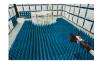


-PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA Tel. 410.290.6652 / Fax 410.290.6654 http://www.pctest.com



MEASUREMENT REPORT

LTE NB Device

Applicant Name:

Tecore Networks 7030 Hi Tech Drive Hanover, MD 21076 USA

Date of Testing: 5/13 - 5/21/2019 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M1905200075.QLJ.

FCC ID:

QLJ4GNBIOT-086

APPLICANT:

Tecore Networks

Application Type: Model: EUT Type: FCC Classification: FCC Rule Part(s): Test Procedure(s): Certification NB-IoT Remote Radio Head Licensed Non-Broadcast Station Transmitter (TNB) §27; §2 ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



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MEASUREMENT REPORT FCC Part 27



ECC Dula	TYE	AN	IT1	AN	IT2	МІ	мо			
FCC Rule TX Frequency Part (MHz)	Max. Power (W)	Max. Power (dBm)	Max. Power (W)	Max. Power (dBm)	Max. Power (W)	Max. Power (dBm)	ANT1 Emission ANT2 Emission Designator Designator	Modulation		
27	757.0 - 758.0	21.23	43.27	18.58	42.69	37.07	45.69	180KG7D	180KG7D	QPSK

EUT Overview

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Tecore Networks Remote Radio Head FCC ID: QLJ4GNBIOT-086**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function. The Remote Radio Head functions as a NarrowBand LTE device operating in the Guard Band A Block per FCC Part 27 Subpart G. The signal output level is set to 20 Watts from each antenna port and it is fed via a low loss cable to the input of a spectrum analyzer or a 50 Ω load, depending on the type of testing performed. EUT was set up to operate as shown below with a -48VDC power supply. Server equipment was used to control the RF functions of the EUT.

The Device is capable of operating through either a single port with 16 Watts (1×16) or two ports with 8 Watts repectivley (2×8) .

Test Device Serial No.: 19060002

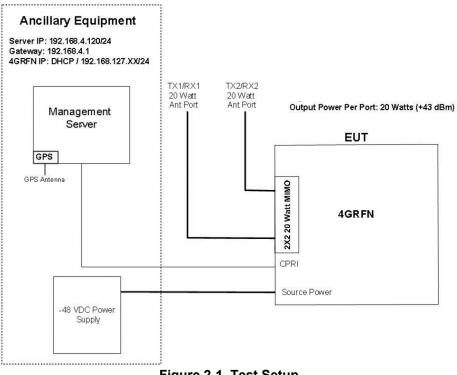


Figure 2-1. Test Setup

2.2 Device Capabilities

This device contains the following capabilities: LTE 2x2 MIMO

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

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2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

 $P_{d [dBm]} = P_{g [dBm]} - cable loss _{[dB]} + antenna gain _{[dBd/dBi]}$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g [dBm]}$ – cable loss [dB].

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + 10 log₁₀(Power [Watts]).

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	N9020A	MXA Signal Analyzer	4/20/2019	Annual	4/20/2020	US46470561
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
EMCO	3160-09	Small Horn (18 - 26.5GHz)	8/9/2018	Biennial	8/9/2020	135427
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
ETS-Lindgren	3115	Double Ridged Guide Horn 750MHz - 18GHz	3/28/2018	Biennial	3/28/2020	150693
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	9/19/2018	Annual	9/19/2019	100040
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	6/18/2018	Annual	6/18/2019	102134
Sunol	DRH-118	Horn Antenna (1-18GHz)	8/11/2017	Biennial	8/11/2019	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 5-1. Test Equipment

Notes:

- 1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
- 2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz W = Amplitude/Angle Modulated 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

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7.0 TEST RESULTS

7.1 Summary

Company Name:	Tecore Networks
FCC ID:	QLJ4GNBIOT-086
FCC Classification:	Licensed Non-Broadcast Station Transmitter (TNB)

LTE

Mode(s):

FCC Part Test Test **Test Limit** Reference **Test Description** Section(s) Condition Result Transmitter Conducted 2.1046 N/A Section 7.2 **Output Power** 2.1049 Occupied Bandwidth N/A Section 7.3 > 43 + 10 log₁₀ (P[Watts]) at CONDUCTED PASS 2 1051 Section 7.4. Band Edge and for all out-of-Out of Band Emissions 27.53 7.5 band emissions Emission must remain in band 27.54 **Frequency Stability** Section 7.7 (Part 27) > 43 + 10 log₁₀ (P[Watts]) for all 1053 Undesirable Emissions PASS Section 7.6 out-of-band emissions RADIATED At 27.50 Radiated Power 1000W at 305m N/A Licensing

Table 7-1. Summary of Radiated Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots (Sections 7.2, 7.4, 7.5) were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version 4.8.
- 5) For the Radiated Emissions test, the EUT was tested for case radiated spurious emissions with both antenna ports terminated in 50ohms while the EUT was set to transmit from either both antenna ports (2 x 8W) or one antenna port (1 x 16W) at maximum power.

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7.2 Conducted Power §2.1046

Test Overview

The EUT was set to transmit in all four available modulations of LTE mode at 43.01 dBm or as applicable for the channe through a management server. An output power level of 43.01dBm was used to ensure that the amplifier would operate in its linear region. The output terminal of the EUT was connected through a calibrated cable and 30dB of external attenuation to a signal analyzer. The signal analyzers' "Channel Power" function was used to measure the conducted output powers in accordance to the guidance of KDB 971168 D01 v03r01.

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.2.1

ANSI C63.26-2015 Section 6.4.3.1

Test Settings

- 1. Power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
- 2. Span = 2 3 times the OBW
- 3. RBW = 1 5% of the expected OBW
- 4. VBW \geq 3 x RBW
- 5. No. of sweep points \geq 2 x span / RBW
- 6. Sweep time = auto-couple
- 7. Detector = RMS
- 8. Trigger is set to "free run" for signals with continuous operation.
- 9. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
- 10. Trace mode = trace averaging (RMS) over 100 sweeps
- 11. The trace was allowed to stabilize

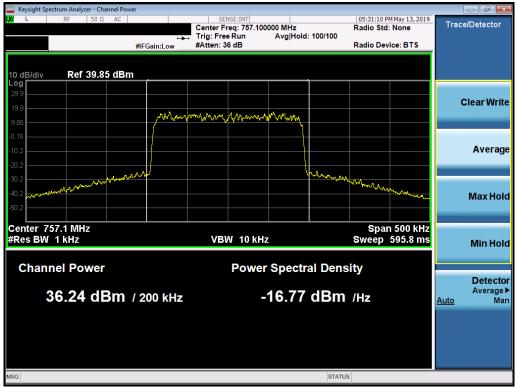
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Antenna 1 Conducted Power Measurements

Frequency [MHz]	Channel Bandwidth [kHz]	Mod.	ANT 1 Conducted Power [dBm]	ANT 2 Conducted Power [dBm]	Total Conducted Power [dBm]	Total Conducted Power [Watts]	Test Mode
757.10	200	QPSK	36.24		36.24	4.21	Ant 1 SISO [1 x 16]
757.20	200	QPSK	43.27		43.27	21.23	Ant 1 SISO [1 x 16]
757.50	200	QPSK	42.72		42.72	18.71	Ant 1 SISO [1 x 16]
757.80	200	QPSK	42.68		42.68	18.54	Ant 1 SISO [1 x 16]
757.90	200	QPSK	35.83		35.83	3.83	Ant 1 SISO [1 x 16]

Table 7-2. Maximum Average Conducted Power ANT 1



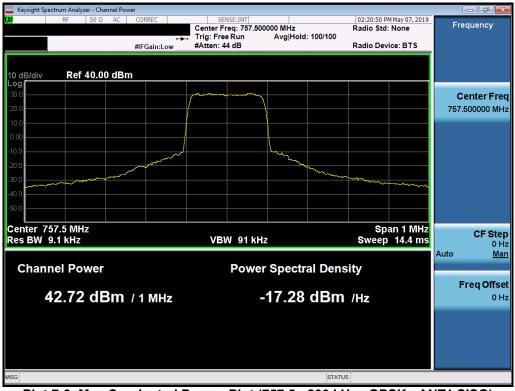
Plot 7-1. Max Conducted Power Plot (757.1 - 200 kHz - QPSK - ANT1 SISO)

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Keysight Spectrum Analyzer - Channel Power						- 6 🗙
LXI T RF 50 Ω AC CORRE	Center Freq: 757.2	200000 MHz Avg Hold: 100/100	11:37:45 PM Radio Std:	May 21, 2019 None	Trac	e/Detector
#IFGai	in:Low #Atten: 30 dB		Radio Devi	ice: BTS		
10 dB/div Ref 50.00 dBm						
40.0						
30.0					(Clear Write
20.0	mon man man	www.way				
10.0						
0.00						Average
-10.0					_	
-20.0 -30.0		www.	mary			
-30.0			- WW LAU	mmunder		Max Hold
-40.0						
Center 757.2 MHz			Span	500 kHz		
#Res BW 1 kHz	#VBW 10	kHz	Sweep	595.8 ms		Min Hold
Channel Power	Pow	er Spectral Dens	sity			Defende
		0 720 dDm				Detector Average ►
43.27 dBm / 200	0 KHZ	-9.738 dBm	/Hz		<u>Auto</u>	Man
MSG		STATU	\$			

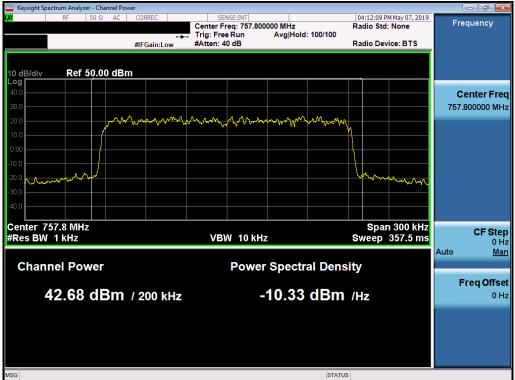
Plot 7-2. Max Conducted Power Plot (757.2 - 200 kHz - QPSK - ANT1 SISO)

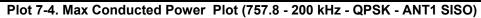


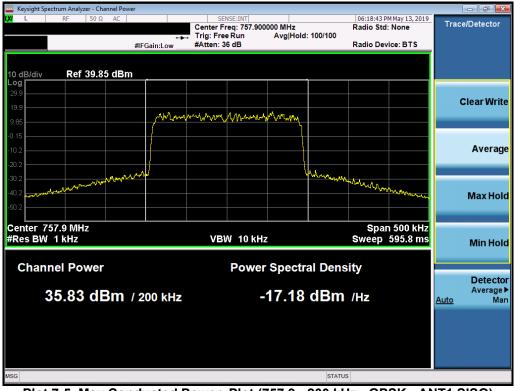
Plot 7-3. Max Conducted Power Plot (757.5 - 200 kHz - QPSK - ANT1 SISO)

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Plot 7-5. Max Conducted Power Plot (757.9 - 200 kHz - QPSK - ANT1 SISO)

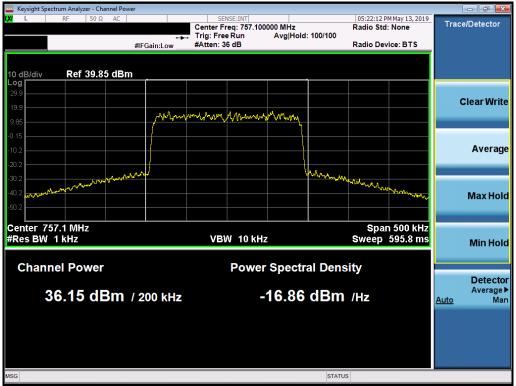
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Frequency [MHz]	Channel Bandwidth [kHz]	Mod.	ANT 1 Conducted Power [dBm]	ANT 2 Conducted Power [dBm]	Total Conducted Power [dBm]	Total Conducted Power [Watts]	Test Mode
757.10	200	QPSK		36.15	36.15	4.12	Ant 2 SISO [1 x 16]
757.20	200	QPSK		42.68	42.68	18.54	Ant 2 SISO [1 x 16]
757.50	200	QPSK		42.69	42.69	18.58	Ant 2 SISO [1 x 16]
757.80	200	QPSK		42.66	42.66	18.45	Ant 2 SISO [1 x 16]
757.90	200	QPSK		35.74	35.74	3.75	Ant 2 SISO [1 x 16]

Antenna 2 Conducted Power Measurements

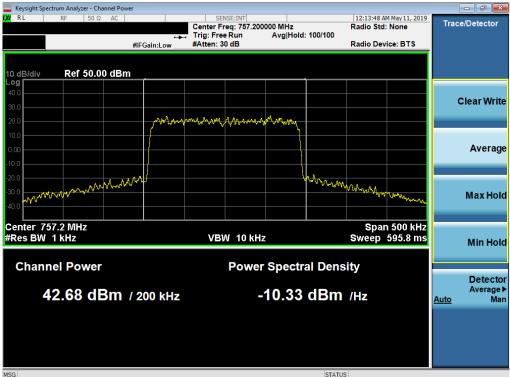
Table 7-3. Maximum Average Conducted Power ANT 2



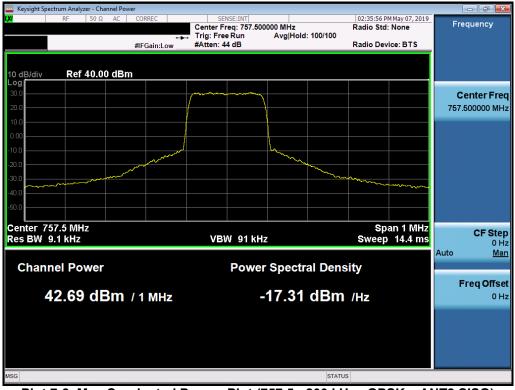
Plot 7-6. Max Conducted Power Plot (757.1 - 200 kHz - QPSK - ANT2 SISO)

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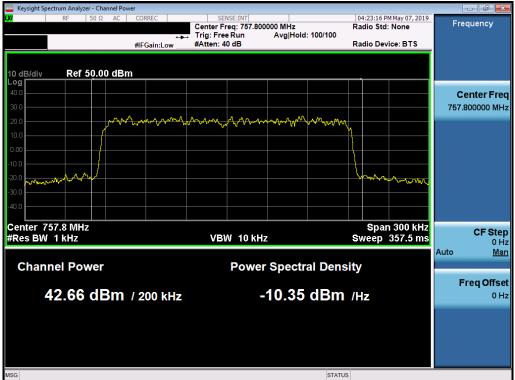
Plot 7-7. Max Conducted Power Plot (757.2 - 200 kHz - QPSK - ANT2 SISO)

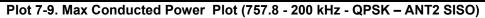


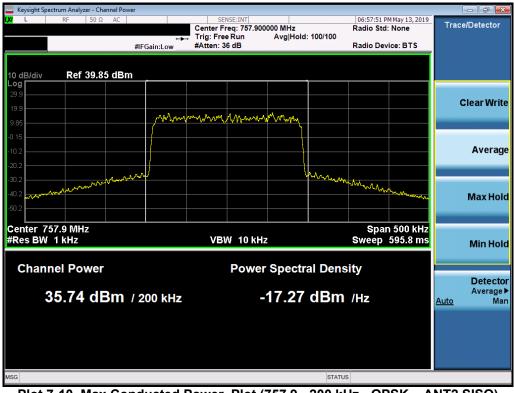
Plot 7-8. Max Conducted Power Plot (757.5 - 200 kHz - QPSK – ANT2 SISO)

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Plot 7-10. Max Conducted Power Plot (757.9 - 200 kHz - QPSK - ANT2 SISO)

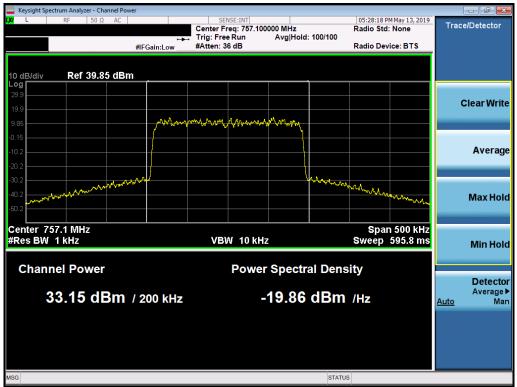
FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Frequency [MHz]	Channel Bandwidth [kHz]	Mod.	ANT 1 Conducted Power [dBm]	ANT 2 Conducted Power [dBm]	Total Conducted Power [dBm]	Total Conducted Power [Watts]	Test Mode
757.10	200	QPSK	33.40	33.16	36.29	4.26	MIMO [2 x 8]
757.20	200	QPSK	42.67	42.67	45.68	36.99	MIMO [2 x 8]
757.50	200	QPSK	42.66	42.70	45.69	37.07	MIMO [2 x 8]
757.80	200	QPSK	42.66	42.62	45.65	36.73	MIMO [2 x 8]
757.90	200	QPSK	33.07	33.04	36.07	4.04	MIMO [2 x 8]

MIMO Conducted Power Measurements

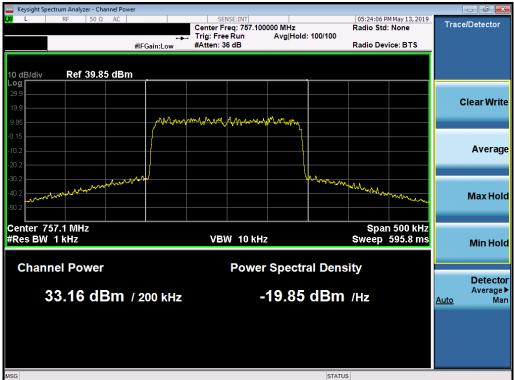
Table 7-4. Maximum Average Conducted Power MIMO

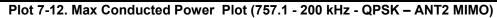


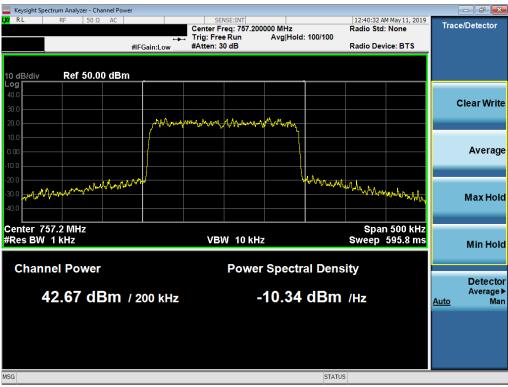
Plot 7-11. Max Conducted Power Plot (757.1 - 200 kHz - QPSK – ANT1 MIMO)

FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Tecore	Approved by: Quality Manager
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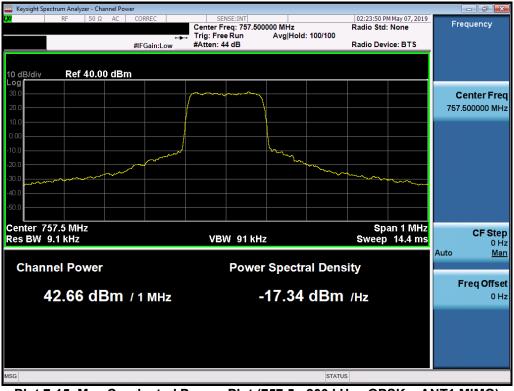
Plot 7-13. Max Conducted Power Plot (757.2 - 200 kHz - QPSK – ANT1 MIMO)

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www.com analyzer - Channel Power								
X RL RF 50 Ω AC		SENSE:INT r Freq: 757.200 Free Run	000 MHz Avg Hold	. 100/100	12:10:38 A Radio Std	M May 11, 2019 : None	Trac	e/Detector
#IF		n: 30 dB	Avginoid	. 100/100	Radio Dev	vice: BTS		
10 dB/div Ref 50.00 dBm								
40.0								
30.0							1	Clear Write
20.0	mound	MAAnny	Manna					
10.0								
0.00								Average
-10.0							_	_
-20.0 -30.0	/		<u> </u>	Mary				
-30.0 -30.0					V WY AND	www.m		Max Hold
-40.0								
Center 757.2 MHz					Spai	n 500 kHz		
#Res BW 1 kHz	V	BW 10 kHz			Sweep	595.8 ms		Min Hold
Channel Power		Power	Spectr	al Dens	ity			Detector
			10 24	d D m				Detector Average ►
42.67 dBm / 2	00 kHz	-	10.34	dBm	/Hz		<u>Auto</u>	Man
MSG				STATUS				

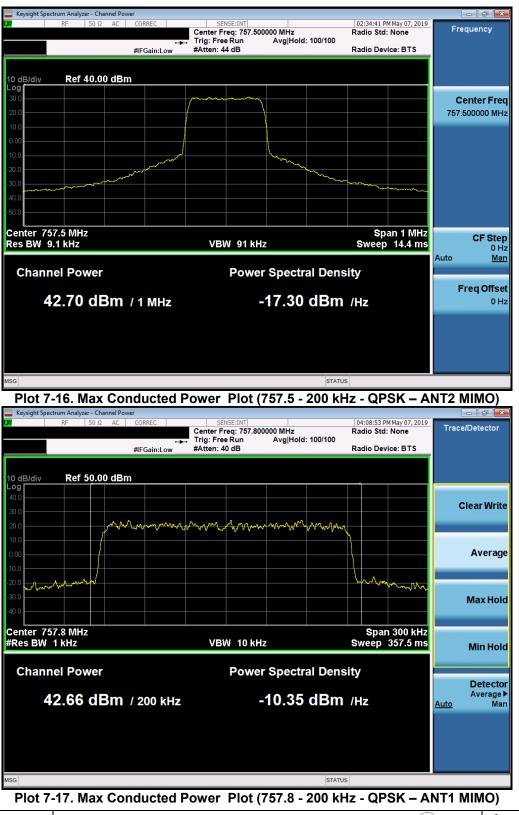
Plot 7-14. Max Conducted Power Plot (757.2 - 200 kHz - QPSK – ANT2 MIMO)



Plot 7-15. Max Conducted Power Plot (757.5 - 200 kHz - QPSK – ANT1 MIMO)

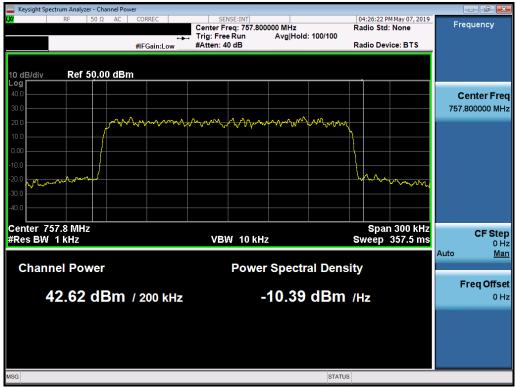
FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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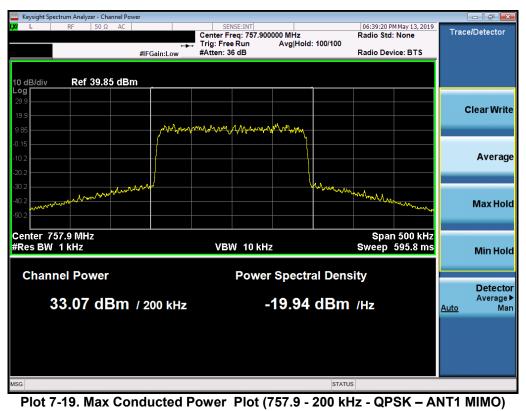


FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Tecore	Approved by: Quality Manager
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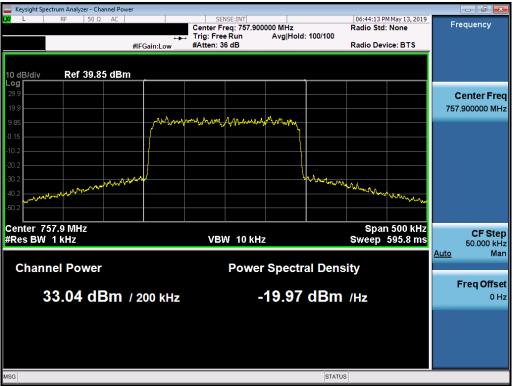
Plot 7-18. Max Conducted Power Plot (757.8 - 200 kHz - QPSK – ANT2 MIMO)



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Plot 7-20. Max Conducted Power Plot (757.9 - 200 kHz - QPSK – ANT2 MIMO)

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7.3 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 4.2

Test Settings

- 1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 1 5% of the expected OBW
- 3. VBW \geq 3 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = auto couple
- 7. The trace was allowed to stabilize
- 8. If necessary, steps 2 7 were repeated after changing the RBW such that it would be within

1-5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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Occupied Bandwidth Results



Plot 7-21. Occupied Bandwidth Plot (200kHz QPSK) - ANT1 SISO



Plot 7-22. Occupied Bandwidth Plot (200kHz QPSK) – ANT2 SISO

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7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is $43 + 10 \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
- 2. Detector = RMS
- 3. Trace mode = trace average
- 4. Sweep time = auto couple
- 5. The trace was allowed to stabilize
- 6. Please see test notes below for RBW and VBW settings

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

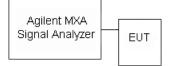


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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Antenna 1 SISO

	Analyzer - Swept SA					
KI L RF	50 Ω AC	CORREC PNO: Fast ↔ IFGain:Low	SENSE:INT Trig: Free Run #Atten: 26 dB	#Avg Type: RMS	10:27:09 PM May 13, 2019 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N	Frequency
0 dB/div Re	f 12.00 dBm	IF Galil.EUW		N	/kr1 755.95 MHz -41.880 dBm	Auto Tu
og 2.00						Center F 393.000000 I
8.0					DL1 -13.00 dBm	Start F 30.000000
8.0					1	Stop F 756.000000
8.0			ng pantan di kang di ka			CF S 72.600000 <u>Auto</u>
8.0						Freq Of
8.0						Scale T
tart 30.0 MH Res BW 100		#VBW	300 kHz	Sweep 9	Stop 756.0 MHz 00.02 ms (14521 pts)	Log
G				STAT	us	

Plot 7-23. Conducted Spurious Plot (200kHz QPSK – Low Channel)

Keysight Spect	rum Analyzer - Sw							
	RF 50 Ω	AC	CORREC	SENSE:II	#Avg T	ype: RMS	10:26:18 PM May 13, 2 TRACE 1 2 3 4 TYPE A WWW	5 6 Frequency
10 dB/div	Ref 12.00	dBm	PNO: Fast ++ IFGain:Low	#Atten: 26 dB	•	Μ	bet A NNN kr1 758.00 MI -41.907 dB	Auto Tun
2.00								Center Fre 879.000000 MH
18.0							DL1 -13.00	18m Start Fre 758.000000 Mi
28.0 38.0 <mark>1</mark>								Stop Fr 1.000000000 G
			ng tipun kan dan dan di bang yang sa kan Ing tipun kan dan di bang yang sa kan di bang yang s	na ayan kalina kalina na kalina di kalina Kalina di kalina di ka		⋗⋬ [⋺] ⋐⋳⋎⋴⋖⋶⋪⋺⋴⋬⋶⋼∊⋵⋵∊⋎⋎	efertives the strategies of an independence	CF St 24.20000 M Auto M
8.0								Freq Offs 0
78.0	0.047						Stop 1.0000 G	Scale Ty
Res BW 1			#VBW	300 kHz		Sweep	30.01 ms (4841 p	ts)

Plot 7-24. Conducted Spurious Plot (200kHz QPSK – Low Channel)

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	ctrum Analyzer -										
L <mark>XI</mark> L	RF 50	0Ω AC	CORREC		SE:INT	#Avg Typ	e: RMS	TRA	M May 13, 2019 CE 1 2 3 4 5 6	Fr	equency
			PNO: Fast ++ IFGain:Low	Trig: Free #Atten: 26				TY D			
10 dB/div Log	Ref 12.0	0 dBm					M	kr1 3.15 -31.1	4 0 GHz 57 dBm		Auto Tune
209										c	enter Freq
2.00										5.500	0000000 GHz
-8.00									DL1 -13.00 dBm		Start Free
-18.0										1.000	0000000 GHz
-28.0		1									Stop Free
-38.0		~~~~								10.000	0000000 GH
-48.0											CF Step
										900 <u>Auto</u>	.000000 MH: Mar
-58.0											- req Offse
-68.0											0 Hz
-78.0											Scale Type
Start 1.000) GHz							Stop 10	.000 GHz	Log	<u>Lir</u>
#Res BW			#VBW	3.0 MHz		s	weep 1	5.60 ms (1	8001 pts)		
MSG							STATU	s			

Plot 7-25. Conducted Spurious Plot (200kHz QPSK – Low Channel)



Plot 7-26. Conducted Spurious Plot (200kHz QPSK - Mid Channel)

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	ectrum Analyze										_	
XI RL	RF	50 Ω AC	PI	NO: Fast 🔸	Trig: Free		#Avg Typ	e: RMS	TRAC	4 May 10, 2019 E 1 2 3 4 5 6 PE A WWWW T A N N N N N	Freq	uency
10 dB/div	Ref Offse Ref 29.	t 29.85 d 85 dBm	dB	Gain:Low	#Atten: 3	BaB		N	/kr1 758.		A	uto Tune
19.9												nter Fred D0000 MH:
9.85												Start Free
-10.2										DL1 -13.00 dBm		Stop Free
-30.2	at na hi shingar (si se hin	di silystal di fossaril	an the second states of	an dayte fi terdinin dige	esg)yyv ^{ar} vdd ^a gesi _y dyda	hysionay types front o	and a state of the	Willensenjestedent	nglarna Alinakania	literer all all and a state of the	24.20 <u>Auto</u>	CFSte 00000 MH Ma
50.2											Fr	eq Offse 0 H
-60.2 Start 0.75 #Res BW				#\/B\M	300 kHz			Sween	Stop 1.0 11.66 ms (OUD OIL	Log	ale Type: <u>Li</u> i
ISG	TOO KHZ			#0000	500 KHZ			Sweep		400 F pts)		

Plot 7-27. Conducted Spurious Plot (200kHz QPSK - Mid Channel)



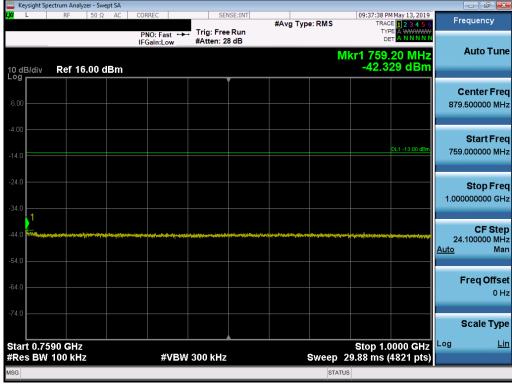
Plot 7-28. Conducted Spurious Plot (200kHz QPSK – Mid Channel)

FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Tecore	Approved by: Quality Manager
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🛄 Key	ysight Sp		alyzer - Sw											- 6 🗙
<mark>LXI</mark> I	L	RF	50 Ω	AC		:C :Fast ↔ in:Low			#Avg Typ	e: RMS	TRA	PM May 13, 2019 ACE 1 2 3 4 5 6 YPE A WWWWW DET A NNNNN	Fre	quency
10 dE Log	3/div	Ref	16.00 (dBm	IFGai	n:Low	#Atten.	20 00		N	/kr1 753	.80 MHz .26 dBm	-	Auto Tun
6.00														enter Fre 500000 MH
-4.00 -14.0												DL1 -13.00 dBm		Start Fre
-24.0 -34.0														Stop Fre
-44.0		all's any social state									line a le same de same de la compañsión Construir y superior de provincion	1	72.' <u>Auto</u>	CF Ste 700000 Mi Ma
-54.0 -64.0													F	req Offs 0 I
-74.0														cale Typ
		MHz 100 k	Hz			#VBV	V 300 KH	z	S	weep 9	Stop 0.15 ms (757.0 MHz 14541 pts)	LUG	Li
MSG										STAT	us			

Plot 7-29. Conducted Spurious Plot (200kHz QPSK – High Channel)





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Keysight Sp	ectrum Analyz												7 X
LXI L	RF	50 Ω	AC	CORREC			NSE:INT	#Avg Typ	e: RMS	TRA	PM May 13, 2019 ACE 1 2 3 4 5 6 A WWWWW	Frequen	су
10 dB/div Log	Ref 12	.00 dE	3m	PNO: F IFGain:	ast ↔ Low	#Atten: 2			М	ہ kr1 3.28	9 0 GHz 35 dBm	Auto	Tun
2.00												Center 5.50000000	
-8.00											DL1 -13.00 dBm	Star 1.00000000	
-28.0								And Antonio Systematical				Stop 10.00000000	
-48.0												CF 900.00000 <u>Auto</u>	F Ste 00 M⊦ Ma
-68.0												Freq	Offs 0⊦
-78.0	00 GHz									Stop 1	0.000 GHz	Scale	тур Ц
#Res BW					#VBW	3.0 MHz		S	weep 1	5.60 ms (18001 pts)		

Plot 7-31. Conducted Spurious Plot (200kHz QPSK – High Channel)

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Antenna 2 SISO

Keysight Spectrum						- đ
L RF	50 Ω AC	PNO: Fast ↔	Trig: Free Run #Atten: 26 dB	#Avg Type: RMS	10:37:20 PM May 13, 2019 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N	Frequency
0 dB/div Rel	f 12.00 dBm		writen. 20 dB	Μ	kr1 205.75 MHz -44.501 dBm	Auto Tu
og 2.00						Center F 393.000000 M
8.0					DL1 -13.00 dBm	Start F 30.000000
8.0						Stop F 756.000000 I
3.0 				nden vers som generaletetetetetetetetetetetetetetetetetetet		CF S 72.600000 <u>Auto</u>
8.0						Freq Of
3.0						Scale T
tart 30.0 MH; Res BW 100		#VBV	/ 300 kHz	Sweep 9	Stop 756.0 MHz 0.02 ms (14521 pts)	Log
iG				STATU	s	

Plot 7-32. Conducted Spurious Plot (200kHz QPSK – Low Channel)

OBJECTIVE Ref 12.00 dBm Center Fre 00 0	Keysight Sp	ectrum Analyzer - Sv									- 6 -
PROFISION #Atten: 26 dB Derr MNNNN Mkr1 929.85 MHz -44.937 dBm Auto Tur 0 Center Fre 879.00000 MH 00 Cul -1300 dBm 01 Cul -1300 dBm 02 Cul -1300 dBm 03 Cul -1300 dBm 04 Cul -1300 dBm 05 Cul -1300 dBm 060 Cul -1300 dBm 07 Cul -1300 dBm 080 Cul -1300 dBm 09 Cul -1300 dBm 100 Cul -1300 dBm<	<mark>XI</mark> L	RF 50 S	2 AC	CORREC			#Avg Typ	e: RMS	TRA	E 1 2 3 4 5 6	Frequency
Bildiv Ref 12.00 dBm Center Fre Ref Ref <td< th=""><th></th><th></th><th></th><th>PNO: Fast ↔ IFGain:Low</th><th></th><th></th><th></th><th></th><th>D</th><th></th><th>Auto Tun</th></td<>				PNO: Fast ↔ IFGain:Low					D		Auto Tun
100 1	10 dB/div Log	Ref 12.00	dBm						-44.9	37 dBm	
00 013.000000 Hill 00 013.000000 Hill 00 013.00000 Hill 00 013.0000000 Gill 00 013.00000000 Gill 013.00000000 Gill 013.00000000 Gill 013.00000000 Gill 014.000000000 Gill 013.00000000 Gill 014.000000000 Gill 013.00000000 Gill 014.000000000 Gill 013.000000000 Gill 014.000000000 Gill 013.000000000 Gill 014.000000000 Gill 013.0000000000 Gill 014.0000000000 Gill 013.00000000000000000000000000000000000	2.00										Center Fre
Image: Contract of the start of the sta	2.00										879.000000 MH
8.0 Image: Stop Free	-8.00									DL1 -13.00 dBm	Start Fre
80 1 </td <td>-18.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>758.000000 MH</td>	-18.0										758.000000 MH
Image: set in the set in th	-28.0										Ston Fre
8.0 Image: CF Step 24.20000 Mi Auto 8.0 Image: CF Step 24.20000 Mi Auto 8.0 Image: CF Step 24.2000 Mi Auto 8.0 Image: CF Step 24.200 Mi Auto 8.0	-38.0										1.000000000 GH
24.200000 MH Auto Auto B0		والمراجع والمراجع والمراجع والمراجع والمراجع		معر وعمر وأبير وبالرواية ويتر وا	ile so childrene childrene sone	andhaif ann an d Robbinstown	sam is the first draw whether broks	♦ ¹	and the second second	the state of the second st	CE Ster
8.0 8.0 8.0 8.0 8.0 8.0 Scale Typ	-48.0	in the second		idi am Ti dan bu dan si si kata sa sa	na n						24.200000 MH
80 80 Scale Typ	-58.0										
80 Scale Typ	-68.0										Freq Offse
Scale Typ	-78.0										
											Scale Typ
tart 0.7580 GHz Stop 1.0000 GHz Log Log Stop 1.0000 GHz Res BW 100 kHz Sweep 30.01 ms (4841 pts)	Start 0.7	580 GHz		#\/B)/	V 300 kHz			Sween 3	Stop 1.	0000 GHz	Log <u>Li</u>
	#RES DW	TOO KHZ		#VDV	V-500 KHZ					484 r pts)	

Plot 7-33. Conducted Spurious Plot (200kHz QPSK – Low Channel)

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Keysight S	pectrum Analy												
I,XI L	RF	50 Ω	AC	CORREC	. .	ser	NSE:INT	#Avg Typ	e: RMS	TR	PM May 13, 2019 ACE 1 2 3 4 5 6 YPE A WWWWW	F	requency
				PNO: Fas IFGain:Lo		Atten: 2					DET A NNNNN		A
10 dB/div Log	Ref 12	2.00 d	Bm							4kr1 3.14 -31.	46 5 GHz 770 dBm		Auto Tun
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-38.0				No. of Concession, Name			and a state of the					10.00	0000000 GH
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-58.0												<u>Auto</u>	Ma
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MSG										TUS	/ الذي يوجد بين ا		

Plot 7-34. Conducted Spurious Plot (200kHz QPSK - Low Channel)



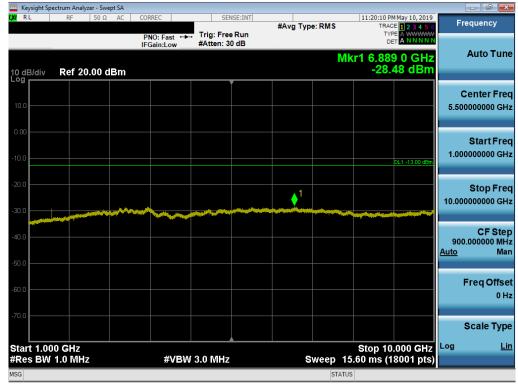
Plot 7-35. Conducted Spurious Plot (200kHz QPSK - Mid Channel)

FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Tecore	Approved by: Quality Manager
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	ectrum Analy		ot SA										- 6 ×
X/RL	RF	50 Ω	AC	CORREC			NSE:INT	#Avg Ty	pe: RMS	TRA	MMay 10, 2019 CE 1 2 3 4 5 6 PE A WWWW	Fr	equency
				PNO: I IFGain:	ast ↔ Low	#Atten: 3				D	ET A N N N N N		Auto Tune
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1SG									STA				

Plot 7-36. Conducted Spurious Plot (200kHz QPSK - Mid Channel)



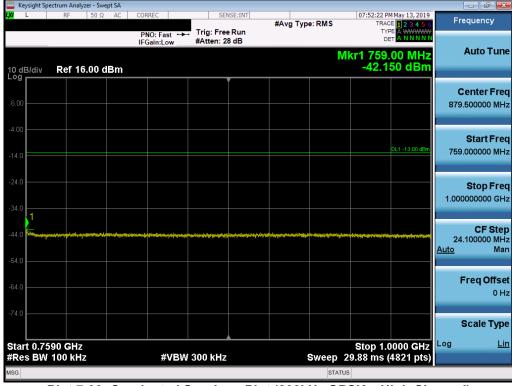
Plot 7-37. Conducted Spurious Plot (200kHz QPSK - Mid Channel)

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🔤 Keysight Spectrum Analyzer - Swept SA					- 5 🔀
LX L RF 50 Ω AC		ENSE:INT #Avg Typ	e: RMS TRACE		requency
	PNO: Fast +++ Trig: Fr IFGain:Low #Atten:		TYP		
10 dB/div Ref 16.00 dBn	n		Mkr1 756. -41.37	35 MHz 75 dBm	Auto Tune
6.00					Center Freq 93.500000 MHz
-4.00				DL1 -13.00 dBm 3	Start Freq 30.000000 MHz
-24.0				75	Stop Freq
-34.0 -44.0					CF Step 2.700000 MHz
-54.0				Auto	Man Freq Offset
-74.0					0 Hz Scale Type
Start 30.0 MHz #Res BW 100 kHz	#VBW 300 kH	z s	\$top 7 weep 90.15 ms (14	57.0 MHz 4541 pts)	Lin
MSG			STATUS		

Plot 7-38. Conducted Spurious Plot (200kHz QPSK – High Channel)





FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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uu Key	sight Spec	trum Analyz												ðX
L <mark>XI</mark> L		RF	50 Ω	AC	CORREC			NSE:INT	#Avg Typ	e: RMS	TRA	M May 13, 2019 CE 1 2 3 4 5 6	Freque	ncy
					PNO: I IFGain:	ast ↔ Low	#Atten: 3				D	PE A WWWWW ET A N N N N N		
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-09								Ĭ					Cente	er Fred
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	t 1.000										Stop 10	.000 GHz	Log	Lii
	5 BW 1	.0 MHz	-			#VBW	3.0 MHz	2	s			18001 pts)		
ISG										STATU	15			

Plot 7-40. Conducted Spurious Plot (200kHz QPSK – High Channel)

FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Tecore	Approved by: Quality Manager	
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7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is $43 + 10 \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
- 2. Span was set large enough so as to capture all out of band emissions near the band edge
- 3. RBW \geq 1% of the emission bandwidth
- 4. VBW <u>></u> 3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = trace average
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

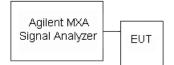


Figure 7-3. Test Instrument & Measurement Setup

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Test Notes

Per 27.917(b)(1) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Per 27.53 (c)(5) in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed.

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Channel Frequency [MHz]	Channel Bandwidth [kHz]	Mod.	Band Edge	Ant 1 Cond. Band Edge [dBm]	Ant 2 Cond. Band Edge [dBm]	MIMO Cond. Band Edge [dBm]	MIMO Cond. Band Edge Limit [dBm]	Cond. Band Edge Margin [dB]
757.10	200	QPSK	Low	-13.12		-13.12	-13	-0.12
757.10	200	QPSK	Low		-13.03	-13.03	-13	-0.03
757.10	200	QPSK	Low	-16.15	-16.16	-13.14	-13	-0.14
757.90	200	QPSK	High	-13.25		-13.25	-13	-0.25
757.90	200	QPSK	High		-13.12	-13.12	-13	-0.12
757.90	200	QPSK	High	-16.15	-16.07	-13.10	-13	-0.10

Plot 7-41. Conducted Band Edge Measurements

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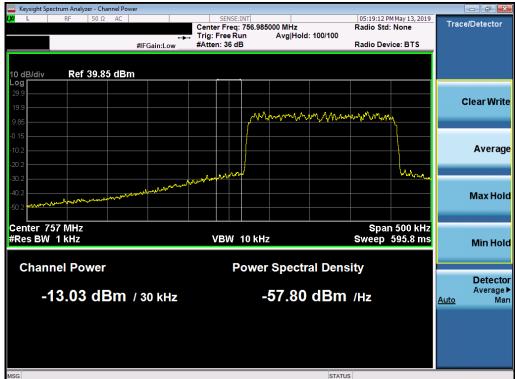
Band Edge Test Results



Plot 7-43: Upper Band Edge Plot (757.9 - 200 kHz - QPSK - ANT1 SISO) - Integration Method

FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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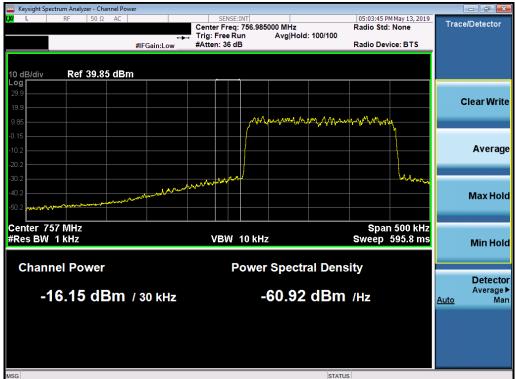
Plot 7-44: Lower Band Edge Plot (757.1 - 200 kHz - QPSK - ANT2 SISO) - Integration Method



Plot 7-45: Upper Band Edge Plot (757.9 - 200 kHz - QPSK - ANT2 SISO) - Integration Method

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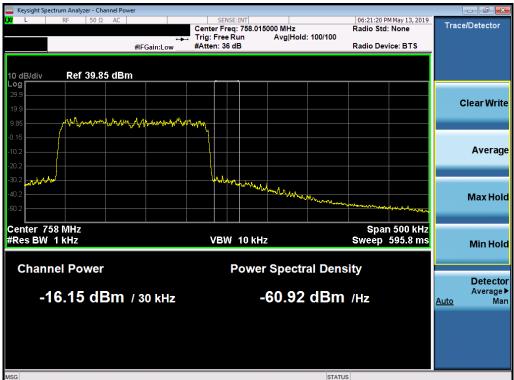
Plot 7-46: Lower Band Edge Plot (757.1 - 200 kHz - QPSK - ANT1 MIMO) - Integration Method



Plot 7-47: Lower Band Edge Plot (757.1 - 200 kHz - QPSK - ANT2 MIMO) - Integration Method

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Plot 7-48: Upper Band Edge Plot (757.9 - 200 kHz - QPSK - ANT1 MIMO) - Integration Method



Plot 7-49: Upper Band Edge Plot (757.9 - 200 kHz - QPSK - ANT2 MIMO) - Integration Method

FCC ID: QLJ4GNBIOT-086		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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7.6 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.8

ANSI/TIA-603-E-2016 - Section 2.2.12

Test Settings

- 1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
- 2. VBW \geq 3 x RBW
- 3. Span = 1.5 times the OBW
- 4. No. of sweep points > 2 x span / RBW
- 5. Detector = RMS
- 6. Trace mode = Average (Max Hold for pulsed emissions)
- 7. The trace was allowed to stabilize

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EUT turntable 8. styrofoam block

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-4. Test Instrument & Measurement Setup

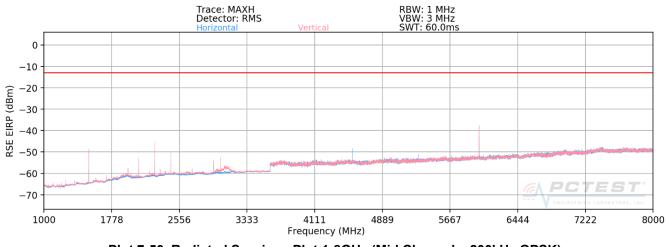
Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested while powered by an DC power source.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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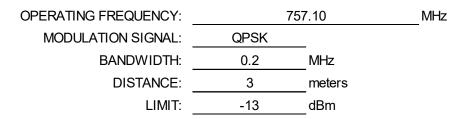
Radiated Spurious Test Results



Plot 7-50. Radiated Spurious Plot 1-8GHz (Mid Channel – 200kHz QPSK)

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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1514.20	V	183	270	-54.53	3.62	-50.91	-37.9
2271.30	V	192	262	-55.92	3.84	-52.08	-39.1
3028.40	V	129	153	-57.04	5.22	-51.82	-38.8
3785.50	V	-	-	-61.94	6.80	-55.14	-42.1
4542.60	V	215	137	-62.43	8.18	-54.25	-41.3
5299.70	V	100	144	-57.74	8.75	-48.99	-36.0
6056.80	V	341	316	-61.92	8.88	-53.04	-40.0

Table 7-5. Radiated Spurious Data (Low Channel)

OPERATING FREQUENCY:

MODULATION SIGNAL:

BANDWIDTH:

757.50 QPSK 0.2 MHz DISTANCE: 3 meters -13 LIMIT: dBm

MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1515.00	V	154	222	-49.97	0.00	-49.97	-10.0
2272.50	V	218	244	-46.29	3.84	-42.45	-29.4
3030.00	V	294	303	-46.92	5.22	-41.70	-28.7
3787.50	V	100	149	-61.17	6.81	-54.36	-41.4
4545.00	V	120	165	-48.36	8.18	-40.18	-27.2
5302.50	V	-	-	-65.75	8.74	-57.01	-44.0
6060.00	V	333	31	-43.76	8.88	-34.88	-21.9

Table 7-6. Radiated Spurious Data (Mid Channel)

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OPERATING FREQUENCY:	75	7.90 M	Hz
MODULATION SIGNAL:	QPSK	_	
BANDWIDTH:	0.2	MHz	
DISTANCE:	3	meters	
LIMIT:	-13	_dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1515.80	V	189	263	-51.58	0.00	-51.58	-11.6
2273.70	V	266	278	-56.53	3.85	-52.68	-39.7
3031.60	V	132	151	-56.30	5.22	-51.07	-38.1
3789.50	V	-	-	-61.85	6.82	-55.03	-42.0
4547.40	V	-	-	-62.38	8.18	-54.20	-41.2
5305.30	V	100	142	-56.59	8.74	-47.85	-34.9
6063.20	V	209	165	-61.69	8.88	-52.81	-39.8

Table 7-7. Radiated Spurious Data (High Channel)

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7.7 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

- 1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
- 2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
- 3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

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Band 7 Frequency Stability Measurements §2.1055 §27.54

OPERATING FREQUENCY:	757,500,000	Hz
CHANNEL:	23230	_
REFERENCE VOLTAGE:	48.00	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	-48.00	+ 20 (Ref)	757,500,251	251	0.0000331
100 %		- 30	757,499,937	-63	-0.0000083
100 %		- 20	757,500,062	62	0.0000082
100 %		- 10	757,500,662	662	0.0000874
100 %		0	757,500,035	35	0.0000046
100 %		+ 10	757,500,255	255	0.0000337
100 %		+ 20	757,500,330	330	0.0000436
100 %		+ 30	757,500,285	285	0.0000376
100 %		+ 40	757,500,385	385	0.0000508
100 %		+ 50	757,500,412	412	0.0000544
85 %	-40.80	+ 20	757,500,068	68	0.0000090
115 %	-55.20	+ 20	757,500,244	244	0.0000322

Table 7-8. Frequency Stability Data

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Band 7 Frequency Stability Measurements §2.1055 §27.54

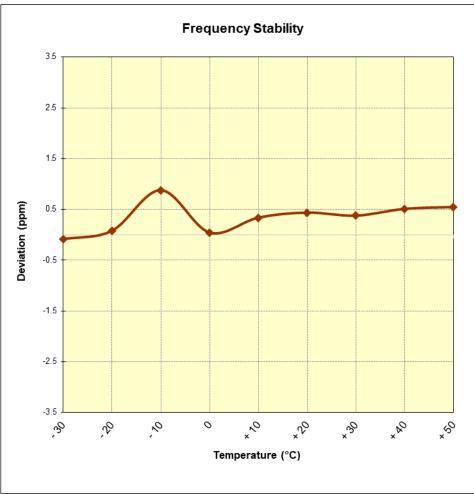


Figure 7-5. Frequency Stability Graph

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Tecore Networks Remote Radio Head FCC ID: QLJ4GNBIOT-086** complies with all the requirements of Part 27 of the FCC Rules for LTE operation only.

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