Meth up to 26.5GHz	±2.14dB	
Adjacent channel power	±1.47dB	(1)
Transient Frequency Response	±1.88%	
Temperature	±1.0°C	(1)
Humidity	±5.0%	

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

END OF REPORT