

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Partial Verification Report

OF

Applicant: Murata Electronics North America
2200 Lake Park Dr #7604, Smyrna, GA 30080 USA

Product Name: Type 1SC

Brand Name: Murata

Model No.: LBAD0XX1SC-DM

Model Difference: N/A

Report Number: E2/2019/B0010

FCC ID: HSW-TY1SCDM

IC: 4492A-TY1SCDM

FCC Rule Part: 2, 22H & 24E & 27C & 90R & 90S

ISED Rule: RSS-130, 132, 133, 139

Issue Date: Feb. 10, 2020

Date of Test: Oct. 24, 2019 ~ Jan. 22, 2019, Feb. 05, 2020

Date of EUT Received: Oct. 24, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.26-2015 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Tested By:

Ashton Chiu

Ashton Chiu / Engineer

Approved By:

Jazz Huang

Jazz Huang / Asst. Supervisor



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Revision History

Report Number	Revision	Description	Issue Date	Remark
E2/2019/B0010	Rev.00	Original.	Feb. 10, 2020	Revised By: Karen Huang

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Contents

1	GENERAL PRODUCT INFORMATION	4
2	SYSTEM TEST CONFIGURATION	7
3	SUMMARY OF TEST RESULTS	9
4	DESCRIPTION OF TEST MODES	10
5	MEASUREMENT UNCERTAINTY	15
6	MAXMUM OUTPUT POWER.....	16
7	OCCUPIED BANDWIDTH MEASUREMENT.....	23
8	OUT OF BAND EMISSION AT ANTENNA TERMINALS	30
9	FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT	48
10	PEAK TO AVERAGE RATIO.....	101

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1 GENERAL PRODUCT INFORMATION

1.1 Product Description

Product Name:	Type 1SC
Brand Name:	Murata
Model No.:	LBAD0XX1SC-DM
Model Difference:	N/A
Hardware Version:	ES2
Software Version:	RK_02_01_02_00_57
Power Supply:	3.6Vdc from DC power supply
IMEI:	351521100062890

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1.2 Frequency Range

1.2.1 Cat. M1

M1 Band	BW (MHz)	Operation Frequency (MHz)
2	1.4	1850.7 - 1909.3
	3	1851.5 - 1908.5
	5	1852.5 - 1907.5
	10	1855 - 1905
	15	1857.5 - 1902.5
	20	1860 - 1900
4	1.4	1710.7 - 1754.3
	3	1711.5 - 1753.5
	5	1712.5 - 1752.5
	10	1715 - 1750
	15	1717.5 - 1747.5
	20	1720 - 1745
5	1.4	824.7 - 848.3
	3	825.5 - 847.5
	5	826.5 - 846.5
	10	829 - 844
12	1.4	699.7 - 715.3
	3	700.5 - 714.5
	5	701.5 - 713.5
	10	704 - 711
13	5	779.5 - 784.5
	10	782
14	5	790.5
	10	793

M1 Band	BW (MHz)	Operation Frequency (MHz)
25	1.4	1850.7 - 1914.3
	3	1851.5 - 1913.5
	5	1852.5 - 1912.5
	10	1855 - 1910
	15	1857.5 - 1907.5
	20	1860 - 1905
26	1.4	824.7 - 848.3
	3	825.5 - 847.5
	5	826.5 - 846.5
	10	829 - 844
	15	831.5 - 841.5
26 Part90	1.4	814.7 - 823.3
	3	815.5 - 822.5
	5	816.5 - 821.5
	10	819
17	5	706.5 - 713.5
	10	709.0 - 711.0

Note:

LTE Band 14 (788~798 MHz) and is disabled by software for Canada.

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1.3 Test Methodology of Applied Standards

FCC 47 CFR Part 2, 22H, 24E, 27C, Part 90.

ISED RSS-130 Issue 2 Feb. 2019,

ISED RSS-132 Issue 3 Jan. 2013

ISED RSS-133 Issue 6, Amendment 1 Jan. 18, 2018, ISED RSS-139 Issue 3 July 16, 2015

ANSI C63.26-2015

KDB971168 D01 Power Meas license Digital System v03r01

TS 151 010-1 is used to set, and measure the output power.

1.4 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory (TAF code 0513)
No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333

FCC Designation number: TW0002

ISED CAB identifier: TW0513

1.5 Special Accessories

No special accessories were used during testing.

1.6 Equipment Modifications

There was no modifications incorporated into the EUT.

1.7 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

1.8 Test data referenced cross different equipment authorizations

This is a partial verification report is aim to demonstrate compliance of referencing test data from

original FCC ID: HSW-TY1SC, grant date: 07/01/2019.

original ISED certificate number: 4492A-TY1SC, Approval Date on REL: 2019-08-29

Test report number:	1036521106LEX-007
Issue date:	5/13/2019
Test Lab:	Intertek Testing Services NA, Inc.

Please refer to attached [FCC referencing test data.doc](#) and [ISED referencing test data.doc](#) for details.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT (Transmitter) was operated in the continuous transmission mode employed with the simulator of the Base Station that fixates at test default channels to fix the Tx frequency which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Measurement at Antenna Port

The EUT is placed on a table which is 0.8 m above ground plane. A low loss of RF cable was used to connect the antenna port of EUT to measurement equipment.

2.3.2 Radiated Emissions (ERP/EIRP)

The EUT is placed on a turn table, for emission measurements below 1 GHz is 0.8 m above ground plane, for emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both Horizontal and Vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna according to the requirements in Section 8 and 13.

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Following shows an offset computation in physical test.

	RF cable loss (dB)	Attenuation factor(dB)	offset(dB)
Low Band (Below 1GHz)	3.6	10	13.6
High Band (Above 1 GHz)	3.8	10	13.8

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2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System (Fixed Channel-Conducted)

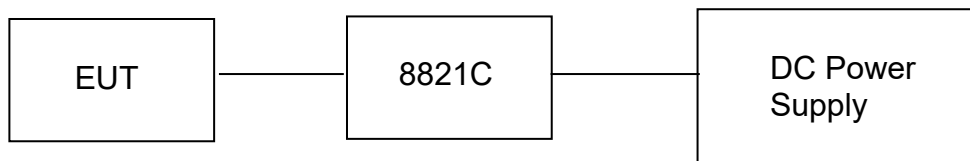
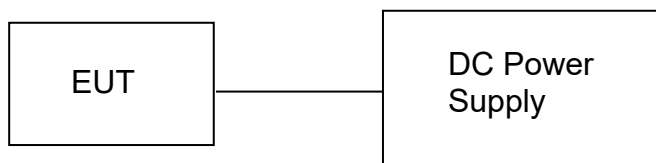


Fig. 2-2 Configuration of Tested System (Fixed Channel-Radiated)



Remote Side

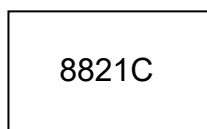


Table 2-1 Equipment Used in

Item	Equipment	Mfr/Brand	Model / Type No.	Series No.	Data Cable	Power Cord
1.	Universal Radio Communication Tester	Anritsu	MT8821C	6261786084	shielded	Un-shielded

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3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§2.1046(a)	RSS-GEN §6.12	RF Power Output	Compliant
§22.913(a)(5) §24.232(c) §27.50(b)(c)(10) §27.50(d)(4) §90.635 §90.542(a)(7)	RSS-130 §4.6 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §6.5	ERP/ EIRP measurement	Compliant
§2.1049(h)	RSS-GEN §6.7	99% & 26dB Occupied Bandwidth	Compliant
§2.1051 §22.917(a)(b) §24.238(a) §27.53(g) §27.50(c) §27.53(h) §90.691 §90.543(e)(2)(3) §90.210(n)	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §6.6	Out of Band Emissions at Antenna Terminals and Band Edge / Emission mask requirements	Compliant
§2.1053 §22.917(a) §24.238(a) §27.53(g) §27.53(h) §27.53(c)(f) 1559-1610 MHz §90.543(e)(3) §90.543 (f) §90.691	RSS-GEN §6.13 RSS-130 §4.7 RSS-132 §5.5 RSS-133 §6.5 RSS-139 §6.6	Field Strength of Spurious Radiation	Compliant
§24.232(d) §27.50((B)	RSS-130 §4.6.1 RSS-132 §5.4 RSS-133 §6.4 RSS-139 §6.4	Peak to Average Ratio	Compliant
§2.1055(a)(1) §22.355 §24.235 §27.54 §90.539 (e)	RSS-130 §4.5 RSS-132 §5.3 RSS-133 §6.3 RSS-139 §6.5	Frequency Stability	Compliant

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4 DESCRIPTION OF TEST MODES

4.1 The Worst Test Modes and Configuration

1. The EUT has been tested under operating condition.
2. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X(E1)Y(E2)Z(H) axis and antenna ports. The worst case was found as listed below. Following channel(s) was (were) selected for the final test as listed below:

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4.2 Cat M1

M1 Band 2

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
EIRP	18607 to 19193	18607	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
OCCUPIED BAND-WIDTH	18607 to 19193	18607	1.4MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	18607 to 19193	18607	1.4MHz	QPSK, 16QAM	Full RB
BAND EDGE	18607 to 19193	18607	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
CONDCUDED EMIS-SION	18607 to 19193	18607	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
RADIATED EMISSION	18607 to 19193	18607	1.4MHz	QPSK, 16QAM	6 RB, 0 RB Offest

M1 Band 4

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
EIRP	19957 to 19393	19957	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
OCCUPIED BAND-WIDTH	19957 to 19393	19957	1.4MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	19957 to 19393	19957	1.4MHz	QPSK, 16QAM	Full RB
BAND EDGE	19957 to 19393	19957	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
CONDCUDED EMIS-SION	19957 to 19393	19957	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
RADIATED EMISSION	19957 to 19393	19957	1.4MHz	QPSK, 16QAM	6 RB, 0 RB Offest

M1 Band 5

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	20407 to 20643	20407	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
OCCUPIED BAND-WIDTH	20407 to 20643	20407	1.4MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	20407 to 20643	20407	1.4MHz	QPSK, 16QAM	Full RB
BAND EDGE	20407 to 20643	20407	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
CONDCUDED EMIS-SION	20407 to 20643	20407	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
RADIATED EMISSION	20407 to 20643	20407	1.4MHz	QPSK, 16QAM	6 RB, 0 RB Offest

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M1 Band 12

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	23017 to 23173	23017	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
OCCUPIED BANDWIDTH	23017 to 23173	23017	1.4MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	23017 to 23173	23017	1.4MHz	QPSK, 16QAM	Full RB
BAND EDGE	23017 to 23173	23017	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
CONDCUDED EMISSION	23017 to 23173	23017	1.4MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
RADIATED EMISSION	23017 to 23173	23017	1.4MHz	QPSK, 16QAM	6 RB, 0 RB Offset

M1 Band 13

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	23205 to 23255	23205	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
OCCUPIED BANDWIDTH	23205 to 23255	23205	5MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	23205 to 23255	23205	5MHz	QPSK, 16QAM	Full RB
BAND EDGE	23205 to 23255	23205	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
CONDCUDED EMISSION	23205 to 23255	23205	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
RADIATED EMISSION	23205 to 23255	23205	5MHz	QPSK, 16QAM	6RB/ 0 RB Offset

M1 Band 14

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	23305 to 23355	23305	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
OCCUPIED BANDWIDTH	23305 to 23355	23305	5MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	23305 to 23355	23305	5MHz	QPSK, 16QAM	Full RB
BAND EDGE	23305 to 23355	23305	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
CONDCUDED EMISSION	23305 to 23355	23305	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offset
RADIATED EMISSION	23305 to 23355	23305	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offset

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LTE Band 17

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	23755 to 23825	23755	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
OCCUPIED BAND-WIDTH	23755 to 23825	23755	5MHz	QPSK, 16QAM	Full RB
PEAK TO AVERAGE RATIO	23755 to 23825	23755	5MHz	QPSK, 16QAM	Full RB
BAND EDGE	23755 to 23825	23755	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
CONDCUETED EMISSION	23755 to 23825	23755	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offest
RADIATED EMIS-SION	23755 to 23825	23755	5MHz	QPSK, 16QAM	6 RB/ 0 RB Offest

LTE Band 25

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
EIRP	26047 to 26683	26047	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
OCCUPIED BAND-WIDTH	26047 to 26683	26047	1.4MHz	QPSK, 16QAM,	Full RB
PEAK TO AVERAGE RATIO	26047 to 26683	26047	1.4MHz	QPSK, 16QAM,	Full RB
BAND EDGE	26047 to 26683	26047	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
CONDCUETED EMISSION	26047 to 26683	26047	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
RADIATED EMISSION	26047 to 26683	26047	1.4MHz	QPSK, 16QAM	6 RB, 0 RB Offest

M1 Band 26

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	26797 to 27033	26797	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
OCCUPIED BAND-WIDTH	26797 to 27033	26797	1.4MHz	QPSK, 16QAM,	Full RB
PEAK TO AVERAGE RATIO	26797 to 27033	26797	1.4MHz	QPSK, 16QAM,	Full RB
BAND EDGE	26797 to 27033	26797	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
CONDCUETED EMIS-SION	26797 to 27033	26797	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
RADIATED EMISSION	26797 to 27033	26797	1.4MHz	QPSK, 16QAM	6 RB, 0 RB Offest

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M1 Band 26 for 90S

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
ERP	26697 to 26783	26693	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
OCCUPIED BAND-WIDTH	26697 to 26783	26693	1.4MHz	QPSK, 16QAM,	Full RB
PEAK TO AVERAGE RATIO	26697 to 26783	26693	1.4MHz	QPSK, 16QAM,	Full RB
CONDCUDEDTED EMIS-SION	26697 to 26783	26693	1.4MHz	QPSK, 16QAM,	6 RB/ 0 RB Offest
RADIATED EMISSION	26697 to 26783	26693	1.4MHz	QPSK,, 16QAM	6 RB, 0 RB Offest

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
RF Power Output	+/- 1.10 dB
ERP/ EIRP measurement	Vertical Polarization = +/- 4.74dB Horizontal Polarization = +/- 4.62dB
99% Occupied Bandwidth	+/- 5.19 Hz
Out of Band Emissions at Antenna Terminals and Band Edge	+/- 0.70 dB
Peak to Average Ratio	+/- 0.70 dB
Frequency Stability vs. Temperature	+/- 5.19 Hz
Frequency Stability vs. Voltage	+/- 5.19 Hz
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz – 30MHz: +/- 2.87 dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 MAXMUM OUTPUT POWER

6.1 Standard Applicable

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals.

6.2 FCC ERP/EIRP LIMIT

According to FCC §2.1046

FCC 22.913(a)

(5) mobile transmitters and auxiliary test transmitters must not exceed 7 watts.

FCC 24.232(c)

Mobile and portable stations are limited to 2 W EIRP.

FCC 27.50 (b)

(10) Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.

FCC 27.50(c)

(10) Portable stations (hand-held devices) are limited to 3 watts ERP.

FCC 27.50(d)

(4) Mobile, and portable (hand-held) stations operating in the 1710-1755 MHz, 1695-1710 MHz and 1755-1780 MHz bands are limited to 1W EIRP.

FCC 90.542(a)

(7) Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

FCC 90.635(b)

Mobile station is limited to 100W ERP

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RSS-130 §4.6

The e.r.p. shall not exceed 3 watts for mobile equipment, fixed subscriber equipment and portable equipment operating in the Band 617-652 and 663-698MHz.

RSS-132 §5.4

The equivalent isotropically radiated power (e.i.r.p.) for mobile equipment in operating in the Bands 824-849 and 869-894MHz shall not exceed 11.5 watts.

RSS-139 §6.5

The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters in the Bands 1710-1780MHz shall not exceed one watt.

RSS-130 §4.6

The e.r.p. shall not exceed 3 watts for mobile equipment, fixed subscriber equipment and portable equipment.

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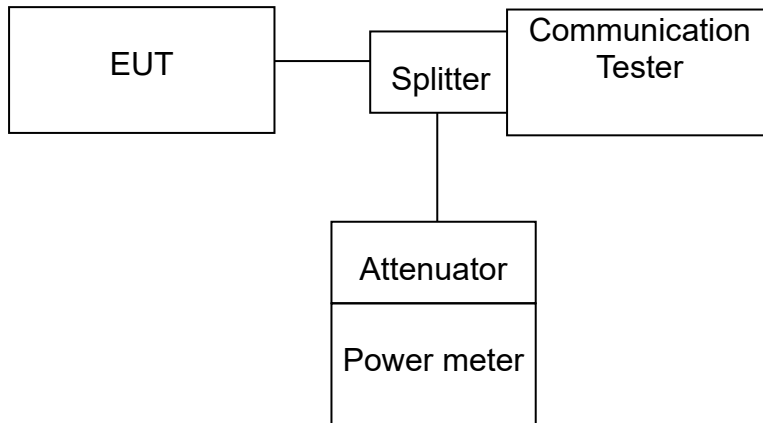
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6.3 Test Set-up



Note: Measurement setup for testing on Antenna connector

6.4 Output Power Measurement Applicable Guidance

The transmitter output was connected to a calibrated attenuator, the other end of which was connected to a power meter. Transmitter output was read off the power meter in dBm. The power output at the transmitter antenna port was determined by adding the value of the attenuator to the power meter reading. TS 151 010-1 is reference to conduct the measurement of output power.

The Procedure of KDB941225 (SAR Measurement Procedures for 3G devices, (WCD-MA/HSPA) was used for EUT and Base station setting. RMC 12.2kps is used for this testing, and KDB 971168 D01 Power Meas License Digital System as the supplemental test methodology to adjust the proper setting obtaining the measurement results. Wall bands conducted average power is obtained from the simulator telecommunication test set.

6.5 Determining ERP and/or EIRP from conducted RF output power measurements

$$ERP/EIRP = P_{Meas} + GT - LC$$

Where:

ERP/EIRP	= effective or equivalent radiated power, respectively (expressed in the same units as P _{Meas} , typically dBW or dBm);
P _{Meas}	= measured transmitter output power or PSD, in dBm or dBW;
GT	= gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)
LC	= signal attenuation in the connecting cable between the transmitter and antenna, in dB.

For devices utilizing multiple antennas, KDB 662911 provides guidance for determining the effective array transmit antenna gain term to be used in the above equation.

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6.6 Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY53140006	05/31/2019	05/30/2020
Radio Communication Analyser	Anritsu	MT8821C	6261786084	01/09/2019	01/09/2020
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/15/2019	07/14/2020
Splitter	Marvelous	MVE8586	RF265	11/20/2019	11/19/2020
DC Block	PASTER-NACK	PE8210	RF256	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF268	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF220	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF229	11/20/2019	11/19/2020

6.7 Measurement Result

6.7.1 Cat M1

Antenna gain (dBi) 10

M1 Band 2_Uplink frequency band : 1850 to 1910 MHz										
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB allocation	RB Start	Index	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
1.4	18607	1850.7	QPSK	6	0	0	22.25	32.25	33	-0.75
	18607	1850.7	16QAM	6	0	11	22.18	32.18	33	-0.82

Antenna gain (dBi) 7

M1 Band 4_Uplink frequency band : 1710 to 1755 MHz										
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB allocation	RB Start	Index	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
1.4	19957	1710.7	QPSK	6	0	0	22.38	29.38	30	-0.62
	19957	1710.7	16QAM	6	0	11	22.15	29.15	30	-0.85

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Antenna gain (dBi) 11.41

M1 Band 5_Uplink frequency band : 824 to 849 MHz											
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB allocation	RB Start	Index	Conducted Average (dBm)	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
1.4	20407	824.7	QPSK	6	0	0	22.02	31.28	33.43	38.45	-5.02
	20407	824.7	16QAM	6	0	11	21.87	31.13	33.28	38.45	-5.17

Antenna gain (dBi) 10.7

M1 Band 12_Uplink frequency band : 699 to 716 MHz											
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB allocation	RB Start	Index	Conducted Average (dBm)	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
1.4	23017	699.7	QPSK	6	0	0	20.13	28.68	30.83	34.77	-3.94
	23017	699.7	16QAM	6	0	11	19.69	28.24	30.39	34.77	-4.38

Antenna gain (dBi) 11.16

M1 Band 13_Uplink frequency band : 777 to 787 MHz											
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB allocation	RB Start	Index	Conducted Average (dBm)	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
5	23205	779.5	QPSK	6	0	0	20.32	29.33	31.48	34.77	-3.29
	23205	779.5	16QAM	6	0	11	20.21	29.22	31.37	34.77	-3.4

Antenna gain (dBi) 11.22

M1 Band 14_Uplink frequency band : 788 to 798 MHz											
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB allocation	RB Start	Index	Conducted Average (dBm)	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
5	23305	790.5	QPSK	6	0	0	20.81	29.88	32.03	34.77	-2.74
	23305	790.5	16QAM	6	0	11	20.68	29.75	31.90	34.77	-2.87

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Antenna gain (dBi) 10.73

M1 Band 17_Uplink frequency band : 704 to 716 MHz											
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Index	Conducted Average (dBm)	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
5	23755	706.5	QPSK	6	0	0	22.12	30.70	32.85	34.77	-1.92
	23755	706.5	16QAM	6	0	11	21.94	30.52	32.67	34.77	-2.1

Antenna gain (dBi) 10

M1 Band 25_ Uplink frequency band : 1850 to 1915 MHz										
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Index	Conducted Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
1.4	26047	1850.7	QPSK	6	0	0	20.85	30.85	33	-2.15
	26047	1850.7	16QAM	6	0	11	20.64	30.64	33	-2.36

Antenna gain (dBi) 11.36

M1 Band 26_Uplink frequency band : 824 to 849 MHz											
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Index	Conducted Average (dBm)	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
1.4	26797	824.7	QPSK	6	0	0	20.12	29.33	31.48	38.45	-6.97
	26797	824.7	16QAM	6	0	11	19.12	28.33	30.48	38.45	-7.97

Antenna gain (dBi) 11.36

Part 90S_M1 Band 26_Uplink frequency band : 814 to 824 MHz											
BW (MHz)	UL Channel	Frequency (MHz)	Modulation	RB Size	RB Offset	Index	Conducted Average (dBm)	ERP Average (dBm)	EIRP Average (dBm)	EIRP Limit (dBm)	Margin (dB)
1.4	26697	814.7	QPSK	6	0	0	20.05	29.26	31.41	50	-18.59
	26697	814.7	16QAM	6	0	11	19.01	28.22	30.37	50	-19.63

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Note:

The Antenna Gain values used to determine ERP / EIRP are derived from allowable gain values from below test report:

Test report number:	1036521106LEX-007
Issue date:	5/13/2019
Test Lab:	Intertek Testing Services NA, Inc.

The above test report is under

FCC ID: HSW-TY1SC, Grant Date: 07/01/2019

ISED certificate number: 4492A-TY1SC, Approval Date on REL: 2019-08-29

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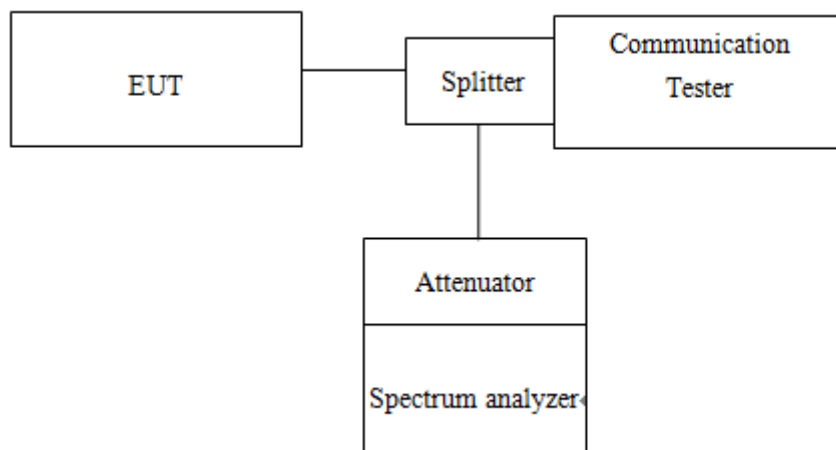
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7 OCCUPIED BANDWIDTH MEASUREMENT

7.1 Standard Applicable

The occupied bandwidth 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.

7.2 Test Set-up



7.3 Measurement Procedure

99% & 26dB Bandwidth with detector peak

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% of emission BW, VBW= 3 times RBW, -26dBc display line was placed on the screen (or 26dB bandwidth), the occupied bandwidth is the delta frequency between the two points where the display line intersects the signal trace. Then set RBW to 99% bandwidth, RBW= 1%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

99% Bandwidth with detector sample

The EUT's output RF connector was connected with a short cable to the spectrum analyzer, RBW was set to about 1% ~ 5% of emission BW, VBW= 3 times RBW, -20dBc display line was placed on the screen (or 20dB bandwidth). Set RBW to 99% bandwidth, RBW= 1% ~ 5%, VBW= 3 RBW, with span > 2 * Signal BW, set % Power = 99%.

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7.4 Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY53140006	05/31/2019	05/30/2020
Radio Communication Analyzer	Anritsu	MT8821C	6261786084	01/09/2019	01/09/2020
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/15/2019	07/14/2020
Splitter	Marvelous	MVE8586	RF265	11/20/2019	11/19/2020
DC Block	PASTERNAK	PE8210	RF256	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF268	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF220	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF229	11/20/2019	11/19/2020

7.5 Measurement Result

7.5.1 Cat M1

M1 BAND 2 Channel bandwidth: 1.4MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
1850.7	18607	1.0946	1.0963	1.241	1.243

M1 BAND 4 Channel bandwidth: 1.4MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
1710.7	19957	1.0951	1.0976	1.238	1.244

M1 BAND 5 Channel bandwidth: 1.4MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
824.7	20407	1.0999	1.0968	1.250	1.240

M1 BAND 12 Channel bandwidth: 1.4MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
699.7	23017	1.0944	1.0962	1.239	1.242

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M1 BAND 13 Channel bandwidth: 5MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
779.5	23205	1.2766	1.2426	1.804	1.785
M1 BAND 14 Channel bandwidth: 5MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
790.5	23305	1.2605	1.2655	1.801	1.803
M1 BAND 17 Channel bandwidth: 5MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
706.5	23755	1.2554	1.2055	1.716	1.578
M1 BAND 25 Channel bandwidth: 1.4MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
1850.7	26047	1.0940	1.0969	1.235	1.238

M1 BAND 26 Channel bandwidth: 1.4MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
824.7	26797	1.0952	1.0945	1.237	1.242

M1 BAND 26 for part 90S Channel bandwidth: 1.4MHz					
Freq. (MHz)	CH	99% BW (MHz)		26 dB BW (MHz)	
		QPSK	16QAM	QPSK	16QAM
814.7	26697	1.0910	1.0899	1.242	1.276

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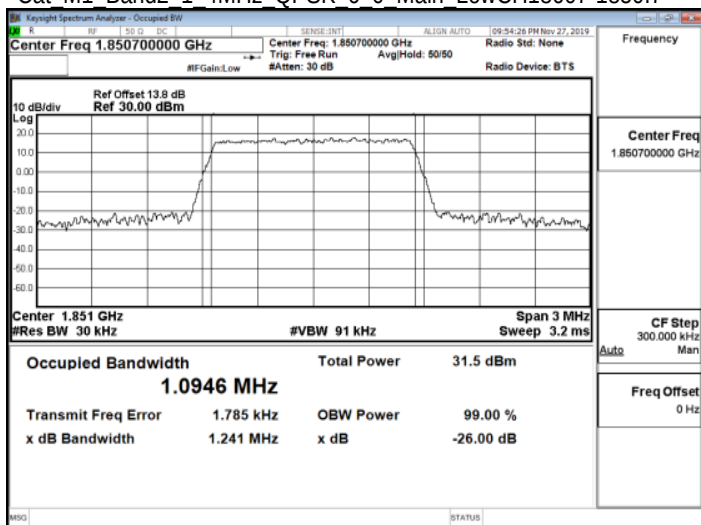
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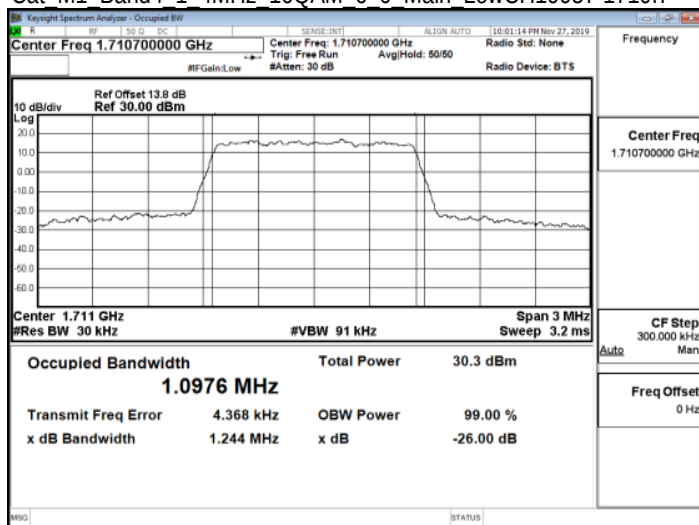
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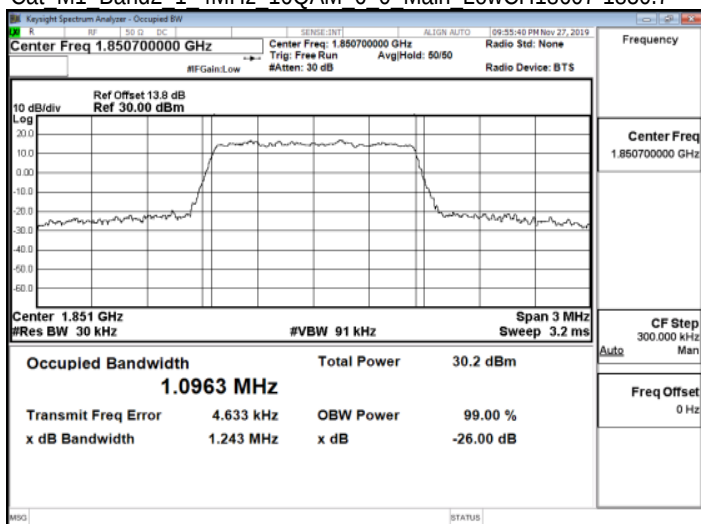
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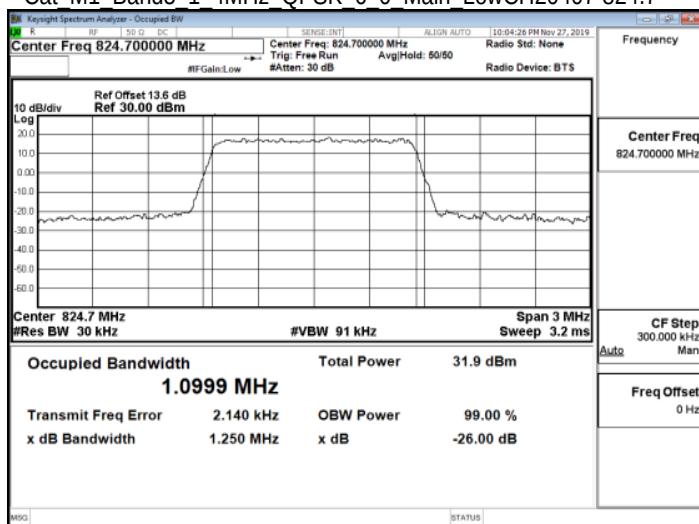
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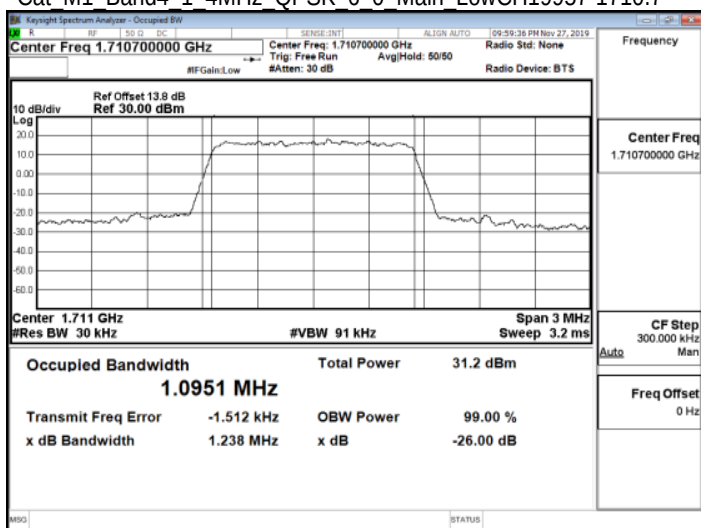
Cat M1 Band2 1 4MHz 16QAM 6 0 Main LowCH18607-1850.7



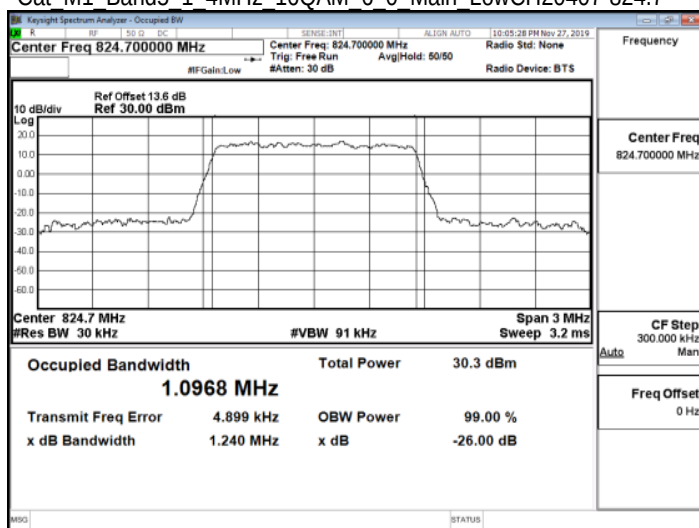
Cat M1 Band5 1 4MHz QPSK 6 0 Main LowCH20407-824.7



Cat M1 Band4 1 4MHz QPSK 6 0 Main LowCH19957-1710.7



Cat M1 Band5 1 4MHz 16QAM 6 0 Main LowCH20407-824.7



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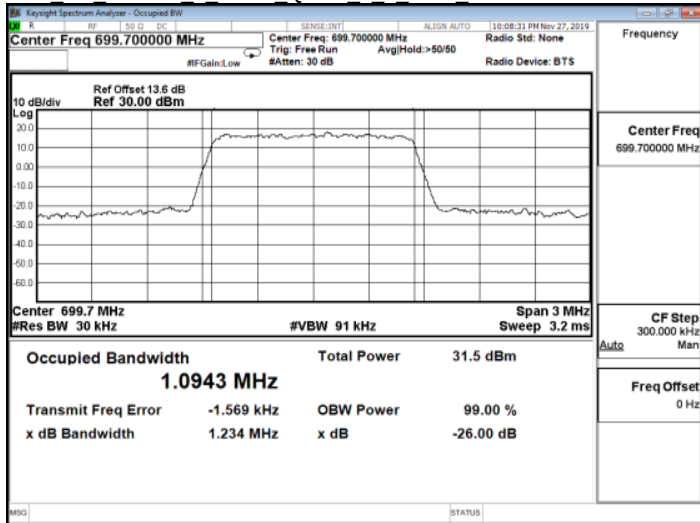
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f (886-2) 2298-0488

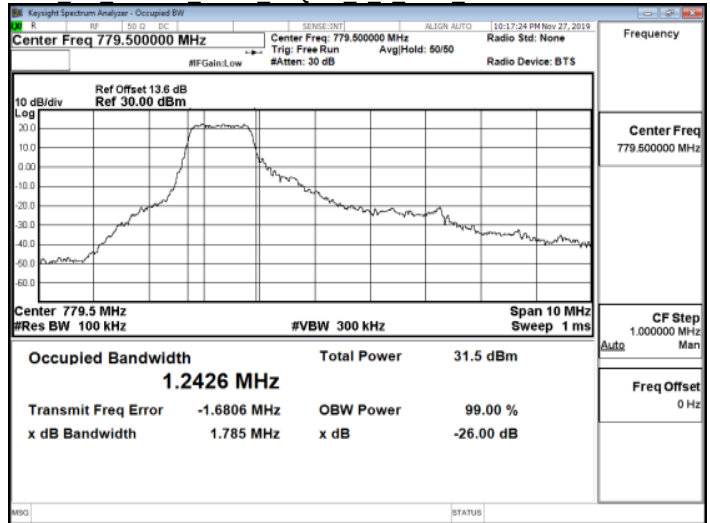
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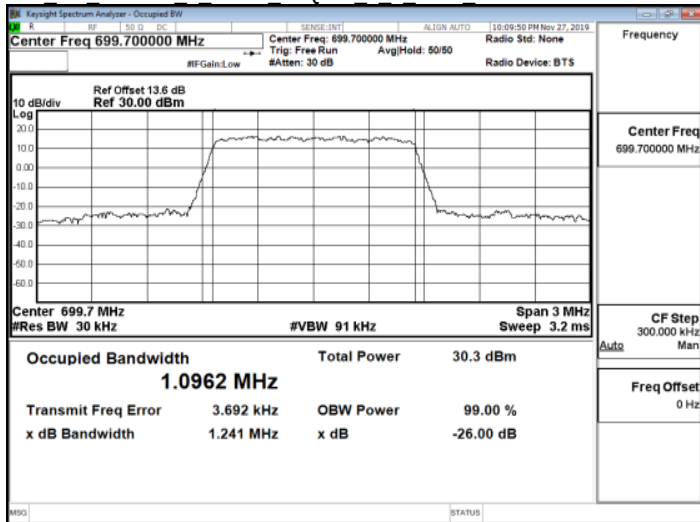
Cat M1 Band12 1 4MHz QPSK 6 0 Main LowCH23017-699.7



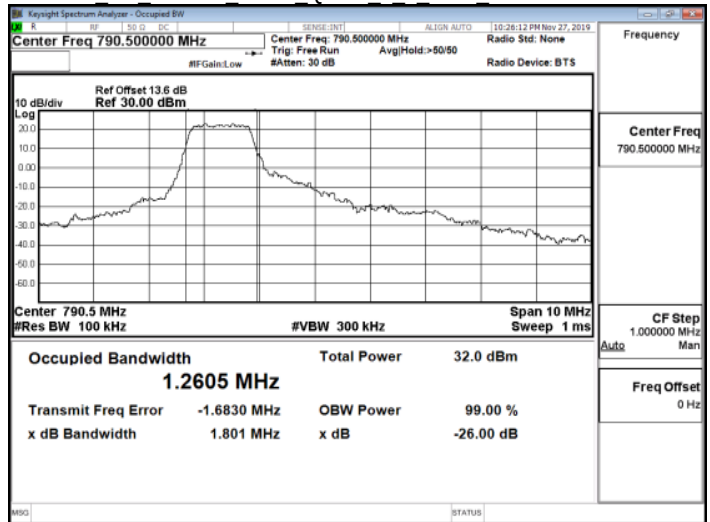
Cat M1 Band13 5MHz 16QAM 6 0 Main LowCH23205-779.5



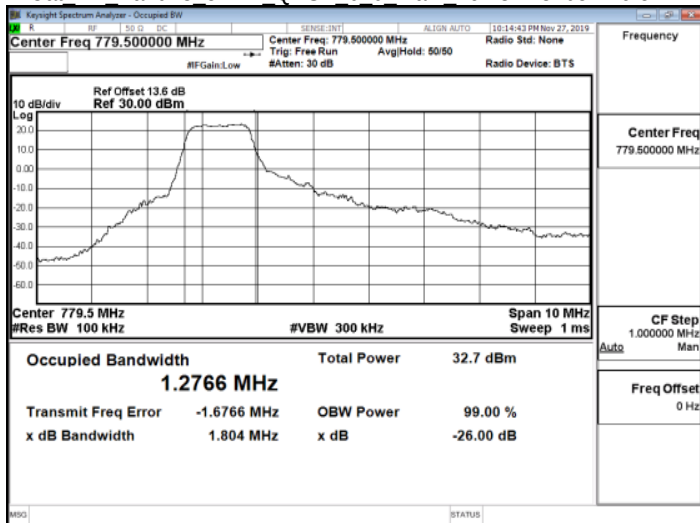
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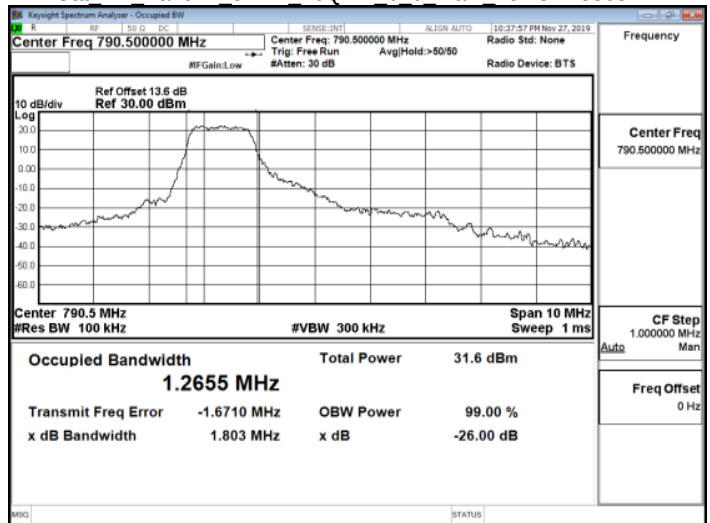
Cat M1 Band14 5MHz QPSK 6 0 Main LowCH23305



Cat M1 Band13 5MHz QPSK 6 0 Main LowCH23205-779.5



Cat M1 Band14 5MHz 16QAM 6 0 Main LowCH23305



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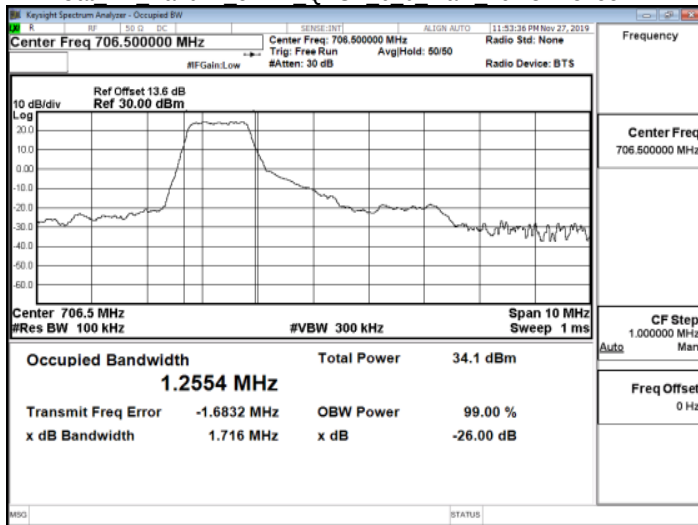
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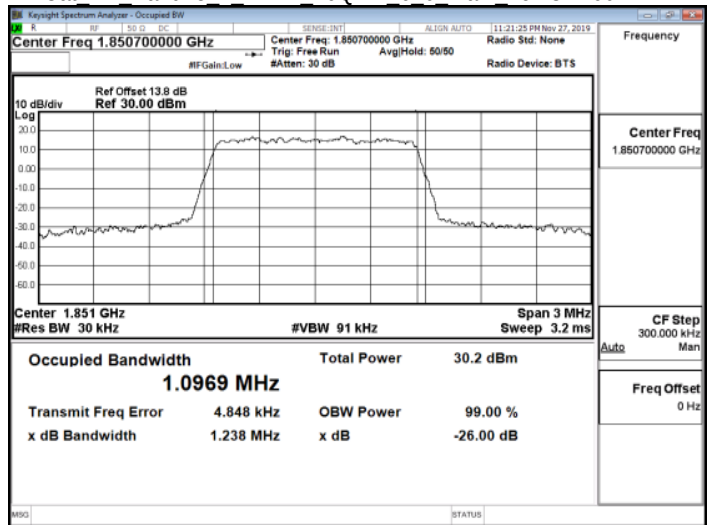
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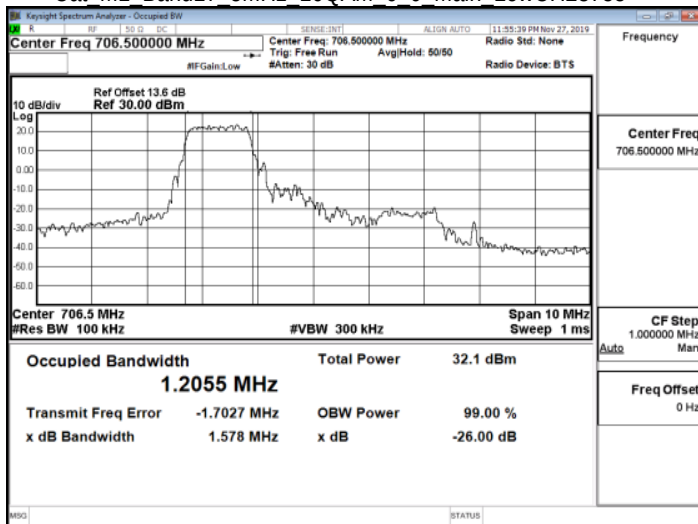
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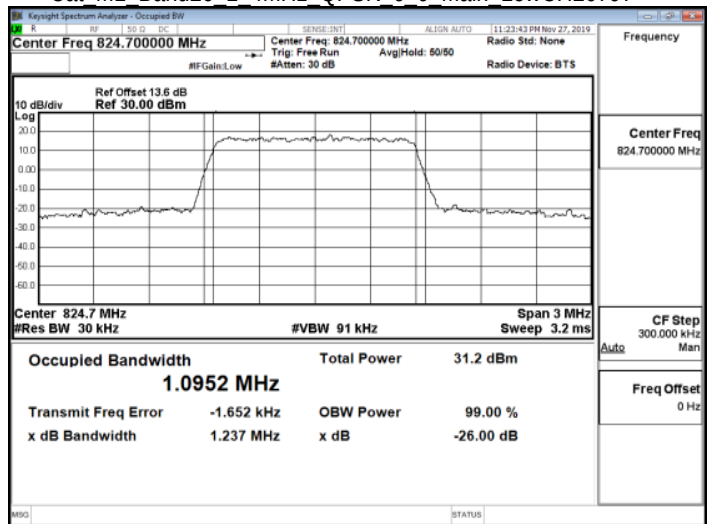
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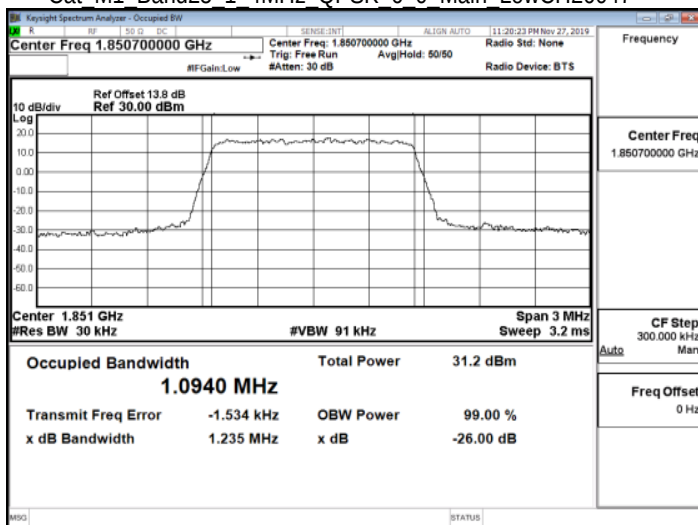
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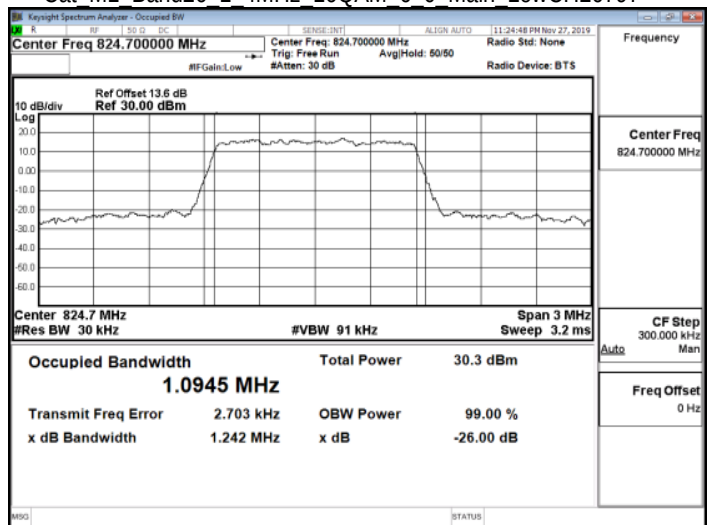
Cat M1 Band26 1 4MHz QPSK 6 0 Main LowCH26797



Cat M1 Band25 1 4MHz QPSK 6 0 Main LowCH26047



Cat M1 Band26 1 4MHz 16QAM 6 0 Main LowCH26797



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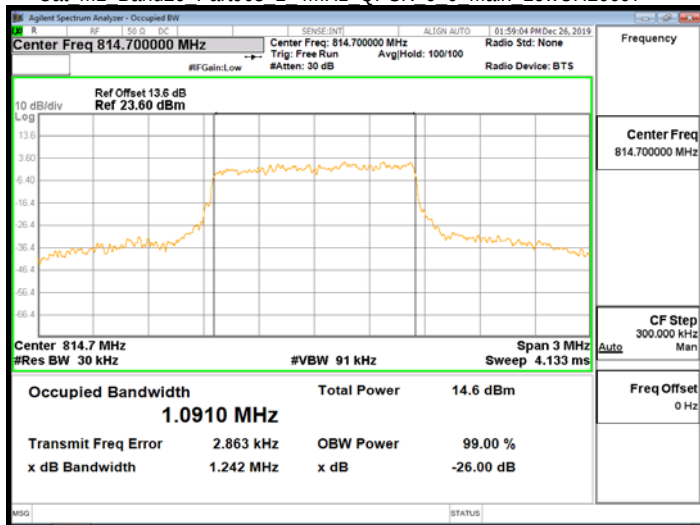
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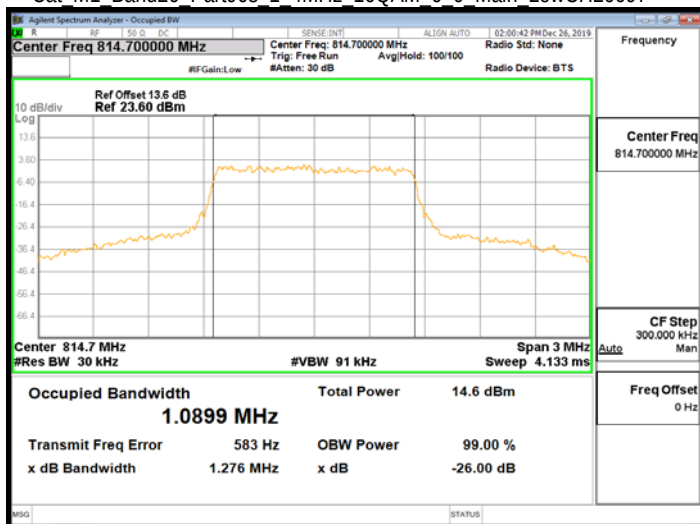
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Cat M1 Band26 Part90s 1 4MHz QPSK 6 0 Main LowCH26697



Cat M1 Band26 Part90s 1 4MHz 16QAM 6 0 Main LowCH26697



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8 OUT OF BAND EMISSION AT ANTENNA TERMINALS

8.1 Standard Applicable

FCC §22.917(a), §24.238(a), §27.53(h)

RSS-130 §4.7, RSS-132 §5.5, RSS-139 §6.5, RSS-139 §6.6

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

FCC §27.53(c) for B13

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB (-13dBm)

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

FCC §27.53 (f) for B13

For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC §27.53(c) (5) & FCC §27.53(g) for B12, 13

Compliance for operations in the 600 MHz, 698-746 MHz, 746-758 MHz and the 776-788 MHz band with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

ISED RSS-130 §4.7.1 for B12, 13

Compliance for operations in the 617-652 MHz, 663-698 MHz, 698-756 MHz and the 777-787 MHz band, the unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

ISED RSS-130 §4.7.2 for B13

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746-756 MHz and 777-787 MHz shall also comply with the following restrictions:

the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

$76 + 10 \log_{10} p$ (watts), dB, for base and fixed equipment and

$65 + 10 \log_{10} p$ (watts), dB, for mobile and portable equipment

the e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

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FCC §27.53(h)(3) for B4

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's 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 emissions are attenuated at least 26 dB below the transmitter power.

RSS-139 §6.6 for B4

In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, Footnote 2 which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least $43 + 10 \log_{10} p$ (watts) dB.

FCC §90.691 Emission mask requirements for EA-based systems for B26

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \log_{10}(f/6.1)$ decibels or $50 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

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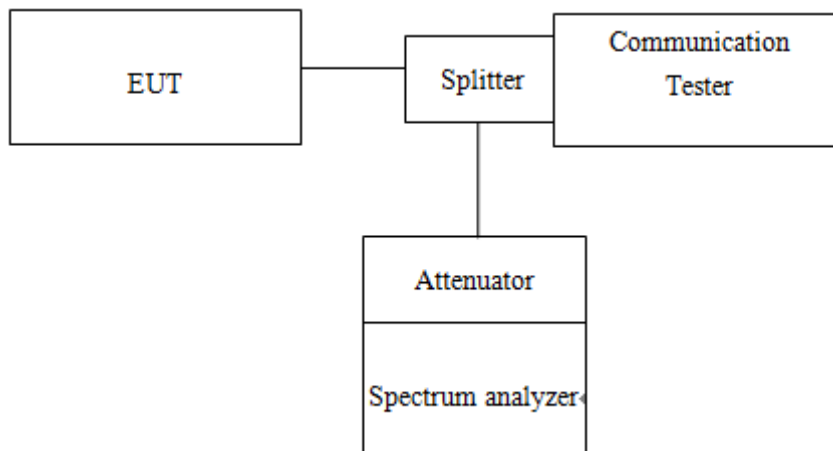
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8.2 Test SET-UP



8.3 Measurement Procedure

8.3.1 Conducted Emission

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 1MHz, sufficient scans were taken to show the out of band Emissions if any up to 10th harmonic.

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 1MHz & VBW = 1MHz on Spectrum.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

8.3.2 Band Edge

1. To connect Antenna Port of EUT to Spectrum.
2. The band edge of low and high channels for the highest RF powers was measured. Setting $RBW \geq 1\% \text{ EBW}$.
3. Allow trace to fully stabilize
4. Repeat above procedures until all default test channel measured were complete.

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8.4 Measurement Equipment Used

Conducted Emission (measured at antenna port) Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
DC Power Supply	Agilent	E3640A	MY53140006	05/31/2019	05/30/2020
Radio Communication Analyzer	Anritsu	MT8821C	6261786084	01/09/2019	01/09/2020
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	07/15/2019	07/14/2020
Splitter	Marvelous	MVE8586	RF265	11/20/2019	11/19/2020
DC Block	PASTERNAK	PE8210	RF256	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF268	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF220	11/20/2019	11/19/2020
Coaxial Cables	Woken	00100A1F1A185C	RF229	11/20/2019	11/19/2020

8.5 Measurement Result:

Refer to next pages.

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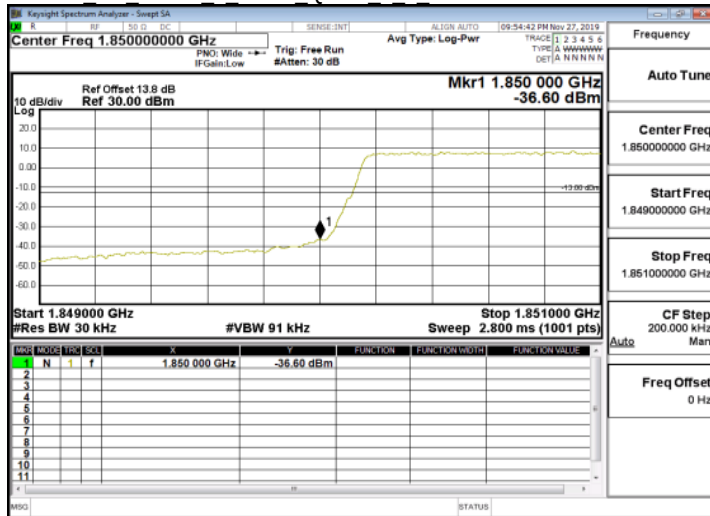
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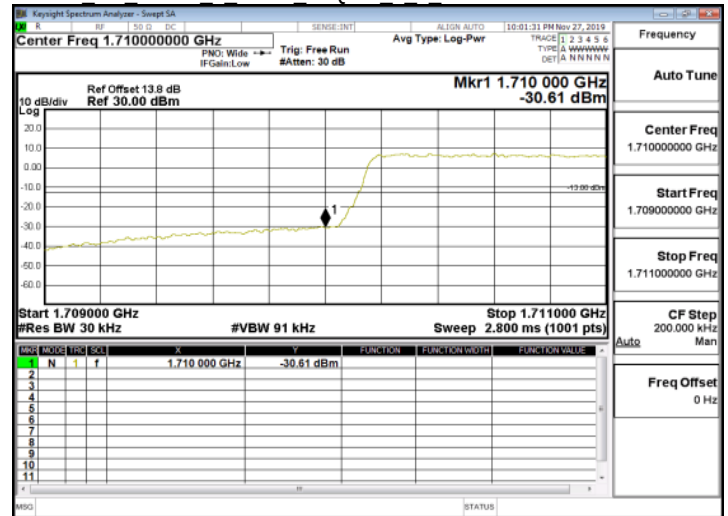
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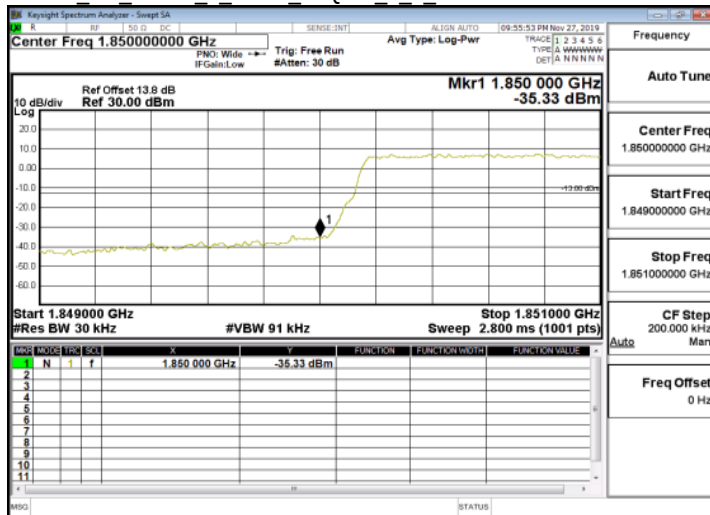
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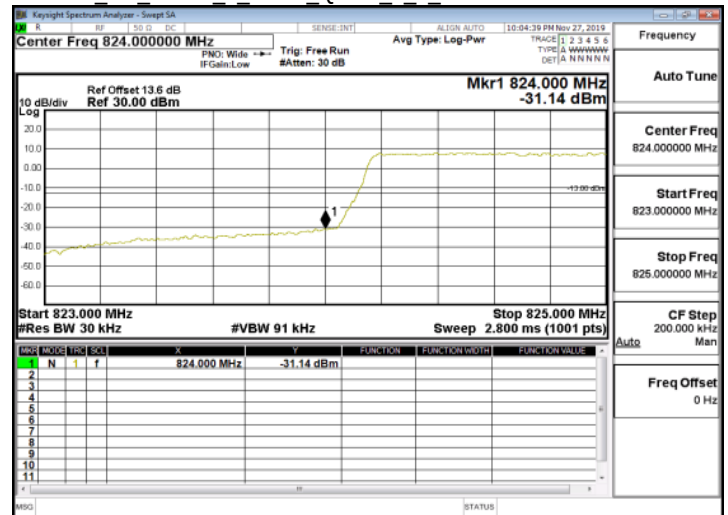
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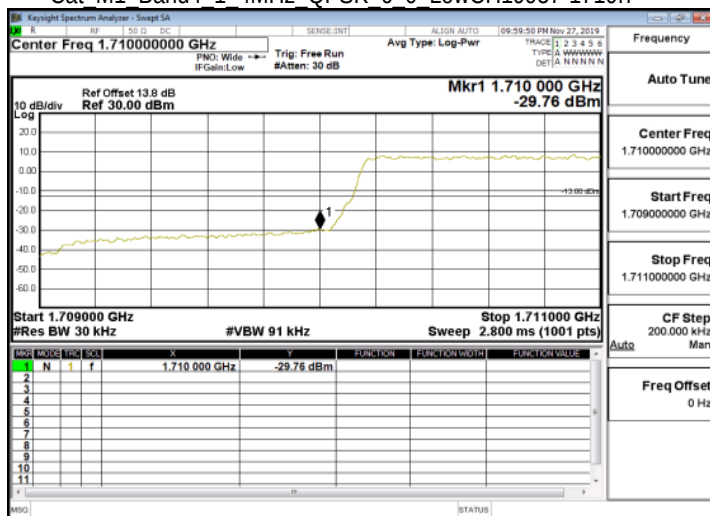
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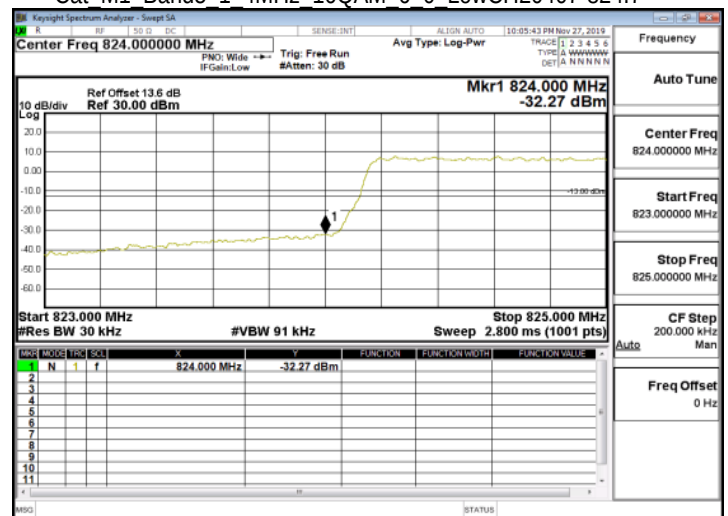
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Cat M1 Band4 1 4MHz QPSK 6 0 LowCH19957-1710.7



Cat M1 Band5 1 4MHz 16QAM 6 0 LowCH20407-824.7

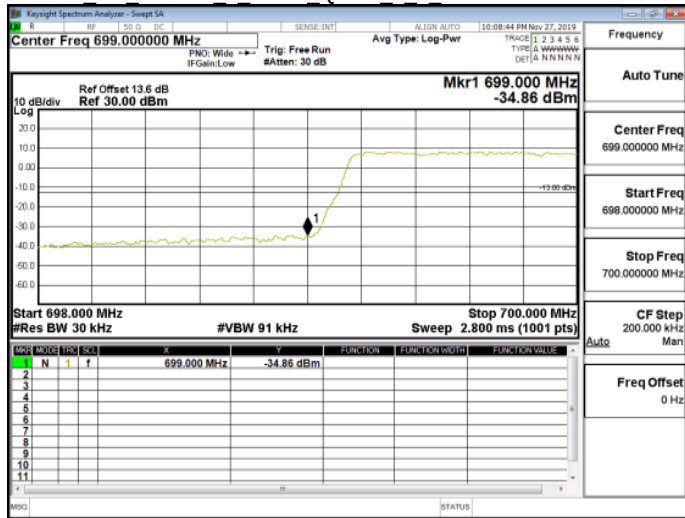


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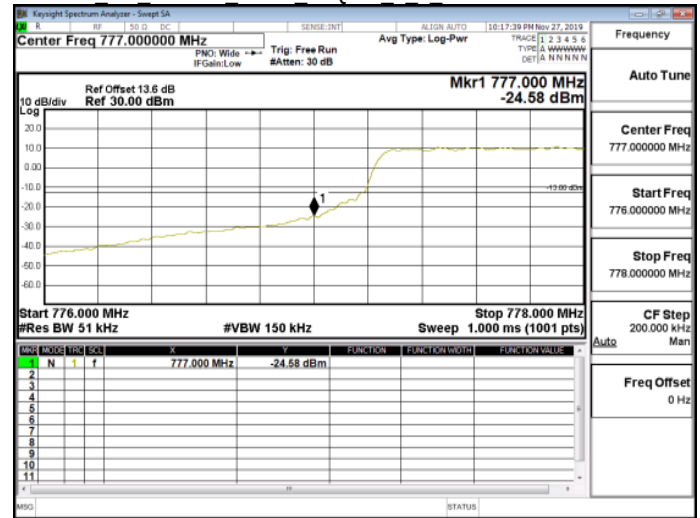
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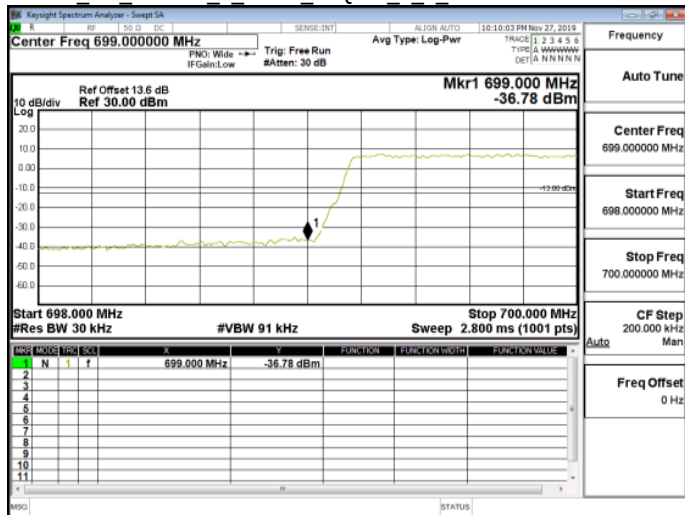
Cat M1_Band12 1 4MHz QPSK 6 0 LowCH23017-699.7



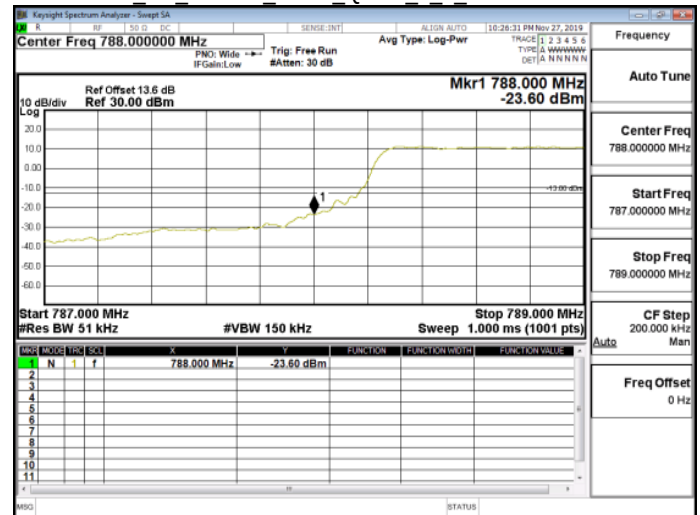
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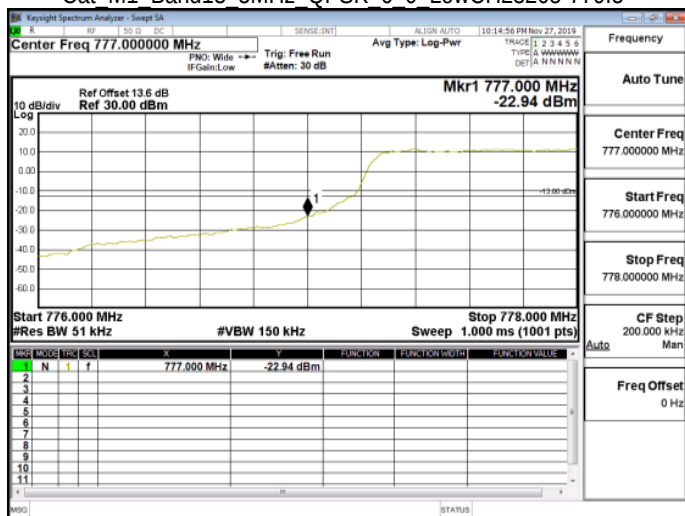
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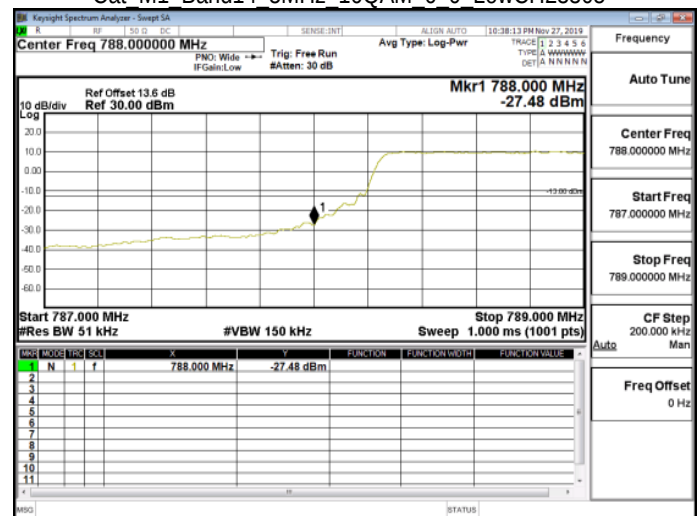
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Cat M1_Band13 5MHz QPSK 6 0 LowCH23205-779.5



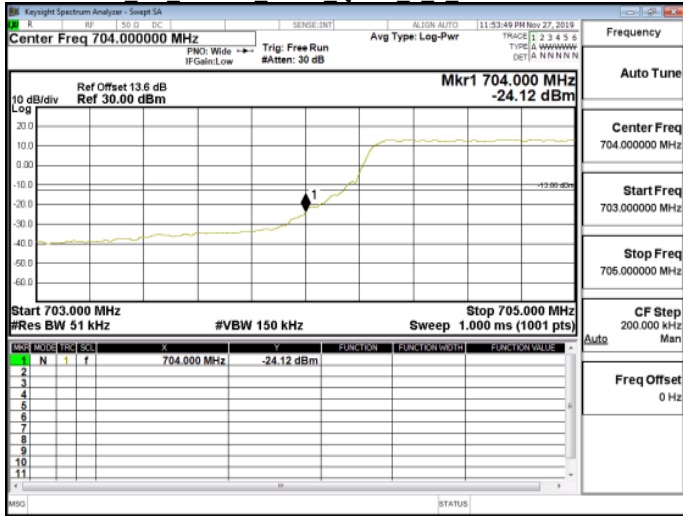
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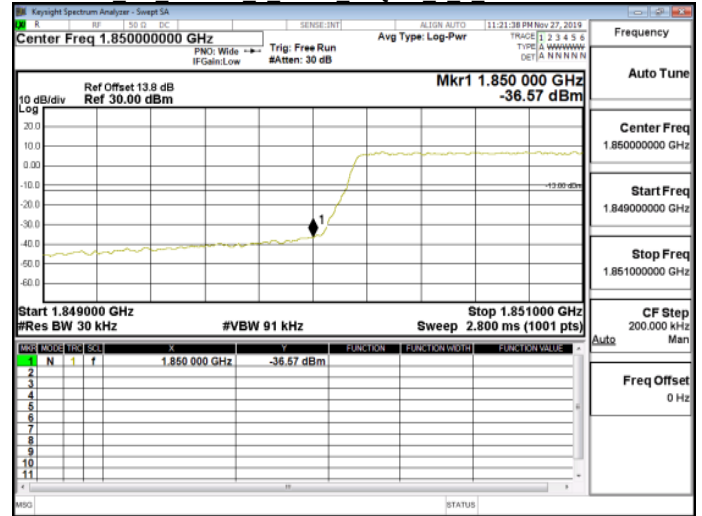
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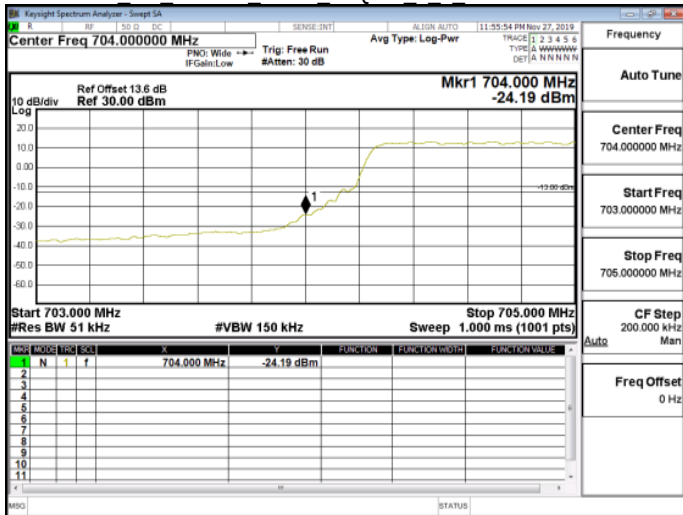
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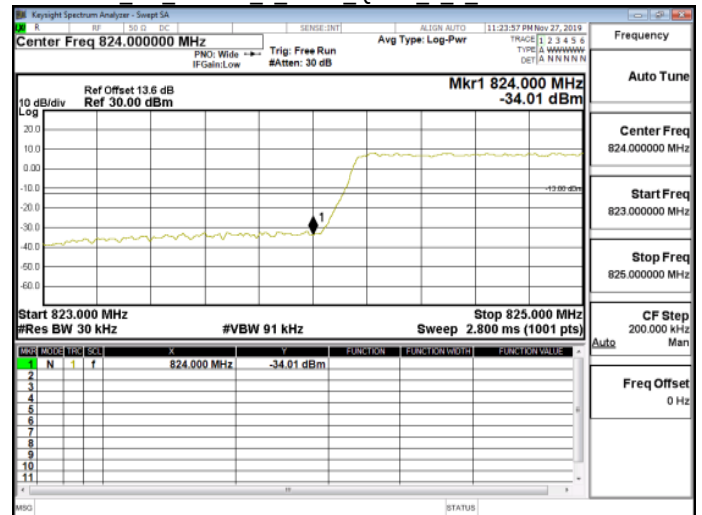
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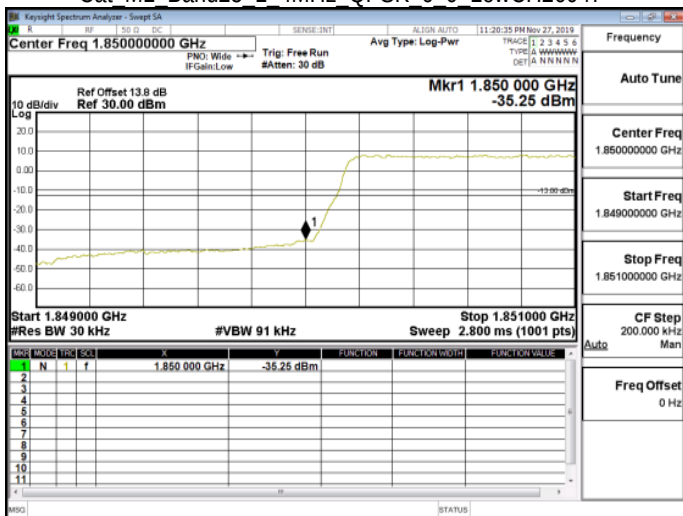
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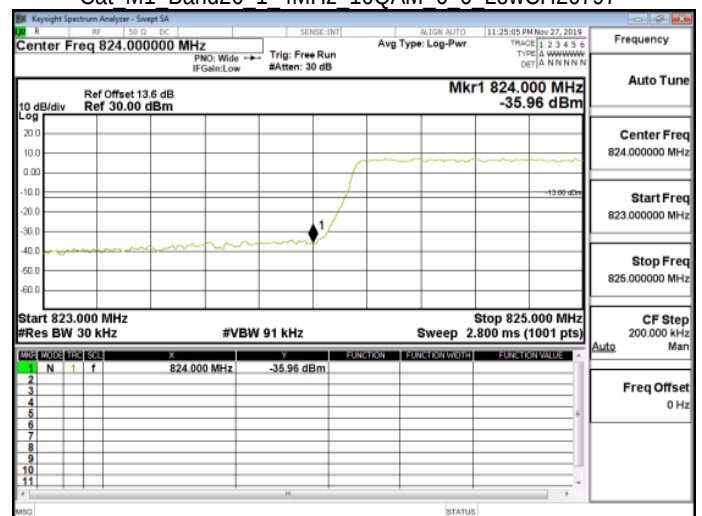
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Cat M1 Band25 1 4MHz QPSK 6 0 LowCH26047



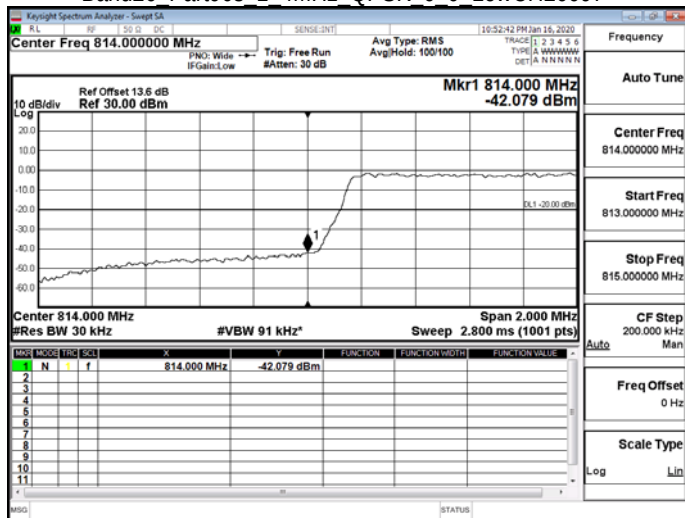
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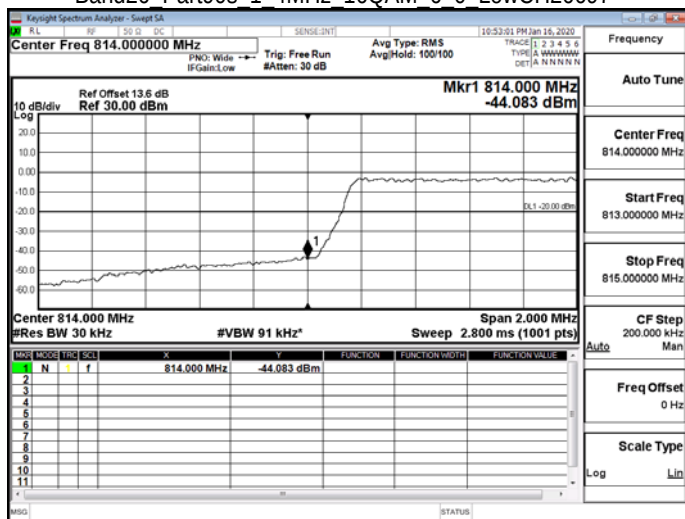
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Band26 Part90s 1 4MHz QPSK 6 0 LowCH26697



Band26 Part90s 1 4MHz 16QAM 6 0 LowCH26697



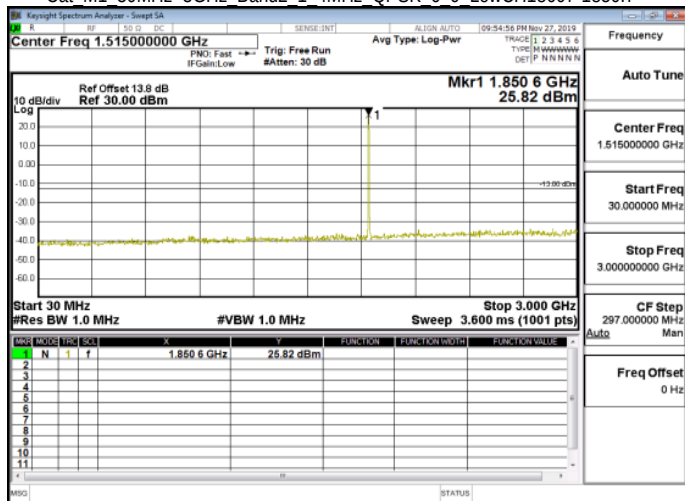
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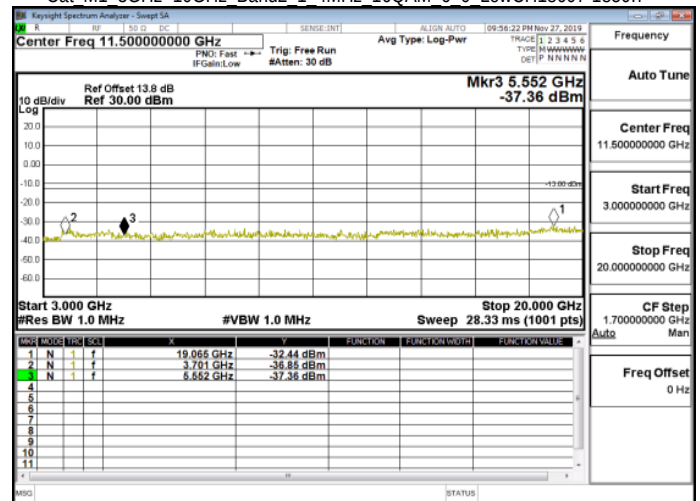
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8.5.2 Spurious Emission

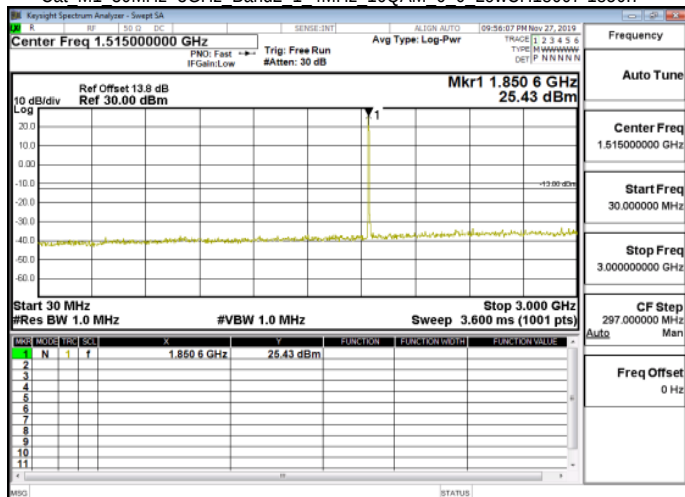
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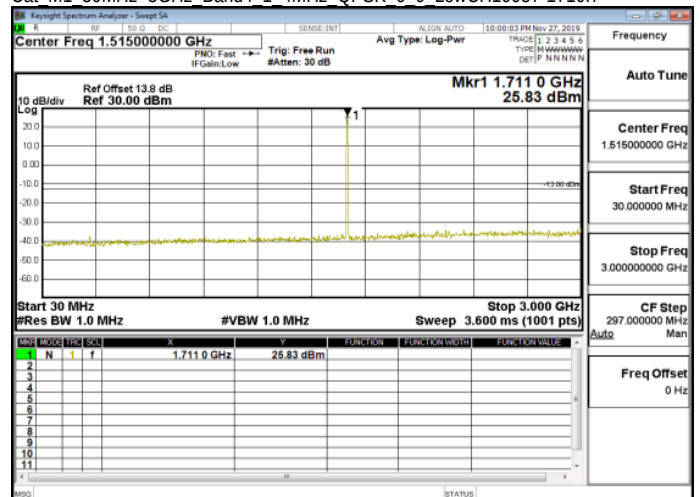
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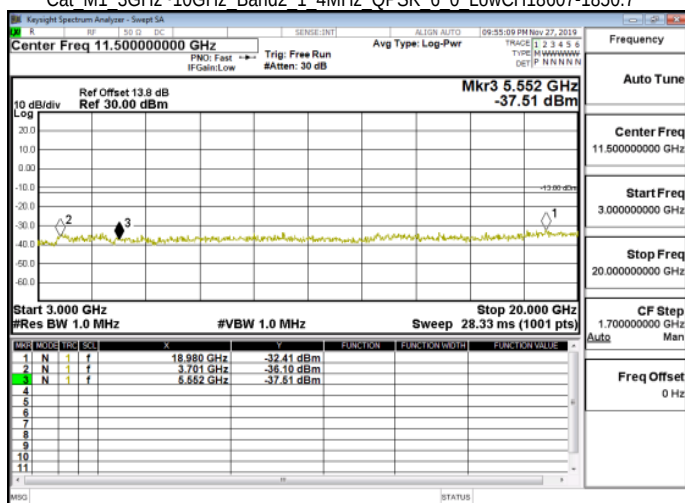
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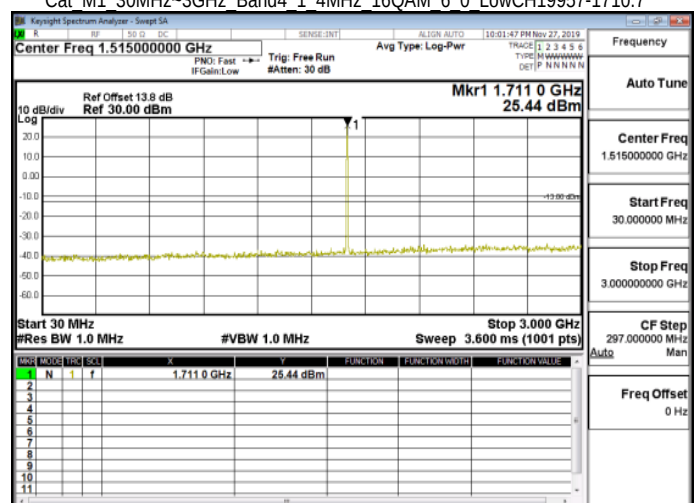
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Cat M1 3GHz-10GHz Band2 1 4MHz QPSK 6 0 LowCH18607-1850.7



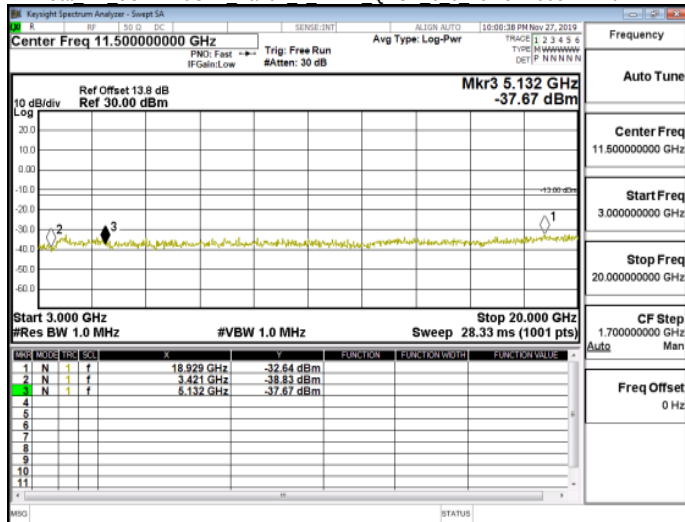
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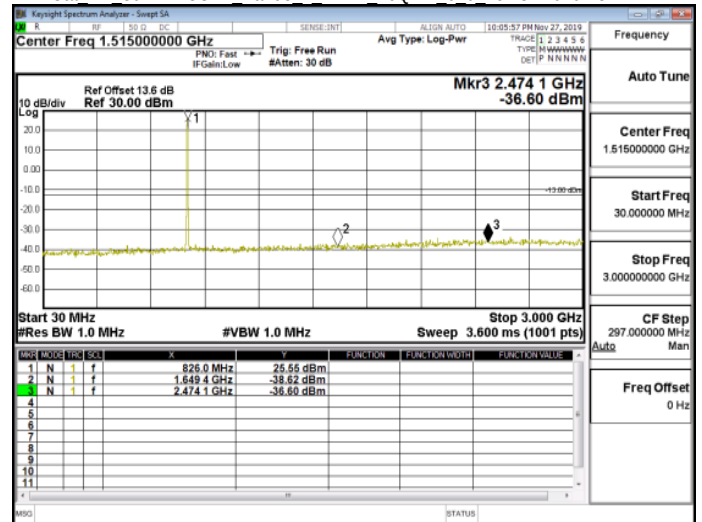
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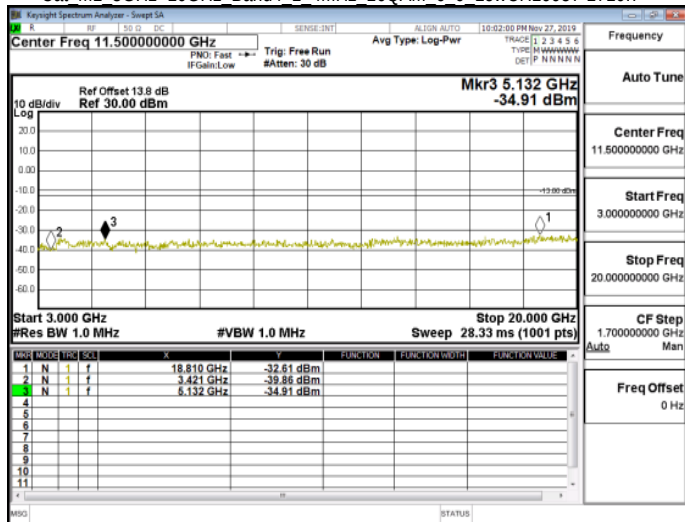
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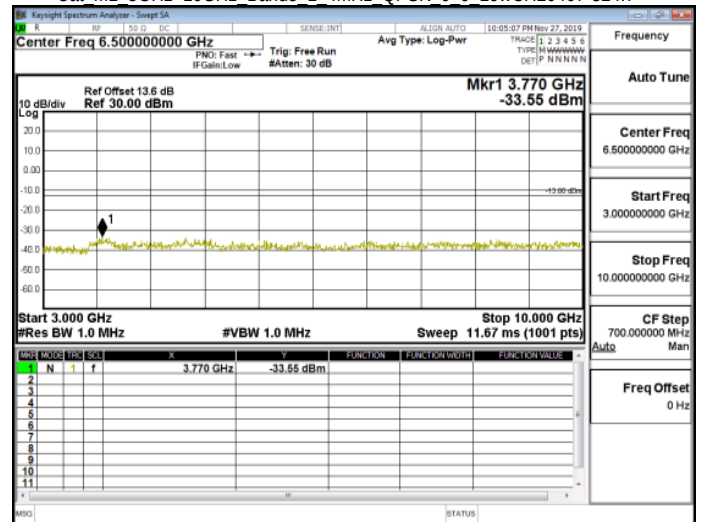
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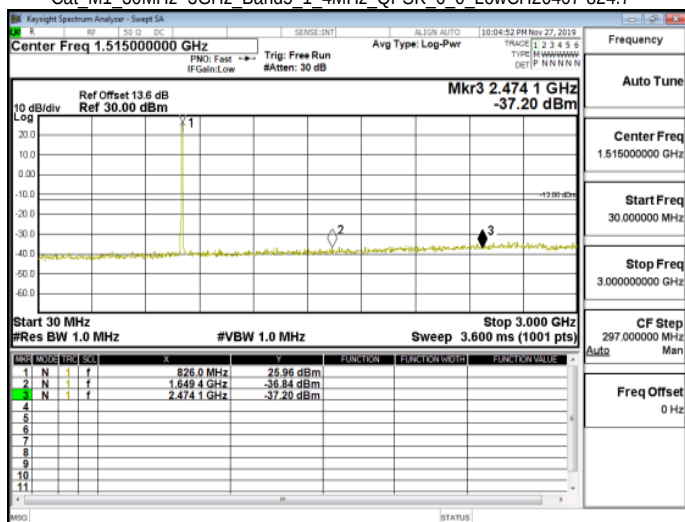
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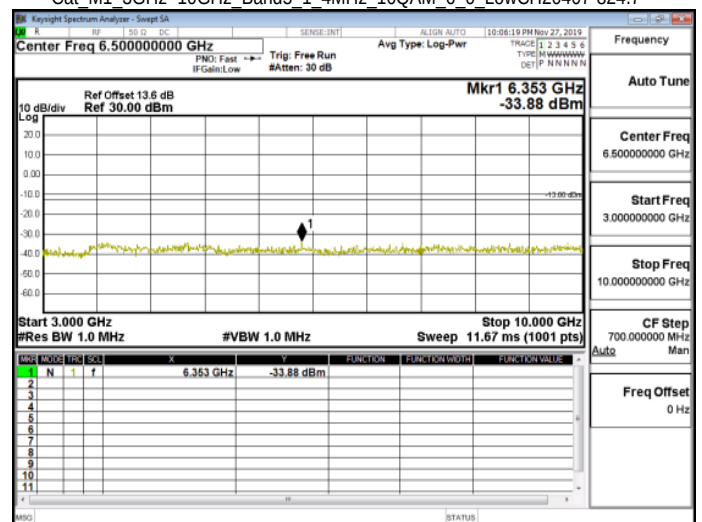
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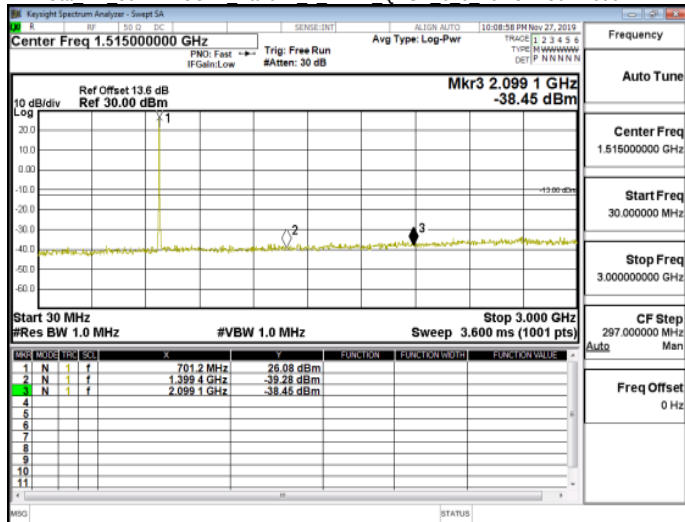
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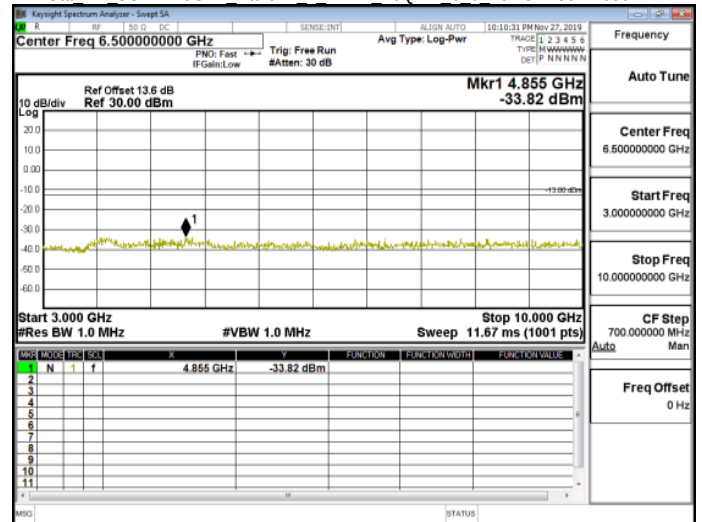
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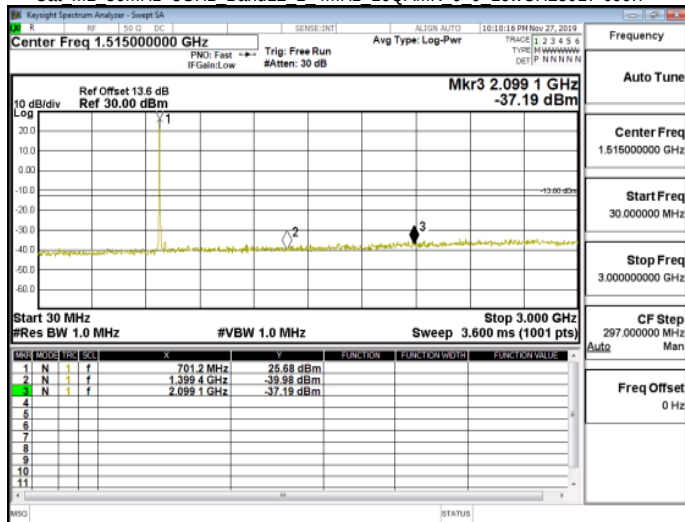
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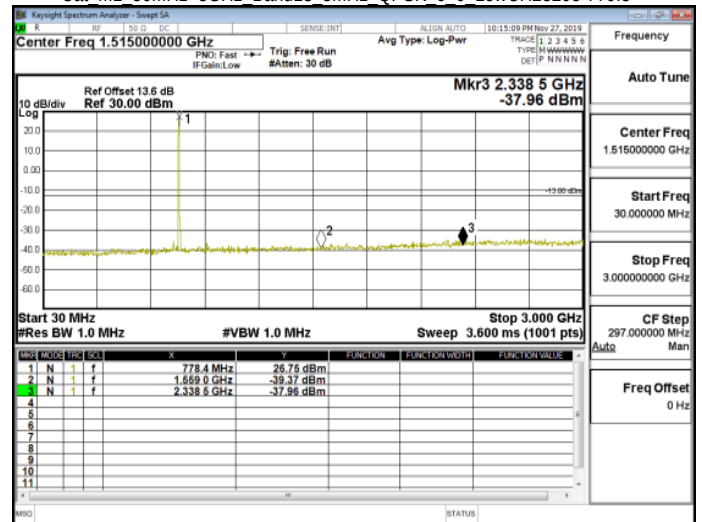
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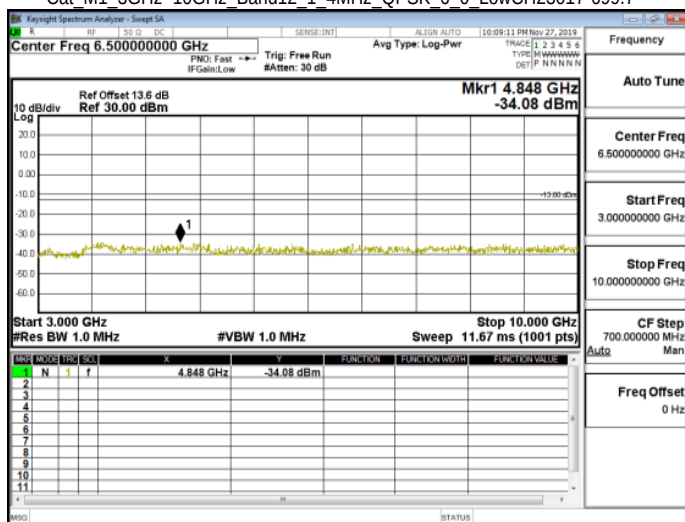
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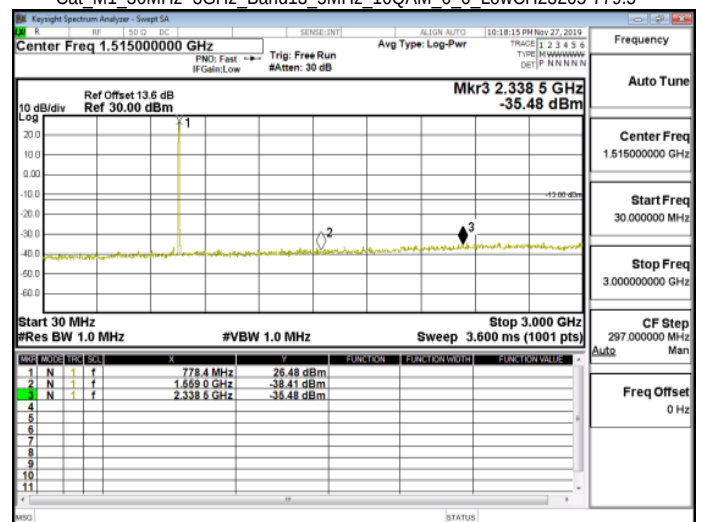
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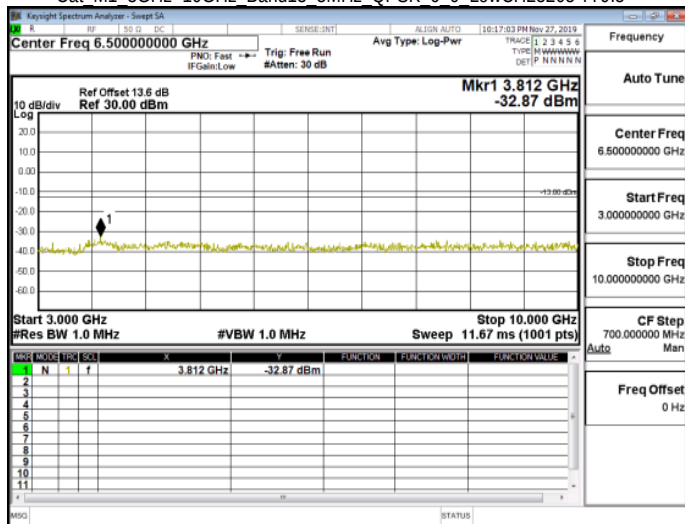
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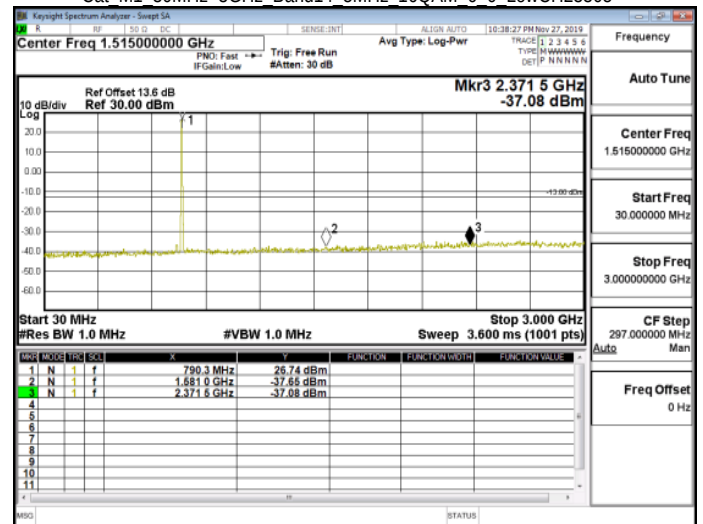
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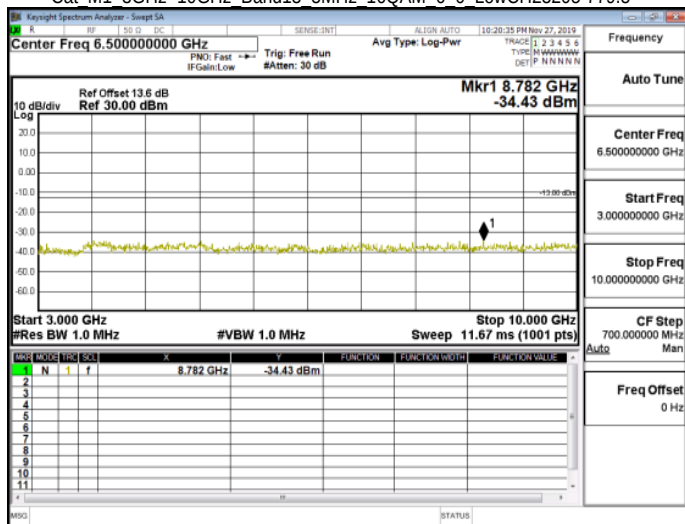
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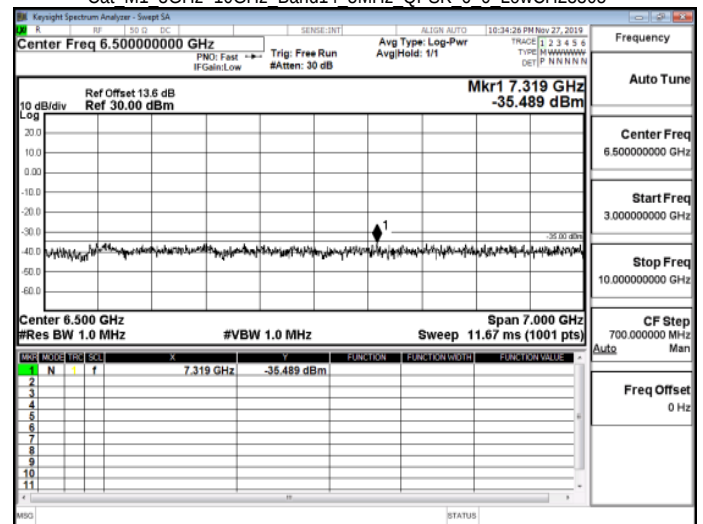
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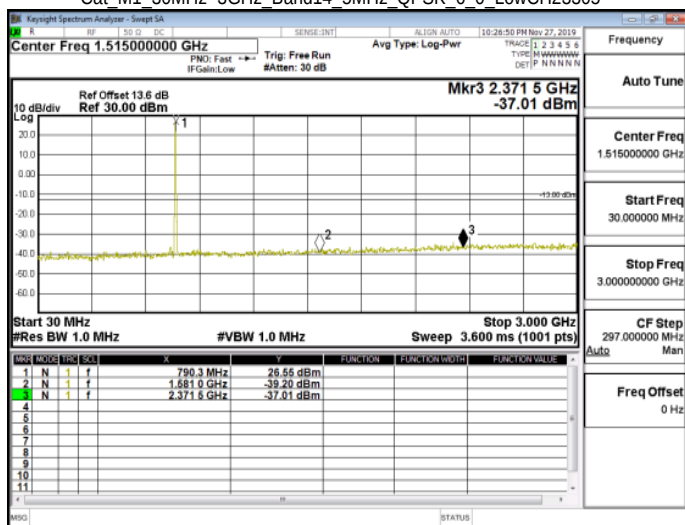
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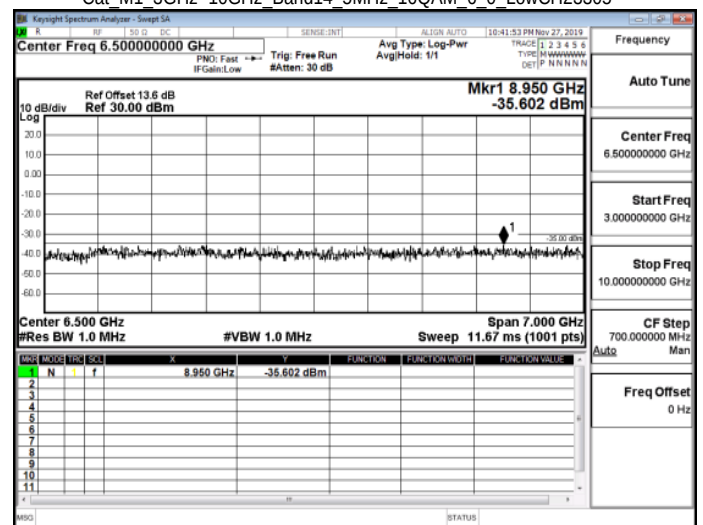
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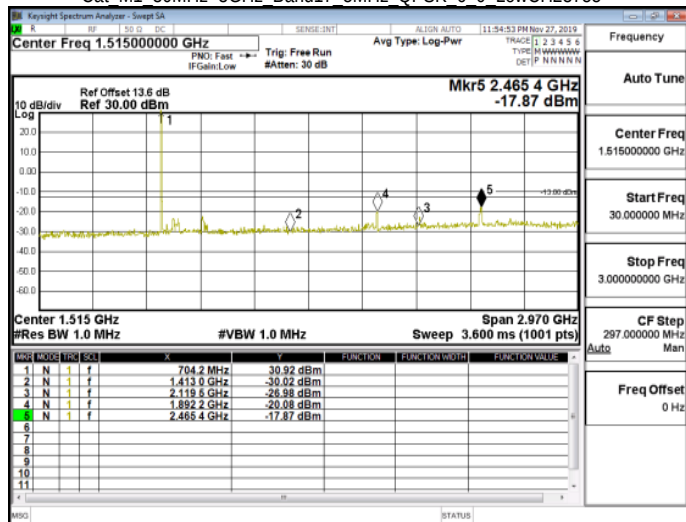
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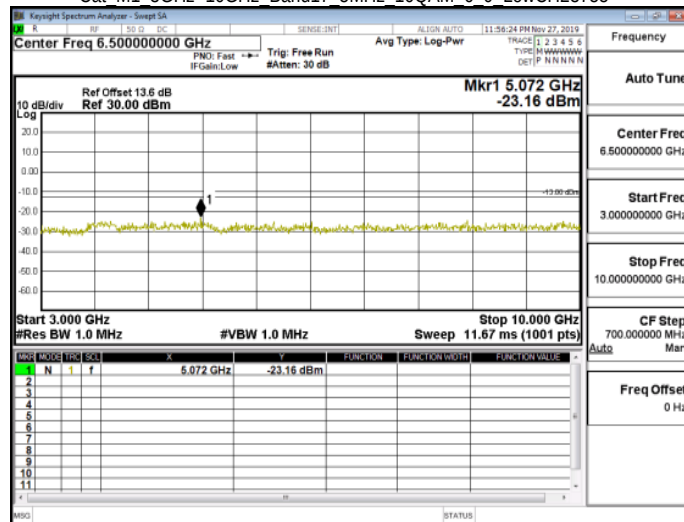
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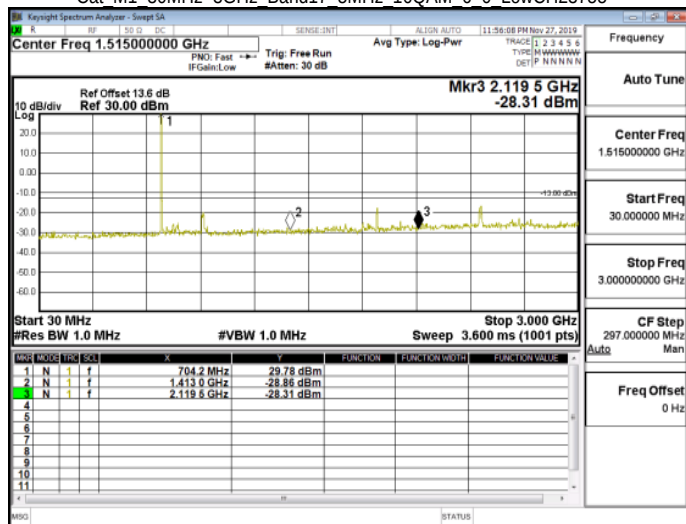
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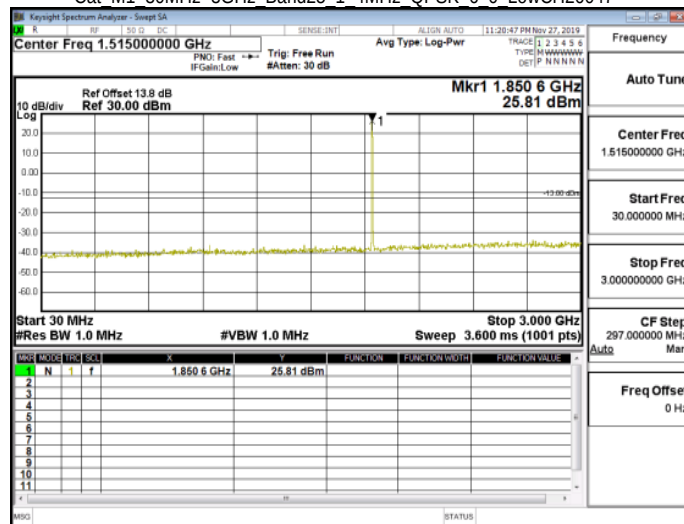
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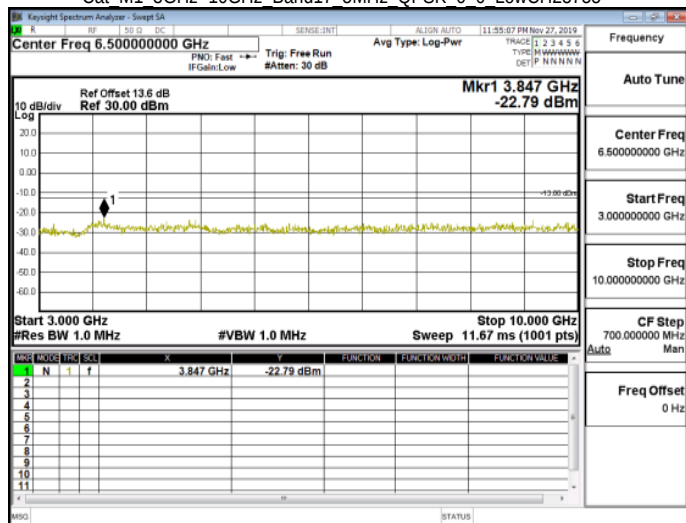
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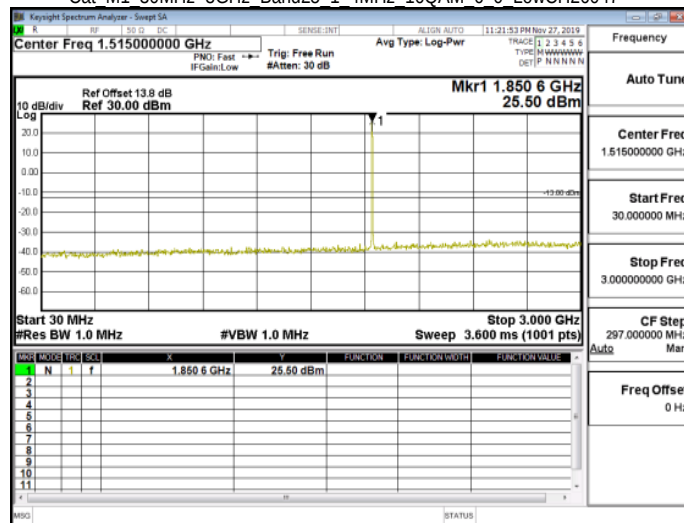
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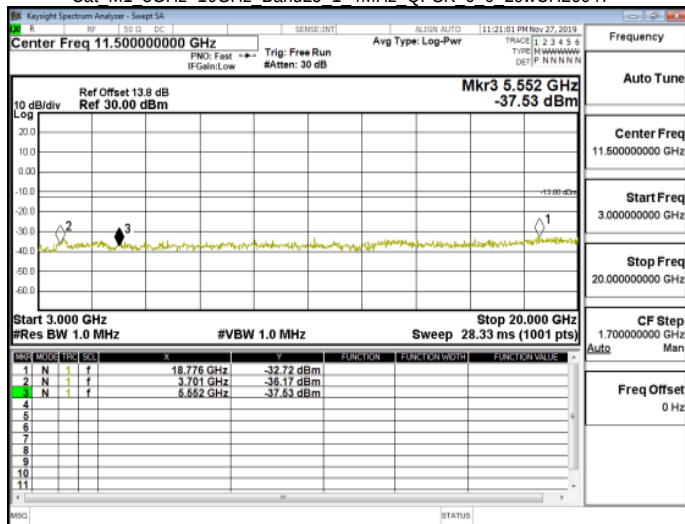


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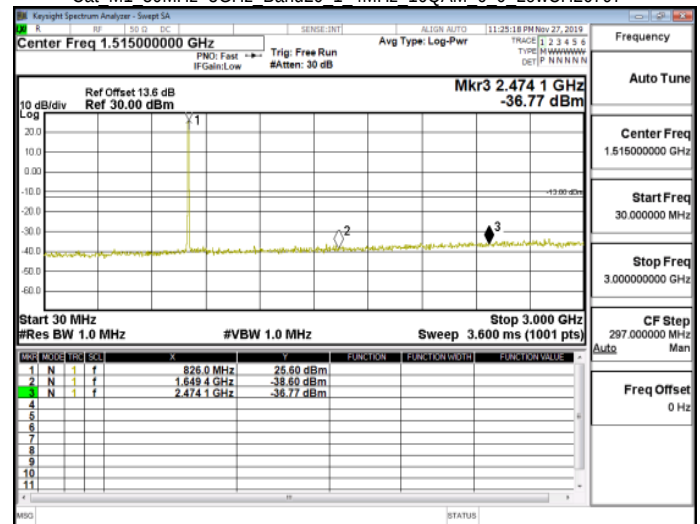
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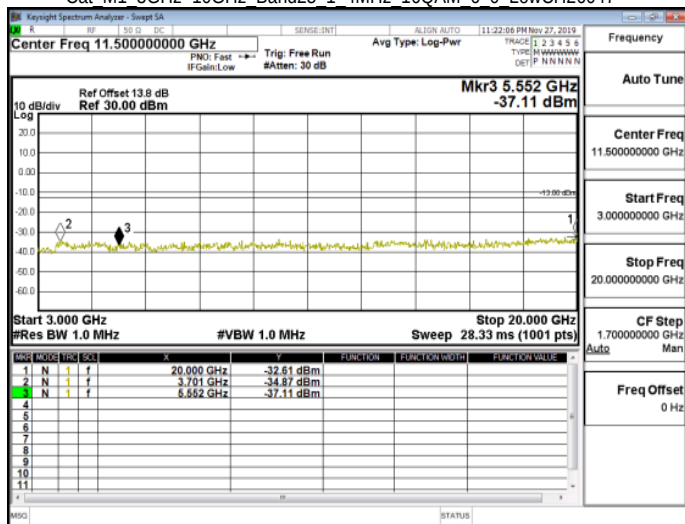
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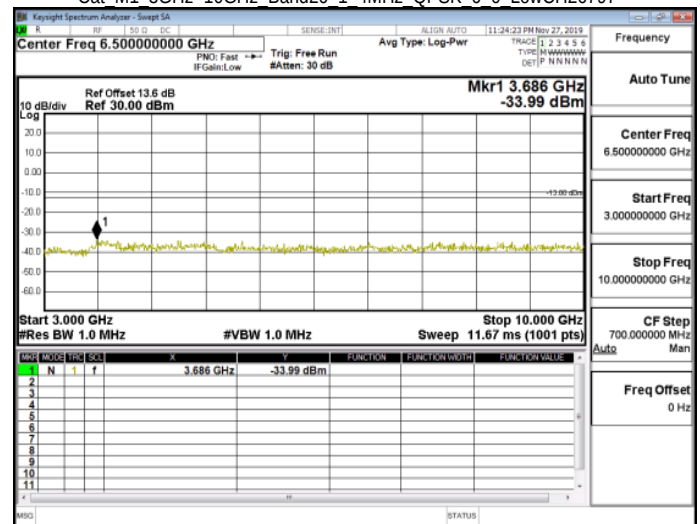
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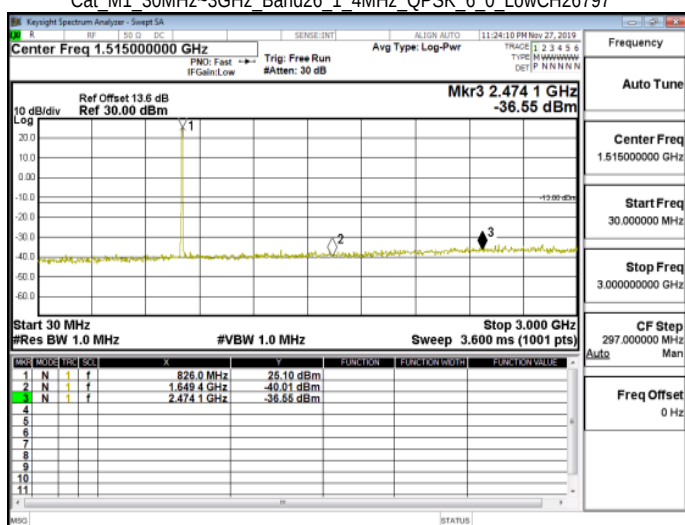
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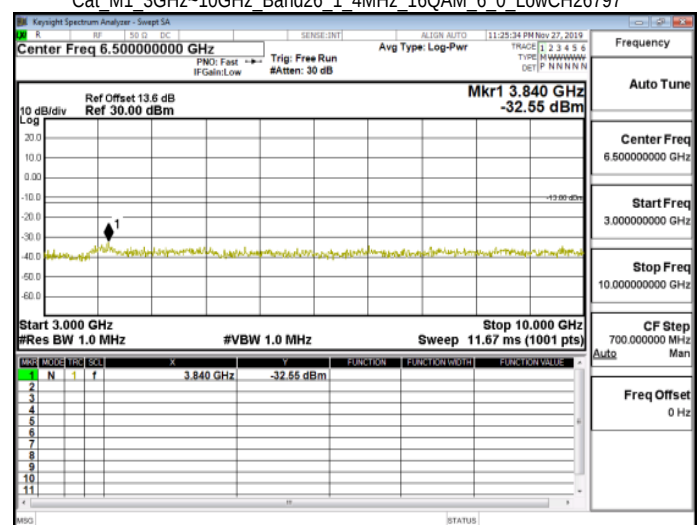
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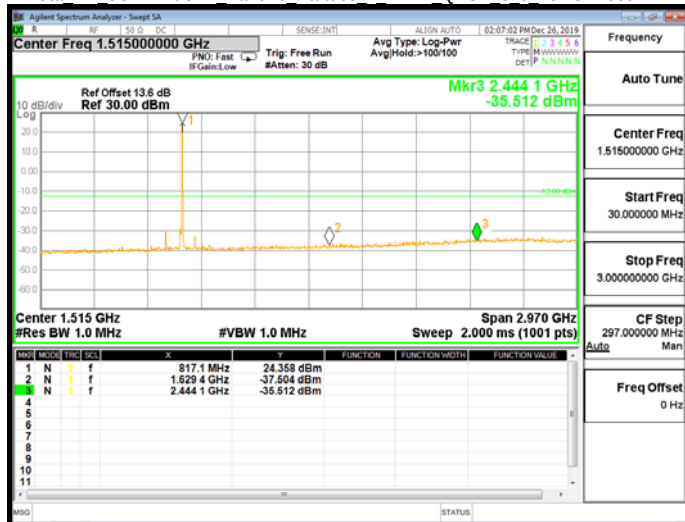
Cat M1 3GHz~10GHz Band26 1 4MHz 16QAM 6 0 LowCH26797



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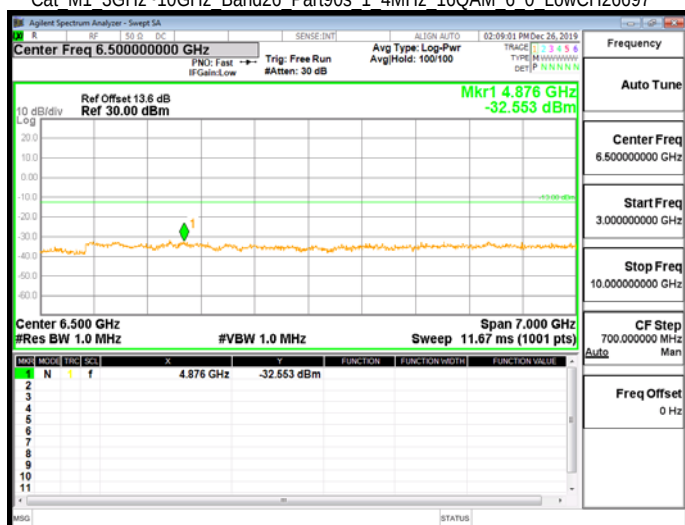
Cat M1 3GHz~10GHz Band26 Part90s 1 4MHz QPSK 6 0 LowCH26697



Cat M1 3GHz~10GHz Band26 Part90s 1 4MHz QPSK 6 0 LowCH26697



Cat M1 3GHz~10GHz Band26 Part90s 1 4MHz 16QAM 6 0 LowCH26697

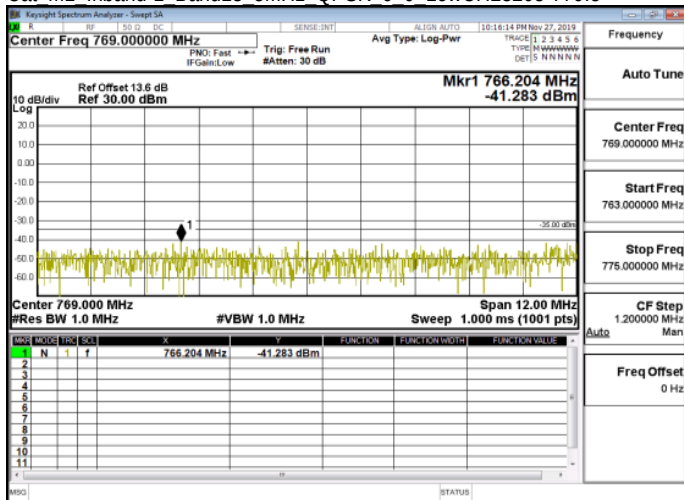


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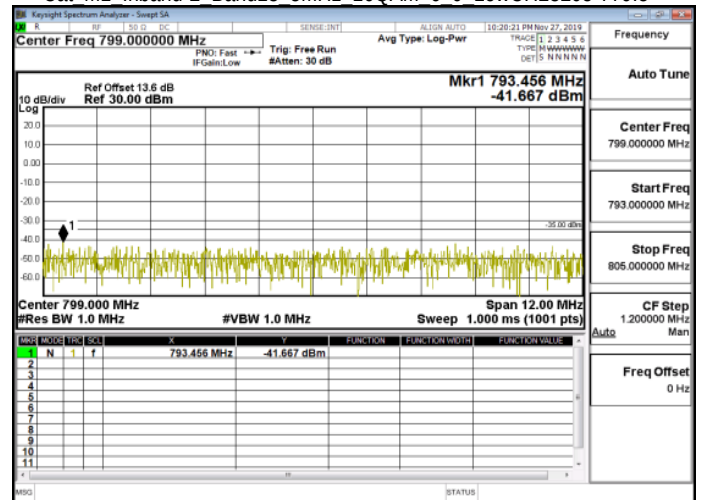
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8.5.3 Emissions outside the 746–758, 776–788 MHz

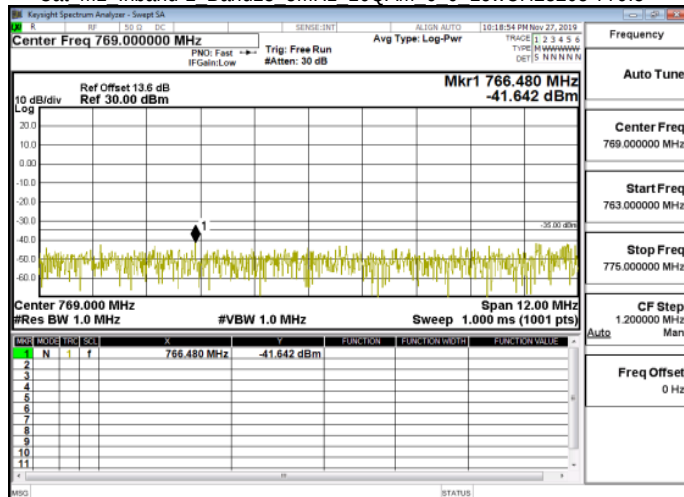
Cat M1 Inband-1 Band13 5MHz QPSK 6 0 LowCH23205-779.5



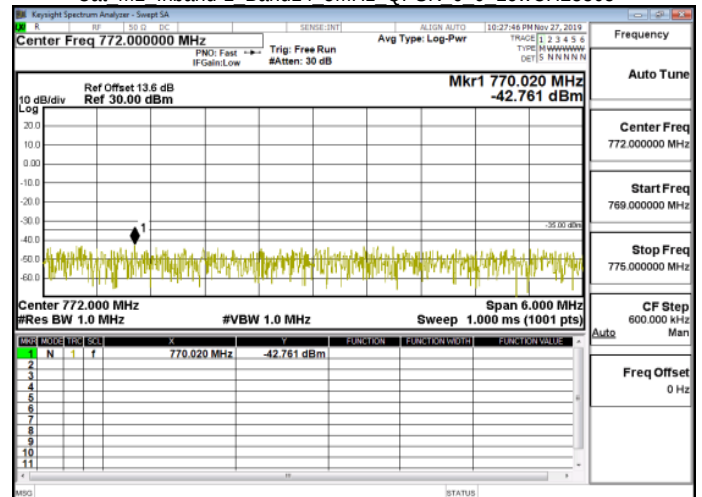
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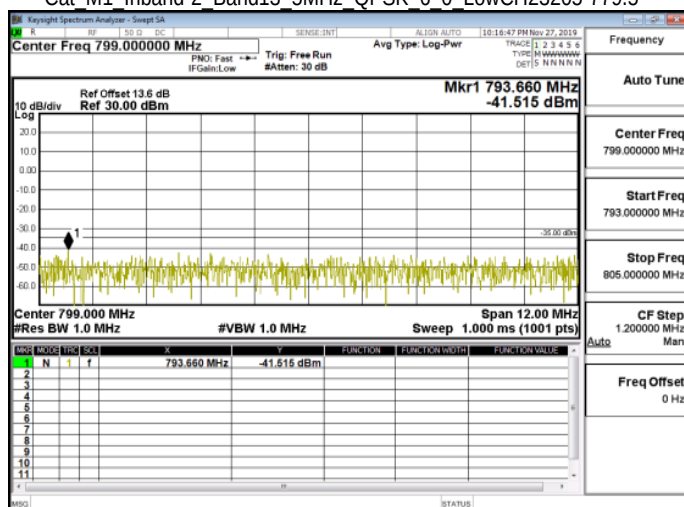
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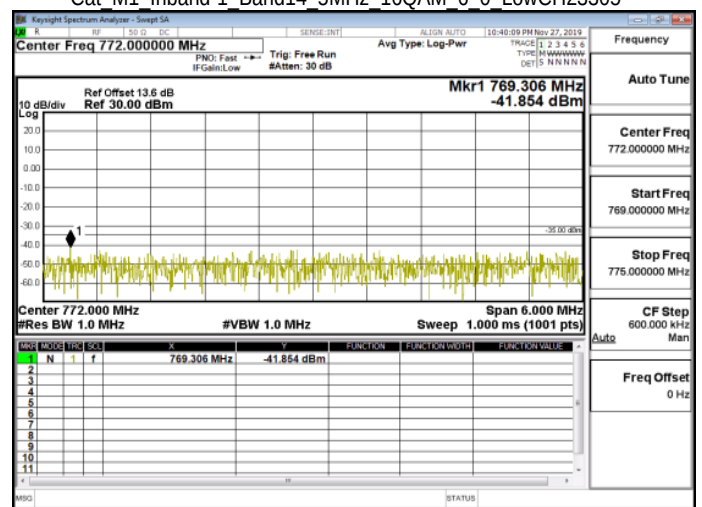
Cat M1 Inband-1 Band14 5MHz QPSK 6 0 LowCH23305



Cat M1 Inband-2 Band13 5MHz QPSK 6 0 LowCH23205-779.5



Cat M1 Inband-1 Band14 5MHz 16QAM 6 0 LowCH23305

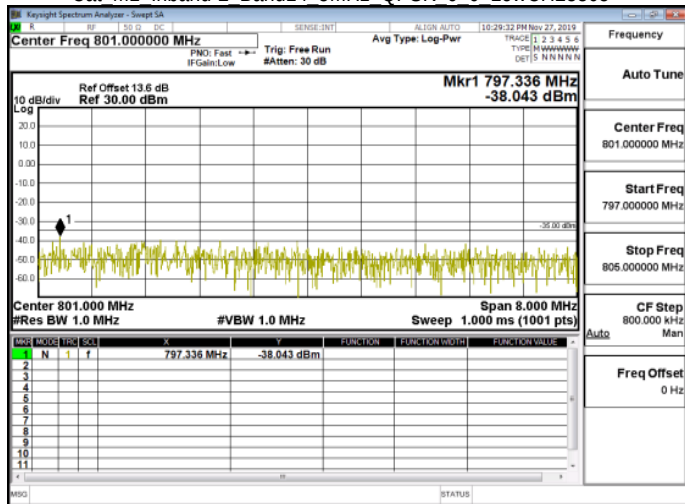


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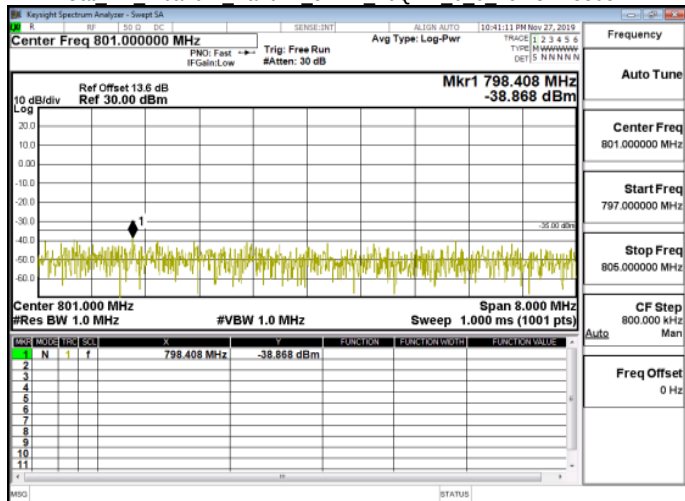
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Cat M1 Inband-2 Band14 5MHz QPSK 6 0 LowCH23305



Cat M1 Inband-2 Band14 5MHz 16QAM 6 0 LowCH23305



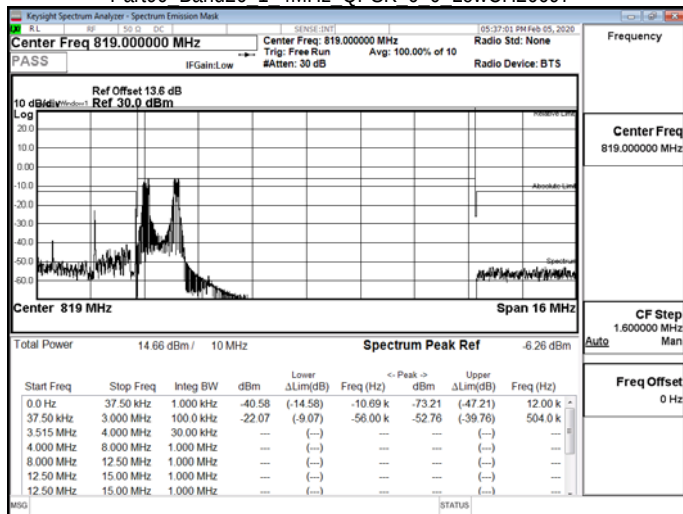
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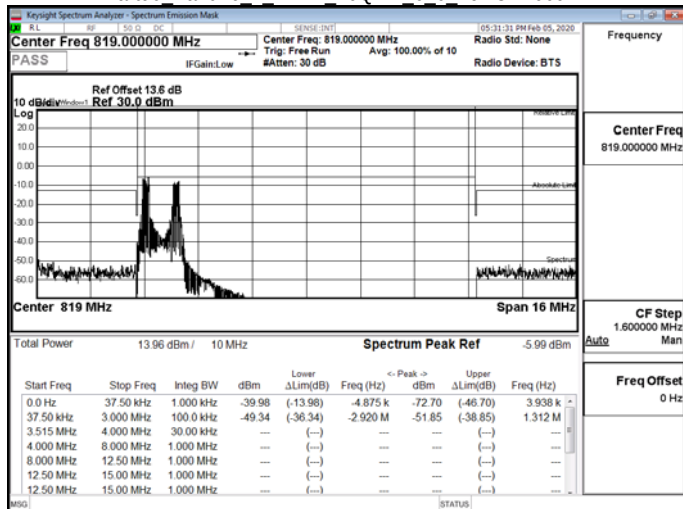
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8.5.4 Emission Mask

Part90 Band26 1 4MHz QPSK 6 0 LowCH26697



Part90 Band26 1 4MHz 16QAM 6 0 LowCH26697



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9 FIELD STRENGTH OF SPURIOUS RADIATION MEASUREMENT

9.1 Standard Applicable

According to FCC §2.1053,

FCC §22.917(a), §24.238(a), §27.53(h)

RSS-130 §4.7, RSS-132 §5.5, RSS-139 §6.5, RSS-139 §6.6

Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

FCC §27.53(c) for B13

For operations in the 746–758 MHz band and the 776–788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(2) On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB (-13dBm)

(4) On all frequencies between 763–775 MHz and 793–805 MHz, by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations;

FCC §27.53 (f) for B13

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

FCC §27.53(c) (5) & FCC §27.53(g) for B12, 13

Compliance for operations in the 600 MHz, 698–746 MHz, 746–758 MHz and the 776–788 MHz band with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

RSS-130 §4.7.1 for B12, 13

Compliance for operations in the 617–652 MHz, 663–698 MHz, 698–756 MHz and the 777–787 MHz band, the unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

RSS-130 §4.7.2 for B13

In addition to the limit outlined in section 4.7.1 above, equipment operating in the frequency bands 746–756 MHz and 777–787 MHz shall also comply with the following restrictions:

the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763–775 MHz and 793–806 MHz shall be attenuated below the transmitter power, P (dBW), by at least:

$76 + 10 \log_{10} p$ (watts), dB, for base and fixed equipment and

$65 + 10 \log_{10} p$ (watts), dB, for mobile and portable equipment

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the e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW/MHz for wideband signal and -80 dBW for discrete emission with bandwidth less than 700 Hz.

FCC §27.53(h)(3) for B4

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's 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 emissions are attenuated at least 26 dB below the transmitter power.

§90.691 Emission mask requirements for EA-based systems for B26

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $116 \text{ Log}_{10}(f/6.1)$ decibels or $50 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \text{ Log}_{10}(P)$ decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

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Table 2 — Unwanted Emissions for Mobile, Portable and Low-Power Fixed Subscriber Equipment

Frequency (MHz)	Attenuation (dB)
<2200	$43 + 10 \log_{10}(p)$
2200 - 2288	$70 + 10 \log_{10}(p)$
2288 - 2292	$67 + 10 \log_{10}(p)$
2292 - 2296	$61 + 10 \log_{10}(p)$
2296 - 2300	$55 + 10 \log_{10}(p)$
2300 - 2305	$43 + 10 \log_{10}(p)$
2305 - 2320	$43 + 10 \log_{10}(p)$ ^{Note}
2320 - 2324	$55 + 10 \log_{10}(p)$
2324 - 2328	$61 + 10 \log_{10}(p)$
2328 - 2337	$67 + 10 \log_{10}(p)$
2337 - 2341	$61 + 10 \log_{10}(p)$
2341 - 2345	$55 + 10 \log_{10}(p)$
2345 - 2360	$43 + 10 \log_{10}(p)$ ^{Note}
2360 - 2365	$43 + 10 \log_{10}(p)$
2365 - 2395	$70 + 10 \log_{10}(p)$
>2395	$43 + 10 \log_{10}(p)$

Note: Measured at the edges of the highest and lowest frequency range(s) in which the equipment is designed to operate. See Section 1.2 for the permitted frequency ranges for various equipment types.

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