

# Appendix B

**E-UTRA Band 13**

## TABLE OF CONTENTS

<b>1. MAIN TEST INSTRUMENTS</b> .....	<b>3</b>
<b>2. MEASUREMENT UNCERTAINTY</b> .....	<b>3</b>
<b>3 EFFECTIVE (ISOTROPIC) RADIATED POWER</b> .....	<b>4</b>
3.1. TEST RESULT .....	4
<b>4. PEAK-TO-AVERAGE RATIO (CCDF)</b> .....	<b>6</b>
4.1. TEST RESULT .....	6
4.2. TEST PLOTS.....	6
<b>5. MODULATION CHARACTERISTICS</b> .....	<b>7</b>
5.1. TEST MODE = LTE /TM1 10MHZ.....	7
5.1.1. TEST CHANNEL = MCH.....	7
5.2. TEST MODE = LTE /TM2 10MHZ.....	8
5.2.1. TEST CHANNEL = MCH.....	8
<b>6. 26DB BANDWIDTH AND OCCUPIED BANDWIDTH</b> .....	<b>9</b>
6.1. TEST RESULT .....	9
6.2. TEST PLOTS.....	9
<b>7. BAND EDGE COMPLIANCE</b> .....	<b>12</b>
7.1. TEST PLOTS.....	12
<b>8. SPURIOUS EMISSION AT ANTENNA TERMINAL</b> .....	<b>17</b>
8.1. TEST PLOTS.....	17
<b>9. FREQUENCY STABILITY</b> .....	<b>18</b>
9.1. FREQUENCY VS VOLTAGE .....	18
9.2. FREQUENCY VS TEMPERATURE .....	18

## 1. Main Test Instruments

RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018/3/13	2021/3/12
Spectrum Analyzer (20Hz-43GHz)	Rohde & Schwarz	FSU43	SEM004-08	2019/3/2	2020/3/1
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017/6/27	2020/6/26
Horn Antenna (800MHz-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018/4/13	2021/4/12
Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017/10/17	2020/10/16
Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2019/7/14	2020/7/14
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2019/7/14	2020/7/14
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	EMC2063	2019/9/20	2020/9/19
Pre-amplifier (26-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2019/3/2	2020/3/1
Band filter	N/A	N/A	N/A	N/A	N/A
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2019/6/12	2020/6/11
Wideband Radio Communication Tester	Anristu	MT8821C	6201462742	2019/4/3	2020/4/3
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	W005-02	2019/1/13	2020/1/12
RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal.Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
Dual Output Mobile Communication DC Source	Agilent Technologies Inc	66311B	W009-09	2018/11/2	2019/11/1
Signal Analyzer	Rohde & Schwarz	FSV	W005-02	2019/3/2	2020/3/1
Coaxial Cable	SGS	N/A	SEM031-01	2019/6/12	2020/6/11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/11/2	2019/11/1
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	HTC-1	W006-17	2018/11/2	2019/11/1
Temperature Chamber	GIANT FORCE	ICT-150-40-CP-AR	W027-03	2018/11/2	2019/11/1
Wideband Radio Communication Tester	Anristu	MT8821C	6201462742	2019/3/2	2020/3/1

## 2. Measurement Uncertainty

For a 95% confidence level ( $k = 2$ ), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item	Extended Uncertainty	Data
Transmit Output Power Data	Power [dBm]	$U = \pm 0.37$ dB
Bandwidth	Magnitude [%]	$U = \pm 0.2\%$
Band Edge Compliance	Disturbance Power [dBm]	$U = \pm 2.0$ dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	$U = \pm 2.0$ dB
Frequency Stability	Frequency Accuracy [ppm]	$U = \pm 0.24$ ppm

## 3 Effective (Isotropic) Radiated Power

### 3.1. Test Result

Band	Bandwidth	Modulation	Channel	RB Configuration	Conducted Power(dBm)	ERP (dBm)	Limit (dBm)	Verdict
Band13	5MHz	QPSK	23205	1RB#12	22.95	19.10	34.77	PASS
Band13	5MHz	QPSK	23205	1RB#24	22.68	18.83	34.77	PASS
Band13	5MHz	QPSK	23205	1RB#0	22.71	18.86	34.77	PASS
Band13	5MHz	QPSK	23205	12RB#0	21.85	18.00	34.77	PASS
Band13	5MHz	QPSK	23205	12RB#6	21.91	18.06	34.77	PASS
Band13	5MHz	QPSK	23205	12RB#13	21.89	18.04	34.77	PASS
Band13	5MHz	QPSK	23205	25RB#0	21.89	18.04	34.77	PASS
Band13	5MHz	QPSK	23230	1RB#0	22.72	18.87	34.77	PASS
Band13	5MHz	QPSK	23230	1RB#12	23.04	19.19	34.77	PASS
Band13	5MHz	QPSK	23230	1RB#24	22.66	18.81	34.77	PASS
Band13	5MHz	QPSK	23230	12RB#0	21.80	17.95	34.77	PASS
Band13	5MHz	QPSK	23230	12RB#6	21.90	18.05	34.77	PASS
Band13	5MHz	QPSK	23230	12RB#13	21.87	18.02	34.77	PASS
Band13	5MHz	QPSK	23230	25RB#0	21.82	17.97	34.77	PASS
Band13	5MHz	QPSK	23255	1RB#24	22.67	18.82	34.77	PASS
Band13	5MHz	QPSK	23255	1RB#0	22.69	18.84	34.77	PASS
Band13	5MHz	QPSK	23255	1RB#12	22.95	19.10	34.77	PASS
Band13	5MHz	QPSK	23255	12RB#6	21.88	18.03	34.77	PASS
Band13	5MHz	QPSK	23255	12RB#0	21.82	17.97	34.77	PASS
Band13	5MHz	QPSK	23255	12RB#13	21.81	17.96	34.77	PASS
Band13	5MHz	QPSK	23255	25RB#0	21.83	17.98	34.77	PASS
Band13	5MHz	16QAM	23205	1RB#12	22.12	18.27	34.77	PASS
Band13	5MHz	16QAM	23205	1RB#0	21.89	18.04	34.77	PASS
Band13	5MHz	16QAM	23205	1RB#24	21.95	18.10	34.77	PASS
Band13	5MHz	16QAM	23205	12RB#13	20.90	17.05	34.77	PASS
Band13	5MHz	16QAM	23205	12RB#6	20.93	17.08	34.77	PASS
Band13	5MHz	16QAM	23205	12RB#0	20.85	17.00	34.77	PASS
Band13	5MHz	16QAM	23205	25RB#0	20.84	16.99	34.77	PASS
Band13	5MHz	16QAM	23230	1RB#0	21.94	18.09	34.77	PASS
Band13	5MHz	16QAM	23230	1RB#12	22.24	18.39	34.77	PASS
Band13	5MHz	16QAM	23230	1RB#24	21.88	18.03	34.77	PASS
Band13	5MHz	16QAM	23230	12RB#0	20.77	16.92	34.77	PASS
Band13	5MHz	16QAM	23230	12RB#6	20.88	17.03	34.77	PASS
Band13	5MHz	16QAM	23230	12RB#13	20.86	17.01	34.77	PASS
Band13	5MHz	16QAM	23230	25RB#0	20.79	16.94	34.77	PASS
Band13	5MHz	16QAM	23255	1RB#0	21.97	18.12	34.77	PASS
Band13	5MHz	16QAM	23255	1RB#12	22.17	18.32	34.77	PASS
Band13	5MHz	16QAM	23255	1RB#24	21.91	18.06	34.77	PASS
Band13	5MHz	16QAM	23255	12RB#13	20.78	16.93	34.77	PASS
Band13	5MHz	16QAM	23255	12RB#0	20.84	16.99	34.77	PASS
Band13	5MHz	16QAM	23255	12RB#6	20.91	17.06	34.77	PASS
Band13	5MHz	16QAM	23255	25RB#0	20.82	16.97	34.77	PASS
Band13	10MHz	QPSK	23230	1RB#49	22.72	18.87	34.77	PASS
Band13	10MHz	QPSK	23230	1RB#24	22.94	19.09	34.77	PASS
Band13	10MHz	QPSK	23230	1RB#0	22.81	18.96	34.77	PASS
Band13	10MHz	QPSK	23230	25RB#0	21.91	18.06	34.77	PASS
Band13	10MHz	QPSK	23230	25RB#12	21.89	18.04	34.77	PASS

# JianYan Testing Group Shenzhen Co., Ltd.

Report No: JYTSZB-R12-2102954

Band13	10MHz	QPSK	23230	25RB#25	21.92	18.07	34.77	PASS
Band13	10MHz	QPSK	23230	50RB#0	21.89	18.04	34.77	PASS
Band13	10MHz	16QAM	23230	1RB#49	21.97	18.12	34.77	PASS
Band13	10MHz	16QAM	23230	1RB#0	21.99	18.14	34.77	PASS
Band13	10MHz	16QAM	23230	1RB#24	22.16	18.31	34.77	PASS
Band13	10MHz	16QAM	23230	25RB#0	20.87	17.02	34.77	PASS
Band13	10MHz	16QAM	23230	25RB#12	20.88	17.03	34.77	PASS
Band13	10MHz	16QAM	23230	25RB#25	20.89	17.04	34.77	PASS
Band13	10MHz	16QAM	23230	50RB#0	20.87	17.02	34.77	PASS

Remark:

a: For getting the EIRP (Efficient Isotropic Radiated Power), the following formula should be taken to calculate it,

ERP [dBm] = Conducted Power [dBm] + Gain [dBd]

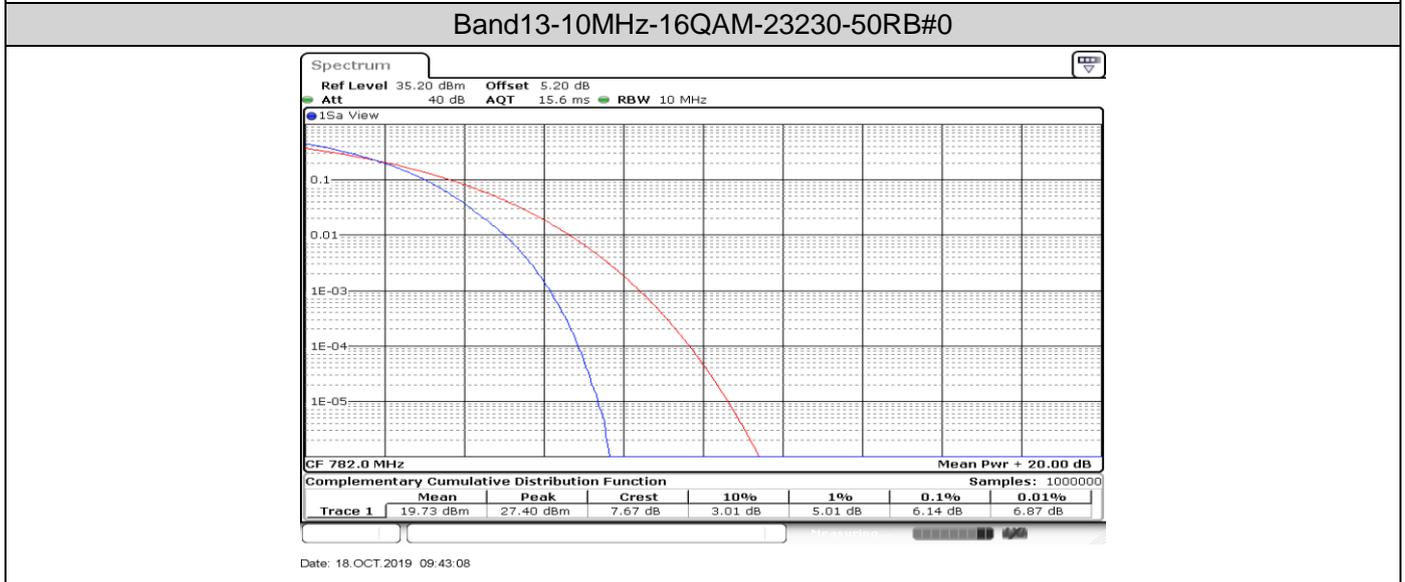
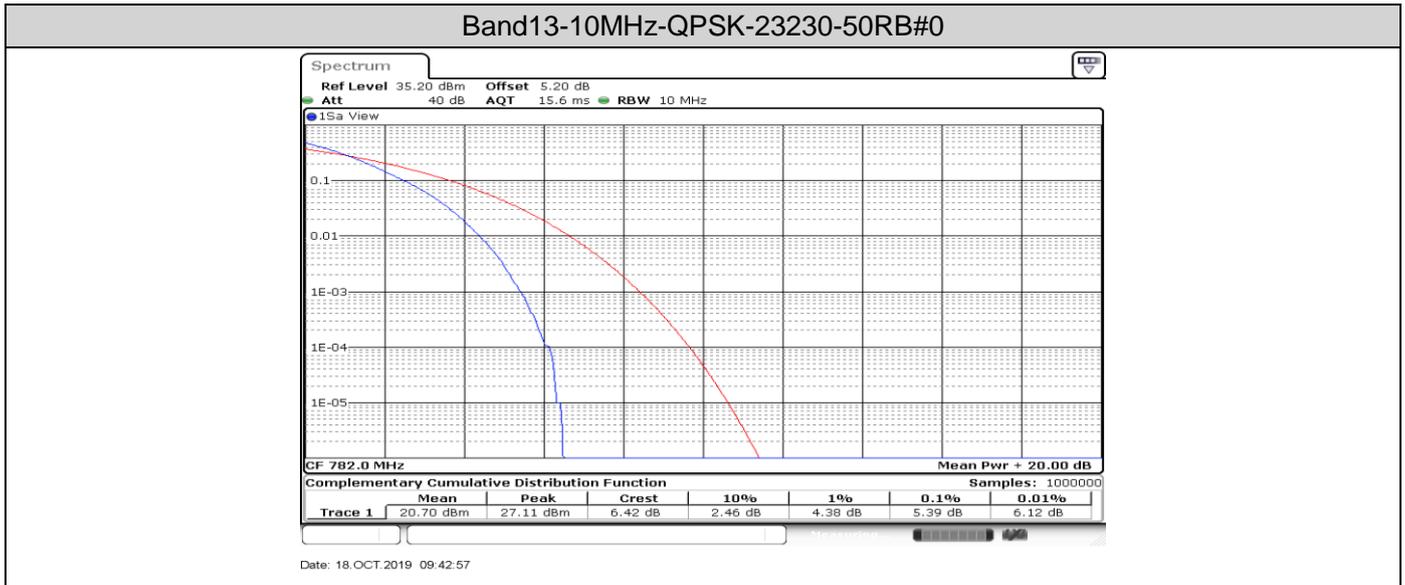
EIRP [dBm] = Conducted Power [dBm] + Gain [dBi]

## 4. Peak-to-Average Ratio (CCDF)

### 4.1. Test Result

Band	Bandwidth	Modulation	Channel	RB Configuration	Result(dB)	Limit(dB)	Verdict
Band13	10MHz	QPSK	23230	50RB#0	5.39	13	PASS
Band13	10MHz	16QAM	23230	50RB#0	6.14	13	PASS

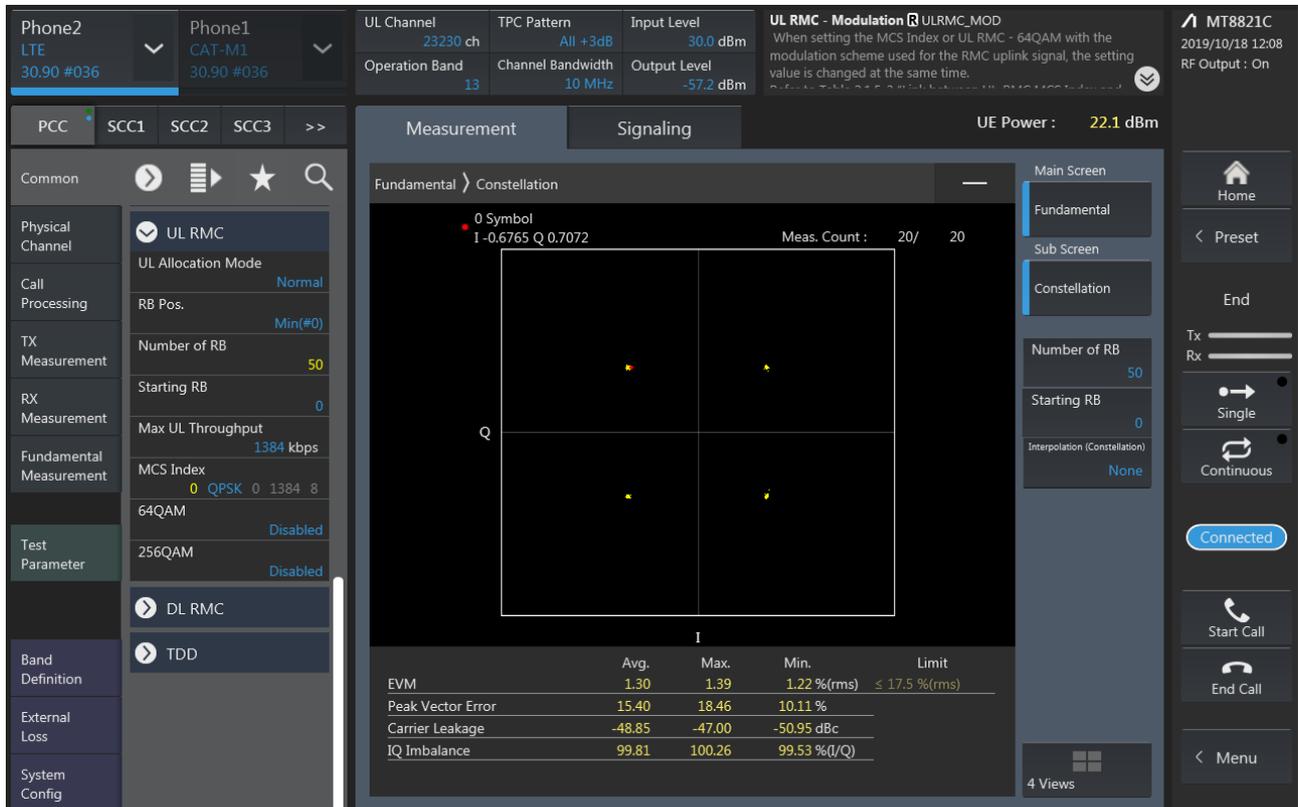
### 4.2. Test Plots



## 5. Modulation Characteristics

### 5.1. Test Mode = LTE /TM1 10MHz

#### 5.1.1. Test Channel = MCH



## 5.2. Test Mode = LTE /TM2 10MHz

### 5.2.1. Test Channel = MCH

The screenshot displays a mobile testing software interface with the following sections:

- Top Bar:** Phone2 (LTE, 30.90 #036), Phone1 (CAT-M1, 30.90 #036), UL Channel (23230 ch), TPC Pattern (All +3dB), Input Level (30.0 dBm), UL RMC - Number of RB (ULRMC\_RB), and MT8821C (2019/10/18 12:08, RF Output: On).
- Configuration Panel (Left):**
  - Physical Channel: UL RMC (UL Allocation Mode: Normal)
  - Call Processing: RB Pos. (Min(#0))
  - TX Measurement: Number of RB (50)
  - RX Measurement: Starting RB (0), Max UL Throughput (8760 kbps)
  - Fundamental Measurement: MCS Index (11 16QAM 10 8760 8), 64QAM (Disabled), 256QAM (Disabled)
  - Test Parameter: DL RMC, TDD
  - Band Definition, External Loss, System Config
- Measurement Panel (Center):**
  - Measurement: Fundamental Constellation
  - 0 Symbol: I -0.9115 Q 0.9574
  - Meas. Count: 20/ 20
  - Constellation Diagram: A 2D plot showing 4 QAM symbols.
  - Table below the diagram:

	Avg.	Max.	Min.	Limit
EVM	1.50	1.63	1.41%(rms)	≤ 12.5 %(rms)
Peak Vector Error	15.83	24.95	10.44 %	
Carrier Leakage	-49.06	-46.84	-50.72 dBc	
IQ Imbalance	99.94	100.33	99.57 %(I/Q)	
- Right Panel:** UE Power: 21.1 dBm, Main Screen (Fundamental, Constellation), Number of RB (50), Starting RB (0), Interpolation (Constellation) (None), Connected status, and Home/End/Start Call/End Call/Menu buttons.

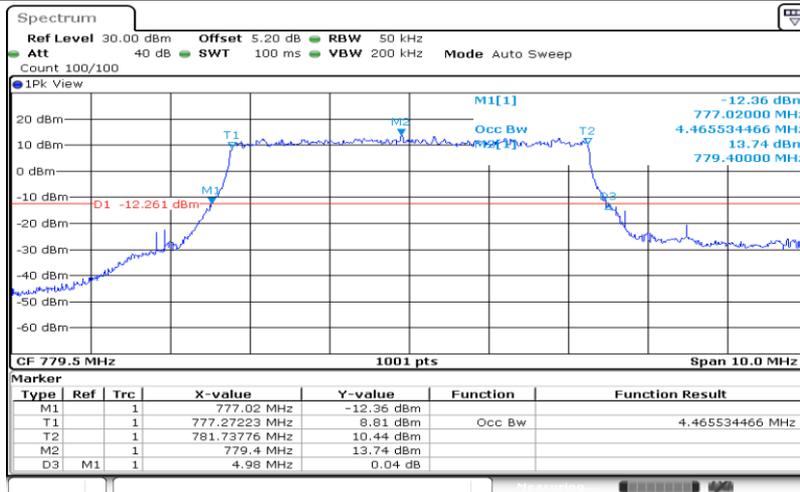
## 6. 26dB Bandwidth and Occupied Bandwidth

### 6.1. Test Result

Band	Bandwidth	Modulation	Channel	RB Configuration	Occupied Bandwidth (MHz)	26dB Bandwidth (MHz)	Verdict
Band13	5MHz	QPSK	23205	25RB#0	4.466	4.980	PASS
Band13	5MHz	QPSK	23230	25RB#0	4.476	5.080	PASS
Band13	5MHz	QPSK	23255	25RB#0	4.486	5.020	PASS
Band13	5MHz	16QAM	23205	25RB#0	4.486	5.020	PASS
Band13	5MHz	16QAM	23230	25RB#0	4.496	5.100	PASS
Band13	5MHz	16QAM	23255	25RB#0	4.486	5.090	PASS
Band13	10MHz	QPSK	23230	50RB#0	8.931	9.920	PASS
Band13	10MHz	16QAM	23230	50RB#0	8.931	9.900	PASS

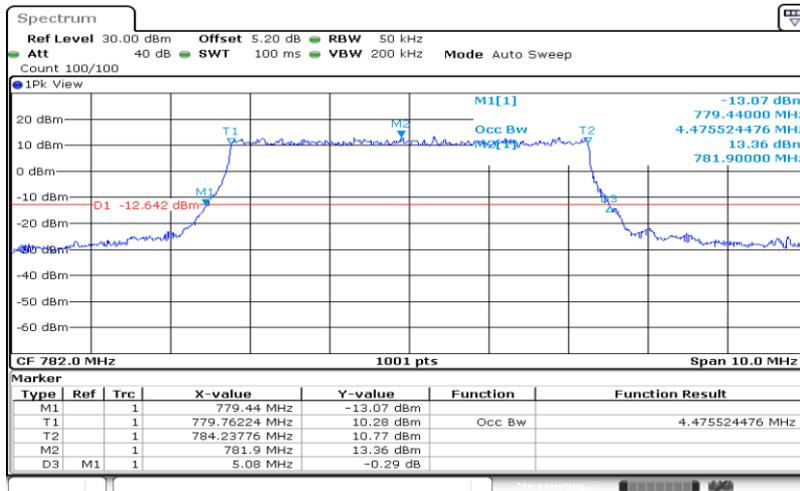
### 6.2. Test Plots

Band13-5MHz-QPSK-23205-25RB#0-4.466



Date: 18.OCT.2019 09:34:47

Band13-5MHz-QPSK-23230-25RB#0-4.476



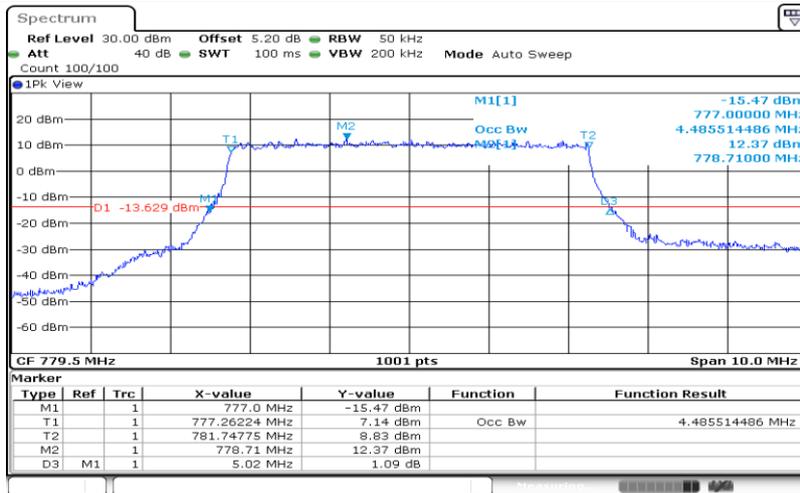
Date: 18.OCT.2019 09:35:28

## Band13-5MHz-QPSK-23255-25RB#0-4.486



Date: 18.OCT.2019 09:36:08

## Band13-5MHz-16QAM-23205-25RB#0-4.486



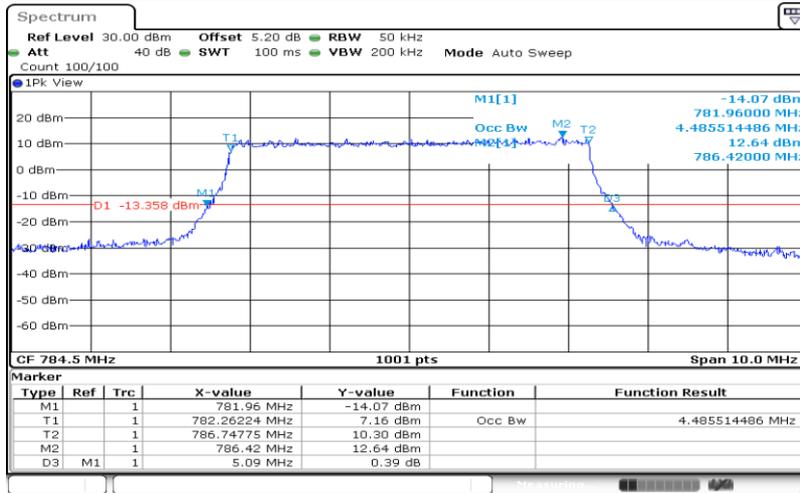
Date: 18.OCT.2019 09:35:07

## Band13-5MHz-16QAM-23230-25RB#0-4.496



Date: 18.OCT.2019 09:35:47

## Band13-5MHz-16QAM-23255-25RB#0-4.486



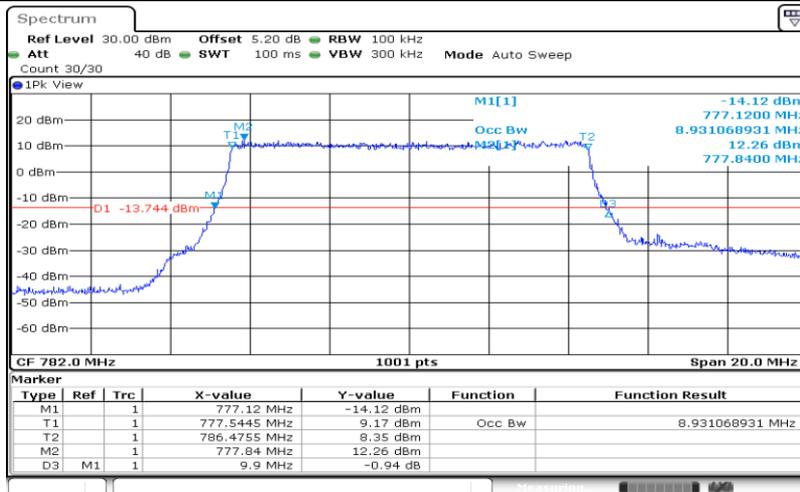
Date: 18.OCT.2019 09:36:27

## Band13-10MHz-QPSK-23230-50RB#0-8.931



Date: 18.OCT.2019 09:36:45

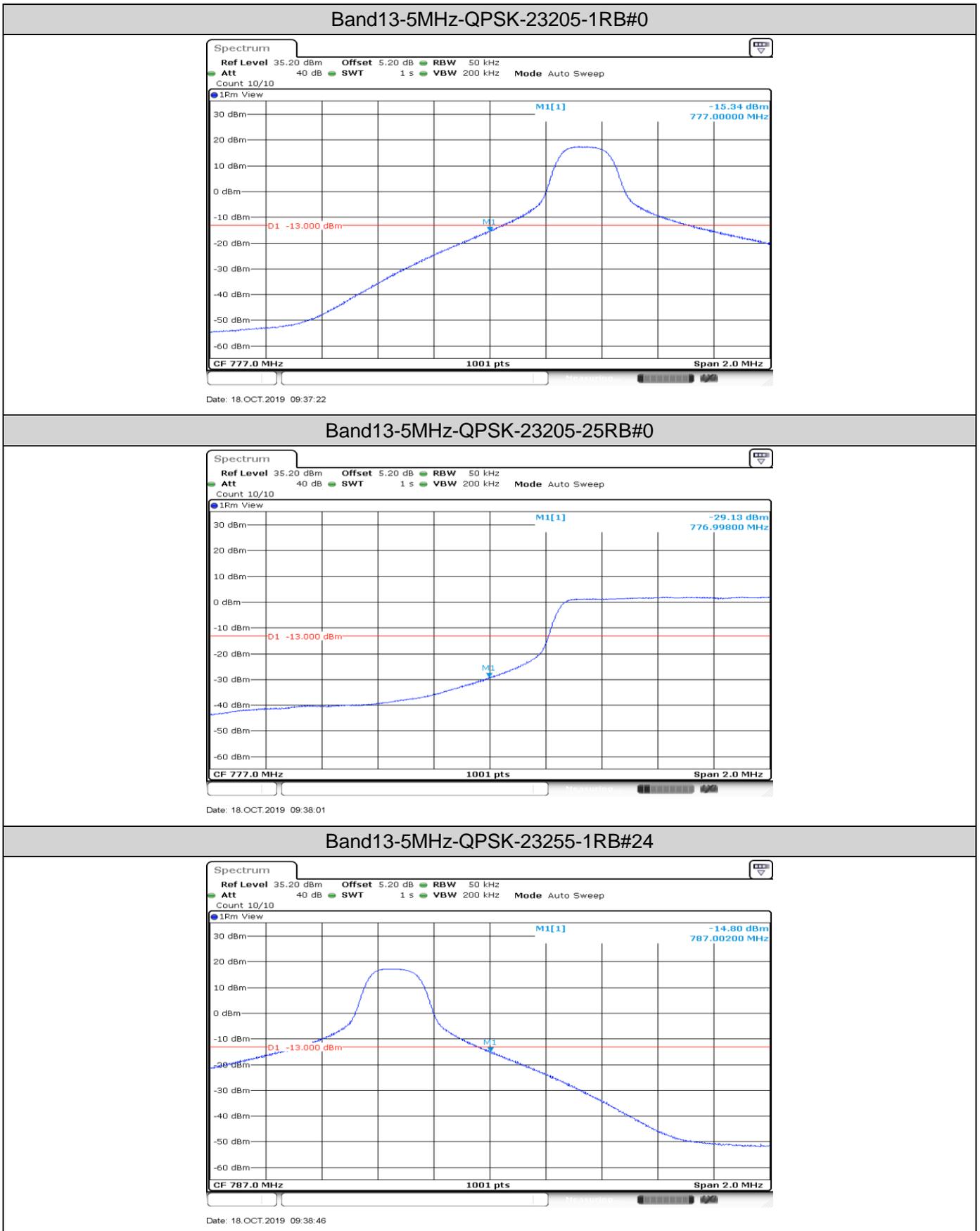
## Band13-10MHz-16QAM-23230-50RB#0-8.931



Date: 18.OCT.2019 09:36:58

## 7. Band Edge Compliance

### 7.1. Test Plots

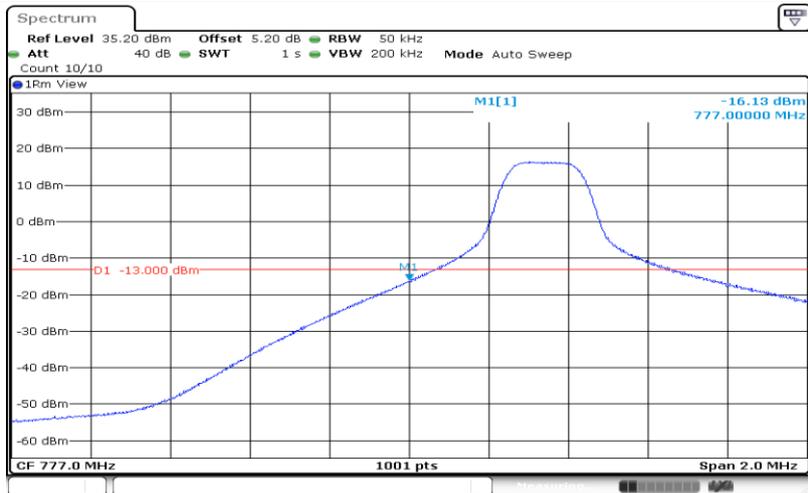


## Band13-5MHz-QPSK-23255-25RB#0



Date: 18.OCT.2019 09:39:25

## Band13-5MHz-16QAM-23205-1RB#0



Date: 18.OCT.2019 09:37:41

## Band13-5MHz-16QAM-23205-25RB#0



Date: 18.OCT.2019 09:38:21

## Band13-5MHz-16QAM-23255-1RB#24



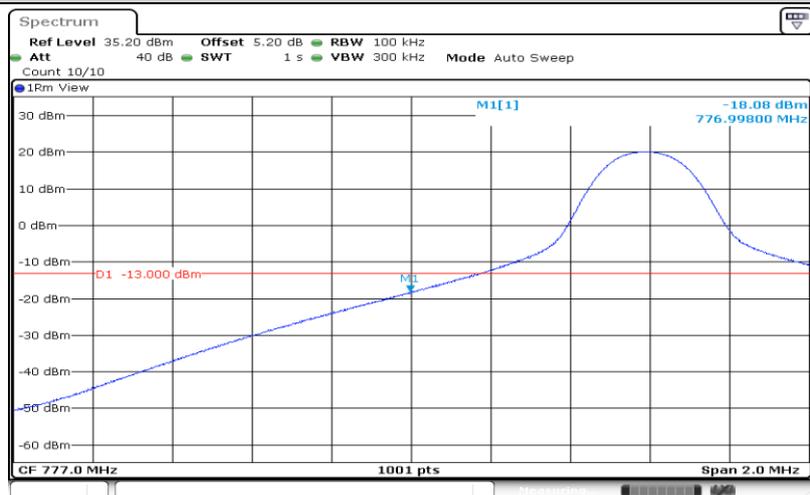
Date: 18.OCT.2019 09:39:05

## Band13-5MHz-16QAM-23255-25RB#0



Date: 18.OCT.2019 09:39:44

## Band13-10MHz-QPSK-23230\_Left-1RB#0



Date: 18.OCT.2019 09:40:09

## Band13-10MHz-QPSK-23230\_Right-1RB#49



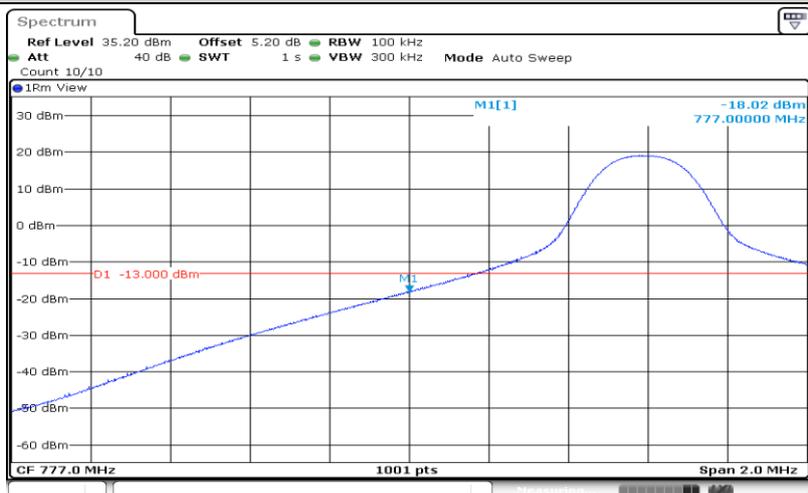
Date: 18.OCT.2019 09:40:52

## Band13-10MHz-QPSK-23230\_Right-50RB#0



Date: 18.OCT.2019 09:41:31

## Band13-10MHz-16QAM-23230\_Left-1RB#0



Date: 18.OCT.2019 09:40:28

## Band13-10MHz-16QAM-23230\_Right-1RB#49



Date: 18.OCT.2019 09:41:11

## Band13-10MHz-16QAM-23230\_Right-50RB#0



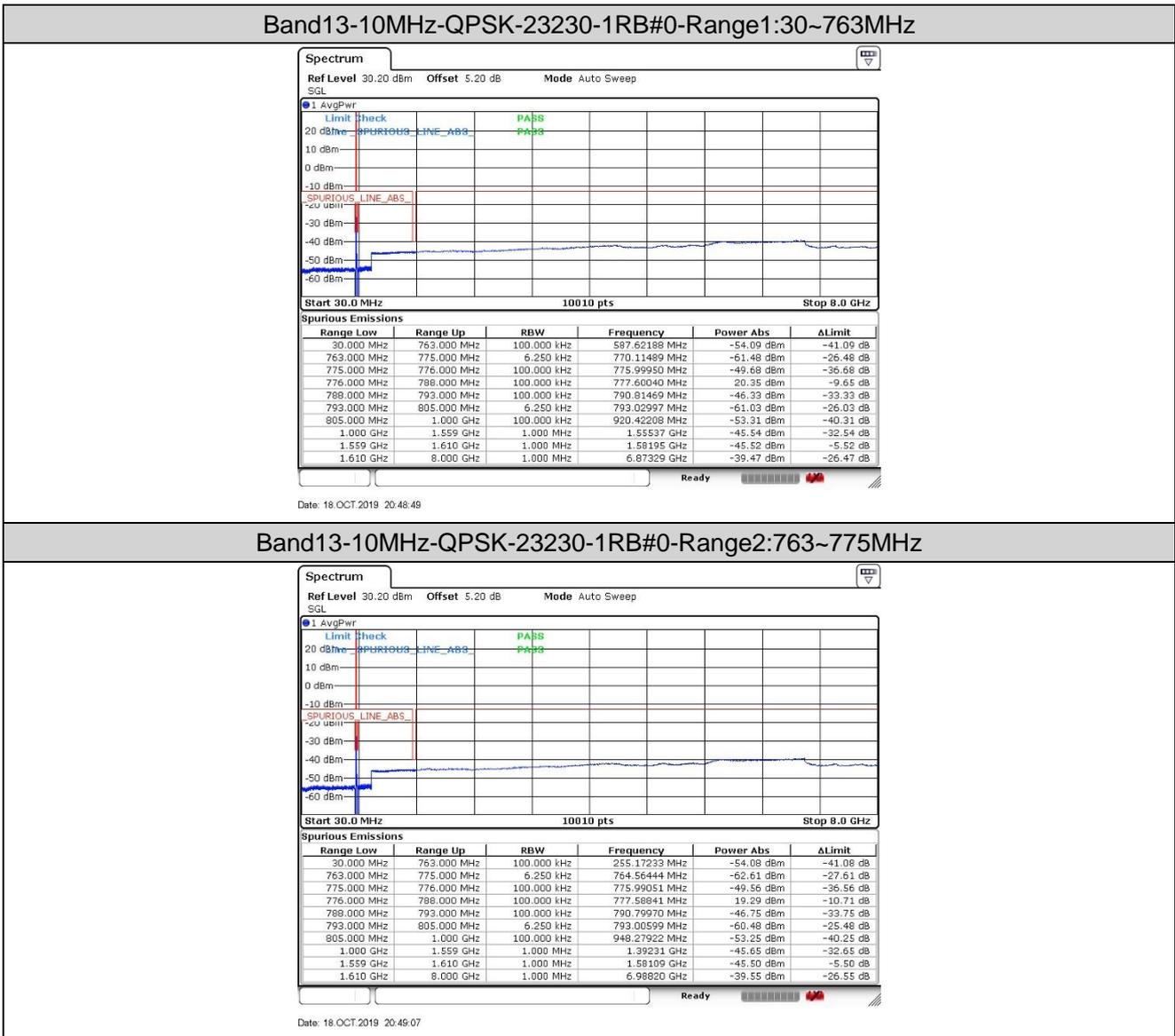
Date: 18.OCT.2019 09:41:50

## 8. Spurious Emission at Antenna Terminal

Remark1: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of  $< RBW/2$  so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points =  $k * (\text{Span} / RBW)$ " with  $k$  between 4 and 5, which results in an acceptable level error of less than 0.5 dB.

Remark2: only the worst case data displayed in this report.

### 8.1. Test Plots



## 9. Frequency Stability

### 9.1. Frequency Vs Voltage

Band	Bandwidth	Modulation	Channel	RB Configure	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
Band13	10MHz	QPSK	23230	50RB#0	VL	NT	-9.10	-0.011637	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	VN	NT	-6.20	-0.007928	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	VH	NT	-5.70	-0.007289	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	VL	NT	-1.20	-0.001535	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	VN	NT	-8.70	-0.011125	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	VH	NT	-4.90	-0.006266	±2.5	PASS

### 9.2. Frequency Vs Temperature

Band	Bandwidth	Modulation	Channel	RB Configure	Voltage [Vdc]	Temperature (°C)	Deviation (Hz)	Deviation (ppm)	Limit (ppm)	Verdict
Band13	10MHz	QPSK	23230	50RB#0	NV	-30	-3.10	-0.003964	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	NV	-20	-5.40	-0.006905	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	NV	0	-1.90	-0.002430	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	NV	10	-1.10	-0.001407	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	NV	20	-9.40	-0.012020	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	NV	30	-1.30	-0.001662	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	NV	40	-2.00	-0.002558	±2.5	PASS
Band13	10MHz	QPSK	23230	50RB#0	NV	50	-2.10	-0.002685	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	-30	-6.00	-0.007673	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	-20	-6.60	-0.008440	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	0	1.00	0.001279	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	10	-10.40	-0.013299	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	20	-2.30	-0.002941	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	30	-3.20	-0.004092	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	40	-5.10	-0.006522	±2.5	PASS
Band13	10MHz	16QAM	23230	50RB#0	NV	50	-2.20	-0.002813	±2.5	PASS

The End