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ETC Report #: t29e22a141-DSS Release2

Report date: March 7, 2022

Test Date: February 04, 07, 08, 11 and 18, 2022

# EMC testing of the Tektelic Communication Inc. Kona Micro Gateway in accordance with FCC Part 15.247, and ANSI C63.10: 2013 as referenced by FCC OET KDB 558074 D01 15.247 Measurement Guidance v05r02.

#### FCC ID: 2ALEPT0008073

Test Personnel:

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Prepared for:

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### **REVISION RECORD**

ISSUE	DATE	AUTHOR	REVISIONS
DRAFT 1	2022-02-16	I. Akram	Initial draft submitted for review.
Release1	2022-03-01	I. Akram	Sign Off
Release2	2022-03-07	I. Akram	Updated Firmware version in section 1.3 Sign Off

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### 1.0 INTRODUCTION

#### 1.1 Scope

The purpose of this report is to present the results of compliance testing performed in accordance with FCC Part 15.247 and ANSI C63.10-2013 to gain FCC Certification Authorization for Low-Power License-Exempt transmitters. All test procedures, limits, criteria, and results described in this report apply only to the Tektelic Communication Inc. Kona Micro Gateway test sample, referred to herein as the EUT (Equipment Under Test).

This report does not imply product endorsement by the Electronics Test Centre, A2LA, nor any Canadian Government agency.

#### 1.2 Applicant

This test report has been prepared for Tektelic Communication Inc., located in Calgary, Alberta, Canada.

#### 1.3 Test Sample Description

Product Nam	Product Name:		* Kona Micro Gateway	
	Frequency Range		902.3 – 927.7 MHz	
	Type of Modu	lation	LoRa 125KHz DSS	
Lora Radio	io Associated	LoRa	SUZHOU WUTONG COMMUNICATION CO.,LTD 860M Antenna, Omni directional, Gain 0.4 dBi	
	Antennas		Antenova, PCB antenna CU9013-ANT1 Gain(peak) 0.51dBi	
Firmware ID #	#		HAL version 5.0.0-r2	
Model# / Serial#			T0007915 Rev B0, / 2208K0002	
Power supply:			(100 – 240)AC/DC Adaptor (12VDC@1A) / POE	

As provided to ETC (Airdrie) by Tektelic Communication Inc.:

\*This product is a Kona Micro Gateway is a LoRa base station. It may incorporate a 3G/4G backhaul module, FCC ID: XMR201906EG21G.

This model contains all of the equipment options in this family of products. This model represents model number T0007915. This model was chosen as a worst-case condition for emission testing.

Detail differences between the models are given in Kona Micro Gateway family exhibit.

#### 1.4 General Test Conditions

The EUT was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. All inputs and outputs to and from other equipment associated with the EUT were adequately simulated.

Where relevant, the EUT was only tested using the monitoring methods and test criteria defined in this report.

The environmental conditions are recorded during each test, and are reported in the relevant sections of this document.

#### 1.5 Reference Standards

Standards	Description	
FCC, title 47 CFR § 15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.	
FCC, title 47 CFR § 15.207	General Requirements for Compliance of Radio Apparatus	
FCC, title 47 CFR § 15.209	Intentional radiator, conducted emission limits	
ANSI C63.10-2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	
ANSI C63.10-2014	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	
558074 D01 15.247 Meas Guidance v05r02	Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, And Hybrid System Devices Operating Under Section 15.247 Of The FCC Rules	

#### 1.6 Test Methodology

Test methods are specified in the Basic Standard as referenced and/or modified by the Product Standard in the part of Section 2 of this report associated with each particular test case.

#### 1.6.1 Variations in Test Methodology

Any variance in methodology or deviation from the reference Standard is documented in the part of Section 2 of this report associated with each particular Test Case.

#### **1.6.2 Test Sample Verification, Configuration & Modifications**

EUT setup, configuration, protocols for operation and monitoring of EUT functions, and any modifications performed in order to meet the requirements, are detailed in each Test Case of Section 2 of this report.

#### 1.6.3 Uncertainty of Measurement:

The factors contributing to measurement uncertainty are identified and calculated in accordance with CISPR 16-4-2: 2011.

This uncertainty estimate represents an expended uncertainty expressed at approximately 95% confidence using a coverage factor of k = 2.

Test Method	Uncertainty
Radiated Emissions Level (9 KHz – 1 GHz)	±5.8 dB
Radiated Emissions Level (1 GHz – 18 GHz)	±4.9 dB
Radiated Emissions Level (18 GHz – 26.5 GHz)	±5.0 dB
Conducted Emissions Level (150 KHz – 30 MHz)	±3.0 dB
Uncertainty Conducted Power level	±0.5 dB
Uncertainty Conducted Spurious emission level	±0.6 dB
Uncertainty for Bandwidth test	±1.5 %

#### 2.0 TEST CONCLUSION

#### STATEMENT OF COMPLIANCE

The customer equipment referred to in this report was found to comply with the requirements, as summarized below.

The EUT was subjected to the following tests. Compliance status is reported as **Compliant** or **Non-compliant**. **N/A** indicates the test was Not Applicable to the EUT.

The measurement uncertainty is not accounted for determination of the statement of compliance. The statement of compliance is based only on the measurement value recorded.

**Note:** Maintenance of compliance is the responsibility of the Manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the EUT with respect to the standards detailed in this test report.

The following table summarizes the tests performed in terms of the specification, class or performance criterion applied, and the EUT modification state.

Test Case	Test Type	Specification	Test Sample Mod. Config.		Config.	Result	
2.1	AC Conducted Emissions	15.207	Kona Micro Gateway	none	see § 2.1	Compliant	
2.2	Occupied Bandwidth	15.247(a)(1) 15.247(2)(2)	Kona Micro Gateway	none	see § 2.2	Compliant	
2.3	Max Output average Power Conducted	15.247(b)	Kona Micro Gateway	none	see § 2.3	Compliant	
2.4	Power Spectral Density	15.247(e) 15.247(f)	Kona Micro Gateway	none	see § 2.4	Compliant	
2.5	Band Edge	15.247(d)	Kona Micro Gateway	none	see § 2.5 Complia		
2.6	Conducted Spurious Emission (Non-Restricted Band Operation)	15.247(d)	Kona Micro Gateway	none	see § 2.6	Compliant	
2.7	Minimum channel separation	15.247(a)(1)	Kona Micro Gateway	none	see § 2.7	Compliant	
2.8	Average time of Occupancy for hybrid System	15.247(f)	Kona Micro Gateway	none	see § 2.8	Compliant	
2.9	EUT Position	ANSI C63.4	Kona Micro Gateway	-	see § 2.9	assed	
2.10	Radiated Spurious Emission (Restricted Band Operation)	15.205, 15.209 15.247(d)	Kona Micro Gateway	none	see § 2.10	Compliant	
2.11	RF Exposure	15.247(i)	Kona Micro Gateway	none	see § 2.11	Compliant	

Refer to the test data for applicable test conditions.

#### 2.1 AC Power Line Conducted Emissions: Transmit Mode

<b>Test Lab: Electronics</b>	Test Centre, Airdrie
------------------------------	----------------------

Test Personnel: Branden Van Hee

EUT: Kona Micro Gateway Standard: FCC Part 15.207 Basic Standard: ANSI C63.10: 2013

Date: 2022-02-07(19.0 C,15.9 % RH)

# **EUT status: Compliant**

#### Specification: Part15-207

Frequency (MHz)	Quasi-Peak Limit (dBµV)	Average Limit (dBµV)			
0.15 – 0.5	66 – 56	56 – 46			
0.5 – 5	56	46			
5 – 30	60	50			
Criteria: The conducted emissions produced by a device shall not exceed the limits as specified.					

#### 2.1.1 Test Guidance: ANSI C63.4-2014, Clause 7.3.1

Before any testing is performed, the Ambient (measurement noise floor) is recorded, and a QC check is performed to show that the system is functioning correctly.

Testing starts with a scan, performed under software control. After this is complete, the list of frequencies of interest is generated. These frequencies are then investigated for quasi-peak and average amplitude, as applicable. Emissions measured with a QP detector that fall below the Average limit are deemed to meet both requirements.

#### 2.1.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

#### 2.1.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm- dd)
EMC Software	UL	Ver. 9.5	ETC-SW- EMC 2.1	N/A	N/A
EMI receiver	Keysight Technologies Inc.	N9038A (FW A.25.05)	6130	2021-06-18	2022-06-18
LISN	Com-Power	LI-215A	6180	2020-06-30	2022-06-30
Temp/RH logger	Extech	42270	5892	2021-04-06	2022-04-06

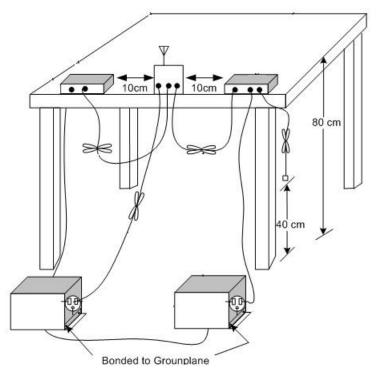
#### 2.1.4 Test Sample Verification, Configuration & Modifications

The EUT was set to selected channels with test-specific software. The output was modulated as in normal operation. Configuration in Tx mode. GSM/LoRa radios are transmitting simultaneously.

The EUT was powered via an AC to DC Adaptor; manufacturer is Shenzhen Click Technology Co., LTD Model#CPS012D120100Uand POE adaptor manufacturer is PowerDsine Model#3501G.

The EUT met the requirements without modification.

#### Test setup diagram:



#### 2.1.6 Conducted Emissions Data:

The EUT was evaluated in all transmit mode. No mode of transmission showed emission worst then another. The plots are from the DSS mode using mid-channel.

Freq. Marker	Freq. (MHz)	Raw reading (dBµv)	Det.	LISN Factor (dB/m)	Cable Loss (dB)	Corrected Reading (dBµV)	FCC 15.207 Limit (dBµV)	Delta (dB)	L/N
				Α	C/DC Ada	ptor			
1	0.154	30.6	Av	.1	.1	30.8	55.81	-25.01	N

Av = Average Detector

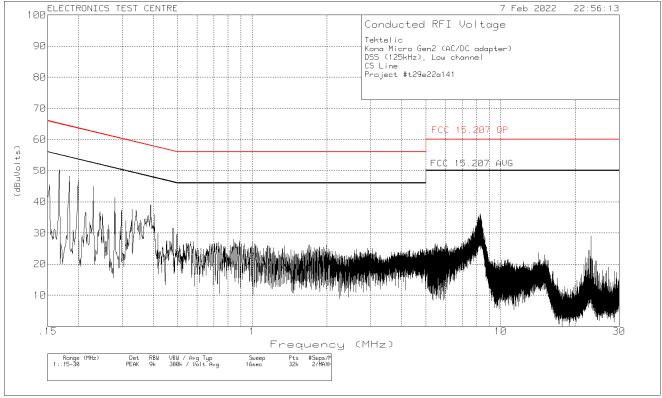
Raw Reading in dB $\mu$ V + LISN Factor in dB + Gain/Loss Factor in dB = Corrected Value db $\mu$ V.

Negative values for Delta indicate compliance.

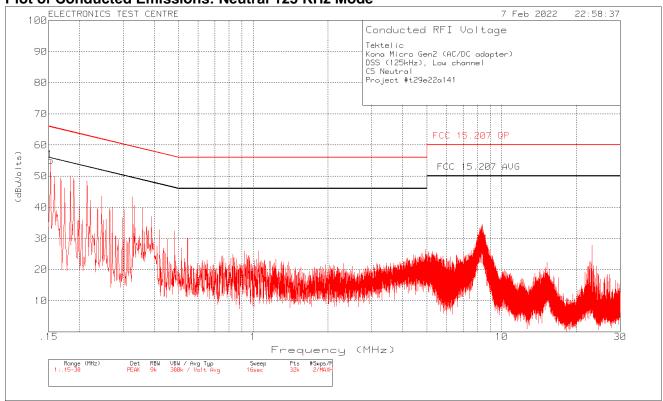
The Ground Bond was measured and found to be 1.25 m $\Omega$ .

#### Plots for AC/DC Adaptor

#### Plot of Conducted Emissions: Line 125 KHz Mode

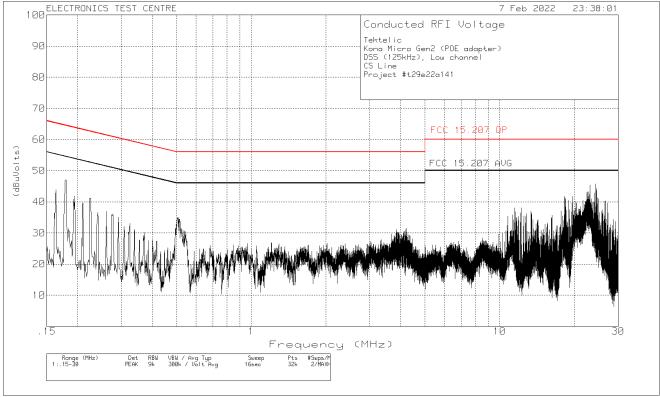


#### Plot of Conducted Emissions: Neutral 125 KHz Mode

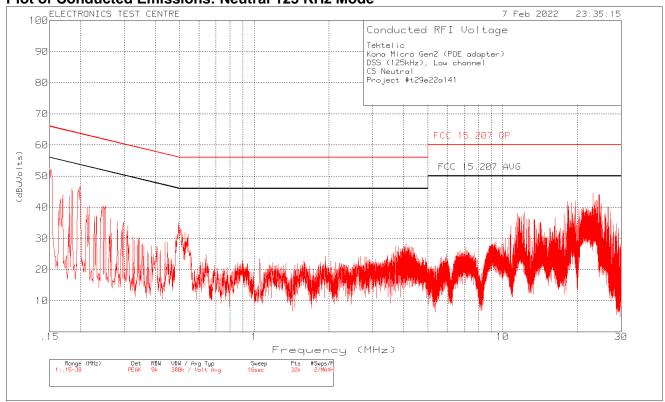


#### Plots for POE Adaptor

#### Plot of Conducted Emissions: Line 125 KHz Mode



#### Plot of Conducted Emissions: Neutral 125 KHz Mode



#### 2.2 **Channel Occupied Bandwidth**

Test Lab: Electronics Test Centre, Airdrie
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**Test Personnel: Imran Akram** 

Test Sample:

Kona Micro Gateway

FCC ID:2ALEPT0008073

Date: 2022-02-08 (20.7°C,11.3 % RH)

**EUT: Kona Micro Gateway** 

Standard: FCC PART 15.247

Basic Standard: ANSI C63.10-2013 **FCC OET KDB 558074** 

### **EUT status: Compliant**

#### Specification: FCC Part 15.247 (a, 2), FCC 15.215 (c)

**Criteria:** There is no requirement for this type of hybrid system to comply with the 500 kHz minimum bandwidth normally associated with a DTS transmission.

#### 2.2.1 Test Guidance: ANSI C63.10-2013, Clause 6.9.2 & 6.9.3/ FCC OET KDB 558074

This measurement is performed at low, mid and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following spectrum analyzer setting:				
Span	Between two time and five times the channel center frequency OBW			
RBW	1% to 5% of the OBW			
VBW	Approximately three times of RBW			
Sweep	Auto Couple			
Detector Function	Peak			
Trace	Max Hold			
Allow the trace to stabilize. The automated 99% BW function of the spectrum analyzer is engaged, 20dB bandwidth is measured with the X dB function.				

#### 2.2.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

#### 2.2.3 Test Equipment

Testing was performed with the following equipment:

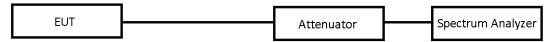
Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EXA Signal Analyzer	Agilent	N9010A FW A.14.16	6678	2021-07-22	2022-07-22
Temp/Humidity	Extech	42270	5892	2021-04-05	2022-04-15
Attenuator	Mini-Circuits®	BWS102W263	6932	Cal. before	e each use
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before each use	

### 2.2.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

#### Test setup diagrams for Occupied Bandwidth testing:

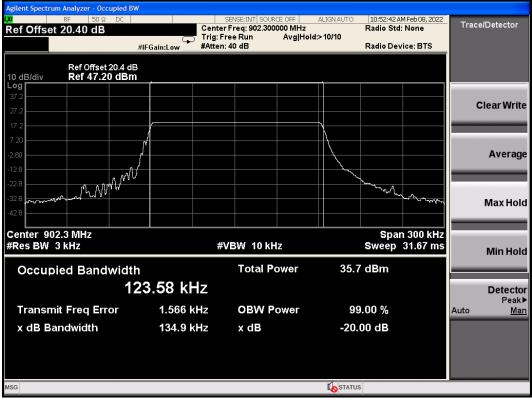
#### Conducted:



#### 2.2.5 Channel Occupied Bandwidth Data:

Mode of operation	Channel	Freq. [MHz]	20 dB OBW [kHz]	99% OBW [KHz]
	Low	902.3	134.9	123.58
LoRa 125KHz	Mid	914.9	133.7	123.63
	High	927.7	134.7	124.01

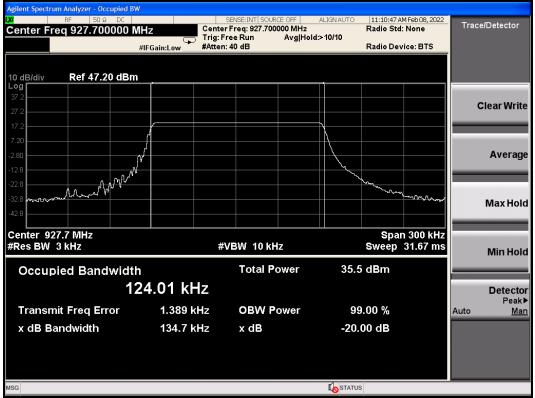
#### Screen Captures from the spectrum analyzer: Low Channel



#### Screen Captures from the spectrum analyzer: MID Channel

Agilent Spectrum Analyzer - Occupi									
Center Freq 914.90000		Cent	SENSE:INT SOU er Freg: 914.90		ALIGN AUTO	11:03:43 A	M Feb 08, 2022	Trac	e/Detector
Center Freq 514.50000		Trig:	Free Run n: 40 dB	Avg Hold	1:>10/10				
	#IFGaiı	n:Low #Atte	en: 40 dB			Radio De	/ice: B15		
10 dB/div Ref 47.20 c	lBm		l.			1		-	
37.2									
27.2									Clear Write
17.2	$\sim$				$\neg$				
7.20	/								
-2.80									Average
-12.8	'wy								
Л Л Л Л	M					have			
-22.8 -32.8 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							Contraction of the second		
-42.8							11 May 1. 1		Max Hold
-42.0								_	_
Center 914.9 MHz							n 300 kHz		
#Res BW 3 kHz			#VBW 10 k	Hz		Sweep	31.67 ms		Min Hold
Occupied Bandw	idth		Total F	ower	36.2	2 dBm			
		0.1-11-							
	123.5	S3 kHz							Detector Peak►
Transmit Freq Error	. ,	1.520 kHz	OBW F	ower	99	9.00 %		Auto	Man
x dB Bandwidth	,	133.7 kHz	x dB		-20	00 dB			
A de Banaman			A GB		20.	00 00			
					The out of the				
MSG						5			

#### Screen Captures from the spectrum analyzer: High Channel



#### 2.3 Max Average Output Power

Test Lab:	Electronics	Test	Centre,	Airdrie
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Test Personnel: : Imran Akram

EUT: Kona Micro Gateway

Standard: FCC PART 15.247

Date: 2022-02-08 (20.7°C,11.3 % RH)

Basic Standard: ANSI C63.10: 2013 FCC OET KDB 558074

# EUT status: Compliant

#### Specification: FCC Part 15.247

**Criteria** For systems using digital modulation / hybrid in the 902-928 MHz bands: 1 Watt.

# 2.3.1 Test Guidance: ANSI C63.10-2013, Clause 11.9.2.2.2 Clause 7.8.5 / FCC OET KDB 558074

This measurement is performed at low, mid and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

#### 2.3.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

#### 2.3.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EXA Signal Analyzer	Agilent	N9010A FW A.14.16	6678	2021-07-22	2022-07-22
Temp/Humidity	Extech	42270	5892	2021-04-05	2022-04-15
Attenuator	Mini-Circuits®	BWS102W263	6932	Cal. before	e each use
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	e each use

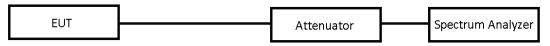
#### 2.3.4 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation.

The EUT met the requirements without modification.

#### Test setup diagrams for Peak Power testing:

#### Conducted:



#### 2.3.5 Max Output Power Data

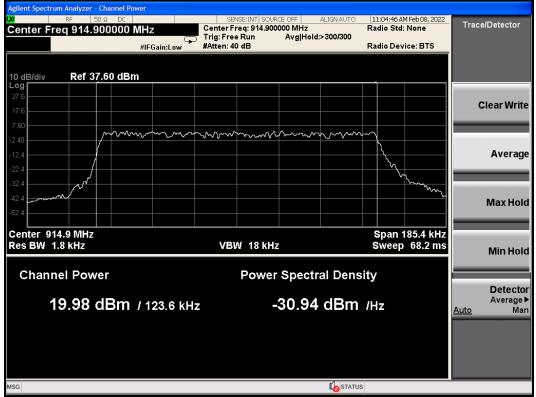
Mode of Operation	Channel	Freq. [MHz]	Out Put Power (dBm)	Out Put Power Limit (dBm
	Low	902.3	19.49	30
LoRa 500 KHz	Mid	914.9	19.98	30
	High	927.7	19.24	30

Output Power Method AVGSA-1 For DTS				
Span	≥ 1.5 times the OBW			
RBW	$1 - 5$ % of the OBW, $\leq 1$ MHz			
VBW	≥ 3 x RBW			
Number of Points in sweep	≥ 2 x Span / RBW			
Sweep time	Auto Couple			
Detector	RMS (Power Averaging)			
Sweep trigger	Free Run (Duty Cycle ≥98%)			
Trace Average	Minimum 100 traces in power Averaging (RMS)			
Power measured	Integrated the spectrum across the OBW of the signal using the S/A band power measurement function, with band limit set equal to the OBW band edge.			

#### Screen Captures from the spectrum analyzer Low Channel

Agilent Spectrum Analyzer - Channel F	Power						
<mark>(X)</mark> RF 50Ω DC		SENSE:INT SOUR		ALIGN AUTO		M Feb 08, 2022	Trace/Detector
Integration BW 123.58 k		enter Freq: 902.300 ig: Free Run	000 MHz Avg Hold:	>300/300	Radio Std	None	Theorem
		itten: 40 dB	in glinoid.		Radio Dev	ice: BTS	
10 dB/div Ref 37.60 dB	sm		1				
27.6							
17.6							Clear Write
7.60	m	m		m a A00 -	~		
-2.40		w w wy w		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim$		
-12.4					<u>_</u>		Average
-22.4					\		
-32.4							
~~·						www	
-42.4						Ĩ	Max Hold
-52.4							
					0		
Center 902.3 MHz Res BW 1.8 kHz		VBW 18 kHz				85.4 kHz	
Res BW 1.8 KHZ					Sweep	68.2 ms	Min Hold
Channel Power		Power	Spectra	al Densi	ity		
							Detector
19.49 dBm	1 1 1 2 2 C VU-		21 42	dBm	/山-		Average►
13. <del>4</del> 5 dBm	1 / 123.0 KHZ		J I.TJ	uDIII	/П2		<u>Auto</u> Man
MSG							
				-			

#### Screen Captures from the spectrum analyzer: MID Channel



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#### Screen Captures from the spectrum analyzer: High Channel

Agilent Spectrum Analyzer - Channel Power			
	SENSE:INT SOURCE OFF ALIGN AUTO	11:12:01 AM Feb 08, 2022 Radio Std: None	Meas Setup
Integration BW 124.01 kHz	Trig: Free Run Avg Hold:>300/300		
#IFGain:Lov	w #Atten: 40 dB	Radio Device: BTS	Avg/Hold Num 300
			<u>On</u> Off
10 dB/div Ref 37.60 dBm			
27.6			Aven Manula
17.6			Avg Mode
			<u>Exp</u> Repeat
7.60	man man man man	~~~	
-2.40			Integ BW
-12.4			124.01 kHz
-22.4			
-32.4		- Www	
-42.4			
-52.4			
Center 927.7 MHz		Span 186 kHz	
Res BW 1.8 kHz	VBW 18 kHz	Sweep 68.47 ms	
Channel Power	Power Spectral Den	eitv	
	Power opectral Der	isity	PhNoise Opt
19.24 dBm / 124 kł	⊣z -31.70 dBn	o ///_	Fast Tuning ►
19.24 UDIII / 124 Ki	-31.70 UBI	I /HZ	Auto <u>Man</u>
			More
			1 of 2
MSG	In STAT		
Mog	LO STAT	105	

#### 2.4 Power Spectral Density

Test Lab: Electronics Test Centre, Airdrie	EUT: Kona Micro Gateway
Test Personnel: : Imran Akram	Standard: FCC PART 15.247
	Basic Standard: ANSI C63.10: 2013
Date: 2022-02-08 (20.7°C,11.3 % RH)	

**EUT status: Compliant** 

#### Specification: FCC Part 15.247(f)

#### 2.4.1 Test Guidance: ANSI C63.10-2013, Clause 11.10.3 / FCC OET KDB 558074

This measurement is performed at low, mid and high frequencies, in continuous transmission, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following Spectrum Analyzer settings					
Span	At least 1.5 times the OBW of channel center Frequency				
RBW	3 KHz				
VBW	≥ 3 x VBW				
Sweep	Auto Couple				
Detector Function	Power averaging (RMS) or Sample detector (when RMS not available.				
Trace	Employ trace average (rms) mode over a minimum of 100 traces.				
Ensure that the number of measurement points in the sweep $\geq$ [2 x span / RBW]. Allow the					
trace to stabilize. Use	trace to stabilize. Use the peak marker function to determine the maximum amplitude level.				

#### 2.4.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

#### 2.4.3 Test Equipment

Testing was performed with this equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due	
EXA Signal Analyzer	Agilent	N9010A FW A.14.16	6678	2021-07-22	2022-07-22	
Temp/Humidity	Extech	42270	5892	2021-04-05	2022-04-15	
Attenuator	Mini-Circuits®	BWS102W263	6932	Cal. before each use		
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before each use		

**Criteria** The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### 2.4.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

# Test setup diagrams for Peak Power Spectral Density testing: Conducted:

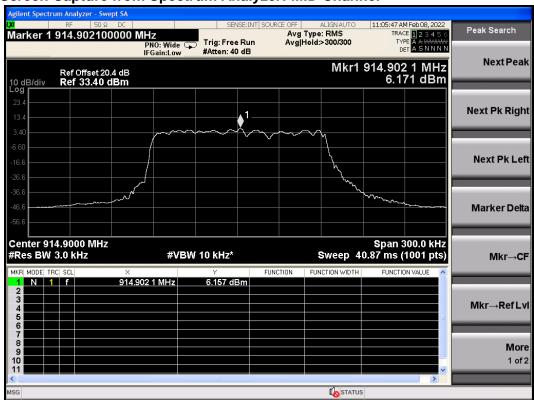


#### 2.4.5 Average PSD Data

Mode of operation	Channel	Freq. [MHz]	PSD (dBm)	PSD Limit (dBm
	Low	902.3	5.813	8
LoRa 125 KHz	Mid	914.9	6.171	8
	High	927.5	5.973	8

#### Screen Capture from Spectrum Analyzer: Low Channel

	um Analyzer - Swej RF 50 Ω 902.332100	DC 1000 MHz PN	0: Wide 🖵 ain:Low			Avg Ty	ALIGNAUTO pe: RMS d:>300/300	TRAC	4 Feb 08, 2022 E 1 2 3 4 5 6 E A <del>A WWWW</del> T A S N N N N	Peak Search
10 dB/div	Ref Offset 20. Ref 33.40 d	4 dB					Mkr1	902.332 5.8	2 1 MHz 13 dBm	Next Peak
23.4 13.4 3.40						↓1				Next Pk Right
-6.60 -16.6 -26.6										Next Pk Left
-36.6 -46.6 -56.6		~~~~							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Marker Delta
Center 90 #Res BW			#VBW	10 kHz*	FUN	CTION F	Sweep 4	0.87 ms (	00.0 kHz 1001 pts)	Mkr→CF
1 N 1 2 3 4 5 6 9	f	902.332 1	MHz	5.799 dB			UNCTION WIDTH	FUNCTIO		Mkr→RefLvl
7 8 9 10 11				Ш						More 1 of 2
MSG								3		



#### Screen Capture from Spectrum Analyzer: MID Channel

Screen Capture from Spectrum Analyzer: High Channel

Agilent Spectrum Analyz	50 Ω DC	Trig: Free Run	T SOURCE OFF ALIGNAUTO Avg Type: RMS Avg Hold>300/300	11:13:34 AM Feb 08, 2022 TRACE 12345 6 TYPE A A WWWW DET A S N N N N	Peak Search
10 dB/div Ref 3	IFGain:Low fset 20.4 dB 3.40 dBm		Mkr	1 927.745 6 MHz 5.973 dBm	Next Peak
23.4			1		Next Pk Right
3.40 -6.60 -16.6 -26.6			~~~~		Next Pk Left
-20.0 -36.6 -46.6				horizon and the second	Marker Delta
Center 927.7000 #Res BW 3.0 kH:		BW 10 kHz*	Sweep	Span 300.0 kHz 40.87 ms (1001 pts)	Mkr→CF
1         N         1         f           2         2         2         2           3         2         2         2           4         2         2         2           5         2         2         2	927.745 6 MHz	5.959 dBm			Mkr→RefLv
6 7 8 9 10					More 1 of 2
MSG			STA T		

#### 2.5 Band Edge Attenuation

Test Lab: Electronics Test Centre, Airdrie

Test Personnel: Imran Akram

EUT: Kona Micro Gateway Standard: FCC PART 15.247 Basic Standard: ANSI C63.10: 2013

Date:2022-02-08/18 (20.7°C,11.3 % RH)

### **EUT status: Compliant**

#### Specification: FCC Part 15.247(d)

**Criteria:** 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.209(a) (see §15.205(c)).

# 2.5.1 Test Guidance: ANSI C63.10-2013 Clause 6.10.4 & 7.8.6, 6.10.6 / FCC OET KDB 558074

This measurement is performed at the low and high frequencies, with modulation.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following s	Use the following spectrum analyzer settings:							
Span	Wide enough to capture the peak level of the emission operating on							
	the channel closest to the band edge, as well as any modulatic							
	products that fall outside of the authorized band of operation.							
Attenuation	Auto (at least 10 dB preferred).							
RBW	100 kHz							
VBW	300 kHz							
Sweep	Coupled							
Detector function	peak							
Trace	max hold							
Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the								
highest modulation product outside of the band, if this level is greater than that at the								
band edge. Enable	band edge. Enable the marker-delta function, and then use the marker-to-peak function							
to move the marke	er to the peak of the in-band emission.							

#### 2.5.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

#### 2.5.3 Test Equipment

Testing was performed with the following equipment:

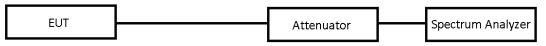
Equipment	Manufacturer	er Model # Asset #		Cal. Date	Cal. Due	
EXA Signal Analyzer	Agilent	N9010A FW A.14.16	6678	2021-07-22	2022-07-22	
Temp/Humidity	Extech	42270	5892	2021-04-05	2022-04-15	
Attenuator	Mini-Circuits®	BWS102W263	6932	Cal. before each use		
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	e each use	

#### 2.5.4 Test Sample Verification, Configuration & Modifications

The EUT was set to transmit continuously on a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

#### Test setup diagrams for Band Edge Attenuation testing:

#### **Conducted:**



# 2.5.5 Band Edge Data

#### Worse Case Data

Mode of operation	Channel	Attenuation at Band Edge	Attenuation Limit at Band Edge
Lora 125KHz	902.3	48.357dBc	30 dBc
(Non-Hopping)	927.7	42.297dBc	30 dBc
Lora 125KHz	902.3	49.206 dBc	30 dBc
(Hopping)	927.7	42.014dBc	30 dBc

#### Screen Capture from the spectrum analyzer: Lower Band Edge (Non-Hopping)

Agilent Spect	rum Analyzer - Sw								
Marker 2	RF 50 S	8 kHz				ALIGN AUTO Type: Log-Pwr IHold:>300/300	10:56:20 AM F	123456	Peak Search
10 dB/div	Ref Offset 20 Ref 43.40	0.4 dB	PNO: Wide G IFGain:Low	#Atten: 40 o		•	Mkr2 300.	9 kHz 57 dB	Next Peak
23.4							2∆3		Next Pk Right
13.4 3.40 -6.60								-10.51 dBm	Next Pk Left
-16.6 -26.6 -36.6	man mar	~~~~~	nannan	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Lunswor	~~~X3			Marker Delta
Start 900 #Res BW	100 kHz	×	#VBV	V 300 kHz	FUNCTION	Sweep 1	Stop 902.6 .000 ms (10	001 pts)	Mkr→CF
1 N 2 Δ3 3 F 4 5	f f (∆)	902.27 30	4 4 MHz 00.9 kHz (Δ) 0 0 MHz	19.682 dBr	n 3				Mkr→RefLvl
6 7 8 9 10									More 1 of 2
11 <				ш				>	
MSG							s		

#### Screen Capture from the spectrum analyzer: Upper Band Edge (Non-Hopping)

Agilent Spectrum Analyzer - Swept SA				
x         RF         50 Ω         DC           Marker 3 -392.200000 kHz		SOURCE OFF ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>300/300	11:16:07 AM Feb 08, 2022 TRACE 1 2 3 4 5 6 TYPE MA WWW DET P S N N N N	Trace/Detector
Ref Offset 20.4 dB 10 dB/div Ref 43.40 dBm	IFGain:Low #Atten: 40 dB		ста -392.20 kHz 42.297 dB	Select Trace 1
Log           33.4           23.4				Clear Writ
13.4 3.40 6.60 16.6			-10.76 dBm	Trace Averag
26.6 36.6 46.6	manna manna an	m harrow		Max Ho
Start 927.550 MHz #Res BW 100 kHz MKRI MODE  TRC  SCL  ×	#VBW 300 kHz	Sweep 1	Stop 930.000 MHz .000 ms (1001 pts)	Min Ho
1         N         1         f         927.64           2         N         1         f         928.00           3         Δ4         1         f         0.33	8 00 MHz 19.485 dBm 0 00 MHz -19.196 dBm 92.20 kHz (Δ) 42.297 dB 0 00 MHz -22.679 dBm			<b>View Blank</b> Trace Or
7				<b>Мо</b> 1 о
sg				

#### Screen Capture from the spectrum analyzer: Lower Band Edge (Hopping)

- 5		_							Analyzer - Sw			Keysigl
Peak Search	HFeb 18, 2022 E 1 2 3 4 5 6	TRAC	ALIGN AUTO		E:INT			00 kHz	ESEL 50 Ω			arke
Next Pea		Mkr3 35	l:>100/100	Avg Hold		Trig: Free Atten: 30	NO: Wide 🕞 Gain:Low		080	D.4		
	206 dB	49							Offset 20			dB/d
Next Pk Righ			3∆4			Ĭ						.4 —
Hext F K Rigi	~~~~	~ ~ ~	~~~~									.4
												10
Next Pk Le	DL1 -10.51 dBm											50
				h.	$-\langle \rangle^2_{\mathcal{M}}$							.6
Marker Delt				4		and the second s	······································	m longoures	han	~~~	•~~~~~~	.6
												.6 —
	.318 MHz								MHz			
Mkr→C			Sweep 1			300 kHz	#VBW				3W 1	
	DN VALUE	FUNCTI	NCTION WIDTH	CTION FL	n	20.598 dB -27.132 dB	0 MHz 8 MHz			f f	DE TRC	N
Mkr→RefL	E				3	49.206 d -28.612 dB	6.0 kHz (Δ) 0 MHz	3	<u>(</u> Δ)	f	1	Ν Δ4 F
												i '
Mor 1 of												   
1.01												
		5	STATUS									1

#### Screen Capture from the spectrum analyzer: Upper Band Edge (Hopping)

							n Analyzer -		Keysigl
Peak Search	07:01:29 AM Feb 18, 2022 TRACE 1 2 3 4 5 6 TYPE M WWWWW	ALIGN AUTO pe: Log-Pwr ld:>100/100	Avg	SENSE:		00 kHz	RESEL 50		larke
NextPea	DET P NNNN		Avgi	Atten: 30 dB	O: Wide   ⊊⊃ ain:Low				
	lkr3 -348.0 kHz 42.014 dB			Ref Offset 20.4 dB Ref 40.40 dBm					0 dB/d
Next Pk Righ						3∆4 -			30.4 -
								~	20.4
									.400
Next Pk Le	DL1 -10.76 dBm								9.60
					~% <u>4</u>				19.6
Marker Del									39.6
									49.6
Mkr→C	Stop 930.000 MHz .067 ms (2001 pts)	Sweep 1		00 kHz	#VBW			927.00 3W 10	
	FUNCTION VALUE	UNCTION WIDTH	FUNCTION	Y		Х		DE TRC S	MKR MOL
				9.733 dBm 7.659 dBm 42.014 dB		927.700 0 928.591 5		1 1 1 1	1 Ν 2 Ν 3 Δ4
Mkr→RefL	=			2.279 dBm		928.050 0		1	4 F 5
									6 7 8
<b>Mo</b> 1 of									9 10
									11
	6	STATUS							SG

#### 2.6 Conducted Spurious Emissions (Non- Restricted Band)

Test Lab: Electronics Test Centre, Airdrie

Test Personnel: Imran Akram

EUT: Kona Micro Gateway Standard: FCC PART 15.247

Date: 2022-02-08 (20.7°C,11.3 % RH)

Basic Standard: ANSI C63.4-2014 FCC OET KDB 558470 v04 DTS

# **EUT status: Compliant**

#### Specification: FCC Part 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.

#### 2.6.1 Test Guidance: ANSI C63.10-2013, Clause 6.7, 7.8.8 / 558074 D01 15.247 Measurement Guidance v05r02

This measurement is performed at the low, mid and high frequencies, with modulation. The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

Use the following spectrum analyzer settings:							
Span	Set the center frequency and span to encompass frequency range to be measured.						
RBW	100 kHz						
VBW	300 kHz						
Sweep	Auto Coupled						
Detector function	peak						
Trace	max hold						
Allow the trees to	Allow the trace to stabilize Lles the neck marker function to determine the maximum						

Allow the trace to stabilize. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in

#### 2.6.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

#### 2.6.3 Test Equipment

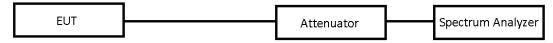
Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EXA Signal Analyzer	Agilent	N9010A FW A.14.16	6678	2021-07-22	2022-07-22
Temp/Humidity	Extech	42270	5892	2021-04-05	2022-04-15
Attenuator	Mini-Circuits®	BWS102W263	6932	Cal. before each use	
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	e each use

#### 2.6.4 Test Sample Verification, Configuration & Modifications

The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation. The EUT met the requirements without modification.

#### Test setup diagram for Conducted Spurious Emissions testing:



#### 2.6.5 Conducted Emissions Data:

#### Low Channel

10 dB/div - 9g 27.6	Ref 3	7.60 dB	im							ClearWri
7.60										Clear Wri
2.40		/~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~		unson			Avera
22.4 32.4	كمسمه								m	
52.4										Max Ho
Center 90 Res BW 1				VE	W 18 kH	z		Span Sweej	185.4 kHz 68.2 ms	Min Ho
Chanr	iel Pow	/er			Power	Spect	ral Densi	ity	,	

		MSG		STATUS			
ilent Spec		- Spurious Emissions					
arkor '	RF !	50 Q DC	SENSE:IM	VT SOURCE OFF ALIGN 902.300000 MHz	AUTO 10:58:59	AM Feb 08, 2022	Range Table
ASS	H === HZ		Trig: Free Ru	n Avg Hold:>50/	50		
A00		IFGain:	Low #Atten: 40 dB		Radio De	VICE: BIS	Ran
	Ref Of	fset 20.4 dB 6.00 dBm					<u>On</u>
) dB/div pg	Ref 5	6.00 dBm					
6.0							Start Fr
6.0							30.000 k
6.0							
6.0						_	01 E
.00							Stop Fr 1.000000000 G
.00							1.00000000 G
4.0							
1.0							Res B 100.00 k
4.0							Auto M
						-	
tart 30	kHz				S	top 1 GHz	Video E
							300.00 k
Spur	Range	Frequency	Amplitude	Limit	Δ Limit		Auto M
1	2 2	902.3 MHz	19.61 dBm	-10.51 dBm	30.12 dB	^	
2	2	928.1 MHz	-31.18 dBm	-10.51 dBm	-20.67 dB		Filter Typ
3 4	2 2	789.3 MHz 937.3 MHz	-31.74 dBm -32.14 dBm	-10.51 dBm -10.51 dBm	-21.23 dB -21.63 dB	-	Gaussia
4 5	2	937.3 MHZ 711.9 MHz	-32.33 dBm	-10.51 dBm	-21.63 dB		
				-10.51 dBm	-22.03 dB		Mo
6	2	864.5 MHZ	-32,34 ubm	•10.31 ubiii			
6 7	2 2	864.5 MHz 725.3 MHz	-32.54 dBm -32.70 dBm	-10.51 dBm	-22.19 dB		1 0
						~	1 0
7 8	2	725.3 MHz	-32.70 dBm	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB	×	1 o
7 8 g	2	725.3 MHz 711.4 MHz	-32.70 dBm	-10.51 dBm -10.51 dBm	-22.19 dB	V	1 0
7 8 g	2 2 rum Analyzer -	725.3 MHz	-32.70 dBm -32.78 dBm	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB	M Eab (19, 2022	
7 8 G lent Spect	2 2 rum Analyzer - RF 5	725.3 MHz 711.4 MHz Spurious Emissions 20 Q DC	-32.70 dBm -32.78 dBm sense::in Center Freg:	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB	AM Feb 08, 2022 d: None	1 o Range Table
7 8 Ient Spect art Lin	2 2 rum Analyzer -	725.3 MHz 711.4 MHz Spurious Emissions	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS JAUTO 11:01:00. Radio Str 50	d: None	Range Table
7 8 Ient Spect art Lin	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 111:01:00. Radio Str Radio De	d: None vice: BTS	Range Table Ran
7 8 Ient Spect art Lin ASS	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran
7 8 Ient Spect art Lin ASS	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS	Range Table Ran
7 8 Ient Spect art Lin ASS dB/div	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran On Start Fr
7 8 Ient Spect art Lin ASS	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran On Start Fr
7 8 Ient Spect art Lin ASS	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran On Start Fr
7 8 Ient Spect art Lin ASS dB/div 9 9 7.4 7.4 7.4	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran <u>On</u> 1.00000000 G
7 8 ent Spect art Lin ASS dB/div 9 9 4 4 4 4	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran <u>On</u> 1.00000000 G Stop Fr
7         8           G         Ient Spect           art Lin         ASS           dB/div         9           4.4         40	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran <u>On</u> 1.00000000 G Stop Fr
7         8           G         Ient Spect           art Lin         ASS           dB/div         9           4.4         4           4.4         4           40         4	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions 30 DC C dBm IFGain: (set 21.8 dB / 40 dBm	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran <u>On</u> 1.00000000 G Stop Fr 10.00000000 G
7 8 Ient Spect art Lin ASS dB/div 9 4 4 4 4 4 50 50 6	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions © Q DC   dBm IFGain:	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran On Start Fr 1.00000000 G Stop Fr 10.00000000 G Res E
7 8 Ient Spect art Lin ASS dB/div 9 4 4 4 4 4 50 50 50 50 50 50 50 50 50 50 50 50 50	2 2 rum Analyzer - RF S nit -10.51	725.3 MHz 711.4 MHz Spurious Emissions 30 DC C dBm IFGain: (set 21.8 dB / 40 dBm	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB STATUS IAUTO 11:01:00. Radio Str Radio De 3.77	d: None vice: BTS 833 GHz	Range Table Ran <u>On</u> Start Fr 1.000000000 G Stop Fr 10.00000000 G Res E 100.00 k
7 8 art Lin ASS dB/div 4 4 4 4 4 4 4 4 4 4 4 6 6 6	2 2 RF IE Ref Of Ref 5	725.3 MHz 711.4 MHz Spurious Emissions 30 DC C dBm IFGain: (set 21.8 dB / 40 dBm	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27	4: None vice: BTS 833 GHz 83 dBm	Range Table Ran <u>On</u> Start Fr 1.000000000 G Stop Fr 10.00000000 G Res E 100.00 k
7 8 art Lin ASS dB/div 4 4 4 4 4 4 4 4 4 4 4 6 6 6	2 2 RF IE Ref Of Ref 5	725.3 MHz 711.4 MHz Spurious Emissions 30 DC C dBm IFGain: (set 21.8 dB / 40 dBm	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27	d: None vice: BTS 833 GHz	Range Table Ran <u>On</u> Start Fr 1.000000000 G Stop Fr 10.00000000 G Res E 100.00 k Auto <u>M</u> Video E
7 8 art Lin ASS dB/div 4 4 4 4 4 4 4 4 4 4 4 6 6 6	2 2 RF IE Ref Of Ref 5	725.3 MHz 711.4 MHz Spurious Emissions 30 DC C dBm IFGain: (set 21.8 dB / 40 dBm	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27	4: None vice: BTS 833 GHz 83 dBm	Start Fr           0n           Start Fr           1.00000000 G           Stop Fr           10.00000000 G           Res E           100.00 k           Auto           Video E           300.00 k
7 8 art Lin ASS dB/div 4 4 4 4 4 4 4 4 4 4 4 6 6 6	2 2 RF IE Ref Of Ref 5	725.3 MHz 711.4 MHz Spurious Emissions 30 DC C dBm IFGain: (set 21.8 dB / 40 dBm	-32.70 dBm -32.78 dBm SENSE:IT Center Freq: S	-10.51 dBm -10.51 dBm	-22.19 dB -22.27	4: None vice: BTS 833 GHz 83 dBm	Start Fr           0n           Start Fr           1.00000000 G           Stop Fr           10.00000000 G           Res E           100.00 k           Auto           Video E           300.00 k
7 8 lent Spect art Linn 3 3 dB/div 4 4 4 4 4 4 4 4 5 5 6 6 6 6 6 6 6 6 7 7 7 8 7 7 7 8 7 7 7 7 7 7 7 7	2 2 mm Analyzer - 1020 / 1020	725.3 MHz 711.4 MHz Spurfaus Entissions 000 CC d dBm IFGaint set 21.8 dB 7.40 dBm	-32.70 dBm -32.78 dBm Center Freq: Trig: Free Rut #Atten: 40 dB	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB -22.27 dB -22.27 dB -22.27 dB -25.6 Radio De -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.6 -25.7 -25.6 -	4: None vice: BTS 833 GHz 83 dBm	Range Table           Ran <u>On</u> Start Fr           1.000000000 G           Stop Fr           10.00000000 G           Res E           100.00 k           Auto           Video E           300.00 k           Auto
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7         8           a         a           att Spect         a           att Lin         a	2 2 rum Analyzer Be off Ref 5 Hit -10.51	725.3 MHz 711.4 MHz Spurious Enfestions 30 DC Gene (Gene) (Set 21.8 dB 7.40 dBm (Fed and Comparison) (Set 21.8 dB 7.40 dBm (Fed and Comparison) (Set 21.8 dB 7.40 dBm) (Frequency 3.897 GHz 3.789 GHz 3.810 GHz	-32.70 dBm -32.78 dBm -32.78 dBm Center Freq L Center Freq L #Atten: 40 dB	-10.51 dBm -10.51 dBm (c) (c) (c) (c) (c) (c) (c) (c) (c) (c)	-22.19 dB -22.27 dB status Radio 5t Radio 5t Radio 2t Radio 5t Radio 2t Status A Limit -11.70 dB -12.25 dB	4: None vice: BTS 833 GHz 83 dBm	Range Table           Qn           Start Fr           1.00000000 G           Stop Fr           10.00000000 G           Res E           100.00 k           Auto           Video E           300.00 k           Auto           Filter Typ
7         8           Ient Spect         art Lin           ASS         dB/div           dB/div         7           ASS         art Lin           Spect         art 1 C           Spur         1           2         3           4         4	2 2 mm Analyzer 1020 102 1020 102 Ref Off Ref S 1020 Hz Hz Range 1 1 1 1	725.3 MHz 711.4 MHz Spurious Enissions 300 CC d dBm IFGaint set 21.8 dB 7.40 dBm Set 21.8 dB 7.40 dBm	-32.70 dBm -32.78 dBm -32.78 dBm Center Freq: Trig: Free Rut #Atten: 40 dB	-10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB status Radio Str Radio De 3.77 -25.8 A Limit -11.70 dB -12.27 dB	4: None vice: BTS 833 GHz 83 dBm	Range Table           Qn           Start Fr           1.00000000 G           Stop Fr           10.00000000 G           Res E           100.00 k           Auto           Video E           300.00 k           Auto           Filter Typ
7         8           G         art Lin           ASS         dB/dly           9         4           4         4           60         6           61         6           62         6           63         6           64         7           7         4           64         6           65         6           7         4           7	2 2 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	725.3 MHz 711.4 MHz Spurious Enission 00 DC d dBm IFGain: set 21.8 dB 7.40 dBm Frequency 3.897 GHz 3.752 GHz 3.752 GHz 3.752 GHz	-32.70 dBm -32.78 dBm -32.78 dBm Center Freq : Trig: Free Ru #Atten: 40 dB	-10.51 dBm -10.51 dBm (50.0000 MHz n Avg Hold>50.00 Limit -10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB -22.27 dB -22.27 dB -22.27 dB -25.8 -25.	4: None vice: BTS 833 GHz 83 dBm	Range Table Ran <u>On</u> Start Fr 1.00000000 G Stop Fr 10.000 k Auto <u>W</u> Video E 300.00 k Auto <u>M</u> Filter Typ Gaussia
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7         8           art Lin         Spect           art Lin         4           ASS         4           4         4           5         6	2 2 rum Analyzer / Be 0 / Be 0 / Ref 5/ Hz Hz Hz	725.3 MHz 711.4 MHz Spurious Enfestions dBm (FGains) (set 21.8 dB 7.40 dBm (Fagains) (set 21.8 dB 7.40 dBm) (set 21.8 dB) (set 21.8 d	-32.70 dBm -32.78 dBm -32.78 dBm Center Freq L Center Freq L #Atten: 40 dB -22.72 dBm -22.72 dBm -22.72 dBm -23.08 dBm -23.10 dBm -23.11 dBm	-10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm -10.51 dBm	-22.19 dB -22.27 dB -22.27 dB -22.27 dB -22.27 dB -22.27 dB -22.27 dB -22.27 dB -22.27 dB -22.25 dB -12.25 dB -12.25 dB -12.25 dB -12.59 dB -12.59 dB -12.59 dB	4: None vice: BTS 833 GHz 83 dBm	Range Table Ran On Start Fr 1.00000000 G Stop Fr 10.00000000 G Res B 100.00 k Auto M Video B 300.00 k

#### **MID Channel**

Center Freq 914.90000		SOURCE OFF ALIGNAUTO L900000 MHz Avg[Held>300/300	11:04:46 AM Feb 08, 2022 Radio Std: None Radio Device: BTS	Trace/Detector
10 dB/div Ref 37.60 d	iBm			
27.6				Clear Write
-240	m Marine Marine	al and the second s	h.	Average
42.4 42.4 42.4				Max Hold
Center 914.9 MHz Res BW 1.8 kHz	VBW 18	kHz	Span 185.4 kHz Sweep 68.2 ms	Min Hold
Channel Power 19.98 dBr	Pov M / 123.6 kHz	ver Spectral Dens -30.94 dBm	/11-	Detector Average Auto Mar
M95		L STATU		

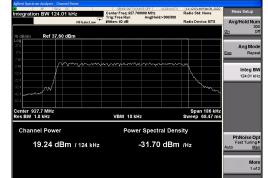
XI	RF 5	Spurious Emissio	lis	SENS	E:INT SOURCE OFF	ALIGN	AUTO	11:06:51A	M Feb 08, 2022	-	
larker 1		JOM DC		<b>Center Fre</b>	q: 914.900000 M	łz	R	adio Std		Rai	nge Table
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		IFC	Salu:Low	PAttern 40 (	<b>4</b> 0			auto Des	ice. DTS		Kang
	Ref Of	set 20.4 dB								<u>On</u>	0
l0 dB/div ₋og	Rero	6.00 dBm									
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36.0											30.000 kH
26.0										_	_
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Spur	Range	Frequenc	y Amp	olitude	Li	nit	ΔL	imit		Auto	Ma
1	2	914.9 MHz		5 dBm	-10.02		29.97		^		
2	2	784.1 MHz		4 dBm	-10.02		-22.0			F	ilter Type
3	2	919.7 MHz		8 dBm	-10.02		-22.0		=		Gaussian
4	2	854.6 MHz		7 dBm	-10.02		-22.2				
5 6	2 2	898.3 MHz 758.3 MHz		5 dBm 7 dBm	-10.02 -10.02		-22.4 -22.4				
7	2	830.6 MHz		2 dBm	-10.02		-22.4				Mor
8											
	2	909.7 MHz	-32.6						~		1 of
	2	909.7 MHz	-32.6	4 dBm	-10.02		-22.0 -22.6		~		1 01
SG	2	909.7 MHz	-32.6			dBm			~		TOP
						dBm	-22.6		.~	_	Tor
gilent Spectr	r <mark>um Analyzer</mark> - RF S	Spurious Emissio	ns	4 dBm	-10.02		-22.6 STATUS	2 dB	M Feb 08, 2022		_
gilent Spectr	rum Analyzer -	Spurious Emissio	ns	4 dBm SENS	-10.02		-22.6 STATUS AUTO	2 dB		Ra	nge Table
gilent Spectr	r <mark>um Analyzer</mark> - RF S	Spurious Emissio 0 Ω DC   dBm	ns	4 dBm	-10.02		-22.6 STATUS AUTO R	2 dB 11:08:20 A adio Std		Ra	nge Table
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O dB/div           0 dB/div           77.4      77.4 <td>Rer Off Ref 5</td> <td>Spurious Emissio O Q DC dBm IFC iset 21.8 dB</td> <td>ns iain:Low</td> <td>4 dBm SENS Center Fre Trig: Free F</td> <td>-10.02</td> <td></td> <td>-22.6 STATUS AUTO R</td> <td>2 dB 11:08:20A adio Std adio Dev 3,80 -25.6</td> <td>: None rice: BTS <b>)26 GH</b>Z</td> <td>Ra 0n 1.00 10.00 Auto</td> <td>nge Table Rang C Start Fre 0000000 GH Stop Fre 0000000 GH 100.00 kh <u>Ma</u></td>	Rer Off Ref 5	Spurious Emissio O Q DC dBm IFC iset 21.8 dB	ns iain:Low	4 dBm SENS Center Fre Trig: Free F	-10.02		-22.6 STATUS AUTO R	2 dB 11:08:20A adio Std adio Dev 3,80 -25.6	: None rice: BTS <b>)26 GH</b> Z	Ra 0n 1.00 10.00 Auto	nge Table Rang C Start Fre 0000000 GH Stop Fre 0000000 GH 100.00 kh <u>Ma</u>
O dB/div           0 dB/div           77.4      77.4 <td>Rer Off Ref 5</td> <td>Spurious Emissio O Q DC dBm IFC iset 21.8 dB</td> <td>ns iain:Low</td> <td>4 dBm SENS Center Fre Trig: Free F</td> <td>-10.02</td> <td></td> <td>-22.6 STATUS AUTO R</td> <td>2 dB 11:08:20A adio Std adio Dev 3,80 -25.6</td> <td>: None Idee: BTS 26 GHz 23 dBm</td> <td>Ra 0n 1.00 10.00 Auto</td> <td>nge Table Rang C Start Fre 0000000 GH Stop Fre 0000000 GH Res B 100.00 kH <u>Ma</u> Video B</td>	Rer Off Ref 5	Spurious Emissio O Q DC dBm IFC iset 21.8 dB	ns iain:Low	4 dBm SENS Center Fre Trig: Free F	-10.02		-22.6 STATUS AUTO R	2 dB 11:08:20A adio Std adio Dev 3,80 -25.6	: None Idee: BTS 26 GHz 23 dBm	Ra 0n 1.00 10.00 Auto	nge Table Rang C Start Fre 0000000 GH Stop Fre 0000000 GH Res B 100.00 kH <u>Ma</u> Video B
O         dB/div           0         dB/div <td>rum Analyzer -: RF P Init -10.02 Ref Off Ref 5;</td> <td>Spurjous Emissio a S DC   dBm IFC Set 21.8 dB 4.40 dBm</td> <td>ns iain:Low</td> <td>4 dBm</td> <td>-10.02</td> <td>dEm ALIGN 12 Hold&gt;50/5</td> <td>-22.6</td> <td>2 dB 11:06:20A adio Std adio Dev 3.80 -25.6</td> <td>: None Idee: BTS 26 GHz 23 dBm</td> <td>Ra 0n 1.00 10.00 Auto</td> <td>nge Table Rang C Start Fre 0000000 GF Stop Fre 0000000 GF 100.00 K Ma Video Bl 300.00 k</td>	rum Analyzer -: RF P Init -10.02 Ref Off Ref 5;	Spurjous Emissio a S DC   dBm IFC Set 21.8 dB 4.40 dBm	ns iain:Low	4 dBm	-10.02	dEm ALIGN 12 Hold>50/5	-22.6	2 dB 11:06:20A adio Std adio Dev 3.80 -25.6	: None Idee: BTS 26 GHz 23 dBm	Ra 0n 1.00 10.00 Auto	nge Table Rang C Start Fre 0000000 GF Stop Fre 0000000 GF 100.00 K Ma Video Bl 300.00 k
0         dB/div           •         9           •         9           •         9           •         7           •         7           •         7           •         9           •         9           •         7 <td>Ref off Ref 5 Ref Si</td> <td>Spurjous Enrisolo as DC d dBm IFC set 21.8 dB 7.40 dBm</td> <td>ns iain:Low</td> <td>4 dBm</td> <td>-10.02</td> <td>dBm</td> <td>-222.6</td> <td>2 dB 11:06:20A adio Std adio Dev 3.80 -25.6 Sto</td> <td>: None Idee: BTS 26 GHz 23 dBm</td> <td>On           1.00           10.00           Auto</td> <td>nge Table Rang C Start Fre 0000000 GF Stop Fre 0000000 GF 100.00 K Ma Video Bl 300.00 k</td>	Ref off Ref 5 Ref Si	Spurjous Enrisolo as DC d dBm IFC set 21.8 dB 7.40 dBm	ns iain:Low	4 dBm	-10.02	dBm	-222.6	2 dB 11:06:20A adio Std adio Dev 3.80 -25.6 Sto	: None Idee: BTS 26 GHz 23 dBm	On           1.00           10.00           Auto	nge Table Rang C Start Fre 0000000 GF Stop Fre 0000000 GF 100.00 K Ma Video Bl 300.00 k
O         dB/div           0         dB/div           0         dB/div           0         37.4           17.4	Ref Off Ref off	Spurjous Entistio 0 0 0 0 dBm IFC set 21.9 dB 4.40 dBm 5.40 d	ns iain:Low	4 dBm	-10.02	dBm ALION 12 Hold>50/5	-22.6 STATUS AUTO IO R R C R	2 dB 11:06:20 A adio Std adio Dev 3.80 -25.6 Sto sto	: None Idee: BTS 26 GHz 23 dBm	On           1.00           10.00           Auto	nge Table Rang C Start Fre 0000000 GH Stop Fre 0000000 GH Stop Stop Start Not Stop Stop Stop Start Stop Start Start Stop Start Stop Start Start Stop Start Stop Start Stop Stop Start Stop Start Stop Start Stop Stop Start Stop Stop Start Stop S
glient Spectr           itart Lim           ASS           0 dB/div           0 glient Spectr           2 glient Spectr           0 dB/div           0 glient Spectr           0 glient Spectr <td>rum Analyzer - RF P int -10.02 Ref Off Ref off Ref 5; Hz Kange 1</td> <td>Spurjous Emissio 26 DC dBm IFC set 21 8 dB 40 dBm 54 dBm</td> <td>ns iain:1 ow</td> <td>4 dBm</td> <td>-10.02</td> <td>dBm</td> <td>-222.6 STATUS AUTO B R R AUTO R AUTO AU</td> <td>2 dB 11:06:20 A adio Std adio Dev 3.80 -25.6 Sto Sto imit 8 dB 4 dB</td> <td>: None Idee: BTS 26 GHz 23 dBm</td> <td>On           1.00           10.00           Auto</td> <td>nge Table Rang Start Fre 0000000 GF Stop Fre 0000000 GF Stop Fre 0000000 GF Stop Stop Stor Nice SB 100.00 kH Ma Stop Stor Stop Stor Stor Stor Stor Stor Stor Stor Stor Stor Stor Stor</td>	rum Analyzer - RF P int -10.02 Ref Off Ref off Ref 5; Hz Kange 1	Spurjous Emissio 26 DC dBm IFC set 21 8 dB 40 dBm 54 dBm	ns iain:1 ow	4 dBm	-10.02	dBm	-222.6 STATUS AUTO B R R AUTO R AUTO AU	2 dB 11:06:20 A adio Std adio Dev 3.80 -25.6 Sto Sto imit 8 dB 4 dB	: None Idee: BTS 26 GHz 23 dBm	On           1.00           10.00           Auto	nge Table Rang Start Fre 0000000 GF Stop Fre 0000000 GF Stop Fre 0000000 GF Stop Stop Stor Nice SB 100.00 kH Ma Stop Stor Stop Stor Stor Stor Stor Stor Stor Stor Stor Stor Stor Stor
O         dB/div           0         dB/div           0         dB/div           0         37.4           17.4	Ref Off Ref off	Spurjous Entistio 0 0 0 0 dBm IFC set 21.9 dB 4.40 dBm 5.40 d	ns iain:Low	4 dBm	-10.02	dBm	-22.6 STATUS AUTO IO R R C R	2 dB 1100:20A adio Std adio Dev 3.80 -25.6 Sto mit 8 dB 8 dB	: None Idee: BTS 26 GHz 23 dBm	On           1.00           10.00           Auto	nge Table Rang C Start Fre 0000000 GH

3.844 GHz 3.621 GHz 3.912 GHz -22.14 dBm -22.70 dBm -22.88 dBm -10.02 dBm -10.02 dBm -10.02 dBm -12.12 dB -12.68 dB -12.86 dB

**I**STATUS

More

#### High Channel



And and Court	man Anatha	Country Control				_	
Agilent Spect		Spurious Emissions	SENSE	INT SOURCE OFF	NAUTO 11:17:43 A	4 Feb 08, 2022	
Marker 1	10	NA DO	Center Free	a: 928.775000 MHz	Radio Std:		Range Table
PASS		IFGain:	Trig: Free F Low #Atten: 40 d		/50 Radio Dev	ice: BTS	Range
		IFGain:	Low MAtten: 40 C		Radio Dev	ice. DTS	2
	Ref Of	fset 20.4 dB					<u>On</u> Off
10 dB/div Log	Ref 5	6.00 dBm					
46.0							Start Freq
36.0							30.000 kHz
26.0							50.000 KHZ
16.0							
							Stop Freq
6.00							1.000000000 GHz
-4.00							
-14.0							
-24.0							Res BW 100.00 kHz
-34.0							Auto Man
Start 30	kHz				St	op 1 GHz	Video BW
							300.00 kHz
Spur	Range	Frequency	Amplitude	Limit	∆ Limit		Auto <u>Man</u>
1	2	927.7 MHz	19.33 dBm	-10.76 dBm	30.09 dB	^	
2	2	829.3 MHz	-32.28 dBm	-10.76 dBm	-21.52 dB		Filter Type
3	2	864.3 MHz	-32.29 dBm	-10.76 dBm	-21.53 dB		Gaussian
4	2	867.3 MHz	-32.63 dBm	-10.76 dBm	-21.87 dB	-	
5	2	866.7 MHz	-32.85 dBm	-10.76 dBm	-22.09 dB		
6	2 2	956.4 MHz	-32.86 dBm	-10.76 dBm	-22.10 dB		More
7 8	2	792.7 MHz 992.4 MHz	-32.98 dBm -33.13 dBm	-10.76 dBm -10.76 dBm	-22.22 dB -22.37 dB		1 of 3
<b>°</b>	2	992.4 WITZ	-55.15 UBIII	-10.70 uBili	-22.37 UB	~	
MSG				Ľ.	STATUS		
Ref Offse PASS	RF 5	Spurious Emissions	Center Free Trig: Free F	q: 928.775000 MHz tun Avg Hold:≻50	Radio Std		Range Table Range
.,		IFGain:L	.0W #Atten: 40 0			66 GHz	1 tange
	Ref Off	set 21.8 dB 7 <b>.40 dBm</b>				94 dBm	<u>On</u> Off
10 dB/div Log	Reij	.40 UBIII					
47.4							Start Fred
37.4							1.00000000 GHz
27.4							
17.4							
7.40							Stop Freq
-2.60							10.00000000 GHz
-12.6							
-22.6		<b>▲</b> 1					Res BW
							100.00 kHz
-32.6							Auto <u>Man</u>
Start 1 G	Hz	^			Sto	p 10 GHz	
							Video BW 300.00 kHz
0	Denne	<b>F</b>	A new life rate	l insit	A L invit		Auto Man
Spur	Range	Frequency	Amplitude	Limit	∆ Limit		
1 2	1 1	3.822 GHz	-21.99 dBm	-10.76 dBm	-11.23 dB	^	Filter Turs
2 3	1 1	3.759 GHz 3.768 GHz	-22.38 dBm -22.40 dBm	-10.76 dBm -10.76 dBm	-11.62 dB -11.64 dB		Filter Type
3	1	3.790 GHZ	-22.40 dBm	-10.76 dBm	-12.06 dB	Ξ	Gaussian
5	1	3.809 GHz	-23.00 dBm	-10.76 dBm	-12.24 dB		
6	1	3.695 GHz	-23.04 dBm	-10.76 dBm	-12.28 dB		More
7	1	3.779 GHz	-23.19 dBm	-10.76 dBm	-12.43 dB		1 of 3
8	1	3.874 GHz	-23.62 dBm	-10.76 dBm	-12.86 dB	~	
MSG					STATUS		
MSG					STATUS		

#### 2.7 Channel Separation (Hybrid Mode)

Test Lab: Electronics Test Centre, Airdrie

Test Personnel: Imran Akram

n Standard: FC

Date:2022-02-18 (20.8°C, 12.7% RH)

Standard: FCC Part 15.247

EUT: Kona Micro Gateway

Basic Standard: ANSI C63.10: 2013

# **EUT status: Compliant**

#### Specification: FCC Part 15.247(a, 1)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

# 2.7.1 Test Guidance: ANSI 63.10 Clause 7.8.2 / 558074 D01 15.247 Measurement Guidance v05r02

This measurement is performed with the EUT transmitter frequency hopping function active.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

The spectrum analyzer is set for a frequency span wide enough to capture at least two adjacent channels. The RBW is set to at least 1% of the span. The Peak detector is used, with the trace set to Max Hold. Channel Separation is displayed with the Marker Delta function.

#### 2.7.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

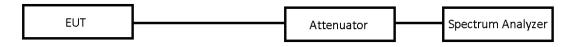
#### 2.7.3 Test Equipment

Testing was performed with the following equipment:

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EXA Signal Analyzer	Agilent	N9010A FW A.14.16	6678	2021-07-22	2022-07-22
Temp/Humidity	Extech	42270	5892	2021-04-05	2022-04-15
Attenuator	Mini-Circuits®	BWS102W263	6932	Cal. Before	e each use
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. Before	e each use

#### 2.7.4 Test Sample Verification, Configuration & Modifications

#### EUT configuration for Channel Separation testing:



#### 2.7.5 Channel Separation Data:

The channel separation Compliant for this device.

Channel separation measured for all 16 bands are between 199 KHz – 200 KHz Screen Captures from the spectrum analyzer:

#### BAND-1



#### Band-16

									nalyzer - Sw		sight Sp	Key
Marker Select Marke	M Feb 18, 2022 E 1 2 3 4 5 6 PE M WWWWW T P N N N N N	TRAC	ALIGN AUTO e: Log-Pwr :>100/100	Avg Type Avg Hold	Run dB	SEN Trig: Free Atten: 30	IO: Wide 🖵 Gain:Low	AC OO kHz PN IFC	SEL   50 Ω 99.5000		(er '	ark
	.50 kHz 417 dB		ΔМ						Offset 20 40.40		/div	D dE
Norm					Δ2	1						30.4 20.4
			V	V		•	X_2	V	\	$\square$		0.4 400 -
De												.60 9.6
Fixe											~~~^	9.6 9.6
	.100 MHz	Stop 029							VIU 7	.000	026	9.6 Hari
(	2001 pts)	067 ms (;	Sweep 1.		FUNC	10 kHz	VBW 5	X		51 k	5 BW	Res
Propertie		- Powerne			dB	0.417 ( 13.424 dE	0 kHz (Δ) 5 MHz		<u>(</u> Δ)		Δ2 F	1 / 2 3 4
	=											5 6 7
												8
<b>M</b> 0 1 c												9 0 1

#### 2.8 Time of Occupancy (Hybrid Mode)

EUT: Kona Micro Gateway
Standard: FCC PART 15.247
Basic Standard: ANSI C63.10: 20013

# EUT status: Compliant

#### Specification: FCC Part 15.247 (f)

The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned-off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

# 2.8.1 Test Guidance: ANSI 63.10 Clause 7.8.4 / 558074 D01 15.247 Measurement Guidance v05r02

This measurement is performed with the EUT frequency hopping function active.

The RF output of EUT with an antenna connector is fed to the input of the spectrum analyzer through appropriate attenuation. The loss from the cable and the attenuator were added on the analyzer as gain offset setting there by allowing direct measurements, without the need for any further corrections.

The spectrum analyzer is set for Peak detection over a 0 Hz frequency span (time domain) centered on a hopping channel. The RBW shall be  $\leq$  Channel spacing and where possible RBW should be set >> 1/T, where T is the expected dwell time per channel. VBW  $\geq$  RBW. The sweep time is adjusted to clearly capture one transmission. The Dwell time is measured with the Marker Delta function.

Another sweep is set to capture enough transmission events to calculate the number of events within the specified period of time. The Peak detector is used, with the trace set to Max Hold.

#### 2.8.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

#### 2.8.3 Test Equipment

Equipment	Manufacturer	Model #	Asset #	Cal. Date	Cal. Due
EXA Signal Analyzer	Agilent	N9010A FW A.14.16	6678	2021-07-22	2022-07-22
Temp/Humidity	Extech	42270	5892	2021-04-05	2022-04-15
Attenuator	Mini-Circuits®	BWS102W263	6932	Cal. before	e each use
Coaxial Cables (RF)	Huber+Suhner	Enviroflex 400	-	Cal. before	e each use

Testing was performed with the following equipment:

#### 2.8.4 Test Sample Verification, Configuration & Modifications

The EUT was operating in normal mode. The EUT met the requirements without modification.

#### EUT configuration for Dwell Time testing:

EUT	Attenuator	<u> </u>	Spectrum Analyzer
-----	------------	----------	-------------------

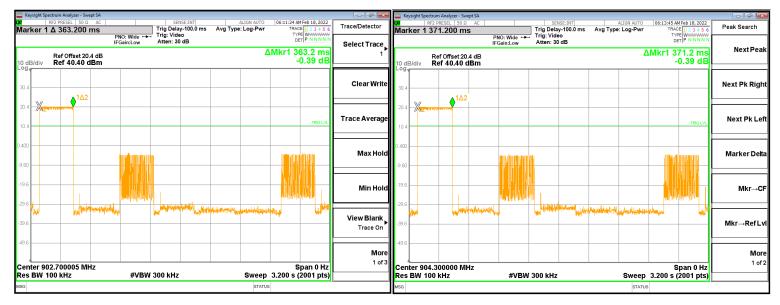
#### 2.8.5 Dwell Time Data:

Measured Dwell time < 400ms Kona Micro Gateway has 16 bands and each band have 8 channels. Window of measurement is equal to number of hopping channels multiple by 400ms =  $0.4 \times 8 = 3.2$  Sec Number of events in 3.2 Sec = 1

#### Screen Capture from the spectrum analyzer: sweep Time in 3.2 Sec

#### Band-1 (902.3 - 903.7 MHz)

#### Band-2 (903.9 – 905.3 MHz)



#### Band-3 (905.5 - 906.9 MHz)

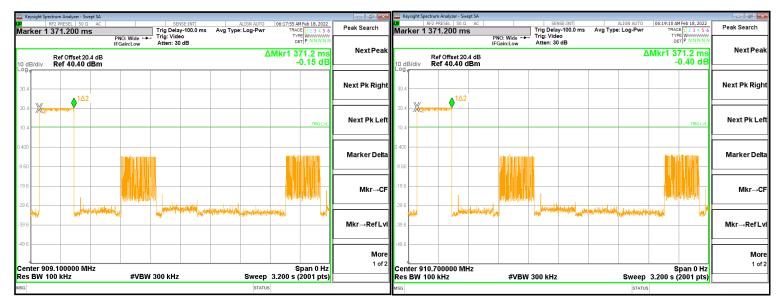
#### Band-4 (907.1 - 908.5 MHz)

🔤 Keysight	t Spectrum Analyzer - Swept SA				- # <b>*</b>	🔤 Keysight !	Spectrum Analyzer - Swept SA						
<mark>w</mark> Marker	RF2 PRESEL 50 Ω AC r 1 371.200 ms	SENSE Trig Delay-1		06:15:17 AM Feb 18, 2022 TRACE 1 2 3 4 5 6	Peak Search	w Marker	RF2 PRESEL 50 Ω AC 1 371.200 ms		SENSE:INT Trig Delay-100.0 m Trig: Video	AL s Avg Type:	LIGN AUTO Log-Pwr	06:16:40 AM Feb 18, 2022 TRACE 1 2 3 4 5 6	Peak Search
	F	PNO: Wide +++ Trig: Video FGain:Low Atten: 30 de		DET P NNNN	Nové Doole			PNO: Wide ++ IFGain:Low	Atten: 30 dB			TYPE WWWWWW DET P NNNNN	NewtDeels
10 dB/div Log	Ref Offset 20.4 dB v Ref 40.40 dBm		Δ	Mkr1 371.2 ms -0.20 dB	Next Peak	10 dB/div	Ref Offset 20.4 dB Ref 40.40 dBm				Δ!	/lkr1 371.2 ms 0.02 dB	NextPeak
30.4					Next Pk Right	-1							Next Pk Right
				TRIG LVL	Next Pk Left	20.4	X	Such a breath	1Δ2			TRIO LVL	Next Pk Left
0.400					Marker Delta	0.400							Marker Delta
-9.60						-9.60							
-29.6	L. Jana Para Lakaran		Allian the the second and the second states and the second states and the second states and the second states a	a haan dh	Mkr→CF	-29.6	and a second at the se		Andthermatica		a sa katula.	nyalanithaninjinta,anah	Mkr→CF
-39.6	Million ( proceeding of	M Maaaabaaa	. Philoson of the second distribution of		Mkr→RefLvl		siddinengeningeningenengelyseine	v 1	Mr. a no. ( noti ti novi ti o M)	MAY		Manania in a subara 1900 and 1	Mkr→RefLv
-49.6					More 1 of 2	-49.6							More 1 of 2
	905.900000 MHz V 100 kHz	#VBW 300 kHz	Sweep	Span 0 Hz 3.200 s (2001 pts)	1012	Center 9 Res BW	007.500000 MHz 100 kHz	#VBW	300 kHz		Sweep 3	Span 0 Hz 3.200 s (2001 pts)	1012
MSG			STATUS			MSG					STATUS		

Test Sample: Kona Micro Gateway FCC ID:2ALEPT0008073

#### Band-5 (908.7 - 910.1 MHz)

#### Band-6 (910.3 - 911.7 MHz)



#### Band-7 (911.9 - 913.3 MHz)

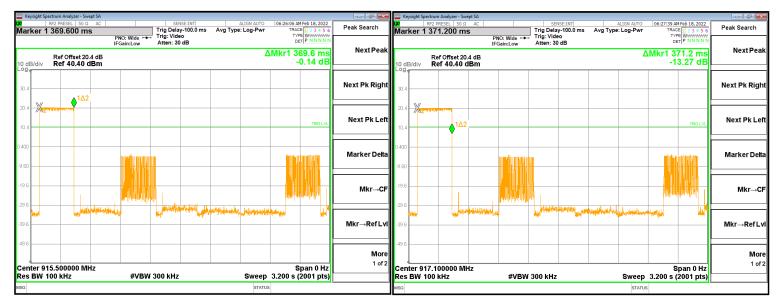
#### Band-8 (913.5 - 914.9 MHz)

Keysight Spectrum Analyzer - Swept SA			
RF2 PRESEL         50 Ω         AC         SENSE:INT         ALIGN AUTO           Marker 1 371.200 ms         Trig Delay-100.0 ms         Avg Type: Log-Pwr           PNO: Wirlds         Trig: Video         Avg Type: Log-Pwr	06:20:38 AM Feb 18, 2022 TRACE 1 2 3 4 5 6 TYPE Waaaaaaaa		SENSE:INT         ALIGN AUTO         06:22:19 AMFeb 18, 2022           rig Delay-100.0 ms         Avg Type: Log-Pwr         TRACE 12.3.4.5.6         Peak Search           rys: Video         TYPE[WWWWWWW         TYPE[WWWWWWW         Peak Search
IFGain:Low Atten: 30 dB	ΔMkr1 371.2 ms	IFGain:Low A	tten: 30 dB ΔMkr1 371.2 ms NextPea
10 dB/div Ref 40.40 dBm	-0.40 dB	10 dB/div Ref 40.40 dBm	-0.17 dB
30.4	Next Pk Rig	t 30.4 ▲1△2	Next Pk Righ
20.4	Next Pk L		Next Pk Le
10.4		10.4	
	Marker De		Marker Delt
9.60	Mkr→4		Mkr-C
225 ben hand hand hand hand hand hand hand han	Mkr→RefL		hardussianing and a stand a
49.6	Ma 1 o		Mor
Center 912.300000 MHz Res BW 100 kHz #VBW 300 kHz Sweep	Span 0 Hz 3.200 s (2001 pts)	Center 913.900000 MHz Res BW 100 kHz #VBW 30	Span 0 Hz
ASG STATU	is	MSG	STATUS

Test Sample: Kona Micro Gateway FCC ID:2ALEPT0008073

#### Band-9 (915.1 - 916.5 MHz)

#### Band-10 (916.7 - 918.1 MHz)



## Band-11 (918.3 - 919.7 MHz)

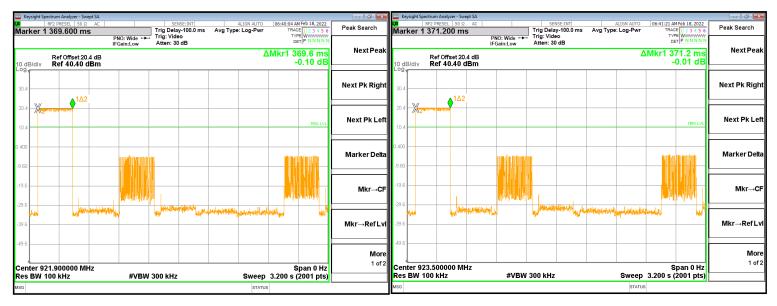
## Band-12 (919.9 - 921.3 MHz)

Keysight Spectrum Analyzer - Swept SA			🔤 Keysight Spectrum Anslyzer - Swept SA
arker 1 371.200 ms Trig Delay-100.0 ms Avg Type: Log-Pwr	06:29:02 AM Feb 18, 2022 TRACE 1 2 3 4 5 6 TYPE WWWWW DET P N N N N N	Peak Search	Marker 1 371.200 ms         Δμαγ μαζε μαζε μαζε μαζε μαζε μαζε μαζε μαζε
IFGain:Low Atten: 30 dB		NextPeak	IFGain:Low Atten: 30 dB DET P N N N N
Ref Offset 20.4 dB	/kr1 371.2 ms -0.25 dB		Ref 0ffset 20.4 dB ΔΝ/RT 37 1.2 ms 10 dB/div Ref 40.40 dBm -0.34 dB
0.4		Next Pk Right	30.4
	TRIG LVL	Next Pk Left	20.4 10.2 100 100 100 100 100 100 100 100 100 10
		Marker Delta	0.400 Marker Delta
		Mkr→CF	-19.5
	norskyrser og beneftet og som	Mkr→RefLvl	test kisketesten ander and
enter 918.700000 MHz	Span 0 Hz	More 1 of 2	49.6 More Center 920.300000 MHz Span 0 Hz 1 of 2
es BW 100 kHz #VBW 300 kHz Sweep 3.	.200 s (2001 pts)		Res BW 100 kHz #VBW 300 kHz Sweep 3.200 s (2001 pts)
G STATUS			MSG STATUS

Test Sample: Kona Micro Gateway FCC ID:2ALEPT0008073

## Band-13 (921.5 - 922.9 MHz)

#### Band-14 (923.1 - 924.5 MHz)



## Band-15 (924.7 - 926.1 MHz)

## Band-16 (926.3 - 927.7 MHz)

	pectrum Analyzer - Swept SA					- # <b>*</b>	— Ке		trum Analyzer - Swe									- # <u>×</u>
	RF2 PRESEL 50 Ω AC 1 371.200 ms	Trig De	SENSE:INT elay-100.0 ms Avg Typ	ALIGN AUTO e: Log-Pwr	06:42:33 AM Feb 18, 2022 TRACE 1 2 3 4 5 6	Peak Search	<mark>ixi</mark> Mar		F2 PRESEL 50 Ω	ms		Trig Dela	NSE:INT	Avg Type:	LIGN AUTO	06:45:02 AM Fe	23456	Marker
		PNO: Wide +++ Trig: V IFGain:Low Atten:	ideo 30 dB		DET P N N N N						PNO: Wide ↔ FGain:Low	Trig: Vide Atten: 30					PNNNN	Select Marker
10 dB/div	Ref Offset 20.4 dB Ref 40.40 dBm			Δ	Mkr1 371.2 ms -0.30 dB			B/div	Ref Offset 20 Ref 40.40 c						Δ	Mkr1 371 -0.	.2 ms 42 dB	1
30.4						Next Pk Right		1										Normal
20.4					TRIG LVL	Next Pk Left	20.4		1Δ2								TRIG LVL	Delta
-9.60						Marker Delta	0.400				la <b>n</b> a ini ala any.					in the second	i di sul	Fixed⊳
-19.6						Mkr→CF	-19.6				/							Off
-29.6	niamahkilontianshanakabili minamilanaka	stration of the post of the day in the section of	w the state of the		we w	Mkr→RefLvl	-29.6	May	,,, <mark>()))</mark>	n an	*	and the state of t	anderiging <sub>(pal</sub> ika	ris, over the table	Jouil-Arlian	how	- <b>V</b>	Properties►
-49.6						More 1 of 2	-49.6											More 1 of 2
Center 92 Res BW	25.100000 MHz 100 kHz	#VBW 300 kH	Iz	Sweep	Span 0 Hz 3.200 s (2001 pts)			ter 926 BW 10	6.700000 MH 00 kHz	Hz	#VBW	300 kHz			Sweep	Spa 3.200 s (20	an 0 Hz )01 pts)	
MSG				STATUS			MSG								STATUS			

## 2.9 EUT Positioning Assessment

Test Lab: Electronics Test Centre, Airdrie	EUT: Kona Micro Gateway
Test Personnel: Imran Akram/Janet	Standard: FCC PART 15.247
Date: 2022-02-04 (21.0° C,8.2 % RH)	Basic Standard: ANSI C63.4-2014

**Comments:** Unit real life installation is ether wall mount or Table Top. Both positions were assed. Table top position found worse.

#### Specification: ANSI C63.4-2014, Clause 6.3.2.1

Portable, small, lightweight, or modular devices that may be handheld, worn on the body, or placed on a table during operation shall be positioned on a non-conducting platform, the top of which is 80 cm above the reference ground plane. The preferred area occupied by the EUT arrangement is 1 m by 1.5 m, but it may be larger or smaller to accommodate various sized EUTs (see Figure 6, Figure 7, and Figure 9). For testing purposes, ceiling- and wall-mounted devices also shall be positioned on a tabletop (see also 6.3.4 and 6.3.5). In making any tests involving handheld, body-worn, or ceiling-mounted equipment, it is essential to recognize that the measured levels may be dependent on the orientation (attitude) of the three orthogonal axes of the EUT. Thus, exploratory tests as specified in 8.3.1 shall be carried out for various axes orientations to determine the attitude having maximum or near-maximum emission level.

Refer to Test Setup photo exhibit.

## 2.10 Radiated Spurious Emissions / Co-Location (Restricted Band)

Test Lab: Electronics Test Centre, Airdrie Test Personnel: Janet / Branden Van Hee EUT: Kona Micro Gateway Standard: FCC PART 15.247/15.209 Basic Standard: ANSI C63.10-2013

Date: 2022-02-04/07/11 (20.7° C,11.3 % RH)

# **EUT status: Compliant**

## Specification: FCC PART 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.0900000 -	8.2910000 -	16.804250 -	162.01250 -	1660.0000 -	3.6000000 -	14.470000 -
0.1100000	8.2940000	16.804750	167.17000	1710.0000	4.4000000	14.500000
0.4950000 -	8.3620000 -	25.500000 -	167.72000 -	1718.8000 -	4.5000000 -	15.350000 -
0.5050000	8.3660000	25.670000	173.20000	1722.2000	5.1500000	16.200000
2.1735000 -	8.3762500 -	37.500000 -	240.00000 -	2200.0000 -	5.3500000 -	17.700000 -
2.1905000	8.3867500	38.250000	285.00000	2300.0000	5.4600000	21.400000
4.1250000 -	8.4142500 -	73.000000 -	322.00000 -	2310.0000 -	7.2500000 -	22.010000 -
4.1280000	8.4147500	74.600000	335.40000	2390.0000	7.7500000	23.120000
4.1772500 -	12.290000 -	74.800000 -	399.90000 -	2483.5000 -	8.0250000 -	23.600000 -
4.1777500	12.293000	75.200000	410.00000	2500.0000	8.5000000	24.000000
4.2072500 -	12.519750 -	108.00000 -	608.00000 -	2655.0000 -	9.0000000 -	31.200000 -
4.2077500	12.520250	121.94000 **	614.00000	2900.0000	9.2000000	31.800000
5.6770000 -	12.576750 -	123.00000 -	960.00000 -	32600000 -	9.3000000 -	36.430000 -
5.6830000	12.577250	138.00000 **	1240.0000 ***	3267.0000	9.5000000	36.500000
6.2150000 -	13.360000 -	149.90000 -	1300.0000 -	3332.0000 -	10.600000 -	Above
6.2180000	13.410000	150.05000	1427.0000 ***	3339.0000	12.700000	38.600000
6.2677500 -	16.420000 -	156.52475-	1435.0000 -	3345.8000 -	13.250000 -	
6.2682500	16.423000	156.52525	1626.5000	3358.0000	13.400000	
6.3117500 -	16.694750 -	156.70000 -	1645.5000 -	3500.0000 -		
6.3122500	16.695250	156.90000	1646.5000	3600.0000 ****		

#### **Restricted Bands of Operation:**

## 2.8.1 Test Guidance: ANSI C63.10-2013, Clause 13.4.2

From 9 kHz to 150 kHz (resolution bandwidth of 200 Hz) and from 150 kHz to 30 MHz (resolution bandwidth 9 kHz) measurements are performed with a loop antenna (as per KDB 460108).

From 30 MHz to 1000 MHz, measurements are performed with a broadband biconilog antenna and a resolution bandwidth of 120 kHz.

Above 1000 MHz, measurements are performed with a DRG Horn antenna or a Standard Gain horn, and a resolution bandwidth of 1 MHz. The EUT is raised to 150 cm above the ground plane, and the area between the EUT and the antenna mast is covered with RF absorbent material.

The scan is performed at discreet increments of turntable azimuth and antenna height, which are selected in accordance with the applicable standard in order to assure capture of frequencies of interest. Optimization is performed based on the scan data.

Frequencies having peak emissions within 10dB of the limits are optimized. The EUT is rotated in azimuth over 360 degrees and the direction of maximum emission is noted.

Antenna height is varied from 1 - 4 meters at this azimuth to obtain the maximum emission. Then the maximum level is measured with the appropriate detector and recorded. Up to 1 GHz, measurements are performed with a Quasi-Peak detector. Above 1 GHz, measurements are recorded with Peak and/or Average detectors, as applicable.

## 2.8.2 Deviations From The Standard:

There were no deviations from the EUT setup or methodology specified in the standard.

## 2.8.3 Test Equipment

Testing was performed with the following equipment:

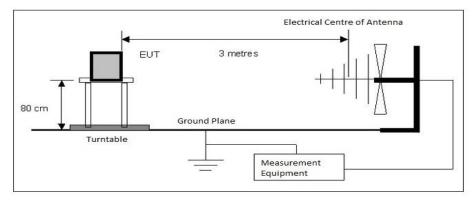
Equipment	Manufacturer	Model #	Asset #	Cal. Date (yyyy-mm-dd)	Cal. Due (yyyy-mm-dd)
EMC Software	UL	Ver. 9.5	ETC-SW-EMC 2.1	N	I/A
EMI receiver	Agilent	N9038A (FW A.25.05)	6130	2021-06-18	2022-06-8
Loop Antenna	EMCO	6502	10868	2021-05-11	2023-05-11
Biconilog Antenna	AR	JB1	6905	2021-10-29	2023-10-21
DRG Horn	EMCO	3115	19357	2020-09-29	2022-09-29
Humidity/Temp Logger	Extech Ins. Corp.	42270	5892	2021-04-06	2022-04-06
Low Noise Amplifier (1 – 18 GHz)	MITEQ	JS43-01001800- 21-5P	4354	2021-05-11	2022-05-11
Pre-Amplifier (30 – 1400 MHz)	HP	8447D	9291	2021-05-11	2022-05-11
RE Cable below 1GHz	Insulated Wire Inc.	KPS-1501A- 3600-KPA- 01102006	4419	2021-05-11	2022-05-11
Re Cable Above 1 GHz	A.H. System Inc.	SAC-26G-8.23	6187	2021-05-11	2022-05-11
High Pass Filter	K&L	4DH21	-	2021-05-11	2022-05-11

## 2.8.4 Test Sample Verification, Configuration & Modifications

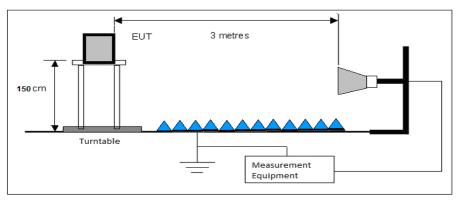
The EUT was set to a selected channel with test-specific software. The output was modulated as in normal operation. Both radios transmitting simultaneously, pre-approved GSM module is transmitting at 784 MHz and LoRa radio transmitting at MID Channel 914.9 MHz.

The EUT met the requirements without modification.

## Test setup diagram for Radiated Spurious Emissions testing (below 1GHz):



Test setup diagram for Radiated Spurious Emissions testing (above 1GHz):



## 2.8.5 Radiated Emissions Data:

The emissions data are presented in tabular form, showing turntable azimuth, antenna height and polarization, the uncorrected spectrum analyzer reading, the correction factors applied, the net result, the value of the limit at the frequency investigated, and the Delta between the result and the limit.

#### Meter Reading in $dB\mu V$ + Antenna Factor in dB/m + Gain/Loss Factor in dB = Corrected Field Strength in $db\mu V/m$ .

#### Delta = Field Strength – Limit

#### Notes:

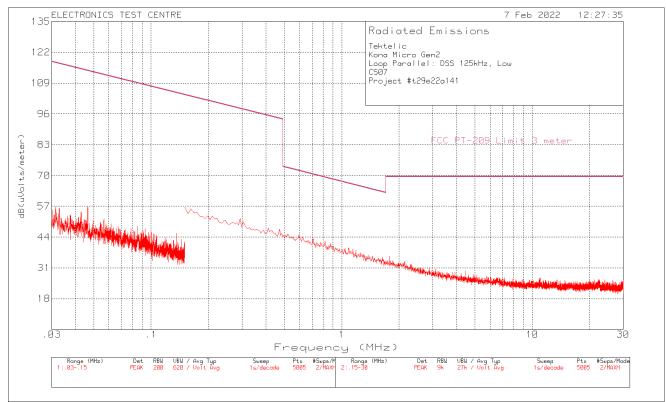
- When a preamp is used, the resulting gain is compensated, producing a negative value for the Cable Loss.
- Measurements reported are the result of adjusting the turntable azimuth and antenna height to obtain the maximum EUT emission. This may produce a different reading than the plot trace. The plot is a Peak Hold function obtained at discreet increments of height and azimuth, while the reported measurement is obtained with the appropriate Quasi Peak or Average detector after the height and azimuth have been adjusted for maximum emission.
- Preliminary scans were performed for all channels in Transmit modes. The LOW band channel 902.3 MHz was selected as the worst-case condition for detailed examination.
- In Transmit mode, the EUT was assessed up to 10.0 GHz.

Freq. Marker	Freq. [MHz]	Raw reading [dBµv]	Det	Antenna Factor [dB/m]	Pre amp Gain/Cable Loss [dB]	Corrected Reading [dBµv/m]	FCC 15.247 Limit [dBµv/m]	Delta [dB]	Azimuth [Deg]	Height [cm]	Polarization
1	120.21	20.86	QP	17.6	2.7	41.16	43.52	-2.36	65	103	Vertical
1	1564.1	38.6	AV	25.4	-33	31	54	-23.0	352	309	Horizontal
1	1564.1	47.08	PK	25.4	-33	39.48	74	-34.52	352	309	Horizontal
2	2346.3	41.24	AV	28.6	-34.1	35.74	54	-18.26	143	108	Horizontal
2	2346.3	49.26	PK	28.6	-34.1	43.76	74	-30.24	143	108	Horizontal
3	2706.8	45.23	AV	29.1	-33.2	41.13	54	-12.87	140	152	Horizontal
3	2706.8	49.08	PK	29.1	-33.2	44.98	74	-29.02	140	152	Horizontal
4	5413.5	42.43	AV	33.9	-30.5	45.83	54	-8.17	58	142	Horizontal
4	5413.5	47.71	PK	33.9	-30.5	51.11	74	-22.89	58	142	Horizontal
5	1564.1	39.53	AV	25.4	-33	31.93	54	-22.07	136	150	Vertical
5	1564.1	47.84	PK	25.4	-33	40.24	74	-33.76	136	150	Vertical
6	2346.3	37.82	AV	28.6	-34.1	32.32	54	-21.68	215	154	Vertical
6	2346.3	46.77	PK	28.6	-34.1	41.27	74	-32.73	215	154	Vertical
7	2706.5	46.84	AV	29.1	-33.2	42.74	54	-11.26	100	162	Vertical
7	2706.5	51.65	PK	29.1	-33.2	47.55	74	-26.45	100	162	Vertical
8	5414.0	47.25	AV	33.9	-30.5	50.65	54	-3.35	164	114	Vertical
8	5414.0	50.82	PK	33.9	-30.5	54.22	74	-19.78	164	114	Vertical
9	6315.8	43.97	AV	34.4	-29.2	49.17	54	-4.83	173	106	Vertical
9	6315.8	48.31	PK	34.4	-29.2	53.51	74	-20.49	173	106	Vertical

#### Negative values for Delta indicate compliance.

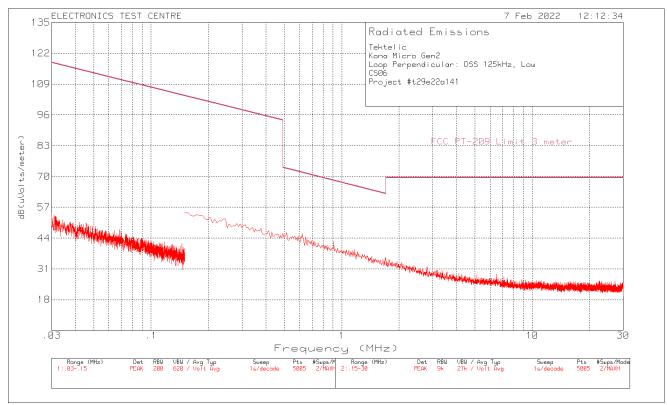
## **Spurious Emission**

#### \* Restricted Band

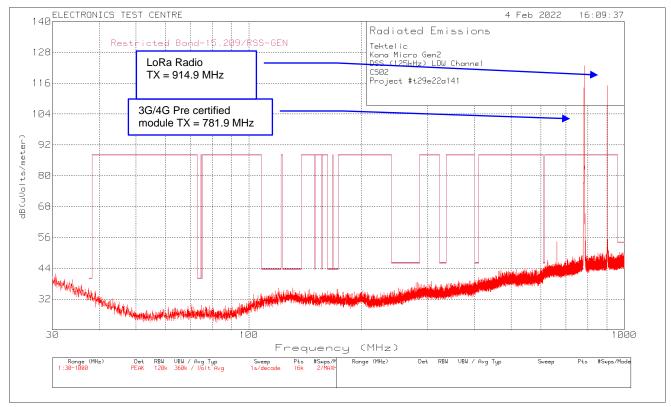


## Plot of Radiated Emissions: Measuring Antenna Parallel

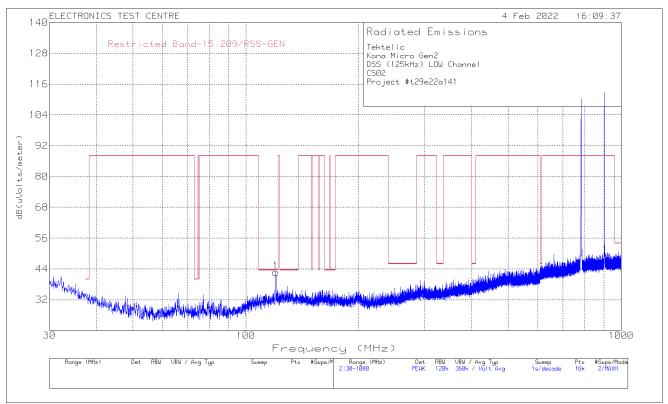
Plot of Radiated Emissions: Measuring Antenna Perpendicular



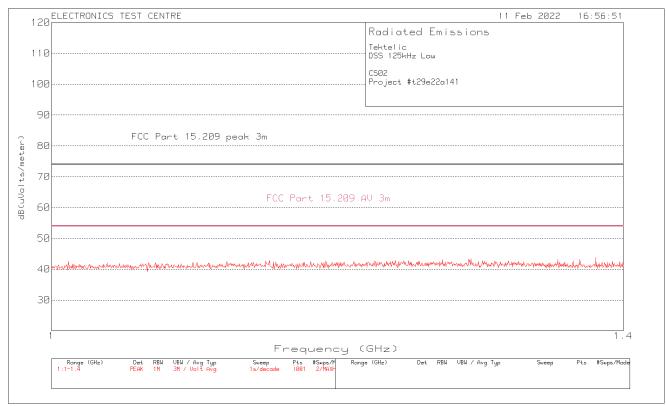




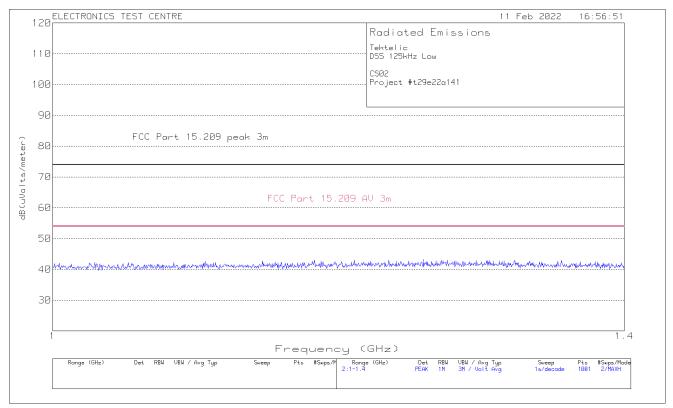
## Plot of Radiated Emissions: Vertical polarization

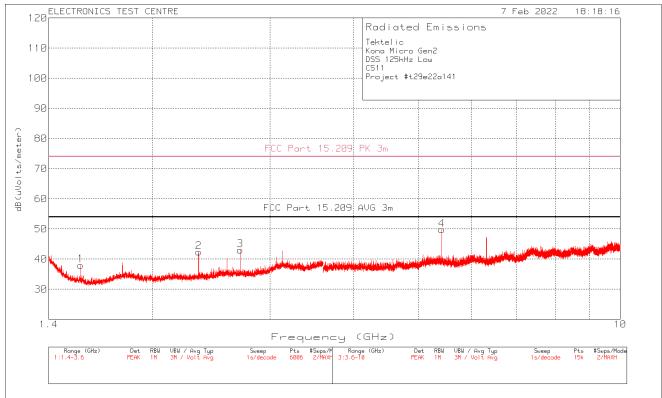


## Plot of Radiated Emissions: Horizontal polarization



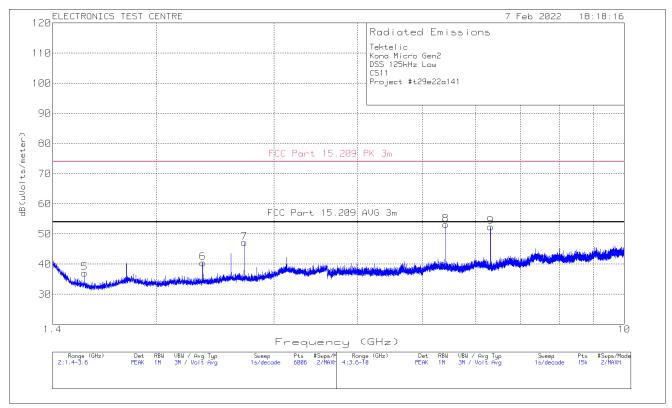
## Plot of Radiated Emissions: Vertical polarization





## Plot of Radiated Emissions: Horizontal polarization

## Plot of Radiated Emissions: Vertical polarization



#### 2.11 RF Exposure

Test Lab: Electronics Test Centre, Airdrie Test Personnel: Date:	EUT: Kona Micro Gateway Standard: FCC PART 15.247					
EUT status: Compliant						

Compliant: RF exposure assessment to be provided in a separate Exhibit.

## 3.0 TEST FACILITY

## 3.1 Location

The Kona Micro Gateway was tested at the Electronics Test Centre laboratory located in Airdrie, Alberta, Canada. The Radio Frequency Anechoic Chamber (RFAC), identified as Chamber 1, has a usable working space measuring 10.6 m long x 7.3 m wide x 6.5 m high.

Measurements taken at this site are accepted by Industry Canada as evidence of conformity per registration file # 2046A. This site is also listed with the FCC under Registration Number CA2046.

The floor, walls and ceiling consist of annealed steel panels. The walls and ceiling are covered with ferrite tile, augmented by RF absorbant foam material on the end wall nearest the turntable, and on the adjacent walls and the ceiling. The chamber floor supports a 15 cm high internal floor, constructed of annealed steel panels, that forms the ground plane, and is bonded to the chamber walls.

The 3-m diameter turntable is flush-mounted with the floor. A sub-floor cable-way is provided to route cables between the turntable pit and EUT support equipment located in the Control Room. Cables reach the EUT through an opening in the centre of the turntable.

Test instrumentation and EUT support equipment is located in the Control Room, consisting of two shielded vestibules joined together at the side of the main room. Cables are routed through bulkhead panels between the rooms and the test chamber as required. Power feeds are routed into the main room and vestibules through line filters providing at least 100 dB of attenuation between 10 kHz and 10 GHz.

Either floor mounted or table-top equipment can be tested at this facility.

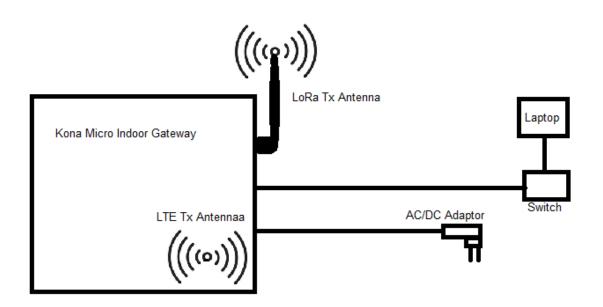
## 3.2 Grounding Plan

The Kona Micro Gateway was placed at the center of the test chamber turntable on top of a polystyrene foam table. The EUT was grounded according to Tektelic Communication Inc. specifications.

## 3.3 Power Supply

All EUT power was supplied by an AC/DC adaptor.

## Appendix A – Test Setup Block Diagram



End of Document