

AS/NZS 4268:2017

TEST REPORT

For

Shenzhen RAKwireless Technology Co., Ltd.

Room 506, Bldg B, New Compark, Pingshan First Road, Taoyuan Street, XiLi town
Nanshan District, Shenzhen, China

Model: RAK7268

Report Type: Original Report	Product Type: WisGate
Report Number: RSZ200922006-14A	
Report Date: 2021-01-12 Nancy Wang	
Reviewed By: RF Engineer	
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

Note: BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	4
SYSTEM TEST CONFIGURATION	5
DESCRIPTION OF TEST CONFIGURATION	5
EUT EXERCISE SOFTWARE	5
SPECIAL ACCESSORIES	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL I/O CABLE	5
BLOCK DIAGRAM OF TEST SETUP	6
SUMMARY OF TEST RESULTS	7
TEST EQUIPMENT LIST	8
AS/NZS 4268:2017 §6.6 OPERATION FREQUENCIES	9
APPLICABLE STANDARD	9
TEST DATA	9
AS/NZS 4268:2017 §6.6, §7.2 – UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN.....	11
APPLICABLE STANDARD	11
METHOD OF MEASUREMENT	11
TEST DATA	11
AS/NZS 4268:2017 §6.3 – MAXIMUM EIRP	14
APPLICABLE STANDARD	14
METHOD OF MEASUREMENT	14
TEST DATA	15
AS/NZS 4268:2017 Table 1Note 2 –PEAK POWER SPECTRAL DENSITY.....	17
APPLICABLE STANDARD	17
METHOD OF MEASUREMENT	17
TEST DATA	17
AS/NZS 4268:2017 §6.5 - EMISSION BANDWIDTH	22
APPLICABLE STANDARD	22
METHOD OF MEASUREMENT.....	22
TEST DATA	23
EXHIBIT A - EUT PHOTOGRAPHS.....	27
EXHIBIT B- TEST SETUP PHOTOGRAPHS	28
RADIATED SPURIOUS EMISSIONS TEST VIEW (BELOW 1GHz)	28
RADIATED SPURIOUS EMISSIONS TEST VIEW (ABOVE 1GHz)	28

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	WisGate
Tested Model	RAK7268
Frequency Range	923.3-927.5 MHz
Transmit Power (EIRP)	22.20dBm
Modulation Technique	LoRa / Chirp –based Spread-Spectrum
Antenna Specification*	2.3dBi(It is provided by the applicant)
Voltage Range	DC 12.0V from adapter or DC 48V from POE
Sample serial number	RSZ200922006-EM-S1(Assigned by BACL, Shenzhen)
Received date	2020-09-22
Sample/EUT Status	Good condition
Normal/Extreme Condition	N.V.: Nominal Voltage: 230V _{AC} L.V.: Low Voltage 207V _{AC} ; L.T.: Low Temperature -10℃; N.V.: Normal Voltage 230V _{AC} ; N.T.: Normal Temperature +25℃; H.V.: High Voltage 253V _{AC} ; H.T.: High Temperature +55℃ <i>Note: the extreme test condition was declared by manufacturer.</i>
Adapter information	Model: RA040-1202000AU Input: AC 100-240V~50/60Hz, 0.6A Max Output: DC 12.0V, 2.0A 24.0W

Objective

This report is in accordance with AS/NZS 4268:2017, Radio equipment and systems-Short range devices-Limits and methods of measurement.

The objective is to determine the compliance of EUT with AS/NZS 4268:2017.

Test Methodology

According to AS/NZS 4268:2017§6.1:

6.1 General

Evidence of transmitter compliance to this Standard may be demonstrated by providing a complete ETSI or FCC test report. Australian and New Zealand requirements, for example, frequency assignments or transmitter power levels, may be different to international requirements and compliance with any differences shall be addressed and documented.

To determine compliance, a transmitter has the option of being tested to either the ETSI or FCC generic standards listed in Clause 6.2.2. Where Table 1 (in the column headed ‘Test method’) lists a specific ETSI product Standard for Australia, the supplier still has the option of testing to the FCC generic standard and vice versa. Refer to Figure 1 for guidance.

Where testing to an ETSI Standard or the FCC rules is permitted by this Standard (AS/NZS 4268), testing to the requirements of either of these shall be undertaken to the version(s) of the ETSI Standard published in the *Official Journal of the European Union*, or the FCC rules that apply on the date the device is imported into or manufactured in Australia or New Zealand.

All test Method in this report according to EN 300 220-1 V3.1.1 /ETSI EN 300 220-2 V3.2.1 to determine compliance with AS/NZS 4268 requirements.

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Shenzhen).

Measurement Uncertainty

Parameter	Flab	Maximum allow uncertainty
Radio frequency	±0,5 ppm	±0,5 ppm
RF power, conducted	±0.73dB	±1.5dB
Conducted spurious emission of transmitter, valid up to 6 GHz	±1.6dB	±3dB
Conducted emission of receivers	±1.6dB	±3dB
Below 1GHz emissions, radiated	±4.75dB	±6dB
Above 1GHz emissions, radiated	±4.88dB	±6dB
RF level uncertainty for a given BER	±1.5dB	±1.5 dB
Occupied BandWidth	±5%	±5%
Temperature	±1 °C	±2,5 °C
Humidity	±1%	±10%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

This EUT contains two LoRa modules, which have the model are RAK2247 and RAK2287.

The system was configured for testing in an engineering mode.

Frequency list

Channel	Frequency (MHz)
1	923.3
2	923.9
3	924.5
4	925.1
5	925.7
6	926.3
7	926.9
8	927.5

EUT Exercise Software

“SecureCRT”* software was use to the EUT tested and power level is 12(for Lora module of RAK 2287) and 14(for Lora module of RAK 2247)*. The software and power level was provided by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT.

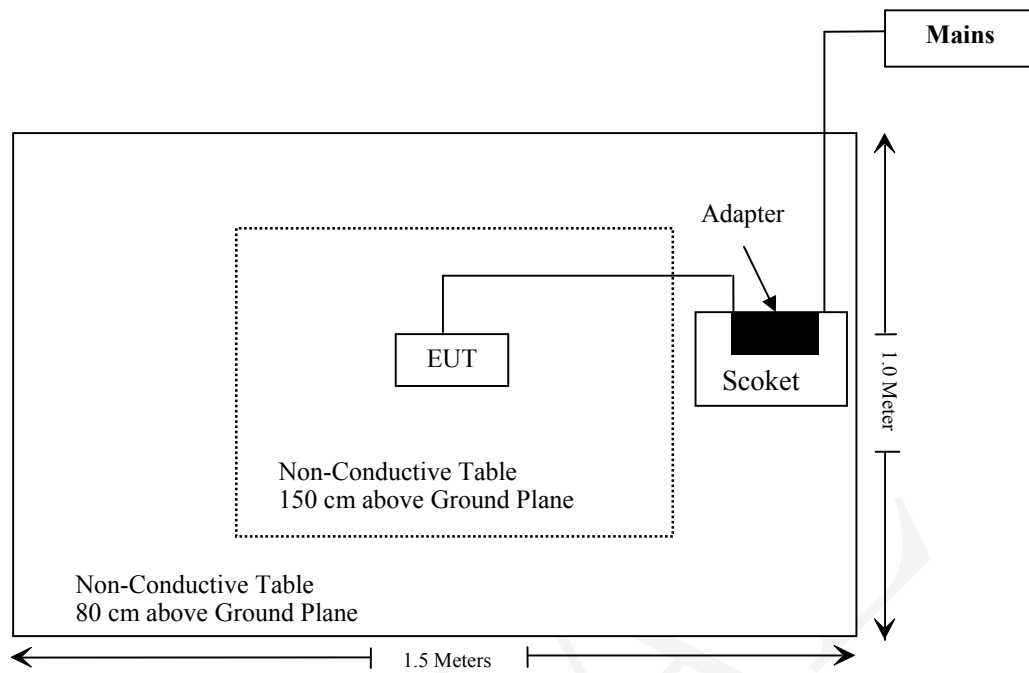
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Detachable DC Cable	1.0	EUT	Adapter

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

Rules	Description of Test	Test Result
AS/NZS 4268:2017 § 6.6	Operating Frequencies	Compliance
AS/NZS 4268:2017 § 6.4 & § 7.2	Unwanted emissions in the spurious domain	Compliance
AS/NZS 4268:2017 § 6.3	Maximum EIRP	Compliance
AS/NZS 4268:2017 Table 1 Note 2	Peak power spectral density	Compliance
AS/NZS 4268:2017 § 6.5	Emission Bandwidth	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
COM-POWER	Dipole Antenna	AD-100	721027	NCR	NCR
Unknown	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknown	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
A.H.System	Horn Antenna	SAS-200/571	135	2018/09/01	2021/08/31
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
Unknown	High Pass filter	1.3GHz	101120	2020/04/20	2021/04/20
Agilent	Signal Generator	N5183A	MY51040755	2020/01/14	2021/01/13
RF Conducted test					
Agilent	USB Wideband Power Sensor	U2021XA	MY54250003	2020/08/04	2021/08/03
Rohde & Schwarz	SPECTRUM ANALYZER	FSU26	200120	2020/04/03	2021/04/02
WEINSCHL	3dB Attenuator	Unknown	F-03-EM121	2020/11/29	2021/11/28
Yijia	Temperature & Humidity Meter	10316377	T-03-EM397	2020/09/30	2021/09/29
instek	DC Power Supply	GPS-3030DD	EM832096	NCR	NCR
Fluke	Digital Multimeter	287	19000011	2020/07/23	2021/07/22

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

AS/NZS 4268:2017 §6.6 OPERATION FREQUENCIES

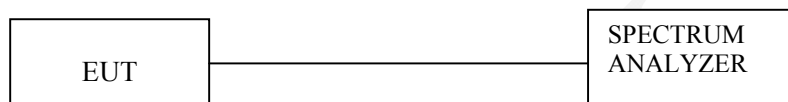
Applicable Standard

Limit is 915~928MHz

The upper and lower frequency limits of the transmitter 99% emission power bandwidth shall at all times remain within the operating frequency limits.

Some transmitter categories require a specific limit for emission bandwidth. In such cases, the emission bandwidth shall be established by testing in accordance with the relevant specified Standard.

Test Set up Block diagram



Test Data

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2020-10-22

EUT operation mode: Transmitting

Test Result: Compliance. Please refer to the following table:

For Lora module of RAK2247:

Mode	Test Conditions		Frequency (MHz)			
	Temperature	Voltage	f _L at Low Channel	f _H at High Channel	f _L Limit	f _H Limit
Lora	L.T.	L.V.	922.9236	927.8749	915	928
	L.T.	H.V.	922.9211	927.8803	915	928
	N.T.	N.V.	922.9202	927.8766	915	928
	H.T.	L.V.	922.9194	927.8778	915	928
	H.T.	H.V.	922.9202	927.8768	915	928

For Lora module of RAK2287:

Mode	Test Conditions		Frequency (MHz)			
	Temperature	Voltage	f _L at Low Channel	f _H at High Channel	f _L Limit	f _H Limit
Lora	L.T.	L.V.	922.9081	927.9045	915	928
	L.T.	H.V.	922.9103	927.9013	915	928
	N.T.	N.V.	922.9074	927.9038	915	928
	H.T.	L.V.	922.9075	927.9066	915	928
	H.T.	H.V.	922.9065	927.9039	915	928

AS/NZS 4268:2017 §6.6, §7.2 – UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN**Applicable Standard****Table 19: Spurious domain emission limits**

Frequency \ State	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1 000 MHz	Frequencies above 1 000 MHz
TX mode	-54 dBm	-36 dBm	-30 dBm
RX and all other modes	-57 dBm	-57 dBm	-47 dBm

Method of Measurement

According to ETSI EN 300 220-1 V3.1.1 (2017-02) clause 5.9

Test Data**Environmental Conditions**

Temperature:	25.7~30 °C
Relative Humidity:	44~58 %
ATM Pressure:	100.9~101.1 kPa

The testing was performed by Harris He for below 1GHz and Leven Gan for above 1GHz on 2020-11-12.

Test result: Compliance. Please refer to the following tables.

Radiated spurious emissions**For Lora module of RAK 2247:**

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
Test mode: Transmitting										
923.3 MHz										
479.9	36.23	100	1.3	H	-62.3	1.37	0.0	-63.67	-54	9.67
479.9	29.68	246	2.3	V	-68.0	1.37	0.0	-69.37	-54	15.37
1846.60	46.12	302	1.5	H	-58.9	1.30	9.30	-50.90	-30	20.90
1846.60	49.36	353	1.4	V	-55.3	1.30	9.30	-47.30	-30	17.30
2769.90	48.36	240	1.8	H	-55.6	1.80	10.50	-46.90	-30	16.90
2769.90	50.18	20	1.9	V	-53.4	1.80	10.50	-44.70	-30	14.70
927.5 MHz										
479.9	36.35	98	2.2	H	-62.2	1.37	0.0	-63.57	-54	9.57
479.9	30.12	134	1.9	V	-67.5	1.37	0.0	-68.87	-54	14.87
1855.00	45.36	107	1.9	H	-57.7	1.30	9.40	-49.60	-30	19.60
1855.00	49.78	317	1.5	V	-53.5	1.30	9.40	-45.40	-30	15.40
2782.50	46.99	239	1.9	H	-57.0	1.80	10.50	-48.30	-30	18.30
2782.50	51.57	239	1.2	V	-52.0	1.80	10.50	-43.30	-30	13.30
Test mode: Receiving										
923.3 MHz										
479.9	36.54	80	1.6	H	-62.0	1.37	0.0	-63.37	-57	6.37
479.9	29.67	155	1.9	V	-68.0	1.37	0.0	-69.37	-57	12.37
1812.45	42.94	209	2.5	H	-62.4	1.30	9.30	-54.40	-47	7.40
1812.45	42.51	289	1.5	V	-62.5	1.30	9.30	-54.50	-47	7.50
927.5 MHz										
479.9	37.12	164	1.3	H	-61.4	1.37	0.0	-62.77	-57	5.77
479.9	30.26	21	1.7	V	-67.4	1.37	0.0	-68.77	-57	11.77
1379.56	42.25	175	2.3	H	-66.0	1.60	7.90	-59.70	-47	12.70
1379.56	42.55	185	1.5	V	-66.0	1.60	7.90	-59.70	-47	12.70
Test mode: Standby Mode										
479.9	36.84	30	2.2	H	-61.7	1.37	0.0	-63.07	-57	6.07
479.9	30.42	35	1.8	V	-67.2	1.37	0.0	-68.57	-57	11.57
1669.81	41.16	64	1.9	H	-65.6	1.30	8.90	-58.00	-47	11.00
1669.81	41.63	97	2.3	V	-64.5	1.30	8.90	-56.90	-47	9.90

For Lora module of RAK2287:

Frequency (MHz)	Receiver Reading (dBμV)	Turntable Angle Degree	Rx Antenna		Substituted			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)	SG Level (dBm)	Cable Loss (dB)	Antenna Gain (dBd/dBi)			
Test mode: Transmitting										
923.3 MHz										
479.9	37.18	121	2.0	H	-61.3	1.37	0.0	-62.67	-54	8.67
479.9	30.23	235	2.0	V	-67.4	1.37	0.0	-68.77	-54	14.77
1846.60	45.66	9	1.4	H	-59.4	1.30	9.30	-51.40	-30	21.40
1846.60	48.51	344	1.7	V	-56.1	1.30	9.30	-48.10	-30	18.10
2769.90	48.53	41	1.1	H	-55.4	1.80	10.50	-46.70	-30	16.70
2769.90	49.69	52	2.5	V	-53.9	1.80	10.50	-45.20	-30	15.20
927.5 MHz										
479.9	36.96	32	1.8	H	-61.6	1.37	0.0	-62.97	-54	8.97
479.9	30.55	29	1.4	V	-67.1	1.37	0.0	-68.47	-54	14.47
1855.00	46.12	185	1.8	H	-57.0	1.30	9.40	-48.90	-30	18.90
1855.00	48.49	293	1.9	V	-54.8	1.30	9.40	-46.70	-30	16.70
2782.50	47.69	246	2.1	H	-56.3	1.80	10.50	-47.60	-30	17.60
2782.50	50.11	290	1.2	V	-53.5	1.80	10.50	-44.80	-30	14.80
Test mode: Receiving										
923.3 MHz										
479.9	36.39	357	1.6	H	-62.1	1.37	0.0	-63.47	-57	6.47
479.9	29.62	359	1.4	V	-68.0	1.37	0.0	-69.37	-57	12.37
1389.66	41.19	134	2.3	H	-67.1	1.60	7.90	-60.80	-47	13.80
1389.66	42.56	321	1.1	V	-66.0	1.60	7.90	-59.70	-47	12.70
927.5 MHz										
479.9	36.45	9	1.1	H	-62.1	1.37	0.0	-63.47	-57	6.47
479.9	29.74	149	1.5	V	-67.9	1.37	0.0	-69.27	-57	12.27
1796.73	42.47	159	2.5	H	-62.9	1.30	9.30	-54.90	-47	7.90
1796.73	42.99	65	2.3	V	-62.0	1.30	9.30	-54.00	-47	7.00
Test mode: Standby Mode										
479.9	36.12	101	1.8	H	-62.4	1.37	0.0	-63.77	-57	6.77
479.9	29.87	319	2.3	V	-67.8	1.37	0.0	-69.17	-57	12.17
1673.52	42.40	54	1.2	H	-64.3	1.30	8.90	-56.70	-47	9.70
1673.52	42.05	250	1.6	V	-64.1	1.30	8.90	-56.50	-47	9.50

Note 1: The unit of antenna gain is dBd for frequency below 1GHz and is dBi for frequency above 1GHz.

Note 2:

Absolute Level = SG Level - Cable loss + Antenna Gain

Margin = Limit- Absolute Level

AS/NZS 4268:2017 §6.3 – MAXIMUM EIRP**Applicable Standard**

58	Digital modulation transmitters	915 to 928	1 W		Refer to Note 2.
----	---------------------------------	------------	-----	--	------------------

Method of Measurement

According to ETSI EN 300 220-1 V3.1.1 (2017-02) clause 5.2.2.1:

Effective Radiated Power (conducted measurement):

This method applies only to EUT with a permanent external antenna connector.

The transmitter shall be connected to a dummy load as described in clause 4.3.7 and the conducted power delivered shall be measured with a measurement receiver according to clause 4.3.10.

In the case of non-constant envelope modulation, a peak detector shall be used.

The maximum gain of the antenna to be used together with the equipment shall be declared by the manufacturer and this shall be recorded in the test report.

Perp, the radiated power (e.r.p.) limit applies to the maximum measured conducted power ($P_{\text{conducted}}$) value adjusted by the antenna gain (relative to a dipole) ($P_{\text{erp}} = P_{\text{conducted}} + \text{antenna gain}$).

The information shown in Table 7 shall be recorded in the test report.

**Table 7: Information Recorded in the Test Report
for conducted Effective Radiated Power**

Value	Notes
Test environment	Normal operation or unmodulated carrier
Centre frequency	Nominal Operating Frequency
Measured Effective Radiated Power	maximum measured conducted power value adjusted by the antenna gain (relative to a dipole)
NOTE: In case of a dedicated antenna the antenna gain (in dB, i.e. relative to a dipole) is declared by the manufacturer.	

According to ETSI EN 300 220-1 V3.1.1 (2017-02) clause 5.2.2.2:

Effective radiated power (radiated measurement):

This measurement method applies to EUT other than those measured using clause 5.2.2.1.

A suitable test site shall be selected from those described in clause C.1 and the radiated power established using the procedures described in clause C.5.1 (or clause C.5.2) depending on the test site, followed by clause C.5.3.

In the case of non-constant envelope modulation, a peak detector shall be used.

The information shown in Table 8 shall be recorded in the test report.

Table 8: Information Recorded in the Test Report for Effective Radiated Power

Value	Notes
Test environment	Normal operation or unmodulated carrier
Centre frequency	Nominal Operating Frequency
Measure of Effective Radiated Power	Larger value from horizontal and vertical measurement equivalent radiated power, plus equipment antenna gain
NOTE: In case of a removable antenna the antenna gain (in dB, i.e. relative to a dipole) is declared by the manufacturer.	

Test Data

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2020-10-22.

EUT operation mode: Transmitting

Test Result: Compliant, please refer to following table.

For Lora module of RAK2247:

Test Condition			Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Result
Frequency (MHz)	Temperature	Voltage					
923.3	L.T	L.V.	17.33	2.3	19.63	30	Pass
		H.V.	17.59	2.3	19.89	30	Pass
	N.T.	N.V.	17.64	2.3	19.94	30	Pass
	H.T.	L.V.	17.56	2.3	19.86	30	Pass
		H.V.	17.68	2.3	19.98	30	Pass
925.1	L.T	L.V.	17.95	2.3	20.25	30	Pass
		H.V.	18.01	2.3	20.31	30	Pass
	N.T.	N.V.	18.04	2.3	20.34	30	Pass
	H.T.	L.V.	17.92	2.3	20.22	30	Pass
		H.V.	17.98	2.3	20.28	30	Pass
927.5	L.T	L.V.	17.53	2.3	19.83	30	Pass
		H.V.	17.41	2.3	19.71	30	Pass
	N.T.	N.V.	17.48	2.3	19.78	30	Pass
	H.T.	L.V.	17.44	2.3	19.74	30	Pass
		H.V.	17.52	2.3	19.82	30	Pass

For Lora module of RAK2287:

Test Condition			Conducted Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Result
Frequency (MHz)	Temperature	Voltage					
923.3	L.T	L.V.	19.48	2.3	21.78	30	Pass
		H.V.	19.42	2.3	21.72	30	Pass
	N.T.	N.V.	19.46	2.3	21.76	30	Pass
	H.T.	L.V.	19.50	2.3	21.80	30	Pass
		H.V.	19.47	2.3	21.77	30	Pass
925.1	L.T	L.V.	19.22	2.3	21.52	30	Pass
		H.V.	19.18	2.3	21.48	30	Pass
	N.T.	N.V.	19.20	2.3	21.50	30	Pass
	H.T.	L.V.	19.23	2.3	21.53	30	Pass
		H.V.	19.19	2.3	21.49	30	Pass
927.5	L.T	L.V.	19.87	2.3	22.17	30	Pass
		H.V.	19.84	2.3	22.14	30	Pass
	N.T.	N.V.	19.86	2.3	22.16	30	Pass
	H.T.	L.V.	19.90	2.3	22.20	30	Pass
		H.V.	19.87	2.3	22.17	30	Pass

AS/NZS 4268:2017 Table 1 Note 2 –PEAK POWER SPECTRAL DENSITY**Applicable Standard**

2 The radiated peak power spectral density in any 3 kHz is limited to 25 mW per 3 kHz.

Method of Measurement

ANSI C63.10:2013 Section 11.10

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Kong on 2020-10-22.

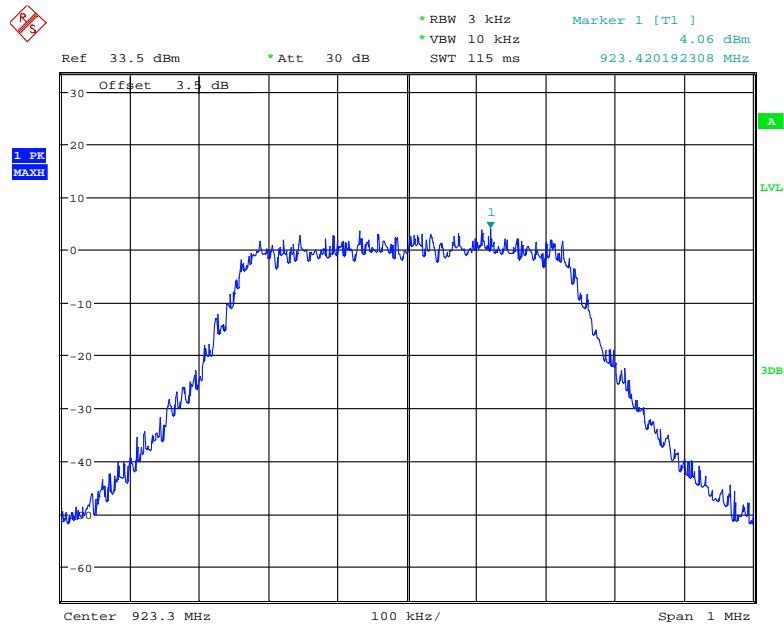
EUT operation mode: Transmitting

Test Result: Compliant, please refer to following plots.

For Lora module of RAK 2247:

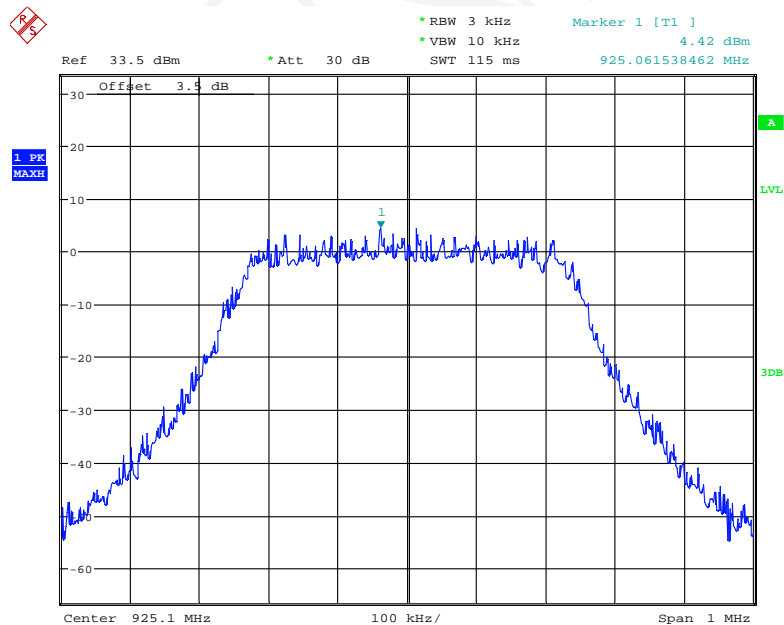
Mode	Channel	Frequency (MHz)	Reading (dBm/3kHz)	Antenna Gain (dBi)	EIRP PSD (dBm/3kHz)	Limit (dBm/3kHz)
Lora	Low	923.3	4.06	2.3	6.36	≤14
	Middle	925.1	4.42	2.3	6.72	≤14
	High	927.5	3.74	2.3	6.04	≤14

Low Channel



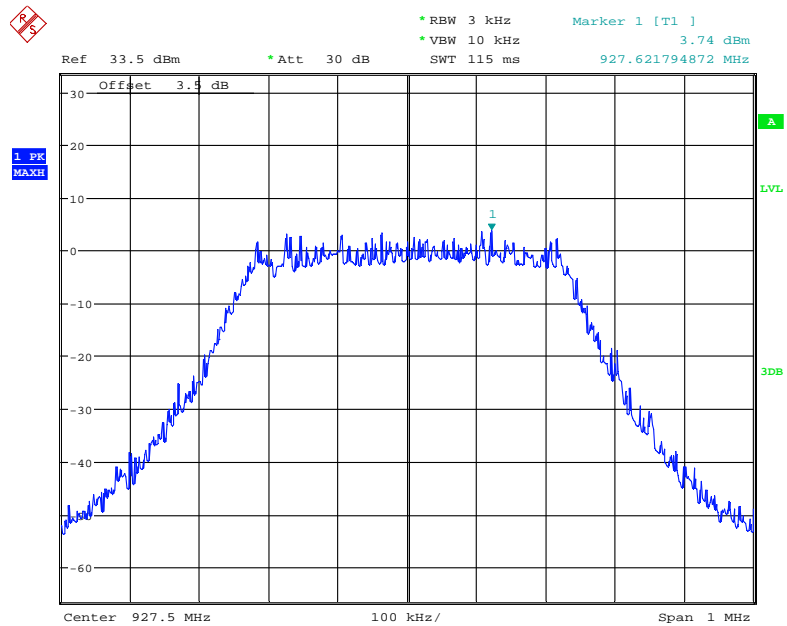
Date: 22.OCT.2020 16:59:46

Middle Channel



Date: 22.OCT.2020 17:01:24

High Channel

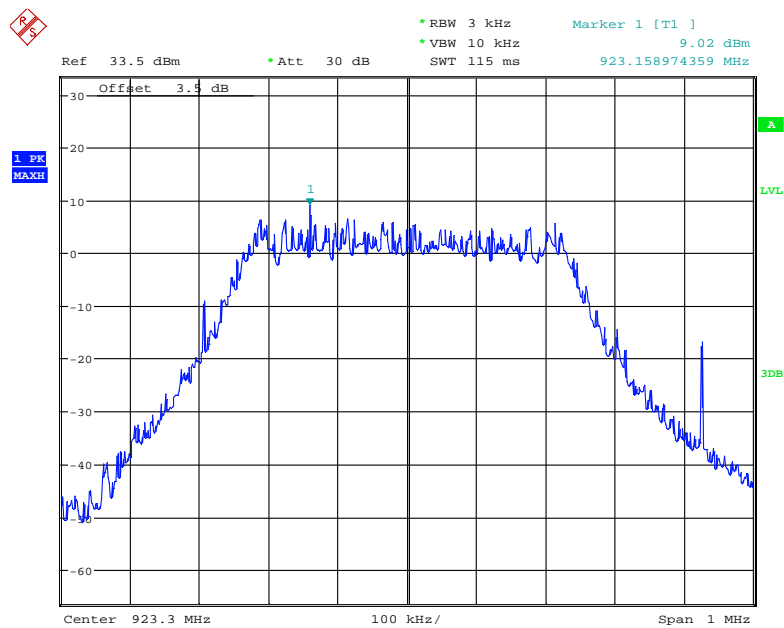


Date: 22.OCT.2020 17:02:53

For Lora module of RAK 2287:

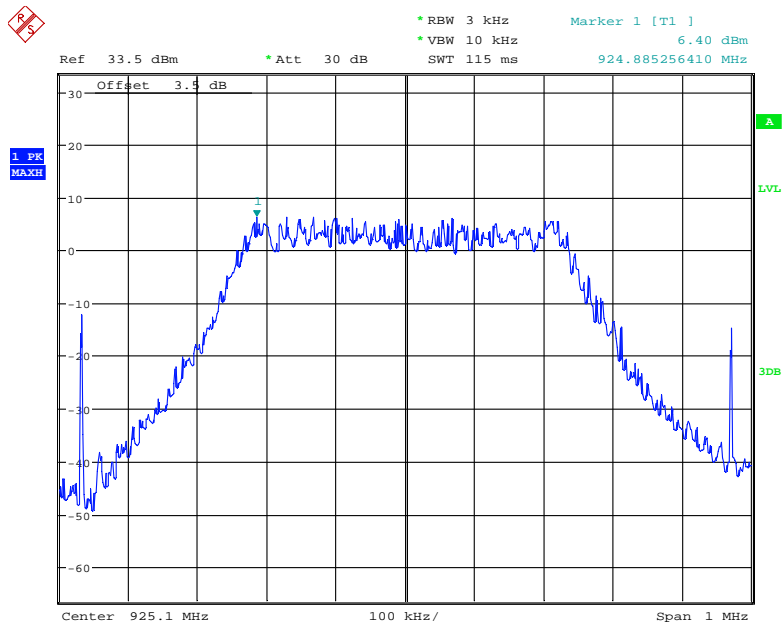
Mode	Channel	Frequency (MHz)	Reading (dBm/3kHz)	Antenna Gain (dBi)	EIRP PSD (dBm/3kHz)	Limit (dBm/3kHz)
Lora	Low	923.3	9.02	2.3	11.32	≤14
	Middle	925.1	6.40	2.3	8.70	≤14
	High	927.5	7.36	2.3	9.66	≤14

Low Channel



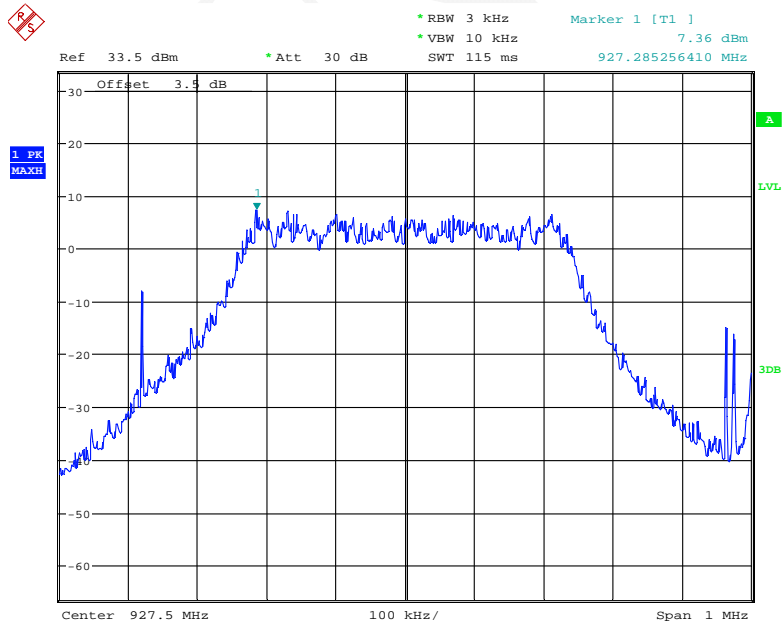
Date: 22.OCT.2020 15:20:39

Middle Channel



Date: 22.OCT.2020 15:38:49

High Channel



Date: 22.OCT.2020 15:31:37

AS/NZS 4268:2017 §6.5 - EMISSION BANDWIDTH**Applicable Standard**

The upper and lower frequency limits of the transmitter 99% emission power bandwidth shall at all times remain within the operating frequency limits.

Method of measurement

According to ETSI EN 300 220-1 V3.1.1 (2017-02) clause 5.6.3:

The spectrum analyser shall be configured as appropriate for the parameters shown in Table 12.

Table 12: Test Parameters for Max Occupied Bandwidth Measurement

Setting	Value	Notes
Centre frequency	The nominal Operating Frequency	The highest or lowest Operating Frequency as declared by the manufacturer
RBW	1 % to 3 % of OCW without being below 100 Hz	
VBW	3 x RBW	Nearest available analyser setting to 3 x RBW
Span	At least 2 x Operating Channel width	Span should be large enough to include all major components of the signal and its side bands
Detector Mode	RMS	
Trace	Max hold	

If the equipment is capable of producing an unmodulated carrier and the test in clause 5.7 is performed, then the OBW measurements need only be performed under normal test conditions. Any required results for Maximum OBW under extreme conditions are obtained by addition and subtraction of the upper and lower frequency error results to each bandwidth measurement obtained in this test.

Step 1: Operation of the EUT shall be started, on the highest operating frequency as declared by the manufacturer, with the appropriate test signal.

The signal attenuation shall be adjusted to ensure that the signal power envelope is sufficiently above the noise floor of the analyser to avoid the noise signals on either side of the power envelope being included in the measurement.

Step 2: When the trace is completed the peak value of the trace shall be located and the analyser marker placed on this peak.

Step 3: The 99 % occupied bandwidth function of the spectrum analyser shall be used to measure the occupied bandwidth of the signal.

Test Data**Environmental Conditions**

Temperature:	22 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

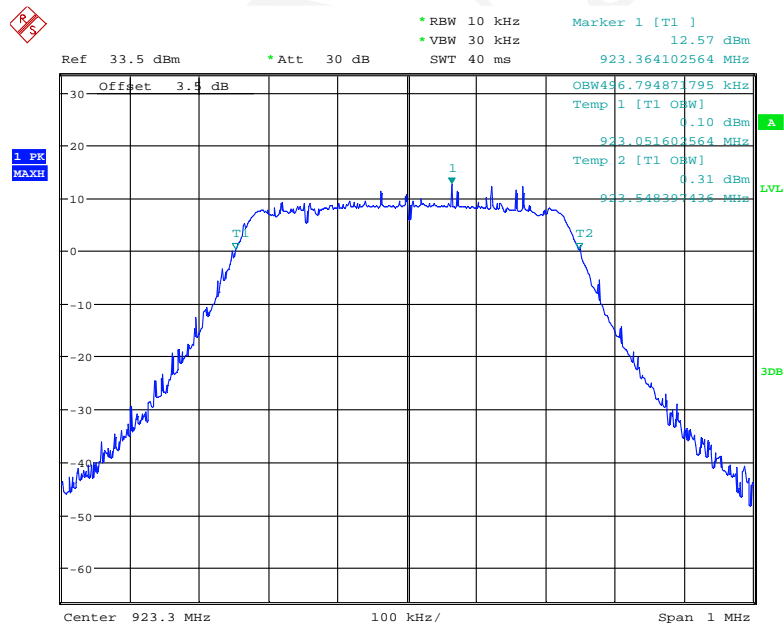
The testing was performed by Jacob Kong on 2020-10-22.

EUT operation mode: Transmitting

Test Result: Compliant, please refer to following table and plots.

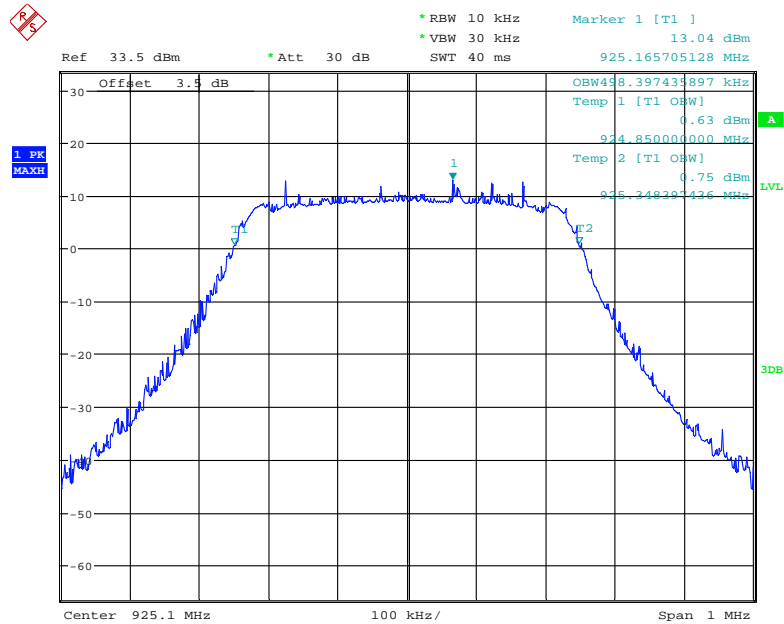
For Lora module of RAK 2247:

Frequency (MHz)	Occupied Bandwidth (kHz)	Frequency of Lower point (MHz)	Frequency of Upper point (MHz)	Limit (MHz)
923.3	496.79	923.0516	923.5484	Within 915 to 928
925.1	498.40	924.8500	925.3484	
927.5	496.79	927.2516	927.7484	

Low Channel

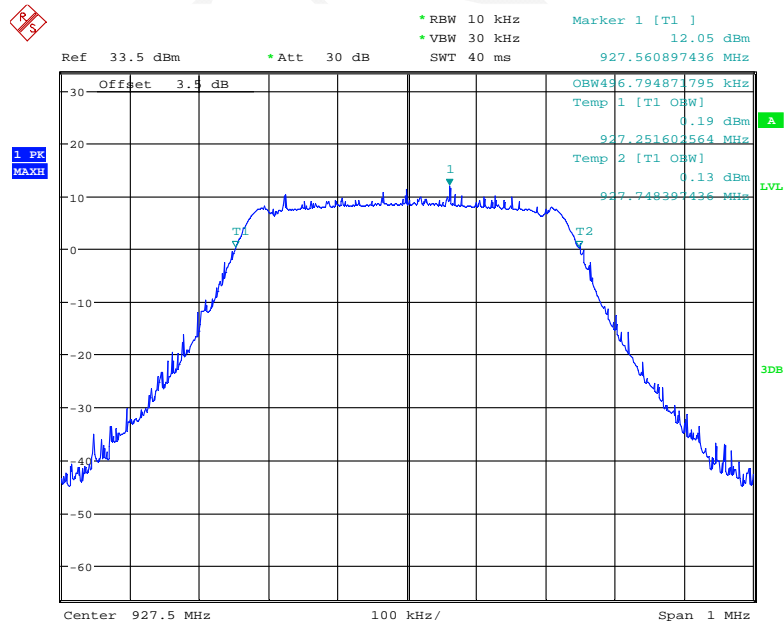
Date: 22.OCT.2020 16:57:00

Middle Channel



Date: 22.OCT.2020 16:55:59

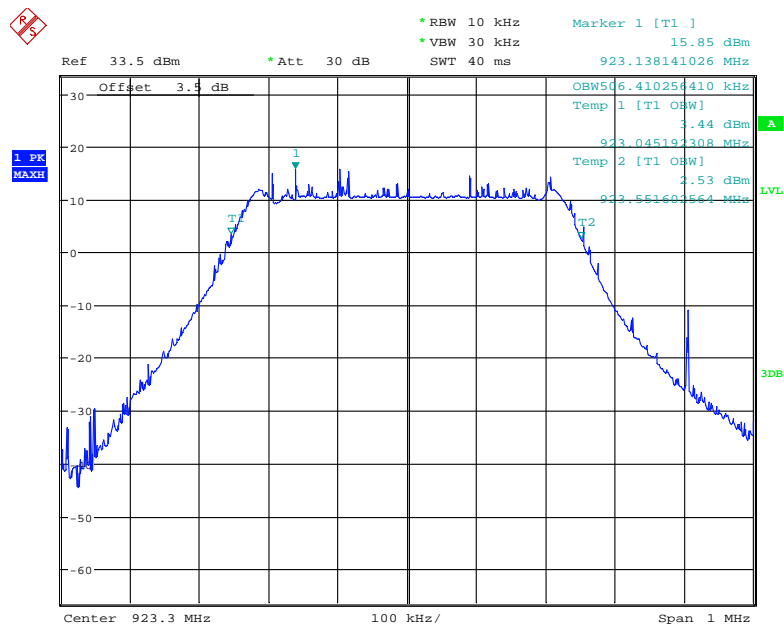
High Channel



Date: 22.OCT.2020 16:53:39

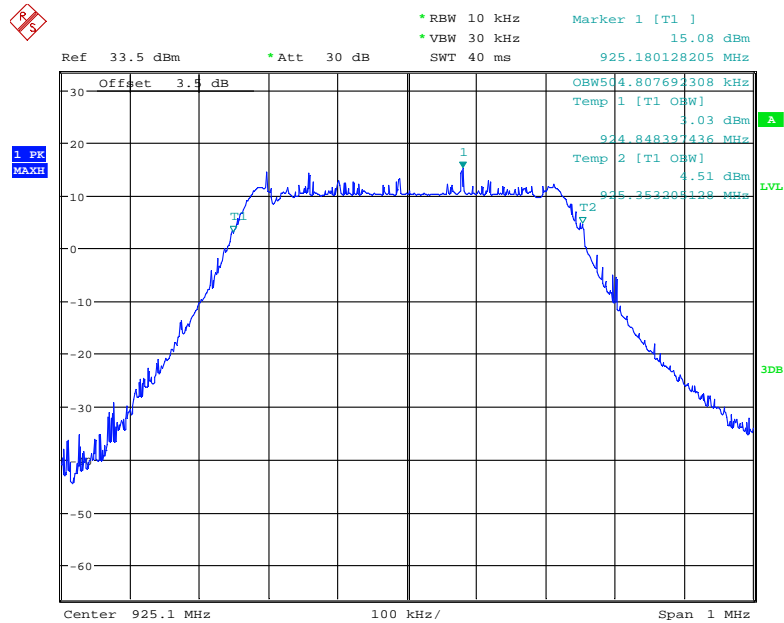
For Lora module of RAK 2287:

Frequency (MHz)	Occupied Bandwidth (kHz)	Frequency of Lower point (MHz)	Frequency of Upper point (MHz)	Limit (MHz)
923.3	506.41	923.0452	923.5516	Within 915 to 928
925.1	504.81	924.8484	925.3532	
927.5	500.00	927.2500	927.7500	

Low Channel

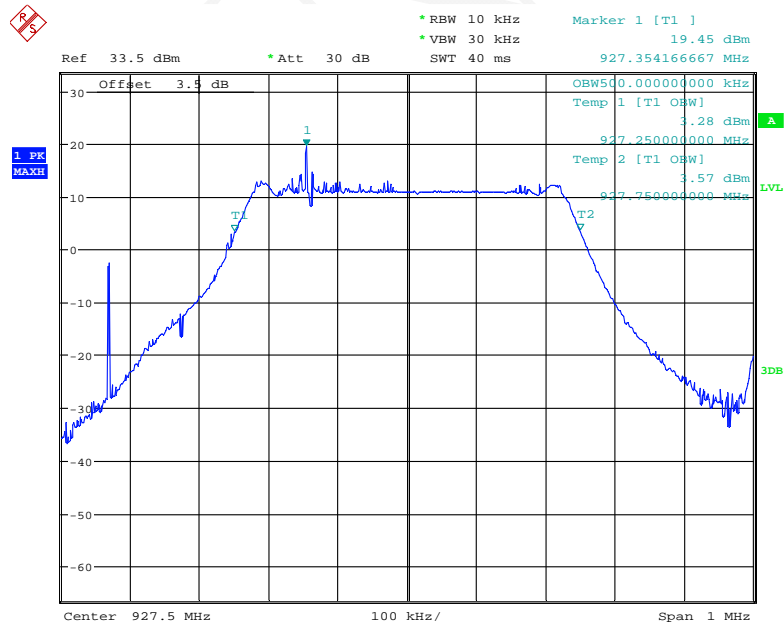
Date: 22.OCT.2020 15:22:05

Middle Channel



Date: 22.OCT.2020 15:39:40

High Channel



Date: 22.OCT.2020 15:28:24

EXHIBIT A - EUT PHOTOGRAPHS

Please refer to the Attachment.

FINAL

EXHIBIT B- TEST SETUP PHOTOGRAPHS

Radiated Spurious Emissions Test View (Below 1GHz)



Radiated Spurious Emissions Test View (Above 1GHz)



******* END OF REPORT *******