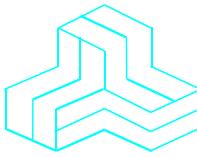


ENGINEERING TEST REPORT



915MHz ISM Module

Model: LLRXR27

FCC ID: 2AO4BLLRXR27

Applicant:

Braingrid Corporation

150 Bridgeland Ave. Suite 100
North York, Ontario
Canada M6A 1Z5

In Accordance With

Federal Communications Commission (FCC)

Part 15, Subpart C, Section 15.247

Digital Modulation Systems (DTS) Operating in 902 - 928 MHz Band

UltraTech's File No.: 18BRAC002_FCC15C247

This Test report is Issued under the Authority of
Tri M. Luu
Vice President of Engineering
UltraTech Group of Labs

Date: March 23, 2018

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: March 23, 2018

Test Dates: February 28, 2018
March 14-15, 2018

- The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- This report must not be used by the client to claim product endorsement by any agency of the US Government.*
- This test report shall not be reproduced, except in full, without a written approval from UltraTech*

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4

Tel.: (905) 829-1570 Fax.: (905) 829-8050

Website: www.ultratech-labs.com, Email: vic@ultratech-labs.com, Email: tri@ultratech-labs.com



91038



1309



46390-2049



AT-1945



SL2-IN-E-1119R



CA2049

TABLE OF CONTENTS

EXHIBIT 1. INTRODUCTION.....	1
1.1. SCOPE	1
1.2. RELATED SUBMITTAL(S)/GRANT(S)	1
1.3. NORMATIVE REFERENCES	1
EXHIBIT 2. PERFORMANCE ASSESSMENT	2
2.1. CLIENT INFORMATION	2
2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION	2
2.3. EUT'S TECHNICAL SPECIFICATIONS.....	3
2.4. ASSOCIATED ANTENNA DESCRIPTIONS	3
2.5. LIST OF EUT'S PORTS.....	3
2.6. ANCILLARY EQUIPMENT.....	4
EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS	5
3.1. CLIMATE TEST CONDITIONS	5
3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS.....	5
EXHIBIT 4. SUMMARY OF TEST RESULTS.....	6
4.1. LOCATION OF TESTS	6
4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS	6
4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES	6
EXHIBIT 5. TEST DATA.....	7
5.1. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]	7
5.2. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]	11
5.3. RF EXPOSURE REQUIRMENTS [§§ 15.247(i), 1.1310 & 2.1091].....	17
EXHIBIT 6. TEST EQUIPMENT LIST.....	19
EXHIBIT 7. MEASUREMENT UNCERTAINTY	20
7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY	20

EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15 – Radio Frequency Devices
Purpose of Test:	Equipment Certification for Digital Modulation Systems (DTS) Operating Under §15.247
Test Procedures:	<ul style="list-style-type: none">▪ ANSI C63.4▪ ANSI C63.10▪ FCC KDB Publication No. 558074 D01 DTS Meas Guidance v04
Environmental Classification:	<input checked="" type="checkbox"/> Commercial, industrial or business environment <input checked="" type="checkbox"/> Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2017	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
FCC, KDB Publication No. 558074 D01 DTS Meas Guidance v04	2017	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Braigrid Corporation
Address:	150 Bridgeland Ave. Suite 100 North York, Ontario Canada M6A 1Z5
Contact Person:	Mr. Michael Kadonoff Phone #: 416-508-4708 Fax #: N/A Email Address: michael@braingrid.io

MANUFACTURER	
Name:	Link Labs, LLC
Address:	130 Holiday Ct., Suite 100 Annapolis, MD 21401 United States
Contact Person:	Mr. Brian Ray Phone #: (443) 924-6980 Fax #: N/A Email Address: brian.ray@link-labs.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Braigrid Corporation
Product Name:	915MHz ISM Module
Model Name or Number:	LLRXR27
Serial Number:	Test Sample
Type of Equipment:	Digital Transmission System (DTS)
Input Power Supply Type:	External DC Power Supply
Primary User Functions of EUT:	Collection and transmission of sensor data

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	<ul style="list-style-type: none">• Mobile• Base Station (fixed use)
Intended Operating Environment:	<ul style="list-style-type: none">▪ Commercial, industrial or business environment▪ Residential environment
Power Supply Requirement:	3.7 VDC
RF Output Power Rating:	15 dBm typical
Operating Frequency Range:	902.6 – 927.5 MHz
RF Output Impedance:	50 Ω
Duty Cycle:	Continuous
Modulation Type:	FSK
Antenna Connector Types:	Integral or U.FL

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

Antenna Type	Maximum Gain (dBi)
PCB	0
Omni Directional Antenna	1.9

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	RF port	1	U.FL	Shielded cable
2	DC supply and I/O port	1	Pin header	Direct connection (no cable)

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Test Jig
Brand name:	Braigrid Corporation
Model Name or Number:	N/A
Connected to EUT's Port:	I/O Port

Ancillary Equipment # 2	
Description:	AC/DC Adaptor
Brand name:	XP
Model Name or Number:	VEL05US050-US-MB
Connected to EUT's Port:	Test Jig of the EUT

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21 to 23 °C
Humidity:	45 to 58%
Pressure:	102 kPa
Power Input Source:	3.7 VDC from test jig

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Test software provided by the Applicant to operate the EUT at each channel frequency continuously and in the range of typical modes of operation.
Special Hardware Used:	Test Jig
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	902.6 – 927.5 MHz
Frequency(ies) Tested:	902.6 MHz, 915.0 MHz, 927.5MHz
RF Power Output: (measured maximum output power at antenna terminals)	24.93 dBm Peak Power
Normal Test Modulation:	FSK
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes
15.207(a)	AC Power Line Conducted Emissions	See Note 1
15.247(a)(2)	6 dB Bandwidth	See Note 1
15.247(b)(3)	Peak Conducted Output Power - DTS	Yes
15.247(d)	Band-Edge Spurious Emissions	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(e)	Power Spectral Density	See Note 1
15.247(i), 1.1307, 1.1310, 2.1091	RF Exposure	Yes

Note 1: Not applicable for this Class II Permissive Change filing.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

EXHIBIT 5. TEST DATA

5.1. PEAK CONDUCTED OUTPUT POWER - DTS [§ 15.247(b)(3)]

5.1.1. Limit(s)

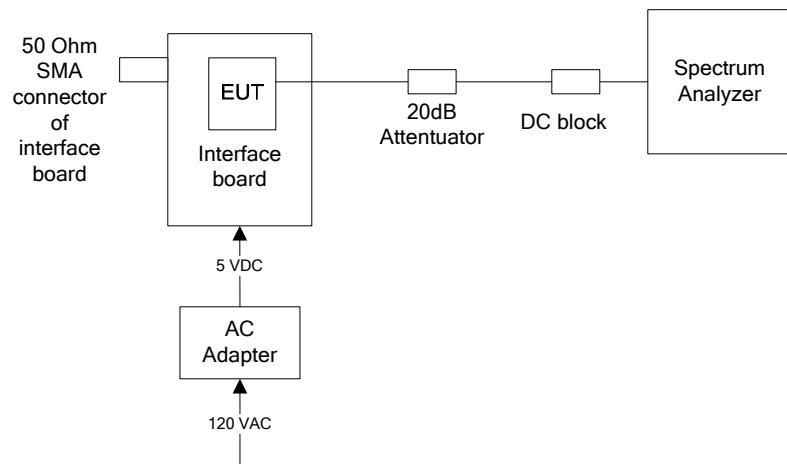
§ 15.247(b)(3): For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

§ 15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2. Method of Measurements & Test Arrangement

KDB 558074 D01 DTS Meas Guidance V04, Section 9.1.1

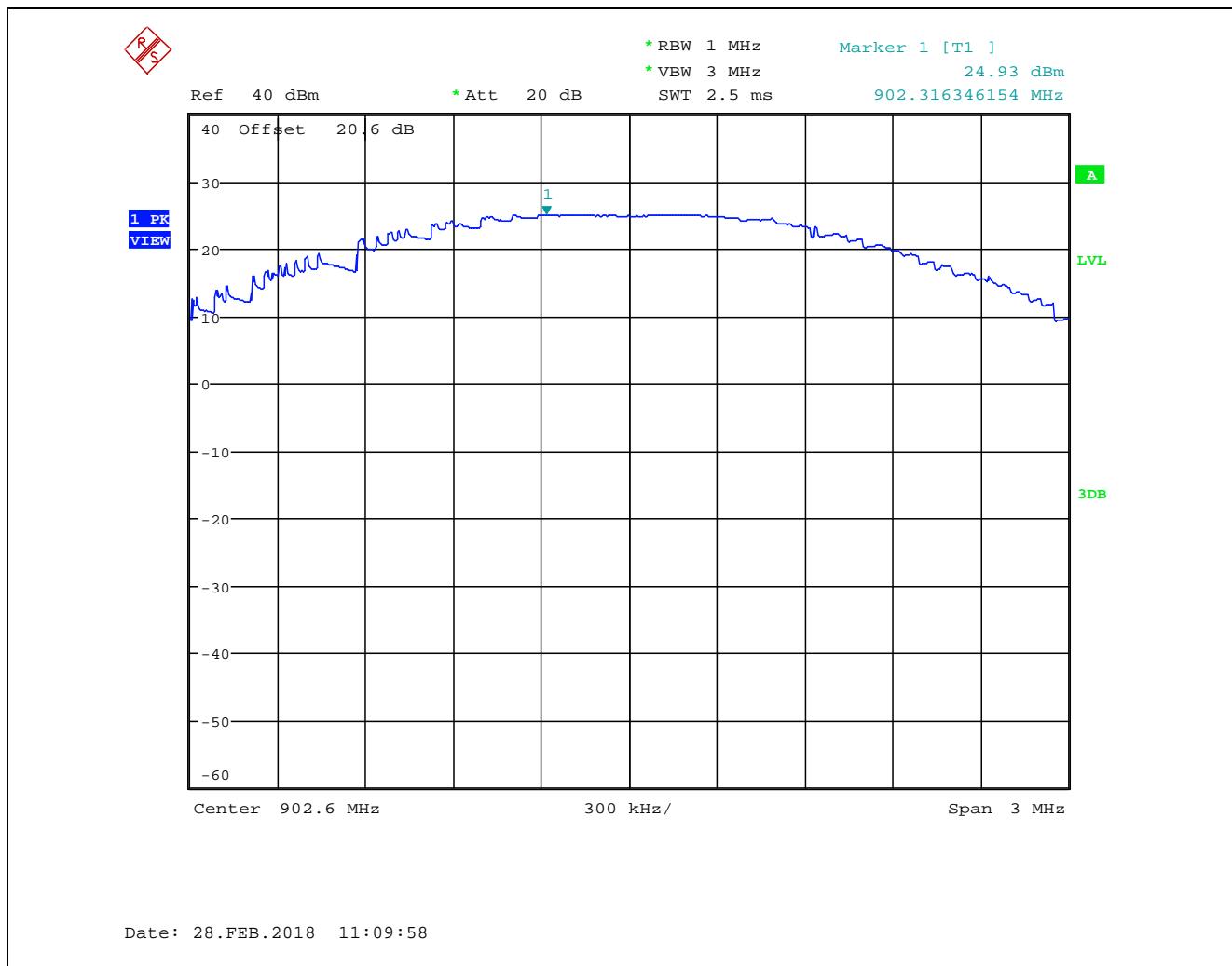
5.1.3. Test Arrangement



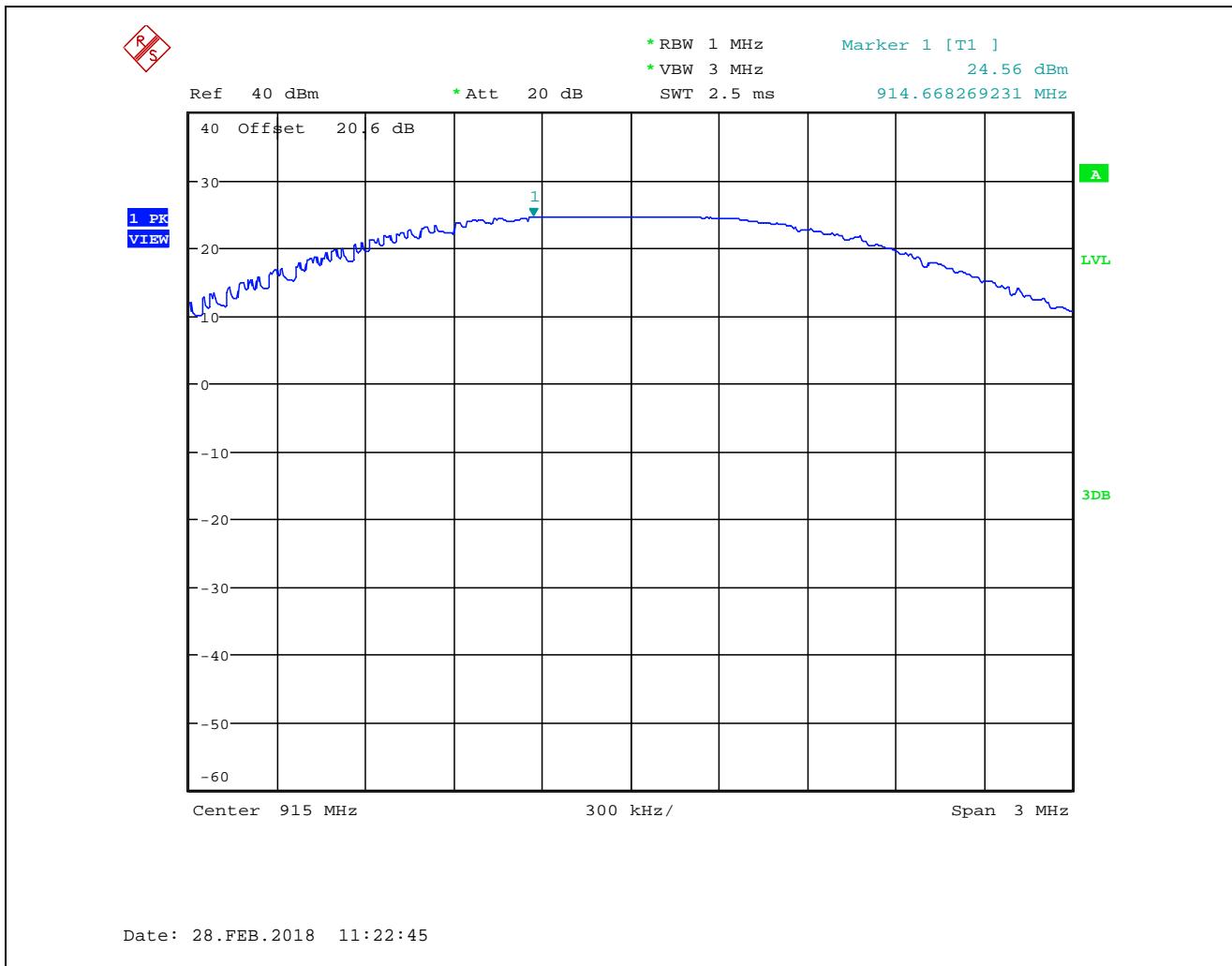
5.1.4. Test Data

Modulation	Frequency (MHz)	Max. Peak Conducted Output Power (dBm)	Peak Conducted Output Power Limit (dBm)
FSK	902.6	24.93	30
	915.0	24.56	30
	927.5	24.10	30

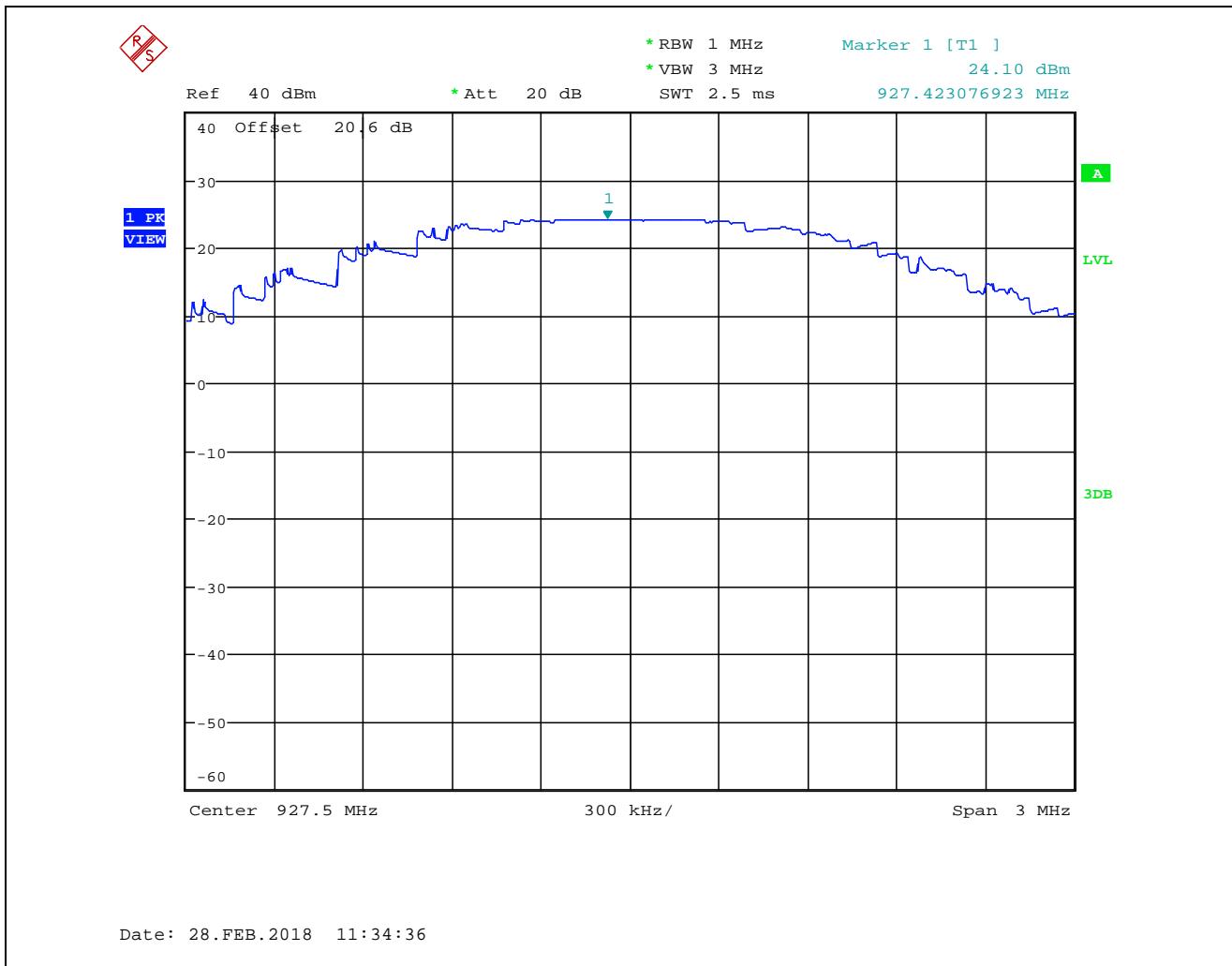
Plot 5.1.4.1. Maximum Peak Conducted Output Power, 902.6 MHz



Plot 5.1.4.2. Maximum Peak Conducted Output Power, 915.0 MHz



Plot 5.1.4.3. Maximum Peak Conducted Output Power, 927.5 MHz



5.2. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.2.1. Limit(s)

§ 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
1.0495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(²)
13.36–13.41.			

¹ Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

² Above 38.6

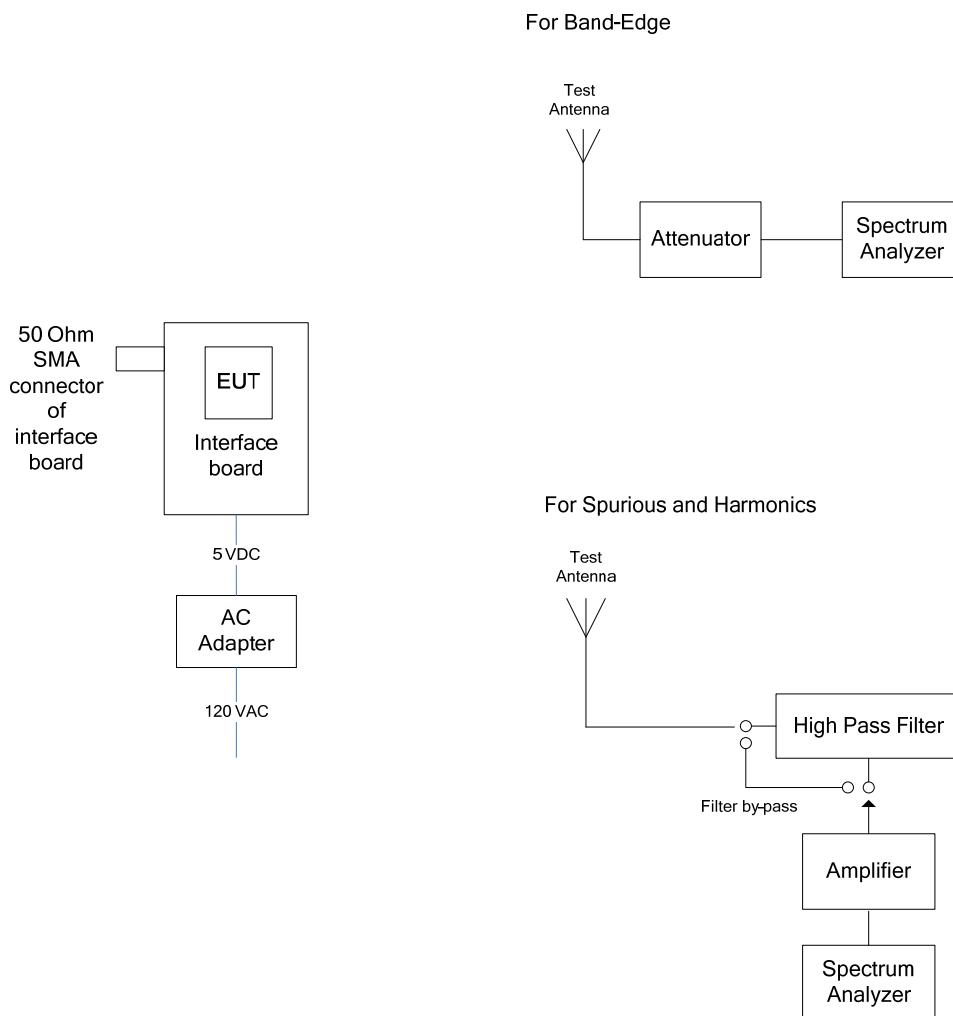
Section 15.209(a) - Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / F (kHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.2.2. Method of Measurements

ANSI C63.10.

5.2.3. Test Arrangement



5.2.4. Test Data

Remark(s):

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- Exploratory tests performed to determined worst-case test configurations, the following test results represent the worst-case.

5.2.4.1. Spurious Radiated Emissions: EUT with 0 dBi integral PCB Antenna

Fundamental Frequency: 902.6 MHz							
Frequency Test Range: 30 MHz – 10 GHz							
Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/Fail
902.6	123.27	--	V	--	--	--	--
902.6	126.55	--	H	--	--	--	--
2707.8	54.93	40.39	V	54.0	106.6	-13.6	Pass*
2707.8	58.77	48.53	H	54.0	106.6	-5.5	Pass*
3610.4	52.18	40.35	V	54.0	106.6	-13.7	Pass*
3610.4	52.71	43.09	H	54.0	106.6	-10.9	Pass*
5415.6	53.15	36.93	V	54.0	106.6	-17.1	Pass*
5415.6	54.08	40.73	H	54.0	106.6	-13.3	Pass*
8123.4	56.25	41.79	V	54.0	106.6	-12.2	Pass*
8123.4	52.85	40.47	H	54.0	106.6	-13.5	Pass*

All other spurious emissions and harmonics are more than 20 dB below the applicable limit.

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency: 915.0 MHz Frequency Test Range: 30 MHz – 10 GHz							
Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/Fail
915.0	123.15	--	V	--	--	--	--
915.0	123.78	--	H	--	--	--	--
2745.0	56.92	44.62	V	54.0	103.8	-9.4	Pass*
2745.0	58.41	48.93	H	54.0	103.8	-5.1	Pass*
3660.0	50.86	39.15	V	54.0	103.8	-14.9	Pass*
3660.0	49.98	34.81	H	54.0	103.8	-19.2	Pass*
4575.0	50.29	35.94	V	54.0	103.8	-18.1	Pass*
4575.0	49.37	34.62	H	54.0	103.8	-19.4	Pass*
8235.0	57.17	42.67	V	54.0	103.8	-11.3	Pass*
8235.0	55.01	41.29	H	54.0	103.8	-12.7	Pass*

All other spurious emissions and harmonics are more than 20 dB below the applicable limit.

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

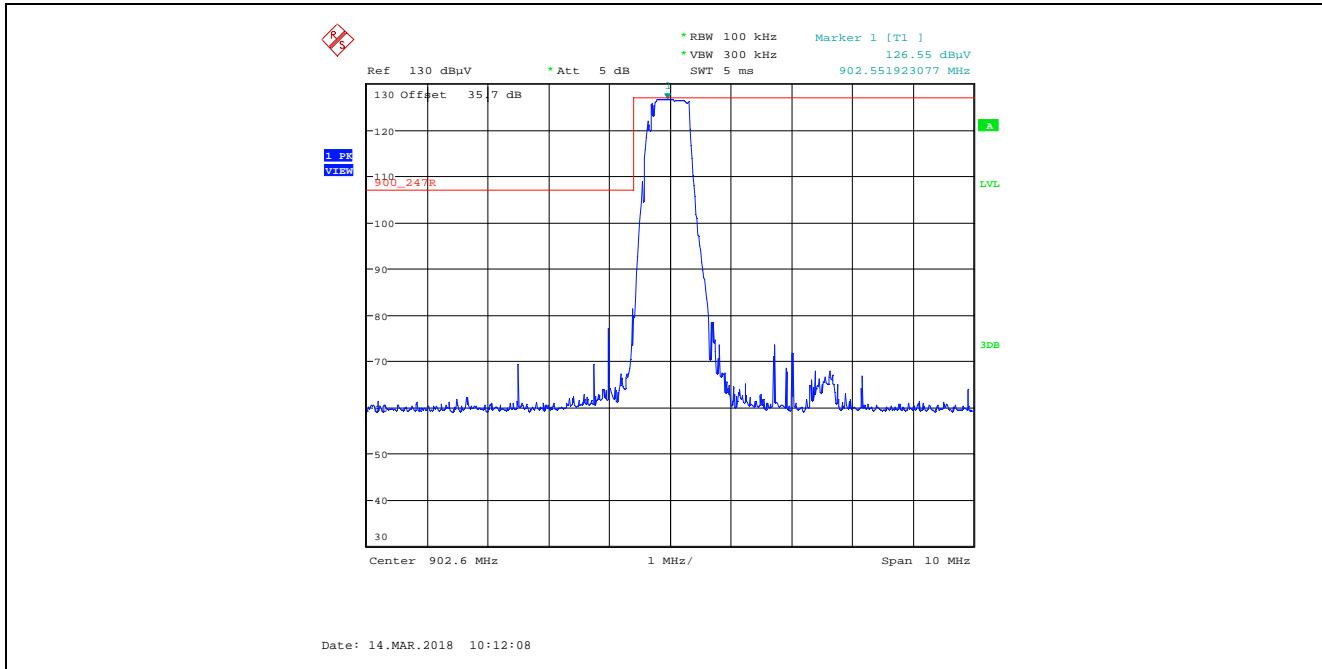
Fundamental Frequency: 927.5 MHz Frequency Test Range: 30 MHz – 10 GHz							
Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/Fail
927.5	122.69	122.69	V	--	--	--	--
927.5	122.98	122.98	H	--	--	--	--
2782.5	58.35	44.19	V	54.0	103.0	-9.8	Pass*
2782.5	63.97	46.71	H	54.0	103.0	-7.3	Pass*
3710.0	48.23	35.40	V	54.0	103.0	-18.6	Pass*
3710.0	51.15	38.65	H	54.0	103.0	-15.4	Pass*
8347.5	54.08	42.10	V	54.0	103.0	-11.9	Pass*
8347.5	56.90	42.16	H	54.0	103.0	-11.8	Pass*

All other spurious emissions and harmonics are more than 20 dB below the applicable limit.

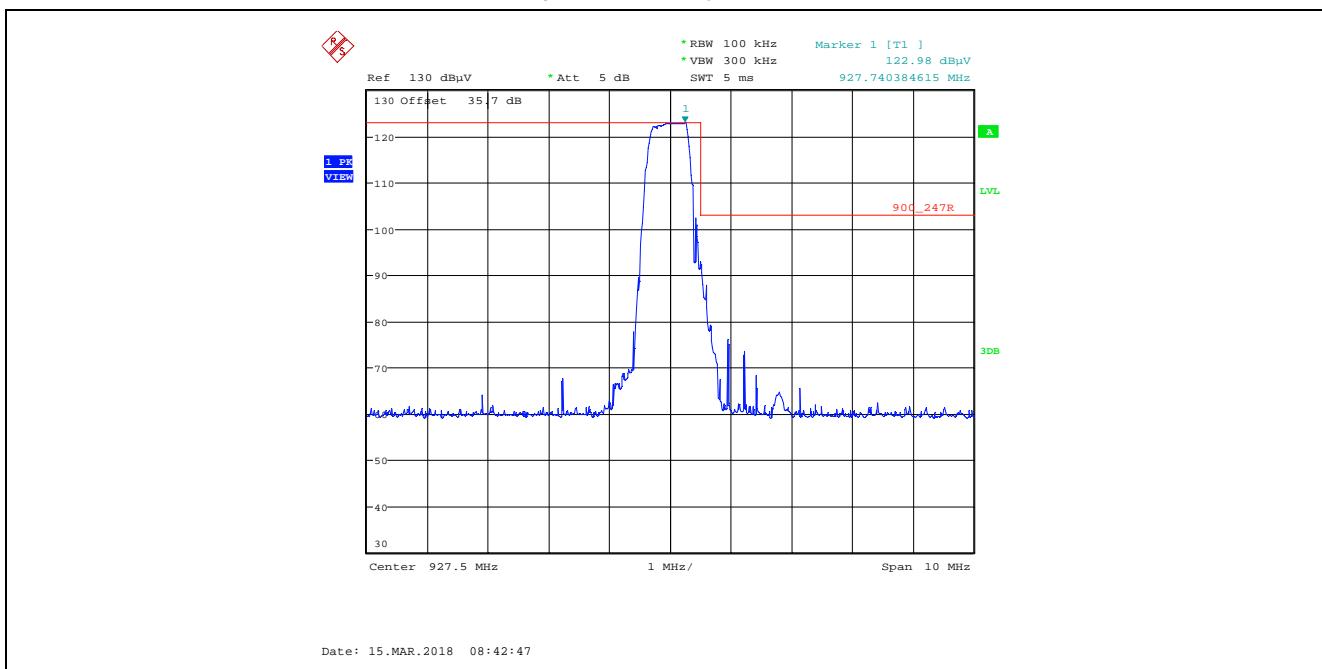
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.2.4.2. Band-Edge RF Radiated Emissions

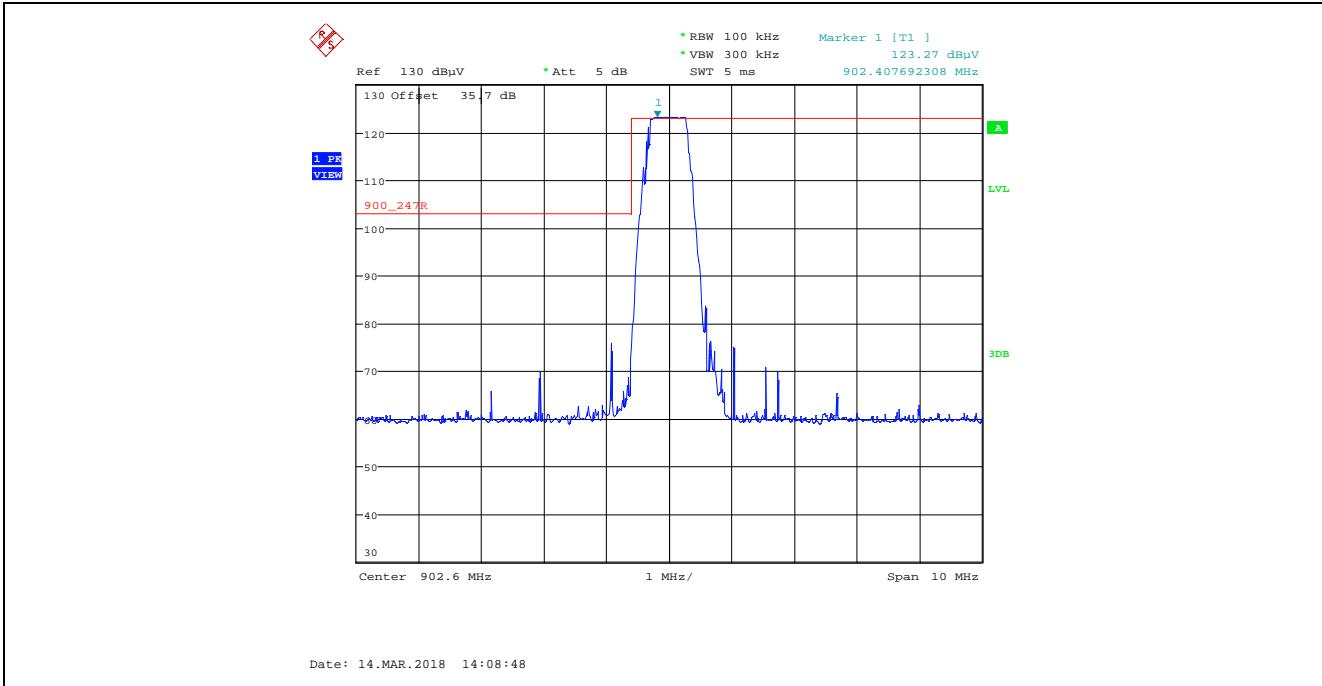
Plot 5.2.4.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Lowest Frequency Channel



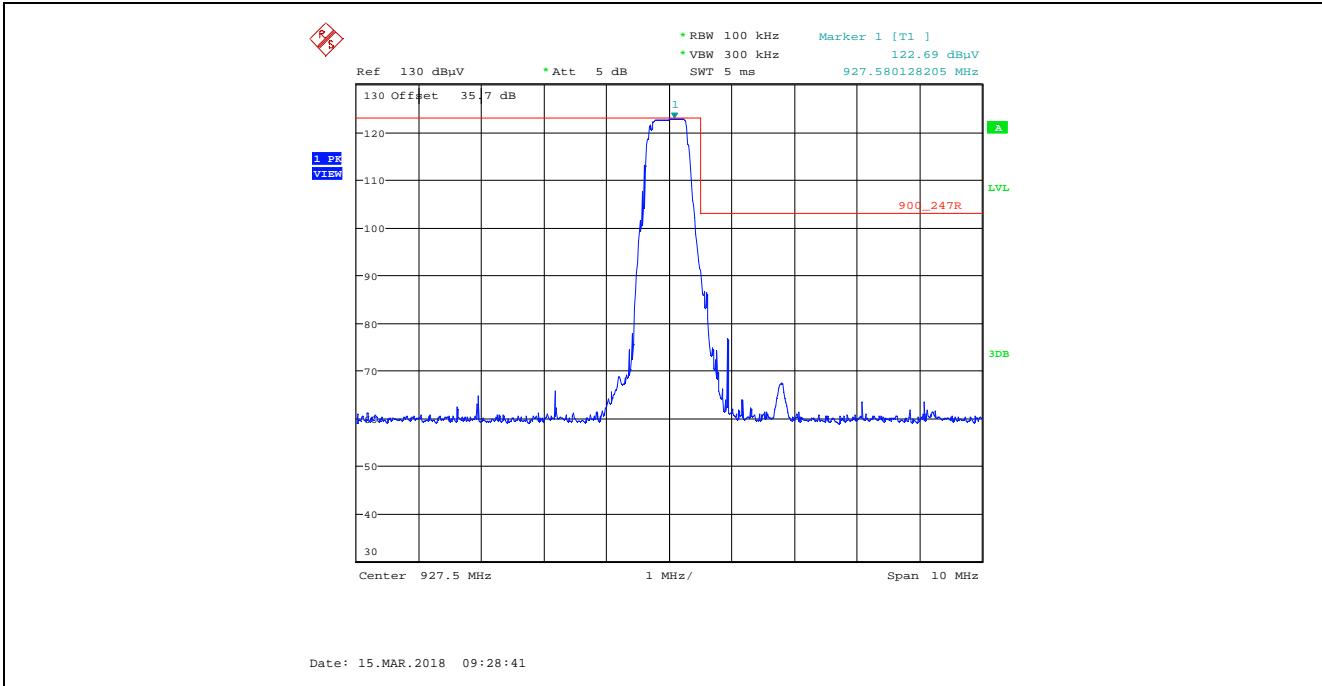
Plot 5.2.4.2.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Highest Frequency Channel



Plot 5.2.4.2.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization Lowest Frequency Channel



Plot 5.2.4.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization Highest Frequency Channel



5.3. RF EXPOSURE REQUIREMENTS [§§ 15.247(i), 1.1310 & 2.1091]

5.3.1. Limits

§ 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.3.2. Method of Measurements

Calculation Method of Power Density/RF Safety Distance:

$$S = \frac{PG}{4\pi \cdot r^2} = \frac{EIRP}{4\pi \cdot r^2}$$

Where, P: power input to the antenna in mW
 EIRP: Equivalent (effective) isotropic radiated power.
 S: power density mW/cm²
 G: numeric gain of antenna relative to isotropic radiator
 r: distance to centre of radiation in cm

5.3.3. RF Evaluation

5.3.3.1. Co-location (Evaluation Distance at 24 cm)

Pursuant to KDB 447498 D01 General RF Exposure Guidance v06, Section 7.2:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured field strengths or power density.

Co-location will applies to EUT with 1.9 dBi typical antenna gain, worst case EIRP of 27.9 dBm will be used in co-location at the minimum 24 cm evaluation separation distance required by the operating configurations and exposure conditions of the host device.

The maximum calculated MPE ratio of the EUT with 1.9 dBi antenna gain

Frequency (MHz)	EUT EIRP (dBm)	EUT EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm ²)	FCC MPE Limit (mW/cm ²)	MPE Ratio
902.6	27.9	616.595	24	0.085	0.602	0.141

The maximum calculated MPE ratio for the EUT with 1.9 dBi dipole antenna is 0.141, this configuration can be co-located with other antennas provided the sum of the MPE ratios for all the other simultaneous transmitting antennas incorporated in a host device is $\leq 1.0 - 0.141 \leq 0.859$.

The following table addresses the co-location of the EUT with 1.9 dBi antenna and the specified radio module(s).

Co-location of EUT with 1.9 dBi antenna and radio module identified in this table

*Radio Module	Frequency (MHz)	EIRP (dBm)	EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm ²)	FCC MPE Limit (mW/cm ²)	MPE Ratio	MPE Ratio of EUT with 1.9 dBi antenna	Sum of MPE Ratios	Verdict
WP8548 Radio Module (FCC ID: N7NWP8, IC 2417C-WP8)	824	30.98	1253.141	24	0.173	0.549	0.315	0.141	0.456	Compliant

* The test data of the radio modules represented in this table is the worst-case configuration (maximum MPE ratio) derived from the original radio module(s) MPE report(s). Refer to the report(s) for details.

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Semi-Anechoic Chamber	TDK	2049A-3	--	--	03 Mar 2020
Spectrum Analyzer	Rohde & Schwarz	FSU26	200946	20Hz–26.5 GHz	21 Jul 2018
DC Block	Hewlett Packard	11742A	12460	0.045 – 26.5 GHz	See Note 1
Attenuator	Pasternack	7024-20	6	DC–26.5 GHz	See Note 1
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz–40 GHz	09 May 2018
Spectrum Analyzer	Rohde & Schwarz	FSU26	200946	20Hz–26.5 GHz	21 Jul 2018
RF Amplifier	Com-Power	PAM-0118A	551052	0.5 – 18 GHz	17 Jul 2018
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	04 Oct 2018
Biconilog	EMCO	3142	9601-1005	26-1000 MHz	12 May 2018
Horn Antenna	EMCO	3155	6570	1 – 18 GHz	13 Oct 2018
High Pass Filter	K & L	11SH10-1500/T8000	2	Cut off 900 MHz	See Note 1
Attenuator	Pasternack	PE7024-10	4	DC–26.5 GHz	See Note 1
Log Periodic	ETS-Lindgren	3148	23845	200 – 2000 MHz	20 Jul 2018
Note 1: Internal Verification/Calibration check					

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.79	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.75	Under consideration